APPENDIX G

STORMWATER QUALITY

Surface and Stormwater Quality - Introduction

The proposed Fashion Square shopping center located in the Sherman Oaks community of the City of Los Angeles will include project design features (PDFs) specifically designed to reduce urban runoff and associated pollutants. These PDFs include source controls, low impact development concepts, and treatment control best management practices (BMPs) that will be selected and sized in accordance with applicable regulations. The project is in the early stages of conceptual design and, therefore, the site-specific BMPs have not been selected or designed. However, in keeping with Westfield's forward-thinking approach to this and other projects, several stormwater quality improvement PDFs are being evaluated as part of best practice management (BPM) for project. Ultimately, site-specific constraints, such as needed paved surface area to meet parking requirements and traffic control and ADA requirements, and surface and underground utility clearance requirements for the project upgrades will dictate PDFs that will be evaluated as part of final design.

The purpose of this section of the EIR is to:

1) identify potential pollutants of concern that exist in the receiving waters adjacent to the project and/or that may be generated or transported from the proposed Project site and potentially impact receiving waters,

2) briefly summarize the applicable stormwater treatment and design requirements, and

3) provide a list of recommended project design features (PDFs) for implementation.

Potential Pollutants of Concern

Potential pollutants of concern consist of those pollutants that exhibit one or more of the following characteristics: current loadings or historic deposits of the pollutant are impacting the beneficial uses of a receiving water, elevated levels of the pollutant are found in sediments of a receiving water and/or have the potential to bioaccumulate in organisms therein, or the detectable inputs of the pollutant are at concentrations or loads considered potentially toxic to humans and/or flora and fauna. The potential pollutants of concern for the water quality analysis are those that are anticipated or potentially could be generated by the Project at concentrations, based on water quality data collected in Los Angeles County from land uses that are the same as those proposed by the Project, that exhibit these characteristics. Identification of the pollutants of concern for the Project considered proposed land uses, current 303(d) listings and Total Maximum Daily Loads (TMDLs) in the Los Angeles River, as well as pollutants that have the potential to cause toxicity or bioaccumulate in the Project's receiving waters.

The following pollutants were chosen as the potential pollutants of concern for purposes of evaluating water based upon the above considerations:

Sediments (TSS and Turbidity) − Excessive erosion, transport, and deposition of sediment in surface waters are a significant form of pollution resulting in water quality impairments. Sediment imbalances impair waters' designated uses. Excessive sediment can impair aquatic life by reducing beneficial habitat structure in stream channels affecting benthic infauna, by filling interstitial spaces of spawning gravels, impairing fish food sources, and filling rearing pools. In addition, excessive sediment can cause taste and odor problems in drinking water supplies and block water intake structures or recharge systems.

Nutrients (Phosphorus and Nitrogen (Nitrate-N, Nitrite-N and Ammonia-N)) − Inorganic forms of nitrogen include nitrate, nitrite and ammonia. Organic forms of nitrogen are associated with vegetative matter such as particulates from sticks and leaves. Total Nitrogen (TN) is a measure of nitrogen present, including inorganic and particulate forms. There are several sources of nutrients in urban areas, mainly fertilizers in runoff from lawns, pet wastes, failing septic systems, and atmospheric deposition from industry and automobile emissions. Nutrient over-enrichment is especially prevalent in agricultural areas where manure and fertilizer inputs to crops significantly contribute to nitrogen and phosphorus levels in streams and other receiving waters. Eutrophication due to excessive nutrient input can lead to changes in algae, benthic, and fish communities; extreme eutrophication can cause hypoxia or anoxia, resulting in fish kills. Surface algal scum, water discoloration, and the release of toxins from sediment can also occur.

Various downstream reaches of the Los Angeles River are identified as impaired by nutrients in general and nitrogen compounds in particular. Evidence of impairment includes low diversity of benthic macroinvertebrates and observations of excessive algae growth. TMDLs have been developed and adopted into the Los Angeles Region Basin Plan for nitrogen compounds, including nitrate/nitrite and ammonia.

Trace Metals (Copper, Lead, and Zinc) − The primary sources of trace metals in stormwater are typically commercially available metals used in transportation (e.g., automobiles), buildings, and infrastructure. Metals are also found in fuels, adhesives, paints, and other coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, and mercury, are typically not detected in urban runoff or are detected at very low levels. Metals are of concern because of the potential for toxic effects on aquatic life and the potential for ground water contamination resulting from surface water infiltration to underlying aquifer systems. High metal concentrations can lead to bioaccumulation in fish and shellfish and affect beneficial uses of receiving waters.

Various downstream reaches of the Los Angeles River are identified as impaired for metals including cadmium, copper, lead, and zinc and TMDLS have been developed and adopted into the Los Angeles Region Basin Plan.

Pathogens (Bacteria, Viruses, and Protozoa) – Elevated pathogens are typically caused by the transport of domestic animal, wildlife, or human fecal wastes from the watershed. Runoff that flows over land such as urban runoff can mobilize pathogens, including bacteria and viruses. Even runoff from natural areas can contain pathogens (e.g., from wildlife). Other sources of pathogens in urban areas include pets, leaky sanitary sewer pipes, and recreational vehicle waste discharges to the storm sewer system. The presence of pathogens in runoff can impair receiving waters and contaminate drinking water sources. Many of the downstream reaches of the Los Angeles River are identified as impaired by high fecal coliform counts. However, coliform TMDLs have not yet been developed.

Petroleum Hydrocarbons (Oil and Grease and PAHs) – The sources of oil, grease, and other petroleum hydrocarbons in urban areas include spillage fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff can be contaminated by leachate from road surfaces, wearing of tires, and deposition from automobile exhaust. Also, do-it-yourself auto mechanics may dump used oil and other automobile-related fluids directly into storm drains. Petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can bioaccumulate in aquatic organisms from contaminated water, sediments, and food and are toxic to aquatic life at low concentrations. Hydrocarbons can persist in sediments for long periods of time and result in adverse impacts on the diversity and abundance of benthic communities. Hydrocarbons can be measured as total petroleum hydrocarbons (TPH), oil and grease, or as individual groups of hydrocarbons, such as PAHs.

Pesticides – Pesticides (including herbicides, insecticides and fungicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide may result in runoff containing toxic levels of its active component. Pesticides may be classified as organochlorine pesticides or organophosphorus pesticides, the former being associated with persistent bioaccumulative pesticides (e.g., DDT and other legacy pesticides) which have been banned. The Los Angeles River estuary is listed as impaired for legacy pesticides. Organophosphorus pesticides include diazinon and chlorpyrifos whose uses also are being restricted by EPA.

Trash and Debris – Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic debris (such as leaves, grass cuttings, and food waste) are general waste products on the landscape that can be entrained in urban runoff. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter can create a high biochemical oxygen demand in a water body and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide. Trash TMDLs for the Los Angeles River Watershed are currently being scoped by the Los Angeles Regional Water Quality Control Board (RWQCB).

SUSMP Requirements

On March 8, 2000, the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements were approved by the RWQCB as part of the National Pollutant Discharge Elimination System (NPDES) MS4 program to address stormwater pollution from new construction and redevelopment projects in the County. The SUSMP contains a list of minimum site design, source control and treatment controls best management practices (BMPs) that must be employed to infiltrate or treat stormwater runoff, control peak flow discharge, and reduce the post-Project discharge of pollutants from stormwater conveyance systems. The SUSMP defines, based upon land use type, the types of practices that must be included and issues that must be addressed as appropriate to the development type and size.

The table below provides a summary of the SUSMP requirements and stormwater BMPs to be implemented on all significant new development and redevelopment projects in Los Angeles County. The Fashion Square Project fits the criteria of redevelopment projects requiring SUSMP mitigation for potential storm water quality impairments. The Project will adhere to SUSMP requirements to the maximum extent practicable.

SUSMP Requirement	Criteria/ Description
1. Peak Flow Controls	• Control post-development peak discharge rates, velocities and duration in Natural Drainage Systems to prevent accelerated downstream erosion and to protect habitat related beneficial uses.[1] • All post-development runoff from a 2-year, 24-hour storm shall not exceed the predevelopment peak flow rate, burned, from a 2-year, 24-hour storm when the predevelopment peak flow rate equals or exceeds five cfs. Discharge flow rates shall be calculated using the County of Los Angeles Modified Rational Method. • Post-development runoff from the 50-year capital storm shall not exceed the predevelopment peak flow rate, burned and bulked, from the 50-year capital storm. • Control peak flow discharge to provide stream channel and over bank flood protection, based on flow design criteria selected by the local agency.
2. Conserve Natural Areas	• Concentrate or cluster development on portions of a site while leaving the remaining land in a natural undisturbed condition. • Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection. • Maximize trees and other vegetation at each site, planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants. • Promote natural vegetation by using parking lot islands and other landscaped areas. • Preserve riparian areas and wetlands.
3. Minimize Stormwater Pollutants of Concern	• Minimize, to the maximum extent practicable, the introduction of pollutants of concern that may result in significant impacts generated from site runoff of directly connected impervious areas (DCIA) to the stormwater conveyance system as approved by the building official.

[1] This requirement is from Part 4, § D.1 of the MS4 Permit.

SUSMP Requirement	Criteria/ Description
4. Protect Slopes and Channels	Project plans must include BMPs consistent with local codes and ordinances and the SUSMP requirements to decrease the potential of slopes and/or channels from eroding and impacting stormwater runoff: • Convey runoff safely from the tops of slopes and stabilize disturbed slopes • Utilize natural drainage systems to the maximum extent practicable • Control or reduce or eliminate flow to natural drainage systems to the maximum extent practicable • Stabilize permanent channel crossings • Vegetate slopes with native or drought tolerant vegetation • Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion with the approval of all agencies with jurisdiction, e.g., the U.S. Army Corps of Engineers and the California Department of Fish and Game.
5. Provide Storm Drain System Stenciling and Signage	• All storm drain inlets and catch basins within the Project area must be stenciled with prohibitive language and/or graphical icons to discourage illegal dumping. • Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the Project area. • Legibility of stencils and signs must be maintained.
6. Properly Design Outdoor Material Storage Areas	• Where proposed Project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system measures to mitigate impacts must be included.
7. Properly Design Trash Storage Areas	All trash containers must meet the following structural or treatment control BMP requirements: • Trash container areas must have drainage from adjoining roofs and pavement diverter around the areas. • Trash container areas must be screened or walled to prevent offsite transport of trash.
8. Provide Proof of Ongoing BMP Maintenance	• Applicant required to provide verification of maintenance provisions through such means as may be appropriate, including, but not limited to legal agreements, covenants, and/or Conditional Use Permits.
9. Design Standards for Structural or Treatment Control BMPs	• Post-construction Structural or Treatment Control BMPs shall be designed to mitigate (infiltrate or treat) stormwater runoff using either volumetric treatment control BMPs or flow-based treatment control BMPs sized per listed criteria (see section 3.6.2 above).

SUSMP Requirement	Criteria/ Description
10.B.1 Properly Design Loading/ Unloading Dock Areas (100,000 ft^2 Commercial Developments)	• Cover loading dock areas or design drainage to minimize run-on and runoff of stormwater. • Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.
10B.2. Properly Design Repair/ Maintenance Bays (100,000 ft^2 Commercial Developments)	• Repair/ maintenance bays must be indoors or designed in such a way that does not allow stormwater run-on or contact with stormwater runoff. • Design a repair/maintenance bay drainage system to capture all wash water, leaks, and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/ maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
10B.3. Properly Design Vehicle/ Equipment Wash Areas (100,000 ft^2 Commercial Developments)	• Self-contained and /or covered, equipped with a clarifier, or other pretreatment facility, and properly connected to a sanitary sewer.
10.D. Properly design fueling area (Retail Gasoline Outlets)	• The fuel dispensing area must be covered with 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 fuel dispensing area must be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited. • The fuel dispensing areas must have 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 urban runoff. • At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.
10.E.1. Properly design fueling area (Automotive Repair Shops)	• See requirement 10.D. above.
10.E.2. Properly design repair/ maintenance bays (Automotive Repair Shops)	• See requirement 10.B.2 above.
10.E.3. Properly design vehicle/equipment wash areas (Automotive Repair Shops)	• Self-contained and/or covered, equipped with a clarifier, or other pretreatment facility, and properly connected to a sanitary sewer or to a permitted disposal facility.
10.E.4. Properly design loading/ unloading dock areas (Automotive Repair Shops)	• See requirement 10.B.1. above.

SUSMP Requirement	Criteria/ Description
10.F.1. Properly Design Parking Area (Parking Lots)	• Reduce impervious land coverage of parking areas. • Infiltrate runoff before it reaches the storm drain system. • Treat runoff before it reaches storm drain system.
10.F.2 Properly Design to Limit Oil Contamination and Perform Maintenance (Parking Lots)	• Treat to remove oil and petroleum hydrocarbons at parking lots that are heavily used. • Ensure adequate operation and maintenance of treatment systems particularly sludge and oil removal.
13. Limitation of Use of Infiltration BMPs	• Infiltration is limited based on design of BMP, pollutant characteristics, land use, soil conditions, and traffic. • Appropriate conditions (groundwater >10 ft from grade) must exist to utilize infiltration to treat and reduce stormwater runoff for the Project.

Recommended Project Design Features (PDFs)

The Project will likely utilize a mosaic of water quality improvement PDFs. Preferred over a "one size fits all" approach, the potential use of a few appropriately-placed PDFs will allow the Project meet the tight space constraints of the upgrade and to potentially divide flows for desired reduction in flow and water quality impacts to surrounding systems (both natural and engineered). Project Design Features (PDFs) for water quality and hydrologic impacts include site design, source control, and treatment control BMPs that will be incorporated into the Project and are considered a part of the Project for impact analysis. Effective management of wet and dry weather runoff water quality begins with limiting increases in runoff pollutants and flows at the source. Site design and source control BMPs are practices designed to minimize runoff peaks and volumes, as well as the initial introduction of pollutants in stormwater runoff. Treatment control BMPs are designed to remove pollutants once they have been mobilized by rainfall and runoff.

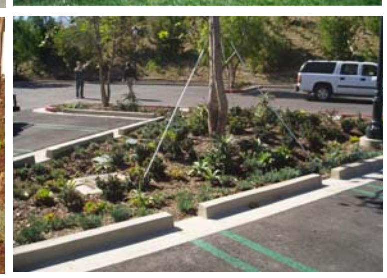
In accordance with the SUSMP requirements, minimum site design and source control BMPs will be met or exceeded. The proposed Project will also incorporate, as PDFs, treatment control BMPs that will minimize urban runoff and associated impacts to receiving water quality and specifically address the identified pollutants of concern. Many BMP alternatives can be easily integrated into planned landscaping, right-of-ways, and infrastructure without requiring large areas of dedicated open space while still meeting the SUSMP sizing requirements.

The following paragraphs describe the types of BMP alternatives that recommended for implementation at the proposed Project. While these alternatives are described herein for planning purposes only (i.e., no site-specific designs have been finalized), they provide a listing of the water quality improvement BMPs specifically being evaluated for the Fashion Square Project. The alternatives have been grouped into 1) vegetated treatment BMPs, 2) onsite storage and reuse, 3) permeable paving, 4) roof top BMPs, and 5) media filters.

Vegetated Treatment BMPs

Vegetated treatment BMPs include swales, filter strips, bioretention and planter boxes. When properly designed and maintained, vegetated BMPs are among the most effective, cost efficient treatment approaches for dry and wet-weather runoff. While the Project is significantly space-constrained, areas such as the northern frontage of the Project adjacent to Riverside Drive will be evaluated for possible siting of such PDFs. Treatment occurs through sedimentation, filtration, adsorption to organic matter, and vegetative uptake. Additionally, vegetated treatment systems can help to reduce runoff volumes through soil soaking, infiltration, and evapotranspiration. A beneficial feature of vegetated treatment systems is that their design and implementation is highly flexible and adaptable. On-site implementation of these systems can be integrated into surface conveyances and on-site landscaping in innovative ways that provide site amenities, are functionally effective for runoff conveyance and water quality treatment, and in some cases are less costly to construct than traditional storm sewers.

Vegetated Swales − Vegetated swales are engineered vegetation-lined channels that provide water quality benefits in addition to stormwater conveyance. Swales provide pollutant removal through settling and filtration in the vegetation (often grasses) lining the channels and also provide the opportunity for volume reductions through infiltration and evapotranspiration. Swales are most effective where longitudinal slopes are small (two to six percent), increasing the residence time for treatment, and where water depths are less than the vegetation height.



Bioretention − Bioretention is a structural BMP that makes use of soils and plants to remove pollutants from runoff. Runoff is typically directed over a grass buffer strip to a shallow vegetated depression that contains deep, porous soils. These depressions are designed to incorporate many of the pollutant removal mechanisms that operate in forested ecosystems, including, filtration, sorption, plant uptake, microbial activity, decomposition, sedimentation and volatilization. Bioretention provides volume reduction through infiltration, soil soaking and evapotranspiration. Runoff is designed to pond in the bioretention area to allow for adequate time for infiltration and pollutant adsorption and uptake. During large storms, a portion of runoff is diverted past the facility to the storm drain system. Depending on location and site constraints, bioretention systems can be designed with and without perforated underdrains, which return filtered runoff to the storm drain system. Bioretention systems are flexible in their configuration and design, and can be readily integrated into site landscaping.


Stormwater Planter Boxes - Stormwater planter boxes are structural landscaped reservoirs similar to bioretention that are used to collect and filter stormwater runoff, typically from rooftops, but sometimes from roadways. Infiltration planters allow water to infiltrate through the planter soil matrix and into the ground. Flow-through planters include the use of a waterproof lining and underdrain. Both types of planter boxes require an overflow to an approved stormwater conveyance system and may be used to help fulfill site landscaping requirements.

Onsite Storage and Reuse

The goal of onsite storage and reuse is to temporarily detain stormwater and then use it to meet irrigation or other non-potable water demands. With the space and geotechnical constraints of the existing on-site (commercial buildings) and off-site (utility corridors and roadways) structures, large-scale retention is not feasible. Nevertheless, small-scale systems such as small storage tanks strategically located next to and upgradient from landscaped areas will be evaluated for feasibility at the Project.


Cisterns and Rain Barrels – Cisterns and rain barrels are low-cost water conservation devices that could be used to reduce runoff volume and, for smaller storm events, delay and reduce the peak runoff flow rates. They store and divert runoff from impervious roof areas. This stored runoff could provide a source of chemically untreated 'soft water' for landscaping, free of most sediment and dissolved salts.

Individual cisterns and rain barrels can be located above-ground and beneath downspouts, or the desired storage volume could be provided in one common cistern that collects rainwater from several sources. Pre-manufactured cisterns are typically available in sizes ranging from 57 to 10,000 gallons, but cast-in-place tanks can also be used. Although the cistern option would not manage sufficient quantities of runoff to eliminate the need for other runoff management options, it can provide both a positive effect with regard to water conservation and can eliminate low flow runoff and associated loadings from very small storm events. The cisterns and rain barrels should have lids and screened inlets to minimize potential for breeding mosquitoes in the stored water.

Underground Storage − Underground storage involves capturing runoff from areas other than, or in addition to, rooftops and storing it for subsequent reuse on-site. These other areas may include driveways, parking lots, and sidewalks. Capturing and storing runoff from these areas would help to reduce runoff from common source areas of urban stormwater constituents of concern and would also help to reduce dry-weather runoff from common sources such as over-watering of landscape. Each system would be designed and sized to collect and treat runoff and would be stored underground in a system sized to supply an appropriate percentage of the water demand. This option could also include some treatment (such as on-site filtration and disinfection) and would require careful management and consideration of water distribution systems. These facilities would need to be installed underground in order to facilitate storage of large volumes of runoff. Without adequate treatment, landscape irrigation may require a controlled subsurface distribution system (i.e., no sprinkler system) so that direct public contact would essentially be eliminated. Examples of these types systems include proprietary products by Evaporative Control Systems, Inc (http://www.ecsgreen.com) and Glenn Rehbein Companies (http://www.rehbein.com). As with the considerations described above related to the potential use of cisterns, the opportunities for these types of PDFs would have to be evaluated based on space and geotechnical constraints of the Project.

Permeable Paving

Areas such as roadways, driveways, parking areas, and walkways covered with impermeable (non-porous) pavement are one of the largest contributors to wet weather urban runoff. Permeable, or porous pavements are a special type of material that allows water to drain down to the underlying soil, yet are strong enough to structurally support vehicular or pedestrian traffic. Many types of porous pavements and configurations have been developed for a variety of applications. Most of the systems are supported by a stone base that has large pore spaces. This base acts both as pavement support and as a reservoir to store water so that it can be infiltrated, if the soil conditions allow, or detained and slowly released to the storm drain system. In addition, the pavement roughness may be improved (i.e., increased with no significant effect on the driver) thereby providing greater control of runoff hydraulics (i.e., increasing the time required to reach discharge points). Supplemental storage facilities, such as underground vaults (described above) or drainage blankets, can be used in conjunction with these systems. Some of the available permeable pavements that may be further evaluated as PDFs for the Project, subject to geotechnical constraints, are described below. Similar to other PDF alternatives described above, these paving alternatives may be used in specific locations and in conjunction with other PDFs. It should also be noted that these systems are currently being evaluated for the concrete matrix ability to support beneficial bacterial growth that can provide treatment benefits to the water percolating through the pavement.

Pervious Concrete − Pervious concrete has stable air pockets that allow water to drain uniformly into the ground or engineered drainage structure below, where it can be naturally filtered. The material becomes stronger and more stable when it gets wet, so it does not deteriorate as fast as other paving materials. Its use should be restricted to parking lots and local roads since it may not support loads similar to those supported by standard concrete. Pervious concrete is cement based and therefore will not release harmful chemicals into the environment. It has been in use throughout Europe for about fifty years. A domestic formula known as the Portland Cement Pervious Pavement has been used successfully since the 1970s in the U.S. The pavement is a special blend of Portland cement, sand-free coarse aggregate, and water.

Pervious Asphalt − Pervious asphalt mix pavements consist of a layer of pervious asphalt paving, underlain with a pervious base rock section. There may or may not be a layer of geotextile fabric that separates the base rock from underlying native soils. There also may be a perforated pipe underdrain system where native soils do not infiltrate well or where it is undesirable to infiltrate. The base rock section typically has very little fines to maximize the void ratio while providing for adequate compaction. The base rock section is typically designed to temporarily store the volume of stormwater generated from a design storm and infiltrate it into underlying soils or into an underdrain system. Similar to pervious concrete designs, pervious asphalt mix pavements have been used in parking lots, private streets, driveways, and pedestrian access areas since the 1970s.


Pervious Asphalt installation near SE 162nd & Foster

Media Filters

Media filtration is primarily intended to separate fine particulates and associated pollutants, but depending on the type of media, dissolved constituents, such as metals and nutrients, may be removed via sorption processes. Stormwater is captured and directed either under gravity or pressure through media such as sand, engineered media, compost, zeolite, or combinations of media. These PDFs can be either large installations (not described herein due to Project size constraints), or sized to address a portion of the Project runoff.

Cartridge Filters - Several proprietary filtration systems are now available that utilize disposable cartridge filters that are typically placed in an underground vault or manhole. These designs often include siphon-actuated filtration that provides backflushing of the filter media as the water level drops. A variety of media types engineered for the removal of specific stormwater constituents are available for these cartridges in several sizes depending on runoff area. Given the Project space constraints, further evaluation of the feasibility of media filtration is warranted.