

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

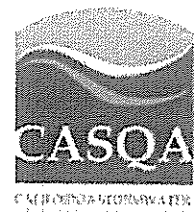
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

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.



- 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 bark) 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.

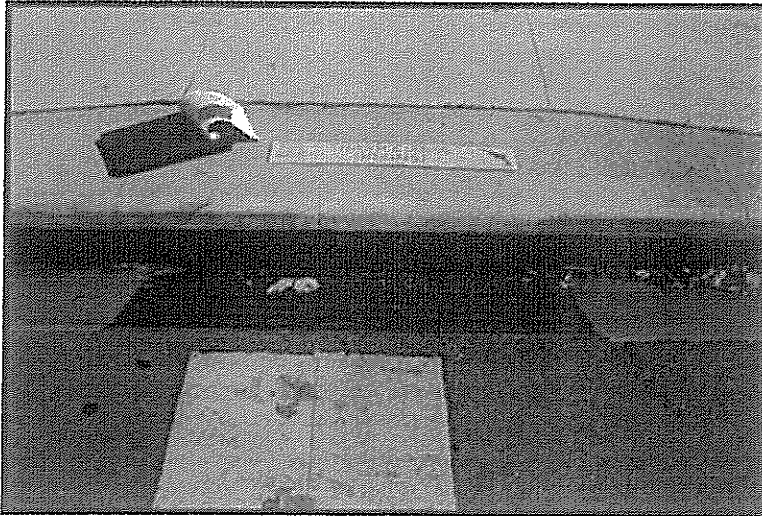
Other Resources

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.



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Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING



- DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.
- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

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. If the project meets the definition of "redevelopment", then the requirements stated under "designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

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.

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APPENDIX D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
NON-STRUCTURAL SOURCE CONTROL BMPs			
Yes	<p>N1. Education for Property Owners, Tenants and Occupants</p> <p>The Owner/HOA will provide Homeowners with storm water pollution prevention educational materials upon first occupancy and on an annual basis thereafter. These materials can be found in Appendix C and on the County of Orange website: www.ocwatersheds.com.</p>	<p>Provide educational materials to new homeowners upon first occupancy and annually thereafter.</p> <p><u>Frequency:</u> Annually</p>	Owner / HOA
Yes	<p>N2. Activity Restrictions</p> <p>The Owner/HOA shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance, as well as any other activities that may potentially contribute to water pollution.</p>	<p>The Owner / HOA will prescribe activity restrictions to protect surface water quality, through CC&Rs or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing.</p> <p><u>Frequency:</u> Ongoing</p>	Owner / HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	<p>N3. Common Area Landscape Management The Owner/HOA shall be responsible for ongoing maintenance and management of all landscaped areas on their property, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors.</p>	<p>Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usage shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets. <u>Frequency:</u> Monthly</p>	Owner / HOA
Yes	<p>N4. BMP Maintenance The Owner/HOA will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors.</p>	<p>Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the Owner and documented with the WQMP, and shall be available for review upon request. <u>Frequency:</u> Ongoing</p>	Owner / HOA
No	N5. Title 22 CCR Compliance (How development will comply)	Not Applicable	
No	N6. Local Industrial Permit Compliance	Not Applicable	
No	N7. Spill Contingency Plan	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	N8. Underground Storage Tank Compliance	Not Applicable	
No	N9. Hazardous Materials Disclosure Compliance	Not Applicable	
No	N10. Uniform Fire Code Implementation	Not Applicable	
Yes	N11. Common Area Litter Control The Owner/HOA will be responsible for performing trash pick-up and sweeping of littered common areas on a weekly basis, and proper disposal of waste collected. Responsibilities will also include investigating, noting and documenting improper disposal materials by residents.	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Litter collection and removal shall be performed on a weekly basis. <u>Frequency:</u> Weekly	Owner / HOA
Yes	N12. Employee Training All employees and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.	The Owner/HOA shall educate all new employees on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be used are attached to this WQMP. <u>Frequency:</u> Annually	Owner / HOA
No	N13. Housekeeping of Loading Docks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	<p>N14. Common Area Catch Basin Inspection All private on-site catch basin inlets, area drains, ribbon gutters, curb and gutters, basins and other drainage systems shall be inspected and cleaned out by the Owner/HOA at least once a year, prior to the rainy season, no later than October 1st of each year in accordance with the fact sheets attached to this WQMP.</p>	<p>Catch basin inlets, area drains, curb-and-gutter systems and other drainage systems shall be inspected after each storm event and, if necessary, cleaned prior to the storm season by October 1st each year. <u>Frequency:</u> Annually</p>	Owner / HOA
Yes	<p>N15. Street Sweeping Private Streets and Parking Lots Private streets and parking stalls shall be swept quarterly at a minimum and prior to the rainy season, no later than October 1st each year.</p>	<p>Parking areas and streets must be swept at least quarterly, including prior to the start of the rainy season (October 1st). <u>Frequency:</u> Quarterly</p>	Owner / HOA
No	N16. Retail Gasoline Outlets	Not Applicable	
STRUCTURAL SOURCE CONTROL BMPs			
Yes	<p>S1. Provide storm drain system stenciling and signage The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy.</p>	<p>Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible. <u>Frequency:</u> Annually</p>	Owner / HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	S2. Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable	
No	S3. Design and construct trash and waste storage areas to reduce pollution introduction	Not Applicable	
Yes	<p>S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control</p> <p>The Owner/HOA will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The developer will be responsible for implementing all efficient irrigation systems for common area landscaping including but not limited to provisions for water sensors and programmable irrigation cycles. The irrigation systems shall be in conformance with water use efficiency guidelines.</p>	<p>In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or nighttime temperatures based on system specifications and local climate patterns.</p> <p><u>Frequency:</u> 2x per year</p>	Owner / HOA
No	S5. Protect slopes and channels and provide energy dissipation	Not Applicable	
No	S6. Dock areas	Not Applicable	
No	S7. Maintenance bays	Not Applicable	
No	S8. Vehicle wash areas	Not Applicable	
No	S9. Outdoor processing areas	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	S10. Equipment wash areas		Not Applicable
No	S11. Fueling areas		Not Applicable
No	S12. Hillside landscaping		Not Applicable
No	S13. Wash water control for food preparation areas		Not Applicable
No	S14. Community car wash racks		Not Applicable

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
LOW IMPACT DEVELOPMENT BMPs		
<p>Biotreatment BMP # 1: Bioretention with Underdrains A bioretention facility with underdrain will be incorporated at the southwest portion of the site. Bioretention storm water treatment facilities are landscaped shallow depressions that capture and filter storm water runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes.</p>	<p>Inspections should occur semi-annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Inspections should also look for potential clogging and clean planters or, if necessary, replace the entire filter bed. Inspect for weeds, and prune and/or replace plants in accordance with routine landscape maintenance activities. Replace mulch and prune shrubs as necessary.</p> <p><u>Frequency:</u> 2x per year</p>	<p>Owner / HOA</p>

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
<p>Biotreatment BMP # 2: Modular Wetland Systems (MWS) Modular Wetlands by Modular Wetlands Systems, Inc. are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. The pre-treatment chamber contains the first three stages of treatment, and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.</p>	<p>Annual maintenance consists of a minimum of two scheduled visits (every 6 months), one after the rainy season to clean up after the wet season, and one before the wet season to inspect and clean the unit. Each maintenance visit consists of the following: Inspection, cleaning, and/or replacement per manufacturer's recommendations. <u>Frequency:</u> 2x per year</p>	<p>Owner / HOA</p>

Required Permits

Permits are not required for the implementation, operation, and maintenance of the BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

XII.5. Conceptual Biotreatment Maintenance Requirements

Biotreatment maintenance requirements contained in the Project O&M Plan shall be consistent with the following principles:

- **Routine maintenance shall be provided to ensure consistently high performance and extend facility life.**
 - Maintain vegetation and media to perpetuate a robust vegetative and microbial community (thin/trim vegetation, replace spent media and mulch).
 - Periodically remove dead vegetative biomass to prevent export of nutrients or clogging of the system.
 - Remove accumulated sediment before it significantly interferes with system function.
 - Where filtration/infiltration is employed, conduct maintenance to prevent surface clogging (surface scarring, raking, mulch replacement, etc.).
 - Add energy dissipation and scour-protection as required based on facility inspection.
 - Routinely remove accumulated sediment at the inlet and outlet and trash and debris from the entire BMP.
- **Major maintenance shall be provided when the performance of the facility declines significantly and cannot be restored through routine maintenance.**
 - Replace media / planting soils as triggered by reduction in filtration/infiltration rates or decline in health of biological processes.
 - Provide major sediment removal to restore volumetric capacity of basin-type BMPs.
 - Repair or modify inlets/outlets to restore original function or enhance function based on observations of performance.

Detailed descriptions of BMP maintenance activities are provided in:

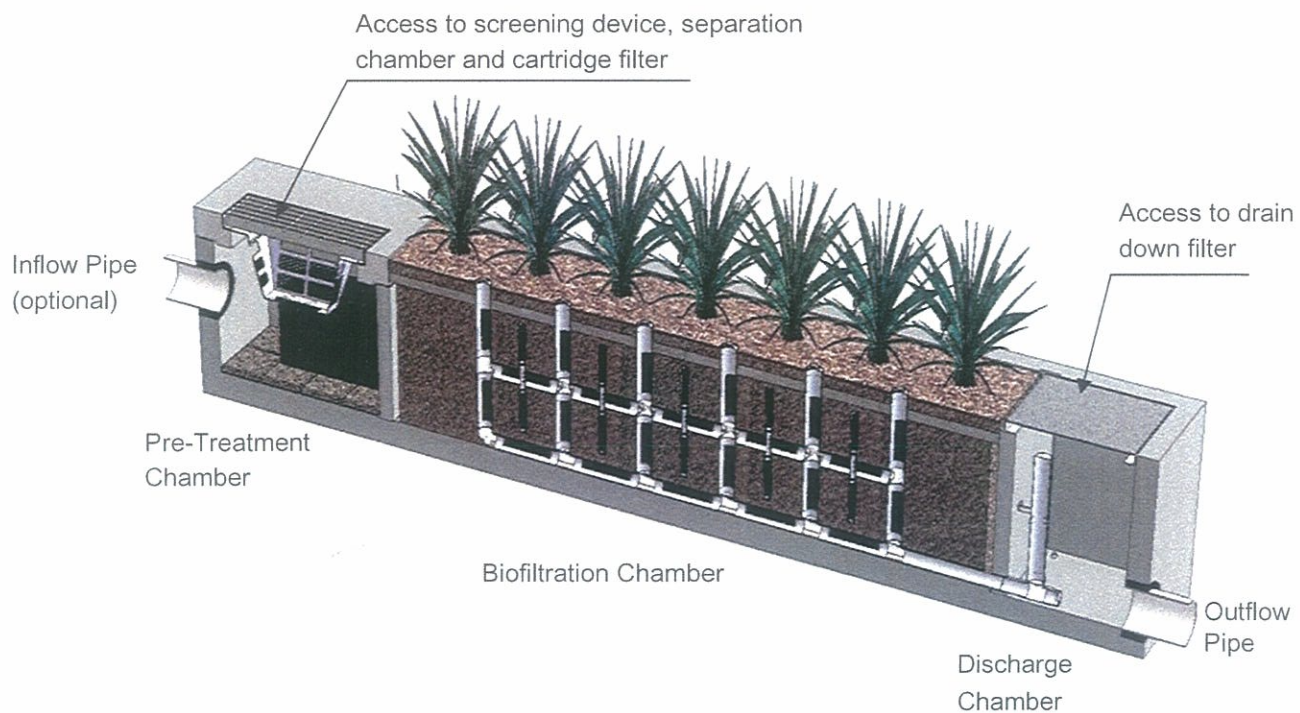
- Los Angeles County Stormwater BMP Operations and Maintenance Manual, Chapter 5:
http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
 - (5 minute average service time).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
 - (10 minute average service time).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
 - (10-15 minute per cartridge average service time).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
 - (5 minute average service time).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
 - (Service time varies).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.



Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the Biofiltration Chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



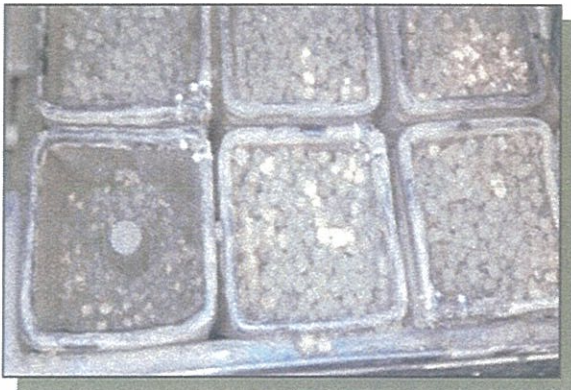
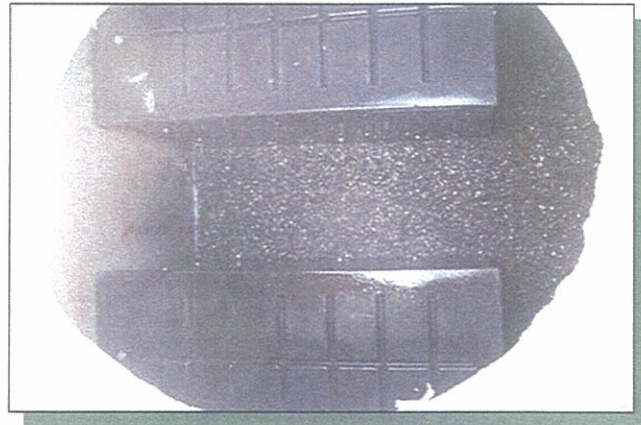
Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



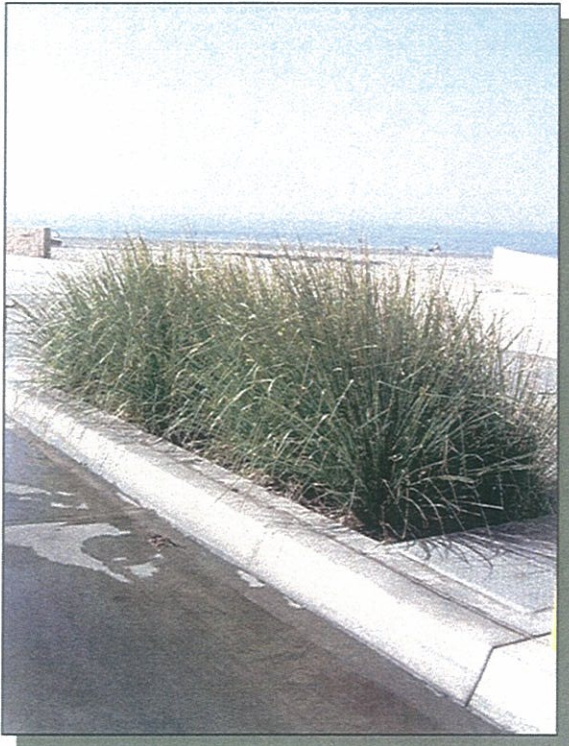
Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



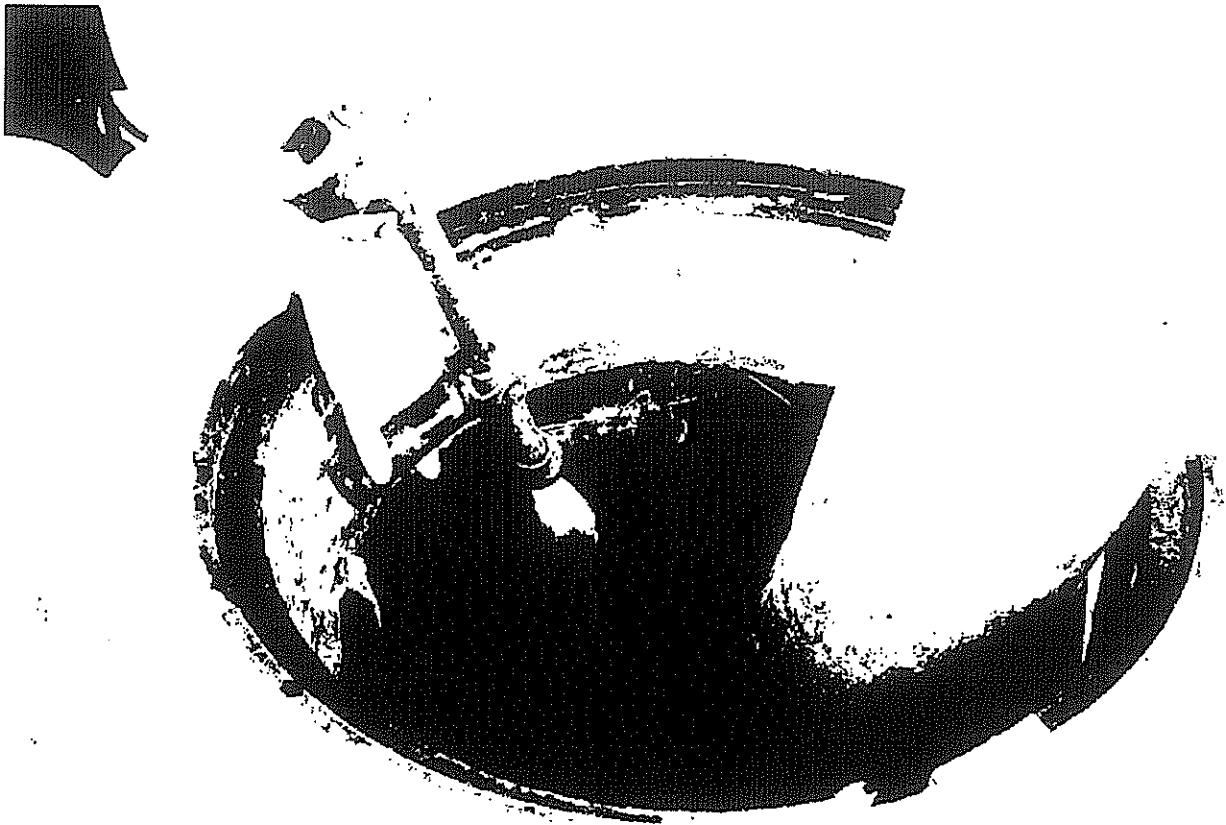
Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.





Inspection Form



Modular Wetland System, Inc.

P. 760.433-7640

F. 760-433-3176

E. Info@modularwetlands.com

www.modularwetlands.com



Inspection Report Modular Wetlands System



Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone () -

Inspector Name _____ Date ____/____/____ Time ____ AM / PM

Type of Inspection Routine Follow Up Complaint Storm Storm Event in Last 72-hours? No Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By) _____
(Date) _____ Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____



Maintenance Report



Modular Wetland System, Inc.

P. 760.433-7640

F. 760-433-3176

E. Info@modularwetlands.com

www.modularwetlands.com



Cleaning and Maintenance Report Modular Wetlands System



Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone () - _____

Inspector Name _____ Date ____ / ____ / ____ Time _____ AM / PM

Type of Inspection Routine Follow Up Complaint Storm Storm Event in Last 72-hours? No Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By) _____
(Date) _____ Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: _____ Long: _____	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments: _____

APPENDIX E

CONDITIONS OF APPROVAL (PLACEHOLDER – PENDING ISSUANCE)

APPENDIX F

SOILS REPORT

November 12, 2012

Project No. 10132-01

Mr. GG Kohlhagan
South Shores Church
32712 Crown Valley Parkway
Dana Point, CA 92629

Subject: *Geotechnical Evaluation and Slope Stabilization Design for Environmental Impact Report Purposes, for Proposed New Structures at the South Shores Church, City of Dana Point, California*

In accordance with your request, LGC Geotechnical, Inc. has performed a geotechnical evaluation of subsurface conditions relative to the proposed construction of new structures at the South Shores Church located in the City of Dana Point, California. The proposed site development includes phased construction of four, two-story buildings, associated walls, a parking structure, and a meditation garden. Previous iterations of this report have been submitted and reviewed by the City of Dana Point. This integrated report encompasses our previous findings, conclusions, and recommendations as well as responses to review questions in a stand alone report. It is intended to provide sufficient geotechnical information and design recommendations as required for environmental impact report purposes, to show that the project can be successfully developed from a geotechnical point of view. Subsequent, specific design reports will be required prior to actual construction.

Please note that the proposed "Master Plan Alternative" was also considered from a geotechnical perspective within the report in order to present the possible design for review as part of the EIR process. The Master Plan Alternative project can also be successfully developed from a geotechnical point of view.

Should you have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Sincerely,

LGC Geotechnical, Inc.

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1.0 INTRODUCTION

The purpose of this evaluation was to review previous geotechnical data relevant to the South Shores Church property located in the City of Dana Point, California (Site Location Map, Page 4), refine and update the geologic model, and provide geotechnical recommendations for the proposed re-development of the site. During previous geotechnical evaluations of the site, numerous borings and trenches were excavated, logged, tested, and reported. LGC Geotechnical has reviewed the referenced geotechnical reports and drilled two additional borings in order to gain supplemental information and to create a baseline of comparison with borings and trenches previously excavated and logged by others (References, Appendix A). Off-site borings, regional and local geologic maps by others, and interpretations of aerial photographs were incorporated into our geotechnical evaluation. The combination of previously available data and supplemental data has provided detailed characterization of the subsurface conditions that may affect the proposed re-development of the site. Specific geologic features were stratigraphically and structurally correlated between borings and a refined geologic model was created for engineering analysis.

The available suite of subsurface data was geotechnically analyzed with the intent to improve the previously proposed mitigation design. The previous mitigation design involved construction of a replacement fill buttress with significant earthwork grading and construction phasing, in addition to installation of a mechanical stabilization system at the completion of earthwork grading (Nicoll, 2006 through 2008d). A revised plan was desired in order to reduce the complexity of construction and potential impact to surrounding neighborhoods. Also, the overall development plan for the Proposed Master Plan has been reduced in scope at the northeast portion of the project with a scaling back of the previously proposed, stabilized flat area and retaining wall to the east of the proposed Christian Education Buildings. The development plan for the Proposed Master Plan Alternative is even further scaled back in overall scope and square footage of structures and incorporates additional setbacks from the property limits. The combined benefits of a refined geologic model, reduced development, and revised stabilization methods presented herein are anticipated to significantly reduce the level of earthwork grading and construction that was previously required. The intent of this report is to present the refined geologic model and to demonstrate feasibility of construction of the planned re-development project using the stabilization methods presented herein.

1.1 Project Description

The South Shores Church is a hilltop property located on the east side of Crown Valley Parkway, approximately a quarter-mile from its intersection with Pacific Coast Highway, in the City of Dana Point, California, as shown in the Site Location Map (Figure 1, Page 4).

The subject site is bounded at the west by Crown Valley Parkway, at the south by an existing residential community, and at the north by a descending graded cut slope and vacant area within an existing apartment complex. At the east boundary, a large, natural slope descends to a graded area with a portion of a golf course and a bike path near the toe-of-slope. Salt Creek runs through the golf course that is adjacent to and below the site.

The proposed re-development of the subject site will include phased demolition of the existing Preschool, Chapel, and Administration/Fellowship Hall. Ground improvement in the form of mechanical slope stabilization will be undertaken at the northeast portion of the site, and various new buildings and retaining walls will be constructed. New buildings will be constructed to the south and

north of the existing Sanctuary, which will remain. The new buildings will consist of a Preschool/Administration Building with a Meditation Garden to the south of the Sanctuary, and two Christian Education Buildings (one Christian Education Building in the Alternative Design) and a Community Life Center to the north of the Sanctuary. The proposed buildings are two-story structures, to be set into gently variable topography with the use of interior and exterior retaining walls. Parking areas and access pathways will be reconfigured with relatively minor cut and fill grading and a second-story parking deck is proposed for a portion of the parking area. Proposed structures, relative to each respective design, are depicted on the Geotechnical Maps, Sheets 1 and 5.

This evaluation includes information pertaining to both the Proposed Master Plan and the Proposed Master Plan Alternative. The Alternative Design generally represents a significantly lesser footprint of environmental impact in the majority of areas in comparison to the Proposed Master Plan. Per the Alternative Design, the Christian Education Buildings become one, smaller structure, the retaining wall at the east side of the property is removed, and the Preschool/Administration Building and parking structure become smaller and further set back from the property limits. Additionally, the Community Life Center moves slopeward in order to accommodate an increased distance from Crown Valley Parkway. We anticipate that the City's review of the project can be evaluated for both cases with regards to environmental impact, utilizing the information presented herein.

1.2 Background

The existing structures at the subject site have been constructed over the many years of existence of the South Shores Church. The existing Sanctuary building is the most modern structure onsite, and it will remain during construction of the proposed improvements. The previous consultant, G.A. Nicoll and Associates, Inc. (Nicoll), provided geotechnical engineering services for the design and construction of the existing crib wall at the southern boundary of the site and Sanctuary (1992 & 1993), and then continued as the geotechnical consultant during the majority of the subsurface investigation that forms the basis for the geologic model presented here.

A series of subsurface investigation and review response reports was provided by Nicoll (References), in support of a previous iteration of the South Shores Church plan. The plan has since been refined, and the geologic model has also been refined based on the subsurface evaluation conducted by LGC Geotechnical that is described below.

1.3 Subsurface Evaluation

The recent subsurface evaluation by LGC Geotechnical consisted of the excavation of two large-diameter borings, LGC-1 and LGC-2, at the locations shown on the Geotechnical Maps, Sheets 1 and 6. The purpose of the borings was to obtain additional structural geologic data and to establish a baseline of comparison with previous subsurface excavations by others over the years (References). Previous subsurface investigations both onsite and off-site have been compiled and reviewed, data included herein. Boring and trench locations are depicted on the Geotechnical Maps (Sheets 1 and 6), and boring and trench logs have been included in Appendix B. Results of laboratory testing on samples from recent borings are noted on boring logs and included in Appendix C, Laboratory Test Results.

The combination of the previous investigations and the recent borings by LGC Geotechnical provide a sufficient amount of data for design of mitigation measures for the geotechnical issues that affect the site. Additionally, laboratory testing has been performed by LGC Geotechnical and by others during previous investigations and earthwork activities at the site, and the data will be incorporated into a future grading plan review of the proposed development.

SITE LOCATION MAP

2.0 GEOTECHNICAL CONDITIONS

2.1 Geologic Structure

The subject site is generally located within the Peninsular Ranges Geomorphic Province, more specifically within the San Joaquin Hills that are located along the southern boundary of the broad Los Angeles Sedimentary Basin. The San Joaquin Hills is an area of coastal uplift estimated to be based on a blind thrust fault at depth. The property is near the top of a hill that is underlain by materials of the Tertiary-age San Onofre Formation, landslide derived from the San Onofre Formation, and artificial fill.

The majority of the subject site is underlain by the San Onofre Breccia, one of the most resilient bedrock formations in South Orange County. The marine sedimentary formation consists of cobble conglomerate zones, cemented zones, and a few zones of well-bedded, fine grained material. The few zones of fine grained material consisting of silt and clay form weaker layers within the otherwise resilient bedrock. Another formational material, the Tertiary Monterey Formation, was identified off-site, near the toe of the large descending slope that underlies the site. The Monterey Formation is primarily a siltstone, and it is known for its potential for landsliding due to the presence of weak clay layers. The two bedrock formations, landslides, and graded areas of artificial fill have altogether created a variable complex of materials at the off-site, toe-of-slope area.

A landslide is present at the northeast portion of the site that follows one of the weak layers of the San Onofre Breccia described above, at depth. A second weak layer at depth below the landslide at the northeast corner of the site was specifically noted by both the previous consultant and LGC Geotechnical as an important geologic control for slope stabilization. Formerly labeled "hypothetical shear" in Nicoll, 2008a, the feature is now labeled "Silty Clay Bed" in this report. The character of the material between the identified landslide and the Silty Clay Bed is variously described as tectonically fractured bedrock and queried landslide. The material below the Silty Clay Bed was observed by LGC Geotechnical to be bedrock.

In general, site data regarding bedding and jointing/fractures can be summarized as follows. Within the formational materials at the site, the fine grained bedding has been interpreted to possess the actual strike and dip of the bedding that underlies the site. Based on review of previous borings and downhole logging observations of a recently excavated large-diameter boring LGC-1, bedding within the coarse grained/cobble beds indicates a large variation of strikes, and a lesser variation of dips. Strike of the coarse grain deposits as measured ranged widely between N85E and N20W, and dips range between 12 degrees south/east and 38 south/east. Fine grain materials are considered to be more representative of actual, originally horizontal bedding. Strike of the fine grain beds generally range between N25W and N10E, while dips range between 12 degrees east and 25 degrees east. More variation is present within the landslide-affected outer slope areas and areas to the south where the east boundary hillside shallows and significantly decreases in height.

In general, within the critical location of areas north of the existing Sanctuary structure, the upper portion of the hillside has a slightly steeper dip range than the lower portion of the hillside indicating a slight synclinal component but with an overall trend close to the character of a dip-slope. The recently excavated boring LGC-2 at the southern portion of the site indicates the bedding there is anomalously southwest-dipping. Fracture orientation was relatively sporadic within the landslide portion of the observed geologic structure, and few fracture attitudes were recorded in previous logs, especially within

the predominantly coarse-grained material. Minor shears indicative of tectonic faulting were recorded within various borings, however.

A fault was observed in boring LB-7(B) at a depth of 18 feet, oriented into-slope and within the bedrock core of the site, presented on the Geotechnical Maps (Sheets 1 and 6). The fault is interpreted as a normal fault due to the inclination of the feature and the general extensional regional geologic regime related to uplift (not compression) of the San Joaquin Hills. No geomorphic indicators of the fault were observed in review of aerial photographs. A similarly oriented shear is recorded within nearby boring BA-3. The presence of minor faulting has been considered with relation to the Silty Clay Bed and overall site geologic conditions.

Specific stratigraphic correlation between borings and interpretation of the large suite of available data was necessary for refining the geologic model for geotechnical mitigation of the site relative to the previous consultant's interpretations. The recent boring LGC-1 was advanced at a critical location where previous borings by others had terminated on refusal. Information obtained from the boring was used to compare stratigraphy between previous borings. The Silty Clay Bed observed at 68 feet in depth in LGC-1 was correlated to similarly-described features in older borings and projected to the surface along strike and dip. Previous interpretations did not present the surface location of the feature and did not project the bed to the north and south along bedding.

The surface expression of the Silty Clay Bed was constructed one point at a time, starting with Cross-Sections A-A' and B-B'. Boring BN-1 supports the location of the feature in addition to the information gathered in LGC-1. The total depth of those borings helps to constrain against the presence of additional weak beds at depth. Off-site Boring LB-1(B) behind and below the Silty Clay Bed also helps to constrain against the presence of additional weak beds at depth.

For establishing the location of the Silty Clay Bed in the area of Cross-Section C-C', presence of the fault in LB-7 and the feature at 28.5 feet in depth within Boring BB-106 were important. The fault is interpreted to offset the Silty Clay Bed down to the northwest (normal movement), putting the Silty Clay Bed at the location observed in BB-106. This was supported by a fence diagram constructed through borings BB-106 and BA-1(X) in the area of the existing Sanctuary. The Silty Clay Bed was observed in BB-106 but was not observed in BA-1(X) below the Sanctuary. The feature in Boring BB-104, at 9 feet in depth, established another location of the Silty Clay Bed further to the south in the area of Cross-Section D-D' that lines up with the feature as observed in BB-106.

At the southern portion of the site between the areas of Cross-Sections D-D' and E-E', the descending offsite slope is reduced to a gently-inclined ridgeline. Areas previously graded under the observation and testing of Nicoll (1993) were provided with a stabilization fill and subdrain. The southern boundary of the subject property was provided with a crib wall approximately 215 feet long, backfilled with engineered fill. Recent boring LGC-2 was excavated through the existing engineered fill to evaluate the fill and underlying geologic conditions, as depicted on Cross-Section G-G'. Orientation of bedding is south to southwest in this area, significantly different from the northwest portion of the site. The change in bedding direction may be related to the change in geomorphology of the hillside (reduction in slope height and inclination), as may occur with a resistant anticline within the bedrock. Such an anticline, if present, would not influence the slope stability evaluation of the eastern perimeter slope. The bedding orientation at LGC-2 is geotechnically favorable in that it is into-slope relative to the site's eastern boundary condition.

The Geotechnical Maps, Sheets 1 and 6, present the borings and geologic attitudes of the critical surfaces in each boring depicted with overlays of the Proposed Master Plan and Alternative Design, respectively. The approximate surface location of the Silty Clay Bed is also depicted. Cross Sections A-A' through G-G' depict the interpreted subsurface geologic structure relative to each plan also. Boring logs and trenches from the recent investigation and previous investigations are included in Appendix B for reference.

2.2 Seismicity and Faulting

Southern California is an area known for its active faults, and seismic hazards exist for areas of active faulting in the form of ground rupture and ground shaking due to earthquakes. The subject site is not located within an active fault zone, but may still be affected by ground shaking. Some of the active faults that may affect the subject site include the San Andreas Fault, the Newport-Inglewood Fault, and the Whittier Elsinore Fault. The closest significant fault to the site is the active off-shore portion of the Newport-Inglewood Fault Zone, located approximately 3 miles west of the site. The site is located within the San Joaquin Hills; the coastal hills are inferred by indirect evidence to be uplifted along a blind thrust fault at depth.

The subject site is not located within an Alquist-Priolo/Special Studies Earthquake Fault Zone and there are no known active or potentially active faults onsite (CDMG, 2001). Therefore ground rupture due to faulting is not anticipated to affect the site. Secondary hazards from ground shaking are discussed below in the section titled "Geotechnical Hazards".

2.3 Geologic Material Types

The following materials were encountered during the recent and previous subsurface investigations. The approximate extent of materials described below is depicted on the Geotechnical Maps and Cross Sections (Sheets 1 through 10).

2.3.1 Artificial Fill Soils (Map Symbol - Af)

Artificial fill soils are present across the site with the exception of the central area of the existing parking lot. The maximum depth of fill is estimated to be 25 feet at the southeast portion of the site, placed under the observation and testing of the previous consultant and reported in the referenced grading report (Nicoll, 1993). Boring LGC-2 was recently excavated by LGC Geotechnical for evaluation of the quality of the material at the southern portion of the site adjacent to the existing crib wall. The boring log is presented in Appendix B, and laboratory test results are presented on the boring and in Appendix C. Where encountered, the fill was observed to be reddish-brown to dark brown clayey sand with gravel, moist and dense.

2.3.2 Quaternary Landslide (Map Symbol – Ols)

Recent boring LGC-1 was excavated through the upper portion of a landslide at the northeastern portion of the site. At depth, the basal rupture surface of the landslide is estimated to follow one of the weak beds of the San Onofre Breccia or Monterey Formation near the toe-of-slope. The landslide material, where encountered, was highly to moderately weathered cobble breccia and clayey sandstone, moist, and dense.

2.3.3 Tertiary San Onofre Breccia (Map Symbol – Tso)

The primary bedrock formation underlying the site is the San Onofre Breccia Formation. Variable brecciated cobbles and gravels of metamorphic origin are weakly to well cemented within a matrix of clayey sandstone, brown to gray, moist, and very dense. Few, thin beds of clay and silty clay materials were encountered during various phases of subsurface exploration, generally traceable between borings. Also, zones of nested cobbles and boulders were encountered, typically at the base of a coarsening-downward stratigraphic sequence. Correlation of the cobble and boulder zones between borings indicated these high-energy deposits have variable thickness.

The upper, weathered portion of the San Onofre Breccia Formation was observed to be relatively more oxidized, slightly less dense, and weakly cemented in comparison to the same material at depth. There is some question in the recent and previous boring logs and reports as to whether the queried San Onofre Breccia material (Map Symbol - Tso?) on the Geotechnical Map is landslide material or weathered bedrock affected by tectonic shearing. Below the Silty Clay Bed feature, the bedrock in LGC-1 was observed to be fresh, unoxidized, consistently gray, very dense, and weakly to well cemented. Approximate locations of the oxidized to unoxidized bedrock are presented for locations where the contact was encountered in borings at depth or projected, then contoured to match site topography.

2.3.4 Tertiary Monterey Formation (Map Symbol – Tm)

Monterey Formation material is located off-site near the base of the large descending natural slope east of the site. This material generally consists of thinly interbedded siltstone, clayey siltstone, and fine sand lenses, typically brown to dark gray, moist, and stiff to moderately hard in comparison to “soil”, moderately soft in comparison to “rock”.

2.4 Expansion and Corrosion Potential

The expansion potential of the near-surface soils underlying the subject site have been identified by others during construction of the existing improvements as low to moderate based on visual observation. Testing in accordance with ASTM D4829 Test Method indicated site soils possess an expansion index of 78, indicating “moderate” expansion potential (Nicoll, 2006).

Corrosion potential of near surface soils has been evaluated by Nicoll in the referenced report (2007a). Test results indicated that the level of sulfate exposure for concrete is classified as “not applicable”, however, onsite soils are considered very highly corrosive to buried metals (ACI, 2008).

2.5 Geotechnical Hazards

Geotechnical hazards that may affect development of any site include earthquake-induced landslides, liquefaction potential, lateral spreading, subsidence, soil collapse, and potential for tsunami or seiche. Based on review of the Dana Point Seismic Hazards Report (CDMG, 2001), the subject site is located in an area with potential for earthquake-induced landslide, however, the potential hazard to development at the site can be mitigated with implementation of the geotechnical recommendations of this report and future applicable reports.

The site is not located within an area of potential liquefaction (CDMG, 2001), and it is not considered a potential risk for lateral spreading, subsidence, or soil collapse, based on the material types underlying the site, and anticipation that site earthwork will be performed in accordance with project specifications.

The site is not considered to have potential for tsunami or seiche hazard due to the elevation above sea level and lack of a major body of water in the proximity.

2.6 Infiltration Feasibility

Based on the geotechnical conditions encountered during subsurface evaluations by this firm and previous consultants, LGC Geotechnical recommends that no water be purposefully infiltrated to the subsurface on a permanent basis. However, it is our opinion that watering to “mimic ambient rainfall” may be performed for establishment of plantings within the un-improved portions of the site such as the Fuel Management Zone.

Additionally, based on review of the proposed “bioretention BMPs” planned to be installed adjacent to the proposed buildings, it is our opinion that the planted retention areas will not lead to infiltration of water to the subsurface, as the areas are lined with impermeable materials and collected water is ultimately transported to site drainage conveyances.

2.7 Groundwater

Groundwater seepage was encountered sporadically during the subject evaluation and previous evaluations at various depths within deep borings. A static water table was encountered in LGC-1 at approximately 90 feet in depth.

3.0 ENGINEERING ANALYSES

3.1 Soil Shear Strength Parameters

Soil shear strength parameters for the materials that comprise the site, utilized in our slope stability analysis, are provided in Table 1. These values are based upon our experience in the area and review of parameters used by Nicoll, supported by back-calculation of the existing conditions and published shear strength data (References). The back calculations are included in the attached Appendix D, Slope Stability Analyses. The site soil shear strength values were applied to the existing slope in the original condition, without engineered fill at the toe-of-slope, along both the defined landslide rupture surface and the Silty Clay Bed, respectively.

Shear strength values for the controlling feature, the Silty Clay Bed, are the same as the landslide rupture surface shear strength value previously used by Nicoll, reviewed by LGC Geotechnical and accepted for the project. The material noted as Tso(?), on the Geotechnical Maps and Cross Sections has been modeled using shear strength values obtained during direct shear testing of multiple saturated samples taken from the same material interval (Nicoll, 2008), also reviewed and geotechnically accepted for the project.

One additional shear strength value has been added for the unoxidized zone of the San Onofre bedrock as encountered during drilling at depth within the hillside. The zone of unoxidized bedrock was observed in limited areas within borings excavated at the site and it has been delineated on the Geotechnical Cross-Sections provided herein, for areas where it has been observed. The material is too hard to sample and has therefore not been specifically tested; it represents the cemented and partially cemented material that can be difficult to excavate, sometimes resulting in drilling refusal with conventional bucket auger drill rigs.

The laboratory testing performed by G.A. Nicoll and Associates, Inc. and others (References), has been gathered and provided in the attached Appendix C, Laboratory Test Results.

TABLE 1

Soil Shear Strength Parameters

Soil Type	ϕ (Degrees)	Cohesion (psf)
Landslide Material, Landslide Rupture Plane, and Silty Clay Bed	19	270
Compacted Fill (Af)	29	200
Weathered San Onofre Breccia (Tso), and Queried San Onofre Breccia	30	500
Unoxidized San Onofre Breccia (Tso), across bedding	39	1,500

3.2 Slope Stability Analyses

Slope stability analyses were based on modeling the two-dimensional geotechnical Cross-Sections A-A' through F-F' for both the Proposed Master Plan and the Alternative. Slope stability analyses for the critical area of the slope at the northeast portion of the site were performed utilizing a conceptual design of caissons (a.k.a. "piers") and tiebacks in order to stabilize the ground supporting the proposed building locations. Caisson depths and tieback array details including unbonded length, strength, and spacing of tiebacks were modeled to increase the static factor of safety to a minimum of 1.5 and pseudo-static factor of safety to a minimum of 1.1. These analyses were performed using the computer program GSTABL7 with STEDwin version 2.002. Block failure modes were analyzed using Janbu's Simplified Method. Pseudo-static analysis was performed utilizing a vertical acceleration coefficient of 0.4g and a horizontal coefficient of 0.15g. The engineering analyses have been provided in Appendix D. The Preliminary Remedial Measures Maps (Sheets 2 and 7) and selected cross-sections depict the proposed tieback and caisson mitigation plan.

The areas depicted by Cross-Sections D-D' and E-E' at the southeast portion of the site have been analyzed for slope stability using the Modified Bishop Method. Factors of safety for the proposed development of the southeast portion of the site were calculated to exceed code minimums. Engineering analyses for Cross-Sections D-D' and E-E' are included in Appendix D.

Slope stability analysis for the slope area to the east of the proposed structures at the northern portion of the site has been performed for estimation of post-construction stability of unimproved areas at the most critical location in the area of Cross-Section A-A'. Results of the analysis are presented in Appendix D. The unimproved areas are incrementally more stable where the steepness of the slope decreases to the south. The line noted as "Approximate Limit of Factor of Safety of 1.5" on the Preliminary Remedial Measures Maps (Sheets 2 and 7) represents the approximate line of demarcation between portions of the site which will possess slope stability factors of safety of at least 1.5 for static and 1.1 for seismic, and portions of the site that do not.

After construction of site improvements in general accordance with the recommendations presented herein, unimproved slope areas will remain at risk for failure. The size of potential failure is significantly reduced, however, and there is some reduction in the risk for global failure as the solution provides for mechanical support of the upper portion of the slope instead of bearing on the lower portion of slope. Practices such as establishing plants, avoiding concentration of water to the subsurface, discouraging rodent activities, and repairing erosion rills that may occur will help to limit potential for failure of unimproved areas. Slope maintenance recommendations will be provided in a future grading plan review report. In the event of failure, slope repairs should be implemented in accordance with geotechnical recommendations on a case-by-case basis.

The proposed new structures to the north of the existing Sanctuary will be protected in their entirety with the caisson and tieback array. The existing Sanctuary structure is founded on bedrock of the San Onofre Formation as reported by Nicoll and additionally determined by LGC Geotechnical based on review of site geologic structure. The Sanctuary building is supported by engineered fill placed on bedrock reviewed and accepted by Nicoll, within a zone where underlying geologic conditions for construction of the Sanctuary are supported by their excavation and analysis of data from Boring BA-1(X) at the outer edge of the structure. In the unlikely event of failure through the engineered fill materials that overlie the projected location of the Silty Clay Bed east of the Sanctuary, a bedrock slope would be left in-place for support of the Sanctuary structure.

For the proposed Mater Plan, an additional row of caissons has been recommended south of the tieback system in order to extend the increase in stability gained with the tieback system southward, toward the existing Sanctuary. The caissons are depicted in plan view on the Preliminary Remedial Measures Map (Sheet 2) to the limits of existing engineered fill placed for support of the slope below the Sanctuary, but may be extended further south at the prerogative of the owner with no significant change to the limits of proposed site earthwork. Although presence of caissons in this area would limit potential size of a hypothetical failure east of the Sanctuary, such a failure would require slope repairs to be implemented in accordance with standard geotechnical recommendations.

3.3 Seismic Design Criteria

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2010 C.B.C. Site coordinates of latitude 33.4880 degrees north and longitude -117.7213 degrees west, which are representative of the site, were utilized in our analyses. The initial results of our analyses for the maximum considered earthquake spectral response accelerations (S_s and S_1) are presented in Table 2A.

TABLE 2A

Seismic Design Values

Selected Parameters from the 2010 C.B.C. Section 1613 - Earthquake Loads	Seismic Design Values
Site Class per Table 1613.5.2	C
Spectral Acceleration for Short Periods (S_S)*	1.629 g
Spectral Accelerations for 1-Second Periods (S_1)*	0.593 g
Site Coefficient F_a per Table 1613.5.3(1)	1.0
Site Coefficient F_v per Table 1613.5.3(2)	1.3

* Calculated from the USGS computer program "Seismic Hazard Curves, Response Parameters and Design Parameters" v5.1.0 (02/10/11)

The spectral response accelerations (S_{MS} and S_{M1}) and design spectral response acceleration parameters (S_{DS} and S_{D1}), adjusted for Site Class C, were evaluated for the site in general accordance with section 1613 of the 2010 C.B.C. These site class adjusted parameters are presented in Table 2B.

TABLE 2B

Seismic Design Values Modified for Site Class C

Selected Parameters from the 2010 C.B.C. Section 1613 - Earthquake Loads	Seismic Design Values Modified for Site Class C
Site Modified Spectral Acceleration for Short Periods (S_{MS}) for Site Class C [Note: $S_{MS} = F_a S_S$]	1.629 g
Site Modified Spectral Acceleration for 1-Second Periods (S_{M1}) for Site Class C [Note: $S_{M1} = F_v S_1$]	0.771 g
Design Spectral Acceleration for Short Periods (S_{DS}) for Site Class C [Note: $S_{DS} = (2/3)S_{MS}$]	1.086 g
Design Spectral Acceleration for 1-Second Periods (S_{D1}) for Site Class C [Note: $S_{D1} = (2/3)S_{M1}$]	0.514 g

In accordance with Tables 1613.5.6 (1 & 2), the Seismic Design Category for the subject site is Category D, where $S_{DS} \geq 0.50g$ and $S_{D1} \geq 0.20g$.

Section 1803.5.12 of the 2010 C.B.C. states that the PGA for a site may be defined as $S_{DS}/2.5$. The S_{DS} for the subject site has been calculated as 1.086g. Therefore, $PGA = 1.086g/2.5 = 0.43g$

4.0 CONCLUSIONS

The following conclusions have been determined to be applicable to the proposed re-development of the subject site.

- The site is feasible for construction and is suitable for the proposed re-development in accordance with both the Proposed Master Plan and Alternative Design from a geotechnical viewpoint, provided the recommendations of this report and a future grading plan review report are implemented.
- The northeast portion of the site has potentially unstable areas that require slope stabilization in order to achieve stable land for construction of the Community Life Building and the Christian Education Buildings (two buildings per Proposed Master Plan; one building per Alternative Design).
- The site is potentially affected by earthquake-induced landslides that can be mitigated by slope stabilization in accordance with the geotechnical recommendations of this report and future reports.
- Seismic design parameters indicate the site is subject to a peak ground acceleration of approximately 0.43g.
- No liquefaction hazard is present, based on our subsurface evaluation and the Seismic Hazard Map applicable to the City of Dana Point.
- Expansive soil potential at the site is anticipated to range from “low” to “moderate”, based on visual observation and testing of on-site, near surface soils in accordance with ASTM D4829 Test Method.
- Groundwater was encountered during the subsurface investigations as random seepages and as a static water table as observed at approximately 90 feet below ground in boring LGC-1.
- It is our opinion that no substantial soil erosion or loss of topsoil in ungraded areas will occur as a result of the proposed development, as long as the recommendations presented here and in future reports are implemented.

5.0 PRELIMINARY RECOMMENDATIONS

The following recommendations are to be considered preliminary, and should be finalized and expanded in a grading plan review report. In addition, all recommendations from LGC Geotechnical should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the City of Dana Point.

Slope stability analyses for slope areas to the east of the proposed structures at the northern portion of the site have been performed for estimation of post-construction stability of unimproved areas. Results of the analysis are presented in Appendix D. The line noted as "Approximate Limit of Factor of Safety of 1.5" on the Preliminary Remedial Measures Maps (Sheets 2 and 7) represents the line of demarcation between portions of the site which will possess slope stability factors of safety of at least 1.5 for static and 1.1 for seismic, and portions of the site that do not. Slope Stability Analysis of unimproved areas after completion of construction, outside of the influence of the proposed slope stabilization system for the site, are presented in Appendix D.

Please note that the proposed tieback and caisson solution presented below for mitigation of onsite stabilization issues also significantly lessens the potential for off-site failure of northeastern slope areas in the future. The solution provides for mechanical support of the upper portion of the slope instead of bearing on the lower portion of the slope.

5.1 Mechanical Slope Stabilization

In order to increase the gross stability of the northeast portion of the site to the minimum factor of safety required for new construction, a slope stabilization system consisting of tiebacks and caissons is proposed as presented on the Preliminary Remedial Measures Maps (Sheets 2 and 7). The geologic feature that controls the engineering analysis is labeled Silty Clay Bed on the Geotechnical Maps (Sheets 1 and 6). The feature is angled at depth as shown on the cross-sections. Based on slope stability analysis of the most critical Cross-Section A-A' for the Proposed Master Plan, the proposed tieback and caisson array for stabilization of the area furthest from the design geologic feature is achievable and stabilizes the slope to the required minimum factor of safety of 1.5 for static conditions, and to the minimum factor of safety of 1.1 for pseudo-static conditions. Slope stability analysis is presented in Appendix D.

The tieback array as modeled is recommended to be 5-foot on center for both rows and columns. Recommended preliminary positions of reaction walls, tieback columns, and caissons are presented on the Preliminary Remedial Measures Maps. Tieback columns are shown in cross-sectional view at 5-foot on center vertical spacing showing 4 tiebacks, 3 tiebacks, and 2 tiebacks per column depending on distance to the design feature. Based on the geometry of the design geologic feature (Silty Clay Bed), stabilization of areas closer to the feature requires fewer tiebacks (or lower-capacity tiebacks) and shallower caissons. Stabilization of areas further from the feature requires more, higher-capacity tiebacks and deeper caissons.

The restraining loads needed to stabilize the slope at the location of the highest anticipated loads, Cross-Section A-A' for the Proposed Master Plan, are approximately 360 kips per anchor for the analyzed tieback array, as shown on the slope stability analysis for the cross-section. This load is achievable in accordance with the current standards of tieback installation, using approximately 11 strands per anchor. It is our understanding that loads of up to 420 kips are constructible with standard

equipment, using 14-strand anchors. Therefore, there is some room for a greater load in the unlikely event that distance to the design feature was to increase.

There is a great deal of flexibility in the potential design in that an additional row of tieback anchors could be designed to reduce the restraining loads of each anchor, or a row could be removed and the loads increased for areas of lesser distance from the design feature. The maximum load of 360 kips per anchor is an achievable load that will allow excavation of the anticipated access pad geometry for the number of rows proposed at each area for both the Proposed Master Plan and the Alternative Design as represented by Cross-Sections A-A', B-B', and C-C'.

Please note that with the Alternative Design, the critical cross-section becomes Cross-Section B-B'; all other tieback wall locations would be pulled back toward the Silty Clay Bed and have lesser loads or fewer tiebacks than the Proposed Master Plan. The Preliminary Remedial Measures Map-Alternative Design (Sheet 7) shows the potential maximum extent of the Alternative Design footprint. Restraining loads are approximately 250 kips per anchor at Cross-Section B-B' in this preliminary design. All other aspects of the footprint for the Alternative Design represent foundation locations at lesser distances from the Silty Clay Bed than the design as proposed, and will therefore reduce the degree of geotechnical remediation and the size of the earthwork footprint for the project.

Caissons recommended to be constructed in conjunction with the tieback array are modeled to be 3 feet in diameter, and should extend to depths that exceed approximately 40 feet of horizontal setback from the Silty Clay Bed at depth. This relationship is presented on applicable cross-sections for clarity. Grade beams connecting the caissons will be utilized.

For the Proposed Master Plan, additional grade beams will be recommended to tie all caissons supporting the proposed retaining wall east of the Christian Education Buildings to the caissons adjacent to the tieback array, in order to ensure stability. Three locations where the retaining wall is outside of the tieback wall create respective structural triangles in plan view. The caissons supporting the eastern retaining wall will be sufficiently deepened and reinforced to take deflection due to the small wedge of earth between the tieback reaction wall and the retaining wall. Within the structural triangles, interior grade beams and additional caissons may be added by the structural engineer during design. The retaining wall should be constructed on a grade beam supported by the caissons, and designed with geogrid or similar locally stabilizing elements. The caisson array will be tied to the tieback reaction wall within an additionally reinforced grade beam at the base of the tieback wall. A caisson row is recommended to extend past the tiebacks to the south in order to extend the increase in stability gained with the tieback wall toward the existing Sanctuary.

Caissons that are recommended for the horizontal slope setback should be specifically designed in accordance with slope setback/deepened footing requirements as discussed in Section 5.7.

Specific details of the proposed tieback and caisson array and grade beam connections will be designed at the grading plan review phase.

5.2 Tieback Access Excavation

In order to construct the recommended tieback and caisson stabilization system, an excavation will be necessary to achieve access. It is anticipated that the tieback and caisson access excavation will be performed in stages, where the first section is cut down to the level required to install the system, and the next section is cut to the required level while backfilling the first section. Please note that a completed, installed stabilization system does not depend on the presence of backfill for achieving stability, therefore timing of backfill of the access excavation is not critical to the interim stability of the site.

Approximate limits of the proposed tieback access excavation are depicted on the Preliminary Remedial Measures Maps, Sheets 2 and 7.

5.3 Community Life Center and Christian Education Building Retaining Walls

Retaining walls are proposed at the northeast area of the subject site for both the Proposed Master Plan and the Alternative Design. The most structurally significant wall is the approximately 270-foot long wall proposed for local support of both the Community Life Center and the walkway and drive aisles adjacent to the Christian Education Building(s). Although the Alternative Design depicts only one Christian Education Building in comparison to the two buildings presented in the Proposed Master Plan, the wall is similar between the two designs.

For each of the respective designs presented herein, the retaining structure adjacent to the Community Life Center would begin along the north-facing side of the building pad, turn a corner, and extend the length of the east-facing side of the Community Life Building. Going south, a wall for support of walkways and drive aisles is proposed adjacent to the west side of the Christian Education Building(s). Specifics of these proposed retaining structures have not been provided at this time, however, they are considered feasible for construction from a geotechnical viewpoint. Cross-Sections A-A', B-B', and F-F' generally depict the walls relative to the respective designs. Deepened foundations for the northern boundary of the wall adjacent to the Community Life Center are recommended as presented on the Preliminary Remedial Measures Maps, Sheets 2 and 7, and in profile on the noted cross-sections. See Section 5.7 for further discussion on deepened footings.

For the Proposed Master Plan only, a retaining wall is proposed at the eastern side of the Christian Education buildings that provides for a small area of fill between approximately 6 feet and 12 feet high, supported on caissons. Structural support for the wall is discussed in Section 5.1 titled "Mechanical Slope Stabilization". The retaining wall is depicted on the Preliminary Remedial Measures Map (Sheet 2), and within profiles on Cross-Sections A-A' and C-C'. The additional fill has been modeled on slope stability analyses for the noted cross-sections, as presented in Appendix D.

Once final design plans for the proposed retaining walls are completed, LGC Geotechnical will provide specific geotechnical recommendations for structural design and construction. Provisional geotechnical analysis indicates the proposed retaining walls can be constructed without off-site geotechnical impact.

5.4 Pre-School/Administration Building and Meditation Garden

The Pre-School/Administration Building at the southeastern portion of the site is planned to be contiguous with the adjacent Meditation Garden. For the Alternative Design, the Pre-School/Administration structure is significantly smaller than the Proposed Master Plan and pulled back from the eastern property line. A series of retaining walls have been proposed along the east and south facing outside slope face, to create the curving walls for the Meditation Garden at variable levels, to be combined with water features and landscaping. Cross-Sections D-D' and E-E' for both the Proposed Master Plan and the Alternative Design depict the area in profile, and global slope stability analysis of the cross-sections for each respective design are presented in Appendix D.

Once final design plans for the proposed retaining walls are completed, LGC Geotechnical will provide specific geotechnical recommendations for structural design and construction. Provisional geotechnical analysis indicates the proposed retaining walls can be constructed without off-site geotechnical impact.

5.5 Existing Crib Wall

The existing crib wall structure and engineered backfill at the southern boundary of the project was geotechnically reviewed with regards to the additional load of the parking structure to be placed near the top of the crib wall. An exploratory boring was excavated through the approximately thickest portion of engineered fill for confirmation of the competency of the fill placed under observation and testing by Nicoll (1992). Boring LGC-2, depicted on the Geotechnical Maps (Sheets 1 and 6), was sampled, downhole logged, and laboratory testing was performed on representative samples. Boring information and laboratory testing results are presented in Appendix B and C, respectively. Minor tension cracks are visible within the existing parking lot parallel to the top of the ascending slope above the existing crib wall; however, no vertical offset was observed within the relatively old cracks. The approximately 20-year-old certified fill was observed, tested, and determined to be competent for future continued use in support of parking areas. Specific recommendations for construction of new improvements adjacent to the existing crib wall are required in order to ensure no additional structural loads are placed on the wall.

5.6 Parking Structure

A two-story parking structure is proposed within both the Proposed Master Plan and Alternative Design. Within the Alternative Design, however, the majority of the southern boundary of the structure is pulled back from the crib wall by 10 feet in comparison to the Proposed Master Plan. The structure will be constructed with several conventional retaining walls at the northern and western perimeters, and it will overlie a portion of the backfill for the existing crib wall at the southern perimeter. Although actual design loads for the parking structure are not available at this time, we anticipate that all structural loads over existing fill material will be transmitted to bedrock below by caissons or deepened footings in the area of the existing crib wall. Areas of the structure underlain directly by the San Onofre Breccia can be provisionally designed as spread footings.

For evaluation of the parking structure relative to the crib wall, an Existing Crib Wall Exhibit was provided by Adams-Streeter, presented at the rear of text. The exhibit depicts the subsurface configuration of the existing crib wall at approximately the maximum height of the wall, and the relative distance between existing and proposed foundation elements for the parking structure. Cross-

Section G-G' by LGC Geotechnical (Sheets 5 and 10) depicts our geotechnical recommendations for construction of the proposed parking structure. The approximate locations of the recommended deepened foundation elements, or caissons, are presented in plan view on the Preliminary Remedial Measures Maps (Sheets 2 and 7). See Section 5.7 for further discussion on deepened footings.

Once final design plans for the parking structure are completed and structural loads are finalized, LGC Geotechnical will provide specific geotechnical recommendations for construction. Provisional geotechnical analysis indicates the structure can be constructed without off-site geotechnical impact.

5.7 Deepened Foundations for Top of Slope Structures

The City of Dana Point and the current California Building Code are applicable in determining the appropriate depth of deepened foundations for reducing the required top-of-slope setback for proposed structures. Foundation criteria should be reviewed by LGC Geotechnical based on the final grading plan. Specific foundation systems for each area are not fully designed at this time, however, the following guidelines are recommended.

In general, the intent of the geotechnical slope setback requirements is to ensure the stability of proposed structures. As such, since the majority of the Community Life Center and the Christian Education Building(s) are to be founded above an extensive system of slope stabilizing caissons and tiebacks, no additional setbacks are recommended. This condition applies to Geologic Cross-Sections A-A', B-B', and C-C' for both the Proposed Master Plan and the Alternative Design. The Christian Education Building(s) are recommended to be founded on conventional footings for both designs. For the Proposed Master Plan, the northwest corner of Christian Education Building No. 2 will require a small zone of deepened footings to ensure the entire foundation is within competent native soils.

The variable height wall at the northern perimeter of the Community Life Center is recommended to be supported by deepened footings in accordance with horizontal setbacks per code. As shown in the slope stability analysis for Cross-Section F-F' that is included within this report (Appendix D), the location does not require global stabilization due to the shallower inclination of the slope, the presence of fill at the toe-of-slope, and slightly more favorable structural geology (apparent dip). However, we recommend that the wall structure at the top of the slope be founded on a deep foundation system to negate the effects of slope creep. The approximate locations of caissons for deepened foundations are presented on the Preliminary Remedial Measures Maps (Sheets 2 and 7). Specific recommendations for these caissons, including anticipated deflection, will be provided in the design phase of the project. The Community Life Center structure is located above and behind the wall and is recommended to be founded on conventional footings. The entire foundation will be constructed on engineered fill that is a minimum of 5 feet thick.

The Pre-School/Administration Building at the southeastern portion of the site is proposed to be founded on conventional footings. The foundation will be constructed on the engineered fill that is a minimum of 5 feet thick. The retaining walls for the adjacent Meditation Garden will require deepened footings. For geologic Cross-Sections D-D' and E-E', where slopes are relatively gradual below the proposed improvements, we will provide specific foundation setbacks from slope faces at the design phase of the project. As a general rule, we recommend that the base of retaining wall footings be a minimum of 10 feet from slope faces and other habitable structure footings be a minimum of 20 feet from slope faces. These recommendations will be finalized at the grading plan review/design stage of the project.

The southern boundary of the proposed parking structure will require caissons and deepened foundation elements in consideration of its proximity with the existing crib wall near the southern property line, as discussed in the section titled Parking Structure (Section 5.6), and in accordance with the Existing Crib Wall Exhibit (Rear of Text) and Cross-Sections G-G' (Sheets 5 and 10). We anticipate all these caissons will extend through fill to bedrock. Approximate locations of proposed caissons are depicted on the Preliminary Remedial Measures Maps (Sheets 2 and 7).

5.8 Site Earthwork

The proposed remedial grading for the project will include site preparation, design cuts and fills in accordance with the civil engineering plan, overexcavation of structures supported on conventional (non-deepened) footings on cut to fill transitions where the exposed cut is formational material, excavation of an access pad for installation of tiebacks at the eastern boundary of the tieback reaction wall area, and retaining wall and utility line excavation and backfill. Design cuts and fills planned for achieving the terracing effect of the Meditation Garden are intended to work with the natural topography of the area. Both the Proposed Master Plan and Alternative Design incorporate these grading features.

Some export of excess soils is anticipated in order to balance site earthwork. The "South Shores Church Corrective Grading Exhibit, Rough Grade Earthwork Quantities, Sheets 1 through 6" by Adams-Streeter Civil Engineers, Inc., specifically details the design cuts and fills for the proposed plan. Material that is removed during remedial grading may be placed as fill. Placement and compaction of fill should be performed in accordance with the grading plan review report, local grading ordinances, and under the observation and testing of LGC Geotechnical. General Earthwork and Grading Specifications for Rough Grading have been included as Appendix E for reference. All areas to accept fill placement shall be geotechnically accepted prior to placement of fill.

Design cuts of up to 5 feet and design fills of up to 10 feet are anticipated to be required at the southeast portion of the site, below the proposed Pre-School/Administration structure. The structure is sited within previously placed artificial fill soils and will therefore require minimal remedial grading including surficial reprocessing estimated to be approximately 2 to 3 feet below existing grades in order to moisture condition and re-compact any weathered existing engineered fill. The existing engineered fill placed under observation and testing by Nicoll (1992) was evaluated by LGC Geotechnical within the recently excavated boring LGC-2, and it was found to be generally acceptable for support of future fill and structures constructed in accordance with project specifications. Additionally, a relatively small area of shallow fill at the northern corner of the building will require 5 feet of overexcavation, as depicted in plan view of the Preliminary Remedial Measures Maps, Sheets 2 and 7.

The parking structure is generally proposed to be a variable design cut of up to 10 feet. The parking areas are not recommended to be overexcavated, and the materials that will be exposed at grade are anticipated to be acceptable for construction. Conventional retaining walls, proposed at the parking structure boundaries, will range between approximately 3 and 10 feet in height, and will require standard backcut excavations for construction access. The southern boundary of the parking structure will require additional foundation recommendations as outlined above in Section 5.6, Parking Structure.

The proposed Community Life Center is sited over a significant cut to fill transition of design cut up to 5 feet, and design fill of up to 15 feet per the Proposed Master Plan (up to 22 feet high with the Alternative Design) for the variable-height retaining wall supporting the overall structure at the northern and eastern boundary for both the Proposed Master Plan and Alternative Design. Cross-Sections B-B' (Sheets 3 and 8) depict the proposed geometry of the most critical location in this area for each respective design. To reduce differential settlement, the cut portion of the building footprint is recommended to be overexcavated 5 feet below pad grade. The material will be removed and replaced as engineered fill to achieve pad grade.

The Christian Education Building(s) are generally within design cut, up to 18 feet at the west boundary. For the Proposed Master Plan, a very small zone of sliver fill at the northeast corner of the north building of up to 5 feet will be required. Based on the materials observed within the upper portion of Boring LGC-1, it is our opinion that remedial measures were performed prior to placement of engineered fill, and the landslide materials are competent at approximate foundation grade (to be verified during grading). This area will be provided with recommendations for deepened footings, placing footing foundations into native materials throughout.

The remaining area of important grading activity is the access pad for construction of the proposed tieback reaction wall at the eastern boundary of the Community Life Center and Christian Education Building(s). The approximate elevations and limits of the access pad for each design are depicted on the Preliminary Remedial Measures Maps and detailed in the corrective grading plan by Adams-Streeter. Section 5.2 titled "Tieback Access Excavation" provides additional details regarding the anticipated earthwork for this area. We recommend the access pad be removed in stages and backfilled concurrently, in order to minimize overall disturbance and/or stockpiling activities at the site.

5.9 Geotechnical Role during Construction

During construction of the project, the geotechnical consultant must observe and geologically map native materials within all overexcavation bottoms, design cuts, temporary slopes, and tieback access pad exposures. Areas of pre-existing engineered fill shall be verified to be competent in accordance with project specifications prior to additional fill placement. Landslide materials to be left in place below the Christian Education Building(s) shall be verified to be competent for support of structures. Caissons shall be downhole-logged as required in order to verify geologic conditions at regular intervals. More detailed specifications for the geotechnical consultant's role during construction will be provided at the grading plan review phase of work. This will include observation and testing requirements for fill placement, tieback and caisson installation, subsurface drainage, and wall construction.

5.10 Temporary Stability

The most significant temporary slopes that will be exposed during grading of the subject site are the tieback reaction walls depicted on Cross-Sections A-A', B-B', and C-C' for both the Master Proposed Plan and Alternative Design. The method of construction of the tieback walls is anticipated to be from top to bottom with installation of upper tieback anchors prior to excavation of lower portions of each section of wall. This type of installation will be recommended unless the contractor prefers and defends an alternative that is similarly protective. The individual tieback anchors will provide both temporary and permanent shoring.

The temporary 1:1 (H:V) slopes proposed for interim earthwork construction within the interior of the site are a maximum of 15 feet in height and anticipated to be constructed within bedrock and engineered fill. Temporary slopes are noted on the cross sections herein. These temporary slopes are anticipated to be sufficiently stable for the interim condition. The project geologist should review these slopes during construction and provide additional recommendations in the event that unanticipated geotechnical conditions are observed.

The retaining walls proposed at other locations throughout the subject site are either design fill construction or conventional retaining walls less than 10 feet in height without surcharged backcuts. It is the responsibility of the contractor to construct temporary backcuts for the conventional walls in accordance with OSHA regulations and standard of care for the industry.

5.11 Subsurface Drainage

Tieback reaction wall backdrains and retaining wall drains should be planned and constructed in accordance with current standards of practice and reviewed by LGC Geotechnical prior to construction. We anticipate the elevation of the lowest tieback reaction wall drainage outlet will allow drainage utilizing the conventional drain system currently proposed for the subject property.

LGC Geotechnical specifically recommends that no purposeful storm water or other infiltration to the subsurface be planned at the site. Landscape watering should primarily drain to site surface drainage conveyances. However, as noted in Section 2.6, Infiltration Feasibility, a minimal watering to establish healthy plant growth may be implemented for the Fuel Management areas that generally “mimics ambient rainfall.”

5.12 Grading Plan Review

We have reviewed the referenced preliminary plans (Matlock, 2012 & Adams-Streeter, 2012) and find them to be in general accordance with our geotechnical recommendations. Once the plans are approved, LGC Geotechnical should perform a grading plan review in order to provide full ground stabilization, foundation, and earthwork construction recommendations. Future versions of the development plan and all subsequent plans should be provided to this office for geotechnical review for conformance with the geotechnical recommendations provided in this and subsequent reports.

6.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

It should be understood that LGC Geotechnical has relied on the accuracy of documents, verbal information, and other material and information provided by you and other associated parties in preparation of this report. LGC Geotechnical makes no warranties or guarantees as to the accuracy or completeness of information obtained from or compiled by others.

APPENDIX A

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Appendix A
References

Appendix B
Boring Logs and Trench Logs

Appendix C
Laboratory Data

Appendix D
Slope Stability Analyses

Appendix E
General Earthwork and Grading Specifications
for Rough Grading

ATTACHMENT C
CITY MEMORANDUM

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MEMORANDUM

TO: LSA Associates

FROM: Brad Fowler, Director of Public Works and Engineering Services
City of Dana Point

DATE: November 13, 2014

RE: Roger Von Butow Complaint Regarding Alleged Erosion and Sedimentation
Issues

This Memorandum summarizes the results of a several-week investigation conducted by the City of Dana Point Department of Public Works and Engineering Services (“City”) and the San Diego Regional Water Quality Control Board (“Regional Board”) regarding the complaint filed by Mr. Roger Von Butow regarding various erosion and sedimentation issues occurring on or adjacent to the Monarch St. Regis property, the Makallon LLC. Open Space property and the South Shores Community Church property in the City.

In the Fall of 2014, the City and the Regional Board received a complaint from Mr. Roger Von Butow (“Complaint”), alleging that various drainage features and conditions occurring on the current South Shores Community Church property were causing unlawful erosion and sedimentation deposits into the City’s storm drain facilities which were ultimately discharging into Salt Creek. This Complaint was reported during the time at which South Shores Community Church was in the process of processing land use applications with the City seeking to modernize the Church’s current facilities. To this end, a Draft EIR has been prepared and was circulated for public review in the fourth quarter 2014. Mr. Von Butow, a paid consultant retained by the “Voices of Monarch Beach”, has been very clear that the purpose of his complaint was to forestall the release and the City’s consideration of the South Shores modernization project until the alleged issues pertaining to erosion and sedimentation were addressed by the City and the Regional Board.

In response to the Complaint, City staff and staff from the Regional Board conducted several telephonic meetings and site visits to investigate the Complaint. The results of this investigation are summarized in the electronic memorandum and related photographs attached hereto as Exhibit “A.”

In summary, the alleged erosion that was the subject of Mr. Von Butow’s complaint (i) could not be determined to be the result of any condition occurring on South Shores Community Church’s property; (ii) South Shores Community Church is not violating any applicable provision of any NPDES or MS-4 permit; and, accordingly, (iii) South Shores Community Church is not violating any provision of the federal Clean Water Act or the State’s Porter Cologne Clean Water Act. The allegations and conclusions set forth in the Complaint involve the other adjacent properties, rather than South Shores Church.

As set forth in the attached documentation from the Regional Board, the erosion that is occurring is located on an undeveloped piece of property identified as “the Makallon” property

which is not the South Shores Community Church property. Sedimentation and erosion coming off the Makallon property was discharged into a private storm drain located on the Monarch St. Regis property (and again not located on the South Shores Community Church property) which outlets to Salt Creek. Upon notification of the Complaint, the City investigated and concluded that sediment had discharged into the private drain which outlets into Salt Creek. To effectively prohibit this discharge, a variety of erosion and sedimentation control “best management practices” were repaired as identified in the photographs attached hereto as Exhibit “A.” The use of these erosion and sedimentation control BMPs comply with the applicable NPDES permit that was in existence at the time at which the South Shores Church and St. Regis properties were developed. These BMPs will prevent sediment from discharging into the private drain and Salt Creek. The City is committed to ensuring proper maintenance of these BMPs by the private property owners.

Thus, contrary to the allegations set forth in the Complaint, South Shores Community Church is currently not violating any provision of the Federal Clean Water Act, the state’s Clean Water Act (Porter Cologne) or the NPDES permit under which South Shores Community Church has operated when it was constructed in 1992. In addition, installation of the BMPs as set forth in the attached photographs, complies with Regional Order R9-2009-0002 insofar as the City has now ensured that erosion and sedimentation control measures are installed such that the discharge of sediment is controlled, and does not cause or threaten to cause a condition of pollution, contamination, or nuisance into the receiving water.

In addition, it should be acknowledged that the South Shores Community Church Modernization Project will be subject to the NPDES permit requirements including Model Water Quality Management Plan and Hydromodification Management Plan requirements that became effective in December 2013. The storm water water quality treatment and detention features will be designed in accordance with more strict on-site treatment requirements that will actually improve the water quality coming off the South Shores Church property. Thus, the South Shores Community Church Modernization Project will, in fact, reduce the amount of sedimentation (if any) that flows off-site and will, in fact, improve water quality consistent with state and Federal law. Thus, the allegations contained in the Complaint, aimed at South Shores Church, are simply inaccurate; South Shores Community Church is not in violation of applicable Regional Board permits.

This memorandum and the incorporated attachments will be included as part of the Final EIR and Response to Comments, and which will be reviewed by the Regional Board for their follow-up comments (if any) to the extent this memorandum does not accurately reflect the status of the joint investigation that occurred in connection with the Complaint.

We look forward to answering any questions that the City decision-makers or members of the public may have regarding this issue as this project proceeds to public hearings in the months ahead.

EXHIBIT A

From: [Walsh, Laurie@Waterboards](mailto:Walsh.Laurie@Waterboards)
To: [Roger Butow \(rogerbutow@me.com\)](mailto:Roger.Butow(rogerbutow@me.com))
Cc: [Becker, Eric@Waterboards](mailto:Becker.Eric@Waterboards); [LISA ZAWASKI](#); [BRAD FOWLER](#); [Barker, David@Waterboards](mailto:Barker.David@Waterboards)
Subject: San Diego Water Board response to request for review of erosion condition and South Shores Church project in the City of Dana Point
Date: Wednesday, November 05, 2014 11:34:19 AM

Roger,

In response to your October 8, 2014 request for further review of the South Shores Church development project and the conditions of erosion on the Makallon property we have the following information as discussed with you during a teleconference on Wednesday, November 5, 2014. On Wednesday October 22, 2014, the San Diego Water Board conducted a site visit of the area within the City of Dana Point including the South Shores Church property, undeveloped land owned by Makallon Monarch VI LLages LLC, the Monarch Bay Villas, and the trail along Salt Creek. Our findings are as follows:

Existing Development

Surface water flows through the Makallon property have caused and may continue to cause a condition of accelerated erosion. This condition of accelerated erosion has caused sedimentation and a discharge of sediment to the drain located next to the trail on property. The City of Dana Point reports the drain located next to the walking/bike trail is within private property and discharges directly to Salt Creek. Therefore, sediments are being discharged to the MS4 and the receiving water as a result of the erosion occurring on the Makallon (undeveloped) property. As Copermittees under the requirements of Order R9-2009-0002, the City of Dana Point is responsible for controlling discharges of sediment to its MS4 caused by the condition of accelerated erosion in this area. Order R9-2009-0002 prohibits discharges into and from the MS4 in a manner causing a condition of pollution, contamination, or nuisance. If the conditions causing erosion are caused by private parties within the City of Dana Point, it is the City's responsibility to determine the cause of the erosive conditions and use its legal authority to control the discharge of sediments (causing or threatening to cause a condition of pollution, contamination, or nuisance) to its MS4 and to Salt Creek. Measures to fix the basin on the private property such that it functions correctly to capture sediment and prevent it from being discharged is required.

The City of Dana Point provided photo documentation to the San Diego Water Board via email on 10/31/2014 and 11/3/2014 , documenting erosion control BMPs installed on the Makallon property to address conditions of accelerated erosion within the property and documenting sediment control BMPs near the discharge point located around the drain next to the walking/bike trail. Order R9-2009-0002 requires the City ensure erosion and sediment control measures be maintained such that the discharge of sediment (into its MS4) is controlled and does not *cause or threaten* to cause a condition of pollution, contamination, or nuisance in the receiving water. The City of Dana Point reports it is continuing to work with the private property owners of the Makallon Monarch property and the parcels around this property to develop a long range management plan to control erosion to prevent discharges of sediment that cause or threaten to cause a condition of pollution, contamination, or nuisance in the future.

Historical Land Development

The City of Dana Point reports that the most recent development improvements at the South Shores Church property were constructed in 1992. Water quality treatment and infiltration requirements were not included in MS4 permits until the third term storm water permit adopted in 2002 for Orange County. Consequently, the Church expansion project was not required to install water quality treatment or flow control BMPs as part of their 1992 development application process.

Future Land Development

The South Shores Church has recently applied for a development permit from the City of Dana Point. Order R9-2009-0002 requires the City to condition Priority Land Development Projects to retain runoff flows in accordance with Provision F.1.d.(4)(d) and implement treatment control BMPs sized in accordance with Provision F.1.d.(6)(a) of Order R9-2009-0002. The San Diego Water Board will work with the City to ensure that the South Shores Church Priority Development Project meets the flow control and treatment control requirements of Order R9-2009-0002 or subsequently updated requirements under Tentative Order R9-2015-0001, as applicable.

Laurie Walsh, PE

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