California Regional Water Quality Control Board

San Diego Region

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http:// www.waterboards.ca.gov/sandiego

May 20, 2010

Certified Mail – Return Receipt Requested
Article Number: 7009 1410 0002 2347 4374

Gary Johnson
Granite Construction
38000 Monroe Street
Indio, CA 92203

In reply, refer to:

Reg. Measure 332025
Place 657378
Party 397327

Dear Mr. Johnson:

Subject: **Amendment No. 2 to Clean Water Act Section 401 Water Quality Certification No. 06C-070 for the Rosemary's Mountain Quarry and State Route 76 Realignment Project**

The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) is amending the Rosemary's Mountain Quarry and State Route 76 Realignment project, Certification number 06C-070. The original certification with changes from amendments 1 and 2 is included as Attachment A. This second amendment to the Water Quality Certification has been requested by Granite Construction. The first amendment included revised (lessened) impacts to Waters of the U.S. and State and clarification regarding the types of 404 permits to be issued by the U.S. Army Corps of Engineers. Amendment number 1 is attached for reference as Attachment B.

Amendment number 2 proposes the substitution of some structural Best Management Practices (BMPs for storm water filtration) for higher efficacy and lower-cost. Product details are described in Attachments C and D. Amendment request number two specifically states:

1) Amend Section B, Item 2a (page 4) from "*One (1) catch basin with hydrodynamic solids filtration, CDS brand*" to "*One (1) catch basin with hydrodynamic solids filtration, CDS brand or equivalent.*"

2) Amend Section B, Item 2c (page 4) from "*One (1) oil/water separator, VortClarex brand. " to "One (1) oil/water separator, BioClean brand nutrient separating baffle box with Up Flow Media Filter utilizing BioMediaGreen.*"

3) Amend Section B, Item 2d (page 4) from "*One (1) media filter, StormFilter brand with either CSF Leaf brand media or MetalRx brand media" to "One (1) media filter, BioClean brand Nutrient Separating Baffle Box with Up Flow Media Filter utilizing BioMediaGreen.*"

Any petition for reconsideration of this Certification amendment must be filed with the State Water Resources Control Board within 30 days of certification action (23 CCR § 3867). If no petition is received, it will be assumed that Granite Construction has accepted and will comply with all conditions of the Certification. Failure to comply with all conditions of this Certification may result in enforcement actions against Granite Construction.

Changes (amendments 1 and 2) to the Water Quality Certification are shown as strikeout and bold-underlined font in the amended Water Quality Certification (Attachment A). Technical information provided by Granite Construction regarding the BMPs in support of amendment No. 2 is included as Attachments C and D.

In the subject line of any response, please include the requested "In reply refer to:" information located in the heading of this letter. For questions pertaining to the subject matter, please contact Mike Porter at (858) 467-2726 or mporter@waterboards.ca.gov.

Respectfully,

David W. Gibson
Executive Officer
San Diego Regional Water Quality Control Board

cc: See Attachment 2 in the Amended Certification No. 06C-070

Attachments:

A – Amended Water Quality Certification 06C-070, dated May 6, 2010.

B – Amendment Number 1, dated December 14, 2007.

C – BioClean Brand Technical Information, as provided by Granite Construction.

D – ConTech Brand Technical Information, as provided by Granite Construction.

ATTACHMENT A

AMENDED CERTIFICATION NO. 06C-070
ROSEMARY'S MOUNTAIN QUARRY AND STATE ROUTE 76 REALIGNMENT PROJECT

California Regional Water Quality Control Board

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Arnold Schwarzenegger
Governor

Action on Request
for
AMENDMENT No. 2
to
Clean Water Act section 401 Water Quality Certification
and
Waiver of Waste Discharge Requirements
for
Discharge of Dredged and/or Fill Materials

PROJECT: Rosemary's Mountain Quarry and
State Route 76 Realignment Project
AMENDMENT No. 2 to Certification No. 06C-070

APPLICANT: Mr. Gary Johnson
Granite Construction
38000 Monroe Street
Indio, CA 92203

WDID	9 000001506
CIWQS:	
Party No.	397327
Place No.	657378
Req. Measure. No.	332025

ACTION:

- ☐ Order for Low Impact Certification
- ☑ Order for Technically-conditioned Certification
- ☑ Enrollment in Order No. 2003-017 DWQ
- ☐ Order for Denial of Certification
- ☑ Waiver of Waste Discharge Requirements
- ☐ Enrollment in Isolated Waters Order No. 2004-004 DWQ

STANDARD CONDITIONS:

The following three standard conditions apply to all certification actions, except as noted under Condition 3 for denials (Action 3).

1. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to section 13330 of the California Water Code and section 3867 of Title 23 of the California Code of Regulations (23 CCR).

2. This certification action is not intended and must not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to 23 CCR subsection 3855(b) and the application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. The validity of any non-denial certification action (Actions 1 and 2) must be conditioned upon total payment of the full fee required under 23 CCR section 3833, unless otherwise stated in writing by the certifying agency.

ADDITIONAL CONDITIONS:

In addition to the three standard conditions, Granite Construction must satisfy the following:

A. GENERAL CONDITIONS

1. Granite Construction or subsequent owner(s)/operator(s) must fully comply with the engineering plans, specifications and technical reports submitted with this application for 401 Water Quality Certification **and amendments thereto**, as well as all subsequent submittals required as part of this certification.

2. Granite Construction or subsequent owner(s)/operator(s) must comply with the requirements of State Water Resources Control Board Water Quality Order No. 99-08-DWQ, the NPDES General Permit for Storm Water Discharges Associated with Construction Activity **and any subsequent renewals, as applicable**.

3. Granite Construction or subsequent owner(s)/operator(s) must comply with the requirements of State Water Resources Control Board Water Quality Order No. 97-03-DWQ, NPDES No. CAS000001 Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities excluding Construction Activities **and any subsequent renewals, as applicable**.

4. Granite Construction or subsequent owner(s)/operator(s) must comply with the requirements of State Water Resources Control Board Water Quality Order No. 99-06-DWQ, NPDES No. CAS000003, the NPDES Permit for Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans), July 1999.

5. Granite Construction must maintain a copy of this certification, the application, and supporting documentation at the project site at all times for review by site personnel and agencies.

6. Prior to the start of the project and annually thereafter, Granite Construction must educate all personnel on the requirements in this certification, pollution prevention measures, and spill response.

7. Granite Construction or subsequent owner(s)/operator(s) must permit the Board or its authorized representative at all times, upon presentation of credentials:

    a) Entry onto project premises, including all areas on which wetland fill or wetland mitigation is located or in which records are kept.

    b) Access to copy any records required to be kept under the terms and conditions of this certification.

    c) Inspection of any treatment equipment, monitoring equipment, or monitoring method required by this certification.

    d) Sampling of any discharge or surface water covered by this Order.

8. Granite Construction or subsequent owner(s)/operator(s) must notify the California Regional Water Quality Control Board San Diego Region (Regional Board) within 24 hours of any unauthorized discharge to waters of the U.S. and/or State; measures that were implemented to stop and contain the discharge; measures implemented to clean-up the discharge; the volume and type of materials discharged and recovered; and additional BMPs or other measures that will be implemented to prevent future discharges.

9. Granite Construction or subsequent owner(s)/operator(s) must, at all times, maintain appropriate types and sufficient quantities of materials onsite to contain any spill or inadvertent release of materials that may cause a condition of pollution or nuisance if the materials reached a waters of the U.S. and/or State.

10. This Certification is not transferable to any person(s) except after notice to the Executive Officer of the Regional Board. The applicant must submit this notice in writing at least 30 days in advance of any proposed transfer. The notice must include a written agreement between the existing and new owner(s) containing a specific date for the transfer of this Certification's responsibility and coverage between the current discharger and the new discharger(s). This agreement must include an acknowledgement that the existing owner is liable for compliance and violations up to the transfer date and that the new owner(s)/operator(s) is/are liable from the transfer date on.

11. In the event of any violation or threatened violation of the conditions of this certification, the violation or threatened violation must be subject to any remedies, penalties, process or sanctions as provided for under state law. For purposes of section 401(d) of the Clean Water Act, the applicability of any state law authorizing remedies, penalties, process or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with *the water quality standards and other pertinent requirements incorporated into* this certification.

12. In response to a suspected violation of any condition of this certification, the Regional Board may require the holder of any permit or license subject to this certification to furnish, under penalty of perjury, any technical or monitoring reports the Regional Board deems appropriate, provided that the burden, including costs, of the reports must be a reasonable relationship to the need for *the reports and the benefits to be obtained from the reports.*

13. In response to any violation of the conditions of this certification, the Regional Board may add to or modify the conditions of this certification as appropriate to ensure compliance.

B. Post Construction Storm Water Management

1. All of the elements of the Industrial Storm Water Pollution Prevention Plan (SWPPP) for the Rosemary's Mountain Quarry, dated April 2006, written by Cherry Engineering, and referenced in Appendix I in support of the application must be implemented and maintained by Granite Construction or subsequent owner(s)/operator(s) of the Rosemary's Mountain Quarry and State Route 76 Realignment Project development.

2. *Post-construction* Best Management Practices (BMPs) *proposed by Granite* must be implemented and maintained by Granite Construction or subsequent owner(s)/operator(s) of the quarry and batch plant. These BMPs are in hydraulic series as in the following, bulleted section:

   ~~a) One (1) catch basin with hydrodynamic solids filtration, CDS brand.~~

   a) One (1) catch basin with hydrodynamic solids filtration, CDS brand or equivalent.

   b) One (1) concrete lined desiltation basin.

   ~~c) One (1) oil/water separator, VortClarex brand.~~

   c) One (1) oil/water separator, BioClean brand nutrient separating baffle box with Up Flow Media Filter utilizing BioMediaGreen.

~~d) One (1) media filter, StormFilter brand with either CSF Leaf brand media or MetalRx brand media.~~

d) <u>One (1) media filter, BioClean brand Nutrient Separating Baffle Box with Up Flow Media Filter utilizing BioMediaGreen.</u>

3. Post-construction BMPs for SR 76 runoff proposed by Caltrans through Granite Construction's Application for Water Quality Certification must be implemented and maintained as proposed. These BMPs are bioswales that parallel SR 76 and are located within the Caltrans Right-of-Way.

4. In addition to the BMPs described in <u>Industrial Storm Water Pollution Prevention Plan (SWPPP) for the Rosemary's Mountain Quarry</u>, dated April 2006, written by Cherry Engineering, and referenced in Appendix I in support of the application, the structural BMPs must be sized to comply with the following numeric sizing criteria:

<u>Volume</u>

Volume-based BMPs must be designed to mitigate (infiltrate, filter, or treat) either:

i. The volume of runoff produced from a 24-hour 85th percentile storm event, as determined from the local historical rainfall record (0.6 inch approximate average for the San Diego County area); or

ii. The volume of runoff produced by the 85th percentile 24-hour rainfall event, determined as the maximum captured storm water volume for the area, from the formula recommended in <u>Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998)</u>; or

iii. The volume of annual runoff based on unit basin storage volume, to achieve 90% or more volume treatment by the method recommended in <u>California Stormwater Best Management Practices Handbook – Industrial/Commercial, (1993)</u>; or

iv. The volume of runoff, as determined from the local historical rainfall record, that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85th percentile 24-hour runoff event; or

<u>Flow</u>

Flow-based BMPs must be designed to mitigate (infiltrate, filter, or treat) either:

i. The maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour; or

ii. The maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two; or

iii. The maximum flow rate of runoff, as determined from the local historical rainfall record, that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85th percentile hourly rainfall intensity multiplied by a factor of two.

5. Post-construction BMPs must be installed and functional prior to occupancy and/or planned use of development areas.

6. Granite Construction, their designated party, or other parties that assume future transferred liability under this Certification, must inspect and maintain post-construction structural BMPs per the manufacturers' specifications and/or engineering design specifications. An inspection and maintenance log must be maintained for review by germane agencies. Copies of the inspection and maintenance log must be provided to the Regional Board upon request.

7. Before occupancy, Granite Construction, their designated party or the successor owners/operators of the Rosemary's Mountain Quarry and State Route 76 Realignment Project development, must submit a letter to the Regional Board and the County of San Diego describing where the post-construction inspection and maintenance log will be kept. Failure to maintain a post-construction inspection and maintenance log will be a violation of this Certification.

C. MITIGATION

1. Compensatory mitigation for the proposed ~~1.8-acres / 1,470-linear feet of~~ permanent impacts to ~~(1.6~~ **0.42**-acres / 1,020-linear feet of vegetated waters of the U.S. and State, ~~and~~ **permanent impacts to** 0.2-acre / 450-linear feet of unvegetated and isolated waters of the State, **permanent impacts to 1.18-acres / 1,020-linear feet of vegetated waters of the State~~)~~, temporary impacts to 0.07-acre / 30-linear feet of vegetated waters of the U.S and State, and 0.1-acre / 175-linear feet of vegetated waters of the State** must be achieved at a **an overall** ratio of **8.29:1** ~~9.33:1~~, by the creation of 1.6-acres, restoration of 3.4-acres, and the enhancement of 11.5-acres of wetland waters of the U.S. The proposed mitigation, monitoring and maintenance must be implemented as described in the Conceptual Mitigation Plan for the Rosemary's Mountain Quarry and State Route 76 Realignment Project, Pala, CA, prepared by Mooney · Jones & Stokes, and dated June 2006.

2. Within 90 days of the issuance of this certification, Granite Construction must provide a draft preservation mechanism (e.g. deed restriction, conservation easement, etc.) that will protect all mitigation areas and their buffers in perpetuity. The conservation easement or other legal limitation on the mitigation property must be adequate to demonstrate that the site will be maintained without future development or encroachment on the site which could otherwise

reduce the functions and values of the site for the variety of beneficial uses of waters of the U.S. that it supports. The conservation easement or other appropriate legal limitation must prohibit, without exception, all residential, commercial, industrial, institutional, and transportation development, and any other infrastructure development that would not maintain or enhance the wetland functions and values of the site. Other infrastructure development to be prohibited includes, but is not limited to, additional utility lines, paved maintenance roads, and areas of maintained landscaping for recreation. The Granite Construction must submit proof of a completed preservation mechanism within one year of issuance of this certification.

3. Granite Construction must submit a report (including topography maps and planting locations) to the Regional Board within 90 days of completion of mitigation site preparation and planting, describing as-built status of the mitigation project. If the site grading and planting are not completed within six weeks of each other, separate reports will be submitted describing those specific as-built conditions.

4. The construction of proposed mitigation must be completed within the same calendar year as impacts occur, or at least no later than 9 months following the close of the calendar year in which impacts first occur (e.g., if impacts occur in June 2003, construction of mitigation for all impacts must be completed no later than September 2004). Delays in implementing mitigation must result in an increased mitigation ratio by 1.0 acre for each acre of impact for each year, or part thereof, of delay.

5. Mitigation areas must be maintained free of perennial exotic plant species including, but not limited to, pampas grass, giant reed, tamarisk, sweet fennel, tree tobacco, castor bean, and pepper tree. Annual exotic plant species must not occupy more than 5 percent of the onsite or offsite mitigation areas.

6. If at any time during the implementation and establishment of the mitigation area(s), and prior to verification of meeting success criteria, a catastrophic natural event (e.g., fire, flood) occurs and impacts the mitigation area, Granite Construction, is responsible for repair and replanting of the damaged area(s).

7. Mitigation monitoring reports must be submitted annually until mitigation has been deemed successful by the Regional Board. Monitoring reports must be submitted no later than 30 days following the end of the monitoring period. Monitoring reports must include, but not be limited to, the following:

    a) Names, qualifications, and affiliations of the persons contributing to the report;

    b) Tables presenting the raw data collected in the field as well an analyses of the physical and biological data;

c) Qualitative and quantitative comparisons of current mitigation conditions with pre-construction conditions and previous mitigation monitoring results;

d) Photodocumentation from established reference points;

e) Survey report documenting boundaries of mitigation area; and

f) Other items specified in the draft and final Wetland and Riparian Mitigation and Monitoring Plan.

8. For the purpose of determining mitigation credit for the removal of exotic/invasive plant species, only the actual area occupied by exotic/invasive plant species must be quantified to comply with mitigation requirements.

9. For purposes of this certification, creation is defined as the creation of vegetated or unvegetated waters of the U.S. where they have never been documented or known to occur (e.g., conversion of nonnative grassland to freshwater marsh). Restoration is defined as the creation of waters of the U.S. where they previously occurred (e.g., removal of fill material to restore a drainage). Enhancement is defined as modifying existing waters of the U.S. to enhance functions and values (e.g., removal of exotic plant species from jurisdictional areas and replacing with native species).

D. Stream Photo Documentation Procedure

Granite Construction must conduct photo documentation of the project site and mitigation areas, including all areas of permanent and temporary impact, prior to and after project construction. Photo documentation must be conducted in accordance with the State Water Resources Control Board Standard Operating Procedure 4.2.1.4: Stream Photo Documentation Procedure, included as Attachment 6. In addition, photo documentation must include Geographic Positioning System (GPS) coordinates for each of the photo points referenced. The Granite Construction must submit this information in a photo documentation report to the Regional Board with the Mitigation Maintenance and Monitoring reports. The report must include a compact disc that contains digital files of all the photos (jpeg file type or similar).

E. Post-construction Best Management Practices Photo Documentation Procedure

Granite Construction must conduct photo documentation of implemented post-construction BMPs. Photo-documentation must be modeled after the State Water Resources Control Board Standard Operating Procedure 4.2.1.4: Stream Photo Documentation Procedure, included as Attachment 6. In addition, photo documentation must include Global Positioning System (GPS) coordinates for each of the photo points referenced. Granite Construction must submit this information in a photo documentation report to the Regional Board with the Mitigation Maintenance and Monitoring reports. The report must include a compact disc that contains digital files of all the photos (jpeg file type or similar).

F. Geographic Information System Reporting

Granite Construction must submit Geographic Information System (GIS) shape files of the impact and mitigation areas within 30 days of project impacts and the mitigation areas within 30 days of mitigation installation. All impact and mitigation areas shapefiles must be polygons. Two GPS readings (points) must be taken on each line of the polygon and the polygon must have a minimum of 10 points. GIS metadata must also be submitted.

G. Reporting

1. All information requested in this Certification is pursuant to California Water Code (CWC) section 13267. Pursuant to CWC section 13268, a civil liability may be administratively imposed by the Regional Board for failure to furnish requested information.

2. All applications, reports, or information must be submitted to:

   Executive Officer
   California Regional Water Quality Control Board
   San Diego Region
   Attn: 401 Certification No. 06C-070, Central Watershed Unit
   9174 Sky Park Court, Suite 100
   San Diego, California 92123

H. SIGNATORY REQUIREMENT

1. All applications, reports, or information submitted to the Regional Board must be signed as follows:

    a) For a corporation, by a responsible corporate officer of at least the level of vice president.
    b) For a partnership or sole proprietorship, by a general partner or proprietor, respectively.
    c) For a municipality, or a state, federal, or other public agency, by either a principal executive officer or ranking elected official.

2. A duly authorized representative of a person designated in Items 1.a. through 1.c. above may sign documents if:

    a) The authorization is made in writing by a person described in Items 1.a. through 1.c. above.
    b) The authorization specifies either an individual or position having responsibility for the overall operation of the regulated activity.
    c) The written authorization is submitted to the Regional Board Executive Officer.

3. All applications, reports, or information submitted to the Regional Board Executive Officer must be certified as follows:

    "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

PUBLIC NOTIFICATION OF PROJECT APPLICATION:

On July 12, 2006 receipt of the project application was posted on the San Diego Water Board web site to serve as appropriate notification to the public. The second amendment request was posted on the San Diego Water Board website on March 18, 2010 and no comments were received from the public.

REGIONAL WATER QUALITY CONTROL BOARD CONTACT PERSON:

Mike Porter
California Regional Water Quality Control Board, San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123
858-467-2726
mporter@waterboards.ca.gov

WATER QUALITY CERTIFICATION:

I hereby certify that the proposed discharge from the **Rosemary's Mountain Quarry - State Route 76 Realignment Project** (Certification No. 06C-070) will comply with the applicable provisions of sections 301 ("Effluent Limitations"), 302 ("Water Quality Related Effluent Limitations"), 303 ("Water Quality Standards and Implementation Plans"), 306 ("National Standards of Performance"), and 307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. This discharge is also regulated under California Regional Water Quality Control Board, San Diego Region, Waiver of Waste Discharge Requirements (Waiver Policy) No. 17, and State Water Resource Control Board Order No. **2003-017** DWQ. Please note that this waiver is conditional and, should new information come to our attention that indicates a water quality problem, the regional Board may issue waste discharge requirements at that time.

Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the applicants' project description and/or on the attached Project Information Sheet, and (b) on compliance with all applicable requirements of the Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan).

David W. Gibson
Executive Officer
Regional Water Quality Control Board

5-20-2010
Date

Attachments:
1. Project Information
2. Distribution List

ATTACHMENT 1
PROJECT INFORMATION

Applicant:	Mr. Gary Johnson Granite Construction 38000 Monroe Street Indio, California 92203 Telephone: 760-775-7500 Facsimile: 760-775-8229 E-mail: Gary.Johnson@gcinc.com
Applicant Representatives:	Mooney · Jones & Stokes Attention: Mr. Ted Lee 9903 Businesspark Avenue San Diego, CA 92131 Telephone: 858-578-8964 Facsimile: 858-578-0573 E-mail: tlee@jsanet.com
Project Name:	Rosemary's Mountain Quarry / State Route 76 Realignment Project
Project Location:	The project site is located in the north-eastern unincorporated San Diego County within the community of Pala, approximately 1 ¼ miles east of I-15. The center of the project is located approximately at latitude 33° 20' 35" north, longitude 117° 8' 33" west. Assessor's Parcel Numbers are 12506106 and 10812210 (quarry parcel numbering).
Type of Project:	Quarry asphalt batch plant development, and highway realignment.
Project Description:	The project involves the construction of a hard rock mine and asphalt batch plant. An estimated 22 million tons of aggregate will be mined and processed for approximately 20 years. The aggregate processing will be dry – no washing. The project will also realign and widen 1¼ miles of State Route (SR) -76 from two lanes to four. The realignment will straighten existing sharp curves for improved traffic safety.
Federal Agency/Permit:	Army Corps of Engineers, Clean Water Act section 404, ~~Individual Permit~~ **Nationwide Permits 14 and 39** – Stephanie Hall.
Other Required Regulatory Approvals:	California Department of Fish and Game, Streambed Alteration Agreement – Tamara Spear

California Environmental Quality Act (CEQA) Compliance:	Final Environmental Impact Report for the Palomar Aggregates Quarry, March 5, 1997; State Clearing House No. 91081061.
Receiving Water:	San Luis River and Horse Ranch Creek. San Luis Rey hydrologic unit, Lower San Luis hydrologic area, Mission hydrologic sub area 903.11.
Impacted Waters of the United States and State:	Permanent impacts of ~~1.6-acres~~ **1.18-acres** (1,020-linear feet) of vegetated waters of the ~~U.S. and~~ State, ~~and~~ 0.2-acre (450-linear feet) of unvegetated, isolated waters of the State, **and 0.42-acre (1020-feet) of vegetated waters of the State and U.S.** Combined **permanent** impacts total 1.8-acres (1,470-linear feet). **Temporary impacts of 0.07-acre (30-linear feet) of vegetated waters of the U.S. and State, and 0.12-acre (175-linear feet) of vegetated waters of the State. Combined temporary impacts total 0.19-acre and 205-linear feet, but are contained within the permanent impact areas.**
Dredge Volume:	None
Related Projects Implemented/to be Implemented by the Applicant(s):	The applicant has not identified any related projects at this time.
Compensatory Mitigation:	Compensatory mitigation has been proposed by the creation of 1.6 –acres, restoration of 3.4-acres, and the enhancement of 11.5-acres of wetland waters of the U.S. The overall mitigation ratio is 9.33:1. The proposed mitigation, monitoring and maintenance is proposed in the Conceptual Mitigation Plan for the Rosemary's Mountain Quarry and State Route 76 Realignment Project, Pala, CA, prepared by Mooney · Jones & Stokes and dated June 2006.
Best Management Practices (BMPs):	QUARRY AND ASPHALT BATCH PLANT OPERATION

The Industrial Storm Water Pollution Prevention Plan (SWPPP) for the Rosemary's Mountain Quarry, dated April 2006 and prepared by Cherry Engineering proposes post-construction BMPs.

Construction Phase –

This project is subject to the General Storm Water Permit for Construction Activity (SWRCB Order 99-08). The Storm Water Pollution Prevention Plan proposes standard construction structural and non-structural Best Management Practices (BMPs). Some of these BMPs include designation of specific areas for vehicle maintenance, waste containment and equipment and materials storage. In addition, erosion control measures such as bonded fiber matrix, fiber rolls, silt fencing, mulch and gravel bags, and stabilized construction entrances will be used to prevent sediment pollution.

Post-Construction Phase –

This project is subject to the SUSMP provision from the San Diego Municipal Storm Water Permit (RWQCB Order 2001-001) and will be required and enforced by the County of San Diego.

The water quality technical report proposes treatment control BMPs to prevent and treat post-construction storm water and non-storm water runoff. Treatment control BMPs are hydraulically in-line and include:

~~1) One (1) catch basin with hydrodynamic solids filtration, CDS brand.~~

1) One (1) catch basin with hydrodynamic solids filtration, CDS brand or equivalent.

2) One (1) concrete lined desiltation basin.

~~3) One (1) oil/water separator, VortClarex brand.~~

3) One (1) oil/water separator, BioClean brand nutrient separating baffle box with Up Flow Media Filter utilizing BioMediaGreen.

~~4) One (1) media filter, StormFilter brand with either CSF Leaf brand media or MetalRx brand media.~~

4) **One (1) media filter, BioClean brand Nutrient Separating Baffle Box with Up Flow Media Filter utilizing BioMediaGreen.**

The project is also subject to the requirements of State Water Resources Control Board Water Quality Order No. 97-03-DWQ, NPDES No. CAS000001 Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities excluding Construction Activities**, and any subsequent revisions thereto.** This order requires BMPs and monitoring.

STATE ROUTE 76 WIDENING

Construction and Post-Construction Phases -

The realignment and operation of State Route 76 is subject to the Permit for Storm Water Discharges from the State of California, Department of Transportation Properties, Facilities and Activities (State Board Oder No. 99-06-DWQ). This Order requires the use of construction and post-construction BMPs. Runoff from the reconstructed sections of SR-76 will be treated with biostrips and bioswales.

Public Notice: July 12, 2006

Second Public Notice: **March 18, 2010**

Fees:

Total Due: $10,100.00
Total Paid: $500.00 (Check No. 2478709)
$9,600.00 (Check No. 02602327)

Amendment fee: $640.00 (Check No. 02845360)

List of Submitted Documents:

1. Final Environmental Impact Report for the Palomar Aggregates Quarry (P87-201, RP87-001, Log No. 87-2-13) {Volumes I, II, III}.

2. Geotechnical Design Report State Route 76 Realignment.

3. Drainage Report – State Route 76 Widening and Realignment from Interstate 15 to 2.3 km East, San Diego County.

4. Hydraulic and Scour Report – State Route 76 Widening and Realignment from Interstate 15 to 3.9 km East, San Diego County.

5. Supplemental Hydraulic and Scour Report and Hydromodification Analysis – Rosemary's Mountain Quarry / State Route 76 Widening and Realignment Project, San Diego County.

6. Storm Water Data Report State Route 76 Widening I-15 to 3.9 km East, San Diego, California.

7. ENVIREPEL Energy Building Preliminary Hydraulic Report.

8. Reclamation Plan (Compliance with Section 2772 of the Surface Mining and Reclamation Act of 1975) for Palomar Aggregates Quarry 9P87-021, RP87-001, Log#87-2-13) including the Preliminary Geotechnical Investigation for Palomar Aggregates Quarry Site.

9. County of San Diego Planning Report, Subject: Palomar Aggregates, Inc., Mining and Processing Facility (Rosemary's Mountain); Major Use Permit P87-021RPL^2 and Reclamation Plan RP 87-001RPL^2, Fallbrook Community Planning Area (District: 5).

10. State Route 76 Realignment Draft Study Project Study Report.

11. Combined Project Study Report/Project Report, Widening and Realignment of State Route 76 in San Diego County, at Fallbrook 0.2KM East of SR76/I-15 Separation to 0.5KM East of Couser Canyon Road.

12. Preliminary Geotechnical Evaluation for Power Plant and Private School Site, Bonsall Area, California.

13. Geologic Materials Report Rosemary's Mtn. Quarry T9S; R3W; SE ¼ of S36 T10S; R3W; NE ¼ of S1 Highway 76 San Diego County, California.

14. State Route 76 Project – Bio-Hydrological Report.

15. Biological Assessment for the Rosemary's Mountain Quarry Project.

16. Jurisdictional Delineation for the Rosemary's Mountain Quarry and SR-76 Road Widening Project San Diego County, California.

17. Industrial Storm Water Pollution Prevention Plan (SWPPP) for the Rosemary's Mountain Quarry.

18. Conceptual Mitigation Plan for the Rosemary's Mountain Quarry and State Route 76 Realignment Project, Pala, California.

ATTACHMENT 2
DISTRIBUTION LIST

Mr. Chris Kiser,
Plant Engineer
Granite Construction
38000 Monroe Street
Indio, CA 92203

Ms. Stephanie Hall
U.S. Army Corps of Engineers - Los Angeles District
Regulatory Branch
915 Wilshire Blvd.
Los Angeles, CA 90017

Ms. Tamara Spear
California Department of Fish and Game
South Coast Region
Habitat Conservation Planning – South
4949 Viewridge Avenue
San Diego, CA 92123

U.S. Department of the Interior
Fish and Wildlife Service
6010 Hidden Valley Road
Carlsbad, CA 92011

Mr. Eric Raffini
Wetlands Regulatory Office
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105
R9-WTR8-Mailbox@epa.gov

State Water Resources Control Board
Division of Water Quality
401 Water Quality Certification and Wetlands Unit
P.O. Box 100
Sacramento, CA 95812-0100
Stateboard401@waterboards.ca.gov

ATTACHMENT B

AMENDMENT NUMBER 1,
DATED DECEMBER 14, 2007

California Regional Water Quality Control Board

San Diego Region

Internet Address: http://www.swrcb.ca.gov/rwqcb9/
9174 Sky Park Court, Suite 100, San Diego, California 92123-4340
Phone (858) 467-2952 • FAX (858) 571-6972

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

December 14, 2007

In reply, refer to:
WPS:MGP:18-2006070.02

Mr. Gary Johnson
Granite Construction
38000 Monroe Street
Indio, CA 92203

WDID	9 000001506
CIWQS:	
Party No.	397327
Place No.	657378
Reg. Measure. No.	332025

RE: ROSEMARY'S MOUNTAIN QUARRY AND STATE ROUTE 76 REALIGNMENT PROJECT CERTIFICATION NO. 06C-070 AMENDMENT #1

Dear Mr. Johnson:

The purpose of this letter is to amend language of Rosemary's Mountain Quarry and State Route 76 Realignment Project Certification No. 06C-070. This amendment, requested by your consultant (Mooney · Jones & Stokes) in an E-mail dated November 28, 2007 (enclosed), contains revisions to the Water Quality Certification to correct the type of Army Corps of Engineers permit being sought and impact amounts.

Revisions to the Certification are shown in strikeout and underline fonts below.

ADDITIONAL CONDITIONS

C. MITIGATION

1. Compensatory mitigation for the proposed ~~1.8-acres / 1,470 linear feet of~~ permanent impacts <u>to</u> ~~(1.6~~ <u>0.42</u>-acres / 1,020-linear feet of vegetated waters of the U.S. and State, ~~and~~ <u>permanent impacts to</u> 0.2-acre / 450-linear feet of unvegetated <u>and isolated</u> waters of the State, <u>permanent impacts to 1.18-acres / 1,020-linear feet of vegetated waters of the State</u>~~)~~, <u>temporary impacts to 0.07-acre / 30-linear feet of vegetated waters of the U.S and State, and 0.1-acre / 175-linear feet of vegetated waters of the State</u> must be achieved at ~~a~~ <u>an overall</u> ratio of <u>8.29:1</u> ~~9.33:1~~, by the creation of 1.6-acres, restoration of 3.4-acres, and the enhancement of 11.5-acres of wetland waters of the U.S. The proposed mitigation, monitoring and maintenance must be implemented as described in the <u>Conceptual Mitigation Plan for the Rosemary's Mountain Quarry and State Route 76 Realignment Project, Pala, CA</u>, prepared by Mooney · Jones & Stokes, and dated June 2006.

ATTACHMENT 1
PROJECT INFORMATION

Federal Agency/Permit:	Army Corps of Engineers, Clean Water Act section 404, ~~Individual Permit~~ Nationwide Permits 14 and 39 – Stephanie Hall.
Impacted Waters of the United States and State:	Permanent impacts of ~~1.6 acres~~ 1.18-acres (1,020-linear feet) of vegetated waters of the ~~U.S. and~~ State, ~~and~~ 0.2-acre (450-linear feet) of unvegetated, isolated waters of the State, and 0.42-acre (1020-feet) of vegetated waters of the State and U.S. Combined permanent impacts total 1.8-acres (1,470-linear feet). Temporary impacts of 0.07-acre (30-linear feet) of vegetated waters of the U.S. and State, and 0.12-acre (175-linear feet) of vegetated waters of the State. Combined temporary impacts total 0.19-acre and 205-linear feet, but are contained within the permanent impact areas.

A clean version of the revised text reads as follows:

ADDITIONAL CONDITIONS

C. MITIGATION

2. Compensatory mitigation for the proposed permanent impacts to 0.42-acres / 1,020-linear feet of vegetated waters of the U.S. and State, permanent impacts to 0.2-acre / 450-linear feet of unvegetated and isolated waters of the State, permanent impacts to 1.18-acres / 1,020-linear feet of vegetated waters of the State, temporary impacts to 0.07-acre / 30-linear feet of vegetated waters of the U.S and State, and 0.1-acre / 175-linear feet of vegetated waters of the State must be achieved at an overall ratio of 8.29:1 , by the creation of 1.6-acres, restoration of 3.4-acres, and the enhancement of 11.5-acres of wetland waters of the U.S. The proposed mitigation, monitoring and maintenance must be implemented as described in the Conceptual Mitigation Plan for the Rosemary's Mountain Quarry and State Route 76 Realignment Project, Pala, CA, prepared by Mooney · Jones & Stokes, and dated June 2006.

ATTACHMENT 1
PROJECT INFORMATION

Federal Agency/Permit:	Army Corps of Engineers, Clean Water Act section 404, Nationwide Permits 14 and 39 – Stephanie Hall.
Impacted Waters of the United States and State:	Permanent impacts of 1.18-acres (1,020-linear feet) of vegetated waters of the State, 0.2-acre (450-linear feet) of unvegetated, isolated waters of the State, and 0.42-acre (1020-feet) of vegetated waters of the State and U.S. Combined permanent impacts total 1.8-acres (1,470-linear feet). Temporary impacts of 0.07-acre (30-linear feet) of vegetated waters of the U.S. and State, and 0.12-acre (175-linear feet) of vegetated waters of the State. Combined temporary impacts total 0.19-acre and 205-linear feet, but are contained within the permanent impact areas.

The heading portion of this letter includes a Regional Board code number noted after "In reply refer to:" In order to assist us in the processing of your correspondence please include this code number in the heading or subject line portion of all correspondence and reports to the Regional Board pertaining to this matter. If you have any questions regarding this notification, please call Mike Porter directly at (858) 467-2726 or by email mporter@waterboards.ca.gov.

Respectfully,

for John H. Robertus
Executive Officer
San Diego Regional Water Quality Control Board

Enclosure: E-mail from Ted Lee, Jones & Stokes, dated November 28, 2007.

ATTACHMENT C

BIOCLEAN BRAND TECHNICAL INFORMATION

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

To Whom It May Concern,

The purpose of this letter is to provide a description of operation for the Bio Clean's Nutrient Separating Baffle Box with Up Flow Media Filter (utilizing BioMediaGREEN).

The Nutrient Separating Baffle Box and Up Flow Media Filter are contained within a *single concrete structure to minimize construction cost and maintenance cost*. Older technologies have to utilize multiple structures to achieve the same results. For example, most cartridge filter systems are not designed to provide pretreatment therefore an additional pretreatment system must be installed upstream.

The Nutrient Separating Baffle Box and BioMediaGREEN have both been rigorously tested in the field and laboratory.

NUTRIENT SEPARATING BAFFLE BOX (pretreatment)

- The Nutrient Separating Baffle Box (NSBB) has been used across the United States since 1996.
- Independent field testing has verified the NSBB removes 87% of TSS and 100% of oils & grease (City of Santa Monica).
- The system is comprised of three hydrodynamic separation chambers, a hydrocarbon weir, a BioSorb media cage that permanently absorbs hydrocarbons, a trash rack that prevents organics from leaching nutrients and chemicals into standing water. Note: this is the only system that separates organics.
- Verified by New Jersey Corporation of Advanced Technology. One of the best performing systems and one of only three proved to be effective at removing finer particles. It was also one of only three that proved not to scour.

UP FLOW MEDIA FILTER (utilizing BioMediaGREEN).

- Innovative up flow technology is proven to minimize clogging when compared to downward flow and horizontal flow systems.
- The pretreatment provided by the Nutrient Separating Baffle Box also minimizes clogging by removing TSS, organics, and oils & grease.
- The up flow filter utilizes a revolutionary BioMediaGREEN. This solid state media has 100 times the surface area of traditional granular media. This maximizes it ability to absorb dissolved pollutants. It also allows for the media matrix to retain more pollutants as its void percentage is 80%.
- Through lab and field testing the media is proven to remove very high percentages of the following: organics, TSS, oxygen demanding substances, hydrocarbons, heavy metals, nutrients, bacteria, and other substances.

P O Box 869 Oceanside CA 92049
(760) 433-7640 • Fax (760) 433-3176
www.BioCleanEnvironmental.net

In conclusion, BioMediaGREEN has proven to be an incredibly effective filter media for the treatment of polluted stormwater runoff. This media offers many additional advantages over traditional sorptive granular media.

This media has the ability to effectively remove pollutants associated with asphalt emulsion, thinning solutions, engine coolant and hydraulic fluid.

If you have any questions regarding the Nutrient Separating Baffle Box with Up Flow Filter or the information contained in this letter please fell free to contact me directly.

Sincerely,

Zach J Kent

Stormwater Engineer

zkent@biocleanenvironmental.net

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

To Whom It May Concern,

The purpose of this letter is to provide a description and list the benefits of a revolutionary filter media, BioMediaGREEN. This media has been used to treat and remove pollutants from stormwater runoff and other polluted water sources. Substantial field and laboratory testing has been done to prove the short and long term effectiveness of this media to remove TSS, particulate & dissolved metals, particulate & dissolved nutrients, hydrocarbons, turbidity, and pathogens.

Currently, Bio Clean Environmental is applying this revolutionary filter media to its current line of stormwater treatment systems (Bio Filters) to provide enhanced treatment. The BioMediaGREEN can be utilized in our line of catch basin filters, flume filters, trench drain filters, hydrodynamic separators, inline media filters, and biological filtration systems. Because the BioMediaGREEN is highly effective and inexpensive this enhancement can provide quality solutions in a feasible manner.

Physical Characteristics

This filter media is a porous medium filled with cavities of various forms in which the fluid is retained by the action of capillarity forces. It is made of millions of small fibers that are pressed into lightweight porous blocks. The small fibers are relatively rough compared to sand particles or other types of granular media. The materials apparent density varies between 40 and 100 kg/m3.

BioMediaGREEN has a rigid, 3-dimensional structure consisting of a network of interconnected tunnels and cages. Water moves freely in and out of these pores but the media framework remains rigid. Another special aspect of this structure is that the pore and channel sizes are nearly uniform, allowing the media fibers to act as a fine physical sieve. The solid form of the media makes it easy to work with when compared to granular media. Due to its highly porous structure, BioMediaGREEN is much less dense than sand or zeolites and therefore less BioMediaGREEN is needed by weight.

Since BioMediaGREEN is a bonded fibrous material, solid and suspended particles are trapped between the fibers. The porous structure also causes colloid particles from both organic and mineral origin to be removed from the water. The capacity for the removal of solid particles is up to 40% greater than the capacity of sand or granule media with an equivalent particle size distribution. Since BioMediaGREEN has a void area of 80% there is much more storage capacity between the fibers.

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(760) 433-7640 • Fax (760) 433-3176
www.BioCleanEnvironmental.net

Chemical Characteristics

The higher specific surface area of the finer particles improves adsorption capacity and substantially increases the contact time between the passing stormwater and the surface of the media. The composition of this media is similar to zeolites or other types of natural minerals that are mined in many parts of the world. The most important minerals are Silicon dioxide, aluminum oxide, calcium oxide, and magnesium oxide.

There are a number of different cations present in the stormwater, the adsorption capacity per ion will be lower as a consequence of competition between the different cations. The adsorption will depend on relative selectivity of BioMediaGREEN for the different ions, the composition of water and the temperature. The relative selectivity is determined by the hydrated diameter, the charge and the mobility of the ions. This property enables BioMediaGREEN to exchange harmful ions present in the water for harmless ions present in its structure.

BioMediaGREEN can adsorb organic substances. The material has the largest affinity for polar organics, for example hydrocarbons. Depending on the diameter of the molecules, these are either adsorbed in the micro pores.

Performance

Following is list of removal efficiencies from an independent third party:

- TSS – 85.35% (mean particle size 20 microns)
- Dissolved Phosphorus – 69.66%
- Dissolved Copper – 79.15%
- Dissolved Lead – 98.19%
- Dissolved Zinc – 78.22%
- Oils & Grease – 90.70%
- TPH – 99.99%
- Turbidity – 99.19%
- Fecal Coliform – 68.00%

Physical Specifications

- Density (kg/dm3) of BioMediaGREEN 0.046
- Porosity (%) of BioMediaGREEN 97.6
- Hydraulic Conductivity 0.00464 m/s = 400.896 m/d (test 1)
  Hydraulic Conductivity 363 m/d (test 2)

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www.BioCleanEnvironmental.net

Highlights

- Very low costs. The fact it is light weight minimizes shipping costs and it's carbon footprint.
- It is sterile, lightweight (when dry), convenient, and has excellent physical and chemical properties
- It has a high water-holding capacity (80 percent), and good aeration (17 percent air holding capacity)
- It has tremendous capacity for absorbing nutrients while retaining oxygen for aerobic conditions.
- BioMediaGREEN also contains mineral clay particles to assist in the removal of metals, hydrocarbons, and nutrients.

In conclusion, BioMediaGREEN has proven to be an incredibly effective filter media for the treatment of polluted stormwater runoff. This media offers many additional advantages over traditional sorptive granular media.

If you have any questions regarding BioMediaGREEN or the information contained in this letter please fell free to contact me directly.

Sincerely,

Zach J Kent

Stormwater Engineer

zkent@biocleanenvironmental.net

MODULAR WETLAND SYSTEMS - BioMediaGREEN (C)

MODULAR WETLANDS

FLOW RATES

HYDRAULIC CONDUCTIVITY
363 METERS/DAY*

MAXIMUM FLOW RATE - 6 INCHES OF HEAD
6.18 GPM/SQ FT*

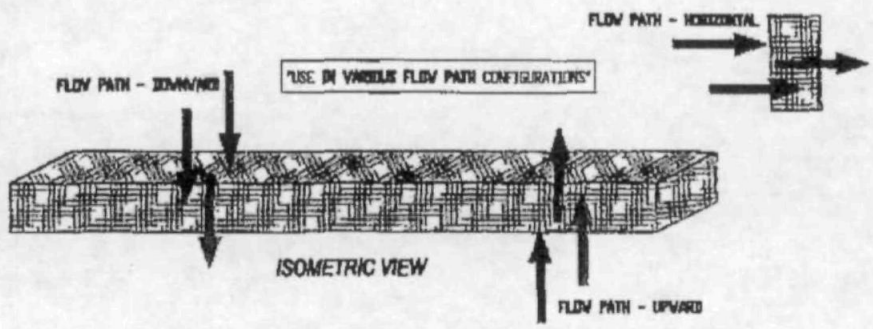
MAXIMUM FLOW RATE - 9 INCHES OF HEAD
12.4 GPM/SQ FT*

MAXIMUM FLOW RATE - 6 INCHES OF HEAD
18.5 GPM/SQ FT*

MAXIMUM FLOW RATE - 12 INCHES OF HEAD
30.9 GPM/SQ FT*

MAXIMUM FLOW RATE - 24 INCHES OF HEAD
55.6 GPM/SQ FT*

* Assumes Downward Flow
Upflow Flow Similar to Downward Flow (slower clogging)
Horizontal Flow Calculations - Please Consultant Manufacturer



SPECIFICATIONS

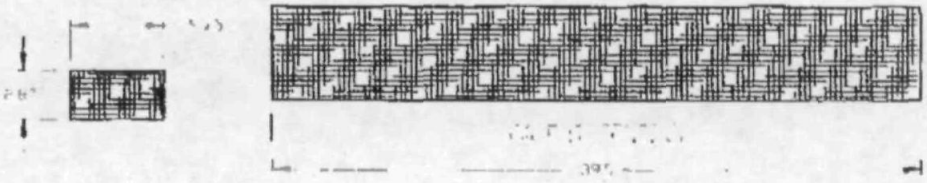
UNIT DIMENSIONS
39.5' x 5.75'

THICKNESS
2.89'

VOID SPACE
80% (by volume)

POLLUTANT REMOVAL PERFORMANCE

POLLUTANT	INFLUENT mg/L	EFFLUENT mg/L	REMOVAL %
TOTAL SUSPENDED SOLIDS (TSS)	84.6	12.1	85.4%
DISSOLVED PHOSPHORUS	2.07	.63	69.66%
ORTHO PHOSPHORUS	3.98	2.33	41.54%
DISSOLVED CADMIUM	.29	.19	52.15%
DISSOLVED COPPER	.37	.32	79.15%
DISSOLVED LEAD	.36	.01	98.19%
DISSOLVED ZINC	.79	.16	78.22%
DISSOLVED MERCURY	.007	.002	71.43%
OIL & GREASE	69.69	6.5	90.7%
TOTAL PETROLEUM HYDROCARBONS	1.4	0	100%
TURBIDITY @NTU	26	.22	99.15%
FECAL COLIFORM (MPN/100 mL)			66%



D.R.F. 9/29/08

3/17/2010

04/04/09

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

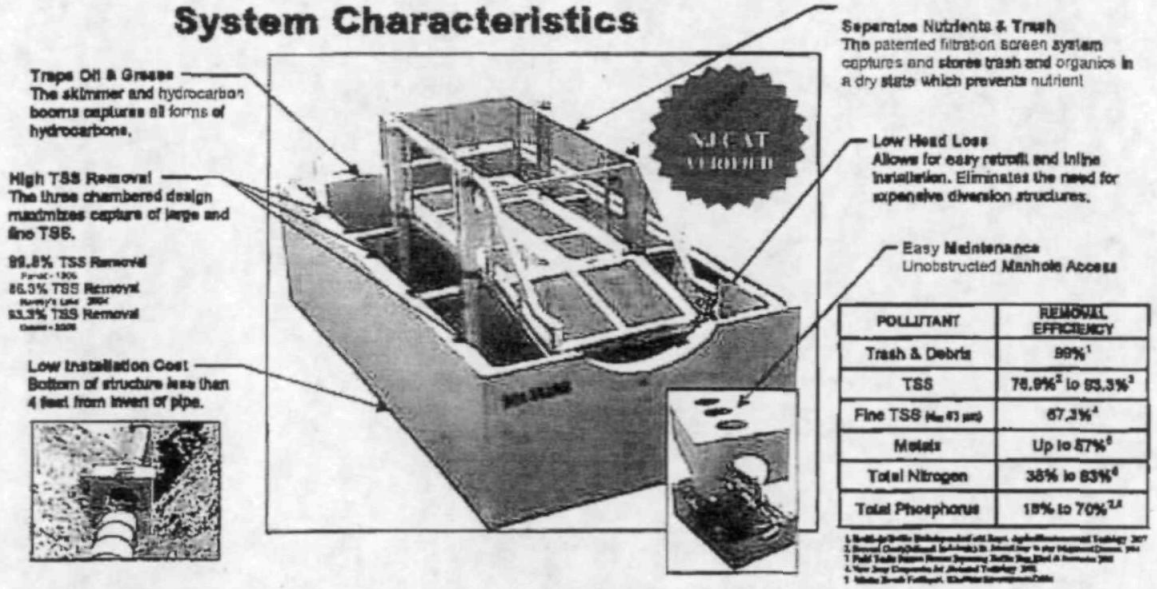
Nutrient Separating Baffle Box

A Superior Stormwater Treatment System Separated from the Rest.

The Nutrient Separating Baffle Box (NSBB) is a widely accepted and desired stormwater solution chosen by civil engineers, municipalities and developers nationwide because of its superior characteristics. The NSBB is easy to install and maintain and is the only systems with a two stage maintenance option, which minimizes maintenance costs.

Hundreds of Nutrient Separating Baffle Boxes have been installed nation wide, from Florida to California because of its superior and proven design. The NSBB efficiently removes TSS, hydrocarbons, nutrients, metals and debris/organics from stormwater runoff. The patented filtration screen system captures and stores trash and organics in a dry state, which prevents nutrient leaching and bacterial build up.

System Characteristics



POLLUTANT	REMOVAL EFFICIENCY
Trash & Debris	99%[1]
TSS	76.9%[2] to 83.3%[3]
Fine TSS (No 43 µm)	67.3%[4]
Metals	Up to 87%[5]
Total Nitrogen	38% to 83%[6]
Total Phosphorus	18% to 70%[7,8]

Setting a New Standard for Hydrodynamic Separators.

The Nutrient Separating Baffle Box is designed to do more than most systems. This system is effective at removing not only TSS, but also fine TSS and gross solids making it, overall, a more effective treatment system compared to traditional swirl type separators. This system has been proven to provide the following benefits:

System Benefits

- **Can Treat 100% of the Flow.**
  Offline Configuration is Not Required.
- **Inexpensive Maintenance.**
  Patented screen system allows gross solids to be removed without vacuuming out the water.
- **Minimal Head Loss.**
  Hydraulically efficient design generates less head loss than diversion structures.
- **Custom Designs Available.**
  Can be modified to meet your needs.
- **Easy to Install.**
  Delivered in a top & bottom half to minimize weight. Shallow profile minimizes installation costs.
- **5 Year Warranty.**
  Made of precast concrete, fiberglass, aluminum & stainless steel. No cheap plastics!

BIO CLEAN ENVIRONMENTAL SERVICES, INC.

P O Box 869, Oceanside, CA 92049
(760) 433-7640 • Fax (760) 433-3176
www.bioclean environmental.net

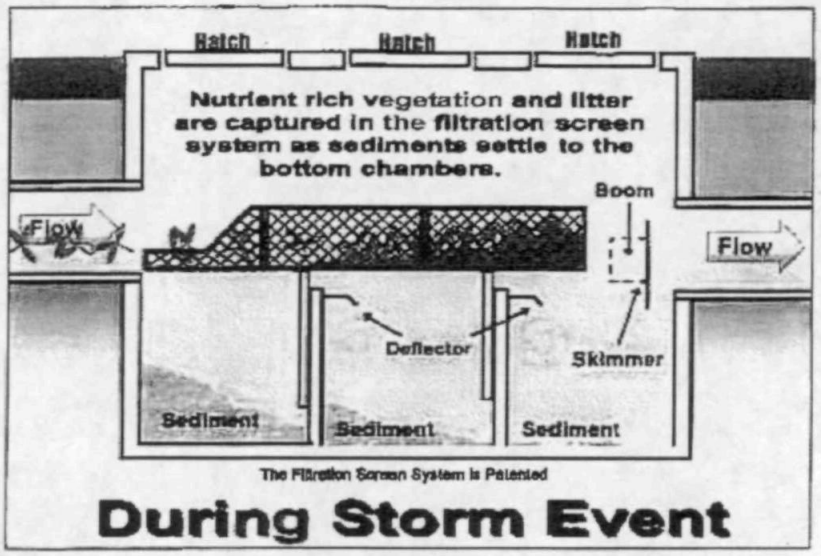
"The Stormwater Standard"

Functional Description

Captures:

- Trash & Debris D
- Oxygen Demanding Substances/Organic Compounds D
- Hydrocarbons, Oils & Grease
- TSS (including fines)
- Nutrients (particulates)
- Heavy Metals (particulates)

"Pollutants with this symbol D are stored in a dry state".



During Storm Event

Nutrient Separating Baffle Box

Standing Water is Clear & No Bacteria Growth Visible.

Other Systems

Standing Water is Not Clear & Bacteria Growth Visible.

After Storm Event

Operation:

Skimmer & Boom
Collects hydrocarbons & controls flow velocity which improves removal efficiency.

Deflectors
Prevents re-suspension of captured pollutants at higher flows by directing water currents above sediment chambers.

Filtration Screen System
Collects and stores trash, debris, organics, and oxygen demanding substances in a dry state above the standing water. As mentioned above this has many performance benefits along with simplifying maintenance

Multiple Sediment Chambers
Maximizes TSS removal and eliminates scouring during extreme flow rates.

BIO CLEAN ENVIRONMENTAL SERVICES, INC.

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www.biocleanenvironmental.net

"The Stormwater Standard"

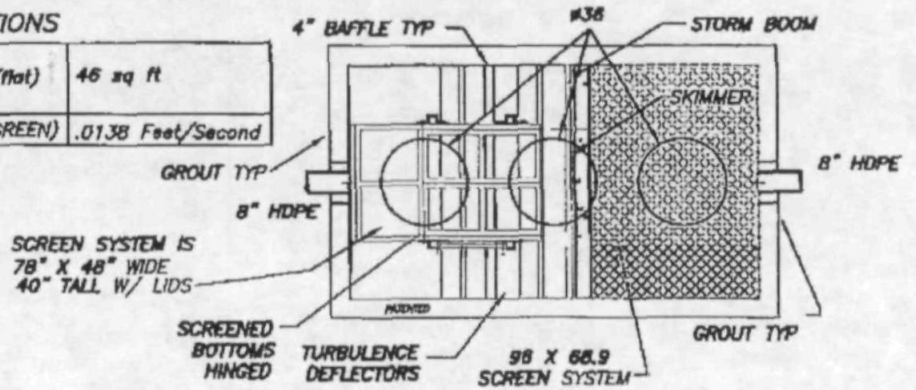
BIO CLEAN ENVIRONMENTAL

NSBB—WATER POLISHER—UP FLOW MEDIA FILTER 8—14—96

FILTER FLOW CALCULATIONS

UP FLOW Media Surface Area (flat)	46 sq ft
Hydraulic Conductivity (BioMediaGREEN)	.0138 Feet/Second

Available Head	21"
MAX Media Filter Flow Rate (no clogging)	5.07 CFS
Safety Factor	3.62
Media Filter Flow Rate (accounts for clogging)	1.4 CFS
PEAK DESIGN FLOW	TBD

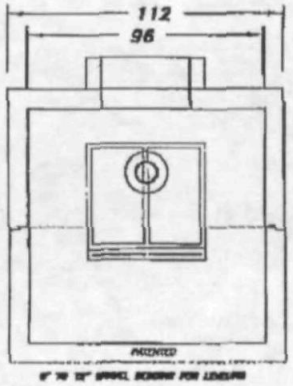


NOTES:

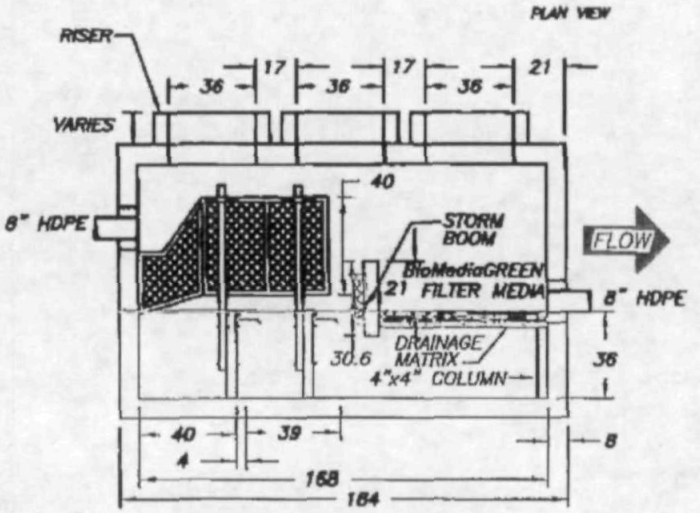
1. CONCRETE 28 DAY COMPRESSIVE STRENGTH fc=5,000 PSI.
2. REINFORCING:ASTM A-615, GRADE 60.
3. SUPPORTS AN H20 LOADING AS INDICATED BY AASHTO.
4. JOINT SEALANT: BUTYL RUBBER SS-S-00210
5. ALL WALLS, TOP + BOTTOM ARE 8" THICK.

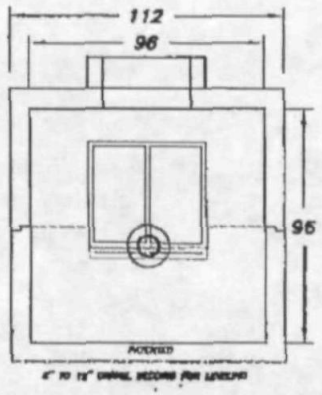
BIOMEDIA GREEN TESTED REMOVAL EFFICIENCIES

Total Suspended Solids "SIL-CO-SIL 106"	85%
Dissolved Phosphorus	69%
Fecal Coliform	68%
Dissolved Copper	79%
Dissolved Lead	98%
Dissolved Zinc	78%
Dissolved Mercury	71%
TPH	99%



LEFT END VIEW





RIGHT END VIEW

1. Complies with ASTM C 858
2. The shop drawings provide information on the storm filter, filter media, and accessory equipment including principle dimensions, filter placement, location of fittings and unit foundation.
3. This is a passive treatment system. Up flow vertical media filter.
4. Media cartridges easily replaceable and can incorporate a variety of filter media.
5. See manufacturers representative regarding recommendations for specific equipment.
6. Doors & Covers shall be hot-dipped galvanized frame and covers. Covers shall have diamond plate finish. These doors are equipped with recessed lift handle and a locking latch. The door shall meet H-20 loading requirements. Ladders shall be constructed of aluminum and steel reinforced copolymer conforming to ASTM D 4101. Ladder shall meet all ASTM C 497M. Steps shall conform with ASTM C 478.

THE STRUCTURE IN THIS DRAWING IS PRIMARILY INTENDED TO BE INSTALLED IN OFF ROAD LOCATIONS WITH LESS THAN 5' OF COVER. STRUCTURES ARE READILY AVAILABLE FOR ALL OTHER CONDITIONS. CONSULT SUNTREE TECHNOLOGIES' REPRESENTATIVE FOR DETAILS.

PATENTED

Email: info@bioclean environmental.net

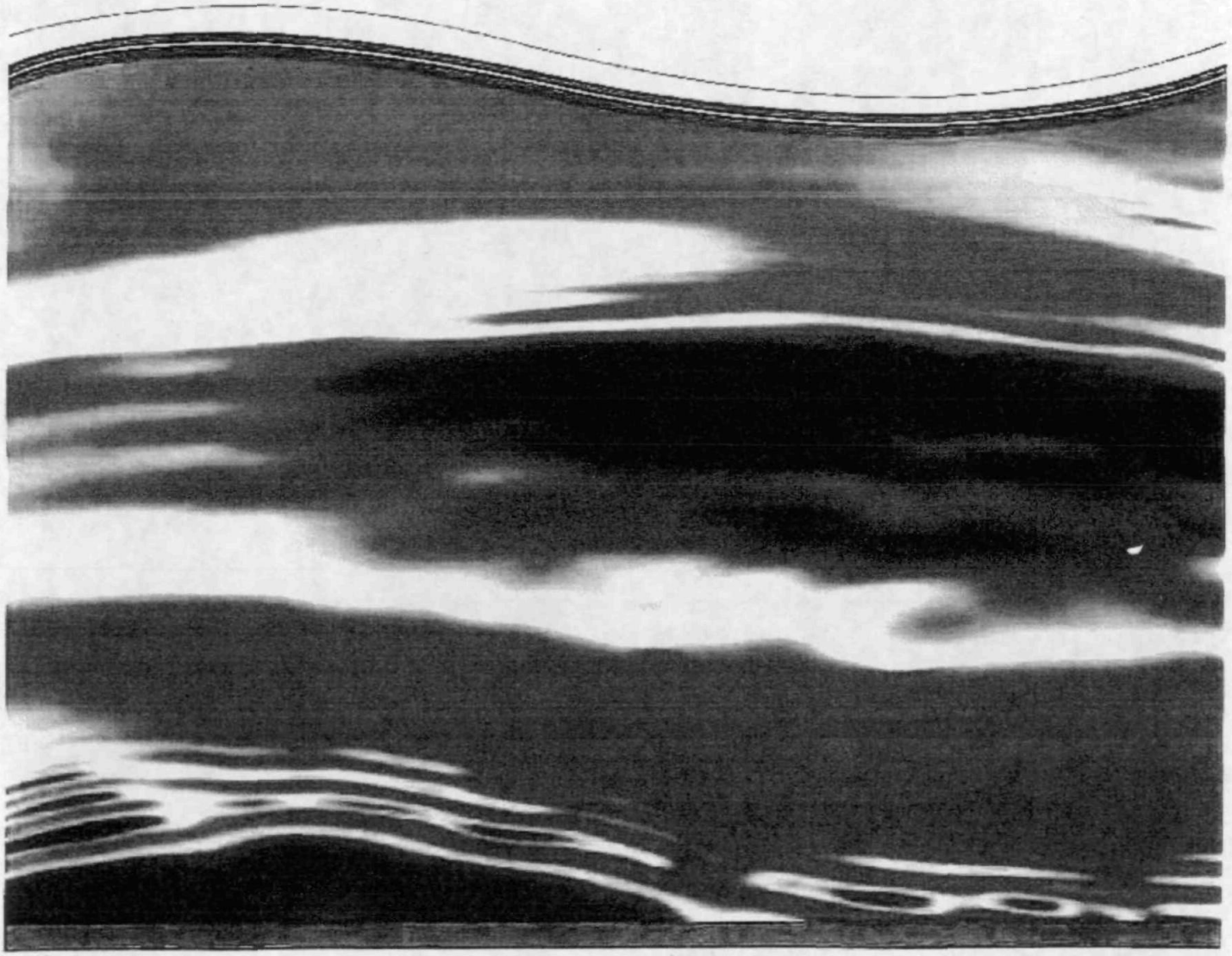
BIO CLEAN ENVIRONMENTAL OCEANSIDE, CA. TEL: 760-433-7640		PROJECT	
NSBB-WP 8-14-96 MODEL NO. 8-14-96		REPRESENTATIVE: BASKET SYSTEM	SHEET: 01/01/04
DATE: 01/01/04	SCALE: 5F = 72	REPRESENTATIVE	DRAWN
DRAFTER: N.R.B.	UNITS -INCHES	REPRESENTATIVE	APPROVED
			SHEET

ATTACHMENT D

CONTECH BRAND TECHNICAL INFORMATION

CONTECH STORMWATER SOLUTIONS INC

Oil/Water Separation



VortClarex™ Oil Stop Valve

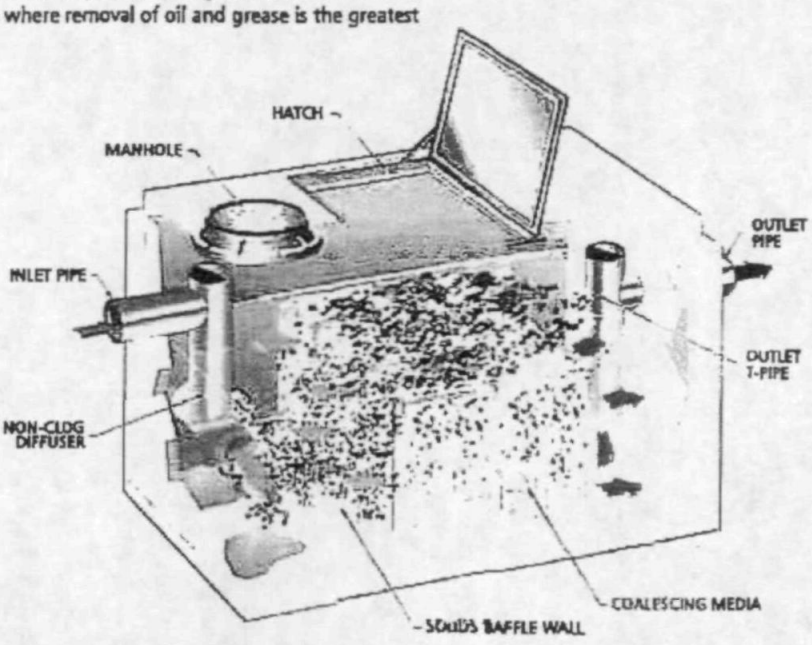
VortClarex™

Highly efficient oil/water separation

VortClarex employs innovative coalescing media to remove free oil from contaminated stormwater flows and help site owners comply with regulations. The system is ideally suited for sites where specific effluent targets are specified, or for sites where removal of oil and grease is the greatest concern.

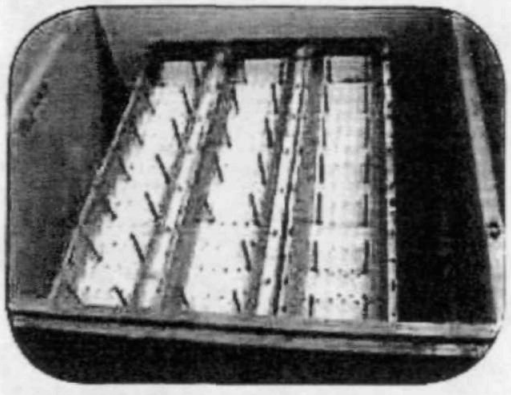
Conventional oil/water separators provide gravity separation by using baffles or T-sections, but are only effective on oil droplets greater than 150 microns. The VortClarex coalescing media maximizes surface area, increasing performance and effluent quality. It is typically sized to remove oil droplets as small as 60 microns, and achieve an effluent concentration of 10 mg/L or less.

The VortClarex coalescing media is housed within a precast concrete vault. Unlike other oil/water separators constructed of fiberglass or steel, it does not require anti-floatation hold-down straps or concrete traffic collars. Maintaining the system is easy using a standard water hose and vacuum truck, and the media can be cleaned either inside or outside the structure.



How does it work?

Flows enter the VortClarex system via a non-clog diffuser and are distributed across the chamber width. The influent passes over a solids baffle wall where settleable solids drop out, reducing the amount of solids in the flow as it enters the coalescing media. As the flow passes through the media, oily pollutants accumulate on the surface and come into contact with others to form larger, more buoyant droplets. These buoyant droplets rise upward through the media and are released near the water surface. The oil is trapped behind the outlet T-pipe, and treated water exits the system.



VortClarex

- Removes up to 99.9% of free oil
- Releases effluent with a quality in the range of 10 mg/L or less
- Installs and maintains easily
- Non-turbulent flow-through system increases separation
- Minimal site work requires no hold down straps
- Precast concrete structure ensures durability
- Underground, traffic-rated BMP maximizes land use

Oil Stop Valve

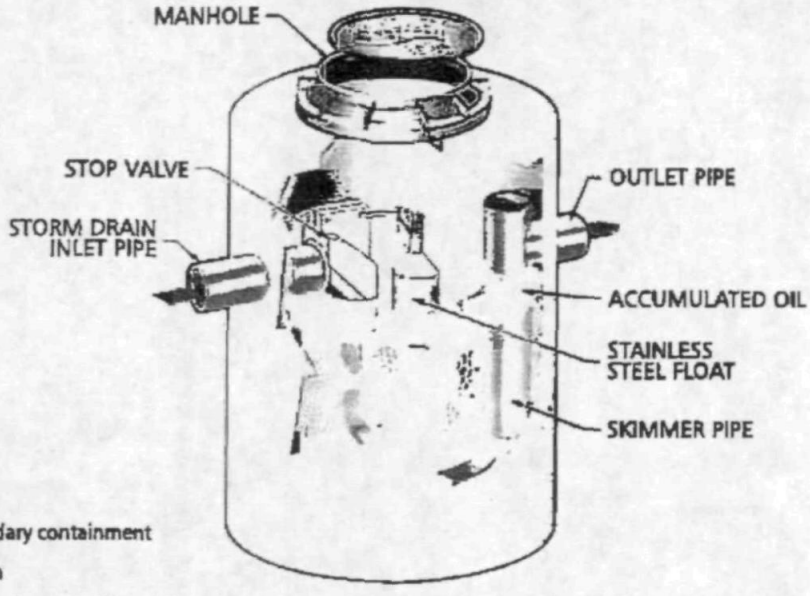
Comprehensive risk management

The Oil Stop Valve reduces the risk of catastrophic oil spills being released from your site. The fully adjustable float accommodates any oil type, oil depth, or alarm condition. A simple mechanism, few moving parts, and corrosion resistant stainless steel construction ensure long product life.

How does it work?

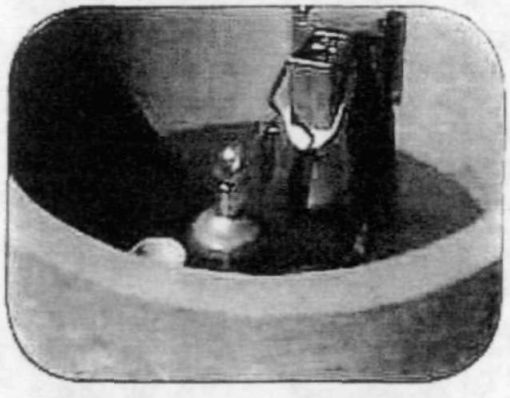
In a spill situation, free oil and stormwater flow into the manhole containment structure through the storm drain pipe inlet and stop valve. While the floating oil accumulates on the water surface in the structure, clean water exits through the skimmer pipe. As the layer of oil gets thicker, the stainless steel float, calibrated to the density of water, begins to sink in the lighter oil.

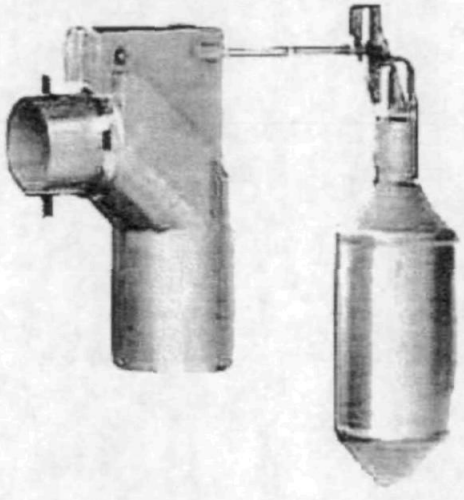
When the accumulated oil reaches a predetermined depth, the float sinks, which triggers the lever and closes the stop valve. The closed valve prevents additional oil or stormwater from flowing through the structure and leaving the site until the unit is reset.



Oil Stop Valve

- Uses existing storm drains and pipes as secondary containment
- Modular manhole design simplifies installation
- Requires no electrical power to operate, and only periodic inspection
- Stainless steel materials and passive design with only one moving part ensures reliability
- Acts as a standalone structure or works in conjunction with an upstream oil/water separator such as the VortClarex
- Needs no operator adjustment or monitoring
- Is virtually maintenance free





Available Models

Use this table to identify the appropriate configuration for your site. Our engineers are available to assist you with your project.

VortClarex	Dimensions ft	Dimensions m	Typical Sump Depth ft	Typical Sump Depth m	Treatment Flow gpm	Treatment Flow lps	Recommended Pipe Size Inlet/Outlet in	Recommended Pipe Size Inlet/Outlet mm
VCL30	6 x 3		3.75		110		6	
VCL40	8 x 4		3.75		150		6	
VCL60-1	12 x 6		3.58		225		8	
VCL60-2	12 x 6		3.58		440		10	
VCL80-1	16 x 8		3.25		300		12	
VCL80-2	16 x 8		3.42		620		12	
VCL80-3	16 x 8		3.42		880		12	

Oil Stop Valve	Diameter ft	Diameter m	Typical Depth (below invert) ft	Typical Depth (below invert) m	Treatment Capacity gpm	Treatment Capacity lps	Max. Size Inlet/Outlet in	Max. Size Inlet/Outlet mm
OSV100[1]	–	–			100			
OSV148	4		4		100		4	
OSV160	5		4		100		4	
OSV300[1]	–	–			280			
OSV360	5		5		280		6	
OSV372	6		5		280		6	
OSV500[1]	–	–			500			
OSV560	5		5		500		8	
OSV572	6		5		500		8	

[1]This model includes valve only, no structure.

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- Site-specific design support is available from our engineers.

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VortClarex® Specification

PART 1.00 GENERAL

1.1 INTRODUCTION

A. The VortClarex® system, with the performance specifications as described in Section 2.2, shall remove essentially all free and dispersed, non-emulsified oil and settleable solids from an oil/water mixture at the specified flow rates and operating temperatures. The system design shall utilize the difference in specific gravity between oil and water (i.e., buoyancy force) to separate these fluids. The separation process shall be enhanced through the use of proprietary VortClarex coalescing media. The separator shall be designed to receive non-emulsified oily water by gravity or pumped flow and shall process it on a once-through basis. The system shall be a single wall, rectangular tank installed below grade.

1.2 DESCRIPTION

The VortClarex system shall be housed within a rectangular, precast reinforced concrete tank. Within the precast concrete vault, parallel-corrugated plate coalescing media shall be utilized to provide enhanced gravity separation of oil and water mixtures. The separator shall include a baffled inlet compartment, separation chamber, and clean water outlet chamber.

A. INLET COMPARTMENT
The inlet compartment shall be of sufficient volume to effectively reduce influent suspended solids, dissipate energy and begin separation. The inlet shall be comprised of a non-clog diffuser to distribute the flow across the width of the separation chamber. A sediment baffle will be provided to retain settleable solids and prevent sediment from entering the separation chamber.

B. SEPARATION CHAMBER
The oil separation chamber shall contain VortClarex coalescing media. The parallel corrugated plates shall be at a 45° angle with respect to longitudinal axis of the plate corrugations, and spaced ½-inch (13 mm) apart for removal of free oil 60 microns in size or greater, and settleable solids. System configuration shall not promote solids buildup on the plates, which may increase velocities and result in the discharge of an effluent of unacceptable quality.

Laminar flow with a Reynolds Number of less than 500 shall be maintained throughout the coalescing media over the range of operating flow rates (treatment through maximum conveyance flow), to prevent re-entrainment of oils with water. Flow through the coalescing media shall be cross-flow perpendicular to plate corrugations so that the oil collects and coalesces at the high point of corrugations and rises to the top of the media pack without clogging.

C. CLEAN WATER OUTLET CHAMBER
An oil retention baffle or inverted T-pipe section shall be provided to prevent free-floating oil from exiting the system.

D. PIPE CONNECTIONS
Internal SDR 35 piping shall extend through the external precast concrete wall of the vault. Influent and effluent pipes shall be connected to the VortClarex® pipe system by means of a Fernco type coupling.

1.3 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections that have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the manufacturer's expense.

B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness and exposure of reinforcement.

C. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi (28 MPa) at the end of 7 days and 5,000 psi (34 MPa) at the end of 28 days when tested in 3-inch (76 mm) by 6-inch (152 mm) cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.4 SUBMITTALS

A. The Contractor shall be provided with dimensional drawings and, when specified, utilize these drawings as the basis for preparation of shop drawings showing details for construction, reinforcing, joints and any cast-in-place appurtenances. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Shop drawings shall be prepared at a scale of not less than 3/16-inches per foot (1:75).

PART 2.00 PRODUCTS

2.1 MATERIALS AND DESIGN

A. Concrete for the precast VortClarex system shall conform to ASTM C 857 and C 858 and meet the following additional requirements:

1. The exterior wall thickness shall not be less than 6-inches (152 mm) or as shown on the dimensional drawings prepared by CONTECH Stormwater Solutions Inc. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20 (MS18) loading requirements as determined by a Licensed Professional Engineer.
2. Sections shall have tongue-and-groove joints or shiplap joints and be sealed with a butyl mastic sealant designed to be resistant to fuel and oil such as ConSeal™ Brand CS-440 or approved equal. All joints will be above the resting water level.
3. Cement shall be Type II Portland cement, or approved equal, conforming to ASTM C 150.
4. All precast concrete sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi (28 MPa) or until 5 days after fabrication and/or repair, whichever is longer.

B. Coalescing media shall be manufactured by Facet International and be made of calcium carbonate filled polypropylene corrugated plates, with corrugation angles no less than 45° with respect to longitudinal axis of the plate corrugations. Plates shall be spaced at ½-inch (13 mm) intervals and be stacked and bound together with sturdy rods and supports to form modular plate packs.

C. Polyurethane elastomeric sealant shall comply with ASTM D-412 and GSA Specification TT-S-00230C, Type II, Class A and ASTM C-920, Type S, Grade NS.

D. Manhole frames and covers shall be provided by the manufacturer in the numbers and configurations as shown on the dimensional drawings prepared by CONTECH Stormwater Solutions. Casting for manhole frames and covers shall be in accordance with ASTM A48, CL.35B and AASHTO M105 and shall be Campbell Foundry Company, or approved equal, casting No. 1009A or No. 1012D custom forged with the CONTECH Stormwater Solutions logo and the words "Committed to Clean Water™", unless specified otherwise on the shop drawings.

E. Hatchways shall be provided by the manufacturer in the numbers and configurations as shown on the dimensional drawings prepared by CONTECH Stormwater Solutions. Hatchways shall be made of steel or aluminum, and shall meet HS20-44 (MS18) loading requirements.

F. Brick or masonry used to build the casting and hatchway frames to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.

2.2 PERFORMANCE

Each standardized VortClarex system shall remove essentially all free and dispersed non-emulsified oil from the water stream down to a 60 micron oil droplet size and produce an effluent of less than 15 ppm TPH or Oils and Grease at the design flow rates listed in the table below. These effluent characterstics shall are based on an a set influent characteristics typical of sites where oils and grease are the primary pollutant of concern. The maximum flow rate through the system shall be limited by controlling the Reynolds Number in the plates to 500 or less and the water level within 3 inches (76 mm) of the inside top of cover so as not to overtop the effluent riser Tee.

System Specifications

VortClarex Model	Approximate Dimensions (Inside WXL)		Standard Design Flow		Typical Maximum Flow		Recommended Pipe Diameter
	ft	mm	gpm	l/s	gpm	l/s	in/mm
VCL30	3X6	914X1829	110	6.9	494	31.1	6/150
VCL40	4X8	1219X2438	150	9.5	494	31.2	6/150
VCL60-1	6X12	1829X3658	225	14.2	898	56.6	8/200
VCL60-2	6X12	1829X3658	440	27.8	1248	78.7	10/254
VCL80-1	8X16	2438X4877	300	18.9	1603	101.1	12/300
VCL80-2	8X16	2438X4877	620	39.1	1670	105.3	12/300
VCL80-3	8X16	2438X4877	880	55.5	1670	105.3	12/300

Influent Characteristics
Specific Gravity of 0.88 at a Temperature of 60°F (15.5°C)
Influent Oil and Grease or TPH Concentration of 100 ppm
Mean Influent Oil Droplet Size of 130 microns

2.3 MANUFACTURER

The manufacturer of said VortClarex system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff for a minimum of 5 years.

Each VortClarex system shall be manufactured by CONTECH Stormwater Solutions, or approved equal.

PART 3.00 EXECUTION

3.1 INSTALLATION

A. Each VortClarex system shall be constructed according to the sizes shown on the drawings and as specified herein. Install at elevations and locations shown on the drawings or as otherwise directed by the engineer.

B. Place the precast base unit on a granular subbase of minimum thickness of 6 inches (152 mm) after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the vault shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-leveled.

C. Prior to setting subsequent sections place ConSeal™ brand CS-440 butyl mastic sealant, or approved equal in conformance with ASTM C 990-91, along the construction joint in the section that is already in place.

D. After setting the precast roof section of the VortClarex system, set riser sections to the height required to bring the cast iron manhole covers or hatches to grade, so that the sections are vertical and in true alignment with a ¼-inch (6 mm) maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch (152 mm) lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of the VortClarex system shall conform to ASTM specification C 891 "Standard Practice for Installation of Underground Precast Utility Structures".

E. Holes made in the concrete sections for handling or other purposes shall be plugged with a non-shrink grout or by using grout in combination with concrete plugs.

CONTECH STORMWATER SOLUTIONS

Product Evaluation

Evaluation of the Stormwater Management StormFilter® for the removal of SIL-CO-SIL® 106, a standardized silica product:

ZPG™ StormFilter cartridge at 28 L/min (7.5 gpm)

Overview

A Stormwater Management StormFilter® (StormFilter) ZPG™ cartridge was tested to assess its ability to remove total suspended solids (TSS) and decrease turbidity from simulated stormwater. Under controlled conditions, 7 runoff simulations (sims) were performed using influent TSS with a silt texture (20% sand, 80% silt, 0% clay), variable event mean concentrations (EMCs) between 0 and 300 mg/L, and a filtration rate of 28 L/min (7.5 gpm) (100% design, per cartridge, operating rate for this configuration). The mean TSS (silt) removal efficiency for this StormFilter cartridge configuration was determined using regression statistics and found to be 87% (P=0.05: L_1=86%, L_2=89%) over the range of influent EMCs tested. Turbidity data was also collected and indicated that this StormFilter cartridge configuration was capable of a 51% (P=0.05: L_1=47%, L_2=55%) mean decrease in turbidity.

Introduction

The goal of testing the ZPG™ StormFilter cartridge was to determine its TSS and turbidity removal performance given a standardized commercial product as the contaminant surrogate. Utilizing a standardized contaminant surrogate eliminates contaminant characteristics as a variable, thereby providing opportunities to compare StormFilter performance with that of other StormFilter configurations or treatment systems tested using the same contaminant surrogate. To assure the comparability of this experiment with other StormFilter performance evaluations, the methodology used for this experiment is identical to that used in previous cartridge-scale StormFilter evaluations for solids removal (Stormwater360, 2002; SMI, 2002a).

Procedure

Media

A StormFilter ZPG™ cartridge was used for this experiment. This specific type of cartridge contains ZPG™ multipurpose media, a proprietary blend of organic and inorganic media (as per Stormwater360 product specifications). ZPG™ media is effective in the removal of solids, metals and organic chemicals.

Prior to testing, the ZPG™ StormFilter cartridge used for testing was flushed so as to remove the residual dust within the media left over from the cartridge production process, as well as to allow the media to approach a typical, wet operating condition. Individual, ~400-L, tap water flushes were performed according to the operation segment of the procedure section. Flushing was ceased after eight flushes, at which point the effluent TSS EMC had decreased to 8.8 mg/L from an initial value of 218 mg/L.

Contaminant

A commercial ground silica product, SIL-CO-SIL® 106 (SCS 106), was used as the surrogate for TSS. This product is manufactured by the US Silica Company* and the sample used for testing originated from the Mill Creek, OK plant. SCS 106 has a uniform specific gravity of 2.65 and is specified by the State of Washington Department of Ecology (WADOE) for the laboratory evaluation of stormwater treatment technologies (WADOE, 2002) for TSS removal. An average particle size distribution is shown in Figure 1, revealing a silt texture (USDA scale) consisting of 20% sand, 80% silt, and 0% clay-sized particles (Stormwater360, 2002).

Based upon a 400-L influent volume, target TSS EMCs were determined for each planned contaminated simulation and associated masses of contaminant were placed in 1-L HDPE bottles of tap water–one bottle of concentrate per planned contaminated simulation. Target TSS EMCs were distributed between 0 and 300 mg/L. The order in which they were used was randomly selected using random number techniques so as not to bias the performance results. The SCS 106 concentrates were given the opportunity to hydrate prior to experimentation so as to promote the disintegration of any aggregate particles that may have been present. The concentrates were then left out at room temperature and periodically shaken to encourage the dissolution of any aggregates.

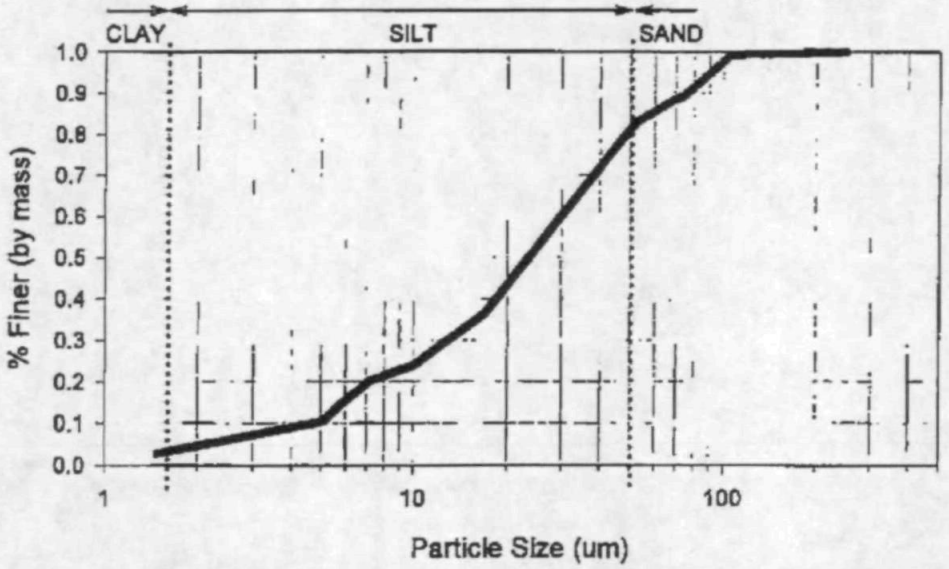

Figure 1. Particle size distribution for SCS 106. Sand/silt/clay **fractions** according to **USDA definitions are approximately 20%, 80%, and 0% for SCS 106, indicating that** the **texture** corresponds to **a silt material.**

Test Apparatus

The typical precast StormFilter system is composed of three bays: the inlet bay, the filtration bay, and the outlet bay. Stormwater first enters the inlet bay of the StormFilter vault through the inlet pipe. Stormwater in the inlet bay is then directed through the flow spreader, which traps some floatables, oils, and surface scum, and over the energy dissipator into the filtration bay where treatment takes place. Once in the filtration bay, the stormwater begins to

*U.S. Silica Company, P.O. Box 187, Berkeley Springs, WV 25411; (800) 243-7500; www.u-s-silica.com

pond and percolate horizontally through the media contained in the StormFilter cartridges. After passing through the media, the treated water in each cartridge collects in the cartridge's center tube from where it is directed into the outlet bay by an under-drain manifold. The treated water in the outlet bay is then discharged through the single outlet pipe to a collection pipe or to an open channel drainage way.

The test apparatus used for this experiment simulates the filtration bay component of a full-scale StormFilter system, including the energy dissipator. Since the design of full-scale StormFilter systems varies, and since the operation of a full-scale system in the laboratory environment would require very large volumes of water, the use of the most common components among all of the possible designs, the StormFilter cartridge and the associated volume of filtration bay area, were selected so as to provide a very conservative estimate of StormFilter performance.

Unlike chemical removal testing, suspended solids removal testing is challenging due to the relatively large, dense, insoluble nature of the contaminant. Care must be taken to maintain the suspension of solids within the influent and effluent reservoirs, maintain the suspension of solids within the conveyance system, avoid the fouling of flow metering devices, avoid the destruction of individual solids by the pumping system, and avoid the destruction of the pumping system by the solids.

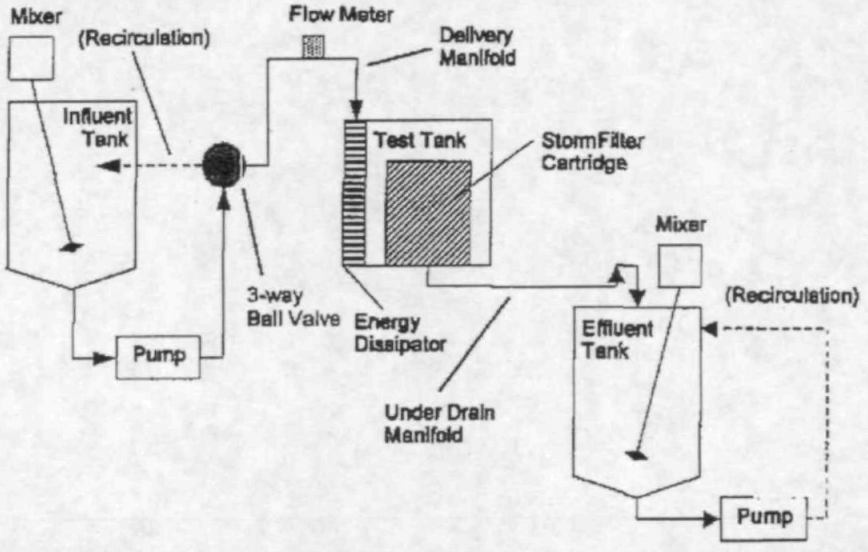

Figure 2. Schematic diagram of the cartridge-scale test apparatus. Arrows indicate flow pathways. Dashed arrows indicate recirculation pathways employed during influent and effluent sampling.

The apparatus used for this experiment was carefully designed to meet these challenges. Figure 2 demonstrates the layout of the test apparatus. Influent and effluent storage is provided by individual 950-L (250 gallon), conical bottom polyethylene tanks (Chem-Tainer). The conical bottom design ensures full drainage of the tanks, in addition to the movement of all solids out of the tanks. Four, evenly-spaced, vertically-oriented baffles, measuring 91 x 8 x 1-cm (36 x 3 x 0.5-in) (L x W x Thickness), affixed to the sidewalls of the influent and effluent tank prevent a mixer-induced vortex. Suspension of solids within the tanks is maintained by individual, 1/2-hp, electric propeller mixers with stainless steel mixing assemblies (J.L. Wingert, B-3-TE-PRP/316). The propeller design maximizes the vertical circulation of solids within the tank and ensures the homogeneity of the mixture. Magnetic drive pumps (Little Giant, TE-6-MD-HC) are used to transfer the influent, and also to re-circulate

water through the underlying manifolds of both tanks during sampling so as to eliminate any possibility of sediment accumulation in the manifolds.

Influent is carried from the influent tank by the magnetic drive pump plumbed with 25-mm (1-in) PVC hose into a PVC intake manifold below the influent tank and discharging into a delivery manifold of 25-mm PVC pipe. Despite the associated head loss, 25-mm diameter hose and pipe are used to ensure high flow velocities that maintain the suspension of solids during transfer. A 25-mm, 3-way, side-control, ball valve used for flow control assures very high flow velocities in the intake manifold, allows some degree of re-circulation back into the reservoir, and allows the high power pump to operate relatively unrestricted.

Discharge from the delivery manifold into the 56 x 56 x 62-cm (22 x 22 x 24.5-in) (L x W x H) polypropylene StormFilter cartridge test tank is by discharge into the tank-mounted energy dissipater, which consists of a vertical length of 76-mm (3-in) PVC pipe with an open bottom and multiple 3-mm (0.125-in) wide horizontal slots along its entire length. The energy dissipater is a typical component of a StormFilter system and is used to minimize the re-suspension of settled material within the test tank by restricting turbulence to the region within the dissipater. Discharge from the StormFilter cartridge test tank into the effluent tank is through free discharge from the under-drain manifold component of the test tank positioned over the top of the effluent tank.

Flow into the StormFilter cartridge test tank is controlled by the 3-way ball valve placed between the pump and the delivery manifold, and flow is monitored with a paddle-wheel type electronic flow meter (GF Signet, Rotor-X Low Flow) coupled with a flow transmitter with totalizer (GF Signet, Processpro).

Operation

The operational procedure consisted of performing multiple runoff simulations (sims) using the same StormFilter cartridge test tank and apparatus described in the Test Apparatus section above. Sims proceeded as follows.

The influent tank was filled with ~400-L of tap water, and the predetermined contaminant concentrate was added to the influent tank. The influent tank was then mixed thoroughly with the mechanical mixer while influent was re-circulated through the underlying manifold and allowed to equilibrate for 5 to 10 minutes before sampling.

Following influent sample collection, a portion of flow was redirected to the test tank energy dissipator via the delivery manifold through adjustment of the 3-way valve. Flow rate was controlled through periodic adjustment of the 3-way valve so as to maintain a constant flow rate reading of 28 L/min ± 2 L/min (7.5 gpm ± 0.5 gpm). Mixing and re-circulation of the effluent reservoir was started towards the end of a sim to allow effluent equilibration prior to sample collection.

The influent pump was operated until as much of the influent had been pumped from the influent reservoir and underlying manifold as was possible, at which point the influent pump was shut down and the StormFilter cartridge test tank was allowed to drain. Once the float valve within the StormFilter cartridge closed, effluent was sampled and the total sim volume reported by the totalizer was recorded.

Sampling

Composite samples of influent and effluent were collected for TSS and turbidity analysis. One set of samples was collected for TSS analysis by North Creek Analytical (NCA), Beaverton, OR, and an additional set was collected for internal turbidity analysis. For this document, a set is defined as a collection of influent and effluent sample pairs corresponding to a specific sim.

Sample handling was performed in accordance with standard handling techniques. All samples to be tested for TSS were promptly refrigerated following collection. Samples were shipped to the laboratory in coolers, accompanied by ice-packs and chain-of-custody documentation for analysis within seven days. NCA performed TSS analysis according to

ASTM method D3977, which is essentially the same as the "whole-sample" variation of EPA method 160.2 (SMI, 2002b).

Samples were extracted with a 1-L PE, 1.2-m ladle using a sweeping motion across and through the center of the reservoir. Six 1-L grab samples were collected in an 8-L churn sample splitter (Bel-Art Products) for composite sample extraction according to manufacturer instructions. Care was taken to transfer all solids from the ladle through quick emptying of the ladle while using a swirling motion. The churn splitter was used to dispense approximately 250-mL of composite sample into 250-mL (8-oz) HDPE bottles for TSS analysis and an additional 500-mL composite sample was dispensed to a 1-L (32-oz) HDPE bottle for turbidity analysis. The sampling ladle and churn splitter were subject to a high-pressure wash between uses.

Internal Analysis

Turbidity, a measure of the light-dispersing characteristics of a fluid, was measured using a bench-top turbidimeter (LaMotte Model 2020). The sample was swirled in its bottle immediately before pouring a subsample to the turbidimeter tube. The tube was wiped clean of moisture using lint-free wipes and then swirled, taking care to prevent bubbles in the sample and to maintain a clean tube surface, prior to insertion into the turbidimeter. The turbidimeter tube was rinsed with deionized water between each use.

Results

TSS removal and turbidity results are shown in Table 1. The discrete efficiencies, efficiencies of individual pairs of associated influent and effluent TSS EMCs, suggest an increase with increasing influent TSS EMC. A similar trend is evident for the generally increasing turbidity reduction contrasted to increasing average influent turbidity.

Table 1. Summary of influent and effluent TSS EMCs and turbidity along with TSS removal and turbidity decrease results shown according to increasing influent TSS EMC.

Influent TSS EMC (mg/L)	Effluent TSS EMC (mg/L)	Discrete TSS Removal Efficiency (%)	Average Influent Turbidity (NTU)	Average Effluent Turbidity (NTU)	Discrete Turbidity Decrease (%)	Sim	Sim Volume (L)
ND (4.00)	7.09	addition	0.45	2.3	addition	7	401
25.4	14.2	44.1	4.1	5.4	addition	4	398
49.1	17.0	65.4	8.8	7.7	12.5	6	397
107	21.1	80.3	17	10.2	40.0	1	393
144	28.2	80.4	25	15	40.0	2	396
188	33.2	82.3	35	19	45.7	5	393
292	45.5	84.4	53	29	45.3	3	389

Discussion

Quality Control

For TSS analysis, Method Blank and Duplicate quality control samples are typically used to measure bias and precision. Method Blank results as reported by the analytical laboratory were non-detect (<4 mg/L) for the four sets of analyses that comprised the data set shown in Table 1. Unfortunately, since the "whole-sample" nature of ASTM method D3977 involves the use of the entire sample volume, none of the sample volume is left over for traditional Duplicate analysis. Thus dedicated Duplicate samples were collected for 2 of the 14 TSS analyses (14% duplicates) and are displayed in Table 2. The results of the Method Blank and Duplicate analyses demonstrate an acceptable level of bias and precision according to SMI (2002c).

Table 2. Summary of Quality Control results.

Sim	Influent/Effluent (I or E)	Official Result (mg/L)	Duplicate Result (mg/L)	Relative Percent Difference (%)
2	I	144	143	0.7
2	E	28.2	29.0	2.8

TSS and Turbidity Removal Performance Evaluation

The graphed results of the external TSS analysis, displayed in Figure 3, show a regressed removal efficiency of 87% (P=0.05: L1=86%, L2=89%), which is calculated by subtracting the regression coefficient (slope) from 1. Based upon an analysis of variance (ANOVA), the regression is significant at the P<0.001 level (<0.1% probability of no correlation between influent and effluent TSS EMC's). Coupled with y-intercept and regression coefficients that are both significant at the P<0.001 levels, this signals a good fit of the data points to the regression equation, which is visually supported by the tight 95% confidence intervals. At P<0.001, the confidence in the TSS EMC removal performance estimate is within the 0.05 limit considered by SMI (2002d) to indicate a valid estimate.

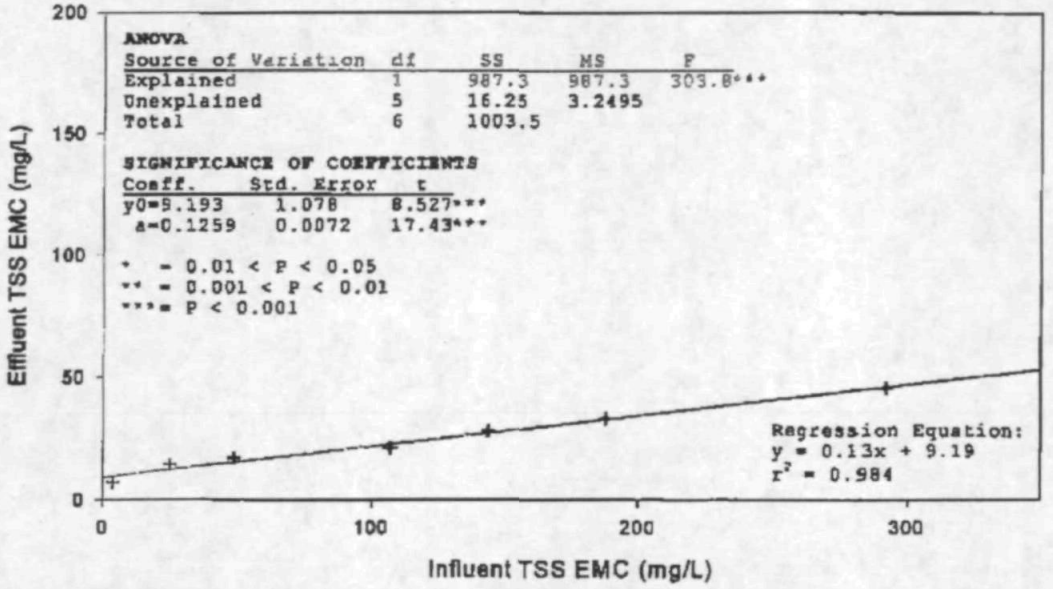

Figure 3. Regression analysis applied to the TSS data associated with the estimation of the SCS 106 TSS removal efficiency of the ZPG™ StormFilter cartridge at 28 L/min. The solid line is the regression. The dotted lines signify the lower and upper 95% confidence intervals. ANOVA indicates a significant (P<0.001) linear relationship between influent and effluent TSS EMC.

The decrease in turbidity associated with the ZPG™ cartridge test is less than the reduction of TSS. The mean turbidity reduction, shown in Figure 4, was observed to be 51% (P=0.05: L_1=47%, L_2=55%) based upon regression analysis that is significant at the P<0.001 level. The y-intercept and regression coefficients, significant at the P<0.01 and P<0.001 levels, respectively, provide ample confidence in the observed relationship.

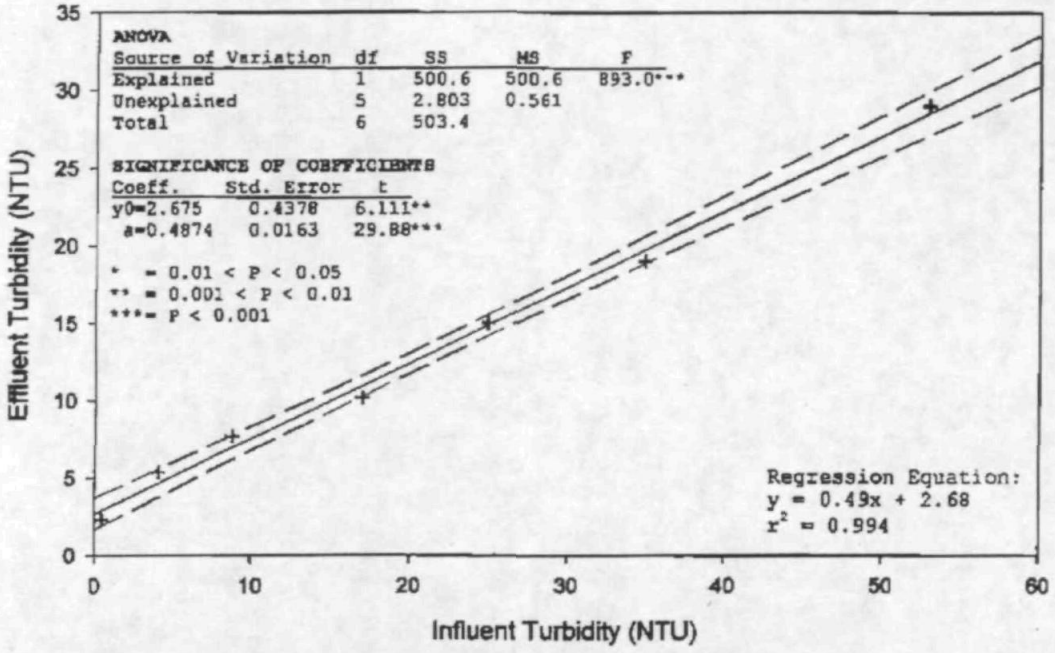

Figure 4. SCS 106 turbidity reduction by the ZPG™ StormFilter cartridge at 28 L/min. The solid line is the regression. The dotted lines signify the upper and lower 95% confidence intervals. ANOVA indicates a significant (P<0.001) linear relationship between influent and effluent turbidity.

TSS Removal Performance with Regard to Particle Size

Based upon the particle size distribution presented in Figure 1, SCS 106 consists primarily of silt-sized silica particles (80% by mass between 2 and 50 microns). Combined with the TSS removal estimate of 87% (by mass) demonstrated in Figure 3, some qualitative inferences concerning the particle size specific removal efficiency of the system can be made.

Assuming that larger particles are preferentially removed over smaller particles, it could be said that the system under review removed particles down to the 6 micron level since, conservatively, 87% (by mass) of SCS 106 is composed of silica particles larger than 6 microns. Since it is likely that some particles smaller than 6 microns were retained and some particles larger than 6 microns were lost by the system, the efficiency of the system under review with regard to particle size is probably best represented by a size range. With this in mind, a better qualitative statement with regard to the particle size removal efficiency of the system under review would be that it is capable of removing silica particles in the vicinity of 10 microns.

Conclusions

The tests utilizing SCS 106 as a contaminant generated results for the assessment of the silt TSS and turbidity removal efficiency of the ZPG™ StormFilter cartridge. The use of a standardized contaminant surrogate allows the results from laboratory evaluations of the TSS removal performance of stormwater treatment systems to be easily compared. In summary:

1. A ZPG™ StormFilter cartridge test unit, operating at 28 L/min, and subject to TSS with a silt texture (20% sand, 80% silt, and 0% clay by mass) originating from SCS 106 provides a mean TSS removal efficiency of 87% (P=0.05: L_1=86%, L_2=89%);
2. A ZPG™ StormFilter cartridge test unit, operating at 28 L/min, and subject to TSS with a silt texture (20% sand, 80% silt, and 0% clay by mass) originating from SCS 106 provides a mean turbidity reduction of 51% (P=0.05: L_1=47%, L_2=55%);
3. A ZPG™ StormFilter cartridge test unit, operating at 28 L/min is effective on silica particles down to the 10 micron size range;

It is important to emphasize that these conclusions reflect laboratory-based testing performed under controlled conditions. Field conditions are notoriously variable with regard to TSS characteristics and sampling methods, and comparison of this experiment to field-derived data will be accordingly affected. Laboratory studies are beneficial for the evaluation of system performance potential as part of the product development or system comparison process.

Stormwater360, Stormwater Management Inc, and Vortechnics Inc. are now CONTECH Stormwater Solutions Inc.

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Revision Summary

PE-E062
Document rebranded.

PE-E061
Document number changed; document rebranded; no substantial changes.

PD-04-006.0
Original

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