

**SECTION C-3**

**PLAN DEVELOPMENT**

**PROGRAM EFFECTIVENESS ASSESSMENT**





### **C-3.0 Plan Development**

#### **C-3.1 Introduction (LIP Section A-3.1)**

This Section provides information on the approach taken by the County of Orange in developing its Local Implementation Plan (LIP). This section also discusses a number of studies that the County is participating in that will assist in future revision and improvement of the overall stormwater compliance program.

#### **C-3.2 Plan Development (LIP Section A-3.2)**

The complexity of the Third Term Permits has necessitated the development of the LIP in order to provide a County-specific plan within the broader policy and program framework of the 2003 DAMP. The LIP focuses predominantly on the jurisdictional implementation of the model pollution prevention-oriented programs detailed in the 2003 DAMP and was completed and submitted to the San Diego Regional Board in February of 2003. Through its role as Principal Permittee, the County worked closely with the Permittees in the San Diego Region on completing their LIPs by February 13, 2003 and the Permittees in the Santa Ana Region on completing their LIPs by July 1, 2003. After February of 2003, the model LIP template used to craft the document was refined based on the County's own experience and feedback received from the San Diego Regional Board and Permittees. With the County under the jurisdiction of both the San Diego and Santa Ana Regional Boards, the County's LIP has undergone significant transformation and additional development between February 13 and July 1 of 2003.

Toward the end of the permit term, the 2003 DAMP will be revised and submitted by the Principal Permittee as the proposed plan for the Report of Waste Discharge. The County LIP, however, is intended to be a more dynamic document that will be evaluated on at least an annual basis by the County or as directed by the Regional Board.

As implementation of pollution prevention programs within the County has taken place and evolved, so too has the LIP. The County's stormwater program management has worked closely with all departments to ensure that the goals of the program are met in concert with the County's overall mission of providing valuable resources and services to its residents. As County departments have begun to use stormwater inspection forms, implement model maintenance procedures and BMPs, complete performance reports, etc., they have provided valuable feedback which has allowed program management to adjust the plan to refine parts of the program that may not be working while continuing forward with parts that are effective.



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**C-3.3 BMP Effectiveness Investigations (LIP Section A-3.3)**

An important element of the County's LIP is the implementation of additional and/or refinement of BMPs to complement the DAMP based jurisdictional program. The tables that follow list the BMPs implemented during the reporting period.

**Summary of BMP Implementation**

	<b>Initiated in FY</b>	<b>Completed in FY</b>	<b>Projected completion in FY</b>	<b>Watershed</b>
<b>Structural BMPs</b>				
J01P01 Munger Media Filter	2001-02		2003-04	Aliso Creek
J01P28 Clear Creek System	2001-02		2003-04	Aliso Creek
Ocean Institute BMP	2001-02	2002-03		Dana Point Harbor
Poche Beach UV Disinfection	2002-03		2003-04	Prima Deshecha
Channel Diversion Facilities	See discussion on diversion facility improvements during 2002-03 in the Unified PEA Document, <b>Section 12</b>			
<b>Litter Control BMPs</b>				
See discussion of Drainage Facilities and Infrastructure Maintenance in <b>Section C-5.A.3</b>				
<b>Non-Structural BMPs</b>				
Public Awareness Survey	See discussion of Public Awareness Survey in Section C-6 of the Unified PEA Document			

**Summary of BMP Effectiveness Investigations**

<b>Watershed</b>	<b>Type of BMP</b>	<b>Manufacturer (if applicable)</b>	<b>Type of Analysis</b>	<b>Report Completed</b>
Aliso-J01P28 Clear Creek System	Media filter; UV disinfection			Yes* <input type="checkbox"/> No <input checked="" type="checkbox"/>
Dana Point Harbor Ocean Institute	Infiltrative swale; In-line separator	Stormceptor®		Yes* <input checked="" type="checkbox"/> No <input type="checkbox"/>
Prima Deshecha Poche Beach	Sediment basin; UV disinfection	Suntec Environmental		Yes* <input type="checkbox"/> No <input checked="" type="checkbox"/>

\* Preliminary monitoring report; final evaluation report scheduled for summer 2004.



### **Munger Storm Drain Sand/Media Filter**

The management measure employed in this project is to construct an in-line sand/media filter to treat Munger Storm Drain (J01P01) low-flow prior to its discharge to Aliso Creek. The system will be comprised of a sedimentation vault and a two-chambered media filter. The system is expected to provide significant suspended solid, bacteria, and other pollutant removal from low flow drainage to Aliso Creek.

In May 2001 the State Water Resources Control Board selected the project for Proposition 13 funding; the grant agreement is expected to be executed in August of 2003. Project design was initiated outside of the grant agreement and is 90 percent complete by end of the 2002-03 reporting period. The project will receive grant funding in the amount of \$204,500 for project construction in early 2004 and performance evaluation in the summer of 2004. The total cost of the project is estimated at \$630,000.

### **J01P28 Clear Creek Treatment System**

The management measure employed in this project is to construct a proprietary package system to treat J01P28 low-flow prior to its discharge to Aliso Creek. The Clear Creek Treatment System at J01P28 will treat urban runoff by filtering and then exposing the water to ultraviolet radiation, and then will return the treated water to Aliso Creek. The system will remove suspended solids, bacteria, and associated pollutants at a maximum rate of 300,000 gallons/day. Construction for the project was completed in June 2003. Operation of the system began in July 2003. The total cost of the project is estimated at \$500,000.

### **Ocean Institute Stormwater Treatment System**

The County received a State Clean Beach Initiative grant to construct and evaluate the performance of stormwater treatment features at the Ocean Institute in Dana Point Harbor as an element of facility redevelopment in 2001-2002. Stormwater treatment features consist of two parking area infiltrative swales with underdrains leading to a Stormceptor® suspended solids separator. Site reconstruction was completed in fall of 2002, and the County immediately initiated a performance evaluation of the treatment system during the 2002-03 wet season, with the performance monitoring of three storm events.

A preliminary monitoring report was submitted in September 2003 to the CBI grant officer. Preliminary evaluation was constrained by inconsistent automated sample collection between the Ocean Institute and the Ensenada Place control site, and the relatively high variability in bacteria data. However, preliminary indications are that: (1) runoff quality between the two sites was sufficiently comparable to affirm Ensenada Place as a suitable control site; (2) storm detection, tide screening, and sample collection protocols were successful in capturing eligible storm events; and (3) improvements to automated sampler installation at the control site should result in better collection reliability there in 2003-2004.

The data collection phase of the evaluation will continue through the 2003-04 wet season. The final evaluation report is scheduled for completion in midsummer of 2004.



### **Poche Beach Ultraviolet Disinfection System**

The County of Orange received a State Clean Beach Initiative grant to construct a disinfection system at the Prima Deshecha storm channel that outlets at Poche Beach. Poche Beach is chronically posted for exceeding AB 411 limits for bacteria in the surf zone. The Poche Beach disinfection system has been designed as a gravity-flow-through type of ultraviolet disinfection system that is placed inside the Prima Deshecha storm channel. The urban runoff flows through the disinfection system, killing bacteria before the urban runoff reaches the beach. The system is intended to operate during the summer season, with the system being installed in the channel in the spring and removed for the winter.

The system was designed and fabricated during the 2002-2003 reporting period, and installed in the channel in October 2003 for a brief functional evaluation before being withdrawn in early November. The functional evaluation findings will allow the County and the City of San Clemente to more effectively prepare for its formal installation in the spring of 2004. A specific installation issue is whether to retain the in-channel system design or to pump water from the channel to the treatment system located beside the channel.

Additionally, two trash booms have been placed in the M01 channel and the Cascaditas channel, a tributary to the Prima Deshecha storm channel. In addition, a source tracking investigation is planned in the Prima Deshecha watershed to determine the sources of the bacteria.

### **Channel Diversion Facilities**

The County has constructed and now operates diversion facilities at Huntington Beach pump station, Talbert Channel, Greenville Banning Channel, and the Lower Santa Ana River. Construction activities during the reporting period are reported in the County Unified PEA **Section 12**; operations activities are discussed in the County PEA **Section C-5.A.3**. Water quality performance monitoring was also conducted at these facilities during periods of operation. Sampling and analysis of diverted runoff for pesticides and heavy metals was conducted on a quarterly basis at all facilities and results submitted to Orange County Sanitation District (OCSD) as a condition of the County's sanitary discharge permit. Diverted runoff was in compliance with OCSD maximum allowable concentrations for the reporting period, such that it would not disrupt the biological treatment process or materially affect OCSD's own outfall discharge permit.

In addition, weekly fecal indicator bacteria monitoring was conducted upstream and downstream at the Greenville Banning Channel through the entire reporting period as a condition of the CBI grant which supported its construction. The monitoring was conducted during both active diversion as well as falldown periods related to construction or rainstorm events. Results were indicative that diversion appreciably improved the quality of downstream waters for total and fecal coliforms relative to periods of no diversion; there appeared to be little or no corresponding improvement for *enterococcus*. Greenville Banning data were submitted twice during the reporting period to the State Water Resources Control Board.



### **Street Sweeper Litter Characterization**

The County of Orange conducted a synoptic characterization of street sweeping debris collected from an area in Tustin during June 2003. Approximately 5,462 pounds (dry weight) of street waste were collected by two regenerative air sweepers over 54.58 curb miles. Liquid and solid fractions of the material collected were subsampled and analyzed for metals, nutrients, organics, total petroleum hydrocarbons, oil and grease, and trash/debris. The collected soils contained approximately 29 pounds of motor oils and fuels, 0.76 pounds of lead, 0.35 pounds of copper and 3 pounds of zinc, predominantly from automotive use. The soils also contained 191 pounds of oils and greases of animal or vegetable origin. The collected soils were found to contain negligible amounts (< 0.003 pounds) of chlorinated hydrocarbon pesticides. Although approximately 100 gallons of free liquid were recovered from the collected material, the total mass of pollutants contributed by this liquid was negligible compared to those contributed by the solid matter.

The soil and vegetative fraction constituted over 99 percent of the load by weight. The trash fraction of the material collected (0.8 % by weight) was manually separated from the soil and vegetative debris and categorized by material (plastic, rubber, metal, cloth, glass, paper, mixed content). The trash fraction was characterized by item and consisted mainly of plastics (57.8%) and paper (20.8%).

The street sweeping characterization data served as the basis for estimates of annual mass and pollutant removals achieved by County street sweeping performed over the reporting period. Sweeping removed an estimated 332 tons of material in County-maintained areas, and is further discussed in **Section C-5.A.5**.

### **Tustin Area Spill Control (TASC) Project**

With growing concerns over bacteriological contamination and increasing regulatory and public pressure to improve water quality, the OCSD and the County, on behalf of all the Permittees, began to meet in 2001 in order to identify the necessary efforts to control, minimize, and prevent the potential environmental impacts caused by sanitary sewer overflows (SSOs).

The initial discussions focused around the need for OCSD to be able to obtain access to the County's flood control channels in order to contain and clean up SSOs. The two agencies quickly recognized that there were a number of issues that needed to be addressed before a channel response program could be effectively implemented.

In order to address the various regulatory, technical and coordination issues associated with preventing and planning for SSOs, OCSD and the County initiated a pilot project titled Tustin Area Spill Control (TASC) Demonstration Project.

The primary objectives of the TASC Demonstration Project were to:

- Prevent SSOs;
- Improve the interagency coordination when responding to SSOs;
- Develop predictive tools for identifying impacts; and
- Protect the beneficial uses of local water bodies.



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The TASC Initial Case Study Report (included in DAMP **Appendix E**) summarizes the work that has been completed to date and specifically:

- Documents the project approach and methodologies that have been undertaken in developing and implementing TASC; and
- Identifies future activities that may be completed.

### **C-3.4 Improvements in Stormwater Science (LIP Section A-3.4)**

The County as Principal Permittee continues to conduct and sponsor investigations and special studies that will better characterize the sources of pollutants in urban and storm runoff, and the impacts these pollutants exert on beneficial uses in receiving waters. During the reporting period The County participated in the following studies:

#### **Residential Pesticide BMP Evaluation**

The County collaborated with the California Department of Pesticide Regulation in sponsoring a study to characterize organophosphorus pesticide (diazinon and chlorpyrifos) runoff from residential neighborhoods in Irvine under both dry weather flow and storm runoff conditions. A secondary objective of the study was to determine the extent to which evapotranspirative irrigation controllers and resident pesticide/irrigation education BMPs could reduce over-irrigation, nuisance runoff, and corresponding loading of pesticides to receiving waters. The study was an adjunct to the Residential Runoff Reduction (R3) Study, sponsored by Municipal Water District of Orange County, Irvine Ranch Water District, National Water Research Institute, and Santa Ana Regional Water Quality Control Board.

The study was initiated in early 2001, with field monitoring continuing into December 2002 and the final report being completed in June 2003. Monthly average dry weather runoff concentrations for diazinon varied by two orders of magnitude ( $10^2$ - $10^4$  ng/l) ; monthly average dry weather concentrations for chlorpyrifos varied by three orders of magnitude ( $10$ - $10^4$  ng/l). Dry weather sample data variability was due to a few samples of very high concentrations. Variability due to spikes created a data set whereby pesticide concentrations showed a significant increase in areas after resident education and irrigation controller BMPs were implemented; removal of the data spikes (as outliers) resulted in no significant differences between before and after BMP efforts.

Mean dry weather runoff pesticide concentrations were generally greater than wet weather concentrations, although wet weather mass loadings were greater than dry weather mass loadings due to greater runoff volumes. Findings regarding pesticide mass loadings and load reductions due to application of BMPs were generally inconclusive given the high concentration variability and difficulties encountered in runoff flow measurements. The study is available on the County Watersheds website ([www.ocwatersheds.com](http://www.ocwatersheds.com)).

#### **Talbert/Lower Santa Ana River Watershed Bacterial Indicator Studies**

During the summer of 1999, extensive beach closures occurred along the coast of Huntington Beach as a result of elevated bacteria levels. Phase I investigations led by the Orange County



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Sanitation District failed to identify a specific source but did identify urban runoff from the Talbert/Lower Santa Ana River watershed as a potential source. Subsequently, the County, Orange County Flood Control District and watershed cities received a Water Code Section 13267 letter from the Santa Ana Regional Water Quality Control Board requiring investigation of these potential sources. In response, the Talbert/Lower Santa Ana River Watershed Permittees (the County of Orange, Orange County Flood Control District, and the cities of Costa Mesa, Fountain Valley, Huntington Beach, Newport Beach and Santa Ana) have sponsored several follow-up investigations and research studies in conjunction with the University of California Irvine, the National Water Research Institute, and the Santa Ana Regional Water Quality Control Board.

Phase II investigations focused on the influence of the Talbert Channel and Marsh system to surf zone water quality. This Phase was completed and reported in December 2000 *Final Report: Huntington Beach Water Quality Investigation Phase II: An Analysis of Ocean, Surf Zone, Watershed, Sediment, and Groundwater Data Collected From June 1998 through September 2000*.

Phase III involved an intensive study focused on the sources and transport of fecal indicator bacteria (FIB) in the lower Santa Ana River, as well as the Greenville-Banning Channel, Newport Slough, and Oxbow Slough. The study analyzed water samples collected at 15 minute intervals during a three week period in the summer of 2001. Preliminary results indicated that surf zone bacteria levels were influenced by spring tidal ebb from the Lower Santa Ana, but also were suggestive of a significant still unidentified source associated with the spring flood cycle. The study indicated that additional data collection and evaluation efforts were needed to better determine the source and nature of these bacterial indicators.

Phase IV included the collection and screening of water samples for several chemical indicators of the presence of human wastewater (coprostanol, linear alkyl benzene, and caffeine), analyses of sediment cores and a more intensive evaluation of bacterial data from pump station fore bays and their relationship to elevated bacteria levels. The draft report entitled *Coastal Runoff Impact Study Phase III: Sources and Dynamics of Fecal Indicators in the Lower Santa Ana River Watershed* was completed in the summer of 2002 and is presently undergoing peer review prior to being finalized and published.

Phase V investigations are being planned for the 2003-2004 reporting period. This phase will extend beyond the prior investigations by focusing on storm events rather than dry season low flow, and by sampling throughout the Santa Ana River watershed. Preliminary sampling locations have been identified in Orange, Riverside, and San Bernardino Counties. This study will examine wet weather FIB loadings in the water column and sediments, the ecology of FIB throughout a storm event, and sediment particle size as it relates to FIB loadings. The initial research year of the Phase V investigations has been carefully coordinated with the Water Quality and Microbiology Committees of Bight '03 (see following subsection). In addition, this research effort will also be coordinated with researchers from the United States Geological Survey (USGS) who will be conducting analyses of dissolved organic carbon and FIB during storm events.

In addition to the aforementioned project reports, the sponsored investigations have generated numerous additional technical and academic articles and papers which examine and report on specific aspects of the applied studies. They are as follows:



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Kim, J.H. and S.B. Grant (200X) "Public mis-notification of coastal water quality: A probabilistic analysis of posting errors at Huntington Beach, California", in press with Environmental Science and Technology.

Boehm, A.B., S.B. Grant, J.H. Kim, S.L. Mowbray, C.D. McGee, C.D. Clark, C.M. Foley, D.E. Wellman (2002) "Decadal and shorter period variability of surf zone water quality at Huntington Beach, California", Environmental Science and Technology, 36:3885-3892

Grant, S.B., B.F. Sanders, J.A. Redman, J.H. Kim, R. Mrse, C.McGee, N.Gardiner, B.H. Jones, J. Svejkovsky, V. Leipzig, A. Brown (2001) "Generation of enterococci bacteria in a coastal salt water marsh and its impact on surf zone water quality", Environmental Science and Technology, 35:2407-2415 (*highlighted on the cover of the journal*)

Reeves, R.L., R.D. Mrse, C. Oancea, B.F. Sanders, A.B. Boehm, and S.B. Grant (200X) "Sources, management, and scaling of fecal indicator bacteria in runoff from a coastal urban watershed in Southern California", submitted.

Jiang, S., S.B. Grant, J. Largier, M. Noble, P. Digiacomo, C. Clark, M. Sobsey, D. Waite, J. Redman, J. Noblet "Combining molecular biology, physical oceanography and remote sensing technology to identify the sources and transport pathways of urban coastal pollution", in prep.

Kim, J.H., S. Ensari, B.F. Sanders, C.D. McGee, J.L. Largier, M.L. Gouldin, and S.B. Grant (200X) "Tidal dynamics and mass budgets of fecal pollution in the surf zone; case study at Huntington State Beach, California", submitted.

Kim, J.H., B. Jones, S. Jenkins, S.B. Grant (200X), "Surf zone entrainment, long-shore transport, and human health implications of fecal pollution from tidal outlets", submitted.

Kim, J.A., Reeves, R.L., Sanders B.F., and S.B. Grant (200X), "Are tidal salt water marshes a net source or sink of fecal pollution?", in prep.

Jeong, Y., S.B. Grant, B.F. Sanders (200X) "Estimating pollutant export rates from tidal outlets: Case study of fecal indicator bacteria export from four tidal salt water marshes in southern California", in prep.

Jeong, Y., S.B. Grant (200X) "A multivariate statistical analysis of fecal indicator bacteria variability in four tidal salt water marshes in Orange County, California", in prep.

Boehm, A.B., Sanders, B.F., and Winant, C.D., Cross-Shelf Transport at Huntington Beach. Implications for the Fate of Sewage Discharged through an Offshore Ocean Outfall, Environmental Science and Technology, Vol. 36, pp. 1899-1906, 2002.

Sanders, B.F. and Piasecki, M., Mitigation of Salinity Intrusion in Well-Mixed Estuaries by Optimization of Freshwater Diversion Rates, ASCE Journal of Hydraulic Engineering. Vol. 128. No. 1, pp. 64-77, 2002.



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Piasecki, M. and Sanders, B.F., Optimization of Multiple Freshwater Diversions in Well-Mixed Estuaries, ASCE Journal of Water Resources Planning and Management. Vol. 128. No. 1., pp. 74-84, 2002.

### **Regional Bight '03 Characterization**

Bight '03 is a collaborative effort of more than 50 organizations to conduct a regional survey to assess the environmental health of coastal waters in the Southern California Bight (the coastal area from Point Conception to the Mexican border). This survey is the third regional survey of its kind, preceded by a Pilot Project in 1994 and Bight '98. Bight '03 consists of three planning committees (Microbiology, Coastal Ecology, and Water Quality), each of which are developing unique study designs. A Steering Committee oversees the efforts of the three planning committees, ensuring that synergy occurs throughout the entire Bight '03 study. A major focus of Bight '03 activities will be the characterization of the extent to which stormflows from major river systems along the Bight influence the quality of adjacent coastal waters.

As Principal Permittee, the County of Orange Public Facilities and Resources Department (PFRD) has taken an active role in the development of each of the three planning committee study designs, and serves on the Steering Committee. PFRD has also made a monetary contribution of \$25,000 to the Water Quality Planning Committee. In addition, PFRD is co-sponsoring researchers from the University of California Irvine in a stormwater characterization study of the Santa Ana River watershed that will complement efforts by the Water Quality Committee to define stormwater plumes through remote sensing satellite imagery and efforts by the Microbiology committee to assess the influence of stormwater flows on the shoreline and surfzone (see preceding subsection). During the current reporting period, Bight '03 activities have consisted primarily of study design and development. All sampling for the Bight '03 study and the Santa Ana River study is scheduled to take place during the 2003-2004 reporting period.

### **Regional Research Monitoring Program (Stormwater Monitoring Coalition)**

The County of Orange continues to participate in an executive leadership role in this collaborative effort by southern California Phase I municipal stormwater NPDES lead permittees and NPDES regulatory agencies. The goal of this working group is to identify region-specific research needs to better understand stormwater mechanisms and impacts, and to collectively sponsor the development of assessment techniques and methodologies that will enable more informed and consistent stormwater management decision-making across the region. The Stormwater Monitoring Coalition relationship is formalized in a letter agreement signed by the following:

- California Regional Water Quality Control Board, Los Angeles Region
- California Regional Water Quality Control Board, San Diego Region
- California Regional Water Quality Control Board, Santa Ana Region
- City of Long Beach
- County of Orange, Public Facilities and Resources Dept.



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- County of San Diego Stormwater Management Program
- Los Angeles County Department of Public Works (LACDPW)
- Riverside County Flood Control and Water Conservation District
- San Bernardino County Flood Control District
- Ventura County Flood Control District
- Southern California Coastal Water Research Project (SCCWRP)

The multi-agency collaboration has demonstrated its effectiveness in working together to identify common needs and to efficiently use public funds in coordinating regional stormwater research efforts. In its first year of formation (2001-2002), the SMC assembled a panel of nationally recognized experts in relevant technical discipline areas to assist them in the development of a five-year priority research agenda which would serve as the basis for activities by the SMC in the foreseeable future. The report is entitled "Stormwater Research Needs in Southern California", and can be found online at [ftp://ftp.sccwrp.org/pub/download/PDFs/358\\_stormwater\\_workplan.pdf](ftp://ftp.sccwrp.org/pub/download/PDFs/358_stormwater_workplan.pdf)

The SMC has initiated several of the 15 research projects identified in the research agenda. A summary of project accomplishments during the current 2002-2003 reporting year are as follows:

### Microbial Source Tracking Method Comparison (Status: 100 % Complete)

This study was developed to compare the performance of several microbial source tracking (MST) techniques in identifying and quantifying the source (e.g. human, dog, etc.) of fecal indicator bacteria found in surface waters. The identification of an accurate and reliable MST technique would be highly beneficial in focusing source control efforts in areas where receiving water beneficial uses are compromised by poor bacterial quality. MST techniques available had as yet not been tested side-by-side for their ability to accurately discriminate or quantify sources of fecal contamination. The study was funded by SMC in collaboration with the US Environmental Protection Agency, State Water Resources Control Board, City of Santa Barbara, and the National Water Research Institute.

In October 2002 a series of blind samples of various sources and concentrations were prepared and split by SCCWRP, and delivered to each of twenty-two prominent researchers in the field employing 10 different MST techniques. Each researcher was asked to identify for each sample: 1) whether of human or non-human origin; 2) if non-human, which source(s) were present (dog, cow, seagull); and 3) what fraction of sample was attributable to each source.

Laboratory analyses were generally completed in February 2003. No MST method tested predicted the source material in the blind samples perfectly. Host-specific PCR performed best at differentiating between human and non-human sources, but primers are not yet available for differentiating among the non-human sources. Virus and F+ coliphage methods reliably identified sewage, but were not able to identify fecal contamination from individual humans. Library-based isolate methods were able to identify the dominant source in most samples, but had difficulty with false positives, identifying the presence of fecal sources that were not in the



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samples. Among the library-based methods, genotypic methods generally performed better than phenotypic methods.

The final report will be available in September 2003. A copy of the final report, including reports from each of the individual researchers, will be published in the December volume of the *Journal of Environmental Health* that is dedicated to this study.

### Develop Standardized Sampling and Analysis Protocols

(Status: 75% complete)

This project is intended to develop a standardized stormwater monitoring infrastructure in order to increase comparability among programs throughout southern California. The SMC developed a four-step approach to accomplish this goal: (1) define questions of interest, (2) assess how existing monitoring programs currently address the questions, (3) create an optimum design for answering the monitoring questions, and (4) conduct laboratory QA intercalibration studies. This study is partially funded by the State Water Resources Control Board (SWRCB) in response to SB 72, whose legislative goal was to standardize sampling, analysis and reporting for stormwater monitoring. The SMC is only developing a design for the southern California region.

A technical working group has been formed to guide the study and meets on a monthly basis. The working group includes SMC, SWRCB, and Heal the Bay (an environmental advocacy group). Priority monitoring questions have been defined:

- 1) Are conditions in receiving water protective of beneficial uses?
  - 1a) What are the mechanism(s) causing receiving water problems?
- 2) What is the extent and magnitude of the receiving water problems?
- 3) What is the relative urban runoff (both storm and non-storm, wet and dry) contribution to the receiving water problem(s)?
- 4) What are the sources of the urban runoff contribution to receiving water problems?
- 5) Are conditions in receiving waters getting better or worse?

The group has developed a philosophy and framework for developing the standardized program, whereby the level of monitoring effort is commensurate with the magnitude of receiving water problems. The preferred framework would include: 1) core monitoring to address ongoing, site-specific needs and to identify trends; 2) regional monitoring to address large spatial scales at infrequent (i.e. every five years) intervals; and 3) special defined-term studies to address directed needs or to answer specific questions.

The inventory of existing programs has been completed (step 2) and the working group is actively creating an optimum monitoring design (step 3). A guidance document on the standardized design should be completed by January 2004.

The laboratory intercalibration study of more than 11 participating laboratories throughout southern California is nearing completion. Three intercalibration exercises have been conducted. The first exercise distributed three types of samples blind to each laboratory for



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analysis of TSS, nutrients, and trace metals. The samples included a runoff sample from an urban catchment, a non-urban catchment, and a certified reference material developed specifically for this study. All of the laboratories performed well on the reference material and the urban runoff sample. There was some additional variability observed in the highly turbid non-urban sample, mostly for particulate-bound analytes. The second exercise, which is currently underway, focuses on particulate-laden samples. The third intercalibration exercise was for microbiological analysis. This exercise was conducted in collaboration with the Bight '03 regional monitoring program that included up to 26 laboratories. Although most labs performed well, follow up quality assurance reviews and training are being used to minimize inter-laboratory variability. A performance-based laboratory guidance manual should be completed by January 2004.

### Peak Flow Impact Assessment

(Status: 10% complete)

The objective of this study is to quantify erosion and habitat loss impacts from increased peak flows as a result of watershed development. The intent is to develop indicators of peak flow and corresponding impacts so that regulators and regulated agencies can develop numerical criteria for peak flow. This project is fully funded by LACDPW, although results will likely have relevance to other SMC members.

This project is in its initial stages. A technical workgroup has been formed to guide the study. Their first accomplishment was the selection of a consultant (EarthTech/Aquifer-Beech), through a competitive bid process, who will implement the project. The consultant has begun the early phases of the study including site-selection and developing a project workplan. Site selection had several criteria including recently developed catchments upstream of relatively natural watercourses. Work over the next year will include sampling and analysis of geomorphic changes at these sites.

### Freshwater Stream Bioassessment Monitoring Program

(Status: pre-initiation)

Assessment of freshwater biological communities represents a potentially powerful tool for evaluating the effects of discharges in southern California creeks and streams. Bioassessments integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters. The value of biological assessments is that they are a better reflection of aquatic life beneficial uses of receiving waters than chemically-derived water quality objectives.

The goal of this study is to build a regionally consistent bioassessment monitoring program. This project will be completed in three phases. The first phase will involve the development of a monitoring infrastructure so that multiple agencies are properly trained, data are collected in a comparable manner, and data can be efficiently shared. The second phase will on involve the development of an assessment tool that is robust enough to be used by all agencies across the region. This will enable a consistent approach for evaluating the status of freshwater biological communities and provide the answers regarding community impacts to managers in



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meaningful and understandable terms. The third phase will focus on development of a study design that answers specific questions at large regional scales.

### **C-3.5 13225 Directive for Aliso Creek**

On March 2, 2001 the San Diego Board issued a written directive pursuant to California Water Code Section 13225 to the County of Orange, Orange County Flood Control District and the Aliso Creek watershed cities (Watershed Permittees). The directive found that the Watershed Permittees may be discharging waste with high bacteria levels from municipal storm drain outfalls into Aliso Creek and its tributaries. As a result the Watershed Permittees were directed to conduct an evaluation of the relative contribution of the urban stormwater discharges to the impairment of beneficial uses or the exceedences of water quality objectives and, where necessary, take appropriate measures to eliminate the sources of pollution.

The Directive requires the Watershed Permittees to submit an initial report by April 30, 2001 and submit quarterly progress reports by July 31, October 31, January 31, and April 30 of each year until the San Diego Board determines that the nuisance discharges have been prevented to the Maximum Extent Possible (MEP). The initial report was submitted on April 30, 2001, and progress reports were submitted quarterly from 2001 through 2003. Detailed information on the Permittees' efforts to identify, evaluate, and reduce or eliminate sources of bacterial contamination, including the County's efforts described below, may be found in these quarterly progress reports which are available on the Watershed and Coastal Resources Division website at [www.ocwatersheds.com](http://www.ocwatersheds.com).

The County of Orange is responsible for implementing elements of the DAMP/LIP in unincorporated areas of the County. The County's unincorporated areas within the Aliso Creek watershed do not contain storm drain outfalls that meet the minimum size criteria of 39 inches and do not contain drainage areas with significant urban land use. Therefore, the County's main responsibilities pursuant to the Regional Board's Directive include coordinating the Watershed Permittees' activities, conducting the monitoring program, and compiling Watershed Permittee information and monitoring data necessary to prepare the quarterly progress reports.

In addition to addressing the above responsibilities the County also conducted the following studies:

- On behalf of the Watershed Permittees, the County and Tetra Tech, Inc. worked to develop a spreadsheet fate and transport model to aid in the ongoing pursuit of source controls and reduction in beach closures/postings in the Aliso Creek Watershed. Using hydraulic data and bacteriological samples, "plugs of flow" were tracked and analyzed for net loss or gain of bacteria as they traveled down the creek. Analysis of the data showed that the input from each reach overwhelms the creek's ability to assimilate the bacteria; therefore each storm drain inflow can result in the exceedance of the bacteria levels at the downstream limit, i.e. the beach. Further details can be found in the fifth quarterly progress report, dated July 31, 2002, and in the seventh quarterly progress report, dated January 31, 2003.



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- On behalf of the Watershed Permittees, the County worked with UC Irvine researchers Dr. Sunny Jiang and Dr. Betty Olson to investigate sources of bacteria in the J03P02 subwatershed. The UCI researchers used three Microbial Source Tracking (MST) methods to identify the sources of bacteria from samples collected in the subwatershed from May through August 2002. These MST methods included: (1) analysis for human enteric viruses, (2) analysis for genetic biomarkers indicative of human, cow, pig/cat, rabbit, and bird sources, and (3) Antibiotic Resistance Analysis (ARA). The analysis of samples for biomarkers of human and animal sources showed no samples with biomarkers of human origin, and showed that all or almost all samples had biomarkers of bird, rabbit, and cow origin. Findings from the human virus and ARA studies suggest that sewage was an unlikely source of fecal coliform in the drainage system, and that bacteria from wild animal feces were the dominant source of *Enterococci* in the watershed. Further details can be found in the eighth quarterly progress report, dated April 30, 2003, and ninth quarterly progress report, dated July 31, 2003.

### **C-3.6 Plan Development Modifications**

The County will continue to review its LIP based on input from the investigations described in the Plan Development Section. During the 2003/04 reporting period, the County, along with the Aliso Creek Watershed cities, will be looking to simplify reporting efforts on the Aliso Creek 13225 Directive by merging updates into the LIP and Watershed Chapters (**DAMP Appendix D**).