Hydromodification Panel Recommendations to the California Water Quality Control Board, San Diego Region

Recommended Hydromodification Management Approaches and Tools for the Regional Municipal Storm Water Permit

October 10, 2012

Hydromodification Management Workshop Recommendations

San Diego Region Hydromodification Management Meeting

August 30, 2012

San Diego Concourse, Copper Room, 202 C Street, San Diego CA

Hydromodification Management

The Draft San Diego Regional MS4 Permit (Regional MS4 Permit) defines hydromodification as:

> "The change in the natural watershed hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow and groundwater flow) caused by urbanization or other land use changes that result in increased stream flows and sediment transport. In addition, alteration of stream and river channels, such as stream channelization, concrete lining, installation of dams and water impoundments, and excessive streambank and shoreline erosion are also considered hydromodification, due to their disruption of natural watershed hydrologic processes."

This report and recommendations focus on management approaches and tools to reduce the impacts of hydromodification.

MS4 Permit Context

The San Diego Regional Water Quality Control Board (SDRWQCB) has issued Municipal Separate Storm Sewer System (MS4) Permits under the National Pollutant Discharge Elimination System (NPDES) Phase-I regulations since 1990 to San Diego County, and portions of Orange County and Riverside County. MS4 Permits are required to be renewed every 5 years—to date the San Diego Countywide MS4 Permit was renewed in 2001, and in 2007. The Regional MS4 Permit currently under review will be the fourth-term permit for San Diego Region Countywide Permittees. However, the SDRWQCB intends that the Regional MS4 Permit will apply to all Phase-I Permittees under the jurisdiction of the SDRWQCB, rather than having three separate MS4 Permits for the three counties. Therefore, the Orange and Riverside County Permittees are closely following and participating in the development of the Regional MS4 Permit.

The Regional MS4 Permit would require the Permittees to condition priority development projects (PDPs) (defined in Sections 3.b.1 and .2) under Section E: Jurisdictional Runoff Management Programs. In addition to Low Impact Development (LID) or conventional Best Management Practices (BMPs) to address pollutants in runoff, PDPs must ensure that downstream drainage conveyances will not be adversely impacted by hydromodification, including increases in runoff volume, flow rate, or flow duration. Specifically, PDPs must, with few exceptions, be constructed to match post-development flows to pre-development flows within 10%.

The current San Diego Countywide MS4 Permit required the development of a Hydromodification Management Plan (HMP), which was approved by the SDRWQCB in December 2009. This HMP is currently being implemented and includes "exemptions" that eliminate hydromodification management requirements for a project that 1) discharged to exempt receiving waters such as the Pacific Ocean, or 2) discharged to hardened conveyance systems that extend to exempt systems, or discharged to highly urbanized watersheds (greater than 70 percent imperviousness).

Orange County's 2009 MS4 permit also required the development of a HMP, which was submitted in draft form to the SDRWQCB in December 2011. The Orange County HMP (OC HMP) was based on the framework of the 2009 San Diego HMP and included hydromodification management requirement exemptions for PDPs under certain conditions. These exemptions include projects that discharge to underground stormdrain systems, projects discharging to exempt receiving waters, discharges to engineered channels with specific attributes (including the capacity to convey a 10-year frequency storm event), projects defined as "infill" projects, and projects that discharge to large river reaches. The OC HMP included maps and analysis to help identify these exempt areas.

Within this context, this Workshop was convened to inform the development of hydromodification management approaches, especially given requirements currently under consideration for the draft San Diego Regional MS4 permit. The workshop centered on a panel of five stormwater and hydromodification management experts, who provided presentations during the first half of the workshop and responded to questions in the latter half. They assumed that the audience had basic background knowledge of hydromodification, causes and impacts, so the meeting focused directly on the applicability of hydromodification management requirements in developed areas with well-established flood control systems--especially as applied in the climate of southern California. The audience and panelists were encouraged to think carefully of existing fears and misperceptions, such as the likelihood of removing large flood-control systems in the foreseeable future, and the concern that hydromodification regulations would be similar everywhere (a one-size- fits-all approach). The participants were also encouraged to identify a short list of the highest priority recommendations for consideration as the Regional Permit is developed.

The expert panel was asked to address two specific questions from the MS4 Permittees (as described in the Meeting announcement and agenda) with an understanding that there would be numerous additional questions that might also be relevant. Two examples of these second-tier questions were also provided. These questions were:

Key Questions

A. What are key decision factors in applicability of hydromodification management requirements?
(HM requirements apply everywhere, but specific requirements for a site or catchment should be commensurate with Beneficial Uses, technical feasibility, and cost—one size does not fit all)

B. Where in the watershed, and using what criteria, should hydromodification management requirements be applied?

(Can we identify specific factors and a process of evaluation that are essential for selecting the type of hydromodification management action or approach that is most likely to reduce adverse hydromodification impacts*?)*

Second-Tier Questions:

C. What constraints and incentives (in lieu, hydromodification management trading/credits) are applicable to hydromodification management approaches?

D. How do we prioritize sites and/or areas within watersheds for application of hydromodification management requirements?

The Workshop consisted of five presentations in the morning by the members of the Panel. Their general areas of focus were as follows:

- **Managing Hydromodification: the Next Generation (Eric Stein**, PhD, Southern California Coastal Water Research Project
- **Hydromod' regulations in California (Eric Berntsen** PH, CPESC, CPSWQ, State Water Resources Control Board**)**
- **Hydromodification and Flood Control--mandates, constraints, and opportunities (Iraj Nasseri,** PhD, PE, PH, Water Resources Division, Los Angeles County Flood Control District**)**
- **Hydromodification regulation and rehabilitation approaches (Chris Bowles,** PhD, PE, cbec, inc., eco engineering**)**
- **Landscape Stratification, Watershed Processes, and Hydromodification Control— A new approach from the Central Coast (Derek Booth,** PhD, PG, PE, UC Santa Barbara, Bren School of Environmental Science and Management)

Panel Recommendations

1. Manage stream channels and hydromodification management within a holistic watershed management framework. The panel's key, overarching recommendation was that hydromodification impacts are best addressed by initially identifying and prioritizing opportunities and constraints at the watershed scale. Site-by-site evaluations, typically conducted only as required for local development project permitting--and in the absence of an overall watershed framework--will never provide an adequate basis for successful mitigation of hydromodifcation impacts. The results of a watershed-scale assessment can be used to establish goals and expected conditions for specific areas of the watershed, and they can be a precursor for both an off-site in-lieu and hydromodification management credit and mitigation program. It must be recognized that the level of watershed functionality is the primary control for stream conditions. A simple starting point is to map geology and slope in the watershed, which can be used to infer the primary watershed processes that determine downstream physical, chemical, and biological conditions. More detailed characterization of receiving waters, using stream (or fluvial) audits, field and desktop reconnaissance, and additional watershed attributes such as habitat types and land use, can be included, if available. All relevant data can then be synthesized and analyzed within a GIS or geodatabase to develop "management zones" that can identify the critical elements of the watershed and its key processes that require protection. Present land use can be evaluated and future land use conditioned to protect and enhance watershed processes, and in turn, stream system integrity.

To the extent data are available, such analyses should consider all watershed attributes—physical, chemical, biological, past and future land use, and the applicability of management practices that can address multiple stressors. Consider whether specific tools such as peak flow control, flow and flow duration control, or erosion potential determinations could be useful, or essential, to management of particular watershed areas. Continuous simulation rainfall-runoff models have been developed for several watersheds in southern California. Such models are expensive to develop and maintain, but, if available, can greatly refine the response of the watershed under various rainfall and land use scenarios.

Watershed processes are better understood when evaluated over appropriate timelines—hydromodification impacts and control practices will span decades. Therefore, emphasize change rather than endpoints, and require hydromodification management monitoring to support adaptive management that allows for revised management approaches given new information. Viable HMPs will translate the watershed assessment and appropriate tools into specific management actions that can be applied at project sites.

2. Project-specific metrics should be used in developing hydromodification management requirements. Each site has unique geology and slope that can be heterogeneous at various scales, and some sites may be severely impacted while others are impacted very little. However, it is also important to evaluate projects and watersheds at various scales to ensure a comprehensive understanding of the existing condition, and, to the extent possible, predicted future condition. Individual subwatersheds may share geology and slope attributes, but have very different land uses, for example, which should lead to different management strategies, different metrics of success, and different monitoring plans.

The timescale of analysis is also critical as watersheds and drainage systems change naturally over long time frames and the full extent of a stressor may not be evident within a 5-year MS4 permit term. An effective HMP will recognize these uncertainties, yet provide implementation guidance on the best understood approaches for specific areas of the watershed, and include a mechanism to review the effectiveness of management actions.

3. Revise Regional MS4 Permit language to reduce constraints on and increase the feasibility of off-site hydromodification management in-lieu, credit, and/or mitigation programs. In some cases, the best benefit for the watershed may be to implement mitigation actions off-site, but, wherever possible, within the same watershed as the potential impact. Allowing and incentivizing in-stream rehabilitation projects, which have been adequately characterized, will provide habitat benefits such as greenbelts and connectivity, and can be part of a larger effort to improve watershed functions and values. In developed areas, the only effective solution to hydromodification impacts over a 10-20 year time frame may be to stabilize the stream with structural means and increase habitat functionality over time. Infill projects often have existing conveyance structures with limited connection opportunities and a smaller footprint to incorporate requisite LID BMPs. These projects should also be eligible for off-site mitigation funding support, where appropriate, within a multi-benefit watershed framework, perhaps similar to the approach used in the Corps/EPA Compensatory Mitigation Rule[1].

[1] Department of the Army, Corps of Engineers 33 CFR Parts 325 and 332; and US Environmental Protection Agency 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. Federal Register / Vol. 73, No. 70 / Thursday, April 10, 2008, p 19594.

Most MS4 Permits in California, including the Regional MS4 Permit, have provisions to allow for "alternative compliance," such as in-lieu off-site, or hydromodification management and/or water quality credit programs. However, few, if any such programs have been implemented under the MS4 regulations here. The Regional MS4 Permit requires that off-site mitigation must be in the same hydrologic unit if at all possible, the mitigation project must be completed before occupancy permits are to be approved, and funding contributions made to an off-site project require the mitigation project be complete before occupancy permits are allowed. These requirements are very difficult to sequence as needed, and other regulatory agencies can have permitting timelines and requirements that destabilize the process. When developing an off-site credit or in-lieu mitigation approach, results should be emphasized rather than the process. Consider an incremental pay-in and monitoring approach, which may show that a result has been achieved earlier than expected, leaving committed funds for other projects[2].

4. Regional Boards should lead the development of implementation processes for MS4 permit requirements that involve other permitting processes and multiple agencies with jurisdiction over project conditioning or permitting. In California, development project requirements within MS4 permits have become a primary vehicle to ensure projects are conditioned for potential water quality and HM impacts at the project level; and they are also the current regulatory backstop to coordinate and ensure multiple other "non-MS4" project requirements are fulfilled before they can break ground. However, for optimal project design and implementation it is essential that, at the earliest possible stage, the development review and permitting process be coordinated with other involved agencies, including: the Regional Boards' 401 Water Quality Certification Program, the U.S. Army Corps of Engineers Section 404 dredge and fill permits, the U.S. Fish and Wildlife Service, the U.S. Forest Service, the California Department of Fish and Game, and Caltrans, among others. Coordinated permitting and permit scheduling would help support a viable HM off-site, in-lieu, credit, and/or mitigation program.

5. The question of whether (or not) to allow hydromodification management exemptions under certain conditions cannot be adequately addressed from the technical perspective alone, and requires guidance and input from local and/or regional stakeholders. Hydromodification management exemptions for specific stream reaches, or for ranges of stream conditions (such as engineered and hardened channels) may be appropriate; however, such exemptions do not account for other watershed scale effects of hydromodification (e.g. coastal erosion). From a strictly technical perspective, some potential HM-exempt reaches or areas can be identified in the watershed inventory. The watershed inventory and evaluation can also identify any potential in-lieu or off-site mitigation project areas that might have a viable nexus to the identified hydromodification management-exempt areas.

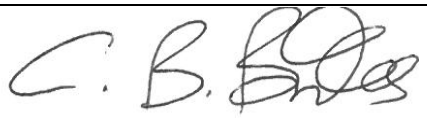
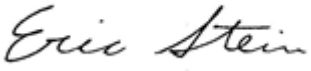
Whereas increased runoff from projects in "hydromodification management-exempt" areas may do little or no apparent harm to the channel that directly receives the discharge, the channel is typically part of a larger system that has been ecologically degraded by anthropogenic stressors, such as urban development and the need for flood protection. Watershed assessment and project planning require scientific and technical support to be

[2]Doyle and Shields, 2012. Compensatory mitigation for streams under the clean water act: Reassessing science and redirecting policy. Journal of the American Water Resources Association, 48(3).

effective in minimizing or reversing environmental impacts over various timescales. However, whether to impose expensive structural hydromodification management requirements on projects that redevelop aging urban areas with existing hardened runoff conveyance systems, or require such a project to pay into an off-site hydromodification management mitigation project or in-lieu fund are not technical questions—they are societal value judgments. Such determinations should be made through the multi-jurisdictional land-development hierarchy that establishes the environmental controls on land development. MS4 permits should incentivize planning and projects that improve watershed attributes and functioning over time, but they also need to recognize the need to integrate technical understanding with policy-level guidance to achieve this goal.

6. Monitoring must be an essential implementation requirement to understand the effectiveness of implemented BMPs or lack thereof. Strategic and judicious hydromodification management monitoring should be an essential component of the Watershed Management or Improvement Plan. Given our current systems and level of understanding, it may be more valuable to prove that a system worked (or did not work), even if conducting such an evaluation process potentially sacrifices some mitigation resources. However, HMP monitoring requires a much longer period of record (typically 10 years or more—well beyond MS4 permit terms) to establish baseline conditions or to discern incremental impacts from developing a single project or a portion of a watershed. Therefore, HMP monitoring must incorporate longer timelines and less frequent reporting than other monitoring program elements.

We, the expert speakers and panelists, support the 6 recommendations as presented above:

		
Eric Berntsen	**Derek Booth**	**Christopher Bowles**
		
Iraj Nasseri	**Eric Stein**	

Respectfully submitted on behalf of the workshop attendees.

Matt A. Yeager

Yeager Environmental Associates