Appendix 2: Construction Plans

Grading and Drainage Plans

CITY OF LAKE ELSINORE

GRADING NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF LAKE ELSINORE MUNICIPAL CODE, CHAPTER 15.12 AND APPLICABLE STANDARDS AND SPECIFICATIONS AND THE LATEST EDITION OF THE UNIFORM BUILDING CODE (U.B.C.), CHAPTER 33.
2. A PERMIT SHALL BE OBTAINED FROM THE ENGINEERING DEPARTMENT, CITY OF LAKE ELSINORE, PRIOR TO ANY OPERATIONS.
3. THE DEVELOPER AND/OR THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND U.S.A. ALERT (1- 800-422-4133) FORTY-EIGHT (48) HOURS PRIOR TO GRADING.
4. THE CONTRACTOR SHALL NOTIFY THE CITY ENGINEERING DEPARTMENT AT LEAST TWENTY-FOUR (24) HOURS IN ADVANCE OF BEGINNING GRADING OPERATIONS.
5. DUST SHALL BE CONTROLLED BY WATERING OR OTHER METHODS APPROVED BY THE CITY ENGINEER.
6. CUT SLOPES SHALL BE NO STEEPER THAN 2 HORIZONTAL TO 1 VERTICAL, UNLESS OTHERWISE APPROVED, AND SHALL BE SHOWN ON THE PLAN.
7. FILL SLOPES SHALL BE NO STEEPER THAN 2 HORIZONTAL TO 1 VERTICAL, UNLESS OTHERWISE APPROVED, SHALL BE SHOWN ON PLAN, AND SHALL NOT HAVE LESS THAN 90% RELATIVE COMPACTION OUT TO THE FINISHED SURFACE.
8. FILLS SHALL BE COMPACTED THROUGHOUT TO 90% DENSITY AS DETERMINED BY THE MODIFIED THREE (3) LAYER A.S.T.M. D-1557-70 TEST METHOD.
9. FILL AREAS SHALL BE CLEANED OF ALL VEGETATION AND DEBRIS, SCARIFIED, AND INSPECTED BY THE GRADING INSPECTOR AND APPROVED SOILS TESTING AGENCY PRIOR TO THE PLACING OF FILL.
10. ALL FILL MATERIAL SHALL BE CLEAN EARTH. NO FILL SHALL BE PLACED UNTIL PREPARATION OF GROUND IS APPROVED BY THE SOILS ENGINEER.
11. FINISH GRADE SHALL BE SLOPED AWAY FROM ALL EXTERIOR WALLS AT NOT LESS THAN 1/2" PER FOOT FOR A MINIMUM OF THREE (3) FEET, THEN 1% (MINIMUM) TO FLOW LINE OF EARTH SWALE.
12. MINIMUM BUILDING PAD AND DRAINAGE SWALE SLOPE SHALL BE 1% IF CUT OR FILL SLOPE IS LESS THAN TEN FEET (10'), AND 2% IF CUT OR FILL IS GREATER THAN TEN FEET (10'). DRAINAGE SWALES SHALL BE A MINIMUM OF 0.5' DEEP AND CONSTRUCTED A MINIMUM OF TWO FEET (2') FROM THE TOP OF CUT OR FILL SLOPES.
13. PROVIDE 5' WIDE BY 1' HIGH BERM OR EQUIVALENT ALONG THE TOP OF ALL FILL SLOPES OVER 5' HIGH.
14. PROVIDE A BROW DITCH, DESIGNED TO HANDLE ONE HUNDRED (100) YEAR STORM FLOWS ALONG THE TOP OF CUT SLOPES.
15. NO OBSTRUCTION OF FLOOD PLAINS OR NATURAL WATER COURSES SHALL BE PERMITTED.
16. A SOILS ENGINEER SHALL BE RETAINED BY THE DEVELOPER, TO SUPERVISE GRADING AND PROVIDE A FINAL SOILS REPORT WHICH INCLUDES FOUNDATION REQUIREMENTS (SUBDIVISIONS) AND EXPANSIVE CHARACTERISTICS OF THE SOIL.
17. GRADING CERTIFICATION BY THE DEVELOPER'S CIVIL ENGINEER AND A FINAL COMPACTION REPORT BY A SOILS ENGINEER SHALL BE SUBMITTED TO THE BUILDING AND ENGINEERING DEPARTMENTS PRIOR TO ISSUANCE OF BUILDING PERMITS.
18. THE SOILS ENGINEERING INVESTIGATION DATED PREPARED BY (ENGINEER CONSULTANT) DATED AND THE ENGINEERING GEOLOGIC INVESTIGATION DATED PREPARED BY (GEOLOGIC CONSULTANT), SHALL BE CONSIDERED A PART OF THIS GRADING PLAN AND SHALL BE IN COMPLIANCE.
19. A REGISTERED CIVIL ENGINEER OR LICENSED LAND SURVEYOR SHALL SUBMIT CERTIFICATION OF BUILDING PAD ELEVATION. WHERE SPECIFIC ELEVATIONS ARE REQUIRED, THE ELEVATION (WITH RESPECT TO MEAN SEA LEVEL) SHALL BE GIVEN. IF AN ELEVATION WITH RESPECT TO ADJACENT GROUND SURFACE IS REQUIRED, THE ACTUAL DISTANCE ABOVE THE ADJACENT GROUND SHALL BE GIVEN.
20. ALL PROPERTY CORNERS SHALL BE CLEARLY DELINEATED IN THE FIELD PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION/GRADING.
21. STABILITY CALCULATIONS WITH A SAFETY FACTOR OF AT LEAST 1.5 SHALL BE SUBMITTED BY A SOILS ENGINEER TO THE BUILDING AND ENGINEERING DEPARTMENTS FOR CUT AND FILL SLOPES OVER THIRTY FEET (30') IN VERTICAL HEIGHT.
22. A FINAL COMPACTION REPORT WILL BE REQUIRED FOR ALL FILLS GREATER THAN ONE (1) FOOT.
23. IF STEEP SLOPING TERRAIN OCCURS UPON WHICH FILL IS TO BE PLACED, IT MUST BE CLEARED, KEYED AND BENCHED INTO FIRM NATURAL SOIL FOR FULL SUPPORT. PREPARATION SHALL BE APPROVED BY A REGISTERED SOILS ENGINEER PRIOR TO PLACEMENT OF FILL MATERIAL. SLOPES GREATER THAN 5:1 ARE REQUIRED TO BE KEYED AND BENCHED.
24. THE SOILS ENGINEER SHOULD INSPECT THE CONSTRUCTION IN THE FOLLOWING STAGES:
    a. UPON COMPLETION OF CLEARING AND DURING EXCAVATION AND BEFORE BACKFILL OF ALLUVIAL, COLLUVIAL AND TERRACED AREAS AND ANY SUBSTRUCTURES.
    b. DURING ALL ROUGH GRADING AND OPERATIONS INCLUDING PRE-COMPACTION, BENCHING AND FILLING OPERATIONS.
    c. DURING INSTALLATION OF BUTTRESS AND CANYON SUB-DRAINS AND FILTER MATERIAL.
    d. WHEN ANY UNUSUAL GRADING CONDITIONS ARE ENCOUNTERED DURING CONSTRUCTION.
25. EROSION CONTROL: ALL GRADED SLOPES SHALL BE PLANTED WITH ROSEA ICE PLANT OR ANOTHER APPROVED GROUND COVER, AT TWELVE INCHES (12") ON CENTER. SLOPES OVER FIFTEEN FEET (15') IN VERTICAL HEIGHT, IN ADDITION TO GROUND COVER, SHALL BE PLANTED WITH APPROVED TREES, SHRUBS OR COMBINATION THEREOF. SHRUBS SHALL BE PLANTED AT TEN FEET (10') ON CENTER; TREES AT TWENTY FEET (20') ON CENTER; COMBINATIONS FIFTEEN FEET (15') ON CENTER. SLOPES OVER THREE FEET (3') IN VERTICAL HEIGHT SHALL HAVE PERMANENT IRRIGATION SYSTEMS WITH BACKFLOW PREVENTION DEVICES PER U.B.C.
26. APPROVED PROTECTIVE MEASURES AND TEMPORARY DRAINAGE PROVISIONS MUST BE USED TO PROTECT ADJOINING PROPERTIES DURING THE GRADING PROJECT.
27. APPROVED EROSION PREVENTIVE DEVICES SHALL BE PROVIDED AND MAINTAINED DURING THE RAINY SEASON AND SHALL BE IN PLACE AT THE END OF EACH DAY'S WORK.
28. ALL WORK SHALL CONFORM TO THE CITY AND STATE CONSTRUCTION SAFETY ORDERS.
29. THE LOCATION AND PROTECTION OF ALL UTILITIES IS THE RESPONSIBILITY OF THE PERMITTEE.
30. AN APPROVED SET OF GRADING PLANS SHALL BE ON THE JOB SITE AT ALL TIME.
31. SANITARY FACILITIES SHALL BE MAINTAINED ON THE SITE FROM BEGINNING TO COMPLETION OF GRADING OPERATION.
32. ALL SLOPES SHALL BE PLANTED AND IRRIGATION FACILITIES SHALL BE PROVIDED FOR ALL SLOPES IN EXCESS OF THREE (3) FEET VERTICAL HEIGHT WITHIN NINETY (90) DAYS AFTER COMPLETION OF ROUGH GRADING AND SHALL BE IN ACCORDANCE WITH CITY OF LAKE ELSINORE GRADING ORDINANCE NO. 882 PRIOR TO THE APPROVAL OF FINAL INSPECTION.
33. ANY CONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE HIMSELF WITH THE SITE AND BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATIONS, WHETHER OR NOT SUCH FACILITIES ARE SHOWN ON THESE PLANS.
34. THE DESIGN ENGINEER SHALL PROVIDE A MINIMUM OF ONE (1) BLUE TOP PER FINISHED PAD, PRIOR TO ROUGH GRADE APPROVAL.
35. APPROXIMATE DATE OF:
    BEGINNING OPERATION:
    COMPLETION:
36. NO ROCK OR OTHER IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN THREE INCHES (3") WILL BE PLACED IN FILLS WITHIN ROADBED AREAS OR THREE FEET (3') OF FINISH GRADES, UNLESS THE LOCATION, MATERIALS, AND DISPOSAL METHODS ARE SPECIFICALLY APPROVED BY THE SOILS ENGINEER.
37. THE ENGINEER MUST SET GRADE STAKES FOR ALL DRAINAGE DEVICES AND OBTAIN INSPECTION BEFORE APPROVAL.
38. GRADING PLANS WILL NOT BE APPROVED UNTIL ALL RETAINING WALLS ARE APPROVED BY THE BUILDING DEPARTMENT.
39. THIS SITE HAS OBTAINED A NATIONAL POLLUTION PREVENTION ELIMINATION SYSTEM (NPDES) PERMIT TO REGULATE MUNICIPAL AND INDUSTRIAL STORM WATER DISCHARGES.
    NPDES WDID # _____ DATE PERMIT ISSUED:_____
40. DRAINAGE EASEMENTS WILL BE KEPT CLEAR OF ALL OBSTRUCTIONS. NO BUILDINGS OR WALLS SHALL BE PLACED WITHIN EASEMENT LIMITS. TEMPORARY IMPROVEMENTS ARE SUBJECT TO REMOVAL AT OWNER'S EXPENSE.

SOILS AND GEOLOGIST CERTIFICATION

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWING SOILS AND GEOLOGIST REPORT FOR THIS PROJECT.

ENTITLED: SOIL ENGINEERING, ENVIRONMENTAL ENGINEERING MATERIAL TESTING, GEOLOGY

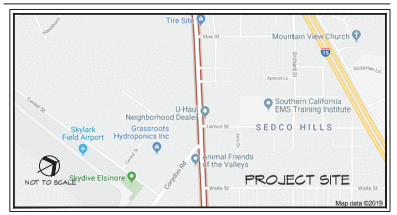
DATED: OCTOBER 9, 2019 JOB NUMBER: 19197-01

FIRM NAME: SOIL EXPLORATION COMPANY, INC.

BY: GENE K. LIU, PE 53417 — PROJECT ENGINEER — DATE

BY: _____ — DATE

VICINITY MAP



SHEET INDEX

OWNER

BERRI BROTHERS
3199 REDHILL AVE
COSTA MESA, CA 92626
P: 714-801-3918

PROJECT ADDRES:

31800 MISSION TRAIL
LAKE ELSINORE, CA 92530

LEGAL DESCRIPTION

PARCEL 3 OF MAP 19767
APN: 363-172-016

DRAINAGE METHODOLOGY

THE PROPOSED METHOD OF DRAINAGE FOR THIS PROJECT INVOLVES THE COLLECTION OF SURFACE DRAINAGE FOR ENTIRE SITE VIA CONCRETE DRAINAGE SWALE AND CURB AND GUTTERS INTO CATCH BASINS AND DIRECTED TO SUBTERRANEAN WATER QUALITY INLET AND PIPE NETWORK TO SAFELY DISCHARGE STORM RUNOFF TO THE EXISTING MAINLINE STORM DRAIN SYSTEM. ROOF DOWNSPOUTS AND DECK DRAINS WILL CONNECT DIRECTLY TO NEAREST AREA DRAINS.

GRADING LEGEND
SYMBOLS AND ABBREVIATIONS

	PROPOSED 8" STORM DRAIN LINE
PERF. SUBDRAIN	PROPOSED 4" STORM DRAIN LINE
	PROPOSED PERFORATED SUBDRAIN
	PROPOSED SQ. GRATE DRAIN INLET
O	PROPOSED PLANTER DRAIN INLET
⊕	PROPOSED ROOF DOWN SPOUT
	PROPOSED MAIN CATCH BASIN
	PROPOSED RETAINING WALL
	PROPOSED SITE SCREEN WALL
	PROPOSED SIDE PROPERTY WALL
TBC	PROPOSED TREE BOX LOCATION
	PROPERTY LINE
F.G. :	FINISHED GRADE
F.S. :	FINISHED SURFACE
T.N.F. :	TOP OF WOOD FENCE
D.F. :	DOWNSPOUT
INV. :	INVERT ELEVATION
T.O.S. :	TOP OF SLAB
T.G. :	TOP OF GRATE (DRAIN INLET)
F.L. :	FLOW LINE
(E.L.E.) :	EXISTING OR NATURAL GRADE ELEV
T.C. :	TOP OF COPING - POOL/SPA
TW :	TOP OF WALL
TF :	TOP OF FOOTING
TP :	TOP OF PILASTER
F.F. :	FINISHED FLOOR
G.F.F. :	GARAGE FINISHED FLOOR
	6" GRAVITY FLOW TO LOWER LEVEL SUMP
	2" FORCE MAIN DISCHARGE TO DRY STREAM BED AND LEAVE SITE @ STREET LEVEL

PROJECT TEAM

ARCHITECT: CJC DESIGN, INC.
11801 PIERCE STREET, SUITE 246
RIVERSIDE, CA 92505
(714) 920-9643
CONTACT: FRED COHEN

CIVIL ENGINEER: DZNE, INC.
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920
CONTACT: RONIE DEMA-ALA

SOILS ENGINEER: SOIL EXPLORATION COMPANY, INC.
7595 JURUPA AVE., UNIT C
RIVERSIDE, CA 92504
P. (951) 688-1200
soilexploration@yahoo.com

LAND SURVEYOR: CRF ENGINEERING
6782 STANTON AVE, SUITE A
BUENA PARK, CA 90621
(714) 348-5842
CONTACT : CESAR RAMIREZ

SITE DATA

ITEM	DESCRIPTION	QTY
1	SITE ACREAGE	77,377 SF (1.78 AC)
2	CONC/ASPHALT AREAS ROOF AREAS IMPERVIOUS AREAS	66,234 SF 2,975 SF 69,209 SF (1.59 AC)
3	PERVIOUS (LANDSCAPE)	8,168 SF (0.19 AC)

EARTHWORK QUANTITIES

ITEM	DESCRIPTION	QTY
1	CUT (2 FT MAX.)	21,015 CY
2	FILL (ALLOWANCE)	500 CY
3	NET EXPORT	20,515 CY
4	OVER EXCAVATION (3 FT) (BUILDING & CARWASH)	865 CY

MARK	REVISIONS	APPR.	DATE

THESE PLANS HAVE BEEN REVIEWED FOR COMPLIANCE WITH THE APPROPRIATE CONDITIONS OF DEVELOPMENT AND/OR CITY AND STATE LAWS AND HAVE BEEN FOUND ACCEPTABLE

REMON HABIB, RCE No. 83156 — CITY ENGINEER, CITY OF LAKE ELSINORE — DATE

PREPARED BY: d'zn engineering, 166 MATISSE CIRCLE, ALISO VIEJO, CA 92656, TEL: (949) 305-8920

RONIE L. DEMA-ALA — DATE

SEAL: REGISTERED PROFESSIONAL ENGINEER, RONIE L. DEMA-ALA, No. C84087, EXP. 12-31-19, CIVIL, STATE OF CALIFORNIA

PRECISE GRADING PLANS
31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN

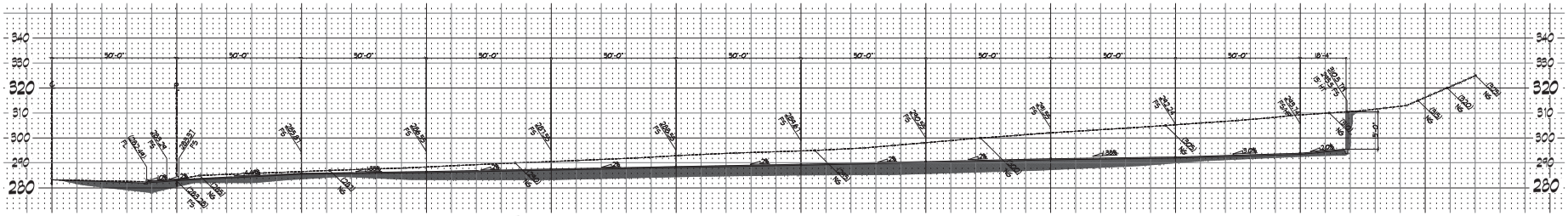
DATE: 22 NOV 2019

BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION : (1275.973 FT)

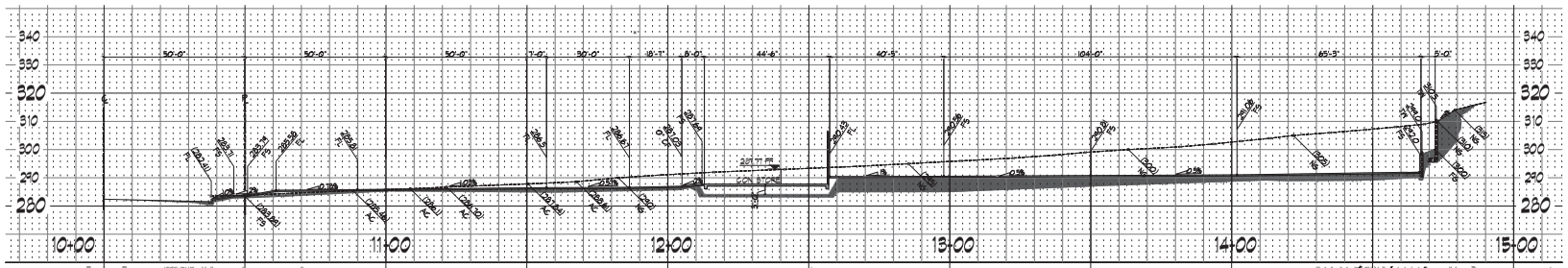
CITY OF LAKE ELSINORE

COVER SHEET

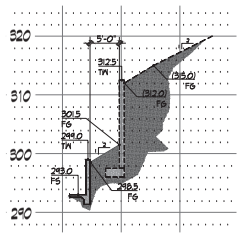
SHEET GP-01
1 OF 6 SHEETS
FILE No.



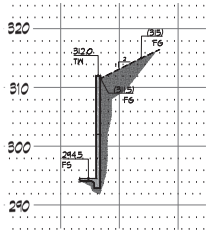
LINE "B"
SCALE: 1"=20'-0"



LINE "A"
SCALE: 1"=20'-0"



SECTION A
SCALE: 1"=10'-0"



SECTION B
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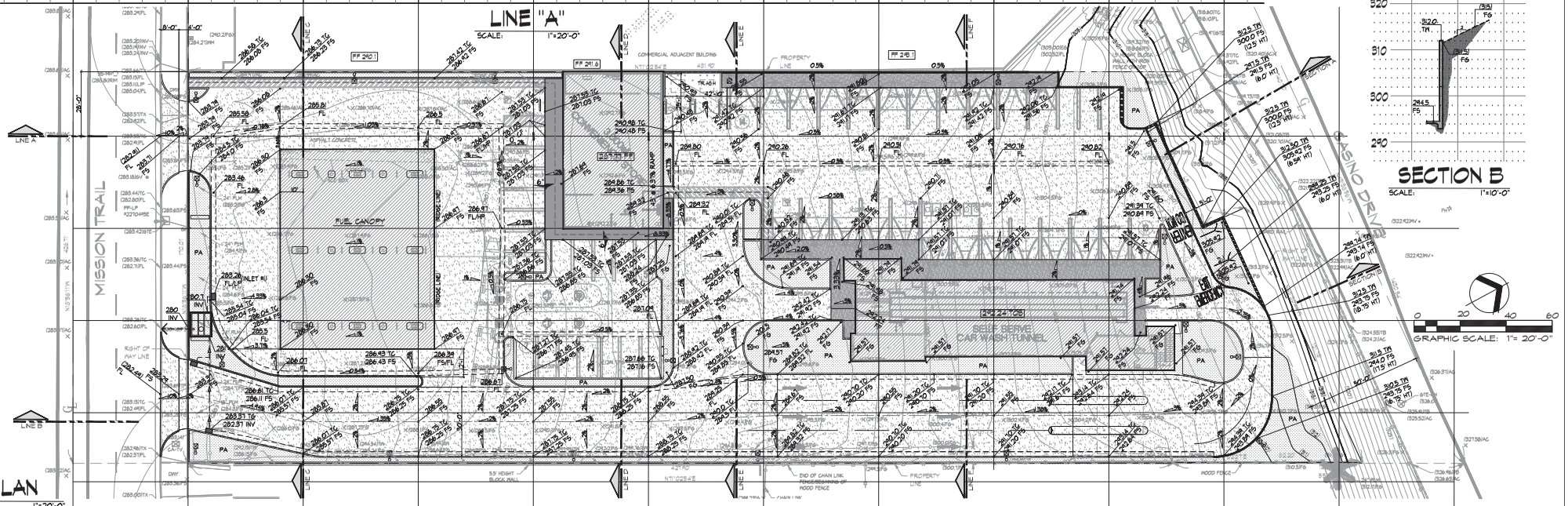

PLAN
SCALE: 1"=20'-0"

MARK	REVISIONS	APPR.	DATE

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REMON HABIB, RCE No. 83156 — DATE
CITY ENGINEER
CITY OF LAKE ELSINORE

PREPARED BY:
d'z'n engineering
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920

RONIE L. DEMA-ALA — DATE

SEAL
RONIE L. DEMA-ALA
No. 084061
EXP 12/31/21
CIVIL
STATE OF CALIFORNIA

PRECISE GRADING PLANS

31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN

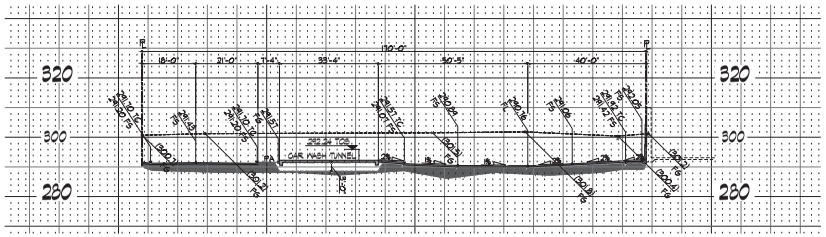
DATE: 22 NOV 2019

BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION = (1275.873 FT)

CITY OF LAKE ELSINORE

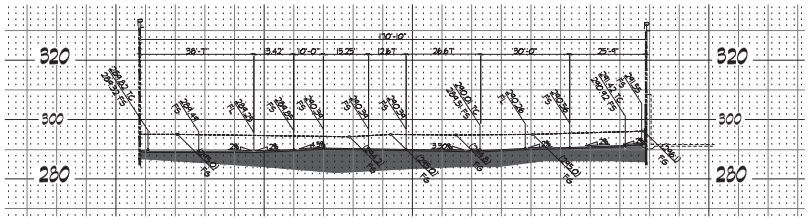
PRELIMINARY GRADING PLAN

SHEET GP-02
2 OF 6 SHEETS
FILE No.



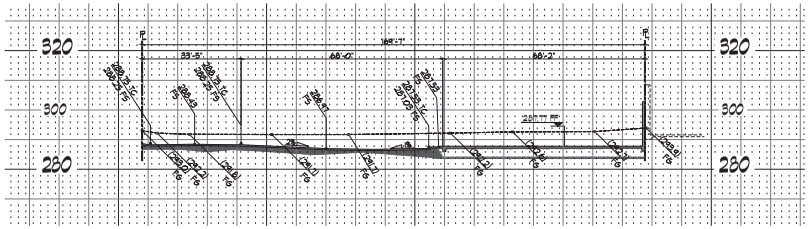
LINE "F"

SCALE: 1"=20'-0"



LINE "E"

SCALE: 1"=20'-0"



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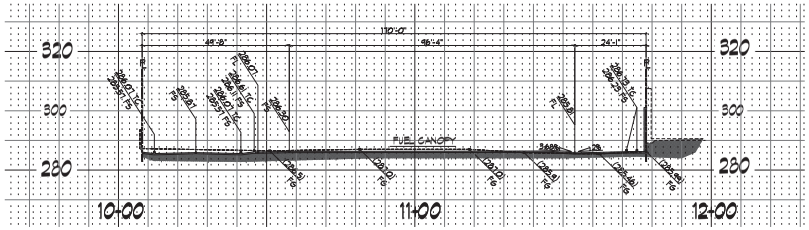

LINE "C"

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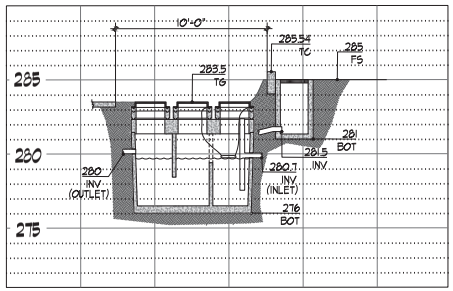


SECTION A-1 (THRU WQ-1)

SCALE: 1/4"=1'-0"

0 20 40 60

GRAPHIC SCALE: 1"= 20'-0"

MARK	REVISIONS	APPR.	DATE

THESE PLANS HAVE BEEN REVIEWED FOR COMPLIANCE WITH THE APPROPRIATE CONDITIONS OF DEVELOPMENT AND/OR CITY AND STATE LAWS AND HAVE BEEN FOUND ACCEPTABLE

REMON HABIB, RCE No. 83156 — DATE
CITY ENGINEER
CITY OF LAKE ELSINORE

PREPARED BY:

d'z'n engineering
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920

RONIE L. DEMA-ALA — DATE

SEAL

PRECISE GRADING PLANS
31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN

DATE: 22 NOV 2019

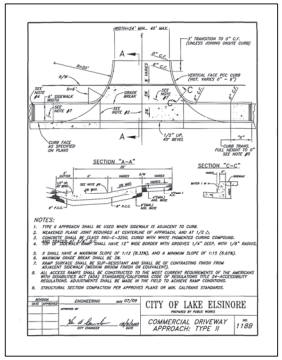
BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION = (1275.973 FT)

CITY OF LAKE ELSINORE

OPTION 1
GRADING SECTIONS

SHEET GP-03
3 OF 6 SHEETS

FILE No.



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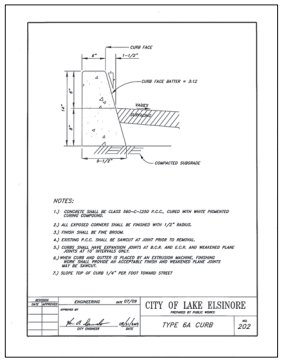

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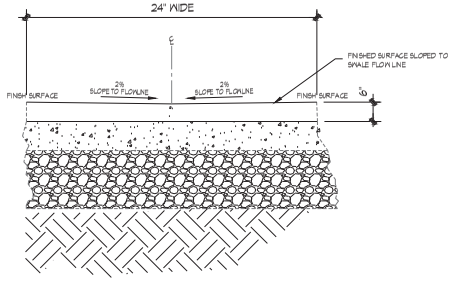

1 TYPICAL CONCRETE SWALE SECTION

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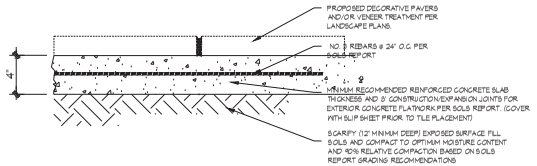

2 TYPICAL CONCRETE HARDSCAPE SECTION

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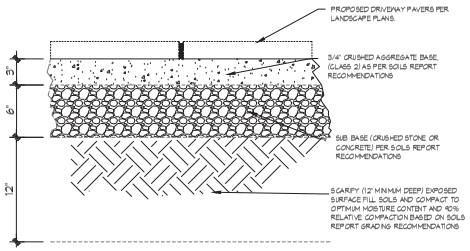


3 TYPICAL DRIVEWAY PAVER SECTION

SCALE: NTS

MARK	REVISIONS	APPR.	DATE

THESE PLANS HAVE BEEN REVIEWED FOR COMPLIANCE WITH THE APPROPRIATE CONDITIONS OF DEVELOPMENT AND/OR CITY AND STATE LAWS AND HAVE BEEN FOUND ACCEPTABLE

REMON HABIB, RCE No. 83156
CITY ENGINEER
CITY OF LAKE ELSINORE

DATE

PREPARED BY:

d'zn engineering
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920

RONIE L DEMA-ALA

DATE

SEAL

REGISTERED PROFESSIONAL ENGINEER
RONIE L. DEMA-ALA
No. C84087
EXP. 12-31-19
CIVIL
STATE OF CALIFORNIA

PRECISE GRADING PLANS

31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN

DATE: 22 NOV 2019

BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION : (1275.973 FT)

CITY OF LAKE ELSINORE

GRADING DETAILS

SHEET GP-04
4 OF 6 SHEETS

FILE No.

EROSION CONTROL NOTES:

1. INSTALL TEMPORARY EROSION CONTROL GRAVEL BAGS - 2 HIGH SE-6 BMP
2. INSTALL TEMPORARY CONCRETE WASH OUT BASIN WITH PLASTIC LINER - WM-8 BMP
3. STREET SWEEPING AND VACUMING AS REQUIRED - SE-7 BMP
4. INSTALL STOCKPILE MANAGEMENT - WM-3 BMP
5. INSTALL SANITARY/SEPTIC WASTE MANAGEMENT - WM-9 BMP
6. INSTALL TEMPORARY CONSTRUCTION ENTRANCE/EXIT - TC-1

N.P.D.E.S. NOTES:

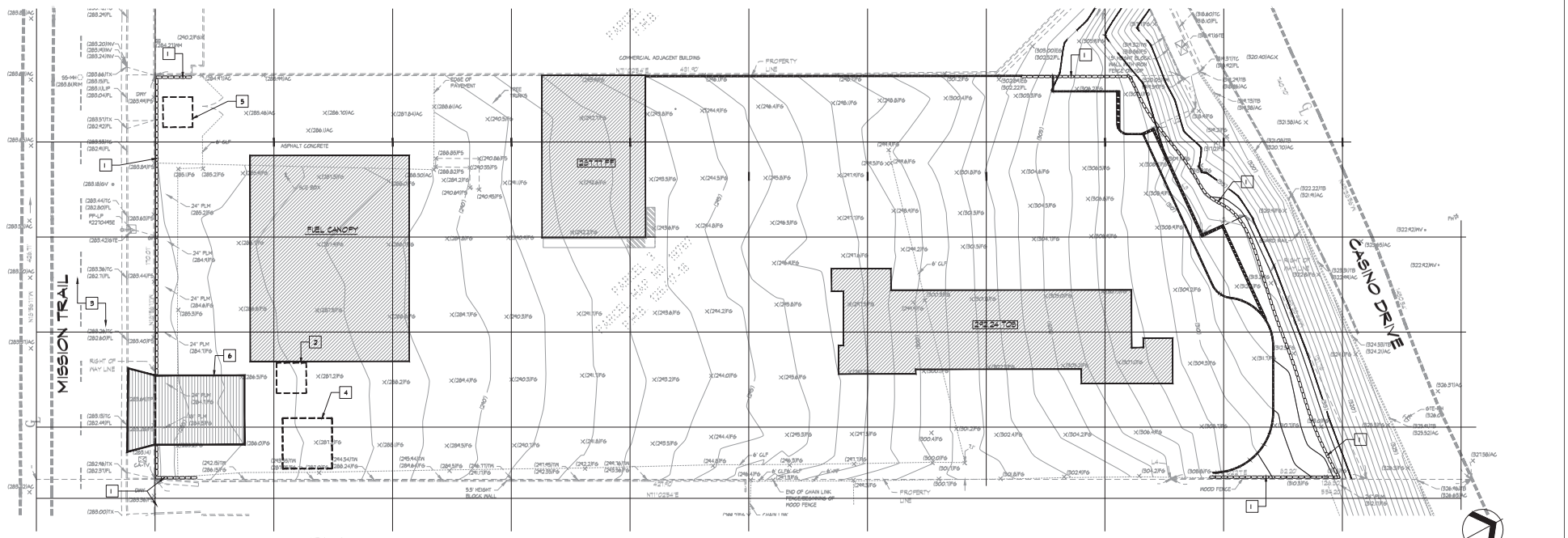
1. IN CASE OF EMERGENCY, CALL BERRI BROTHERS AT OFFICE PHONE # (714) 801-3418
2. SEDIMENT FROM AREAS DISTURBED BY CONSTRUCTION SHALL BE RETAINED ON SITE USING STRUCTURAL CONTROLS TO THE MAXIMUM EXTENT PRACTICABLE.
3. STOCKPILES OF SOIL SHALL BE PROPERLY CONTAINED TO MINIMIZE SEDIMENT TRANSPORT FROM THE SITE TO STREETS, DRAINAGE FACILITIES OR ADJACENT PROPERTIES VIA RUNOFF, VEHICLE TACKING, OR WIND.
4. APPROPRIATE BMPS FOR CONSTRUCTION-RELATED MATERIALS, WASTES, AND SPILLS, SHALL BE IMPLEMENTED TO MINIMIZE TRANSPORT FROM THE SITE TO STREETS, DRAINAGE FACILITIES, OR ADJOINING PROPERTIES BY WIND OR RUNOFF.
5. RUNOFF FROM EQUIPMENT AND VEHICLE WASHING SHALL BE CONTAINED AT CONSTRUCTION SITES UNLESS TREATED TO REDUCE OR REMOVE SEDIMENT AND OTHER POLLUTANTS.
6. ALL CONSTRUCTION CONTRACTOR AND SUBCONTRACTOR PERSONNEL ARE TO BE MADE AWARE OF THE REQUIRED BEST MANAGEMENT PRACTICES AND GOOD HOUSEKEEPING MEASURES FOR THE PROJECT SITES AND ANY ASSOCIATED CONSTRUCTION STAGING AREAS.
7. AT THE END OF EACH DAY OF CONSTRUCTION ACTIVITY ALL CONSTRUCTION DEBRIS AND WASTE MATERIALS SHALL BE COLLECTED AND PROPERLY DISPOSED IN TRASH OR RECYCLE BINS.
8. CONSTRUCTION SITES SHALL BE MAINTAINED IN SUCH A CONDITION THAT AN ANTICIPATED STORM DOES NOT CARRY WASTES OR POLLUTANTS OFF THE SITE. DISCHARGES OF MATERIAL OTHER THAN STORMWATER ONLY WHEN NECESSARY FOR PERFORMANCE AND COMPLETION OF CONSTRUCTION PRACTICES AND WHERE THEY DO NOT: CAUSE OR CONTRIBUTE TO A VIOLATION OF ANY WATER QUALITY STANDARD; CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR NUISANCE; OR CONTAIN A HAZARDOUS SUBSTANCE IN A QUANTITY REPORTABLE UNDER FEDERAL REGULATIONS 40 CFR PARTS 117 & 302.
9. POTENTIAL POLLUTANTS INCLUDE BUT ARE NOT LIMITED TO: SOLID OR LIQUID CHEMICAL SPILLS; WASTES FROM PAINTS, STAINS, SEALANTS, GLUES, LIMES, PESTICIDES, HERBICIDES, WOOD PRESERVATIVES AND SOLVENTS; ASBESTOS FIBERS, PAINT FLAKES OR STUCCO FRAGMENTS; FUELS, OILS, LUBRICANTS, AND HYDRAULIC, RADIATOR OR BATTERY FLUIDS; FERTILIZERS; VEHICLES/ EQUIPMENT WASH WATER AND CONCRETE WASH WATER; CONCRETE, DETERGENT OR FLOATABLE WASTES; WASTES FROM ANY ENGINE/EQUIPMENT STEAM CLEANING OR CHEMICAL DEGREASING; AND SUPER CHLORINATED POTABLE WATER LINE FLUSHING. DURING CONSTRUCTION, PERMITEE SHALL DISPOSE OF SUCH MATERIALS IN A SPECIFIED AND CONTROLLED TEMPORARY AREA ON SITE, PHYSICALLY SEPARATED FROM POTENTIAL STORM WATER RUNOFF, WITH ULTIMATE DISPOSAL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REQUIREMENTS.
10. DEWATERING OF CONTAMINATED GROUNDWATER, OR DISCHARGING CONTAMINATED SOILS VIA SURFACE EROSION IS PROHIBITED. DEWATERING OF NON-CONTAMINATED GROUNDWATER REQUIRES A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT FROM THE RESPECTIVE STATE REGIONAL WATER QUALITY CONTROL BOARD.
11. GRADED AREAS ON THE PERMITTED AREA PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPES AT THE CONCLUSION OF EACH WORKING DAY. DRAINAGE IS TO BE DIRECTED TOWARD DESILTING FACILITIES.
12. THE PERMITEE AND CONTRACTOR SHALL BE RESPONSIBLE AND TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATER CREATES A HAZARDOUS CONDITIONS.
13. THE PERMITEE AND CONTRACTOR SHALL INSPECT THE EROSION CONTROL WORK AND INSURE THAT THE WORK IS IN ACCORDANCE WITH THE APPROVED PLANS.
14. THE PERMITEE AND CONTRACTOR SHALL NOTIFY ALL GENERAL CONTRACTORS, SUBCONTRACTORS, MATERIAL SUPPLIERS, LESSEES, AND PROPERTY OWNERS, THAT DUMPING OF CHEMICALS INTO THE STORM DRAIN SYSTEM OR THE WATERSHED IS PROHIBITED.
15. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. NECESSARY MATERIALS SHALL BE AVAILABLE ON SITE AND STOCKPILED AT CONVENIENT LACATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.
16. ALL REMOVABLE EROSION PROTECTIVE DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN 5-DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
17. SEDIMENTS FROM AREAS DISTURBED BY CONSTRUCTION SHALL BE RETAINED ON SITE USING AN EFFECTIVE COMBINATION OF EROSION AND SEDIMENT CONTROLS TO THE MAXIMUM EXTENT PRACTICABLE, AND STOCKPILES OF SOILS SHALL BE PROPERLY CONTAINED TO MINIMIZE SEDIMENT TRANSPORT FROM THE SITE STREETS, DRAINAGE FACILITIES OF ADJACENT PROPERTIES VIA RUNOFF, VEHICLE TRACKING, OR WIND.
18. APPROPRIATE BMPS FOR CONSTRUCTION-RELATED MATERIALS, WASTES SPILLS OR RESIDUES SHALL BE IMPLEMENTED AND RETAINED ON SITE TO MINIMIZE TRANSPORT FROM THE THE SITE TO STREETS, DRAINAGE FACILITIES, OR ADJOINING PROPERTY BY WIND OR RUNOFF.

DRY SEASON REQUIREMENTS (MAY-SEPTEMBER)

1. WIND EROSION BMPS (DUST CONTROL) SHAL BE IMPLEMENTED.
2. SEDIMENT CONTROL BMPS SHALL BE INSTALLED AND MAINTAINED AT ALL OPERATIONAL STORM DRAIN INLETS.
3. BMPS TO CONTROL OFF-SITE SEDIMENT TRACKING SHALL BE IMPLEMENTED AND MAINTAINED.
4. APPROPRIATE WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPS SHALL BE IMPLEMENTED TO PREVENT THE CONTAMINATION OF STORM WATER BY WASTES AND CONSTRUCTION MATERIALS.
5. APPROPRIATE NON-STORM WATER BMPS SHALL BE IMPLEMENTED TO PREVENT THE CONTAMINATION OF STORM WATER FROM CONSTRUCTION ACTIVITIES.
6. THERE SHALL BE A "WEATHER TRIGGERED" ACTION PLAN AND THE ABILITY TO DEPLOY STANDBY SEDIMENT CONTROL BMPS AS NEEDED TO COMPLETELY PROTECT THE EXPOSED PORTIONS OF THE SITE WITHIN 48 HOURS OF A PREDICTED STORM EVENT (A PREDICTED STORM IS DEFINED AS A FORECASTED, 50% CHANCE OF RAIN).
7. SUFFICIENT MATERIALS NEEDED TO INSTALL STANDBY SEDIMENT CONTROL BMPS (AT THE SITE PERIMETER, SITE SLOPES AND OPERATIONAL INLETS WITHIN THE SITE) NECESSARY TO PREVENT SEDIMENT DISCHARGES FROM EXPOSED PORTIONS OF THE SITE SHALL BE STORED ON SITE. AREAS THAT HAVE ALREADY BEEN PROTECTED FROM EROSION USING PHYSICAL STABILIZATION OR ESTABLISHED VEGETATION STABILIZATION BMPS AS DESCRIBED IN ITEM H ARE NOT CONSIDERED TO BE "EXPOSED" FOR PURPOSES OF THIS REQUIREMENT.
8. DEPLOYMENT OF PERMANENT EROSION CONTROL BMPS (PHYSICAL OR VEGETATION) SHOULD COMMENCE AS SOON AS PRACTICAL ON SLOPES THAT ARE COMPLETED FOR ANY PORTION OF THE SITE. STANDBY BMP MATERIALS SHOULD NOT BE RELIED UPON TO PREVENT EROSION OF SLOPES THAT HAVE BEEN COMPLETED.

WET SEASON REQUIREMENTS (OCTOBER-APRIL)

1. WHERE APPROPRIATE SEDIMENT CONTROL BMPS SHALL BE IMPLEMENTED AT THE SITE PERIMETER, AT ALL OPERATIONAL STORM DRAIN INLETS, AND AT ALL NON-ACTIVE SLOPES, TO PROVIDE SUFFICIENT PROTECTION FOR STORMS LIKELY TO OCCUR DURING THE RAINY SEASON.
2. ADEQUATE PHYSICAL OR VEGETATION EROSION CONTROL BMPS (TEMPORARY OR PERMANENT) SHALL BE INSTALLED AND ESTABLISHED FOR ALL COMPLETED SLOPES PRIOR TO THE START OF THE RAINY SEASON. THESE BMPS MUST BE MAINTAINED THROUGHOUT THE RAINY SEASON. IF A SLECTED BMPS FAILS, IT MUST BE REPAIRED AND IMPROVED, OR REPLACED WITH AN ACCEPTABLE ALTERNATE AS SOON AS IT IS SAFE TO DO SO. THE FAILURE OF A BMP MAY INDICATE THAT THE BMP, AS INSTALLED, WAS NOT ADEQUATE FOR THE CIRCUMSTANCES IN WHICH IT WAS USED. REPAIRS OR REPLACEMENTS MUST RESULT IN A MORE ROBUST BMP, OR ADDITIONAL BMPS SHOULD BE INSTALLED TO PROVIDE ADEQUATE PROTECTION.
3. THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHAL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY DEPLOYING STANDBY EROSION CONTROL AND SEDIMENT CONTROL BMPS PRIOR TO A PREDICTED RAINSTORM.
4. A DISTURBED AREA THAT IS NOT COMPLETED BY THAT IS NOT BEING ACTIVELY GRADED (NON-ACTIVE AREA) SHALL BE FULLY PROTECTED FROM EROSION (WITH TEMPORARY OR PERMANENT BMPS (EROSION AND SEDIMENT CONTROLS). THE ABILITY TO DEPLOY STANDBY BMP MATERIALS IS NOT SUFFICIENT FOR THESE AREAS. EROSION AND SEDIMENT CONTROL BMPS MUST ACTUALLY BE DEPLOYED. THIS INCLUDES ALL BUILDING PADS, UNFINISHED ROADS, AND SLOPES.
5. SUFFICIENT MATERIALS NEEDED TO INSTALL STANDBY EROSION AND SEDIMENTS BMPS NECESSARY TO COMPLETELY PROTECT THE EXPOSED PORTIONS OF THE SITE FROM EROSION AND TO PREVENT SEDIMENT DISCHARGES SHALL BE STORED ON-SITE. AREAS THAT HAVE ALREADY BEEN PROTECTED FROM EROSION USING PERMANENT PHYSICAL STABILIZATION OR ESTABLISHED VEGETATION STABILIZATION BMPS ARE NOT CONSIDERED TO BE "EXPOSED" FOR PURPOSES OF THIS REQUIREMENT.



PLAN
SCALE: 1"=20'-0"

0 20 40 60
GRAPHIC SCALE: 1"= 20'-0"

MARK	REVISIONS	APPR.	DATE

THESE PLANS HAVE BEEN REVIEWED FOR COMPLIANCE WITH THE APPROPRIATE CONDITIONS OF DEVELOPMENT AND/OR CITY AND STATE LAWS AND HAVE BEEN FOUND ACCEPTABLE

REMON HABIB, RCE No. 83156 — DATE
CITY ENGINEER
CITY OF LAKE ELSINORE

PREPARED BY:
d'z'n engineering
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920

RONIE L. DEMA-ALA — DATE

SEAL
REGISTERED PROFESSIONAL ENGINEER
RONIE L. DEMA-ALA
No. C84087
EXP. 12/31/21
CIVIL
STATE OF CALIFORNIA

PRECISE GRADING PLANS
31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN
DATE: 22 NOV 2019

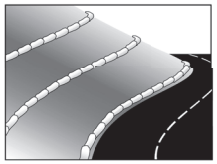
BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION = (1275.973 FT)

CITY OF LAKE ELSINORE

OPTION 1 EROSION CONTROL PLAN

SHEET GP-05
5 OF 6 SHEETS
FILE No.

Gravel Bag Berm SE-6



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Roll
SE-8 Sandbag Barrier
SE-12 Temporary Silt Dike
SE-14 Biofilter Bags

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Description and Purpose

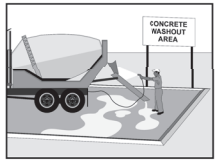
A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

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

Potential Alternatives

None

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Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Continuing the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Stockpile Management WM-3

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:
✓ Primary Objective
✓ Secondary Objective

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

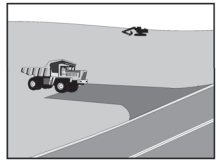
None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

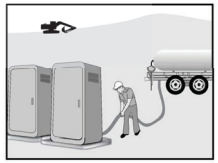
Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water

Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

0 20 40 60
GRAPHIC SCALE: 1" = 20'-0"

MARK	REVISIONS	APPR.	DATE

THESE PLANS HAVE BEEN REVIEWED FOR COMPLIANCE WITH THE APPROPRIATE CONDITIONS OF DEVELOPMENT AND/OR CITY AND STATE LAWS AND HAVE BEEN FOUND ACCEPTABLE

REMON HABIB, RCE No. 83156 — DATE
CITY ENGINEER
CITY OF LAKE ELSINORE

PREPARED BY:
d'zn engineering
166 MATISSE CIRCLE
ALISO VIEJO, CA 92656
TEL: (949) 305-8920

RONIE L DEMA-ALA — DATE

SEAL
REGISTERED PROFESSIONAL ENGINEER RONIE L. DEMA-ALA No. C84061 EXP. 12/31/21 CIVIL STATE OF CALIFORNIA

PRECISE GRADING PLANS
31800 MISSION TRAIL, LAKE ELSINORE, CA 92530

SCALE: AS SHOWN
DATE: 22 NOV 2019

BENCH MARK:
DESIGNATION : E-24
DISK 1.8 MILES SE ALONG BUSINESS ROUTE STATE HWY 71 FROM ATSF RAILROAD STATION
DATUM : NAVD88
YEAR LEVELED: 1970
ELEVATION : (1275.973 FT)

CITY OF LAKE ELSINORE

CONSTRUCTION BMPs

SHEET GP-06
6 OF 6 SHEETS
FILE No.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

SOIL
EXPLORATION
COMPANY, INC.

Soil Engineering, Environmental Engineering, Materials Testing, Geology

October 9, 2019

Project No. 19197-01

TO: CJC Design, Inc.
22485 La Palma Ave., Ste. 202
Yorba Linda, CA 92887

ATTENTION: Fred Cohen

SUBJECT: Preliminary Soil Investigation, Liquefaction Evaluation and Infiltration Tests Report, Proposed Gas Station, Convenience Store and Car Wash Site, 31800 Mission Trail (APN 363-172-016), City of Lake Elsinore, California

Introduction

In accordance with your authorization, Soil Exploration Co., Inc. has performed a preliminary soil investigation, liquefaction evaluation and infiltration tests for the subject site (see Figure 2, Riverside County Liquefaction Map for site location). The accompanying report presents a summary of our findings, conclusions, recommendations and limitations of our work for construction of the proposed gas station, convenience store and car wash with associated parking and driveways.

Scope of Work

- Review soils, seismic, geologic, groundwater data and maps in our files.
- Perform exploration of the site by means of three 8" diameter borings, 18 to 31.5 feet deep, at readily accessible locations.
- Field Engineer (California Registered RCE) for logging of the excavations, sampling of select soils, observation of excavation resistance, record SPT blow counts and water seepage (if any).
- Perform basic laboratory testing on select soil samples, expected to include moisture, density, expansion index, sieve analysis and water soluble sulfates.
- Perform digitized search of known faults within a 50-mile radius of the site.
- Determine California Building Code (CBC) 2016 seismic parameters for the site.
- Consult with project architect/civil design engineer.
- Perform three shallow infiltration tests at locations suggested by you.
- Prepare a report of our findings, conclusions and recommendations for site preparation, including overexcavation/removal depth, allowable bearing value, foundation/slab-on-grade depth/thickness recommendations, excavation characteristics, lateral earth pressures for retaining walls design, pavement thickness estimates for parking/driveways, liquefaction evaluation, general earthwork and grading specifications, California Building Code (2016) seismic design coefficients, Cal/OSHA soil classification and infiltration rate in inches/hour.

Existing Site Condition

The relatively flat, vacant site is located on the east side of Mission Trail, south of Diamond Drive, in the City of Lake Elsinore, Riverside County, California. Mission Trail is a paved road with curbs, gutters and sidewalks. Casino Drive borders the site on the east side. The site is bordered by a wood fence and a chain link fence on the south side and by a chain link fence on the west side. Existing retail plazas are located on adjacent properties to the north and south.

The approximate locations of the above and other features are shown on Exploratory Boring and Infiltration Test Location Map, Plate 1. The base map is Site Plan prepared by CJC Design, Inc. of Yorba Linda, California.

Proposed Development

We understand that a gas station, convenience store, car wash and related improvements are proposed at the site. We understand that the proposed structures will be wood frame and/or CMU construction with concrete slabs supported on prepared subgrade. Based on the relatively flat topography of the site, modest cut or fill grading and no significant cut or fill slopes are proposed.

Field Work

Three exploratory borings were drilled on October 3, 2019, to a maximum depth of 31.5 feet below existing ground surface, utilizing a B-53 mobile drill rig equipped with 8-inch diameter hollow stem auger. Refer to Plate 1 for boring locations. Standard Penetration Tests (SPT) blow counts were recorded for the earth materials. Relatively undisturbed samples of the soils were also obtained by utilizing California Ring Sampler.

In general these borings revealed that the site area is underlain by alluvial soils consisting of silty sand and sand/sand with gravel (USCS "SM" and "SP"). Bedrock was noted in our borings at depths of 17.5 to 30 feet. The earth materials are medium dense to very dense. USGS Geologic Map of the Elsinore Quadrangle shows the site area is underlain with young alluvial-fan deposits (see Figure 1). Detailed descriptions of the earth materials encountered are presented in the form of Geotechnical Boring Logs in Appendix B.

Laboratory Testing

Laboratory tests were performed for select soils samples. The tests consisted primarily of natural moisture contents, dry density, sieve analysis and water soluble sulfates. Laboratory test results are presented in Appendix C and with Geotechnical Boring Logs in Appendix B.

Groundwater/Liquefaction

Groundwater, seepage or wet soils were not encountered in our exploratory borings, drilled to a maximum depth of 31.5 feet, at the time this work was performed. Groundwater study is not within the scope of this work.

Liquefaction Evaluation

Soil liquefaction is a process by which loose, saturated, fine granular deposits, such as fine sands, lose a significant portion of their shear strength due to pore water pressure buildup resulting from cyclic loading, such as that caused by an earthquake. In general, liquefaction potential is higher when the groundwater table is less than 30 feet below ground surface. Soil liquefaction can lead to foundation bearing failures and excessive settlements.

Based on Riverside County Liquefaction map, the site is located within an area of moderate liquefaction potential (see Figure 2).

Summary of conditions for the deep boring B-1 are as follows:

Depth (ft)	Class (USCS)	SPT Count (blows/foot)	Moisture (%)	Passing 200 Sieve (%)	Compactness/ Consistency
2.5	SM	43	3.5	34	Dense
5	SM	25/50	3.8	27	Very dense
10	SM	60/6"	-	-	Very dense
15	SP	46	-	-	Dense
20	SP	51	3.3	3	Very dense
25	Bedrock	50/6"	6.4	7	Very dense

Liquefaction Analysis/Dynamic Settlement: LiquefyPro

Liquefaction susceptibility using Standard Penetration Test data and laboratory grain size test results were analyzed using LiquefyPro software (Version 5.5g). Liquefaction analysis performed for this evaluation included: [1] evaluation of soil consistency and compactness influencing liquefaction, [2] correction of penetration resistance data to convert measured SPT N-values to standard N_{60}-values, [3] calculating the earthquake induced stress ratio (CSR), [4] calculating cyclic resistance ratio (CRR), [5] assume water table at 35 feet below the ground surface, and [6] evaluation of liquefaction potential by calculating a factor of safety against liquefaction (FS), by dividing CRR by CRS. The software output is presented in Appendix G.

The main observations of the results are as follows:

- Onsite soils at the site in general have a Safety Factor of 5.0 against liquefaction. Indicated settlement of saturated and unsaturated sands is 0.00 in. and 0.35 in., respectively, with total settlement of saturated and unsaturated sands of 0.35 in., with differential settlement of 0.176 to 0.233 in. in 30 feet.

- Liquefaction also involves lateral or horizontal displacement (lateral spreading) of essentially intact blocks of surficial soils on slopes or toward a free-face slope such as river or canal bank. The potential for and magnitude of lateral spreading is dependent upon many conditions, including the presence of a relatively thick, continuous, potentially liquefiable sand layer and high slopes. Subsurface information obtained for this study indicates that loose sands are not present and high slopes are not anticipated. Based on currently available procedures, the site does not appear to be susceptible to (lateral spread) ground surface disruption during a moderate seismic event.

Seismicity/Faulting

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone or County of Riverside fault zone.

A computer search of known Quaternary major faults within 50 miles of the site from USGS National Seismic Hazard Maps is presented in Appendix D. Please note that it is probable that not all-active or potentially active faults in the region have been identified. Furthermore, seismic potential of the smaller and less notable faults is not sufficiently developed for assignment of maximum magnitudes and associated levels of ground shaking that might occur at the site due to these faults.

Conclusions

- Any vegetable matter, existing structures, old foundations, seepage pits, leach lines, septic tanks, old fills, buried utilities/irrigation lines, etc. and deleterious materials associated with previous use of the site would require removal from the proposed building/grading areas.

- Overexcavation and recompaction of surficial soils should be anticipated to provide adequate and uniform support for the proposed building(s), pavement and settlement sensitive improvements. All earth materials encountered during our exploration can be excavated with normal grading equipment in good working condition.

- Based on observations and soil classification, the expansion potential of the sandy foundation soils at the site is expected to be very low (EI<20).

- The use of shallow spread footings and caissons appears feasible for the proposed building/canopy columns support.

- Flooding potential of the site should be determined by the design civil engineer and considered in planning and construction.

- Site is located approximately 1.00 mile from the Elsinore fault. The site is located in a region of generally high seismicity, as is all of Southern California. During its design life, the site is expected to experience moderate to strong ground motions from earthquakes on regional and/or nearby causative faults.

- There is a 2 percent probability in 50 years (2475 year return period) that peak ground acceleration at the site will exceed 0.898g (see Appendix D).

- Based on Riverside County Liquefaction map, the site is in an area of moderate liquefaction potential (see Figure 2).

- The potential for seismically induced dynamic settlement of the onsite sandy soils during a strong earthquake is low, however cannot be precluded. This would be partially mitigated by overexcavation and recompaction of the upper foundations soils.

- Groundwater and/or seepage were not encountered during our subsurface investigation. Our experience indicates that surface or near-surface groundwater conditions can develop in areas where groundwater conditions did not exist prior to site development, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation. We have no way of predicting depth to the groundwater which may fluctuate with seasonal changes and from one year to the next due to precipitation, irrigation, land use, climatic conditions as well as other factors. Subdrains, horizontal drains or other devices may be recommended in future for graded areas that exhibit nuisance seepage conditions.

Recommendations

Site Preparation/Overexcavation

All grading and backfills should be performed in accordance with City of Lake Elsinore Grading Ordinance and the attached General Earthwork and Grading Specifications (Appendix E), except as modified in the text of this report. The proposed grading area should be cleared of existing structures, vegetation and deleterious material which should be hauled off site.

New building/structure should be provided with a compacted fill mat that extends to at least 5 feet beyond the structure lines in plan (where practical) and to a depth of at least 4 feet below existing ground or proposed grade, whichever is deeper. The excavated bottom should be cleaned of roots, soft spots, deleterious materials, old fills, etc. As a result, deeper excavations should not be precluded. After cleaning of the excavated bottom, the exposed surfaces should be further scarified to a depth of at least 6 inches, thoroughly watered and recompacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557-12 Test Method, prior to placement of fill. All fills should be compacted to at least 90 percent of the maximum dry density.

In addition to the above recommendations, all foundation bottoms should be underlain by at least 3 feet of compacted fill.

Compacted Fills/Imported Soils

Any soil to be placed as fill, whether presently onsite or import, should be approved by the soil engineer or his representative prior to its placement. All onsite soils to be used as fill should be cleansed of any roots or other deleterious materials. Cobbles larger than 3 inches in diameter should not be placed in the vicinity of foundations and for utility line backfills. All fills should be placed in 6 to 8 inch loose lifts, thoroughly watered, mixed and compacted to at least 90 percent relative compaction. This is relative to the maximum dry density determined by ASTM 1557-12 Test Method.

Any imported soils should be sandy (preferably (USCS "SM" or "SW" and very low in expansion potential, EI<20) and approved by the soil engineer. The soil engineer or his representative should observe the placement of fill and take sufficient tests to verify the moisture content and the uniformity and degree of compaction obtained.

Foundation Design/Footings

Following site preparation, the use of shallow spread footings is feasible. A maximum allowable bearing value of 2000 psf is recommended. This bearing pressure has been established based on the assumption that the footings will be embedded at least 18 inches below lowest adjacent firm grade and into the onsite compacted soil mat, and measure at least 15 inches in width. Isolated column footings should be embedded at least 24 inches below lowest adjacent firm grade. This bearing value may be increased by one third for temporary (wind or seismic) loads. Reinforcement of the footings should be determined by qualified structural engineer, however minimum reinforcement of two No. 5 bars at top and two at bottom of continuous footings is recommended.

Foundation Design/Canopy Caisson

Typical canopy caisson should be 3.5 to 4 feet in diameter and extend to a depth of at least 6 feet below ground surface. An allowable bearing value of 2000 psf and lateral bearing of 300 psf/ft (maximum 3000 pcf) may be used in design.

Concrete Slabs-On-Grade

Floor slabs-on-grade should be at least 4 inches thick and should be reinforced with at least No. 3 bars at 18-inches on-center both ways, properly centered in mid-thickness of slabs (structural recommendations govern). Thicker slabs (at least 8 inches thick and supported on 4-inch thick aggregate base) should be considered for canopy area and driveways by structural design engineer based on the use of facilities.

A modular of subgrade reaction (k) value of 250 psi/inch may be used in the design of rigid slabs. A moisture barrier comprised of 10-mil Visqueen with 2-inches of sand below the Visqueen should be provided for office areas and where moisture intrusion from slabs-on-grade is objectionable. The Visqueen member should be lapped and sealed around all utility conduits. We recommend that a slipsheet (or equivalent) be utilized if grouted tiles or other crack sensitive flooring (such as marble tiles) is planned directly on concrete slabs.

Concrete Joints

The joints spacing for concrete slabs should be determined by the project architect. Joints should be laid out to form approximately square panels (equal transverse and longitudinal joint spacing). Rectangular panels, with the long dimension no more than one-and-one-half times the short, may be used when square panels are not feasible. The depth of longitudinal and transverse joints should be one-fourth the depth of the slab thickness.

Joint layout should be adjusted so that the joints will line up with the corners of structures, small foundations and other built-in structures. Acute angles or small pieces of slab curves as a result of joints layout should not be permitted.

Concrete Slump/Curing

The use of mechanically compacted/dense concrete with slump not exceeding 4 inches is recommended. Fresh concrete should be cured by protecting it against loss of moisture, rapid temperature change, and mechanical injury for at least 3 days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used. After finishing operations have been completed, the entire surface of the newly placed concrete should be covered by whatever curing medium is applicable to local conditions and approved by the engineer. The edges of concrete slabs exposed by the removal of forms should be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab surfaces. The contractor should have at hand and ready to install before actual placement begins the equipment needed for adequate curing of the concrete.

Special Considerations/Excess Soils From Foundation Excavations

Excess soils generated from foundation excavations should not be placed on slabs and driveways without proper moisture and compaction. Slab subgrade should be verified to contain 1.2 times the soil optimum moisture content to a depth of 6 inches prior to placement of slab building materials. Moisture content must be tested in the field by the soil engineer. The addition of fiber mesh in the concrete and careful control of water/cement ratios may lessen the potential for slab cracking.

In hot or windy weather (80°F or 12 mph), the contractor must take appropriate curing precautions after the placement of concrete. The use of mechanically compacted low slump concrete (not exceeding 4 inches at the time of placement) is recommended.

Lateral Earth Pressures

The following lateral earth pressures and soil parameters in conjunction with the above recommended bearing value (2000 psf), may be used for design of canopy caissons and retaining walls with free draining compacted backfills. If passive earth pressure and friction are combined to provide required resistance to lateral forces, the value of the passive pressure should be reduced to two-thirds the following recommendations:

Active Earth Pressure with level backfill (P_a)	35 pcf (EFP), drained, yielding
At Rest Pressure (P_0)	55 pcf (EFP), drained, non-yielding (part of building wall)
Passive Earth Pressure (P_p)	250 pcf (EFP), drained, maximum of 2500 psf
Horizontal Coefficient of Friction (μ)	0.30
Unit Soil Weight (γ_t)	120 pcf
Skin Friction Value (caissons)	300 psf/foot of bounding area of caisson

We recommend drainage for retaining walls to be provided in accordance with Plate 2 of this report. Maximum precautions should be taken when placing drainage materials and during backfilling. Retaining walls should be waterproofed in accordance with project architect recommendations. All wall backfills should be properly compacted to at least 90 percent relative compaction.

Seismic Considerations

The site is located approximately 1.00 mile from the Elsinore fault. The site soils class is D. Moderate to strong ground shaking can be expected at the site and there is a 2 percent probability in 50 years (2475 year return period) that peak ground acceleration will exceed 0.898g. The site soil profile is Class D (stiff soils). The structural engineer should consider City/County local codes, California Building Code (CBC) 2016 seismic data presented in this report (Appendix D), the latest requirements of the Structural Engineers Association of Southern California and any other pertinent data in selecting design parameters.

Expansion Index and Soluble Sulfates

Based on observation and soil classification, the expansion potential of the onsite soils is anticipated to be very low (EI<20).

Results of tests also performed by Cal Land Engineering, Inc. of Brea, California on a select soil sample indicate negligible soluble sulfate exposure (less than 0.1 percent water soluble sulfates by weight) (see Appendix C). Concrete, mix, placement and curing for concrete should comply with ACI guidelines. Based on sulfate test results, there is no restriction on cement type. However we recommend concrete slump not exceeding 4 inches at the time of placement. Ferrous metal pipes should be protected in accordance with recommendations of your structural or corrosion engineer.

Surface Drainage/Groundwater

The surface of the site should be graded to provide positive drainage away from structures and foundations. Drainage should be directed to established swales and then to appropriate drainage structures to minimize the possibility of serious erosion. Surface drainage must be directed and maintained away from the foundations. Water, either natural or by irrigation, should not be permitted to pond or saturate the surface soils.

Pavement Design/Subgrade-Base Compaction

On the basis of laboratory classification, we are of the opinion that the tentative new pavement design may be based on an R-value on the order of 30 (or better) corresponding to near surface soils. Considering this and based on typical traffic indices, the recommended pavement sections are outlined as follows:

Location	TI	Recommended Tentative Pavement Thickness
Heavy Truck/Traffic	6.5	4" asphalt concrete over 8" Class II aggregate base
Concrete Pad Areas	---	8" PCC over 4" Class II aggregate base
Vehicle Drive Area	5.5	3" AC over 7" aggregate base
Parking Area	4.5	3" AC over 4" aggregate base

The upper at least 12 inches of pavement subgrade soils should be recompacted to at least 95 percent relative compaction per maximum dry density determined by ASTM D1557-12. The aggregate base should also be compacted to at least 95 percent relative compaction. All subgrade and base must be firm and unyielding without pumping condition prior to placement of asphalt concrete or PCC pavement. Reinforcement of the concrete pavement (with at least No. 3 bars at 18-inches on-center) and use of 4000 psi concrete should also be a consideration.

Cal/OSHA Classification/Trench Excavations/Backfills

In general Cal/OSHA classification of onsite soils appears to be Type B.

Temporary trench excavations deeper than 5 feet should be shored or sloped at 1:1 or flatter in compliance with Cal/OSHA requirements:

a.) The shoring should be designed by a qualified engineer experienced in the shoring design.

b.) The tops of any temporary unshored excavations should be barricaded to prevent vehicle and storage loads within a 1:1 line projected upward from the bottom of the excavation or a minimum of 5 feet, whichever is greater. If the temporary construction embankments, including shored excavations, are to be maintained during the rainy season, berms are suggested along the tops of the excavations where necessary to prevent runoff from entering the excavation and eroding the slope faces.

c.) The soils exposed in the excavations should be inspected during excavation by the soils engineer so that modifications can be made if variations in the soil conditions occur.

d.) All unshored excavations should be stabilized within 30 days of initial excavation.

Backfills in the utility trenches should be compacted to at least 90 percent relative compaction. Onsite earth materials will be suitable for backfills. Clean sandy materials with sand equivalent value of at least 30 must be utilized for the pipe bedding and shading zone. Placement of the trench backfill in lifts and compaction by mechanical effort should be anticipated.

Foundation Plan Review/Observations and Testing

The recommendations provided in this report are based on preliminary design information and subsurface conditions as interpreted from limited exploratory work. Soil Exploration Co., Inc. should review the foundation plans prior to construction. Our conclusions and recommendations should also be reviewed, verified during grading/construction and revised as necessary.

Soil Exploration Co., Inc. should observe and/or test at the following stages of construction:

- During all overexcavations and grading.
- Following footing excavation and prior to placement of footing materials.
- During wetting of slab subgrade and prior to placement of slab materials.
- During all trench and wall backfills.
- During subgrade and base compaction prior to paving.
- When any unusual conditions are encountered.

Final Compaction Report

A final report of compaction control should be prepared subsequent to the completion of grading. The report should include a summary of work performed, laboratory test results, and the results, locations and elevations of field density tests performed during grading.

Limitation of Investigation

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in this or similar locations. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The field and laboratory test data are believed representative of the project site; however, soil conditions can vary significantly. As in most projects, conditions revealed during grading may be at variance with preliminary findings. If this condition occurs, the possible variations must be evaluated by the Project Geotechnical Engineer and adjusted as required or alternate design recommended.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractor carry out such recommendations in the field.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In additions, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge.

This report was prepared for the client based on client's needs, directions and requirements at the time. This report is not authorized for use by and is not to be relied upon by any party except the client with whom Soil Exploration Co., Inc. contracted for the work. Use of, or reliance on, this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Soil Exploration Co., Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Soil Exploration Co., Inc.

Closure

If you should have any questions or concerns regarding this report, please do not hesitate to call our office. We appreciate this opportunity to be of service.

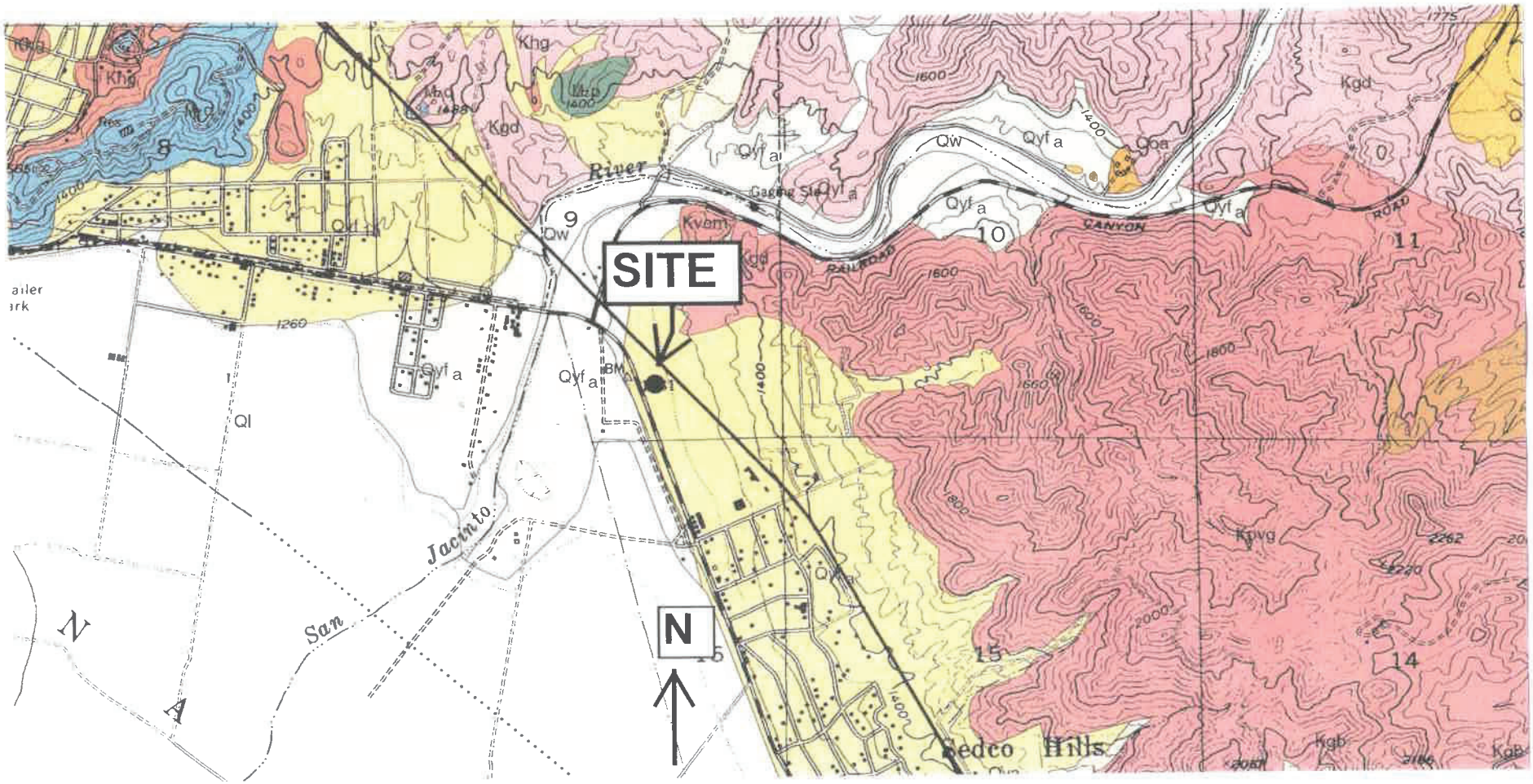
Very truly yours,
Soil Exploration Co., Inc.

Gene K. Luu, PE 53417
Project Engineer

Distribution: [1] Addressee

Attachments:

Figure 1	USGS Geologic Map
Figure 2	Riverside County Liquefaction Map
Figure 3	U.S. Geological Survey Faults Map
Plate 1	Exploratory Boring and Infiltration Test Location Map
Plate 2	Retaining Wall Backfill and Subdrain Detail
Appendix A	References
Appendix B	Geotechnical Boring Logs
Appendix C	Laboratory Test Results
Appendix D	National Seismic Hazard Maps-Source Parameters and CBC (2016) Seismic Parameters
Appendix E	General Earthwork and Grading Specifications
Appendix F	Infiltration Test Procedure and Test Results
Appendix G	Liquefaction Analysis Results



Base Map: USGS Preliminary Geologic Map of the Elsinore 7.5' Quadrangle, Riverside County, California.

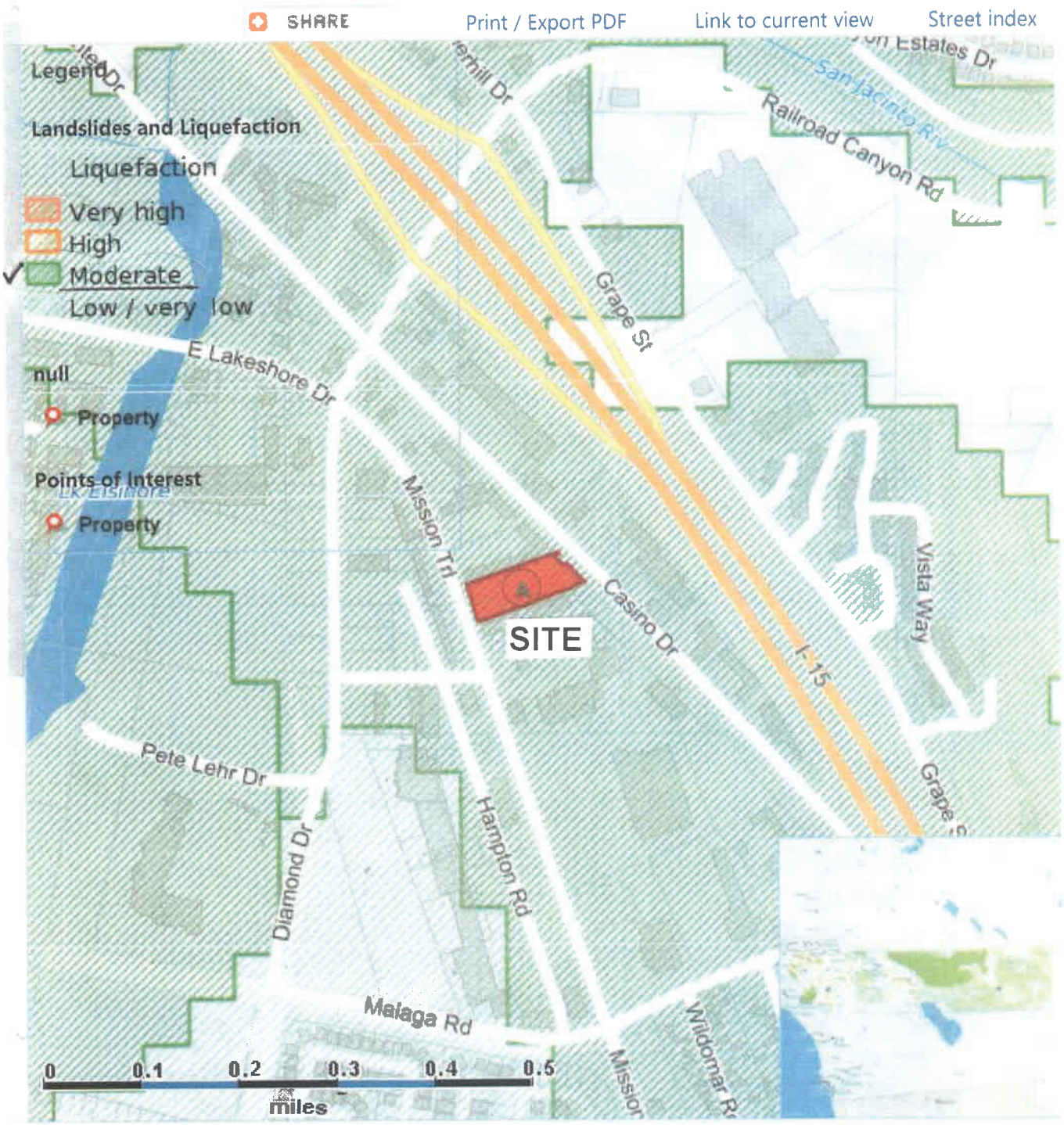
LEGEND:

Qyf_1: Young alluvial-fan deposits, Unit 1 (early Holocene and late Pleistocene.

a: Arenaceous (very coarse sand through very fine sand).

31800 Mission Trail
City of Lake Elsinore, California

Soil Exploration Co., Inc.
Project No.: 19197-01
Date: October 9, 2019
Figure: 1



N

Figure 2

U.S. Geological Survey 2014 Faults

10/2/2019, 12:17:24 PM

NSHM 2014 Fault Sources

- Normal
- Strike Slip
- Thrust
- Unassigned

1:577,791

0 4 8 16 mi

0 5 10 20 km

N

USGS, National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Figure 3

USGS

National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp. | USGS |

EXPLORATORY BORING & INFILTRATION TEST LOCATION MAP
PLATE 1

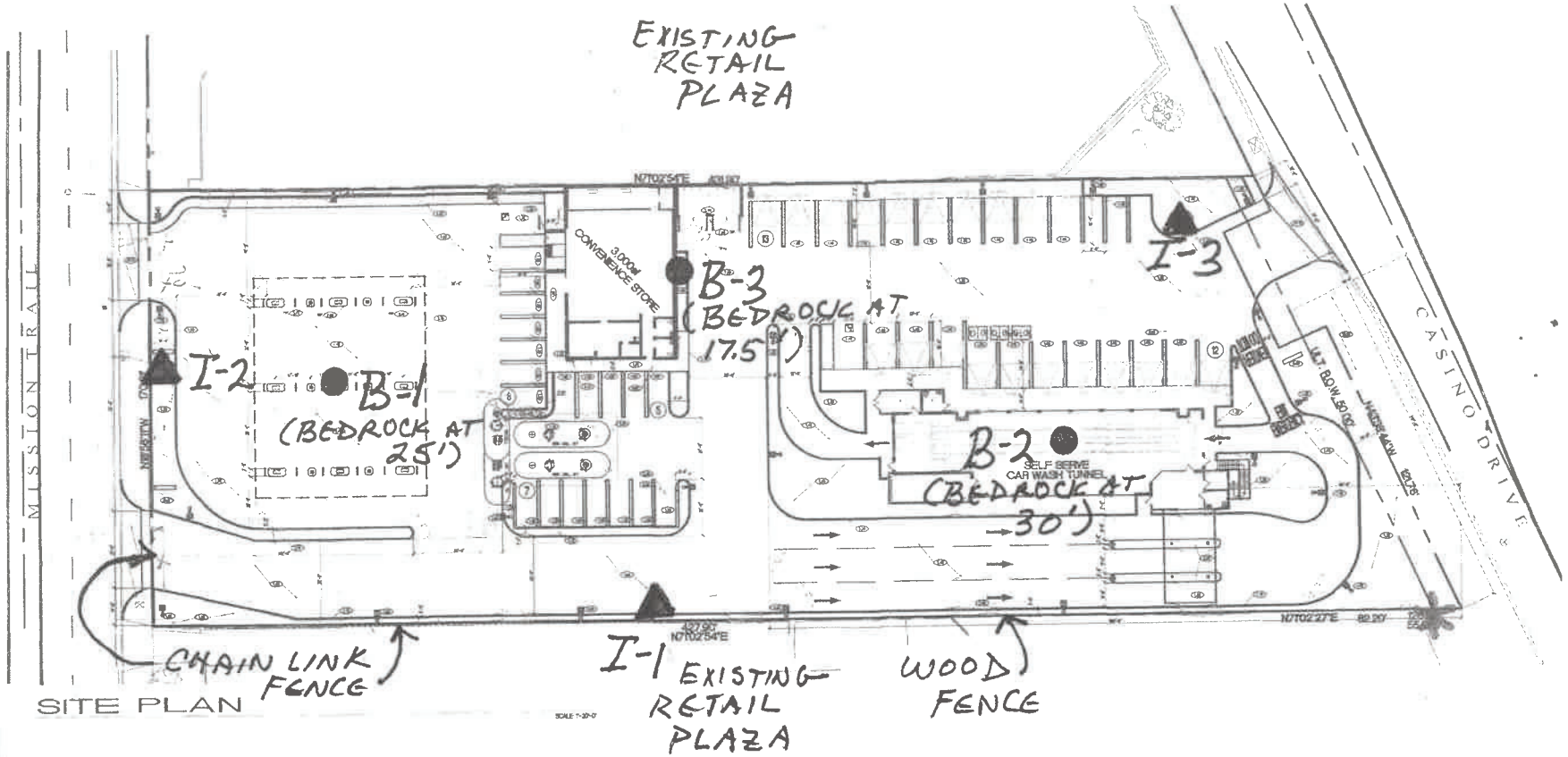
LEGEND

B-3 ● Approximate Location of Boring
I-3 ▲ Approximate Location of Infiltration Test

Soil Exploration Co., Inc.

Project No. 19197-01	October 9, 2019

VICINITY MAP



C.J.C. Design, Inc.
Design Planning Permitting

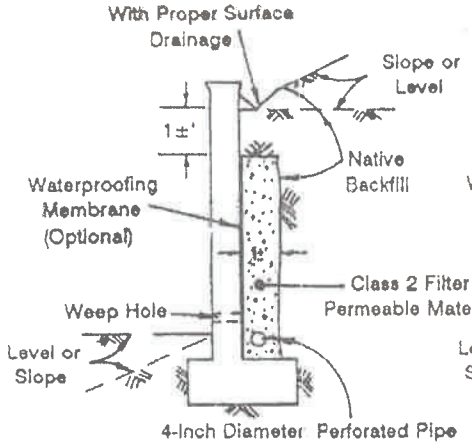
PROJECT:
APN: 363-172-016
31800 MISSION TRAIL
LAKE ELSINORE, CA. 92530

SITE PLAN

DATE 08/15/19
SCALE N.T.S.
DRAWN BY F. SOHEN CHECKED BY F. SOHEN
PROJECT NUMBER 1908
SHEET C1.1

SUBDRAIN OPTIONS FOR NATIVE MATERIAL BACKFILL

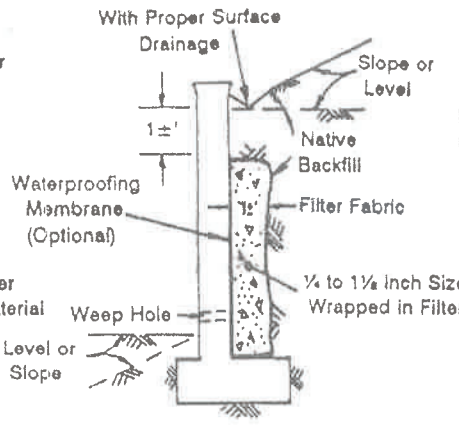
OPTION N2: Pipe Surrounded with Class 2 Material



Class 2 Filter Permeable Material Grading Per Caltrans Specifications

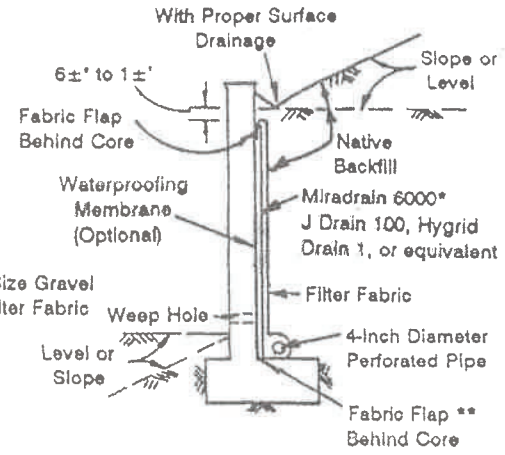
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

OPTION N1: Gravel Wrapped in Filter Fabric



Proper Outlet Should be Provided for Gravel Subdrain (See Notes)

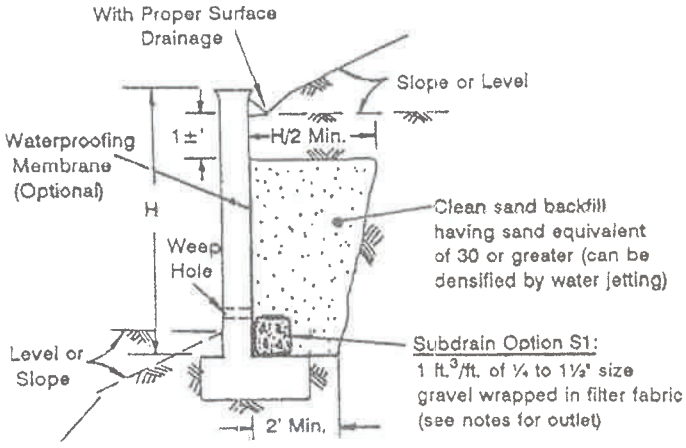
OPTION N3: Geotextile Drain

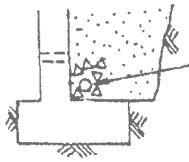


*Miradrain 6000 or J Drain 100 for non-waterproofed walls; Miradrain 6200 or J Drain 200 for completed waterproofed walls

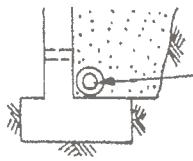
**Peel back the bottom fabric flap, place pipe next to core, wrap fabric around pipe and tuck behind core.

SUBDRAIN OPTIONS FOR CLEAN SAND BACKFILL





Subdrain Option S2:
4" diameter perforated pipe surrounded with 1 ft.³/ft. of Class 2 filter material per Caltrans specifications as above



Subdrain Option S3:
4" diameter perforated pipe wrapped in filter fabric

Notes:

- Pipe type should be ASTM D1527 Acrylonitrile Butediene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down.
- Filter fabric should be Mirafi 140N, 140NS, Supac 4NP, Amoco 4545, Trevira 1114, or approved equivalent.
- All drains should have a gradient of 1 percent minimum.
- Outlet portion for gravel subdrain should have a 4"-diameter pipe with the perforated portion inserted into the gravel approximately 2' minimum and the nonperforated portion extending approximately 1' outside the gravel. Proper sealing should be provided at the pipe insertion enabling water to run from the gravel portion into rather than outside the pipe.
- Waterproofing membrane may be required for a specific retaining wall such as a stucco or basement wall.
- Weephole should be 2" minimum diameter and provided at 25' minimum in length of wall. If exposure is permitted, weephole should be located at 3±" above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to discharge through the curb face or equivalent should be provided, or for a basement-type wall, a proper subdrain outlet system should be provided. Open vertical masonry joints (i.e., omit mortar from joints of first course above finished grade) at 32" maximum intervals may be substituted for weepholes. Screening such as with a filter fabric should be provided for weepholes/open joints to prevent earth materials from entering the holes/joints.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL

Soil Exploration Co. Inc.

Plate: 2

APPENDIX A

REFERENCES

- USGS Preliminary Geologic Map of the Elsinore 7.5' Quadrangle, Riverside County, California.
- CDMG, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada, Dated February 1998.
- Riverside County Liquefaction Map
- U.S. Geological Survey Faults, 2014.

Riverside County Stormwater Quality Best Management Practice, Design Handbook for Low Impact Development, Riverside County, June 2014.

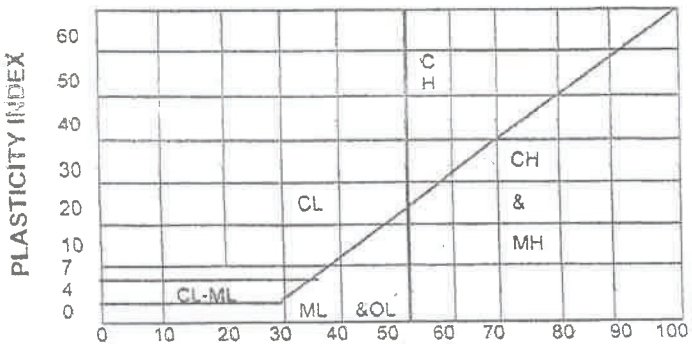
APPENDIX B

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (More than ½ of soil < No. 200 sieve)	GRAVELS (More than ½ of coarse fraction > No. 4 sieve size)	GW		Well-graded gravels or gravel-sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than ½ of coarse fraction < No. 4 sieve size)	SW		Well-graded sands or gravely sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand-salt mixtures
		SC		Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than ½ of soil < No. 200 sieve)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL		Organic silts and organic silty clays of low plasticity.
	SILTS & CLAYS LL > 50	MH		Inorganic silts, caceous or diatonaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of medium to high plasticity, organic silty clays, organic silts
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
	HIGHLY ORGANIC SOILS	Pt		Peat and other highly organic soils

CLASSIFICATION CHART
(UNIFIED SOIL CLASSIFICATION SYSTEM)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDER	ABOVE 12"	ABOVE 305
COBBLES	3" to 12"	305 to 76.2
GRAVEL	3" to No. 4	762 to 4.76
COARSE	3" TO ¾"	76.2 to 19.1
FINE	¾"to No. 4	19.1 to 4.76
SAND	No. 4 to 200	4.76 to 0.074
COARSE	No. 4 to 10	4.76 to 2.00
MEDIUM	No. 10 to 40	2.00 to 0.420
FINE	No. 40 to 200	0.420 to 0.074
SILT & CLAY	BELOW No. 200	BELOW 0.074

GRAIN SIZE CHART



PLASTICITY CHART

Ring Sample	Bag Sample	NR No Recovery	Classification in accordance with ASTM D2487 Description and visual observation in accordance with ASTM D2488 All Sieve Sizes shown are US Standard SPT Refusal is defined as one of the following: 10 blows for no apparent displacement 50 blows for less than 6 inches advancement 100 blows for 6 to 18 inches advancement
SPT Sample	Seepage		

GEOTECHNICAL BORING LOGS

Drill Hole No. B-1

Date: October 3, 2019
Drilling Company: Larry Harklerode
Hole Diameter: 8" Drive Weight: 140 lbs. Drop: 30"

Project No. 19197-01
Type of Rig: B-53
Elevation: Existing Ground

DEPTH (feet)	TYPE OF TEST	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	**SILT Y SAND:** Light brown, fine to coarse grained, dry, dense
2							
3		X	17/19/24	-	3.5		Dry, dense % Passing No. 200 Sieve = 34
4							
5							
6		X	25/50	-	3.8		Dry, very dense % Passing No. 200 Sieve = 27
7							
8							
9							
10							
11		X	60/6"	-	-		Dry, very dense
12							
13							
14							
15							
16		X	22/23/23	-	-	SP	**SAND:** Yellowish/light brown, fine to medium grained, dry, dense
17							
18							
19							
20							
21		X	20/25/26	-	3.3		Dry, very dense % Passing No. 200 Sieve = 3
22							
23							
24							
25							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-1

Date: October 3, 2019
Drilling Company: Larry Harklerode
Hole Diameter: 8" Drive Weight: 140 lbs. Drop: 30"

Project No. 19197-01
Type of Rig: B-53
Elevation: Existing Ground

DEPTH (feet)	TYPE OF TEST	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
26	Bedrock	X	50/6"	-	6.4	Kpvg	**MONOGRANITE TO GRANODIORITE:** Light olive gray, fine to coarse grained, very dense % Passing No. 200 Sieve = 7
27							
28							
29							TOTAL DEPTH = 28 FEET NO GROUNDWATER NO CAVING BORING BACKFILLED
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-2

Date: October 3, 2019
Drilling Company: Larry Harklerode
Hole Diameter: 8" Drive Weight: 140 lbs. Drop: 30"

Project No. 19197-01
Type of Rig: B-53
Elevation: Existing Ground

DEPTH (feet)	TYPE OF TEST	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Allubium					SM	**SILTY SAND:** Light brown, fine to coarse grained, dry, very dense
2							
3		X	24/26/27	-	-		Dry, very dense
4							
5							
6		X	7/8/9	-	2.7		Dry, medium dense
7							
8							
9							
10							
11		X	16/25/38				Dry, very dense
12							
13							
14							
15							
16		X	50/5"	-	-		Slightly moist, very dense
17							
18							
19							
20							
21		X	15/17/21	-	-		Fine to medium grained, slightly moist, dense
22							
23							
24							
25							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-2

Date: October 3, 2019
Drilling Company: Larry Harklerode
Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30"

Project No. 19197-01
Type of Rig: B-53
Elevation: Existing Ground

DEPTH (feet)	TYPE OF TEST	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
26	Alluvium	X	23/50"	*	-	SP	**SAND WITH GRAVEL:** Light brown, fine to coarse grained, dry, very dense
27							
28							
29							
30							
31	Bedrock	X				Kpvg	**MONZOGRANITE TO GRANODIORITE:** Light brown, fine to coarse grained, very dense
32							TOTAL DEPTH = 31.5 FEET NO GROUNDWATER NO CAVING BORING BACKFILLED
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-3

Date: October 3, 2019
Drilling Company: Larry Harklerode
Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30"

Project No. 19197-01
Type of Rig: B-53
Elevation: Existing Ground

DEPTH (feet)	TYPE OF TEST	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	**SILTY SAND:** Light brown, fine to coarse grained, dry, medium dense
2							
3			18/20/22	106.1	4.7		Dry, dense
4							
5							
6			8/10/14	-	4.5		Dry, medium dense
7							
8							
9							
10							
11			34/50	-	-		Fine to medium grained, slightly moist, very dense
12							
13							
14							
15							
16			22/40/40	-	-	SP	**SAND WITH GRAVEL:** Light gray/brown, fine to coarse grained, dry, very dense
17							
18	Bedrock		50/5"	-	-	Kpvg	**MONZOGRANITE TO GRANODIORITE:** Light brown, fine to coarse grained, very dense Practical refusal
19							
20							TOTAL DEPTH = 18 FEET NO GROUNDWATER NO CAVING BORING BACKFILLED
21							
22							
23							
24							
25							

APPENDIX C

31800 Mission Trail
City of Lake Elsinore, California

LABORATORY TEST RESULTS

SIEVE SIZE	B-1 @ 2' % PASSING	B-1 @ 5' % PASSING	B-1@ 20' % PASSING	B-1 @ 25' % PASSING
3/8"	100	100	100	100
No. 4	99	99	88	91
No. 8	90	91	70	73
No. 16	76	76	47	47
No. 30	62	59	25	28
No. 50	52	46	11	18
No. 100	43	36	6	12
No. 200	34	27	3	7
SIEVE ANALYSIS TEST DATA				

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental & Civil Engineering

October 11, 2019

Soil Exploration Company Inc.
7535 Jurupa Avenue, Unit C
Riverside, California 92504

Attn: Mr. Gene Luu

RE: LABORATORY TEST RESULTS/REPORT
Client: N/A
Project: Sulfate
Project No.: 19197-01
QCI Job No.: 19-183-010c

Gentlemen:

We have completed the testing program conducted on sample for above project. The tests were performed in accordance with testing procedures as follows:

TEST	METHOD
Sulfate	CT- 417

Enclosed is Summary of Laboratory Test Results.

We appreciate the opportunity to provide testing services to Soil Exploration Company Inc. Should you have any questions, please call the undersigned.

Sincerely yours,
Cal Land Engineering, Inc. (CLE)
dba Quartech Consultants (QCI)

Giovani Valdivia
Project Engineer

Enclosure

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

Soil Exploration Company Inc.
7535 Jurupa Avenue, Suite C
Riverside, California 92504

QCI Project No.: 19-183-010c
Date: October 11, 2019
Summarized by: GV

Client: N/A
Project: Sulfate
Project No.: 19197-01

Sulfate Test Results

Sample ID	Sample Depth (ft)	Sulfate CT-417 % By Weight
B-1	0-5	0.002

576 East Lambert Road, Brea, California 92821; Tel: 714-671-1050; Fax: 714-671-1090

APPENDIX D

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)
1.00	Elsinore;W+GI	CA	n/a	81	NE	strike slip	0	14
1.00	Elsinore;GI	CA	5	90	V	strike slip	0	13
1.66	Elsinore;GI+T+J+CM	CA	n/a	86	NE	strike slip	0	16
1.66	Elsinore;GI+T	CA	5	90	V	strike slip	0	14
1.66	Elsinore;W+GI+T+J+CM	CA	n/a	84	NE	strike slip	0	16
1.66	Elsinore;W+GI+T+J	CA	n/a	84	NE	strike slip	0	16
1.66	Elsinore;GI+T+J	CA	n/a	86	NE	strike slip	0	17
1.66	Elsinore;W+GI+T	CA	n/a	84	NE	strike slip	0	14
2.13	Elsinore;T	CA	5	90	V	strike slip	0	14
2.13	Elsinore;T+J+CM	CA	n/a	85	NE	strike slip	0	16
2.13	Elsinore;T+J	CA	n/a	86	NE	strike slip	0	17
18.94	San Jacinto;A+C	CA	n/a	90	V	strike slip	0	17
18.94	San Jacinto;A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
18.94	San Jacinto;A+CC	CA	n/a	90	V	strike slip	0	16
18.94	San Jacinto;A	CA	9	90	V	strike slip	0	17
18.94	San Jacinto;A+CC+B	CA	n/a	90	V	strike slip	0.1	15
19.27	Chino, alt 2	CA	1	65	SW	strike slip	0	14

20.17	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17
20.17	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16
20.17	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15
20.17	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
20.17	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
20.17	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15
20.17	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16
20.17	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17
20.17	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17
20.17	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16
20.59	Elsinore;W	CA	2.5	75	NE	strike slip	0	14
20.68	San Jacinto;SJV	CA	18	90	V	strike slip	0	16
20.68	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16
21.86	Chino, alt 1	CA	1	50	SW	strike slip	0	9
22.15	San Joaquin Hills	CA	0.5	23	SW	thrust	2	13
25.00	San Jacinto;SBV	CA	6	90	V	strike slip	0	16
27.47	Elsinore;J	CA	3	84	NE	strike slip	0	19
27.47	Elsinore;J+CM	CA	3	84	NE	strike slip	0	17
28.63	Newport-Inglewood (Offshore)	CA	1.5	90	V	strike slip	0	10
28.63	Newport Inglewood Connected alt 2	CA	1.3	90	V	strike slip	0	11
28.63	Newport Inglewood Connected alt 1	CA	1.3	89		strike slip	0	11
32.75	S. San Andreas;NM+SM+NSB+SSB	CA	n/a	90	V		0	13

						strike slip		
32.75	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
32.75	S. San Andreas;SSB+BG	CA	n/a	71		strike slip	0	13
32.75	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12
32.75	S. San Andreas;CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14
32.75	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	85		strike slip	0	14
32.75	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
32.75	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14
32.75	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14
32.75	S. San Andreas;NM+SM+NSB+SSB+BG	CA	n/a	83		strike slip	0	14
32.75	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13
32.75	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13
32.75	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14
32.75	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0.1	13
32.75	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13
32.75	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
32.75	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13
32.75	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13
32.75	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike slip	0.1	13
32.75	S. San Andreas;SSB	CA	16	90	V	strike slip	0	13
32.75	S. San Andreas;SSB+BG+CO	CA	n/a	77		strike slip	0.2	12

32.75	S. San Andreas;BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14
32.75	S. San Andreas;BB+NM+SM+NSB+SSB+BG	CA	n/a	84		strike slip	0	14
32.75	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13
34.20	S. San Andreas;CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
34.20	S. San Andreas;CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
34.20	S. San Andreas;NSB	CA	22	90	V	strike slip	0	13
34.20	S. San Andreas;SM+NSB	CA	n/a	90	V	strike slip	0	13
34.20	S. San Andreas;NM+SM+NSB	CA	n/a	90	V	strike slip	0	13
34.20	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0.1	13
34.20	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
35.04	S. San Andreas;BG+CO	CA	n/a	72		strike slip	0.3	12
35.04	S. San Andreas;BG	CA	n/a	58		strike slip	0	13
36.60	Cucamonga	CA	5	45	N	thrust	0	8
36.76	Puente Hills (Coyote Hills)	CA	0.7	26	N	thrust	2.8	15
36.86	Newport-Inglewood, alt 1	CA	1	88		strike slip	0	15
37.60	Rose Canyon	CA	1.5	90	V	strike slip	0	8
38.57	San Jose	CA	0.5	74	NW	strike slip	0	15
40.96	Sierra Madre Connected	CA	2	51		reverse	0	14
40.96	Sierra Madre	CA	2	53	N	reverse	0	14
42.56	Cleghorn	CA	3	90	V	strike slip	0	16
42.98	Pinto Mtn	CA	2.5	90	V	strike slip	0	16
44.04	Coronado Bank	CA	3	90	V	strike slip	0	9
44.04	Palos Verdes	CA	3	90	V		0	14

						strike slip		
44.04	Palos Verdes Connected	CA	3	90	V	strike slip	0	10
45.40	San Jacinto;CC+B+SM	CA	n/a	90	V	strike slip	0.2	14
45.40	San Jacinto;CC+B	CA	n/a	90	V	strike slip	0.2	14
45.40	San Jacinto;CC	CA	4	90	V	strike slip	0	16
45.47	North Frontal (West)	CA	1	49	S	reverse	0	16
45.57	Puente Hills (Santa Fe Springs)	CA	0.7	29	N	thrust	2.8	15
46.66	San Jacinto;C	CA	14	90	V	strike slip	0	17
47.64	S. San Andreas;SM	CA	29	90	V	strike slip	0	13
47.64	S. San Andreas;BB+NM+SM	CA	n/a	90	V	strike slip	0	14
47.64	S. San Andreas;PK+CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0.1	13
47.64	S. San Andreas;NM+SM	CA	n/a	90	V	strike slip	0	14
47.64	S. San Andreas;CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14
47.64	S. San Andreas;CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14

2016 CBC – SEISMIC PARAMETERS		
Site Coordinates	**Latitude**	**Longitude**
	33.6578	**-117.2977**
Mapped Spectral Response Acceleration	S_S = 2.34	S_1 = 0.982
Site Coefficients (Class "D")	F_a = 1.00	F_v = 1.50
Maximum Considered Earthquake (MCE) Spectral Response Acceleration	S_{MS} = 2.34	S_{M1} = 1.472
Design Spectral Response Acceleration Parameters	S_{DS} = 1.56	S_{D1} = 0.982
Seismic Design Category	E	
Peak Ground Acceleration (PGA)	0.898g	

References:

- Earthquake.usgs.gov/research/hazmaps/design
- 2016 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Section 1613, Earthquake Loads

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installations of subdrains, and excavations. The recommendations contained in the geotechnical report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supersede these specifications or the recommendations of the geotechnical report.

2.0 EARTHWORK OBSERVATIONS AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the consultant provide adequate testing and observations so that he may determine that the work was accomplished as specified. It shall be the responsibility of the contractor to assist the consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and approved grading plans. If, in the opinion of the consultant, unsatisfactory conditions, such as questionable soil, poor moisture conditions, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the consultant will be empowered to reject the work and recommend that construction be stopped until the unsatisfactory conditions are rectified.

Maximum dry density tests used to determine the degree of compaction will be performed in accordance with the American Society of Testing and Materials, test method ASTM D1557-12.

3.0 PREPARATION OF AREAS TO BE FILLED

3.1 Clearing and Grubbing

All brush, vegetation, and debris shall be removed or piled and otherwise disposed of.

3.2 Processing

The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of 6 inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation

Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such depth that surface processing cannot adequately improve the condition, shall be overexcavated down to firm ground, approved by the consultant.

3.4 Moisture Conditioning

Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed, as required to attain a uniform moisture content near optimum.

3.5 Recompaction

Overexcavation and processed soils which have been properly mixed and moisture-conditioned shall be recompacted to a minimum relative compaction of 90 percent.

3.6 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal : vertical), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm materials, and shall be approved by the consultant. Other benches shall be excavated in firm materials for a minimum width of 4 feet. Ground sloping flatter than 5:1 (horizontal : vertical) shall be benched or otherwise overexcavated when considered necessary by the consultant.

3.7 Approval

All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be approved by the consultant prior to fill placement.

4.0 FILL MATERIAL

4.1 General

Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 Oversize

Oversize materials defined as rock, or other irreducible material with maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically approved by the consultant. Oversize disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or within the range of future utilities or underground construction, unless specifically approved by the consultant.

4.3 Import

If importing of fill material is required for grading, the import material shall meet the requirements of Section 4.1.

5.0 FILL PLACEMENT and COMPACTION

5.1 Fill Lifts

Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 6 inches in compacted thickness. The consultant may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 Fill Moisture

Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture conditioning and mixing of fill layers shall continue until the fill material is at a uniform moisture content at or near optimum.

5.3 Compaction of Fill

After each layer has been evenly spread, moisture-conditioned, and mixed, it shall be uniformly compacted to not less than 90 percent of maximum dry density. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 *Fill Slopes*

Compacting of slopes shall be accomplished, in addition to normal compacting procedures, by backrolling of slopes with sheepsfoot rollers at frequent increments of 2 to 3 feet in fill elevation gain, or by other methods producing satisfactory results. At the completion of grading, the relative compaction of the slope out to the slope face shall be at least 90 percent.

5.5 *Compaction Testing*

Field-tests to check the fill moisture and degree of compaction will be performed by the consultant. The location and frequency of tests shall be at the consultant's discretion. In general, the tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of embankment.

6.0 SUBDRAIN INSTALLATION

Subdrain systems, if required, shall be installed in approved ground to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the approval of the consultant. The consultant, however, may recommend and upon approval, direct changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation and sufficient time shall be allowed for the surveys, prior to commencement of filling over the subdrain.

7.0 EXCAVATION

Excavations and cut slopes will be examined during grading. If directed by the consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes shall be performed. Where fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope shall be made and approved by the consultant prior to placement of materials for construction of the fill portion of the slope.

8.0 TRENCH BACKFILLS

Trench excavations for utility pipes shall be backfilled under engineering supervision.

After the utility pipe has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

The onsite materials, or other soils approved by the soil engineer, shall be watered and mixed as necessary prior to placement in lifts over the sand backfill.

The controlled backfill shall be compacted to at least 90 percent of the maximum dry density as determined by the ASTM D1557-12 test method.

Field density tests and inspection of the backfill procedures shall be made by the soil engineer during backfilling to see that proper moisture content and uniform compaction is being maintained. The contractor shall provide test holes and exploratory pits as required by the soil engineer to enable sampling and testing.

APPENDIX F

Infiltration Test (Percolation Test Procedure)

The tests were performed in accordance with Riverside County Stormwater Quality Best Management Practice Design Handbook for Low Impact Development, dated June 2014.

Three 8-inch diameter test holes (I-1, I-2 and I-3) were drilled at the suggested locations. The soil at the test locations was visually classified as silty sand. To mitigate any possible caving or sloughing of the test holes, a 6-inch diameter perforated pipe was placed in the hole. The bottom of the hole was covered with 2 inches of gravel.

The testing was conducted after presoaking. Two consecutive measurements showed that 6 inches of water seeped away in more than 25 minutes. The tests were therefore run an additional six hours with measurements taken at 30 minute intervals. Water level was adjusted to 20 inches above the bottom of the test hole after each measurement. The drop that occurred during the final reading was used for design rate purposes.

Infiltration Test/Tabulated Test Results

Test No.	Depth of Test (feet)	Earth Material	Infiltration Rate (in/hr)
I-1	8	Silty Sand (SM)	0.12
I-2	8	Silty Sand (SM)	0.21
I-3	8	Silty Sand (SM)	0.72

We recommend that a suitable factor of safety should be applied to the rate in design of the system.

INFILTRATION TEST DATA
(Boring Percolation Test Procedure)

Project: CJC Design, INC. Project No.: 191701
Test Hole No.: TH 1 Date Excavated: 12-3-19
Depth of Test Hole: 2 FEET Soil Classification: SM
Diameter: 8" Presoak: YES
Tested By: EJ Date: 12-3-19

SANDY SOIL CRITERIA TEST

Trial No.	Time	Time Interval (min)	Initial Water Level (inches)	Final Water Level (inches)	Δ in Water Level (inches)	Greater Than or Equal to 6" (Y/N)
1	8:19:44 8:44:44	25	76	76.875	0.875	N
2	8:45:55 9:10:55	25	〃	76.625	0.625	〃

Use Normal Sandy (Circle One) Soil Criteria

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	Do Initial Depth to Water(in.)	Df Final Depth to Water(in.)	ΔD Change in Water Level (in.)	Infiltration Rate (in./hr.)
1	9:11:09	9:41:09	30	76	76.625	0.625	
2	9:47:45	10:17:45	30	〃	〃	〃	
3	10:18:23	10:48:23	30	〃	〃	〃	
4	10:49:34	11:19:34	〃	〃	〃	〃	
5	11:20:45	11:50:45	〃	〃	〃	〃	
6	11:51:56	12:21:56	〃	〃	〃	〃	
7	12:23:08	12:53:08	〃	〃	〃	〃	
8	12:54:20	1:24:20	〃	〃	〃	〃	
9	1:25:32	1:55:32	〃	〃	〃	〃	
10	1:56:43	2:26:43	〃	〃	〃	〃	
11	2:27:55	2:57:55	〃	〃	〃	〃	
12	2:59:08	3:29:08	〃	〃	〃	〃	0.12

COMMENTS:

Infiltration Rate = $\frac{4 \times 60 \times 0.625}{30\,(4 + (20 + (20 - 0.625)))} = 0.12$ in/hr

INFILTRATION TEST DATA
(Boring Percolation Test Procedure)

Project: CJC Design Inc Project No.: 19,97-01

Test Hole No.: I-2 Date Excavated: 10/3/19

Depth of Test Hole: 8 Feet Soil Classification: SM

Diameter: 8" Presoak: yes

Tested By: ER Date: 10/3/19

SANDY SOIL CRITERIA TEST

120

Trial No.	Time	Time Interval (min)	Initial Water Level (inches)	Final Water Level (inches)	Δ in Water Level (inches)	Greater Than or Equal to 6" (Y/N)
1	8:51:11 9:14:11	25	76	77.125	1.125	N
2	9:15:22 9:40:22	23	"	76.875	0.875	"

Use Normal Sandy (Circle One) Soil Criteria

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	Do Initial Depth to Water(in.)	Df Final Depth to Water(in.)	ΔD Change in Water Level (in.)	Infiltration Rate (in./hr.)
1	9:44:06	10:14:06	30	76	77.125	1.125	
2	10:15:45	10:45:45	30	"	"	"	
3	10:48:50	11:18:50	30	"	"	"	
4	11:20:01	11:50:01	"	"	"	"	
5	11:51:12	12:21:12	"	"	"	"	
6	12:22:23	12:52:23	"	"	"	"	
7	12:53:34	1:23:34	"	"	"	"	
8	1:24:45	1:54:45	"	"	"	"	
9	1:55:56	2:25:56	"	"	"	"	
10	2:27:08	2:57:08	"	"	"	"	
11	2:58:20	3:28:20	"	"	"	"	
12	3:29:32	3:59:32	"		"	"	0.21

COMMENTS:

Infiltration Rate = $\frac{2 \times 60 \times 1.125}{30(4+(20+(20-1.125)))}$ = 0.21 in/hr

INFILTRATION TEST DATA
(Boring Percolation Test Procedure)

Project: CJC DESIGN INC Project No.: 19197-01
Test Hole No.: T3 Date Excavated: 10-3-19
Depth of Test Hole: 5'-6" Soil Classification: SM
Diameter: 8" Presoak: YES
Tested By: CJ Date: 10-3-19

SANDY SOIL CRITERIA TEST

Trial No.	Time	Time Interval (min)	Initial Water Level (inches)	Final Water Level (inches)	Δ in Water Level (inches)	Greater Than or Equal to 6" (Y/N)
1		25	76	79.875	3.875	
2	11:09:39 11:34:39	25	11	79.625	3.625	

Use Normal Sandy (Circle One) Soil Criteria

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	Do Initial Depth to Water(in.)	Df Final Depth to Water(in.)	ΔD Change in Water Level (in.)	Infiltration Rate (in./hr.)
1	11:34:32	12:04:32	30	76	79.625	3.625	
2	12:05:21	12:35:21	30	11	11	11	
3	12:36:30	1:06:30	30	11	11	11	
4	1:08:41	1:38:41	11	11	11	11	
5	1:39:52	2:09:52	11	11	11	11	
6	2:11:04	2:41:04	11	11	11	11	
7	2:42:16	3:12:16	11	11	11	11	
8	3:13:28	3:43:28	11	11	11	11	
9	3:44:40	4:14:40	11	11	11	11	
10	4:15:52	4:45:52	11	11	11	11	
11	4:47:05	5:17:05	11	11	11	11	
12	5:18:18	5:48:18	11	11	11	11	0.72

COMMENTS:

Infiltration Rate: $\frac{4 \times 60 \times 3.625}{30(4+(20+(20-3.625)))} = 0.72$ in/hr

APPENDIX G

****

LIQUEFACTION ANALYSIS SUMMARY

****

Font: Courier New, Regular, Size 8 is recommended for this report.
Licensed to , 10/8/2019 3:17:26 PM

Input File Name: UNTITLED
Title: CJC Design Inc.
Subtitle: Proj No. 19197-01

Surface Elev.=Existing Ground
Hole No.=B-1
Depth of Hole= 25.00 ft
Water Table during Earthquake= 35.00 ft
Water Table during In-Situ Testing= 35.00 ft
Max. Acceleration= 0.9 g
Earthquake Magnitude= 7.00

Input Data:

Surface Elev.=Existing Ground
Hole No.=B-1
Depth of Hole=25.00 ft
Water Table during Earthquake= 35.00 ft
Water Table during In-Situ Testing= 35.00 ft
Max. Acceleration=0.9 g
Earthquake Magnitude=7.00

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 0.89
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.00	33.00	120.00	34.00
5.00	100.00	120.00	27.00
10.00	100.00	120.00	27.00
15.00	46.00	120.00	3.00
20.00	51.00	120.00	3.00
25.00	100.00	120.00	7.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.35 in.
Total Settlement of Saturated and Unsaturated Sands=0.35 in.
Differential Settlement=0.176 to 0.233 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.39	0.58	5.00	0.00	0.35	0.35
5.00	2.39	0.58	5.00	0.00	0.34	0.34
10.00	2.39	0.57	5.00	0.00	0.33	0.33
15.00	2.39	0.56	5.00	0.00	0.27	0.27
20.00	2.39	0.56	5.00	0.00	0.06	0.06
25.00	2.39	0.55	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Depth = ft, Stress or Pressure = atm (tsf), Unit Weight = pcf, Settlement = in.

---

1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands
S_dry Settlement from Unsaturated Sands
S_all Total Settlement from Saturated and Unsaturated Sands
NoLiq No-Liquefy Soils

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Subject RE: [External]16007002-191 (Berri Bros Express Car Wash FWQMP - PC1 MEMO
From Damaris Abraham <dabraham@lake-elsinore.org>
To DZN Engineering <rld@dzne.net>, Rita Thompson <rthompson@Lake-Elsinore.org>
Cc Cay Calleja <draw@dzne.net>, Fred Cohen (CJC Design, Inc.) <fcohen@cjccorp.com>, David Berri <david@berribrothers.com>
Date 2020-07-28 13:45

Hi Ronie,

A Phase I ESA was not submitted with the Planning application as it was not a requirement for initial application submittal. Have you checked with the applicant to see if they have prepared a Phase I ESA? This report is generally required as a basis for other technical reports.

Thanks,

Damaris Abraham
Senior Planner
City of Lake Elsinore
(951) 674-3124, ext. 913

From: DZN Engineering <rld@dzne.net>
Sent: Tuesday, July 28, 2020 1:16 PM
To: Rita Thompson <rthompson@Lake-Elsinore.org>
Cc: Cay Calleja <draw@dzne.net>; Fred Cohen (CJC Design, Inc.) <fcohen@cjccorp.com>; David Berri <david@berribrothers.com>; Damaris Abraham <dabraham@lake-elsinore.org>
Subject: Re: [External]16007002-191 (Berri Bros Express Car Wash FWQMP - PC1 MEMO

is there a specific Planner assigned to this?

Best Regards,

RONIE L. DEMA-ALA, PE
d'zn engineering
949.305.8920
rld@dzne.net

On 2020-07-28 13:13, Rita Thompson wrote:

> Hello.
>
> Please see my responses to your inquiries below. Let me know if you have any additional questions.
>
> Regards,
>
> **Rita Thompson**
> Senior Engineering Technician
> NPDES Stormwater Coordinator
> City of Lake Elsinore
> 130 S. Main Street
> Lake Elsinore, CA 92530
> 951-674-3124 x308
> **TEAMWORK MAKES THE DREAM WORK**
>
> ---
>
> **From:** DZN Engineering [mailto:rld@dzne.net]
> **Sent:** Tuesday, July 28, 2020 1:00 PM
> **To:** Rita Thompson <rthompson@Lake-Elsinore.org>
> **Cc:** Cay Calleja <draw@dzne.net>; Fred Cohen (CJC Design, Inc.) <fcohen@cjccorp.com>; David Berri <david@berribrothers.com>; swilson@erscinc.com
> **Subject:** [External]16007002-191 (Berri Bros Express Car Wash FWQMP - PC1 MEMO
>
> **Message from external sender. Use Caution.**
>
> Hi Rita,
>
> As per review comments from Stephen Wilson, please clarify,
>
> 1. Appendix 4: Historical Site Conditions:
>
> "If the City of Lake Elsinore requires a Phase 1 Environmental Site Assessment and if there is one in existence, include that document in this appendix. If one is

required and not completed, explain that in a note. The current Togographic Survey of the site does not suffice for the Site Assessment."

Does the City require a Phase 1 Environmental Site Assessment? If yes and the document is available, may we request for a copy. - ***Please contact the project planner in the City Planning Dept; if there is one or if it is required they will know.***

2. Appendix 9: O&M

"Although a photocopy of a completed, owner-signed and notarized WQMP BMP Maintenance Covenant & Agreement is not required for the approval of a PWQMP, a copy of a blank City Covenant document shall be included in this appendix for future reference in preparation of the Final WQMP. Contact the City of Lake Elsinore to obtain a copy of this document."

May we request for a copy of the WQMP BMP Maintenance Covenant & Agreement. - ***Please see attached.***

Best Regards,

RONIE L. DEMA-ALA, PE

949.305.8920
rld@dzne.net

On 2020-07-28 12:44, DZN Engineering wrote:

> Hi Fred,
>
> As per City's review comments, please provide, if available, to complete our WQMP.
>
> 1. Development Number
>
> 2. Design Review/Case Number
>
> 3. Owner's Certification:
> > Ordinance Number
> > Municipal Code Section
>
> 4. Site Information:
> > Planning Area
> > Community Name
> > Development Name
>
> --
>
> **Best Regards,**
>
> **RONIE L. DEMA-ALA, PE**
>
> d'zn engineering
> **949.305.8920**
> **rld@dzne.net**

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
			Calculated Cells

Company Name:	DZN	Date:	19-Jul
Designed by:	Ronie Dema-ala	County/City Case No.:	

Design Volume

Enter the area tributary to this feature	A_T=	1.8	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	3,400	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.8	ft
Top Width of Bioretention Facility, excluding curb	w_T =	9.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.73	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	1,972	ft^2
Proposed Surface Area	A=	1,202	ft^2

ERROR, the proposed surface area must be equal to or greater than the minimum surface area

Minimum Required Length of Bioretention Facility, L	L =	219.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =		:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:			

Notes: The site is severely sloped - there is a 40' grade difference between Mission Trail and Casino Drive. The most feasible location for the proposed Bioretention area is the planter area fronting Mission Trail. However, this planter area has a size of 1,202 SF and the minimum Bioretention area is 1,972.

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	DZN	Date	10/13/2020
Designed by	Ronie Dema-ala	Case No	
Company Project Number/Name	Berri Bros Express Car Wash		

BMP Identification

BMP NAME / ID: Treatment Control BMP: BioClean Modular Wetlands System: Model MWS-L-8-12-V

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

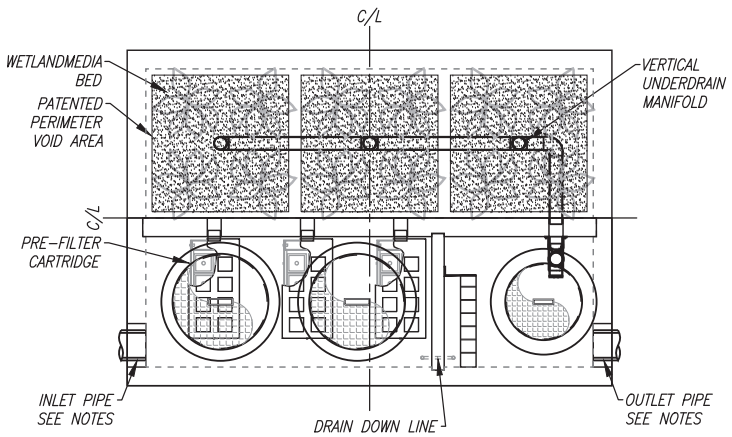
DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
		Natural (D Soil)						
DMA1	*2975*	*Roofs*	*1*	*0.892*	*2653.7*			
	66234	*Concrete or Asphalt*	*1*	*0.892*	*59080.7*			
	8168	*Ornamental Landscaping*	*0.1*	*0.11046*	*902.2*			
	77377		*Total*		*62636.6*	*0.20*	*0.30*	*0.346*

Notes:

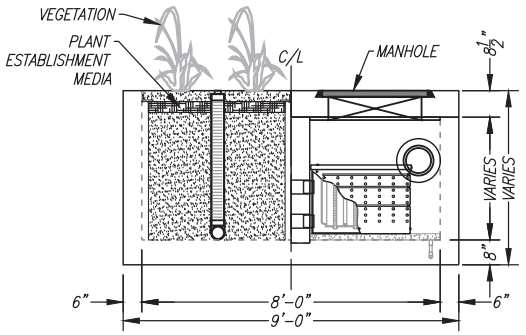
USE BioClean Modular Wetlands System, specifically the Stormwater Biofiltration System Model MWS-L-8-12-V.

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.346	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



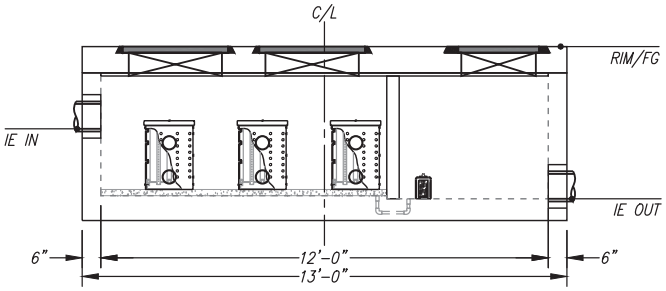
PLAN VIEW



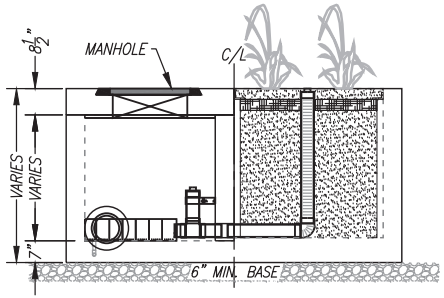
LEFT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

Bio Clean
A Forterra Company

MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Table I.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
Toxic Organic Compounds from potential fuel spills or leakage, vehicle fluid deposits on pavement, car washing detergents, car detailing products, litter & trash	Design and construct roofed trash enclosure with runon protection to reduce pollution introduction. Intercept all carwash wastewater on site and direct to a sanitary sewer.	Education for Property Owners, Tenants & Occupants; Activity Restrictions, BMP Maintenance, Common Area Litter Control; Common Area Catch Basin Inspection; Street Sweeping Private Streets & Parking Lots; Retail Gasoline Outlet BMPs
Nutrients from maintenance of landscaped areas including fertilizer application and over irrigation	Recessed finish grade of raised landscaped areas at 1" below top of curb & irrigation auto shutoff valves for sudden pressure loss.	Education for Property Owners, Tenants/ Occupants & Landscape Maintenance Contractors; Activity Restrictions, BMP Maintenance, Common Area Litter Control; Common Area Catch Basin Inspection; Street Sweeping Private Streets & Parking Lots; Retail Gasoline Outlets

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

WATER QUALITY MANAGEMENT PLAN
STORMWATER BMP
OPERATION AND MAINTENANCE AGREEMENT GUIDANCE

- **Explanation of Operation and Maintenance Agreement**
- **Inspection & Maintenance Agreement**
- **Long Term Maintenance Plan Instructions**
- **BMP Inspections Checklists (Templates)**

Explanation of Operation and Maintenance Agreement

The Operation and Maintenance Agreement is a required component of the Operations and Maintenance Plan (OMP). Guidance on the preparation of the OMP can be found at Chapter 6, Step 5 of the Riverside County, Santa Ana Region WQMP Guidance Document and Template (www.lake-elsinore.org WQMP web page).

The Operation and Maintenance (O&M) Agreement for a site is comprised of the following elements:

1. An Inspection and Maintenance Agreement signed by the developer or BMP owner.

2. A Long-term Maintenance Plan written by the design engineer or plan designer. The maintenance plan must include a description of the stormwater system and its components, inspection priorities and inspection schedule for each component, and a schematic for each BMP.

3. Drawing of easements on a plat or a system location map and decimal longitude and latitude to enable City of Lake Elsinore to locate BMPs as needed.

The O&M Agreement **must be submitted** for City of Lake Elsinore review and approval with the final Water Quality Management Plan. Under the terms of the Inspection and Maintenance Agreement, the property owner or owners are responsible for inspections and maintenance of BMPs and privately-owned stormwater system components outside of the right-of-way. **The O&M Agreement is to be recorded by the Developer/Owner at the Office of the Riverside County Recorder, with a conformed copy provided to the City Engineering Div. before a site is granted occupancy**. If the final configuration of the stormwater system components or BMPs differs from that described in the recorded O&M Agreement, a revised O&M Agreement must be recorded.

An **Inspection and Maintenance Agreement** is contained in this section, as are templates for inspection checklists for each type of structural BMP, including water quality buffers. As noted above, inspection priorities and schedules for each BMP type must be submitted as a component of the long-term maintenance plan for the site. The inspection checklists can serve this purpose, as well as serving as inspection reports for each facility. The template checklists are a general guideline of inspection elements; however, engineers may modify checklists to include inspections and maintenance elements as needed.

RECORDING REQUESTED BY

AND WHEN RECORDED MAIL TO:

Owner Information

TAX STATEMENTS
DO NOT CHANGE MAILING

(Space above this line for City and Recorder's use)

APN'S:

STORMWATER MANAGEMENT FACILITIES OPERATIONS AND MAINTENANCE AGREEMENT AND RIGHT OF ENTRY

PROJECT:

Project Address, _____,
Lake Elsinore, CA 92530

OWNER'S NAMES:

by _____

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INSPECTION AND MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER FACILITIES

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INSPECTION AND MAINTENANCE AGREEMENT FOR STORMWATER MANAGEMENT FACILITIES

Map & Parcel No: _____

Project Name & Address: _____

THIS AGREEMENT, made this _____ day of _____, 20 ____ , by and between _____

hereinafter referred to as the "OWNER(S)" of the following property and CITY OF LAKE ELSINORE, a municipal corporation, located in the County of Riverside, State of California hereinafter referred to as the "CITY".

WHEREAS, the OWNER(S) own real property ("Property") in the City of Lake Elsinore, County of Riverside, State of California, more specifically described in Exhibit "A" and show in Exhibit "B" attached hereto and incorporate herein by this reference;

WHEREAS, at the time of initial approval of development project know as

_____

Within the Property described herein, the CITY required the project to employ Best Management Practices (BMP), hereinafter referred to as "BMPs", to minimize pollutants in urban runoff;

WHEREAS, the OWNER(S) has chosen to install and/or implement BMPs as described in the Water Quality Management Plan (WQMP) on file with the CITY to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

WHEREAS, the OWNER(S) in said WQMP at Section I have identified the funding and maintenance sources for the BMPs. The OWNER(S) has agreed to provide funding for and conduct the maintenance of the stormwater quality facilities identified in Exhibit "D" attached hereto and incorporated herein by this reference;

WHEREAS, the OWNER(S) is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs;

WITNESSETH WE, the OWNER(S), with full authority to execute deeds, mortgages, other covenants, do hereby covenant with the CITY and agree as follows:

1. The OWNER(S) covenant and agree with the CITY that the OWNER(S) shall provide for adequate long term funding and maintenance and continuation of the stormwater quality measures described in the Long Term Maintenance Plan and shown in the location map, deed of easement drawing or plat attached hereto to ensure that the facilities are and remain in proper

working condition in accordance with approved design standards, rules and regulations, and applicable laws. The OWNER(S) shall perform preventative maintenance activities at intervals described in the inspection schedule included in the Long Term Maintenance Plan along with necessary landscaping (grass cutting, etc.) and trash removal as part of regular maintenance. All reasonable precautions shall be exercised by OWNER(S) and OWNER(S) representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the materials(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time and provided in the annual report to the CITY, the OWNER shall provide the CITY with documentation identifying the material(s) removed, the quantity, and disposal destination.

2. The OWNER(S) shall submit to the CITY an **annual report and certification prepared by a Registered Civil Engineer upon request by the City, but not less than once every five (5) years**. The report shall include the Long Term Maintenance Plan that documents the inspection schedule, times of inspection, remedial actions taken to repair, modify or reconstruct the system, the state of control measures, and notification of any planned change in responsibility for the system.

3. The OWNER(S) shall grant to the CITY or its agent or contractor the right of entry at reasonable times and in a reasonable manner for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the facility at the OWNER(S) expense as provided in paragraph 5 below.

4. The OWNER(S) shall grant to the CITY the necessary easements and rights-of-way and maintain perpetual access from public rights-of-way to the facility for CITY or its agent and contractor.

5. If, upon inspection, the CITY finds that OWNER(S) has failed to properly maintain the facilities, the CITY may order the work performed within ten (10) days. In the event the work is not performed within the specified time, the OWNER(S) agrees to allow the CITY to enter the property and take whatever steps it deems necessary to maintain the stormwater quality facilities. This provision shall not be construed to allow the CITY to erect any structure of a permanent nature on the land of the OWNER(S) without first obtaining written approval of the OWNER(S).

6. The CITY is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the CITY The OWNER(S) shall reimburse the CITY upon demand the costs incurred in the maintenance of the facilities.

7. The CITY may require the OWNER(S) to post security in form and for a time period satisfactory to the CITY to quarantee the performance of the obligations stated herein. Should the OWNER fail to perform the obligations under the Agreement, the CITY may, in the case of a cash bond, act for the OWNER(S) using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement. As an additional remedy, the CITY may withdraw any previous stormwater related approval with respect to the property on which BMPs have been installed and/or implemented until such time as OWNER(S) repays to CITY its reasonable costs incurred in accordance with paragraph 5 above.

8. If the OWNER(S) fails to pay the CITY for the above expenses after forty-five (45) days written notice, the OWNER(S) authorizes the CITY to collect said expenses from the

OWNER(S) through appropriate legal action and the OWNER(S) shall be liable for the reasonable expenses of collection, court costs, and attorney fees.

9. The OWNER(S) and the OWNER(S) heirs, administrators, executors, assigns, and any other successor in interest shall indemnify and hold harmless the CITY and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees which might arise or be asserted, in whole or in part, against the CITY from the construction, presence, existence, or maintenance of the stormwater control facilities subject to this AGREEMENT. In the event a claim is asserted against the CITY, its officers, agents or employees, the CITY shall notify OWNER(S) and the OWNER(S) shall defend at OWNER(S) expense any suit based on such claim. If any judgment or claims against the CITY, its officers, agents or employees, shall be allowed, the OWNER(S) shall pay all costs and expenses in connection therewith. The CITY will not indemnify, defend or hold harmless in any fashion the OWNER(S) from any claims arising from any failure, regardless of any language in any attachment or other document that the OWNER(S) may provide.

10. The OWNER(S) shall not be able to transfer, assign or modify its responsibilities with respect to this agreement without the CITY'S written prior consent. Nothing herein shall be construed to prohibit a transfer by OWNER(S).

11. The OWNER(S) shall provide to the CITY updated contact information immediately whenever a property is sold and whenever designated individuals or contractors change. Attach as Exhibit "C" an organization chart or listing of relationships of authority and responsibility between the individuals responsible for O&M.

12. No waiver of any provision of this AGREEMENT shall affect the right of any party thereafter to enforce such provision or to exercise any right or remedy available to it in the event of any other default.

13. The OWNER(S) shall record a plat showing and accurately defining the easements for stormwater control facilities. The plat must reference the Instrument Number where this AGREEMENT and its or attachments are recorded and contain a note that the OWNER(S) is responsible for maintaining the stormwater management facilities.

14. The OWNER(S) shall record this AGREEMENT in the Office of the Recorder of Riverside County, California, at the expense of the OWNER(S) and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the CITY, including interest as herein above set forth, subject to foreclosure in event of default in payment.

15. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute a covenant running with the land, and shall be binding upon the OWNER(S) and the OWNER(S) heirs, administrators, executors, assigns, and any other successors in interest and constitute a lien there against OWNER(S) shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the CITY at the same time such notice is provided to the successor.

16. Time is of the essence in the performance of this Agreement.

17. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY: City of Lake Elsinore
Engineering Department
130 South Main Street
Lake Elsinore, CA 92530

IF TO OWNER(S): _____

_____

_____

_____

[SIGNATURES ON NEXT PAGE]

In WITNESS WHEREOF, the OWNER(S) has caused this agreement to be executed this _____ day of _____, 20___.

OWNER(S):

SIGNED: _____

BY: _____
Type Name & Title on line above

FOR: _____
Type Name of Company on line above

SIGNED: _____

BY: _____
Type Name & Title on line above

FOR: _____
Type Name of Company on line above

CITY OF LAKE ELSINORE

BY:_____
City Manager
CITY OF LAKE ELSINORE

ATTEST:

_____
City Clerk
CITY OF LAKE ELSINORE

NOTARIES ON FOLLOWING PAGE

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EXHIBIT A
(Legal Description)

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EXHIBIT B
(Plat Exhibit)

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EXHIBIT C
(Organization Chart or Listing of Responsibilities)

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EXHIBIT D

LONG TERM BMP MAINTENANCE PLAN

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Long Term Maintenance Plan Instructions

The Long Term Maintenance Plan is a component of the Operation and Maintenance Agreement for the development or site. One of the purposes of the Long Term Maintenance Plan is to inform property owners about the system components on their properties, so that they will know the locations and maintenance needs of the components and structural BMPs

Using the Schedule Format provided the Long-Term Maintenance Plan must include or address the following elements:

- Description and locations of stormwater system components to be inspected, prepared by the engineer. GIS Decimal Degree longitude and latitude coordinates of each BMP to be maintained.

- Schedule of inspections and the techniques used to inspect and maintain the systems to ensure that they are functioning properly as designed. Documentation checklists for each type of BMP including the inspection schedule and potential maintenance items that must be addressed. Templates for checklists are found in this document.

- Where and how the trash, sediment and other pollutants removed from the stormwater system will be disposed.

- WQMP Site Plan with schematics of BMPs located on the site.

- Person(s) and phone number(s) of who will be responsible for inspection and maintenance. If the organization that will be responsible is yet to be organized, list the name, address and phone number of the person or entity with interim responsibility.

- Provisions for permanent access and maintenance easements.

Long Term Maintenance Table Instructions: delete word "SAMPLE", delete BMPs listed in table and insert your project specific BMPs in their place.

STORMWATER STRUCTURAL BMP INSPECTION CHECKLIST TEMPLATES
Instructions: delete non-applicable inspection templates; edit 'checklist' to reflect templates included.

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SAMPLE TABLE FOR LONG TERM MAINTENANCE PLAN –

POST CONSTRUCTION BMP LONG TERM MAINTENANCE SCHEDULE

TYPE OF BMP	LOCATION (see attached site plan)	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY	POLLUTANT DISPOSAL METHOD	O&M RESPONSIBLE PERSON	
					NAME	PHONE #
Floguard Catch Basin Insert (1)(2)	Catch basins on Riverside Dr & Walnut (3)	Monthly and after Rain Events	Min. Annually. Additional cleaning as needed	Trash & vegetation – CR&R / Filter – as hazardous waste	John Smith	951-674-4445
Bioretention swale (1)	Along Riverside Drive (3)	Monthly and after Rain Events	Min monthly, with remediation as needed	Landfill as hazardous waste	Tim Jones	951-777-1542
Landscape						

(1) See attached manufacturer data sheets
(2) Access easement to Boos recorded 5-21-13, #234561 – copy attached
(3) See attached site plan

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STORMWATER STRUCTURAL BMP INSPECTION CHECKLIST TEMPLATES

(COMPONENT OF LONG-TERM MAINTENANCE PLAN)

- **ANNUAL CERTIFICATION FORM**
- **WATER QUALITY DETENTION BASIN**
- **CONSTRUCTED WETLANDS**
- **BIORETENTION**
- **SAND FILTER**
- **INFILTRATION TRENCH**
- **ENHANCED SWALE/GRASS CHANNEL/FILTER STRIP**
- **BUFFERS**
- **PROPRIETARY BMP**
- **GREEN ROOF**
- **PERMEABLE PAVEMENT**

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CITY OF LAKE ELSINORE

ANNUAL WATER QUALITY MANAGEMENT PLAN
FACILITY CERTIFICATION

Complete one form for each water quality facility or facility type (ex. all catch basins on one form, separate form for each water quality basin) – if additional forms are needed contact rthompson@lake-elsinore.org or make copies using this form as a master. Return completed form(s) with Civil Engineer's Certification and/or direct questions to Rita Thompson, Engineering Division, City of Lake Elsinore by ***JULY 1st****.*

1. Facility Information:

Facility/Project Name: _____

Facility/Project Address: _____

Owner/Operator Name(s): _____

Mailing Address: _____

City/State/Zip: _____

Telephone No./Email.: P:_____/ EM: _____

2. Water Quality Facility Information:

Water Quality Facility Type (circle one):

BASIN - Detention Bioretention Retention Regional Detention DeSilting

OTHER - Infiltration Trench BioSwale Vegetated Swale Catch Basin Inserts Underground Detention/Infiltration

Proprietary - _____

Water Quality Facility Location on Site:

Provide either a copy of site plan highlighting location of water quality facility or decimal degree longitude (-117.123456) and latitude (33.123456) - not required for catch basin inserts.

Longitude: _____ Latitude: _____

3. Facility Inspections: Summarize below and/or attach separate documentation of inspections performed during the past year:

Date: _____ / Results/Cleanout:_____

Date: _____ / Results/Cleanout: _____

Date: _____ / Results/Cleanout:_____

Date: _____ / Results/Cleanout:_____

Attach a separate sheet for additional inspections and/or results of inspections as needed.

4. Certification:

I, being a Registered Professional Engineer in California, do hereby certify that to the best of my knowledge and belief based upon personal observation that the above facility approved under the Water Quality Management Plan / SWPPP is clear of debris and operational as of _____.
date

_____
Signature / RCE License No. / Expiration Date

Seal

_____
Name - please print or type

Firm or Agency: _____

Address: _____ / City/State/Zip: _____

Telephone _____Email: _____

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Detention Basin Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency.*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Embankment and Emergency Spillway				
Vegetation healthy?	**A** / M / **S**			
Erosion on embankment?	**A** / M / **S**			
Animal burrows in embankment?	**A** / M / **S**			
Cracking, sliding, bulging of dam?	**A** / M / **S**			
Drains blocked or not functioning?	**A** / M / **S**			
Leaks or seeps on embankment?	**A** / M / **S**			
Emergency spillway obstructed?	**A** / M / **S**			
Slope protection failure functional?	**A** / M / **S**			
Erosion in/around emergency spillway?	**A** / M / **S**			
Other (describe)	**A** / M / **S**			
Riser and Principal Spillway				
Low-flow orifice functional?	**A** / M / **S**			
Trash rack (Debris removal needed? Corrosion noted?)	**A** / M / **S**			
Sediment buildup in riser?	**A** / M / S			
Concrete/masonry condition (Cracks or displacement? Spalling?)	**A** / M / S			
Metal pipe in good condition?	**A** / M / S			
Control valve operation?	**A** / M / S			
Pond drain valve operation?	**A** / M / S			
Outfall channels function, not eroding?	**A** / M / S			
Other (describe)	**A** / M / S			
Sediment Forebays				
Sedimentation description				
Sediment cleanout needed (over 50% full)?	**A** / M / **S**			
Inspection Items	**Inspection Frequency**	**Inspected? (Yes/No)**	**Maintenance Needed? (Yes/No)**	**Comments/Description**
Permanent Pool Areas (if applicable)				

Undesirable vegetation growth?	A / **M** / S			
Visible pollution?	A / **M** / S			
Shoreline erosion?	A / **M** / S			
Erosion at outfalls into pond?	A / **M** / S			
Headwalls and endwalls in good condition?	A / **M** / S			
Encroachment into pond or easement area by other activities?	A / **M** / S			
Evidence of sediment accumulation?	**A** / M / S			
Dry Pond Areas (if applicable)				
Vegetation adequate?	A / **M** / S			
Undesirable vegetation or woody plant growth?	A / **M** / S			
Excessive sedimentation?	**A** / M / S			
Hazards				
Have there been complaints from residents?	A / **M** / S			
Public hazards noted?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Constructed Wetlands
Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Constructed Wetland Type: _____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency.*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Embankment and Emergency Spillway				
Vegetation healthy?	**A** / M / **S**			
Erosion on embankment?	**A** / M / **S**			
Animal burrows in embankment?	**A** / M / **S**			
Cracking, sliding, bulging of dam?	**A** / M / **S**			
Drains blocked or not functioning?	**A** / M / **S**			
Leaks or seeps on embankment?	**A** / M / **S**			
Emergency spillway obstructed?	**A** / M / **S**			
Slope protection failure functional?	**A** / M / **S**			
Erosion in/around emergency spillway?	**A** / M / **S**			
Other (describe)	**A** / M / **S**			
Riser and Principal Spillway			(describe type: concrete pipe, slotted weir, channel, etc.)	
Low-flow orifice functional?	**A** / M / **S**			
Trash rack (Debris removal needed? Corrosion noted?)	**A** / M / **S**			
Sediment buildup in riser?	**A** / M / S			
Concrete/masonry condition (Cracks or displacement? Spalling?)	**A** / M / S			
Metal pipe in good condition?	**A** / M / S			
Control valve operation?	**A** / M / S			
Pond drain valve operation?	**A** / M / S			
Outfall channels function, not eroding?	**A** / M / S			
Other (describe)	**A** / M / S			
Sediment Forebays				
Sedimentation description				
Sediment cleanout needed (over 50% full)?	**A** / M / **S**			

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Constructed Wetland Ponding Areas (if applicable)				
Wetland vegetation present and healthy?	A / **M** / S			
Vegetation removal needed?	A / **M** / S			
Floatable debris removal needed?	A / **M** / S			
Shoreline problem?	A / **M** / S			
Erosion at outfalls into pond?	A / **M** / S			
Headwalls and endwalls in good condition?	A / **M** / S			
Encroachment into pond or easement area?	**A** / M / S			
Hazards				
Have there been complaints from residents?	A / **M** / S			
Public hazards noted?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

Bioretention
Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Treatment Area				
Treatment area free of debris?	A / **M** / S			
Inlets and Outlets unobstructed?	A / **M** / S			
Is there standing water longer than 24 hours after a storm event?	A / M / **S**			
Evidence of erosion?	A / **M** / **S**			
Vegetation				
Surrounding area fully stabilized? (no evidence of material eroding into Bioretention area)	**A** / M / S			
Grass height not more than 6 inches?	A / **M** / S			
Plant height not less than design water depth?	**A** / M / S			
Plant composition according to approved plan?	**A** / M / S			
Vegetation overgrown?	**A** / M / S			
Other				
Hazards				
Have there been complaints from residents?	A / **M** / S			
Public hazards noted?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Sand Filter
Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Sand Filter Type: Perimeter Filter ____ Underground Filter ____ Above Ground Filter ____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Sand filter free of debris?	A / **M** / S			
Inlets and Outlets free of debris?	A / **M** / S			
Vegetation				
Surrounding area fully stabilized? (no evidence of material eroding into sand filter)	**A** / M / S			
Water Retention (where required)				
Water holding chambers at normal pool?	A / **M** / S			
Evidence of erosion?				
Sediment Deposition				
Filtration chamber free of sediments?	**A** / M / S			
Sedimentation chamber not more than 50% full?	**A** / M / S			
Structural Components				
Any evidence of structural deterioration?	**A** / M / S			
Grates in good condition?	**A** / M / S			
Spalling or cracking of structural parts?	**A** / M / S			
Outlet/Overflow Spillway	**A** / M / S			
Other				
Noticeable odors?	**A** / M / S			
Evidence of flow bypassing facility?	**A** / M / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

Infiltration Trench
Inspections and Maintenance Checklist

Site Name: Owner Change since last inspection? Y ☐ N ☐

Location:

Owner Name:

Address: Phone Number

Site Status:

Date: Time: Site conditions:

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Trench surface clear of debris?	A / **M** / S			
Inlets / inflow pipes free of debris?	A / **M** / S			
Overflow spillway clear of debris?	A / **M** / S			
Vegetation				
Mowing done when necessary?	A / **M** / S			
Fertilizer per specification?	A / **M** / S			
Any evidence of erosion?	A / **M** / S			
Contributing drainage area stabilized?	A / **M** / S			
Dewatering)				
Trench dewaters between storms?	A / **M** / S			
Sediment traps, forebays, or pretreatment swales				
Obviously trapping sediment?	**A** / M / S			
Greater than 50% of original storage volume remaining?	**A** / M / S			
Sediment removal of trench				
Any evidence of sedimentation in trench?	**A** / M / S			
Does sediment accumulation currently require removal?	**A** / M / S			
Inlets				
Good condition (no need for repair)?	**A** / M / S			
Any evidence of erosion?	**A** / M / S			
Outlets/overflow spillway				
Good Condition (no need for repair)?	**A** / M / S			
Any evidence of erosion?	**A** / M / S			

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Aggregate repairs				
Surface of aggregate clean?	**A** / M / S			
Top layer of stone in need of replacement?	**A** / M / S			
Trench in need of rehabilitation?	**A** / M / S			
Observation wells				
Evidence of clogging (failure to percolate)?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Enhanced Swales / Grass Channels / Filter Strips
Inspections and Maintenance Checklist

Site Name: Owner Change since last inspection? Y ☐ N ☐

Location:

Owner Name:

Address: Phone Number

Site Status:

Date: Time: Site conditions:

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Facility and adjacent area free of debris?	A / **M** / S			
Inlets and Outlets free of debris?	A / **M** / S			
Any dumping of yard wastes into facility?	A / **M** / S			
Litter (branches) removed?	A / **M** / S			
Vegetation				
Surrounding area fully stabilized? (no evidence of material eroding into sand filter)	A / **M** / S			
Grass mowed?	A / **M** / S			
Plant height not less than design water depth?	A / **M** / S			
Fertilized per specification?	A / **M** / S			
Plan composition according to approved plan?	A / **M** / S			
Unauthorized or inappropriate plantings?	A / **M** / S			
Plants healthy? (no diseased or dying vegetation)	A / **M** / S			
Evidence of plants stressed from inadequate watering?	A / **M** / S			
Filtration Capacity				
Clogging from oil or grease?	A / **M** / S			
Facility dewaters between storms?	A / **M** / S			
Water Retention (where required)				
Water holding chambers at normal pool?	A / **M** / S			
Evidence of erosion?				

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Check dams and energy dissipators/sumps				
Any evidence of sedimentation built up?	**A** / M / **S**			
Are sumps grater than 50% full of sediment?	**A** / M / **S**			
Any evidence of erosion and down stream toe of drop structures?	**A** / M / **S**			
Sediment Deposition				
Swale clean of sediments?	**A** / M / S			
Sediment not more than 20% of swale design depth?	**A** / M / S			
Outlet/Overflow Spillway				
In good condition?	**A** / M / S			
Any evidence of erosion?	**A** / M / S			
Any evidence of blockages?	**A** / M / S			
Has facility been filled or blocked inappropriately?	**A** / M / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Buffers
Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Vegetation				
Mowing done when necessary?	A / **M** / S			
Surrounding area fully stabilized? (no evidence of eroding material into buffer)?	A / **M** / S			
Vegetation healthy?	A / **M** / S			
Level Spreader				
Vegetation is healthy?	A / **M** / S			
Lip of spreader shows no signs of erosion?	A / **M** / S			
Sediment noted in spreader?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Proprietary BMP
Inspections and Maintenance Checklist

Site Name: Owner Change since last inspection? Y ☐ N ☐

Location:

Owner Name:

Address: Phone Number

Site Status:

Date: Time: Site conditions:

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *= recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	A / **M** / S			
Inlets and Outlets free of debris?	A / **M** / S			
Facility (internally) free of debris?	A / **M** / S			
Vegetation				
Surroundng area fully stabilized? (no evidence of material eroding into sand filter)	**A** / M / S			
Grass mowed?	A / **M** / S			
Water Retention (where required)				
Water holding chambers at normal pool?	A / **M** / S			
Evidence of erosion?	A / **M** / S			
Sediment Deposition				
Filtration chamber free of sediments?	**A** / M / S			
Sedimentation chamber not more than 50% full?	**A** / M / S			
Structural Components				
Any evidence of structural deterioration?	**A** / M / S			
Grates in good condition?	**A** / M / S			
Spalling or cracking of structural parts?	**A** / M / S			
Outlet/Overflow Spillway	**A** / M / S			
Other				
Noticeable odors?	**A** / M / S			
Any evidence of filter(s) clogging?	A / **M** / S			
Evidence of flow bypassing facility?	**A** / M / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Green Roof Inspections and Maintenance Checklist

Site Name: Owner Change since last inspection? Y ☐ N ☐

Location:

Owner Name:

Address: Phone Number

Site Status:

Date: Time: Site conditions:

Green Roof Type: Extensive Roof Cover ☐ Intensive Roof Garden ☐

Inspection Frequency Key: A=annual; M=monthly; S=after major storms; G=monthly during April-September growing season
***BOLD** = recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Gutter inlets blocked by plan debris/trash or plant growth hindered by debris?	A / **M** / S / G			
Inlets and Outlets free of debris?	A / **M** / S			
Vegetation				
Any evidence of additional irrigation needs?	A / M / S / **G**			
Fallen leaves/debris interfering with plant health?	A / **M** / S / G			
Any dead plants to be replaced?	A / **M** / S / G			
Any need for weeding/mowing/trimming?	A / M / S / **G**			
Soil Substrate/Growing Medium				
Any evidence of wind/water erosion?	**A** / M / S / G			
Structural Components				
Any evidence of structural deterioration?	**A** / M / S / G			
Load-bearing walls in good condition?	**A** / M / S / G			
Spalling or cracking of structural parts?	**A** / M / S / G			
Access/maintenance routes maintained and free of debris?	A / **M** / S / G			
Other				
Any locations of standing water that may harbor insect infestations?	A / M / **S** / G			
	A / M / S / G			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

CITY OF LAKE ELSINORE
DREAM EXTREME

Permeable Pavement
Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y ☐ N ☐

Location: _____

Owner Name: _____

Address: _____ Phone Number _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual; M=monthly; S=after major storms. ***BOLD*** *recommended frequency*

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Pavement Area				
Pavement area free of debris?	A / **M** / S			
Inlets and Outlets unobstructed?	A / **M** / S			
Is any water standing after a storm event?	A / M / **S**			
Any evidence of clogged pores that require vacuum-sweeping?	A / **M** / S			
Access to pervious pavement (egress and ingress routes) safe and efficient?	A / **M** / S			
Vegetation				
Adjacent area fully stabilized (no evidence of eroding material into or from pervious pavement area)?	**A** / M / S			
Any noticeable irrigation needs?	A / **M** / S			
Fallen leaves/plant debris collecting in paving area?	A / **M** / S			
Grass height over 4 inches?	A / **M** / S			
Vegetation health affected by oil/grease from vehicles?	**A** / M / S			
Other	**A** / M / S			
Hazards				
Obstructions or debris affecting overflows/emergency spillway?	A / **M** / S			
Load-bearing capability of pavement intact?	A / **M** / S			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Facility: ☐: Acceptable ☐ Unacceptable

If any of the above Inspection items are checked “Yes” for “Maintenance Needed”, list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____

Inspected by: (signature) _____

Inspected by: (printed) _____

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

The Ocean Begins at Your Front Door

For More Information

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - community-specific environmental information
1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
714-433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management/Dept. of Orange County-information on household hazardous waste collection centers, recycling centers and solid waste collection
714-834-6752 or visit www.oclandfills.com

O.C. Agriculture Commissioner
714-447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
714-708-1646 or visit www.ucomg.org

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Orange County Stormwater Program

Aliso Viejo	(949) 425-2535
Anaheim Public Works Operations	(714) 765-6860
Brea Engineering	(714) 990-7666
Buena Park Public Works	(714) 562-3655
Costa Mesa Public Services	(714) 754-5323
Cypress Public Works	(714) 229-6740
Dana Point Public Works	(949) 248-3584
Fountain Valley Public Works	(714) 593-4441
Fullerton Engineering Dept	(714) 738-6853
Garden Grove Public Works	(714) 741-5956
Huntington Beach Public Works	(714) 536-5431
Irvine Public Works	(949) 724-6315
La Habra Public Services	(562) 905-9792
La Palma Public Works	(714) 690-3310
Laguna Beach Water Quality	(949) 497-0378
Laguna Hills Public Service	(949) 707-2650
Laguna Niguel Public Works	(949) 362-4337
Laguna Woods Public Works	(949) 639-0500
Lake Forest Public Works	(949) 461-3480
Los Alamitos Community Dev	(562) 431-3538
Mission Viejo Public Works	(949) 470-3056
Newport Beach, Code & Water Quality Enforcement	(949) 644-3215
Orange Public Works	(714) 532-6480
Placentia Public Works	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente Environmental Programs	(949) 361-6143
San Juan Capistrano Engineering	(949) 234-4413
Santa Ana Public Works	(714) 647-3380
Seal Beach Engineering	(562) 431-2527 x317
Stanton Public Works	(714) 379-9222 x204
Tustin Public Works Engineering	(714) 573-3150
Villa Park Engineering	(714) 998-1500
Westminster Public Works Engineering	(714) 898-3311 x446
Yorba Linda Engineering	(714) 961-7138
Orange County Stormwater Program	(714) 567-6363

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
(714)-567-6363

On-line Water Pollution Problem Reporting form
www.ocwatersheds.com

Printed on Recycled Paper

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact the largest source of water pollution comes from city streets, neighborhoods, construction sites, and parking lots. This type of pollution is sometimes called "non-point source" pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff refers to runoff resulting from rainfall. It is very noticeable during heavy rainstorms when large volumes of water drain off the urban landscape picking up pollutants along the way.
- Urban runoff can happen anytime of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers, and cleaners – can be blown or washed into the storm drains.
- A little water from a garden hose or rain can also send materials into the storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets) water in the storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating, and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.

The Effect on the Ocean

Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed by the Orange County Stormwater Program under National Pollutant Discharge Elimination System (NPDES) permits. The program educates and encourages the public to protect water quality, monitor runoff in the storm drain system, manage NPDES permit process for municipalities, investigate illegal disposals, and maintain storm drains.

The support of Orange County residents, businesses and industries is needed to improve water quality and reduce the threat of stormwater and urban runoff pollution. Proper use and disposal of materials we use everyday will help stop this form of pollution before it reaches the storm drain and the ocean.

Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

The Ocean Begins at Your Front Door

Never allow pollutants to enter the street, gutter or storm drain!

Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

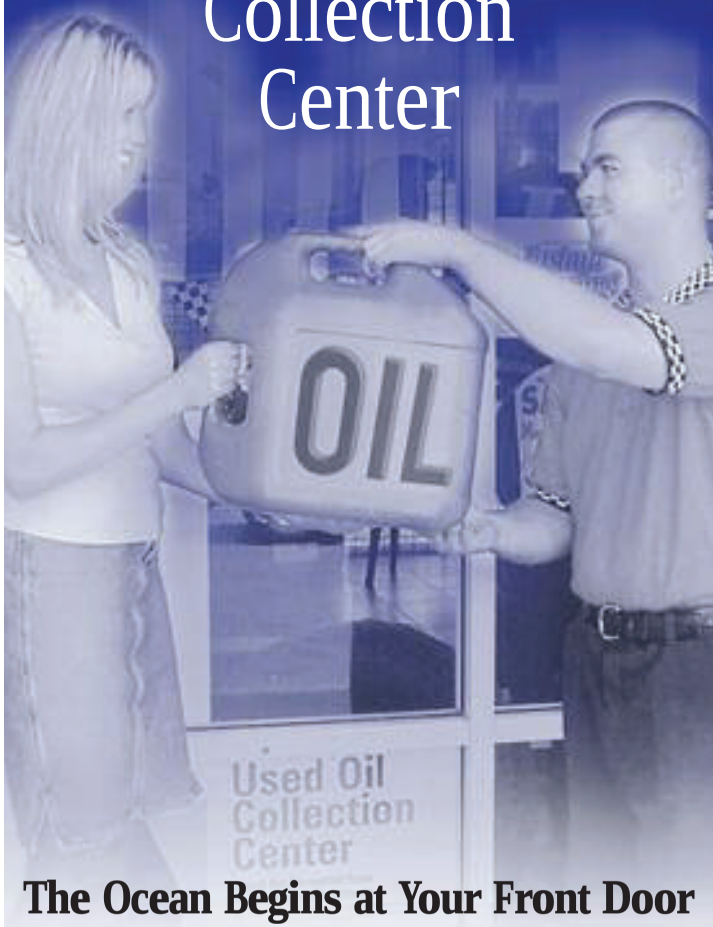
RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

DTP113 Rev 8/03
printed on recycled paper

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

NORTH COUNTY

Used Oil Collection Centers

Anaheim

All Seasons Tire and Auto Center, Inc.
817 S Brookhurst St., Anaheim, CA 92804
(714)772-6090( )
CIWMB#: 30-C-03177

AutoZone #3317
423 N Anaheim Blvd., Anaheim, CA 92805
(714)776-0787( )
CIWMB#: 30-C-05263

AutoZone #5226
2145 W Lincoln Ave., Anaheim, CA 92801
(714)533-6599( )
CIWMB#: 30-C-04604

Bedard Automotive
3601 E Miraloma Ave., Anaheim, CA 92806
(714)528-1380( )
CIWMB#: 30-C-02205

Classic Chevrolet
1001 Weir Canyon Rd., Anaheim, CA 92807
(714)283-5400( )
CIWMB#: 30-C-05223

Econo Lube N' Tune #4
3201 W Lincoln Ave., Anaheim, CA 92801
(714)821-0128( )
CIWMB#: 30-C-01485

EZ Lube Inc - Savi Ranch #43
985 N Weir Canyon Rd., Anaheim, CA 92807
(714)556-1312( )
CIWMB#: 30-C-06011

Firestone Store #71C7
1200 S Magnolia Ave., Anaheim, CA 92804
(949)598-5520( )
CIWMB#: 30-C-05743

Great Western Lube Express
125 N Brookhurst St., Anaheim, CA 92801
(714)254-1300( )
CIWMB#: 30-C-05542

HR Pro Auto Service Center
3180 W Lincoln Ave., Anaheim, CA 92801
(714)761-4343( )
CIWMB#: 30-C-05927

Ira Newman Automotive Services
1507 N State College Blvd., Anaheim, CA 92806
(714)635-2392( )
CIWMB#: 30-C-01482

Jiffy Lube #1028
2400 W Ball Rd., Anaheim, CA 92804
(714)761-5211( )
CIWMB#: 30-C-00870

Jiffy Lube #1903
2505 E Lincoln Ave., Anaheim, CA 92806
(714)772-4000( )
CIWMB#: 30-C-05511

Jiffy Lube #2340
2181 W Lincoln Ave., Anaheim, CA 92801
(714)533-1000( )
CIWMB#: 30-C-04647

Kragen Auto Parts #1303
1088 N State College Blvd., Anaheim, CA 92806
(714)956-7351( )
CIWMB#: 30-C-03438

Kragen Auto Parts #1399
2245 W Ball Rd., Anaheim, CA 92804
(714)490-1274( )
CIWMB#: 30-C-04094

Kragen Auto Parts #1565
2072 Lincoln Ave., Anaheim, CA 92806
(714)502-6992( )
CIWMB#: 30-C-04078

Kragen Auto Parts #1582
3420 W Lincoln Ave., Anaheim, CA 92801
(714)828-7977( )
CIWMB#: 30-C-04103

Pep Boys #613
10912 Katella Ave., Anaheim, CA 92804
(714)638-0863( )
CIWMB#: 30-C-01756

Pep Boys #663
3030 W Lincoln Anaheim, CA 92801
(714)826-4810( )
CIWMB#: 30-C-03417

Pep Boys #809
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808
(714)974-0105( )
CIWMB#: 30-C-03443

Pick Your Part
1235 S Beach Blvd., Anaheim, CA 92804
(714)527-1645( )
CIWMB#: 30-C-03744

PK Auto Performance
3106 W. Lincoln Ave., Anaheim, CA 92801
(714)826-2141( )
CIWMB#: 30-C-05628

Quick Change Lube and Oil
2731 W Lincoln Ave., Anaheim, CA 92801
(714)821-4464( )
CIWMB#: 30-C-04363

Saturn of Anaheim
1380 S Auto Center Dr., Anaheim, CA 92806
(714)648-2444( )
CIWMB#: 30-C-06332

Sun Tech Auto Service
105 S State College Blvd., Anaheim, CA 92806
(714)956-1389( )
CIWMB#: 30-C-06455

Vonic Truck Services
515 S Rose St., Anaheim, CA 92805
(714)533-3333( )
CIWMB#: 30-C-01142

Anaheim Hills

Anaheim Hills Car Wash & Lube
5810 E La Palma Ave., Anaheim Hills, CA 92807
(714)777-6605( )
CIWMB#: 30-C-01387

Brea

Firestone Store #27A9
891 E Imperial Hwy., Brea, CA 92821
(714)529-8404( )
CIWMB#: 30-C-01221

Oil Can Henry's
230 N Brea Blvd., Brea, CA 92821
(714)990-1900( )
CIWMB#: 30-C-04273

Buena Park

Firestone Store #71F7
6011 Orangethorpe Buena Park, CA 90620
(714)670-7912( )
CIWMB#: 30-C-01218

Firestone Store #71T8
8600 Beach Blvd., Buena Park, CA 90620
(714)827-5300( )
CIWMB#: 30-C-02121

Kragen Auto Parts #1204
5303 Beach Blvd., Buena Park, CA 90621
(714)994-1320( )
CIWMB#: 30-C-02623

Cypress

AutoZone #5521
5471 Lincoln Ave., Cypress, CA 90630
(714)995-4644( )
CIWMB#: 30-C-00836

Big O Tires
6052 Cerritos Ave., Cypress, CA 90630
(714)826-6334( )
CIWMB#: 30-C-04245

Econo Lube N' Tune #213
5497 Cerritos Ave., Cypress, CA 90630
(714)761-0456( )
CIWMB#: 30-C-06240

Jiffy Lube #851
4942 Lincoln Ave., Cypress, CA 90630
(626)965-9689( )
CIWMB#: 30-C-06182

M & N Coastline Auto & Tire Service
4005 Ball Rd., Cypress, CA 90630
(714)826-1001( )
CIWMB#: 30-C-04387

Masterlube #103
5904 Lincoln Cypress, CA 90630
(714)826-2323( )
CIWMB#: 30-C-01071

Masterlube #104
5971 Ball Rd., Cypress, CA 90630
(714)220-1555( )
CIWMB#: 30-C-04682

Metric Motors of Cypress
6042 Cerritos Ave., Cypress, CA 90630
(714)821-4702( )
CIWMB#: 30-C-05157

Fullerton

AutoZone #2898
146 N. Raymond Ave., Fullerton, CA 92831
(714)870-9772( )
CIWMB#: 30-C-04488

AutoZone #5522
1801 Orangethorpe W. Fullerton, CA 92833
(714)870-8286( )
CIWMB#: 30-C-06062

AutoZone #5523
102 N Euclid Fullerton, CA 92832
(714)870-8286( )
CIWMB#: 30-C-04755

EZ Lube #17
4002 N Harbor Blvd., Fullerton, CA 92835
(714)871-9980( )
CIWMB#: 30-C-03741

Firestone Store #27EH
1933 N Placentia Ave., Fullerton, CA 92831
(714)993-7100( )
CIWMB#: 30-C-02122

Fox Service Center
1018 W Orangethorpe Fullerton, CA 92833
(714)879-1430( )
CIWMB#: 30-C-02318

Fullerton College Automotive Technology
321 E Chapman Ave., Fullerton, CA 92832
(714)992-7275( )
CIWMB#: 30-C-03165

Kragen Auto Parts #0731
2978 Yorba Linda Fullerton, CA 92831
(714)996-4780( )
CIWMB#: 30-C-02628

Kragen Auto Parts #4133
904 W Orangethorpe Ave., Fullerton, CA 92832
(714)526-3570( )
CIWMB#: 30-C-06256

Pep Boys #642
1530 S Harbor Blvd., Fullerton, CA 92832
(714)870-0700( )
CIWMB#: 30-C-01755

Sunnyside 76 Car Care Center
2701 N Brea Blvd., Fullerton, CA 92835
(714)256-0773( )
CIWMB#: 30-C-01381

Garden Grove

76 Pro Lube Plus
9001 Trask Ave., Garden Grove, CA 92844
(714)393-0590( )
CIWMB#: 30-C-05276

AutoZone #5527
13190 Harbor Blvd., Garden Grove, CA 92843
(714)636-5665( )
CIWMB#: 30-C-04760

David Murray Shell
12571 Vly View St., Garden Grove, CA 92845
(714)898-0170( )
CIWMB#: 30-C-00547

Express Lube & Wash
8100 Lampson Ave., Garden Grove, CA 92841
(909)316-8261( )
CIWMB#: 30-C-06544

Firestone Store #7180
10081 Chapman Ave., Garden Grove, CA 92840
(714)530-4630( )
CIWMB#: 30-C-01224

Firestone Store #71W3
13961 Brookhurst St., Garden Grove, CA 92843
(714)590-2741( )
CIWMB#: 30-C-03690

Jiffy Lube #1991
13970 Harbor Blvd., Garden Grove, CA 92843
(714)554-0610( )
CIWMB#: 30-C-05400

Kragen Auto Parts #1251
13933 N Harbor Blvd., Garden Grove, CA 92843
(714)554-3780( )
CIWMB#: 30-C-02663

Kragen Auto Parts #1555
9851 Chapman Ave., Garden Grove, CA 92841
(714)741-8030( )
CIWMB#: 30-C-04079

Nissan of Grarden Grove
9670 Trask Ave., Garden Grove, CA 92884
(714)537-0900( )
CIWMB#: 30-C-06553

Toyota of Garden Grove
9444 Trask Ave., Garden Grove, CA 92844
(714)895-5595( )
CIWMB#: 30-C-06555

La Habra

AutoZone #5532
1200 W Imperial Hwy., La Habra, CA 90631
(562)694-5337( )
CIWMB#: 30-C-04784

Burch Ford
201 N Harbor Blvd., La Habra, CA 90631
(562)691-3225( )
CIWMB#: 30-C-05179

Firestone Store #2736
1071 S Beach Blvd., La Habra, CA 90631
(562)691-1731( )
CIWMB#: 30-C-01169

Kragen Auto Parts #1569
1621 W Whittier Blvd., La Habra, CA 90631
(562)905-2538( )
CIWMB#: 30-C-04076

Pep Boys #997
125 W Imperial Hwy., La Habra, CA 90631
(714)447-0601( )
CIWMB#: 30-C-04026

SpeeDee Oil Change & Tune-Up
1580 W Imperial Hwy., La Habra, CA 90631
(562)697-3513( )

Los Alamitos

Jiffy Lube #1740
3311 Katella Ave., Los Alamitos, CA 90720
(562)596-1827( )
CIWMB#: 30-C-03529

Midway City

Bolsa Transmission
8331 Bolsa Ave., Midway City, CA 92655
(714)799-6158( )
CIWMB#: 30-C-05768

Placentia

Advanced Auto & Diesel
144 S Bradford Placentia, CA 92870
(714)996-8222( )
CIWMB#: 30-C-06242

Castner's Auto Service
214 S. Bradford Ave., Placentia, CA 92870
(714)528-1311( )
CIWMB#: 30-C-06452

Econo Lube N' Tune
100 W Chapman Ave., Placentia, CA 92870
(714)524-0424( )
CIWMB#: 30-C-06454

Fairway Ford
1350 E Yorba Linda Blvd., Placentia, CA 92870
(714)524-1200( )
CIWMB#: 30-C-01863

Seal Beach

M & N Coastline Auto & Tire Service
12239 Seal Beach Blvd., Seal Beach, CA 90740
(714)826-1001( )
CIWMB#: 30-C-04433

Seal Beach Chevron
12541 Seal Beach Blvd., Seal Beach, CA 90740
(949)495-0774(14)
CIWMB#: 30-C-06425

Stanton

AutoZone #2806
11320 Beach Blvd., Stanton, CA 90680
(714)895-7665( )
CIWMB#: 30-C-04563

Joe's Auto Clinic
11763 Beach Blvd., Stanton, CA 90680
(714)891-7715( )
CIWMB#: 30-C-03253

Kragen Auto Parts #1742
11951 Beach Blvd., Stanton, CA 90680
(714)799-7574( )
CIWMB#: 30-C-05231

Scher Tire #20
7000 Katella Ave., Stanton, CA 90680
(714)892-9924( )
CIWMB#: 30-C-05907

USA 10 Minute Oil Change
8100 Lampson Ave., Stanton, CA 92841
(714)373-4432( )
CIWMB#: 30-C-05909

Westminster

AutoZone #5543
6611 Westminster Blvd., Westminster, CA 92683
(714)898-2898( )
CIWMB#: 30-C-04964

AutoZone #5544
8481 Westminster Blvd., Westminster, CA 92683
(714)891-3511( )
CIWMB#: 30-C-04966

City of Westminster Corporate Yard
14381 Olive St., Westminster, CA 92683
(714)895-2876(292)
CIWMB#: 30-C-02008

Honda World
13600 Beach Blvd., Westminster, CA 92683
(714)890-8900( )
CIWMB#: 30-C-03639

Jiffy Lube #1579
6011 Westminster Blvd., Westminster, CA 92683
(714)899-2727( )
CIWMB#: 30-C-02745

John's Brake & Auto Repair
13050 Hoover St., Westminster, CA 92683
(714)379-2088( )
CIWMB#: 30-C-05617

Kragen Auto Parts #0762
6562 Westminster Blvd., Westminster, CA 92683
(714)898-0810( )
CIWMB#: 30-C-02590

Midway City Sanitary District
14451 Cedarwood St., Westminster, CA 92683
(714)893-3553( )
CIWMB#: 30-C-01626

Pep Boys #653
15221 Beach Blvd., Westminster, CA 92683
(714)893-8544( )
CIWMB#: 30-C-03415

Yorba Linda

AutoZone #5545
18528 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)970-8933( )
CIWMB#: 30-C-04971

Econo Lube N' Tune
22270 La Palma Ave., Yorba Linda, CA 92887
(714)692-8394( )
CIWMB#: 30-C-06513

EZ Lube Inc. #41
17511 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)556-1312( )
CIWMB#: 30-C-05739

Firestone Store #27T3
18500 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)779-1966( )
CIWMB#: 30-C-01222

Jiffy Lube #1532
16751 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)528-2800( )
CIWMB#: 30-C-03777

Mike Schultz Import Service
4832 Eureka Ave., Yorba Linda, CA 92886
(714)528-4411( )
CIWMB#: 30-C-04313

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

HOMEOWNER TIPS

PROTECTING WATER

Before Buying Pest Control Products

- Identify the pest.
- Decide if pest control products are the best control measure or if there are alternatives available.
- Are integrated pest management guidelines available for this pest?
- Read the product label:
  - Is the pest listed on the label?
  - Is it the best product for the pest?

Before Mixing Your Sprayer

- Read the label carefully.
- Buy only enough pesticide to treat the area affected by the pest.
- Check the weather and don't apply if it's windy or about to rain.
- Measure the area you're treating.
- Calculate how much spray to mix.
- Wear long sleeve shirt, long pants, shoes and any other protective equipment listed on the label and follow all the label precautions.
- Be prepared for spills and know how to clean them up.

When You're Ready To Spray

- Mix and load sprayer in an area where any spilled pesticide will not be able to drain or be washed away into storm drains, ditches, streams, ponds or other bodies of water.
- Mix sprayer on grass, not the sidewalk or driveway.
- Mix only as much as needed.

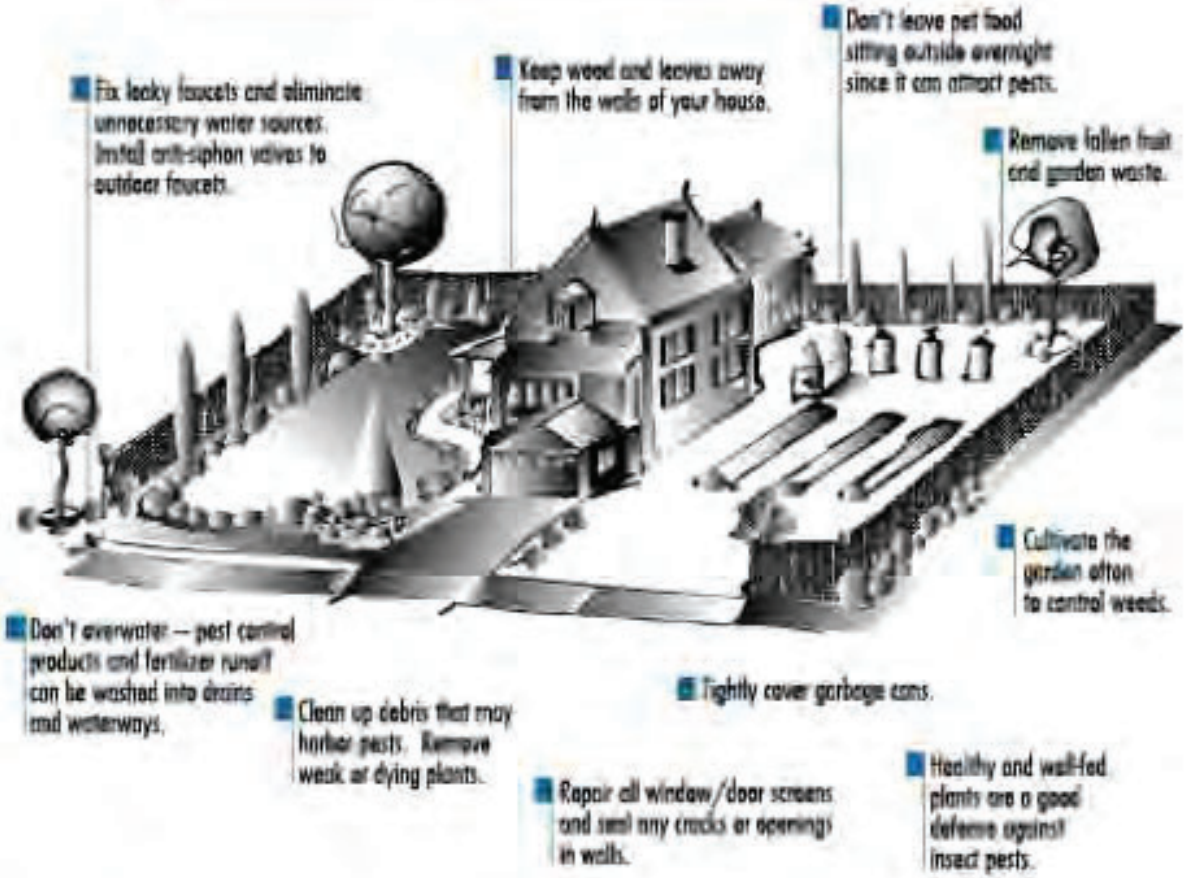
When You're Spraying

- AVOID spraying in or near storm drains, ditches, streams, and ponds!
- Leave an untreated strip around these areas to protect the water.

When You're done

- Never dump leftovers down any drain; Save for a future application.
- Triple-rinse sprayer and apply rinsewater to treated area.
- Take any old or unwanted pesticides to a Household Hazardous Waste Collection Center (716) 834-6752.

Using Pest Control Products. It's Your Responsibility To Do It Right!



IPM... OUTSMARTING PESTS WHILE PROTECTING WATER

With Integrated Pest Management (IPM), homeowners use common sense and nature to make it difficult for pests to survive. IPM techniques include cultural practices (such as mulching to prevent weeds), encouraging natural enemies (good bugs), and judicious use of pest control products.

- First, identify your pest problem. To find the best solution, you need to pin down the problem. Consult gardening books, your county cooperative extension office or your local nursery.
- Decide how much pest control is necessary. If you can live with some pest damage, you can avoid intensive pest control product treatments.
- Choose an effective option. Try various types of controls first: washing bugs off plants, pruning diseased parts of plants. If you need to use pest control products, choose one that targets the problem and poses the least hazard.
- Finally, it's easier to prevent pests than to control them.

Think ahead.

This brochure is being distributed in order to reduce the impacts of pesticides on water quality. It was produced with support from the Orange County Storm Water Program, the Coalition for Urban/Rural Environmental Stewardship (CURES) and a 319(h) grant from the State Water Resources Control Board.

Orange County Storm Water Program Participants:

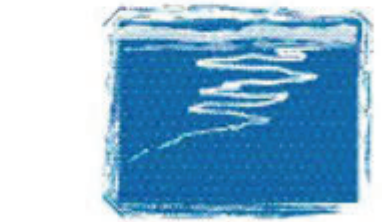
Anaheim Public Works/Engineering	(714) 765-5176
Brea Engineering	(714) 990-7666
Buena Park Public Works	(714) 562-3655
Costa Mesa Public Services	(714) 754-5248
Cypress Engineering	(714) 229-6752
Dana Point Public Works	(949) 248-3562
Fountain Valley Public Works	(714) 593-4400 x347
Fullerton Engineering Dept	(714) 738-6853
Garden Grove Development Services	(714) 741-5554
Huntington Beach Public Works	(714) 536-5432
Irvine Public Works	(949)724-6515
La Habra Public Services	(562) 905-9792
La Palma Public Works	(714) 523-1140 x102
Laguna Beach Municipal Services	(949) 497-0711
Laguna Hills Engineering	(949) 707-2600
Laguna Niguel Public Works	(949) 362-4337
Lake Forest Public Works	(949) 461-3480
Los Alamitos Community Dev	(562) 431-3538 x301
Mission Viejo Public Works	(949) 470-3095
Newport Beach Public works	(949) 644-3311
Orange Public Works	(714) 744-5551
Placentia Engineering	(714) 993-8131
San Clemente Engineering	(949) 361-6100
San Juan Capistrano Engineering	(949) 493-1171
Santa Ana Public Works	(714) 647-3380
Seal Beach Engineering	(562) 431-2527 x318
Stanton Public Works	(714) 379-9222 x204
Tustin Public Works Engineering	(714) 573-3150
Villa Park Engineering	(714) 998-1500
Westminster Public Works Eng.	(714) 898-3311 x215
Yorba Linda Engineering	(714) 961-7170 x174
O.C. Storm Water Program	(714) 567-6363
24 Hour Water Pollution Hotline	(714) 567-6363 or ashbyk@pfrd.co.orange.ca.us
Chemical and Hazardous Material Spill Emergencies	911

Other Important Phone Numbers:

For Additional Brochures	(714) 567-6363
UC Masters & Coop Extension ucmastergardeners@yahoo.com	(714) 708-1646
O.C. Household Hazardous Waste Information or www.oc.ca.gov/IWMD	(714) 834-6752
Information on agriculture chemicals, pesticides and possible alternatives, O.C. Agriculture Commissioner	(714) 447-7115

Original graphics developed with support from:
Coalition For Urban/Rural Environmental Stewardship (CURES)
Western Crop Protection Association (WCPA)
Responsible Industry for a Sound Environment (RISE)

Keeping Pest Control Products Out of Creeks, Rivers and The Ocean



HOMEOWNER TIPS

PROTECTING WATER

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **(714) 567-6363**
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **(714) 567-6363.**

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Landscape & Gardening

PROJECT

PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

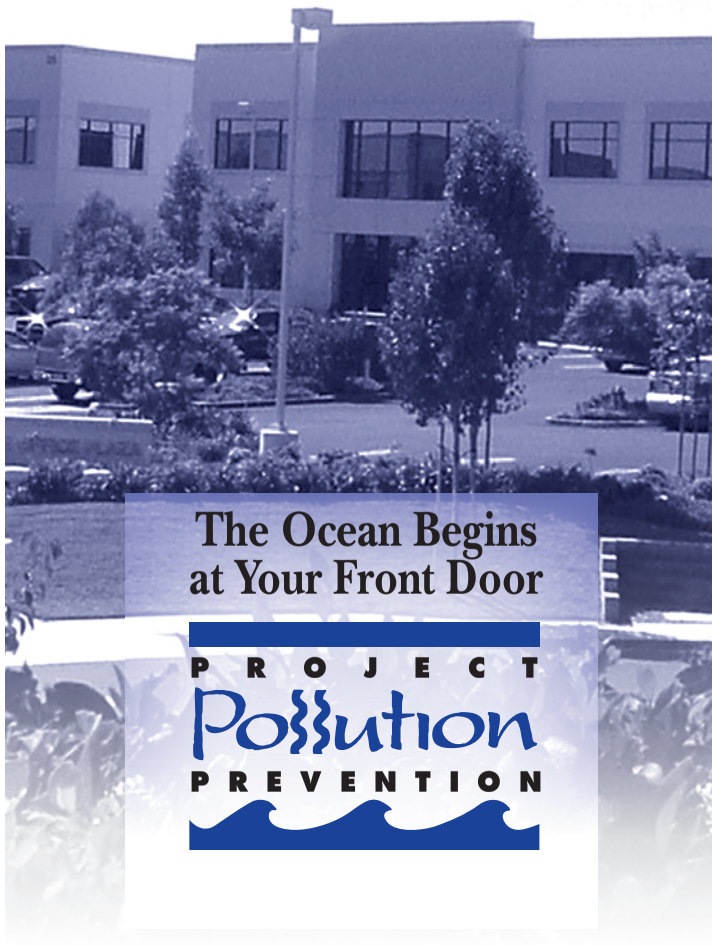
For emergencies, dial 911.

RECYCLE USED OIL

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

NEVER DISPOSE OF ANYTHING IN THE STORM DRAIN.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Fueling Areas SD-30

Photo Credit: Geoff Brosseau

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☑ Collect and Convey

Description

Fueling areas have the potential to contribute oil and grease, solvents, car battery acid, coolant and gasoline to the stormwater conveyance system. Spills at vehicle and equipment fueling areas can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by stormwater treatment devices.

Approach

Project plans must be developed for cleaning near fuel dispensers, emergency spill cleanup, containment, and leak prevention.

Suitable Applications

Appropriate applications include commercial, industrial, and any other areas planned to have fuel dispensing equipment, including retail gasoline outlets, automotive repair shops, and major non-retail dispensing areas.

Design Considerations

Design requirements for fueling areas are governed by Building and Fire Codes and by current local agency ordinances and zoning requirements. Design requirements described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements.

Designing New Installations

Covering

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

Fuel dispensing areas should provide an overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area should drain to the project's treatment control BMP(s) prior to discharging to the stormwater conveyance system. Note - If fueling large equipment or vehicles that would prohibit the use of covers or roofs, the fueling island should be designed to sufficiently accommodate the larger vehicles and equipment and to prevent stormwater run-on and runoff. Grade to direct stormwater to a dead-end sump.

Surfacing

Fuel dispensing areas should be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete should be prohibited. Use asphalt sealant to protect asphalt paved areas surrounding the fueling area. This provision may be made to sites that have pre-existing asphalt surfaces.

The concrete fuel dispensing area should be extended a minimum of 6.5 ft from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 ft, whichever is less.

Grading/Contouring

Dispensing areas should have an appropriate slope to prevent ponding, and be separated from the rest of the site by a grade break that prevents run-on of urban runoff. (Slope is required to be 2 to 4% in some jurisdictions' stormwater management and mitigation plans.)

Fueling areas should be graded to drain toward a dead-end sump. Runoff from downspouts/roofs should be directed away from fueling areas. Do not locate storm drains in the immediate vicinity of the fueling area.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

- In the case of an emergency, provide storm drain seals, such as isolation valves, drain plugs, or drain covers, to prevent spills or contaminated stormwater from entering the stormwater conveyance system.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Vehicle Washing Areas SD-33

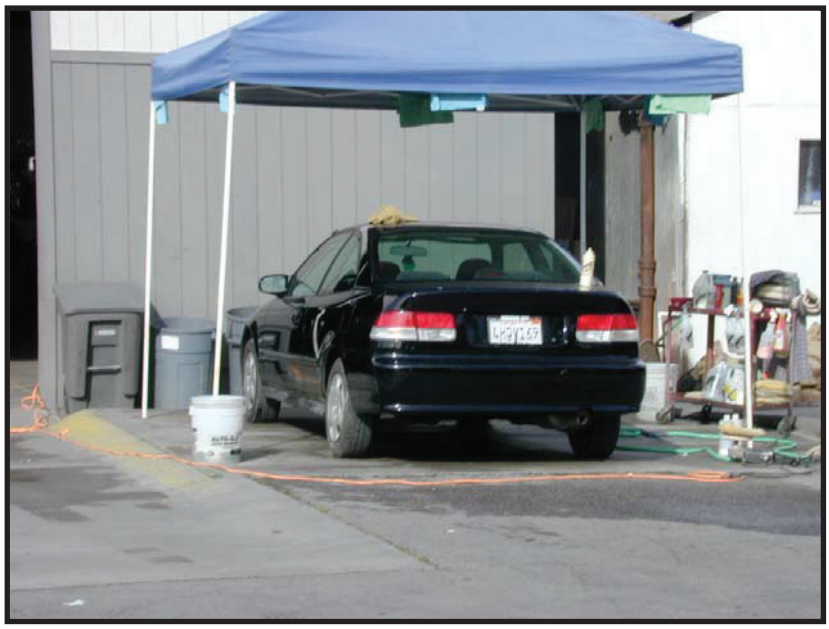

Photo Credit: Geoff Brosseau

Design Objectives

- ☑ Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☑ Collect and Convey

Description

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

Approach

Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

Suitable Applications

Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

Design Considerations

Design requirements for vehicle maintenance are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. Design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Areas for washing/steam cleaning should incorporate one of the following features:

- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer

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- Include other features which are comparable and equally effective

CAR WASH AREAS - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment.

Additional Information

Maintenance Considerations

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Spill Prevention, Control & Cleanup SC-11

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental spills. Preparation for accidental spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify hazardous material storage areas, specify material handling procedures, describe spill response procedures, and provide locations of spill clean-up equipment and materials. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills. An adequate supply of spill clean-up materials must be maintained onsite.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

Approach

General Pollution Prevention Protocols

- ☐ Develop procedures to prevent/mitigate spills to storm drain systems.
- ☐ Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- ☐ Establish procedures and/or controls to minimize spills and leaks. The procedures should address:
  - ✓ Description of the facility, owner and address, activities, chemicals, and quantities present;

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- ✓ Facility map of the locations of industrial materials;
- ✓ Notification and evacuation procedures;
- ✓ Cleanup instructions;
- ✓ Identification of responsible departments; and
- ✓ Identify key spill response personnel.

- ☐ Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Spill and Leak Prevention and Response

Spill Prevention

- ☐ Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- ☐ If illegal dumping is observed at the facility:
  - ✓ Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - ✓ Landscaping and beautification efforts may also discourage illegal dumping.
  - ✓ Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- ☐ Store and contain liquid materials in such a manner that if the container is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- ☐ If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

Preventative Maintenance

- ☐ Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.

- ☐ Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

- ☐ Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

- ☐ Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- ☐ Label all containers according to their contents (e.g., solvent, gasoline).

- ☐ Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- ☐ Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- ☐ Identify key spill response personnel.

Spill Response

- ☐ Clean up leaks and spills immediately.

- ☐ Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- ☐ On paved surfaces, clean up spills with as little water as possible.

  - ✓ Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills.

  - ✓ If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

  - ✓ If possible use physical methods for the cleanup of dry chemicals (e.g., brooms, shovels, sweepers, or vacuums).

- ☐ Never hose down or bury dry material spills. Sweep up the material and dispose of properly.

- ☐ Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- ☐ For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board or local authority as location regulations dictate.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to 911 for dispatch and clean-up assistance when needed. Do not contact fire agencies directly.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - ✓ Types and quantities (in some cases) of wastes;
  - ✓ Patterns in time of occurrence (time of day/night, month, or year);
  - ✓ Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills);
  - ✓ Clean-up procedures; and
  - ✓ Responsible parties.

Employee Training Program

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - ✓ The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur; and
  - ✓ Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.
- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- Develop spill prevention and control plan, provide and document training, conduct inspections of material storage areas, and supply spill kits.
- Extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident;
- Weather conditions;
- Duration of the spill/leak/discharge;

- Cause of the spill/leak/discharge;
- Response procedures implemented;
- Persons notified; and
- Environmental problems associated with the spill/leak/discharge.

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- Date and time the inspection was performed;
- Name of the inspector;
- Items inspected;
- Problems noted;
- Corrective action required; and
- Date corrective action was taken.

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems;
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves);
- External corrosion and structural failure;
- Spills and overfills due to operator error; and
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa.

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanges, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.

- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use absorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:

  Cover fueling area if possible.

  Use a perimeter drain or slope pavement inward with drainage to a sump.

  Pave fueling area with concrete rather than asphalt.

- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off" of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use absorbent materials on small spills and general cleaning rather than hosing down the area. Remove the absorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities.

The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department).
- Develop procedures to prevent/mitigate spills to storm drain systems.
- Identify responsible departments.

- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- Address spills at municipal facilities, as well as public areas.
- Provide training concerning spill prevention, response and cleanup to all appropriate personnel.

References and Resources

California's Nonpoint Source Program Plan. http://www.swrcb.ca.gov/nps/index.html.

Clark County Storm Water Pollution Control Manual. Available online at: http://www.co.clark.wa.us/pubworks/bmpman.pdf.

King County Storm Water Pollution Control Manual. Available online at: http://dnr.metrokc.gov/wlr/dss/spcm.htm.

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities

Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp.org.

The Stormwater Managers Resource Center. http://www.stormwatercenter.net/.

Vehicle and Equipment Fueling SC-20

Description

Spills and leaks that occur during vehicle and equipment fueling can contribute hydrocarbons, oil and grease, as well as heavy metals, to stormwater runoff. Implementing the following management practices can help prevent fuel spills and leaks.

Approach

- Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- Use properly maintained off-site fueling stations whenever possible. These businesses are better equipped to handle fuel and spills properly.
- Focus pollution prevention activities on containment of spills and leaks, most of which may occur during liquid transfers.

Good Housekeeping

- "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly.
- Manage materials and waste properly (see Material Handling and Waste Management) to reduce adverse impacts on stormwater quality.
- Paint signs on storm drain inlets to indicate that they are not to receive liquid or solid wastes.
- Post signs at sinks to remind employees not to pour wastes down drains.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Clean yard storm drain inlets(s) regularly and especially after large storms.
- Do not pour materials down storm drains.
- Build a shed or temporary roof over fueling area to limit exposure to rain.
- Post signs to remind employees and customers not to top off the fuel tank when filling and signs that ban customers and employees from changing engine oil or other fluids at that location.
- Report leaking vehicles to fleet maintenance.
- Ensure the following safeguards are in place:
  - ✓ Overflow protection devices on tank systems to warn the operator or automatically shut down transfer pumps when the tank reaches full capacity.
  - ✓ Protective guards around tanks and piping to prevent vehicle or forklift damage.
  - ✓ Clear tagging or labeling of all valves to reduce human error.
  - ✓ Emergency shut-off and emergency phone number.

Preventative Maintenance

Fuel Dispensing Areas

- Inspect vehicles and equipment for leaks regularly and repair immediately.
- Sweep the fueling area weekly, if it is paved, to collect loose particles, and wipe up spills with rags and other absorbent material immediately. Do not hose down the area to a storm drain.
- Fit underground storage tanks with spill containment and overfill prevention systems meeting the requirements of Section 2635(b) of Title 23 of the California Code of Regulations.
- Fit fuel dispensing nozzles with "hold-open latches" (automatic shutoffs) except where prohibited by local fire departments.
- Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks.
- Design fueling area to prevent stormwater runoff and spills. Use a perimeter drain or slope pavement inward with drainage to sump; regularly remove materials accumulated in sump.
- Pave area with concrete rather than asphalt.

- Cover fueling area with an overhanging roof structure or canopy so that precipitation cannot come in contact with the fueling area. Where covering is not feasible and the fuel island is surrounded by pavement, apply a suitable sealant that protects the asphalt from spilled fuels.

- Install vapor recovery nozzles to help control drips as well as air pollution.

- Use secondary containment when transferring fuel from the tank truck to the fuel tank. Cover storm drains in the vicinity during transfer.

Air/Water Supply Area

- Minimize the possibility of stormwater pollution from air/water supply areas by doing at least one of the following:

  - ✓ Spot clean leaks and drips routinely to prevent runoff of spillage.

  - ✓ Grade and pave the air/water supply area to prevent run-on of stormwater.

  - ✓ Install a roof over the air/water supply area.

  - ✓ Install a low containment berm around the air/water supply area.

Inspection

- Aboveground Tank Leak and Spill Control:

  - ✓ Check for external corrosion and structural failure.

  - ✓ Check for spills and overfills due to operator error.

  - ✓ Check for failure of piping system.

  - ✓ Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

  - ✓ Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.

  - ✓ Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

  - ✓ Conduct integrity testing periodically by a qualified professional.

- Inspect and clean, if necessary, storm drain inlets and catch basins within the facility boundary before October 1 each year.

Vehicle and Equipment Fueling SC-20

Spill Response and Prevention Procedures

- Keep your spill prevention and control plan up-to-date.
- Maintain an adequate stockpile of spill cleanup materials at locations where it will be readily accessible.
- Clean leaks, drips, and other spills with as little water as possible.
  - ✓ Use rags for small spills,
  - ✓ Use a damp mop for general cleanup,
  - ✓ Use dry absorbent material for larger spills.
- Use the following three-step method for cleaning floors:
  - ✓ Clean spills with rags or other absorbent materials
  - ✓ Sweep floor using dry absorbent material
  - ✓ Mop the floor. Mop water may be discharged to the sanitary sewer via a toilet or sink.
- Remove the adsorbent materials promptly and dispose of properly when using absorbent materials on small spills.
- Store portable absorbent booms (long flexible shafts or barriers made of absorbent material) in unbermed fueling areas.
- Report spills promptly.
- If a dead-end sump is not used to collect spills, install an oil/water separator.

Material Handling and Waste Management

- Do not pour liquid wastes into floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- Do not put used or leftover cleaning solutions, solvents, and automotive fluids in the sanitary sewer.
- Collect leaking or dripping fluids in drip pans or containers. Fluids are easier to recycle if kept separate.
- Promptly transfer used fluids to the proper waste or recycling drums. Do not leave drip pans or other open containers lying around.

- Minimize the possibility of stormwater pollution from outside waste receptacles by doing at least one of the following:
  - ✓ Use only watertight waste receptacle(s) and keep the lid(s) closed.
  - ✓ Grade and pave the waste receptacle area to prevent run-on of stormwater.
  - ✓ Install a roof over the waste receptacle area.
  - ✓ Install a low containment berm around the waste receptacle area.
  - ✓ Use and maintain drip pans under waste receptacles.
- Post "no littering" signs.

Employee Training Program

- Educate employees about facility-wide pollution prevention measures and goals.
- Train designated employees (e.g., those involved with the handling or management of fuels) on proper fueling and cleanup procedures.
- Train designated employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
- Use a training log or similar method to document training. The training log should include entries for:
  - ✓ Training topic,
  - ✓ Trainer,
  - ✓ Attendees,
  - ✓ Frequency,
  - ✓ Comments,
  - ✓ Target date for completion of training, and
  - ✓ Date completed.

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for vehicle and equipment fueling, quantities of materials removed, and improvement actions.
- Keep accurate logs of spill response actions that document what types of liquids were spilled, how it was cleaned up, and how the waste was disposed.
- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- The retrofitting of existing fueling areas to minimize stormwater exposure or spill runoff can be expensive. Good design must occur during the initial installation. Extruded curb along the "upstream" side of the fueling area to prevent stormwater run-on is of modest cost.
- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

- Most of the operations and maintenance activities associated with implementing this BMP are integrally linked to routine operations as previously described. Therefore additional O&M is not required.
- For facilities responsible for pre-treating their wastewater prior to discharging, the proper functioning of structural treatment system is an important maintenance consideration.
- Routine cleanout of sumps and oil/water separators is required for the devices to maintain their effectiveness, usually at least once a month. During periods of heavy rainfall, cleanout is required more often to ensure pollutants are not washed through the system. Sediment removal is also required on a regular basis to keep the device working efficiently.

Supplemental Information

Designing New Installations

The elements listed below should be included in the design and construction of new or substantially remodeled facilities.

Fuel Dispensing Areas

- Fuel dispensing areas must be paved with Portland cement concrete (or, equivalent smooth impervious surface), with a 2 to 4% slope to prevent ponding, and must be

separated from the rest of the site by a grade break that prevents run-on of stormwater to the extent practicable. The fuel dispensing area is defined as extending 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus 1 foot, whichever is less. The paving around the fuel dispensing area may exceed the minimum dimensions of the "fuel dispensing area" stated above.

- The fuel dispensing area must be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area, as defined above. The cover must not drain onto the fuel dispensing area.

- If necessary, install and maintain an oil control device in the appropriate catch basin(s) to treat runoff from the fueling area.

Outdoor Waste Receptacle Area

- Grade and pave the outdoor waste receptacle area to prevent run-on of stormwater to the extent practicable.

Air/Water Supply Area

- Grade and pave the air/water supply area to prevent run-on of stormwater to the extent practicable.

Designated Fueling Area

- If your facility has large numbers of mobile equipment working throughout the site and you currently fuel them with a mobile fuel truck, consider establishing a designated fueling area. With the exception of tracked equipment such as bulldozers and perhaps small forklifts, most vehicles should be able to travel to a designated area with little lost time. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain.

Examples

The Spill Prevention Control and Countermeasure (SPCC) Plan, which is required by law for some facilities, is an effective program to reduce the number of accidental spills and minimize contamination of stormwater runoff.

The City of Palo Alto has an effective program for commercial vehicle service facilities. Many of the program's elements, including specific BMP guidance and lists of equipment suppliers, are also applicable to industrial facilities.

References and Resources

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities.

Oregon Department of Environmental Quality, 2013. *Industrial Stormwater Best Management Practices Manual- BMP 8 Vehicle, Pavement and Building Washing*. Available online at: http://www.deq.state.or.us/wq/wqpermit/docs/IndBMP021413.pdf

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control*. Available online at: http://www.msa.saccounty.net/sactostormwater/documents/guides/industrial-BMP-manual.pdf.

Sacramento County Environmental Management Stormwater Program: Best Management Practices –Vehicle Washing. Available online at: http://www.emd.saccounty.net/EnvHealth/Stormwater/Stormwater-BMPs.html.

Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp-w2k.com/.

US EPA. National Pollutant Discharge Elimination System – Stormwater Menu of BMPs - Municipal Vehicle and Equipment Washing, Available online at: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=132.

Washington State Department of Ecology, 2012. *Vehicle and Equipment Washwater Discharges Best Management Practices Manual*. Publication no. WQ-R-95-056. Available online at: https://fortress.wa.gov/ecy/publications/publications/95056.pdf.

Vehicle and Equipment Cleaning SC-21

Description

Wash water from vehicle and equipment cleaning activities performed outdoors or in areas where wash water flows onto the ground can contribute toxic hydrocarbons and other organic compounds, oils and greases, nutrients, phosphates, heavy metals, and suspended solids to stormwater runoff. Use of the procedures outlined below can prevent or reduce the discharge of pollutants to stormwater during vehicle and equipment cleaning.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives

General Pollution Prevention Protocols

- If possible, use properly maintained off-site commercial washing and steam cleaning businesses whenever possible. These businesses are better equipped to handle and properly dispose of the wash waters.
- Use dry cleaning methods to remove debris and sweep area; avoid washing with water when possible.
- Good housekeeping practices can minimize the risk of contamination from wash water discharges.
- Use biodegradable, phosphate-free detergents for washing vehicles as appropriate
- Emphasize the connection between the storm drain system and runoff, help reinforce that vehicle and equipment washing activities affect local water quality through storm drain stenciling programs.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Addressed	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Map on-site storm drain locations to avoid discharges to the storm drain system.
- Designate specific wash area with clarifier or place wash areas away from storm drain connections.

Good Housekeeping

- Mark the area clearly as a wash area by:
  - ✓ Posting signs stating that only washing is allowed in wash area; and
  - ✓ Providing information on how washing is to be done.
- Provide trash containers in wash area.
- Have all vehicle and equipment washing done in areas designed to collect and hold the wash and rinse water or effluent generated. Recycle, collect or treat wash water effluent prior to discharge to the sanitary sewer system.
- If washing/cleaning must occur on-site, consider washing vehicles and equipment inside the building or on an impervious surface to control the targeted constituents by directing them to the sanitary sewer.
- If washing must occur on-site and outdoor:
  - ✓ Use designated paved wash areas. This area must be covered or bermed to collect the wash water and graded to direct the wash water to a treatment or disposal facility.
  - ✓ Do not conduct oil changes and other engine maintenance in the designated washing area. Perform these activities in a place designated for oil change and maintenance activities.
  - ✓ Cover the wash area when not in use to prevent contact with rain water.
- Do not permit steam cleaning wash water to enter the storm drain system.
- If possible, conduct pressure and steam cleaning at appropriate off-site areas to avoid generating runoff with high pollutant concentrations.

Preventative Maintenance

- Install sumps or drain lines to collect wash water for treatment.
- Use hoses with nozzles that automatically turn off when left unattended.
- Perform routine inspections of drain lines, holding tanks, and hoses and repair leaks immediately.

- Perform routine inspection and maintenance of wash water recycling and treatment systems.

Spill Response and Prevention Procedures

- Keep the spill prevention and control plan up-to-date.
- Have an emergency plan, equipment, and trained personnel ready at all times to deal immediately with major spills.
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.

Material Handling and Waste Management

- Collect all wash water from vehicle and equipment cleaning operations. Consider treating and reusing or discharging wash waters to a sanitary sewer system.
- Large quantities of wash waters may require treatment at the facility. Treatment using a process treatment system (e.g., holding tank, filtration system, and related appurtenances) will require engineering and capital expenditures.
- Collect and treat small amounts of wash water at the facility and either recycle or discharge to the sanitary sewer system or collect and dispose of as an industrial waste.
- Discharge wash waters into sanitary sewer only after contacting local sewer authority to find out if pretreatment is required.

Employee Training Program

- Train employees on proper cleaning and wash water disposal procedures and conduct “refresher” courses on a regular basis.
- Train staff on proper maintenance measures for the wash area.
- Train employees and contractors on proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Use a training log or similar method to document training.

Quality Assurance and Record Keeping

- Keep accurate maintenance/inspection logs that document the minimum BMP activities performed for vehicle and equipment cleaning activities and improvement actions.

- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.

- Establish procedures to complete logs and file them in the central office.

Other Facility-Specific Considerations

- Some municipalities may require pretreatment and monitoring of wash water discharges to the sanitary sewer.

- Steam cleaning can generate significant pollutant concentrations requiring that careful consideration be given to the environmental impacts and compliance issues related to the condensate wastewater generated.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of certain BMPs. Provided below are typical limitations and recommended "work-arounds":

- Most car washing best management practices are inexpensive, and rely more on good housekeeping practices (where vehicles are washed, planning for the collection of wash water) than on expensive technology. However, the construction of a specialized area for vehicle washing can be expensive. Also, for facilities that cannot recycle their wash water, the cost of pre-treating wash water through either structural practices or planning for collection and hauling of contaminated water to sewage treatment plants can be cost-prohibitive.

- A potential work-around is to use properly maintained off-site commercial washing and steam cleaning businesses whenever possible.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Many facilities will already have indoor covered areas where vehicle and equipment cleaning takes place and will require no additional capital expenditures for providing cover.

- Capital investments will be required at some sites if systems to collect and recycle/treat and properly discharge wash water are not in place. The cost associated with these investments will vary depending on the size of the washing facility and local regulations regarding effluent wash water.

Maintenance

- Perform wash and collection system inspections and repair.

- Sweep washing areas frequently to remove solid debris.

- Repair berms and dikes as necessary.
- Inspect and maintain sumps, oil/water separators, and on-site treatment/recycling units.

Supplemental Information

Designated Cleaning Areas

- Washing operations outside should be conducted in a designated wash area having the following characteristics:
  - ✓ Paved with Portland cement concrete
  - ✓ Covered and bermed to prevent contact with stormwater and contain wash water
  - ✓ Sloped for wash water collections
  - ✓ Drainage system for wash water to the sanitary or recycle treatment process waste sewer, or to a dead-end sump equipped with an oil/water separator if necessary.

References and Resources

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities.

Oregon Department of Environmental Quality, 2013. *Industrial Stormwater Best Management Practices Manual- BMP 8 Vehicle, Pavement and Building Washing*. Available online at: http://www.deq.state.or.us/wq/wqpermit/docs/IndBMP021413.pdf.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control*. Available online at: http://www.msa.saccounty.net/sactostormwater/documents/guides/industrial-BMP-manual.pdf.

Sacramento County Environmental Management Stormwater Program: Best Management Practices –Vehicle Washing. Available online at: http://www.emd.saccounty.net/EnvHealth/Stormwater/Stormwater-BMPs.html.

Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp-w2k.com/.

US EPA. National Pollutant Discharge Elimination System – Stormwater Menu of BMPs - Municipal Vehicle and Equipment Washing. Available online at: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=132.

Washington State Department of Ecology, 2012 .*Vehicle and Equipment Washwater Discharges Best Management Practices Manual.* Publication no. WQ-R-95-056. Available online at: https://fortress.wa.gov/ecy/publications/publications/95056.pdf.

Waste Handling & Disposal SC-34

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- ☐ Accomplish reduction in the amount of waste generated using the following source controls:
  - ✓ Production planning and sequencing;
  - ✓ Process or equipment modification;
  - ✓ Raw material substitution or elimination;
  - ✓ Loss prevention and housekeeping;
  - ✓ Waste segregation and separation; and
  - ✓ Close loop recycling.
- ☐ Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- ☐ Recycle materials whenever possible.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Use the entire product before disposing of the container.
- To the extent possible, store wastes under cover or indoors after ensuring all safety concerns such as fire hazard and ventilation are addressed.
- Provide containers for each waste stream at each work station. Allow time after shift to clean area.

Good Housekeeping

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain. Clean in a designated wash area that drains to a clarifier.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- If possible, move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Preventative Maintenance

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, vacuuming, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Spill Response and Prevention Procedures

- Keep your spill prevention and plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills.
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - ✓ Vehicles equipped with baffles for liquid waste; and
  - ✓ Trucks with sealed gates and spill guards for solid waste.

Material Handling and Waste Management

Litter Control

- Post “No Littering” signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal. Affix labels to all waste containers.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Employee Training Program

- Educate employees about pollution prevention measures and goals.
- Train employees how to properly handle and dispose of waste using the source control BMPs described above.
- Train employees and subcontractors in proper hazardous waste management.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for waste handling and disposal, types and quantities of waste disposed of, and any improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.

- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital costs will vary substantially depending on the size of the facility and the types of waste handled. Significant capital costs may be associated with reducing wastes by modifying processes or implementing closed-loop recycling.
- Many facilities will already have indoor covered areas where waste materials will be stored and will require no additional capital expenditures for providing cover.
- If outdoor storage of wastes is required, construction of berms or other means to prevent stormwater run-on and runoff may require appropriate constructed systems for containment.
- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

- Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

References and Resources

Minnesota Pollution Control Agency, *Industrial Stormwater Best Management Practices Guidebook*. Available online at: http://www.pca.state.mn.us/index.php/view-document.html?gid=10557.

New Jersey Department of Environmental Protection, 2013. *Basic Industrial Stormwater General Permit Guidance Document NJPDES General Permit No NJ0088315,* Revised. Available online at: http://www.nj.gov/dep/dwq/pdf/5G2_guidance_color.pdf.

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities

Oregon Department of Environmental Quality, 2013. *Industrial Stormwater Best Management Practices Manual- BMP 26 Fueling and Liquid Loading/Unloading Operations*. Available online at: http://www.deq.state.or.us/wq/wqpermit/docs/IndBMP021413.pdf.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control*. Available online at: http://www.msa.saccounty.net/sactostormwater/documents/guides/industrial-BMP-manual.pdf.

Sacramento County Environmental Management Stormwater Program: Best Management Practices. Available online at: http://www.emd.saccounty.net/EnvHealth/Stormwater/Stormwater-BMPs.html.

Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp-w2k.com/

US EPA. National Pollutant Discharge Elimination System – Industrial Fact Sheet Series for Activities Covered by EPA's Multi Sector General Permit. Available online at: http://cfpub.epa.gov/npdes/stormwater/swsectors.cfm.

Safer Alternative Products SC-35

Description

Promote the use of less harmful products and products that contain little or no TMDL and 303(d) list pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests

Objectives
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	
Preventative Maintenance	
Spill and Leak Prevention and Response	
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	

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by methods that pose a lower risk to employees, the public, and the environment.

- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies
- Procedures
  - ✓ Standard operating procedures (SOPs);
  - ✓ Purchasing guidelines and procedures; and
  - ✓ Bid packages (services and supplies).
- Materials
  - ✓ Preferred or approved product and supplier lists;
  - ✓ Product and supplier evaluation criteria;
  - ✓ Training sessions and manuals; and
  - ✓ Fact sheets for employees.

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC-20 – SC-22) and SC-41 Building and Grounds Maintenance.

Employee Training Program

- Employees who handle potentially harmful materials should be trained in the use of safer alternatives.
- Purchasing departments should be trained on safer alternative products and encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.
- Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources provided in this fact sheet.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds"

- Alternative products may not be available, suitable, or effective in every case.

- ✓ Minimize use of hazardous/harmful products if no alternative product is available.

Regulatory Considerations

This BMP has no regulatory requirements unless local/municipal ordinance applies. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- □ Specialized equipment storage and handling requirements;
- □ Storm water runoff sampling requirements;
- □ Training and licensing requirements; and
- □ Record keeping and reporting requirements.

Cost Considerations

- □ The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.
- □ Some alternative products may be slightly more expensive than conventional products.

Supplemental Information

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- □ Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Refined motor oil is also available.
- □ Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- □ Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- □ Paint products – Water-based paints, wood preservatives, stains, and finishes with low VOC content are available.
- □ Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- □ Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- □ Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps.

All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.

- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting. Use paper products with post-consumer recycled content and implement electric had dryers.

Examples

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information

California Department of Toxic Substances Control, http://www.dtsc.ca.gov/PollutionPrevention/GreenTechnology/Index.cfm.

CalRecycle, http://www.calrecycle.ca.gov/Business/Regulated.htm.

City of Santa Monica Office of Sustainability and Environment, http://www.smgov.net/departments/ose/.

City of Palo Alto, http:// www.city.palo-alto.ca.us/cleanbay.

City and County of San Francisco, Department of the Environment, http://www.sfenvironment.org/toxics-health/greener-business-practices.

Green Business Program, http://www.greenbiz.ca.gov/GRlocal.html .

Product Stewardship Institute, http://www.productstewardship.us/index.cfm.

Sacramento Clean Water Business Partners. http://www.sacstormwater.org/CleanWaterBusinessPartners/CleanWaterBusinessPartners.html.

USEPA. National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges From Industrial Facilities, http://cfpub.epa.gov/npdes/stormwater/indust.cfm.

USEPA Region IX Pollution Prevention Program, http://www.epa.gov/region9/waste/p2/business.html.

Western Sustainability and Pollution Prevention Network, http://wsppn.org/.

Metals (mercury, copper)

National Electrical Manufacturers Association – Environmental Stewardship, http://www.nema.org/Policy/Environmental-Stewardship/pages/default.aspx.

Sustainable Conservation, http://www.suscon.org.

Auto Recycling Project

Brake Pad Partnership

Pesticides and Chemical Fertilizers

Bio-Integral Resource Center, http://www.birc.org.

California Department of Pesticide Regulation, http://www.cdpr.ca.gov/dprprograms.htm.

University of California Statewide IPM Program, http://www.ipm.ucdavis.edu/default.html.

Dioxins

Bay Area Dioxins Project, http://www.abag.ca.gov/bayarea/dioxin/project_materials.htm.

Building & Grounds Maintenance SC-41

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- ☐ Switch to non-toxic chemicals for maintenance to the maximum extent possible.
- ☐ Choose cleaning agents that can be recycled.
- ☐ Encourage proper lawn management and landscaping, including use of native vegetation.
- ☐ Encourage use of Integrated Pest Management techniques for pest control.
- ☐ Encourage proper onsite recycling of yard trimmings.
- ☐ Recycle residual paints, solvents, lumber, and other material as much as possible.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Clean work areas at the end of each work shift using dry cleaning methods such as sweeping and vacuuming.

Good Housekeeping

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.

- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.

- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures on exposed soils. See also SC-40, Contaminated and Erodible Areas, for more information.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.

- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and

solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Building & Grounds Maintenance SC-41

Spill Response and Prevention Procedures

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Material Handling and Waste Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Dispose of empty pesticide containers according to the instructions on the container label.
- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Employee Training Program

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the needs of individual staff.

Quality Assurance and Record Keeping

- Keep accurate logs that document maintenance activities performed and minimum BMP measures implemented.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Additional capital costs are not anticipated for building and grounds maintenance. Implementation of the minimum BMPs described above should be conducted as part of regular site operations.

Maintenance

- Maintenance activities for the BMPs described above will be minimal, and no additional cost is anticipated.

Supplemental Information

Fire Sprinkler Line Flushing

Site fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

City of Seattle, Seattle Public Utilities Department of Planning and Development, 2009. *Stormwater Manual Vol. 1 Source Control Technical Requirements Manual*.

Kennedy/Jenks Consultants, 2007. *The Truckee Meadows Industrial and Commercial Storm Water Best Management Practices Handbook*. Available online at: http://www.cityofsparks.us/sites/default/files/assets/documents/env-control/construction/TM-I-C_BMP_Handbook_2-07-final.pdf.

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control*. Available online at:

http://www.msa.saccounty.net/sactostormwater/documents/guides/industrial-BMP-manual.pdf.

US EPA, 1997. *Best Management Practices Handbook for Hazardous Waste Containers*. Available online at: http://www.epa.gov/region6/6en/h/handbk4.pdf.

Ventura Countywide Stormwater Management Program Clean Business Fact Sheets. Available online at: http://www.vcstormwater.org/documents/programs_business/building.pdf.

Parking Area Maintenance SC-43

Description

Parking lots can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

BMPs for other outdoor areas on site (loading/unloading, material storage, and equipment operations) are described in SC-30 through SC-33.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- Encourage advanced designs and maintenance strategies for impervious parking lots. Refer to the treatment control BMP fact sheets in this manual for additional information.
- Keep accurate maintenance logs to evaluate BMP implementation.

Good Housekeeping

- Keep all parking areas clean and orderly. Remove debris, litter, and sediments in a timely fashion.
- Post "No Littering" signs and enforce anti-litter laws.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*
■ *Product Substitution*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ☐ Provide an adequate number of litter receptacles.
- ☐ Clean out and cover litter receptacles frequently to prevent spillage.

Preventative Maintenance

Inspection

Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.

- ☐ Inspect cleaning equipment/sweepers for leaks on a regular basis.

Surface Cleaning

- ☐ Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- ☐ Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- ☐ Sweep all parking lots at least once before the onset of the wet season.
- ☐ Dispose of parking lot sweeping debris and dirt at a landfill.
- ☐ Follow the procedures below if water is used to clean surfaces:
  - ✓ Block the storm drain or contain runoff.
  - ✓ Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
- ☐ Follow the procedures below when cleaning heavy oily deposits:
  - ✓ Clean oily spots with absorbent materials.
  - ✓ Use a screen or filter fabric over inlet, then wash surfaces.
  - ✓ Do not allow discharges to the storm drain.
  - ✓ Vacuum/pump discharges to a tank or discharge to sanitary sewer.
  - ✓ Dispose of spilled materials and absorbents appropriately.

Surface Repair

- ☐ Check local ordinance for SUSMP/LID ordinance.
- ☐ Preheat, transfer or load hot bituminous material away from storm drain inlets.
- ☐ Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- ☐ Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in

place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control during sweeping to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Spill Response and Prevention Procedures

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Employee Training Program

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for parking area maintenance, types and quantities of waste disposed of, and any improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital investments may be required at some sites to purchase sweeping equipment, train sweeper operators, install oil/water/sand separators, or implement advanced BMPs. These costs can vary significantly depending upon site conditions and the amount of BMPs required.

Maintenance

- Sweep and clean parking lots regularly to minimize pollutant transport into storm drains from stormwater runoff.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Maintain advanced BMPs such as vegetated swales, infiltration trenches, or detention basins as appropriate. Refer to the treatment control fact sheets for more information.

Supplemental Information

Advanced BMPs

Some parking areas may require advanced BMPs to further reduce pollutants in stormwater runoff, and a few examples are listed below. Refer to the Treatment Control Fact Sheets and the New Development and Redevelopment Manual for more information.

- When possible, direct sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

References and Resources

City of Seattle, Seattle Public Utilities Department of Planning and Development, 2009. *Stormwater Manual Vol. 1 Source Control Technical Requirements Manual*.

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

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The Storm Water Managers Resource Center, http://www.stormwatercenter.net.

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Drainage System Maintenance SC-44

Description

As a consequence of its function, the stormwater drainage facilities on site convey stormwater that may contain certain pollutants either to the offsite conveyance system that collects and transports urban runoff and stormwater, or directly to receiving waters. The protocols in this fact sheet are intended to reduce pollutants leaving the site to the offsite drainage infrastructure or to receiving waters through proper on-site conveyance system operation and maintenance. The targeted constituents will vary depending on site characteristics and operations.

Approach

Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- ☐ Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.
- ☐ Develop and follow a site specific drainage system maintenance plan that describes maintenance locations, methods, required equipment, water sources, sediment collection areas, disposal requirements, and any other pertinent information.

Good Housekeeping

Illicit Connections and Discharges

- ☐ Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ✓ Identify evidence of spills such as paints, discoloring, odors, etc.
- ✓ Record locations of apparent illegal discharges/illicit connections.
- ✓ Track flows back to potential discharges and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- ✓ Eliminate the discharge once the origin of flow is established.

- ☐ Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" or similar stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- ☐ Refer to fact sheet SC-10 Non-Stormwater Discharges for additional information.

Illegal Dumping

- ☐ Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- ☐ Establish a system for tracking incidents. The system should be designed to identify the following:
  - ✓ Illegal dumping hot spots;
  - ✓ Types and quantities (in some cases) of wastes;
  - ✓ Patterns in time of occurrence (time of day/night, month, or year);
  - ✓ Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills); and
  - ✓ Responsible parties.
- ☐ Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- ☐ Refer to fact sheet SC-10 Non-Stormwater Discharges for additional information.

Preventative Maintenance

Catch Basins/Inlet Structures

- ☐ Staff should regularly inspect facilities to ensure compliance with the following:
  - ✓ Immediate repair of any deterioration threatening structural integrity.
  - ✓ Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Prioritize storm drain inlets; clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Wildlife. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Army Corps of Engineers and USFWS.

Spill Response and Prevention Procedures

- Keep your spill prevention control plan up-to-date.

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

Employee Training Program

- Educate employees about pollution prevention measures and goals.
- Train employees how to properly handle and dispose of waste using the source control BMPs described above.
- Train employees and subcontractors in proper hazardous waste management.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - ✓ OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).
  - ✓ OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).
  - ✓ Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for drainage system maintenance, types and quantities of waste disposed of, and any improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- Keep accurate logs of illicit connections, illicit discharges, and illegal dumping into the storm drain system including how wastes were cleaned up and disposed.
- Establish procedures to complete logs and file them in the central office.

Potential Limitations and Work-Arounds

Provided below are typical limitations and recommended "work-arounds" for drainage system maintenance:

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

  - ✓ Perform all maintenance onsite and do not flush accumulated material downstream to private property or riparian habitats.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, and liquid/sediment disposal.

  - ✓ Develop and follow a site specific drainage system maintenance plan that describes maintenance locations, methods, required equipment, water sources, sediment collection areas, disposal requirements, and any other pertinent information.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

  - ✓ Do not dump illegal materials anywhere onsite.

  - ✓ Identify illicit connections, illicit discharge, and illegal dumping.

  - ✓ Cleanup spills immediately and properly dispose of wastes.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the sanitary sewer system.

  - ✓ Collect all materials and pollutants accumulated in drainage system and dispose of according to local regulations.

  - ✓ Install debris excluders in areas with a trash TMDL.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital costs will vary substantially depending on the size of the facility and characteristics of the drainage system. Significant capital costs may be associated with purchasing water trucks, vacuum trucks, and any other necessary cleaning equipment or improving the drainage infrastructure to reduce the potential .

- Developing and implementing a site specific drainage system maintenance plan will require additional capital if a similar program is not already in place.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.
- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Supplemental Information

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used if allowed or that fire hydrant line flushing coincide with storm sewer flushing.

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BG-21 Automotive Service – Maintenance

Photo Credit: Geoff Brosseau

Description

This category includes facilities that conduct general maintenance and repair on vehicles including:

- General repair shops
- Radiator repair shops
- Car dealerships
- Car washes
- Fleet maintenance operations

Information specific to: auto dismantling, body repair, and service stations is provided in other guide sheets.

Pollutant Sources

The following are sources of pollutants:

- Changing oil and other fluids
- Cleaning engines and parts
- Flushing radiators
- Washing cars and other vehicles

Pollutants can include:

- Heavy metals (copper, lead, nickel, and zinc)
- Hydrocarbons (oil and grease, PAHs)
- Toxic chemicals (solvents, chlorinated compounds, glycols)
- Acids and alkalis

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BG-21 Automotive Service – Maintenance

Approach

Minimize exposure of maintenance areas to rain and runoff by using cover and containment. In and around these areas, use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program. Provide employee education materials in the first language of employees, as necessary.

Source Control BMPs

The best management practices are listed by activity or area.

Changing Oil and Other Fluids	Waste oil, antifreeze, and other vehicle fluids contain toxic chemicals and heavy metals from wear and tear of engine parts. See fact sheet SC-22 - Vehicle and Equipment Maintenance and Repair for other information) □ Whenever possible, change vehicle fluids indoors and only on floors constructed of non-porous materials. Avoid working over asphalt and dirt floors – surfaces that absorb vehicle fluids. □ If vehicle fluids must be removed outdoors, always use a drip pan. Prevent spills from reaching the street or storm drain by working over an absorbent mat and covering nearby storm drains, or working in a bermed area. If necessary, you can use absorbent socks to create a bermed area. □ When draining fluids into a drain pan, place a larger drip pan (e.g., 3' x 4') under the primary drain pan to catch any spilled fluids. □ Transfer used fluids drained from vehicles to a designated waste storage area as soon as possible. Drain pans and other open containers of fluids should not be left unattended unless they are covered and within secondary containment. □ Store waste containers of antifreeze and oil within secondary containment. Antifreeze and waste oil should be stored separately and recycled, or disposed of as hazardous waste. □ Never pour vehicle fluids or other hazardous wastes into sinks, toilets, floor drains, outside storm drains, or in the garbage. These substances should be kept in designated storage areas until recycled or safe disposal. □ Drain fluids from leaking or wrecked vehicles as soon as possible, to avoid leaks and spills.
Cleaning Engines and Parts, and Flushing Radiators	Solvents and other engine cleaning fluids are hazardous to employees and can cause pollution in storm sewers and nearby creeks and streams. (See fact sheet SC-21 – Vehicle and Equipment Washing and Stream Cleaning and fact sheet SC-22 - Vehicle and Equipment Maintenance and Repair for other information) □ Eliminate discharges from these operations to the sanitary sewer and storm drains. Use a licensed service to haul and recycle or dispose of wastes.

	☐ Designate specific areas or service bays for engine, parts, or radiator cleaning. Do not wash or rinse parts outdoors. ☐ Use self-contained sinks and tanks when working with solvents. Keep sinks and tanks covered when not in use. ☐ Inspect degreasing solvent sinks regularly for leaks, and make necessary repairs immediately. ☐ Avoid soldering over drip tanks. Sweep up drippings and recycle or dispose as hazardous waste. ☐ Rinse and drain parts over the solvent sink or tank, so that solvents will not drip or spill onto the floor. Use drip boards or pans to catch excess solutions and divert them back to a sink or tank. ☐ Allow parts to dry over the hot tank. If rinsing is required, rinse over the tank as well. ☐ Collect and reuse parts cleaning solvents and water used in flushing and testing radiators. When reuse is no longer possible, these solutions may be hazardous wastes, and must be disposed of properly. ☐ Never discharge cleaning solutions used for engines or parts into the sewer system without adequate treatment. Most facilities have these solutions hauled offsite as hazardous waste because of the permits necessary for onsite treatment. ☐ Only discharge rinsewater to the sanitary sewer with adequate treatment and approval of the local municipal wastewater utility. ☐ Never discharge wastewater from steam cleaning, or engine/parts cleaning to a street, gutter, or storm drain. ☐ Sweep or use a vacuum to clean up dust and debris from scraping or bead blasting radiators. ☐ Consider using static tanks for rinsing to reduce the volume of discharged rinsewater. ☐ Consider using counter-current rinsing to reduce water usage and rinsewater discharges.
Washing Cars and Other Vehicles	(See fact sheet SC-21 – Vehicle and Equipment Washing and Stream Cleaning for other information) Regular Activity ☐ If car washing is a central activity of your business, the preferred option is to treat and recycle the wash water. ☐ Designate a vehicle washing area and wash cars and trucks only in that area. This “wash pad” should be bermed or protected from storm drains and should drain to an oil/water separator before discharging to the sewer.

	☐ Cover an outside wash pad or minimize the area of an uncovered pad to reduce the amount of rainwater reaching the sewer. Consult your local municipal wastewater utility for guidance. ☐ Minimize the use of acid-based wheel cleaners. These products may require additional treatment (beyond oil/water separation) before discharge to the sewer. Occasional Activity ☐ Even biodegradable soap is toxic to fish and wildlife. Whenever possible, take vehicles to a commercial car wash. ☐ If soap is used in washing, the wash water must be collected and discharged, preferably with treatment, to the sanitary sewer. This water cannot be discharged to a storm drain. ☐ Never rinse off spray-on acid-based wheel cleaners where rinse water may flow to a street, gutter, or storm drain. Washing New Vehicles ☐ If cleaning the exterior of new vehicles with water only, the discharged water may go to the storm drain directly. ☐ Always protect the storm drains from solvents used to remove protective coatings from new cars. Discharges of these solvents to the sanitary sewer must receive adequate treatment and approval of the local municipal wastewater utility.

Keeping a Clean Shop

Good housekeeping practices minimize liability, reduce costs, and make it easier to detect spills and potential problems. (See fact sheet SC-22 - Vehicle and Equipment Maintenance and Repair for other information)

Good House-Keeping Practices	☐ Use drip pans under leaking vehicles to capture fluids. ☐ Sweep or vacuum the shop floor frequently. Use mopping as an alternative to hosing down work areas. ☐ If mopping is used to clean shop floors: 1. Spot clean any spilled oil or fluids using absorbents or rags. 2. Use dry cleanup methods: Sweep the floor using absorbents. 3. After steps 1 and 2 above (if mopping is still needed), mop and discharge mop water to the sanitary sewer. ☐ Do not pour mop water into the parking lot, street, gutter, or storm drain. ☐ Remove unnecessary hoses to discourage washing down floors and outside paved areas.

	☐ Regularly sweep parking lots and areas around your facility instead of washing them down with water. ☐ Collect all metal filings, dust, and paint chips from grinding, shaving, and sanding, and dispose of the waste properly. Never discharge these wastes to the storm drain or sanitary sewer. ☐ Collect all dust from brake pads separately and dispose of the waste properly. Never discharge these wastes to the storm drain or sanitary sewer. ☐ Send rags to an industrial laundry. ☐ Inspect and clean if necessary, storm drain inlets and catch basins within the facility boundary before October 1 each year. ☐ Consider using an oleophilic mop (picks up oil and not water) to reduce the volume of waste liquids you collect and reduce your cost for disposal.

Storage

Appropriate storage protects your shop from hazardous spills. Consult your local hazardous waste agency for details. (See Material and Waste Management fact sheets – SC-30 series for other information)

Proper Material and Waste Storage Guidance	☐ Store hazardous materials and wastes where they are protected from rain and in a way that prevents spills from reaching the sanitary sewer or storm drain. ☐ Keep lids on waste barrels and containers, and store them indoors or under cover to reduce exposure to rain. ☐ All hazardous wastes must be labeled according to hazardous waste regulations. Consult the fire department or your local municipal waste management and recycling agency for details. ☐ Keep wastes separate to increase your waste recycling/disposal options and to reduce your costs. ☐ Never mix waste oil with fuel, antifreeze, or chlorinated solvents. Consult your hazardous waste hauler for details. ☐ Double-contain all bulk fluids to prevent accidental discharges to the sewer and storm drain. Consult the fire department or municipal waste management and recycling agency for details. ☐ Carefully transfer fluids from drip pans or collection devices to designated waste storage areas, as soon as possible. ☐ When receiving vehicles to be parted or scavenged, park them on a paved surface and immediately drain and collect gasoline and other fluids properly.

	☐ Drain all fluids from components, such as engine blocks, which you may store for reuse or recycling. Keep these components under cover and on a drip pan. ☐ Store new batteries securely to avoid breakage and acid spills during earthquakes. Shelving should be secured to the wall. ☐ Store used batteries indoors and in plastic trays to contain potential leaks. Recycle old batteries.

Spill Prevention and Control

Spills cause safety hazards for employees and can spread if not cleaned up immediately. The best spill control is prevention. (See fact sheet SC-11 - Spill Prevention, Control and Cleanup for other information)

Spill prevention and Control Guidance	☐ Maintain and keep current, as required by other regulations, a spill response plan and ensure that employees are trained on the elements of the plan. ☐ Contain and cover all solid and liquid wastes – especially during transfer. ☐ Purchase and maintain the proper absorbent materials for containment and cleanup of different spills, and make sure they are easily accessible anywhere in the shop. Saturated absorbents generally must be disposed of as hazardous waste. ☐ "Spot clean" leaks and drips routinely to prevent runoff of spillage. Leaks are not cleaned up until the absorbent is picked up and disposed of properly. ☐ Seal or remove floor drains to prevent accidental discharge to the sewer system. ☐ Minimize the distance between waste collection points and storage areas.
Outdoor Waste Recep-tacle Area	☐ Minimize the possibility of stormwater pollution from outside waste receptacles by doing at least one of the following: ✓ Use only watertight waste receptacle(s) and keep the lid(s) closed, or ✓ Grade and pave the waste receptacle area to prevent run-on of stormwater, or ✓ Install a roof over the waste receptacle area, or ✓ Install a low containment berm around the waste receptacle area, or ✓ Use and maintain drip pans under waste receptacles.
Air/Water Supply Area	☐ Minimize the possibility of stormwater pollution from air/water supply areas by doing at least one of the following: ✓ Spot clean leaks and drips routinely to prevent runoff of spillage, or

	✓ Grade and pave the air/water supply area to prevent run-on of stormwater, or ✓ Install a roof over the air/water supply area, or ✓ Install a low containment berm around the air/water supply area.

Recycling / Wastewater Treatment

Recycling and properly treating wastes protects the environment and reduces costs. (See fact sheet SC-22 Vehicle and Equipment Maintenance and Repair and fact sheet SC-34 – Waste Handling and Disposal for other information)

Recycling/ Wastewater Management Guidance	□ Provide properly labeled containers, drums or totes to recycle solvents, paints, oil filters, antifreeze, motor oil, batteries, and lubricants.
	□ Set up a recycling system to make it easy for employees to separate wastes and to recycle.
	□ Choose wastewater treatment systems that are easy to maintain and repair.
	□ Properly maintain and service all pretreatment equipment, including sumps, separators, and grease traps to ensure proper functioning. Follow manufacturer's maintenance instructions and consider using a licensed service to conduct maintenance on a regular basis.
	□ Frequently inspect equipment for malfunctioning parts, leaks, and the accumulation of pollutants such as oil and grease. Since pretreatment equipment is supposed to remove pollutants, a lack of accumulation may be a sign of a malfunction.
	□ Retain only a licensed vendor to haul away and dispose of wastes.
	□ Consider installing self-contained, zero-discharge treatment systems that recycle wastewater.

Purchasing

Purchasing decisions have a direct and long-term impact on the products used and disposed of by your shop. Make pollution prevention easier and reduce costs and liability by controlling the types and amounts of products purchased.

- Ask your supplier for information on less toxic chemical cleaners and other products. There are alternatives to chlorinated solvents; chlorofluorocarbons; and 1,1,1, trichloroethane (TCA).
- Ask your supplier for information on the composition of brake pads. Studies have shown that brake dust washed off streets by rain may be the single biggest contributor of copper, a major pollutant, to waterways. Your awareness and understanding of this problem and the available alternatives will help us come up with solutions in the future.
- Minimize inventory by purchasing only as much product as you will need in the foreseeable future. This will reduce your storage space needs, inventory tracking costs, and liability for storing hazardous materials and waste.

Education and Training

Your success in following these guidelines depends on an effective training program.

- Train all employees upon hiring – and annually thereafter – on personal safety, chemical management, and proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices. Use a training log or similar method to document training.
- Post instructional/informational signs around your shop for customers and employees. Put signs above all sinks prohibiting discharges of vehicle fluids and wastes. Put signs on faucets (hose bibs) reminding employees and customers to conserve water and not to use water to clean up spills.
- Label drains within the facility boundary, by paint/stencil (or equivalent), to indicate whether they flow to an oil/water separator, directly to the sewer, or to a storm drain. Labels are not necessary for plumbing fixtures directly connected to the sanitary sewer.

Treatment Control BMPs

If treatment controls are installed at the facility, see Section 4 of this Handbook for information on inspecting and maintaining the BMPs.

For information on designing treatment controls, see Section 5 of the New Development and Redevelopment Planning Handbook.

More Information

Booklets, Checklists, Fact Sheets, and Pamphlets

Alameda County Clean Water Program, 2012, Tips for a Cleaner Bay: How Your Vehicle Service Facility Can Prevent Stormwater Pollution. Available on-line at: http://www.cleanwaterprogram.org/uploads/IIDC%20Vehicle%202012.pdf .

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BG-22 Automotive Service – Service Stations

Photo Credit: Geoff Brosseau

Description

This category includes facilities that provide vehicle fueling services, including self-serve facilities as well as those that provide a car washing facility. Information specific to auto dismantling, body repair, and maintenance is provided in other guide sheets.

Pollutant Sources

The following are sources of pollutants:

- Fueling,
- Spills,
- Surface cleaning, and
- Air/Water supply.
- Dumpster and trash can areas

Pollutants can include:

- Heavy metals (copper, lead, nickel, and zinc),
- Hydrocarbons (oil and grease, PAHs),
- Toxic chemicals (benzene, toluene, xylene, MTBE),
- Detergents
- Food waste and trash

Approach

Minimize exposure of rain and runoff to fueling areas by using cover and containment. In and around these areas, use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program. Provide employee education materials in the first language of employees, as necessary.

Coverage

These best management practices cover the following activities or areas:

- Fuel dispensing
- Underground storage tanks
- Air/Water supply
- Outdoor waste receptacles
- Car washing facilities

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BG-22 Automotive Service – Service Stations

Retail gasoline outlets will typically have these activities/areas onsite. Outdoor activities/areas are potentially exposed to stormwater runoff, and pollutants can also be transported to the storm drain system via leaks or spills. The best management practices described in this guide are intended to be implemented, monitored, and maintained on a year round basis. Training of employees in good housekeeping measures and spill and leak prevention is critical in preventing discharge of pollutants in stormwater.

Source Control BMPs

The best management practices are listed by activity or area. Existing Facilities

Fuel Dispensing Areas	☐ Maintain fuel dispensing areas using dry cleanup methods such as sweeping for removal of litter and debris, or use of rags and absorbents for leaks and spills. Fueling areas should never be washed down unless the wash water is collected and disposed of properly. ☐ Fit fuel dispensing nozzles with "hold-open latches" (automatic shutoffs) except where prohibited by local fire departments. ☐ Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks ☐ Train employees in implementing proper leak and spill prevention and cleanup practices. Major spills require specialized materials and emergency support personnel.
Under-ground Storage Tanks	☐ Fit underground storage tanks with spill containment and overfill prevention systems meeting the requirements of Section 2635(b) of Title 23 of the California Code of Regulations.
	☐ Train employees in implementing proper leak and spill prevention and cleanup practices. Major spills require specialized materials and emergency support personnel.
Facility – General	☐ "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly. ☐ Maintain and keep current, as required by other regulations, a spill response plan and ensure that employees are trained on the elements of the plan. ☐ Manage materials and waste to reduce adverse impacts on stormwater quality. ☐ Train all employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices. Use a training log or similar method to document training. ☐ Label/stencil drain inlets within the facility boundary to remind employees and customers whether they flow to an oil/water separator, directly to the sewer, or to a storm drain. Labels are not necessary for plumbing fixtures directly connected to the sanitary sewer. ☐ Routinely inspect and clean if necessary, storm drain inlets and catch basins within the facility boundary before the beginning of the rainy season (e.g. October 1) each year.

Outdoor Waste Receptacle Area	□ Spot clean leaks and drips routinely to prevent runoff of spillage. □ Minimize the possibility of stormwater pollution from outside waste receptacles by implementing at least one of the following: ✓ Use only watertight waste receptacle(s) and keep the lid(s) closed, or ✓ Grade and pave the waste receptacle area to prevent run-on of stormwater, or ✓ Install a roof over the waste receptacle area, or ✓ Install a low containment berm around the waste receptacle area, or ✓ Use and maintain drip pans under waste receptacles
Air/ Water Supply Area	□ Minimize the possibility of stormwater pollution from air/water supply areas by implementing at least one of the following: ✓ Spot clean leaks and drips routinely to prevent runoff of spillage, or ✓ Grade and pave the air/water supply area to prevent run-on of stormwater, or ✓ Install a roof over the air/water supply area, or ✓ Install a low containment berm around the air/water supply area.
Car Washing Facility	□ Install a wash water treatment system; do not discharge wash water directly to the storm drain. □ Minimize the possibility of stormwater pollution from car washing facilities by implementing the following: ✓ Grade and pave the car wash area to prevent run-on of stormwater, ✓ Install a roof over the car wash area, ✓ Slope the car wash area toward the wash water treatment system, not the storm drain, and ✓ Train employees in implementing proper leak and spill prevention and cleanup practices.

Treatment Control BMPs

If treatment controls are installed at the facility, see Section 4 of this Handbook for information on inspecting and maintaining the BMPs.

For information on designing treatment controls, see Section 5 of the New Development and Redevelopment Planning Handbook.

More Information

Booklets, Checklists, Fact Sheets, and Pamphlets

Alameda County Clean Water Program, 2012, Tips for a Cleaner Bay: How Your Vehicle Service Facility Can Prevent Stormwater Pollution. Available on-line at: http://www.cleanwaterprogram.org/uploads/IIDC%20Vehicle%202012.pdf.

California Department of Toxic Control Substances, undated website, *California Green Station Program, Vehicle Service and Repair (VSR).* Includes fact sheets, training modules, and other resources. Available on-line at https://dtsc.ca.gov/PollutionPrevention/VSR.cfm.

BG-30 Food Service Facilities

Photo Credit: Geoff Brosseau

Description

This category includes:

- Restaurants
- Food truck commissaries
- Institutional cafeterias
- Grocery stores, bakeries, and delicatessens
- Any facility requiring a Health Department permit for food preparation

Pollutant Sources

The following are sources of pollutants:

- Cleaning of equipment
- Grease handling and disposal
- Spills
- Surface cleaning
- Cooling and refrigeration equipment maintenance
- Landscaping and grounds maintenance
- Dumpster and loading dock area
- Parking lots
- Illicit connections to storm drain system

Pollutants can include:

- Organic materials (food wastes)

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- Oil and grease
- Toxic chemicals in cleaning products, disinfectants, and pesticides

Approach

Minimize exposure of rain and runoff to outdoor cleaning and storage areas by using cover and containment. In and around these areas, use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program. Provide employee education materials in the first language of employees.

Source Control BMPs

The best management practices are listed by activity or area in the following table.

Dumpster and Loading Dock Areas	☐ Store and transfer all solid and liquid wastes, such as tallow, in watertight covered containers. ☐ Keep litter from accumulating around loading docks by providing trash receptacles and encouraging employees to use them. ☐ Bag and seal food waste before putting it in the dumpster. Do not place uncontained liquids, or leaking containers or garbage bags into a dumpster. ☐ Keep dumpster lids closed to keep out rainwater and to prevent trash from spilling out. ☐ If the dumpster regularly overflows, get a bigger one or arrange for more frequent collection. If the dumpster is shared with other tenants, speak with the property/lease manager about scheduling more frequent trash pickups or a larger dumpster. ☐ Don't hose out dumpsters. Apply absorbent over any fluids spilled in dumpster. Absorbent will usually be knocked out when the dumpster is emptied. ☐ Have the dumpster leasing company repair or replace leaky dumpsters and compactors, and have them clean out dirty dumpsters. ☐ Install a spill cleanup kit near the dumpster and loading dock areas. ☐ Post employee reminder signs such as "Keep lid closed" near tallow bins and dumpsters. ☐ Consider enclosing the dumpster in a roofed and bermed area to prevent exposure to rainwater, and draining the area to the sanitary sewer. Contact the local wastewater treatment plant or the county environmental health department for guidance. ☐ Keep dumpsters or the dumpster enclosure locked to prevent illegal dumping. ☐ For more information on cleaning dumpster areas see the Mobile Cleaning - Food Service Business-related business guide sheet in this series.

BG-30 Food Service Facilities

Equipment and Outdoor Cleaning	☐ Make sure all discharges from cooling equipment go to the sanitary sewer and not the street, gutter, or storm drain. ☐ Clean floor mats, filters, and garbage cans in a mop sink, floor drain, or proper outside area connected to the sanitary sewer with an oil and water separator. Don't wash them in a parking lot, alley, sidewalk, or street. ☐ Consider installing anti-slip floors when you remodel. ☐ Consider cleaning filters in the dishwasher. Contact the local wastewater treatment plant or the county environmental health department for guidance. ☐ Pour wash water into a janitorial or mop sink. Don't pour it out onto a parking lot, alley, sidewalk, or street. ☐ For outdoor cleaning, have employees or contractors follow the instructions in the following business guide sheet in this series: ✓ Mobile Cleaning - Food Service Business-related ✓ Mobile Cleaning – Surface cleaning ☐ For more information in general on cleaning floor mats, equipment, exhaust filters, and outdoor surfaces see the Mobile Cleaning - Food Service Business-related business guide sheet in this series.
Spill Cleanup	☐ Prepare a spill cleanup plan that includes: ✓ Procedures for different types of spills ✓ Schedule for initial and annual training of employees ✓ Cleanup kits in well-marked, accessible areas ✓ Designation of key employee who monitors cleanup ✓ Posting the plan in the work area ☐ If a spill occurs, immediately stop the spill at its source. ☐ Keep the spill from entering the street, gutter, or storm drain. ☐ Use dry methods for spill cleanup (sweeping, cat litter, etc.). Don't hose down spills. ☐ If wet cleaning (including high-temperature or high pressure washing) is required, dry clean first and then mop (or if it is absolutely necessary, wash) and collect the water. Dispose of water in sink or other indoor drain, not in the street, gutter, or storm drain. ☐ If a final rinse is necessary for health reasons, collect the rinsewater and dispose it to the sink or indoor floor drain. If outdoors, block the storm drain before applying water. Mop up or wet-vacuum water, and dispose it to a sink or indoor drain. ☐ Do not use bleach or disinfectants if there is a possibility that rinsewater could flow to a street, gutter, or storm drain.

	☐ For more information on cleaning outdoor surfaces see the Mobile Cleaning - Surface Cleaning business guide sheet in this series.
Recycling and Disposal	☐ Separate wastes. Keep your recyclable wastes in separate containers according to the type of material. They are easier to recycle if separated. ☐ Recycle the following materials: ✓ Food waste (non-greasy, non-animal food waste can be composted). Donate leftover, edible food whenever possible to local food banks. ✓ Paper and cardboard ✓ Container glass, aluminum, and tin ✓ Pallets and drums ☐ Dispose of toxic waste properly. Toxic waste includes used cleaners, and rags (soaked with solvents, floor cleaners, and detergents).
Grease Handling and Disposal	☐ Never pour oil, grease, or large quantities of oily liquids such as sauces or salad dressings or waste grease down a sink, floor drain, storm drain, or into a dumpster. ☐ Install screens and solid traps in sink and floor drains to catch larger solids. Clean these screens and traps frequently. ☐ Don't try to "dissolve" grease by adding hot water or emulsifying chemicals – it will only move the grease further down the building's sewer line and make it harder to remove later. ☐ Recycle grease and oil. Don't pour it into sinks, floor drains, or onto a parking lot or street. Look in the phone book for "Renderers" or call the local recycling or household hazardous waste information line. ☐ Use tallow bins or sealed containers with tamper-proof lids. Keep the exterior of the container clean. Check for leaks. Ask the recycler for a leak-free tallow bin and replace any leaky grease containers. If grease is stored outside, keep it under a roof, if possible. ☐ Do not contaminate the recyclable oils and grease in the tallow bin with the waste grease from the grease trap or grease interceptor. ☐ Inspect and clean all waste grease removal devices (grease trap or grease interceptor) often enough to keep them functioning properly and efficiently. ☐ For disposal of waste grease from the grease trap or grease interceptor, see "Grease Traps" or "Septic Tanks" in the phone book.

BG-30 Food Service Facilities

Land-scaping and Grounds Maintenance	◻ Never dispose of leftover pesticides in the gutter, street, or storm drain. Leftover pesticides must be either used up or disposed of as hazardous waste. ◻ Do not blow or rake leaves, grass, or garden clippings into the street, gutter, or storm drain. ◻ If pesticides are used, do not over apply or apply when rain is forecast. ◻ Do not use copper-based algaecides in pools or fountains. Control algae with chlorine or other alternatives to copper-based products.
Pest Control	Food Sources ◻ Keep the kitchen free of food scraps. ◻ Take out garbage each night in a closed container. ◻ Refrigerate all food or store in pest-proof containers each night. ◻ Keep ventilation system working properly to keep greasy residue off walls. Appliances ◻ Keep dishwasher area clean. Check the trap nightly. ◻ Where possible, elevate appliances at least 6 inches off the floor. ◻ Clean under appliances nightly. ◻ Steam clean or wash appliances weekly. ◻ Remember to clean under the counter, under the sink, and the refrigerator vent. Drains and Trash Cans ◻ Steam clean or scrub floor drains with a brush to help eliminate fruit flies. ◻ Keep dumpster area clean – inside and out. ◻ Wash garbage cans regularly. Supplies and Entry Points ◻ Check for pests before bringing supplies in to the kitchen. Roaches like corrugated boxes. ◻ Don't store boxes in the kitchen – take boxes away or store in a refrigerated area. ◻ Seal any gaps below doors. Reduce Habitat ◻ Inspect the entire establishment – inside and out. ◻ Suggest physical modifications that may help to eliminate pest behavior.

	☐ Suggest changes in food storage or cleanup practices to eliminate food sources for pests. ☐ Place boric acid powder in wall voids. ☐ Seal cracks and crevices. Monitor for Pests ☐ Use sticky traps to monitor how well the pest control program is working. Pests caught in the traps warn of a possible problem. ☐ When hiring a pest control service, look for a company that provides Integrated Pest Management (IPM) services. Use Baits First ☐ Use baits for controlling pests. Remove bait when pests are gone, or else the bait may attract more pests. ☐ Use chemicals only as a last resort. If absolutely necessary, choose less-toxic chemicals, and ask the pest service to provide label information. ☐ Apply pesticides only if necessary, not on a regular schedule. Follow label directions. Do not apply pesticides around floor drains, sinks, or food. Purchasing ☐ Use non-disposable products. Serve food on ceramic dishware rather than paper, plastic or Styrofoam, and use cloth napkins rather than paper ones. If you must use disposable products, use paper instead of Styrofoam. ☐ Buy the least toxic products available: ✓ Look for "non-toxic," "non-petroleum based," "free of ammonia, phosphates, dye, or perfume," or "readily biodegradable" on the label. Don't assume biodegradable products are safe. Biodegradable means the product will eventually break down, but it may harm the environment in the meantime. ✓ Avoid chlorinated compounds, petroleum distillates, phenols, formaldehyde, and caustic or acidic products. ✓ Use water-based products. ✓ Look for and purchase "recycled" and "recyclable" containers. By doing so, you help ensure a use for the recyclable materials that people collect and recycle.
Education and Training	☐ Employees can help prevent pollution when urban runoff training is included in employee orientations and reviews. ☐ Train all employees upon hiring and annually thereafter. ☐ Use a training log to document employee training.

	☐ Post information about or labels for BMPs where employees and customers can see them. ☐ Remember the facility is liable for the behavior of contractors. Be sure all contractors hired to clean inside or outside are aware of and implement these BMPs. ☐ Explain BMPs to other food businesses through your business associations or chambers of commerce.

Treatment Control BMPs

If treatment controls are installed at the facility, see Section 4 of this Handbook for information on inspecting and maintaining the BMPs.

For information on designing treatment controls, see Section 5 of the Development and Redevelopment Handbook.

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Bio Clean

A Forterra Company

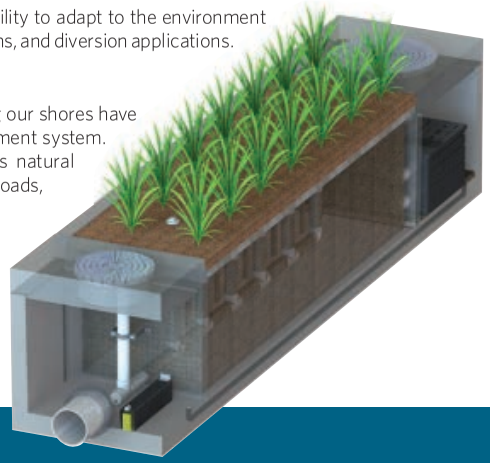
Modular Wetlands® System Linear

A Stormwater Biofiltration Solution

OVERVIEW

The Bio Clean Modular Wetlands® System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint, higher treatment capacity, and a wide range of versatility. While most biofilters use little or no pretreatment, the Modular Wetlands® incorporates an advanced pretreatment chamber that includes separation and pre-filter cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, reducing maintenance costs and improving performance.

Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.



The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the Modular Wetlands® System Linear.

PERFORMANCE

The Modular Wetlands® continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the Modular Wetlands® has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the Modular Wetlands® harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	**69%** REMOVAL OF TOTAL ZINC	**38%** REMOVAL OF DISSOLVED COPPER	**64%** REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	**50%** REMOVAL OF TOTAL COPPER	**95%** REMOVAL OF MOTOR OIL	**67%** REMOVAL OF ORTHO PHOSPHORUS	**85%** REMOVAL OF TSS

APPROVALS

The Modular Wetlands® System Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.

Washington State Department of Ecology TAPE Approved
The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

California Water Resources Control Board, Full Capture Certification
The Modular Wetlands® System is the first biofiltration system to receive certification as a full capture trash treatment control device.

Virginia Department of Environmental Quality, Assignment
The Virginia Department of Environmental Quality assigned the MWS Linear the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) regulation technical criteria.

Maryland Department of the Environment, Approved ESD
Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP Evaluation
The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

Rhode Island Department of Environmental Management, Approved BMP
Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The Modular Wetlands® System Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

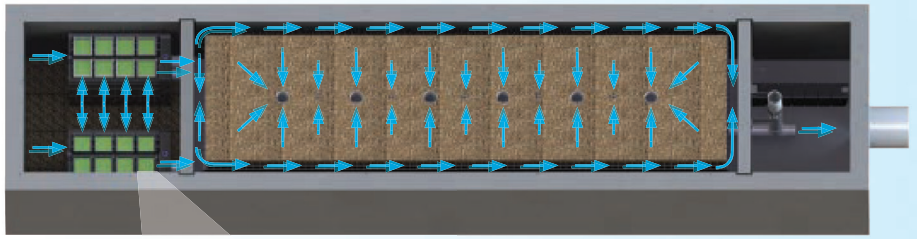


Figure 2,
Top View

2x to 3x more surface area than traditional downward flow bioretention systems.

1 PRETREATMENT

SEPARATION

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

PRE-FILTER CARTRIDGES

- Over 25 sq. ft. of surface area per cartridge
- Utilizes BioMediaGREEN™ filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber

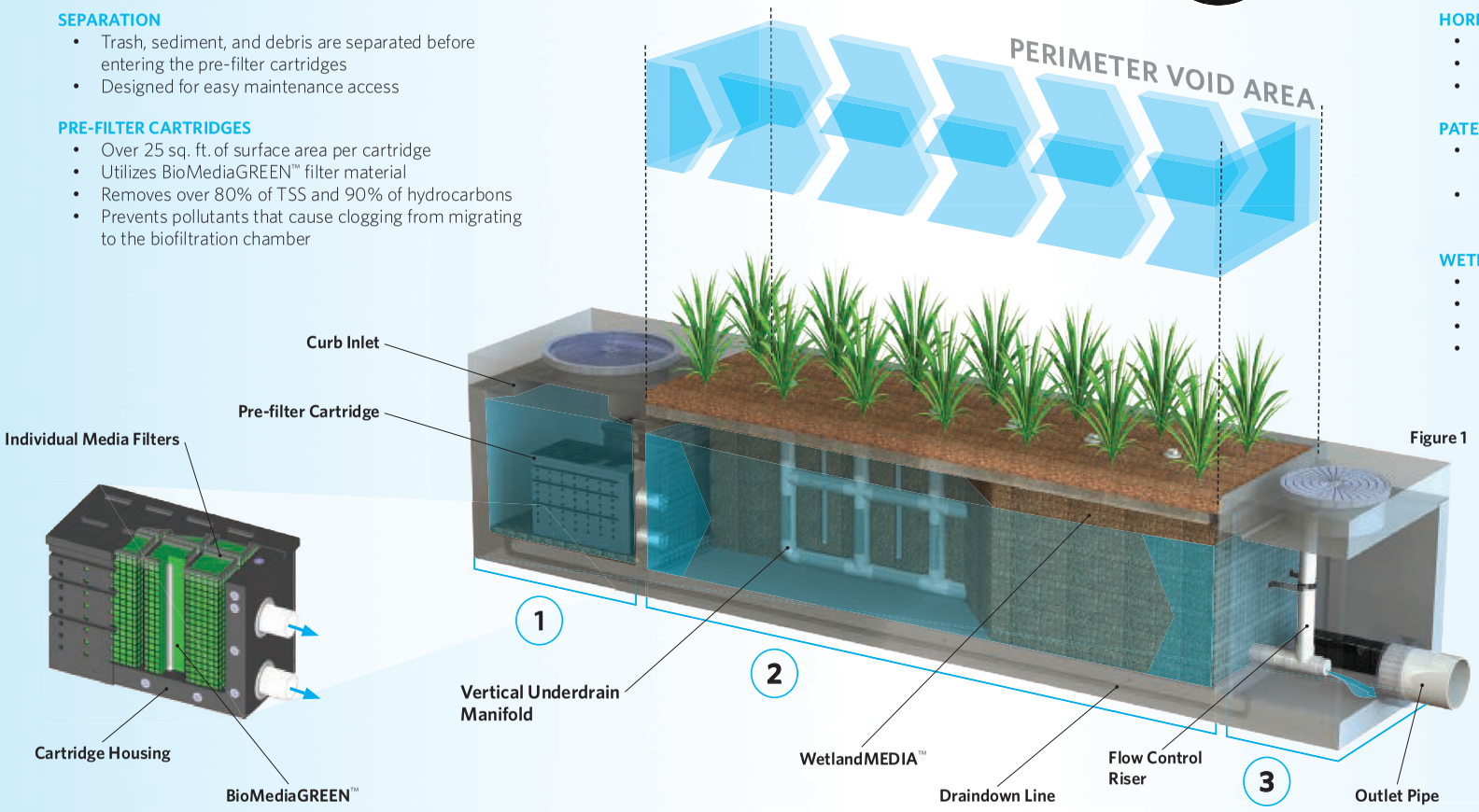


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA™ on all four sides
- Maximizes surface area of the media for higher treatment capacity

WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

3 DISCHARGE

FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA™ to a level lower than the media's capacity
- Extends the life of the media and improves performance

DRAINDOWN FILTER

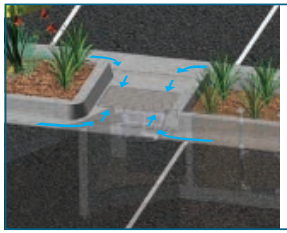
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

CONFIGURATIONS

The Modular Wetlands® System Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

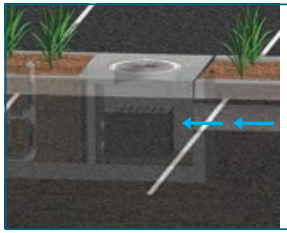
CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



VAULT TYPE

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the Modular Wetlands® can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/ bioretention systems. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

DOWNSPOUT TYPE

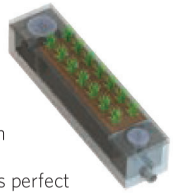
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

ORIENTATIONS

SIDE-BY-SIDE

The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END



The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

EXTERNAL DIVERSION WEIR STRUCTURE

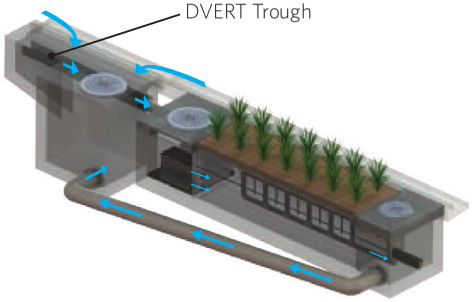
This traditional offline diversion method can be used with the Modular Wetlands® in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the Modular Wetlands® for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the Modular Wetlands® and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over



to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the Modular Wetlands® to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED DESIGNS

The Modular Wetlands® System Linear can be used in stand-alone applications to meet treatment flow requirements. Since the Modular Wetlands® is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-21	4' x 21'	117	0.268
MWS-L-6-8	7' x 9'	64	0.147
MWS-L-8-8	8' x 8'	100	0.230
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462
MWS-L-8-20	9' x 21'	252	0.577
MWS-L-8-24	9' x 25'	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

VOLUME-BASED DESIGNS

HORIZONTAL FLOW BIOFILTRATION ADVANTAGE

Modular Wetlands® with Box Culvert Prestorage

The Modular Wetlands® System Linear offers a unique advantage in the world of biofiltration due to its exclusive horizontal flow design: Volume-Based Design. No other biofilter has the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The systems horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points. In the example above, the Modular Wetlands® is installed downstream of underground box culvert storage. Designed for the water quality volume, the Modular Wetlands® will treat and discharge the required volume within local draindown time requirements.

Modular Wetlands® with Arch Plastic Chambers

DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the Modular Wetlands®, the only biofilter than can be used downstream of storage BMPs.

ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- MEETS LID REQUIREMENTS
- BUILT-IN ORIFICE CONTROL STRUCTURE
- WORKS WITH DEEP INSTALLATIONS

APPLICATIONS

The Modular Wetlands® System Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL
Many states enforce strict regulations for discharges from industrial sites. The Modular Wetlands® has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

RESIDENTIAL
Low to high density developments can benefit from the versatile design of the Modular Wetlands®. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

STREETS
Street applications can be challenging due to limited space. The Modular Wetlands® is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

PARKING LOTS
Parking lots are designed to maximize space and the Modular Wetlands'® 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL
Compared to bioretention systems, the Modular Wetlands® can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE
The Modular Wetlands® can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications include:

• Agriculture • Reuse • Low Impact Development • Waste Water

PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the Modular Wetlands® System Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the Modular Wetlands®, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the Modular Wetlands'® micro/macro flora and fauna.

A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

The Modular Wetlands® is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians is available to supervise installations and provide technical support.

MAINTENANCE

Reduce your maintenance costs, man hours, and materials with the Modular Wetlands®. Unlike other biofiltration systems that provide no pretreatment, the Modular Wetlands® is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.

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