Chapter

7

Hydromodification Management Measures

This Chapter summarizes the requirements for controlling erosive flows from development projects.

7.1 What is Hydromodification?

The change in the timing, peak discharge, and volume of runoff from a site due to land development is known as "hydrograph modification" or "hydromodification". When a site is developed, some of the rainwater can no longer infiltrate into the soils, so it flows offsite at ***faster rates and greater volumes,*** generally in a shorter time period. As a result, erosive levels of flow occur more frequently and for longer periods of time in creeks and channels downstream of the project. Hydromodification is illustrated in Figure 7-1, which shows the stormwater peak discharges after rainstorms in an urban watershed (the red, or dark, line) and a less developed watershed (the yellow, or light, line). The axes indicate the volume of water discharged, and the time over which it is discharged.

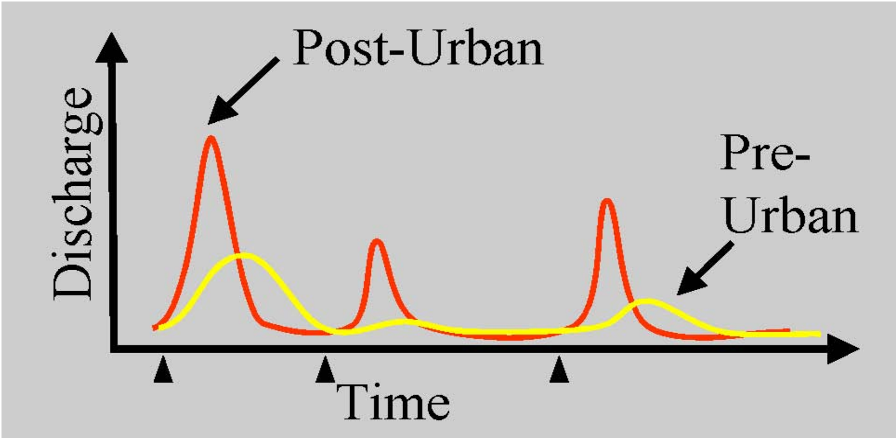

Figure 7-1: Stormwater Peak Discharges in Urban (Red) and Less Developed (Yellow) Watersheds (Source: NEMO-California Partnership, No Date)

Figures 7-2 and 7-3 further illustrate the effect of increasing urbanization on stormwater volumes. Land development increases the impervious area, decreases natural vegetation, changes grading and soil compaction, and creates new drainage facilities. These development activities decrease site infiltration, increase volume, duration, and frequency of flows, and increase connectivity of runoff to creeks. These effects can cause stream channel erosion and impair beneficial uses of the stream channel. Problems from this additional erosion often include property damage, degradation of stream habitat and loss of water quality, and have not been addressed by traditional flood control detention basin designs.

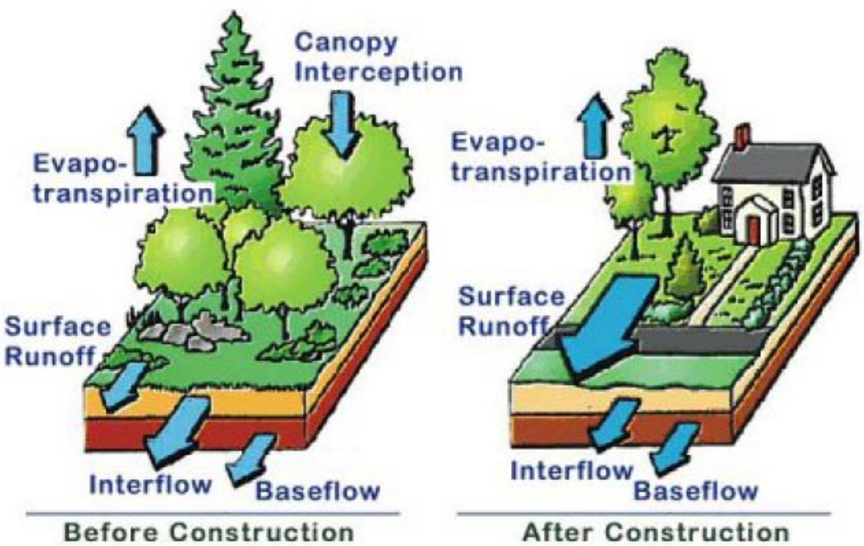

Figure 7-2: Effects of Urbanization on the Local Hydrologic Cycle (Source: 2000 Maryland Stormwater Design Manual)

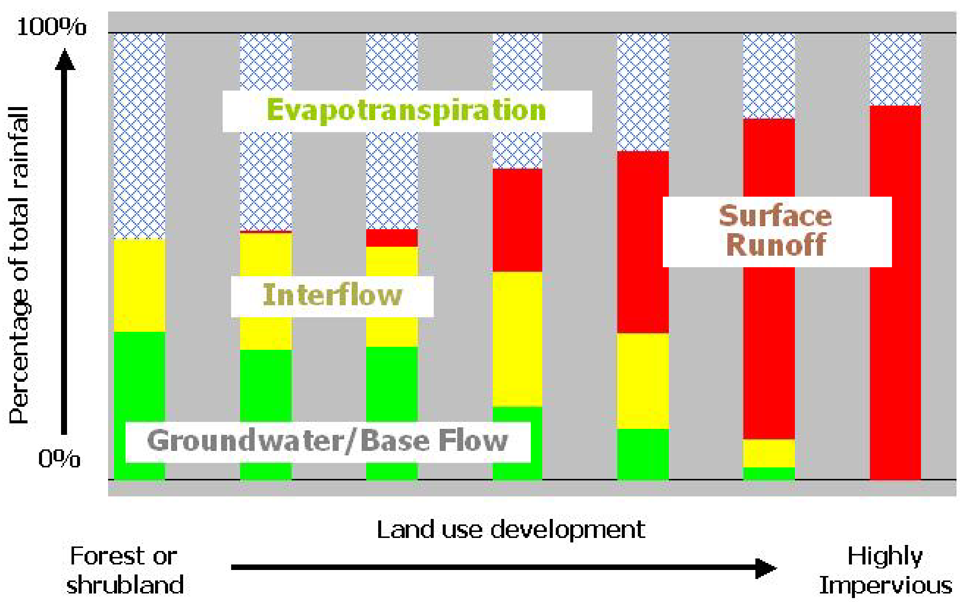

Figure 7-3. Variation in rainfall contribution to different components of the hydrologic cycle for areas with different intensity of urban development. (Chart used by permission of Clear Creek Solutions.)

7.2 Hydromodification Management Requirements

Hydromodification management (HM) techniques focus on ***retaining, or detaining and slowly releasing runoff*** in a way that matches pre-project runoff patterns.

Some projects may be subject to the hydromodification management (HM) requirements in the MRP's Provision C.3.g, which limits increases in runoff peak flow, duration and volume where such increases may cause increased erosion of creek beds and banks, silt pollutant generation, or other impacts to beneficial uses. The Urban Runoff Program developed a Hydromodification Management Plan (HMP) Report[1] in 2005 that delineated areas where such increases will be detrimental to channel health and water quality and described means of managing such situations to maintain the pre-project runoff conditions after development. A recommended management objective and performance criteria were developed based on the watershed assessments and technical analyses described in the HMP. These have now been adopted into the MRP as part of Provision C.3.g. and Attachment F, along with some changes to applicability requirements.

The HM requirements in the MRP and Attachment F can be summarized as follows:

Pre-project runoff conditions are those that exist on-site immediately before development (or redevelopment) activities occur. They are not the same as pre-development conditions (i.e., before any human land use occurred.)

- Increases in runoff peak flow, volume, and duration shall be managed for ***all projects that create and/or replace 1 acre or more of impervious surface***;
- Post-project runoff rates and durations shall not exceed estimated pre-project rates and durations;
- These conditions apply to areas where such increases in runoff flow or volume can cause increased erosion of creek beds and banks (as shown on HM applicability maps).
- HM requirements do not apply to projects that discharge to hardened or tidally-influenced portions of channels, where increased discharges present minimal potential for erosion or other impacts to beneficial uses.

The management objective and detailed performance criteria are presented below.

7.2.1 Hydromodification Management Objective and Standard

Stormwater discharges from any development/redevelopment project that creates or replaces one acre or more of impervious surface shall not cause an increase in the erosion potential of the receiving stream over the pre-project (existing) condition, i.e., an Erosion Potential Index[2] of up to 1.0 will be maintained for stream segments downstream of the project discharge point.

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[1] SCVURPPP, 2005. See: http://www.eoainc.com/hmp_final_draft/

[2] The Erosion Potential Index is explained in detail in the HMP Report, Chapter 3, Section 3.3. For most HMP applications, project applicants and Co-permittee staff will not need to compute this index if on-site flow controls are provided.

Increases in runoff flow and volume shall be managed so that post-project runoff shall not exceed pre-project rates and durations, where such increased flow and/or volume is likely to caused increased potential for erosion of creek beds and banks, silt pollution generation, or other adverse impacts on beneficial uses due to increased erosive force.

7.2.2 Performance Criteria

> ***Flow duration*** means the number of times (or hours) that a certain runoff or stream flow rate occurs over a long period of time. A graph of flow rates versus the number of times they occur is called a ***flow duration curve.***

1. Projects shall meet the management objective by providing stormwater controls as needed to maintain the pre-project stream erosion potential. Stormwater controls may include a combination of on–site, off-site and in-stream measures.
2. On-site controls that are designed to provide flow duration control to the pre-project condition are considered to meet the erosion potential management objective and comply with Provision C.3.g of the MRP.
3. Range of Flows to Control: Flow duration controls shall be designed such that the post-project stormwater discharge rates and durations match pre-project discharge rates and durations from ***10 percent of the pre-project 2-year peak flow up to the pre-project 10-year peak flow***, except as modified in #5 below.
4. Goodness of fit criteria: The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent over more than 10 percent of the length of the curve corresponding to the range of flows to control. (For examples of flow duration curves, see Appendix E.)
5. Allowable Low Flow Rate: Flow control structures may be designed to discharge stormwater at a low flow rate[3] that shall be ***no greater than 10 percent of the pre-project 2-year peak flow*** unless a modified value is substantiated by analysis of actual channel resistance, in accordance with approved methods[4].
6. HM Modeling: On-site and regional HM controls designed using the Bay Area Hydrology Model (BAHM) (see Section 7.5.3) and site specific input data shall be considered to meet the HM Standard. Alternatively, the project proponent may use a continuous simulation hydrologic computer model to simulate pre-project and post-project runoff and to design HM controls. At a minimum, 30 years of hourly rainfall data representative of the area being modeled should be used in the modeling of HM controls. Retention and detention basins must be considered impervious surfaces for purposes of calculating post-project runoff. Pre- and post-project runoff shall be calculated and compared for the entire project area being developed, without separating or excluding areas considered self-retaining.

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[3] The low flow rate, known as "Qcp", is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream. The critical flow, "Qc" is the flow rate that initiates stream bed or bank erosion.

[4] A standard methodology for conducting this analysis is being developed; check with your local municipality for more information.

Applicable projects shall be required to meet the HM Standard when they are located in areas of HM applicability as shown on the revised Santa Clara HM Map (see Section 7.3). The revised HM Map was adopted by the Water Board on November 28, 2011, and incorporated into the MRP through Order No. R2-2011-0083.

7.3 Which Projects Need to Implement HM?

A flow chart for determining whether HM requirements apply to your project is included in Appendix E-1. Unless it is a single family home that is not part of a larger plan of development, your project will be required to comply with the HM requirements if it meets the following applicability criteria:

- The project ***creates and/or replaces one acre or more of impervious surface***, AND
- The project ***will increase impervious surface*** over pre-project conditions, AND
- The project is ***located in a susceptible area***, as shown on the HM applicability map.

The Santa Clara Valley HM applicability map (revised November 2010) is provided in Appendix E-2. City-specific maps are available at:

http://www.scvurppp-w2k.com/hmp_maps.htm?zoom_highlight=map

Contact the local municipality to determine if a more detailed (parcel level) map is available.

Table 7-1 presents a guide to the areas that are identified and shaded on the map with the corresponding HM applicability.

Map Colors	**Table 7-1 HM Applicability**
purple	Catchments draining to exempt channels*: HM controls not required
red	Subwatersheds and catchments greater than or equal to 65% impervious: HM controls encouraged but not required.
green	HM controls required

*Exempt channels include those that are tidally influenced or continuously hardened from the discharge point to the Bay, Sunnyvale East Channel, Sunnyvale West Channel, and underground storm drains discharging directly to the Bay.

The total project area should be used to determine if HM requirements apply. However, if a project site straddles two different applicability zones (e.g., green and red) the separate drainage areas in each applicability zone are used to determine the change in impervious surface and whether full HM requirements apply to that drainage area. For example, say the total area of a project is 25 acres but a 10-acre drainage area is in the green zone and 15 acres is in the red zone according to the HM map. The 10-acre drainage area in the green zone would need to meet full HM requirements. The 15 acres in the red zone would be exempt from HM requirements but encouraged to implement hydrologic source control measures where appropriate and feasible.

The following are guidelines that Co-permittees can use to identify project characteristics that may cause a project to be exempt from HM controls (only one condition is required for exemption). A project is exempt if:

a. The project creates or replaces less than 1 acre of impervious surface or consists of a single family dwelling on a single lot.

b. The project is located in a purple or red area of the applicability map.

c. The project does not increase the amount of impervious area on the site (compared to the pre-project condition) and does not significantly change the drainage pattern from the site.

d. The project can show via a hydrology analysis that even though the impervious surface area has increased, actual runoff will be less because permeability of the remaining area will be enhanced by the project and there is less directly connected impervious surface.

e. The project proponent conducts stream-specific field and modeling studies, consistent with the method used in the HMP to estimate the impacts of a particular project, and demonstrates there will be no increase in potential for erosion or other adverse impact to beneficial uses.

7.4 Selecting HM Controls

Hydromodification management (HM) measures can be grouped into the following categories:

- ***Site design and hydrologic source control measures***, which are generally distributed throughout a project site. These types of measures minimize hydrological changes caused by development beginning with the point where rainfall initially meets the ground. Examples include minimizing impervious area, disconnecting roof leaders and providing localized detention. ***LID treatment measures also serve as hydrologic source control measures*** because they reduce runoff volumes and peak flows by retaining and detaining runoff.
- ***On-site structural HM measures*** that manage excess runoff from the site after hydrologic source control measures are applied. Stormwater is temporarily detained, and then the runoff is gradually discharged at a rate calculated to avoid adverse effects. Examples of storage facilities include extended detention basins, underground vaults, and oversized storm drain pipes. The discharge is controlled by outlet structures containing weirs and/or orifices designed to allow certain flow rates. Depending on pre-project and post-project conditions, the required detention volume is likely to be greater than the capture volume required for treatment.

> Structural HM measures must be sized to control the flow and duration of stormwater runoff according to a ***flow duration control*** standard, which results in facility sizes greater than those required for volume-based treatment.

However, in some cases, HM requirements can be met by increasing the available storage associated with an LID treatment measure and controlling the outflow. LID treatment measures can also be designed to meet HM requirements.

- ***Off-site structural HM measures*** that manage excess runoff from multiple development projects, such as a regional detention facility. Such a facility would require the coordination of multiple projects in close proximity. At the present time, there are no plans for such facilities to be constructed by public agencies.
- ***In-stream or restorative measures*** that modify susceptible watercourses to withstand projected increases in runoff flows and durations without increasing erosion or other impacts to beneficial uses. In-stream measures are more complicated to implement than the hydrologic source control and on-site measures, and are ***best suited for creeks or channels that have already been impacted*** by discharges from previous development and have only localized channel instability. Examples of in-stream measures include biostabilization techniques using roots of live vegetation to stabilize banks and localized structural measures such as rock weirs, grade stabilizers, boulder clusters or deflectors. These measures may not provide erosion protection for channel reaches farther downstream and may require longer planning timelines and cooperation among multiple jurisdictions compared to on-site measures.

  The likely scenario for in-stream measures in Santa Clara Valley streams is one in which development project proponents contribute to the funding of an in-stream project constructed by the Santa Clara Valley Water District. In order to implement in-stream measures, a District project needs to be identified which can address the impacts of the proposed development, given information about the increase in impervious surface and the discharge point of the project. In addition, a mechanism to collect funds from the project proponent and a methodology to determine the project's contribution based on its proportionate impact to the receiving stream would need to be developed.

7.5 Designing Flow Duration Controls

For projects subject to HM requirements, consider HM at every stage of project development and incorporate the step-by-step instructions for C.3 submittals, provided in Chapter 3. In general, the strategy for designing HM measures should:

- ***Start with site design*** to minimize the amount of runoff to be managed (see Planning Steps 2 & 3 in Chapter 3).
- Where possible, ***maximize infiltration*** to further reduce detention requirements. Note that infiltration may be limited by site constraints such as slope stability concerns, low-permeability soils or groundwater levels.
- Use ***structural HM measures*** to detain the remaining increased runoff from the site and ***control its release*** in a way that meets the flow duration control requirements.

7.5.1 Flow Duration Control Approach

Flow duration control differs from traditional "design storm" approaches used to design detention facilities for flood control or water quality treatment. Instead of a peak flow standard for one or a few discrete events, the flow duration control standard requires management of discharges over the full range of flows, based on a long-term precipitation record. Flow duration control requires that the increase in surface runoff resulting from new impervious surfaces be ***retained on-site with gradual discharge*** either to groundwater through infiltration, losses by evapotranspiration, and/or discharge to the receiving stream at a level below the critical flow (Qc) that causes sediment movement in the stream bed or bank. The duration of channel flows below Qc may be increased indefinitely without significant contribution to hydromodification impacts.

> ***Critical flow,*** or **Qc,** is the stream flow that initiates stream bed or bank erosion, depending on stream channel characteristics.

The flow duration control approach has been determined in technical studies to be the most effective method of protecting streams from erosive impacts of hydromodification[5]. Facilities that are designed to meet the pre-project hydrograph for a single design storm event do not effectively protect the receiving stream from the increased durations of runoff flows from multiple small storm events.

7.5.2 Application of Flow Duration Control to Project Areas

On-site controls designed to provide flow duration control to match the pre-project condition are considered to comply with the HM standards. The flow duration control approach involves:

1. Simulating the runoff from the project site, pre- and post-project, using a hydrologic model with a continuous rainfall record;
2. Generating flow duration curves from the results; and
3. Designing a flow duration control facility such that when the post-project time series of runoff is routed through the facility, the discharge pattern matches the pre-project flow duration curve for the required range of flows.

Typically the post-project increase in surface runoff volume is routed through a ***flow duration control pond*** or other structure that detains a certain portion of the increased runoff and discharges it through a ***specialized outlet structure*** (see Figure 7-4). The flow duration basin, tank or vault is designed conceptually to incorporate multiple stages that are filled with different frequencies and discharge at different rates. The low-flow stage is the bottom level designed to capture and retain small to moderate size storms, the initial portions of larger storms, and dry weather flows. These flows are discharged through the lowest orifice which allows continuous ***discharge below the critical flow rate*** for a project (Qcp). Successively higher-flow stages store and release higher but less frequent flows through other orifices or graded weir notches to approximate the pre-project runoff durations. In practice the multiple stages are usually integrated into a single detention basin, tank or vault that works as a unit with the specialized outlet structure. Matching the pre-project flow durations is achieved through fine-tuning of the number, heights and dimensions of orifices or weir notches, as well as depth and volume of the basin, tank or vault. (See Appendix E-3 for a detailed discussion of designing flow duration control facilities and generating flow-duration curves.) For some sites, HM standards may also be achieved through the application of LID site design and/or treatment measures, but this should be verified using a continuous simulation hydrologic model (see Section 7.5.3).

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[5] For more information on these studies, see the SCVURPPP Hydromodification Management Plan Final Report at http://www.eoainc.com/hmp_final_draft/

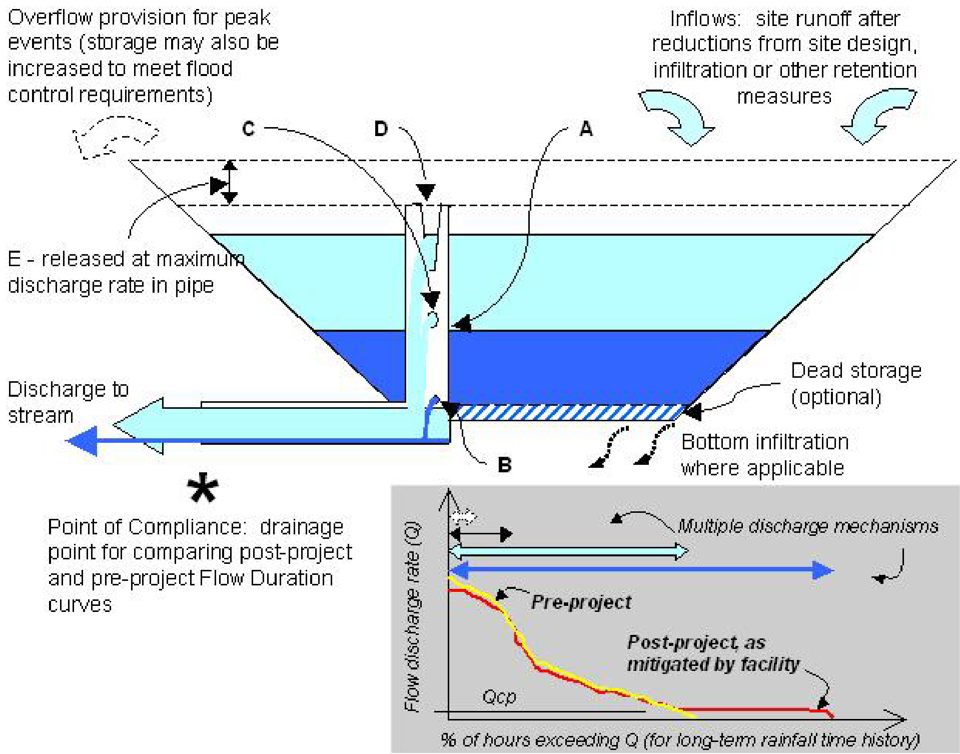

Figure 7-4: Schematic flow duration control pond and flow duration curves matched by varying discharge rates according to detained volume.

Legend:
A-outlet pipe riser
B-low flow orifice
C- intermediate orifice (1 shown)
D-weir notch (V-type shown)
E-freeboard above riser (typically 1 foot)

7.5.3 Bay Area Hydrology Model (BAHM)

To facilitate the continuous simulation modeling and design of flow duration control measures for project proponents and their engineers, the Urban Runoff Program collaborated with the Alameda County and San Mateo County stormwater programs to develop the Bay Area Hydrology Model sizing tool. The BAHM is a calibrated, local version of the Western Washington Hydrology Model (WWHM) developed by Clear Creek Solutions for the State of Washington Department of Ecology. The WWHM was specifically developed to help engineers design facilities to meet a Flow Duration Control standard for development projects. The BAHM makes it easy for project proponents to design, and municipal staff to review, flow control facilities in the Bay Area. Flow control facilities designed using the BAHM and site specific input data are considered to meet the management objective and HM standards.

The BAHM and its User Manual are available for downloading at www.bayareahydrologymodel.org. The BAHM includes:

- Databases to automatically assign ***rainfall and evaporation data*** for a project location selected within the Valley boundary.
- A user interface for developing a ***schematic drainage model*** of the project site, with forms for entering areas of land use or impervious surface for multiple sub-basins.
- Continuous simulation modeling of ***pre-project and post-project runoff*** from the site using long-term rainfall records appropriately scaled for the project location.
- A design module for sizing a ***flow duration control facility*** and designing the discharge structure to meet the Flow Duration standard for matching post-project and pre-project duration-frequency curves. Pre-project and post-project runoff are compared at a "point of compliance" selected by the designer, usually the point where runoff leaves the facility or the project area.
- Options to incorporate runoff reductions attributable to ***LID treatment and hydrologic source control measures***.
- Standardized output ***report files*** that can be saved in Word format, and include all information about data inputs, model runs, facility design, and summary of the hydrological statistics showing the compliance of post-project flow duration curves with the Flow Duration standard. Project input and output data can also be saved in Excel and other formats.

A paper describing the development and use of the BAHM is provided in Appendix E-4. Training workshops on the use of the BAHM are offered periodically. For more information, visit www.bayareahydrologymodel.org or contact the Urban Runoff Program.

7.5.4 HM Control Design Process

If the project is not exempt from HM requirements, it has the potential to cause hydromodification impacts on the receiving stream and must use the HM standards to determine how it will meet the management objective. Non-exempt projects are required to perform a detailed analysis to compare pre-project and post-project runoff patterns for the project site. The BAHM can be used to do this analysis and to design flow control facilities. If the applicant wishes to use a more detailed or site-specific approach, the following steps must be taken. Flow duration curves illustrating the distribution of flows resulting from a continuous rainfall record will need to be generated for the pre- and post-project conditions. This is accomplished using a continuous simulation hydrology model or a sizing tool based on a continuous simulation model. These or similar tools will then be used to design flow duration control measures that produce a discharge pattern that matches the pre-development flow duration curve. ***The input data and results of the BAHM or other model analyses and the flow duration matching curves must be submitted to the municipality as part of the project's Stormwater Management Plan.***

After a project has gone through the analyses described above, the next step is to incorporate the flow duration control measures into the project design. Meeting the flow duration control criteria generally requires some type of above- or below-ground detention and/or infiltration facilities that reduce the volume and control the rate of post-project discharge. These types of facilities may not be suitable for the project site due to space limitations, soil conditions, depth to groundwater, and other factors. You may need to consider a combination of on-site, off-site, and/or in-stream measures to meet HM requirements. Remember that site design measures and LID treatment measures will help meet HM requirements by reducing post-project runoff volumes and peak flows.

The diameter of the low-flow (bottom) orifice is an important design parameter for flow duration facilities, since flows discharged from this outlet must be at or below the critical flow rate for the project (Qcp). However, maintenance and/or other considerations may dictate a practical limit to how small this orifice may be. In Western Washington, which has been implementing HM control requirements since 2001, the minimum orifice diameter specified in its Stormwater Management Manual is 0.5 inches, for orifices that have protective screens and a sump below that collects sediment[6]. If the BAHM or other model indicates that the flow duration matching criteria cannot be achieved with an orifice diameter of 0.5 inches, design options include:

1. Increasing the drainage area to the HM facility (e.g. combining flows from two or more drainage management areas);
2. Reducing the depth of the pond (i.e., increase the surface area) to reduce the head on the orifice;
3. Adding a flow throttling device such as an elbow restrictor; and/or
4. Add an infiltration measure downstream of the pond to further mitigate flows from the low-flow orifice.

The BAHM User Manual, Appendix D, provides more information on how to size a flow duration facility with a specified minimum orifice size[7]. The Western Washington Manual[5] provides more detail on orifice design.

7.5.5 Maintenance Considerations

HM facilities, like treatment measures, should be designed with maintenance considerations in mind. Design guidance for detention basins is provided in Chapter 6 of the C.3 Handbook. Detention basins and underground vaults need safe access for personnel and equipment to perform required maintenance. Detention basins typically require a maintenance ramp leading to the bottom of the basin and a perimeter access road. Underground vaults require sufficient manhole openings and spacing with appropriate railings and ladders for access.

Adequate maintenance of the low-flow orifice is critical to proper performance. Outlet protection, such as a screen, is recommended to reduce risk of clogging. For example, Caltrans detention basin design standards call for a welded stainless steel wire mesh attached to a frame that wraps around the outlet riser[8].

Note that HM facilities are subject to the MRP operations and maintenance verification requirements and will be inspected by municipal staff. Property owners should be familiar with maintenance requirements and perform activities routinely. More information on maintenance of detention basins is provided in Chapter 8 of the C.3 Handbook.

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[6] Washington State Department of Ecology, Feb. 2005. *Stormwater Management Manual for Western Washington*, Volume III – Hydrologic Analysis and Flow Control Design. http://www.ecy.wa.gov/programs/wq/stormwater/manual.html

[7] Clear Creek Solutions, July 2007. *Bay Area Hydrology Model User Manual.* Prepared for the Alameda Countywide Clean Water Program, the San Mateo Countywide Water Pollution Prevention Program, and the Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.bayareahydrologymodel.org/downloads.html

[8] Caltrans Treatment BMP Design Guidance: http://www.dot.ca.gov/hq/oppd/storm1/caltrans_20090729.html Click on Details, then Plans-Details. See Figures 9-2 to 9-5.

7.6 HM Control Submittals for Review

Determine the potential applicability of the HM requirements to the proposed project, using the guidelines in Section 7.3, the flow chart in Appendix E-1 and the applicability map in Appendix E-2 (or city-specific map), and indicate HM applicability on the C.3 Data Form. Then prepare an HM Control Plan as part of the project's Stormwater Management Plan.

Table 7-2 provides a model checklist of submittal requirements for the HM Control Plan. Information on site design and LID treatment measures should also be included, if they are part of the HM Control Plan and any modeling analyses. Check with the local jurisdiction to determine the specific requirements for your project.

Table 7-2: HM Control Plan Checklist

Required?*		
Yes	**No**	**Information on Plan Sheets**
❑	❑	Soil types and depth to groundwater
❑	❑	Existing and proposed site drainage plan and grades
❑	❑	Drainage Management Area (DMA) boundaries
❑	❑	Amount of existing pervious and impervious areas (for total site and each DMA)
❑	❑	Amount of proposed impervious area (for total site and each DMA)
❑	❑	Amount of proposed pervious area (for total site and each DMA)
❑	❑	Proposed site design measures to minimize impervious surfaces and promote infiltration**
❑	❑	Proposed locations and sizes of stormwater treatment measures and HM measures
❑	❑	Stormwater treatment measure and HM measure details
		Information on Modeling Analysis and HM Facility Sizing
❑	❑	BAHM Report with input and output data and additional files as required by municipality
❑	❑	If different model is used, description of model, input and output data
❑	❑	Description of how site is represented in the model, what is proposed and why
❑	❑	Description of any changes to standard parameters (e.g. scaling factor, duration criteria)
❑	❑	Comparison of HM facility sizing per model results vs. details on plan
❑	❑	Description of any unique hydraulic conditions due to HM facility location
❑	❑	Description of orifice/weir sizing, outlet protection measures, and drawdown time
❑	❑	Preliminary maintenance plan for HM facility

* Municipal staff may check the boxes in the "Required" column to indicate which items are required for your project.

** Site design, treatment and HM measures that promote infiltration should be designed consistent with the recommendations of the project geotechnical engineer.

Individual municipalities may have special policies or ordinances for creek protection applicable in all or part of their jurisdictions. ***Contact the municipal staff from your jurisdiction*** to identify any special local provisions that may encourage or affect specific forms of HM implementation. Examples of area-specific provisions can include:

- Watershed-based land-use planning measures, such as creek buffers, which may be incorporated in local General Plans, zoning codes or watercourse ordinances.
- Special permitting provisions for project design and review of projects on streamside properties.
- Specific plans for regional HM measures or in-stream restoration projects.

Individual municipalities may have special policies or ordinances for ***creek protection*** applicable in all or part of their jurisdictions.

Any in-stream HM control measures must be coordinated with the Santa Clara Valley Water District and special permits will be needed.

7.7 When On-site HM is Impracticable

Under specific conditions, the MRP allows projects to meet HM requirements by providing for or contributing financially to an off-site alternative HM project.

7.7.1 Determining Impracticability

In order to use an off-site alternative HM project, you will need to demonstrate the following:

- Due to onsite conditions (such as extreme space limitations), the ***total cost to comply with both HM and stormwater treatment requirements*** exceeds two percent of the project construction cost, excluding land costs. (When calculating costs of HM and stormwater treatment measures, do NOT include land costs, soil disposal fees, hauling, contaminated soil testing, mitigation, disposal, or other normal site enhancement costs such as landscaping or grading that are required for other development purposes.) Guidance on estimating treatment and HM measure costs for application of the 2% “cost cap” criterion is provided in Appendix E-5.
- There is ***no available regional HM measure*** to which runoff from your project can be directed. A regional HM measure is considered available if there is a planned location for the regional HM measure AND if an appropriate funding mechanism for the regional HM measure is in place by the time of your project’s construction.
- Meeting the HM requirements by constructing ***an in-stream measure is not practicable***. An in-stream measure is considered practicable if an in-stream measure for your project’s watershed is planned, and an appropriate funding mechanism for the in-stream measure is in place by the time of project construction.

7.7.2 Requirements for Using an Alternative HM Project

If you have demonstrated that on-site HM is impracticable for your project, you will need to implement the following requirements to use an alternative HM project.

- Include site designs in your project that ***provide hydrologic source control***. Examples include minimizing impervious area, disconnecting roof leaders and providing localized detention.
- Include in your project LID treatment measures that collectively ***minimize, slow and detain runoff*** to the maximum extent practicable.
- ***Contribute financially*** to an alternative HM project, such as a stormwater treatment retrofit, HM retrofit, regional HM control, or in-stream measure that is not otherwise required by the Water Board or other regulatory agency. The contribution shall consist of the difference between two percent of the project construction costs and the cost of the treatment measures at the site (based on calculations described in Section 7.7.1).

Figure 7-5: Example of a multi-purpose detention facility for HM control in San Jose.