REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

STAFF REPORT

To: Loretta K. Barsamian
Executive Officer

Date: October 10, 2001

From: Janet O'Hara
Keith H. Lichten
Dale Bowyer
Watershed Management Division

File No. 2182.05 (JBO, KHL)

SUBJECT: Revised Tentative Order Amending the New and Redevelopment Performance Standard in Provision C.3. of the Santa Clara Valley Urban Runoff Pollution Prevention Program NPDES Permit, Order No. 01-024

Executive Summary

The NPDES stormwater permit for the Santa Clara Valley Urban Runoff Pollution Prevention Program was reissued at the Board's February 2001 meeting, with the previous permit's new and redevelopment performance standard, Provision C.3., retained as an enforceable placeholder. Update of Provision C.3. was deferred with the Co-permittees' (the Dischargers) consent at that time. This deferral has allowed time for further discussions with the Dischargers and other interested parties, and for circulation of a Tentative Order on May 18, 2001, and a Revised Tentative Order on August 17 to revise Provision C.3. of the NPDES permit. Based on additional meetings and comments, the August 17 Revised Tentative Order has been further revised.

The October 10, 2001, version of the Revised Tentative Order would amend the permit's new and redevelopment performance standard to more effectively address impacts of new and redevelopment projects to downstream beneficial uses from both pollutants in stormwater runoff and sediment erosion in streams caused by changes in the amount and timing of stormwater runoff. This revision of Provision C.3. is also intended to address the October 2000 "Cities of Bellflower, et. al." decision by the State Board. The revised Provision C.3. would include requirements that certain sizes of new and redevelopment projects include stormwater treatment measures; that those measures be properly maintained for the life of the project; that the measures be designed to treat an optimal volume or flow of stormwater runoff from the project site; and that significant changes in the way runoff occurs due to any increase in impervious surface created by the project not adversely erode creekbeds and banks downstream from the project.

Therefore, after much discussion at several workshops and meetings with the Dischargers and other interested parties, we recommend that the Board adopt the October 10, 2001, version of the Revised Tentative Order.

Introduction

The Revised Tentative Order revises the New Development Provision (Provision C.3.) of the Santa Clara Valley Municipal Stormwater Permit, Order No. 01-024. The Board has heard four items related to various versions of Provision C.3. over the past year, including:

1. **November 2000**: Workshop on the Santa Clara Valley Municipal Stormwater Permit. Staff presented an overview of the entire stormwater permit, including the need to modify the New and Redevelopment Provision to both gain stakeholder input and respond to the State Board Order No. 2000-11, known as the "Cities of Bellflower, et. al." decision. The "Bellflower" decision generally upheld the approach taken by the Los Angeles Regional Board to require Standard Urban Stormwater Mitigation Plans (SUSMP) for new development and significant redevelopment;
2. **February 2001**: The Board reissued the Santa Clara Valley Municipal Stormwater Permit. The reissued permit retained the previous permit's new and redevelopment performance standard, Provision C.3., as an enforceable placeholder. Update of Provision C.3. was deferred with the Dischargers' consent at that time;
3. **July 2001**: Workshop on the New and Redevelopment Provision. Staff presented the May 18 Tentative Order and outlined further changes to be made based on stakeholder comments; and,
4. **September 2001**: Workshop on stormwater treatment controls. Staff presented the range of treatment controls called for in the New Development Provision, as well as their effectiveness, costs, and examples of use in the Bay Area.

While thorough discussions of supporting information for this issue were presented with these four previous Board items, a brief summary is presented herein of the water quality impacts associated with urban development; regulatory basis for the revised Provision C.3.; costs and effectiveness of stormwater treatment units; and experience in implementing similar requirements. This summary is followed by an outline of the requirements of revised Provision C.3., the process that has occurred since the July Board workshop, and the key revisions to the latest version of the Revised Tentative Order that have been arrived at through stakeholder input.

Stormwater Runoff is the Biggest Source of Water Pollution in Urban Areas

Pollutants such as metals, pesticides, fertilizers, fecal coliform, trash, and other toxic substances wash off of the roofs, road pavement, parking lots, and other impervious surfaces in the urban environment. Urban runoff flows untreated through the storm drain networks directly into the receiving waters of the Santa Clara Basin. Stormwater monitoring in the Bay Area, including in the Santa Clara Basin, has indicated that stormwater contributes to exceedance of state and federal water quality criteria. These monitoring data and various studies show that all urban land use categories contribute some pollutants to stormwater runoff.[1] The Revised Tentative Order requires that new development and significant redevelopment projects in applicable size categories include

[1] **The National Urban Runoff Program (NURP) Study**, U.S. Environmental Protection Agency, 1983.
San Francisco Bay Area Stormwater Runoff Monitoring Data Analysis 1988-1995, Bay Area Storm Water Management Agencies Association, prepared by Woodward-Clyde Consultants (now URS Corp.).

(1) pollutant prevention at the source through site design and source control measures, and (2) stormwater treatment measures integrated into project site design, landscaping, or as below-ground treatment units constructed in the storm drain system.

Urban Stormwater Runoff Impairs Stream Integrity and Beneficial Uses

As the total area of impervious surfaces increases, infiltration of stormwater decreases, forcing more water to run off the surface, picking up speed as well as pollutants and sediment. The larger volumes and speeds of runoff, and its increased sediment loads, cause excessive erosion of streams and other watercourses and impair beneficial uses of receiving waters. Among these impairments are: increased sediment transport; more frequent flooding; stream bed and bank scouring and habitat degradation; and decreased stream base flow during dry weather. The Revised Tentative Order attempts to limit changes in the peak runoff flow that result from increased imperviousness.

Statutory and Regulatory Requirements for New and Redevelopment

The 1987 Clean Water Act (CWA) amendments require municipal stormwater programs to "require controls to reduce the discharge of pollutants to the maximum extent practicable (MEP)." [CWA 402(p)(3)(B)(iii)]

Regulations issued by U.S. EPA in 1990 in response to the 1987 CWA amendments require that municipal urban runoff programs include:

- "…[a] description of **planning procedures…to develop, implement and enforce controls** to reduce the discharge of pollutants from municipal separate storm sewers which receive discharges **from areas of new development and significant redevelopment.**" [40 CFR 122.26(d)(2)(iv)(A)(2)] and,

- "…[a] description of **maintenance activities and a maintenance schedule** for structural controls to reduce pollutants (including floatables) in discharges from municipal separate

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FOOTNOTE 1, CONTINUED:
Heaney, J.B., R. Pitt, and R. Field**, Innovative Urban Wet-Weather Flow Management Systems**, USEPA EPA/600/R-99/029, USEPA, 1999.
Storm Water Phase II Report to Congress, USEPA, 1995. **Report to Congress on the Phase II Storm Water Regulations**, USEPA, 1999. **Coastal Zone Management Measures Guidance**, USEPQ, 1993.
Tiefenthaler, L.L., Schiff, K.C., and Bay, S.M. "**Characteristics of parking lot runoff produced by simulated rainfall**," July 2001. Westminster: Southern California Coastal Water Research Project, discusses results measuring toxicity of parking lot runoff based on parking lot use, maintenance (street sweeping), and duration and intensity of rainfall.
Oltmann, R.N., and Shulters, M.V., **Rainfall and Runoff Quantity and Quality Characteristics of Four Urban Land-Use Catchments in Fresno, California, October 1981 To April 1983**, 1987. USGS Open-File Report 84-710. Discusses results of sampling for a variety of urban runoff and dry weather urban pollutants in Fresno generally and with respect to land use type.

Ebbert et al., **Water Quality in the Puget Sound Basin, Washington and British Columbia, 1996-98**, USGS Circular 1216, and Ayers et al., **Water Quality in the Long Island-New Jersey Coastal Drainages, New Jersey and New York, 1996-98,** USGS Circular 1201, summarize major findings about water quality based on broad land use categories.

storm sewers." [40 CFR 122.26(d)(2)(iv)(A)(1)]

In 1993 the U.S. EPA published the "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters." This guide identifies Best Management Practices (BMP) for stormwater treatment and contains information on urban runoff impacts, BMP pollutant removal efficiency, and BMP cost. The Guidance identifies both chemical pollutants and runoff hydrograph changes leading to excess creek erosion as significant urban runoff impacts.

The Dischargers' NPDES permit, as reissued in 1995, required a Performance Standard for New Development Planning Procedures. The Dischargers developed this Performance Standard, which contains many similar requirements to the Revised Tentative Order, in 1997. Among the similar requirements are:

- Dischargers must have adequate legal authority to require stormwater treatment best management practices as part of their development plan review and approval procedures;
- Developers of projects with "significant stormwater pollution potential" *must be required to mitigate impacts through proper site planning and design techniques and/or addition of stormwater treatment BMPs*;
- Developers of projects with stormwater treatment BMPs must be required to provide for operation and maintenance of such controls;
- Developers must be given information on site design and BMPs for stormwater pollution prevention early in the application process;
- CEQA and NEPA review processes must address stormwater quality impacts during the life of the project; and,
- Dischargers must provide annual training to planning, building, and public works staffs on planning procedures, design guidelines, and BMPs for stormwater pollution prevention.

With some exceptions, the Dischargers' implementation of this Performance Standard has been well below expectations. In the FY 99-00 reporting year, the two largest municipalities reported that only 7 out of 123 private development projects were required to install structural stormwater treatment BMPs.[2]

Cost and Effectiveness

Source control, site design, and treatment control BMP requirements for new development offer a cost-effective strategy to reduce urban runoff pollutant loads to surface waters. Studies on the economic impacts of watershed protection indicate that stormwater quality management has a positive or at least neutral economic effect while reducing stormwater pollutant impacts to the quality of surface waters.[3]

[2] Santa Clara Valley Urban Runoff Pollution Prevention Program FY 1999-00 Annual Report, Section 8, Co-Permittee Activities.

[3] *The Economics of Watershed Protection*, Tom Schueler (1999), Center for Watershed Protection, Endicott, Maryland. The article summarizes nationwide studies to support the statement that watershed planning and stormwater management provide positive economic benefits.
Economic Benefits of Runoff Controls, USEPA (1995), Doc. No. EPA 841-S-95-002, discusses the economic benefits of including stormwater treatment wetlands and wet ponds in projects.

Costs of implementing the revised Provision C.3. requirements are expected to fall in the range of 1-2% of overall project costs for new or significant redevelopment. This estimate was confirmed by the July 18, 2001, testimony before the Board, in which an engineering consultant for the building industry presented his analysis of the costs of a multi-chambered basin with a sand filter outlet, along with underground piping to meet the peak flow criteria, a fairly elaborate option among many BMP options. He determined the cost (including construction of the basin and piping, an access road, landscaping, fencing, maintenance, weed abatement, and vector control) to be approximately 2% of the total costs of a 6-7 lot subdivision in San Jose, based on his engineering project experience.[4]

A separate cost analysis was completed by Board staff and included in the October 10, 2001, Response to comments. This cost estimate is included herein, in expanded form, as Attachment B. Staff's analysis showed that total costs for construction of a wet basin—a relatively expensive treatment control—including capital costs, land costs, and operation and maintenance costs for 50 years, would be approximately 0.66 – 1.2% of total project costs. The estimated cost of designing, constructing, and operating and maintaining vegetated swales for the same project is about 0.1% of total project costs, excluding land costs, or 0.4 – 0.5% of total project costs, including land costs for the swales.

Innovative project designs that utilize site design and treatment control requirements to reduce other costs—for example, draining stormwater in surface swales rather than excavating for and building an underground storm drain system—may, in some cases lower total project costs. Village Homes, constructed in the mid-1970s in Davis, California, is an example of a single-family residential subdivision project that saved money by constructing surface swales and detention basins instead of underground storm drains. Village Homes' use of those measures also resulted in improved flood control, and higher property values as compared to similarly situated single-family subdivisions.

Implementation of Similar Requirements in California and the U.S.

Stormwater treatment measures can be and have been completed at a reasonable cost, and can be integrated into the urban and suburban landscape in an aesthetic and unobtrusive manner. Indeed, approximately 31 structural stormwater treatment controls were installed at private developments in the Santa Clara Basin in the last year.[5] While the treatment of stormwater runoff, in and of itself, is not new to the Dischargers, what is new about the revised Provision C.3. are the requirements to:

(1) implement treatment controls at all applicable projects ("Project Categories");

(2) ensure the treatment controls are properly sized to treat the small storms that generate 80-90% of the stormwater pollutants[6] (Numeric Standards); and

(3) limit changes in the runoff hydrograph (Hydrograph Modification Management).

[4] Transcript of Item 11 at July 18, 2001 Regular Meeting of the California Regional Water Quality Control Board, San Francisco Bay Region, 155:4-159:3.
[5] Santa Clara Valley Urban Runoff Pollution Prevention Program FY 1999-00 Annual Report, Section 8, Co-Permittee Activities.
[6] *Urban Runoff Quality Management*, Water Environment Federation Manual of Practice No. 23, American Society of Civil Engineers Manual & Report on Engineering Practice No. 87, 1998.

A number of municipalities across the country presently are implementing measures similar to these three requirements. In addition, projects with measures for site design, source control, or treatment control, and/or limitations on changes in the runoff hydrograph, like those required in the Revised Tentative Order, have been constructed throughout the Bay Area and in at least 25 states.[7] States such as Maryland, Florida, and Washington have shared their experience in implementing numerical standards[8]. Examples of implementation include:

- **State of Florida:** Since 1979, Florida has required stormwater BMPs be designed using numerical sizing criteria to treat 90 percent+ of average annual runoff, with the goal of reducing the total suspended solids loadings to waters by 80 percent (95 percent for impaired waters).
- **State of Maryland:** Since 1982, Maryland has required treatment of 0.9 – 1.0 inch of rainfall runoff for water quality, and included BMP design standards in a unified approach combining water quality, stream erosion potential reduction, groundwater recharge, and flood management.
- **State of Washington, Puget Sound catchment:** Since 1992, Washington has required use of numerical sizing criteria for stormwater BMPs and hydrograph modification impacts. The 1992 standards required use of numerical criteria for new development and redevelopment projects of 5,000 square feet or larger.[9]
- **Seattle, Washington:** For new developments of 750 square feet or more, stormwater detention must be provided based on a 25-year storm and a peak discharge rate not to exceed 0.2 cubic feet per second per acre. For projects that add more than 9,000 square feet in development coverage, the peak drainage discharge rate is limited to 0.15 cubic feet per second per acre for a 2-year storm.
- **Denver, Colorado:** New residential, commercial, and industrial projects greater than one acre must capture and treat the 80th percentile runoff event.[10] This capture and proper treatment are estimated to remove 80 – 90 percent of the annual total suspended solids (TSS) load. TSS is viewed as a surrogate measure for heavy metal and petroleum hydrocarbon pollutants.

In California, Ventura County, Orange County, Los Angeles County, the City of Long Beach, and the City and County of San Diego are in various advanced stages of drafting and implementing stormwater permit provisions similar in scope to, and in some cases more comprehensive than, the revised Provision C.3. To a large extent, the similarities and variations between Provision C.3. and these other California permit provisions reflect the similarities in urban pollutants and the variations in local conditions.

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[7] "*Stormwater Strategies: Community Responses to Runoff Pollution*," Natural Resources Defense Council (May 1999), National Storm Water BMP Database, ASCE/USEPA (revised 2000). Projects recently permitted by the Board, including residential projects such as the Gale Ranch project in Contra Costa County and the Blue Rock Country Club in Alameda County, and commercial/industrial projects such as Catellus' Pacific Commons project in Fremont and Pacific Shores in Redwood City, include such measures.

[8] See Attachment A of July 10, 2001, Staff Report.

[9] "Stormwater Program Guidance Manual for the Puget Sound Basin," Washington State Department of Ecology (July 1992) (Vol. 1, Appendix A).

[10] "Stormwater Quality Control Plans: An Information Guide," Denver Department of Public Works (2000).

In summary, urban runoff has been identified as a significant contributor to degradation of beneficial uses and water quality criteria exceedance. The measures proposed in the Revised Tentative Order are required under the federal Clean Water Act; will help reduce detrimental impacts to waters of the State caused by urban runoff from new development and significant redevelopment projects; and have been found to be effective in reducing pollutants and cost-effective in applications in the Bay Area and throughout the country.

Elements of the Revised Tentative Order

In previous documents and meetings (Board workshops, Supplemental Fact Sheet, July 10 Staff Report), the major elements of the Revised Tentative Order have been discussed, including their bases and rationale. A brief summary of the elements of the Revised Tentative Order is given herein, followed by a discussion of revisions made for the August 17 and October 10 versions.

Provision	Summary of Requirement
Applicable Project Categories	Group 1 Projects: *require stormwater treatment BMPs beginning Oct. 2002* • Any development – one acre or more of impervious surface • Streets / Highways – one acre or more of impervious surface • Significant Redevelopment – addition or replacement of one acre or more of impervious surface on a developed site
	Group 2 Projects: *require stormwater treatment BMPs beginning Oct. 2004* • Any development – 5000 sq.ft. or more of impervious surface • Streets / Highways – 5000 sq.ft. or more of impervious surface • Significant Redevelopment – addition or replacement of 5000 sq.ft. or more of impervious surface on a developed site
Alternate Project Definition	Optional: Dischargers may propose an Alternative Group 2 Project definition that would address a comparable development area and/or pollutant loading, but would better fit the Dischargers' local development patterns
Numeric Sizing	Select from 2 volume criteria and 3 flow criteria when designing the size of the treatment BMP; these allow for variation in local rainfall data
O & M	Develop & implement an Operation & Maintenance (O&M) program for Group 1 Projects with structural in-ground BMPs such as sand filters, filter inlets, detention/ retention basins. Inspect a prioritized subset of treatment measures for verification. *Begin October 2002*
	Develop & implement an O&M program for Group 1 Projects with landscape and all other BMPs, such as vegetated swales, dry or wet ponds. Continue inspection and followup of a prioritized subset. *Begin October 2003*
Peak Runoff Limitation	Stepwise development of a Hydrograph Modification Management Plan to manage impacts to stream hydrograph from urban development: (1) Submit a detailed workplan and schedule for the HMMP; (2) Submit literature review; (3) Submit draft/final HMMP for Regional Board approval; includes evaluation of cumulative impacts of urbanization and measures to lower impacts *by October 2003*; (4) Implement HMMP *following Board approval*

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Provision	Summary of Requirement
Waiver	Optional: Develop a waiver system, for Regional Board approval, for projects where treatment BMPs are impracticable (defined by Dischargers, can include "excessively costly"); must treat an equivalent load/quantity at another location within same watershed where feasible, or establish equivalent water quality benefit. Dischargers will review/grant waivers for their development projects and report annually to the Regional Board. May allow "***regional solutions***" without showing impracticability, i.e., allow payment into an area-wide stormwater treatment facility rather than requiring stormwater treatment in compensation for each waiver.
	Interim waiver: Dischargers may grant waiver for extreme limitations of space for treatment and lack of below-grade options. Project must assure construction of equivalent stormwater pollutant and/or volume treatment at another location within same drainage basin, or equivalent water quality benefit with Executive Officer approval.
Alternate Certification	To assist Dischargers with workload: Dischargers may accept outside registered engineer / architect's certification that a project's plan meets permit requirements. Can also accept certification from another Discharger agency with overlapping jurisdiction.
Limitation on use of Infiltration	To be sure stormwater treatment via infiltration does not negatively impact groundwater: Revised Tentative Order lists six minimum conditions that infiltration devices must meet.
Site Design	Builds on existing requirements: Evaluate local design standards for requirements that can result in high water-quality impacts (e.g., wider streets than necessary, curb requirement, minimum-size parking restrictions…). Replace such with "lower-impact" design concepts (clustering, disconnecting roof downspouts…).
Source Control	Builds on existing requirements: Include source control (a.k.a., "pollution prevention") measures in conditions of approval for re/development projects.
General Plans	Builds on existing requirements: Revise General Plans *as necessary* to direct land-use decisions and require implementation of consistent water quality protection measures for all development projects.
Review Process	Builds on existing requirements: Revise Environmental Review Processes *as needed* to evaluate water quality impacts of stormwater runoff from new development and significant redevelopment.

Changes included in the August 17, 2001, Revised Tentative Order

The July 18, 2001, Board workshop described the planned stakeholder process for the July-October timeframe. As discussed at that workshop, several stakeholder meetings were held, and the May 18 Tentative Order was subsequently revised and issued for public notice on August 17, 2001. The revisions made for the August 17 Revised Tentative Order included the following, with the more significant changes shown in bold type:

- Deleted changes to Provision C.14. that extended the expiration date of the NPDES Permit No. 01-024 because the attorney for the Dischargers commented that the Dischargers had not agreed to this permit modification;
- Clarified the Group 2 Project definition and other elements of the Tentative Order in response to stakeholder questions and comments;

- Clarified that projects smaller than the Group 1 and Group 2 Project categories are not subject to any of the requirements of revised Provision C.3.;
- **Redefined "Significant Redevelopment"** as: "land-disturbing activity, in a project category that meets the Group 1 or Group 2 size requirements, that results in the creation or addition or replacement of 5000 ft^2 of impervious surface on such an already developed site;"
- Clearly excluded interior remodels and routine maintenance of roofs and parking lots from the Significant Redevelopment definition;
- Eliminated the exclusion for redevelopments that decreased impervious surfaces by 20%, due to lack of supporting data, as pointed out by public comments;
- **Added one year to the implementation date for Group 2 Projects;**
- **Made the Alternate Group 2 Project Definition criteria more general**, to allow more flexibility;
- **Made the interim hydrograph modification standard more flexible,** by removing reference to duration of increased erosive flows;
- **Made the O&M requirements more flexible**;
- **Eliminated O&M requirements for Group 2 Projects** for this permit term;
- **Significant changes to the Peak Flow Limitation** section allowed Dischargers to develop an "equivalent limitation of peak flow impacts" under the Hydrograph Modification Management Plan and simplified the interim standard for limiting peak flow impacts;
- **Allowed Dischargers to develop their own Waiver Program**, rather than follow prescribed waiver procedures, and provided for an interim waiver until the Dischargers' waiver program is approved; and,
- **Allowed the Waiver Program to support "regional solutions,"** a.k.a. area-wide stormwater treatment facilities.

Further Revisions to the October 17, 2001, Revised Tentative Order

In recent weeks, Board staff has compiled and reviewed formal and informal comments on the August 17 Revised Tentative Order. The "informal comments" were received at stakeholders meetings, as listed in Attachment A. Many Commenters indicated improvements had been made in the language of the Revised Tentative Order. However, most if not all of the Commenters requested further changes, either for less or more comprehensive requirements. Many comments were less general in nature and focused on specific implementation issues, as compared to previous public comments. This may be a result of increased understanding of the issues and requirements gained at the public workshops put on by the Dischargers (August 9-10) and by Board staff (August 30 and September 5). We believe there is still a need to provide basic information about the water quality impacts of urbanization and the legal requirements, especially as new members of the public and new municipal employees and managers become involved.

Board staff has evaluated all the comments received on the August 17 Revised Tentative Order and proposes the following revisions:

- Modify language regarding which development projects that are "in-the-pipeline" when the implementation of the T.O. becomes effective are subject to the new requirements. This language more accurately reflects the project approval process for both public and private development projects;
- **Modify the definition of "significant redevelopment"** to say: "a project in a previously developed site that results in addition or replacement which combined total 43,560 sq.ft. or more of impervious surface on such an already developed site; " language that stakeholders find to be more straightforward;
- Remove one of the flow numeric sizing criteria, because stakeholders concurred it was not useful, and further clarified all of the criteria, based on the source references, per the Dischargers' suggestions;
- Clarify the Peak Flow Limitation provision by defining the term "flow duration" as: " the period that flows are above a threshold that causes significant sediment transport and may cause excessive damage to creeks and streams." The stakeholders were concerned that any increase in flow duration, no matter how minor, was prohibited for applicable projects;
- Require the Hydrograph Modification Management Plan to be approved by the Regional Board, rather than the Executive Officer, and allowed an additional three months for preparation of the HMMP;
- **Remove the Interim Standard** for the Peak Flow Limitation, which would have been in effect while the Hydrograph Modification Management Plan is under preparation; stakeholders believed implementation of the Interim Standard would not be cost-effective and would be counter-productive to their efforts to develop the HMMP;
- Modify the Waiver provision to allow "other benefits to water quality" in lieu of equivalent treatment at another location. Waivers granted on the basis of "other benefits to water quality" must be approved by the Executive Officer for the interim waiver;
- Modify the Interim Waiver to expire when the Waiver Program is approved by the Regional Board, in response to a comment by WaterKeepers.

Summary and Conclusions

The Revised Tentative Order (October 10, 2001) is the result of many hours of discussion and consideration with Co-permittees and other interested parties, and is largely patterned on the orders adopted in other regions of California and guidance created with the Co-permittees' involvement over the last two 5-year permit cycles. While this version of the Revised Tentative Order is still not completely satisfactory to all parties, staff believes that this represents the current best compromise on many controversial regulatory components. Future generations will inherit the built environment we create today, including both its positive and negative aspects. There is much we can do, working together, to reduce the impacts to our waters from necessary development. As such, we recommend that the Regional Board adopt the October 10, 2001, version of the Revised Tentative Order.

ATTACHMENT A

AMENDMENT OF THE NEW DEVELOPMENT PROVISION: STAKEHOLDER PROCESS

1999-2000: Discussions and submittals from Co-permittees regarding reissuance of the Program's entire municipal storm water NPDES permit, including new development provisions as well as all other permit provisions.

Oct. 13 - Nov. 13 2000: Formal public comment period on the Tentative Order for the Program's entire NPDES permit reissuance. Comments were received from Co-permittees, environmental advocacy groups, and industry, and included comments on new development provisions.

Nov. 7, 2000: Held a stakeholder meeting during the formal public comment period to discuss permit issues. Significant unresolved comments remained on the new development provisions.

Dec. 13, 2000: Held a stakeholder meeting on the new development provision only. Regional Board staff and stakeholders agreed that the new development provision needed further work, while the remainder of the Program's permit should be reissued. Co-permittees gave their permission to reopen the permit after its reissuance for purposes of updating the new development provision.

Jan. 10, 2001: Held a stakeholder meeting to discuss the new development provision. Regional Board staff considered comments from this and previous meetings to draft updated provision language.

Feb. 21, 2001: Program's NPDES permit is reissued.

Early May 2001: Complete draft of updated new development provision issued for discussion with stakeholders.

May 14, 2001: Held a stakeholder meeting on the new development provision. Verbal comments from the meeting and written comments received after the meeting were used to make additional changes in the provision.

May 18-June 18, 2001: Formal public comment period for the Tentative Order containing the revised new development provision.

June 5, 2001: Held stakeholder meeting on the new development provision to discuss the changes made following the meeting in May.

July 18, 2001: As part of the Regional Board meeting, staff held a workshop on the new development provision, recommending more time for stakeholder input.

Last week of July 2001: Executive Officer met with City Managers and Director of Santa Clara Valley Water District (SCVWD) to discuss Co-permittee concerns.

August 2, 2001: Regional Board supervisory staff met with City Planning and Public Works Directors to discuss Co-permittee concerns.

August 6, 2001: Regional Board staff held a stakeholder meeting on the new development provision. Verbal comments from the meeting and written comments received after the meeting were used to make additional changes in the provision.

August 9 & 10, 2001: Regional Board staff spoke at Bay Area Stormwater Management Agencies Association conferences, "Meeting New Requirements for Stormwater Controls in New and Redevelopment Projects" in Berkeley and Cupertino.

August 27, 2001: Executive Officer and Board staff met with officials from Milpitas, City of Santa Clara, San Jose, Sunnyvale, Palo Alto, and Santa Clara County to discuss provision revisions.

August 30, 2001: Board staff presented a Workshop in San Jose (courtesy of Altera Corporation) to (1) Bring newly involved stakeholders up to date on the proposed permit amendment, and (2) Get feedback on the specific requirements of revised Provision C.3., and possible provision language improvements.

Sept. 5, 2001: Board staff presented a Workshop in San Jose (courtesy of the SCVWD) to (1) Present and discuss example post-construction controls at development projects—how they work, how they are sized, and other technical details, and (2) Get feedback on the technical requirements of the revised permit Provision C.3., and possible provision language improvements.

Sept. 14, 2001: Executive Officer and Board staff met with officials from Milpitas, City of Santa Clara, San Jose, Sunnyvale, Palo, Alto, Los Altos, Santa Clara County and the SCVWD to discuss provision revisions.

Sept. 19, 2001: As part of the Regional Board meeting, staff held a workshop on the types of stormwater treatment measures required by the new development provision.

Sept. 20, 2001: Executive Officer gave a presentation on the new development provision to the Santa Clara Council of Cities.

Sept. 26, 2001: Executive Officer gave a presentation on the new development provision to the Silicon Valley Pollution Prevention Committee.

Sept. 28, 2001: Executive Officer met with officials from Milpitas, City of Santa Clara, San Jose, Sunnyvale, and the SCVWD to discuss provision revisions.

Oct. 1, 2001: Board staff met with members of the Western States Petroleum Association to discuss their concerns regarding regulation of retail gasoline outlets under Provision C.3.

Attachment B

Sizing and Cost Estimates for Inclusion of a Wet Pond or Grassy Swales to Treat Stormwater Runoff from a Project

The following example is excerpted from one of three presented at a September 2001 technical workshop with the stakeholders' group.[11] It is an example of applying the sizing requirements in the revised T.O. to a Bay Area project. Cost estimates have been prepared based on the resulting treatment control sizing.

Project/Site Description

A typical office/light industrial/R&D campus-type development, with surface parking, located in southern Alameda County near Milpitas. The project consists of about 350,000 square feet of interior space in 1- and 2-story buildings. The site's surface parking is comprised of 1,200 spaces of perpendicular parking with bi-directional travel aisles. The site is located in the flats adjacent to the Bay.

Site size: 21.80 acres
Comprised of:
Buildings and concrete: 6.25 acres
Asphalt and pavement: 11.40 acres
Landscaping: 4.15 acres

Percentage Impervious: 81 %

Summary of Detention Requirements, Southern Alameda County

- *WEF Method*

Detention Time	Required Storage Volume
48 hours	1.39 acre-feet
24 hours	1.12 acre-feet

- *California BMP Handbook Appendix D method*

Detention Time	Required Storage Volume
40 hours	0.78 acre-feet (San Jose data)
40 hours (in Hayward)	1.24 acre-feet (Hayward data)

Based on the sizing as shown above, and the depth of the detention basins, the basins could require the following amounts of land:

Average Effective Depth of Basin (not including freeboard)	Approximate Area Required
1 foot	0.78 - 1.39 acres
4 feet	0.2 – 0.35 acres

[11] Sizing information herein is taken from: Lichten, Keith H., 2001. "Technical Discussion—Sizing Notes: Draft new development permit amendment." Document and presentation at technical stakeholder meeting of September 5, 2001, at the Santa Clara Valley Water District; and,
Lichten, Keith H., 2001. "Design Calculations—Examples 1-3: Treatment control sizing discussion." Document and presentation at technical stakeholder meeting of September 5, 2001, at the Santa Clara Valley Water District.

6 feet	0.13 – 0.23 acres

Depending on size, a detention basin for water quality could occupy from 0.5 percent to 6 percent of the total site. The larger design would be for a very shallow basin that might also be used for other purposes. This suggests that a detention basin could be accommodated within the proposed site design.

For the purposes of preparing a cost estimate, we will assume a basin that captures 1.4 acre-feet of water—the largest estimate, and which is an average of 4 feet deep, therefore requiring approximately 0.4 acres of land.

One can estimate total costs for the wet pond by extrapolating from the estimates in "Costs of Urban Nonpoint Source Water Pollution Control Measures" converting to 2001 dollars, and assuming 25% additional cost for engineering design, administration, and legal fees, and contingencies.[12] Per-acre capital costs range from $3,100 – 8,800, for a total basin capital cost of $68,000 – 193,000.[13] This excludes the costs of land. This estimate is similar to that made for extended detention basins in Los Angeles and that presented in the July 2001 Staff Report, albeit higher on the high end. If costs of land are included,[14] and a 0.4 acre basin size is assumed, then the total capital cost, including land, rises to $362,000 – 487,000 (2001 dollars). This cost is approximately 0.6 – 0.8% of the developer's estimated total project cost of $58,500,000.[15]

Public testimony made at the July 2001 Board meeting by an engineering consultant to the building industry stated that operation and maintenance costs for such a basin might be about $500/year. Other references suggest they may be greater, and as much as $2,600/year in 2001 dollars, although references note that costs vary depending on basin design, size, and other factors, and may be less than that estimate.[16] If a 50-year lifetime for the pond is assumed, and costs are assumed to stay constant relative to inflation, then wet pond maintenance costs would be expected to range from about $25,000 – 130,000 over the 50-year life of the basin (in 2001 dollars). This would result in total costs for a wet pond, including capital costs, land, and operation and maintenance, ranging

[12] Southeastern Wisconsin Regional Planning Commission, June 1991. **Technical Report No. 31: Costs of Urban Nonpoint Source Water Pollution Control Measures**. Waukesha, WI: SEWRPC, pp.15-25. This reference surveys, summarizes, and discusses numerous cost estimates for a variety of storm water treatment controls. It includes a variety of references completed over the last 25 years, and including references from Washington, D.C., Maryland, Southern California, Wisconsin, and other locations.

[13] Differences between the low and high estimates include differences in the cost of clearing, grubbing, planting, the costs of riprap, inlet and outlet structures, fencing, excavation and fill, etc. In general, the assumed costs at the high end are a bit more than twice as much as those at the low end. See Costs of Urban Nonpoint Source Water Pollution Control Measures, Table 7, p. 21.

[14] Land costs are estimated at $735,000 per acre (2001 dollars), based on the estimate submitted by the developer to the Board. The inflation conversions in this example were made using the Columbia Journalism Review Inflation Converter, at http://www.cjr.org/resources/inflater.asp.

[15] If costs of land were significantly higher, or $1,500,000 per acre (2001 dollars), then the cost of the basin as a percentage of estimated total project cost would rise slightly, to 0.9 – 1% of the total estimated project cost of $75,500,000. When maintenance costs are included with the higher estimate of land costs, then the cost of the basin as a percentage of estimated total project cost rises to 0.92 – 1.2%.

[16] SEWRPC, 1991. **Costs of Urban Nonpoint Source Water Poln. Ctrl. Measures**. Waukesha: SEWRPC, pp. 15-25.

from $387,000 – 617,000 (2001 dollars). This cost is approximately 0.66 – 1.05% of the developer's estimated total project cost of $58,500,000.

It is also possible to prepare an estimate of total costs for a flow-based solution on the same example project. An estimate of land area and treatment control design for grassy swales was prepared for the September 5, 2001, meeting.

Summary of Flow-Based Requirements, Southern Alameda County

Assume: Rain event equal to 0.2 inches per hour intensity
Resulting flow to be treated from the site: 2.66 cubic feet per second

If one were to take the flow from the entire site to a single grassy swale, then the swale would be sized as shown below. Typically, one would treat the flow with a larger number of swales located at various parts of the site, because of ease of directing drainage into nearby swales as opposed to routing all drainage to a single treatment facility. An example of that more distributed design follows.

There are two primary controlling variables for swale design. The first is velocity—a swale must be designed so that runoff from the water quality design storm flows through slowly enough to receive appropriate treatment, and so that runoff from the peak storm does not erode it. This primarily influences the design of a swale's cross section—its depth and width. Second, flow must have enough residence time in the swale to receive appropriate treatment. The greater the appropriate residence time, the longer a swale's length. Here, the residence time has been assumed to be 9 minutes.

Swale design assumptions	Sizing
Longitudinal slope	1 percent
Side slopes	3 to 1 (horizontal to vertical)
Flow depth (water quality storm)	6 inches
Treatment time of water in the swale (a.k.a. residence time)	9 minutes
Manning's *n* (water quality storm)	0.2
Swale cross-section	Trapezoidal

Parameter	Calculated Sizing
Depth	1.5 feet
Bottom width	10 feet
Total swale width	19 feet
Length	250 feet

The swale, as designed above, would accommodate peak flows. As shown, the swale would occupy approximately 4,750 square feet, or 0.11 acres. For this site, this area is less than 3 percent of the designed landscaping area. Also, this design incorporates 1 foot of freeboard, which may be greater

than necessary, given the width of the swale in the tendency of velocity to increase as flow increases and swale vegetation "lays down," decreasing roughness. The results suggest that there is substantial room available within the proposed landscaping for proposed treatment.

What if there were 5 swales around the site, and each swale took an approximately equivalent portion of runoff? Then their design would be as follows:

Parameter	Calculated Sizing (for each of the 5 swales)
Depth	~ 0.7 feet
Bottom width	3.6 feet
Total swale width	~ 8 feet
Length	190 feet

Thus, a single swale would occupy approximately 1,520 square feet, or 0.035 acres. Together, all five would occupy 7,600 square feet, or 0.17 acres. This is about 0.8 percent of the total site, or about 4 percent of the site's landscaping. While they would occupy a bit more area than a single swale, it may be more practical or convenient to design in a number of swales, and the numbers here suggest that this type of design would also be practical.

Cost Estimate

For the cost estimate, the swale sizing example using 5 swales—which is more likely to be implemented in real life—will be used. Cost estimates have been completed (in 2001 dollars) based on the summaries in "Costs of Urban Nonpoint Source Water Pollution Control Measures," and assuming the following slightly simplified swale dimensions:

Parameter	Calculated Sizing (for each of the 5 swales)
Depth	1 foot
Bottom width	4 feet
Total swale width	10 feet
Length	190 feet
Land area per swale	1900 square feet (0.04 ac)
Total land area required (for 5 swales)	9500 square feet (0.22 ac)

This results in an estimated capital cost of construction per lineal foot of about $16 (2001 dollars).[17] For the 5 swales, which have a total of 950 lineal feet, this results in a capital cost of $15,200 for all five swales.

[17] SEWRPC, June 1991. **Technical Report No. 31: Costs of Urban Nonpoint Source Water Pollution Control Measures**. Waukesha, WI: SEWRPC, pp. 46-55. Capital costs include equipment mobilization/demobilization, site preparation—including clearing, grubbing, general excavation, and levelling and tilling—site development, including

Swale operation and maintenance consists of mowing, general lawn care, debris and litter removal, grass reseeding with mulch and fertilizer, and program administration and quarterly inspection costs. For swales of this size, O&M costs are estimated at about $0.83 per lineal foot. This results in a total estimated annual O&M cost of about $790 (2001 dollars).

If a 50-year swale lifetime is assumed, and O&M costs are assumed to remain constant with respect to inflation over the lifetime of the swales, then total swale costs, including design and capital costs and O&M, but excluding land costs, are approximately $54,700. This is about 0.1% of the estimated total project cost of $58,500,000.

Ordinarily, vegetated swales would be constructed in a site's existing landscaping, and would not, therefore, take up additional land not already dedicated to a landscaping-compatible use. Thus it is not clear it is appropriate to include a separate land cost for them, especially in this example, where there is adequate room in the site's landscaping for them. However, to fully explore potential costs on sites that may be more constrained, an estimate has been prepared here. Assuming an estimated land costs of $735,000/acre and the higher estimate of $1.5 million/acre, respectively, swale costs would rise to $216,000 – 384,700. This results in costs as a percentage of total project cost of 0.4 – 0.5% (i.e., one half of one percent).

Conclusion

Estimates for two types of treatment controls in a 22-acre project show that the controls could be designed, constructed, and operated and maintained over 50 years at costs ranging from 0.4 – 1.05% of total project cost. These estimates provide an example showing that measures may be constructed at reasonable cost in a project.

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salvaging topsoil, seeding, mulching, sodding, and placement of any needed grade control structures; and, engineering, administration, and design cost estimates and contingencies of 25% on top of the remaining costs.