Technical Advisory

CEQA and Low Impact Development Stormwater Design: Preserving Stormwater Quality and Stream Integrity Through California Environmental Quality Act (CEQA) Review

This technical advisory is one in a series of advisories provided by the Governor's Office of Planning and Research (OPR) as a service to land use officials, professional planners and CEQA practitioners. OPR provides technical guidance from time to time on issues that broadly affect the practice of CEQA and land use planning.

Low Impact Development stormwater design (LID) is being widely promoted and applied at the federal, state and local levels as a technique to address impacts of land development on surface water quality and hydrology. This technical advisory provides general information about LID and guidance to CEQA lead agencies regarding the incorporation of water-quality control measures—including LID—as a potential CEQA mitigation strategy early in project design and review. A list of selected references is provided at the end of this technical advisory for readers who would like more information about LID and how it has been implemented.

THE ISSUE

The impacts of urban development on streams, lakes, estuaries, and the ocean are well documented through recent research and study, both nationally and at the state level. Surface runoff from developed areas is a leading source of non-point source water pollution in California. As roofs and pavement cover natural landscapes, rain and snowmelt no longer soak into the ground. Instead, storm drains carry large amounts of runoff directly to streams and other water bodies. Increased flow may cause stream beds and banks to erode, damaging or eliminating stream habitat and carrying

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sediment downstream. Runoff from roofs and pavement also flushes sediment, oil, grease, pesticides, nutrients, bacteria, trash, and heavy metals into streams, lakes, estuaries, and the ocean. Projects that replace previously undeveloped land with new impervious surfaces, or redevelopment that increases impervious surfaces, may contribute to such water quality impacts individually and cumulatively with other development.

LID AS A RESPONSE

LID is a stormwater management strategy aimed at maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features to reduce the rate of surface water runoff, filter pollutants out of runoff, and facilitate infiltration of water into the ground.

Typical LID measures include using pervious pavements and green roofs, dispersing runoff to landscaped areas, and routing runoff to rain gardens, cisterns, swales, and other small-scale facilities distributed throughout a site. Interference with natural watershed functions can be minimized and impacts on groundwater recharge, surface water quality, and flood hazards can thereby be reduced through appropriate implementation at development sites. As explained in greater detail below, LID measures are most effective when incorporated into a project design during initial site layout and configuration.

Recognizing the water quality benefits of advanced site planning, state agencies such as the Department of Transportation (Caltrans), the Department of Water Resources (DWR), the State Water Resources Control Board (SWRCB), the Building Standards Commission and the Ocean Protection Council (OPC), among others, support the use of LID. Local government organizations such as the Local Government Commission (LGC) promote the use of LID through its Ahwahnee Water Principles for Resource Efficient Land Use. The Institute for Local Government (ILG) also makes information available on this issue through its California Climate Action Network Best Practices Framework.

Water Quality Laws and Regulations

State and federal laws and regulations increasingly recognize the value of LID in stormwater management and project design. Following amendments to the Federal Clean Water Act in 1987, municipal separate storm sewer systems (MS4s) were brought under the National Pollutant Discharge Elimination System (NPDES) permitting program. Acting under NPDES permits, many municipalities now require, as a condition of development project approvals, measures to address stormwater pollutants and to control the rate and durations of stormwater discharges.

The Clean Water Act and California Water Code mandate controls on stormwater runoff from urban and developing areas served by storm drain systems. California's Regional Water Quality Control Boards implement this mandate by issuing NPDES permits and discharge requirements to dischargers such as municipalities, to Caltrans, and to operators of construction sites and industrial facilities.

Municipal NPDES permits are reissued on a 5-year cycle and require implementation of a comprehensive municipal stormwater pollution prevention program (also known as Storm Water Management Program or SWMP). These programs include, among other requirements:

- Conducting public education and outreach on stormwater impacts.
- Detecting and eliminating non-stormwater discharges to storm drains.
- Reducing pollution from maintaining public buildings, parks, open space, municipal storm drains, and municipal fleets.
- Requiring erosion and sediment controls, and controls on wastes, at construction sites.
- Developing, implementing, and enforcing a program to address post-construction stormwater runoff discharges from newly developed and redeveloped areas, including incorporation of permanent Best Management Practices (BMPs) in public and private development projects.

Many municipal NPDES permits also require water-quality monitoring of local water bodies and targeted efforts to reduce specific pollutants.

For development projects, required BMPs typically include control of on-site pollutant sources, treatment to remove pollutants from runoff prior to discharge, and control of the rate and duration of runoff discharges from the site. Increasingly, NPDES permits are beginning to favor or require the use of LID to achieve these objectives. However, communication between those who plan and those who permit a project is critical if water quality and hydrologic control measures like LID are to be successfully incorporated into a project design. Too often, an applicant completes its project design before learning that NPDES and other permit conditions necessitate a modification of the project design. This lack of coordination can result in lost time, increased project costs, and misunderstandings between applicants and permit agencies.

LID AS A CEQA MITIGATION TOOL

CEQA requires public agencies to make a good faith, reasoned effort, based upon available information, to identify the potentially significant direct and indirect environmental impacts—including cumulative impacts—of a proposed project or activity. In addition, CEQA obligates public agencies to consider less environmentally damaging alternatives and adopt feasible mitigation measures to reduce or avoid a

project's significant impacts. The CEQA process is intended to inform the public of the potential environmental effects of proposed government decisions and to encourage informed decision-making by public agencies.

A key benefit of the CEQA review process is that project impacts can be identified early, responsible agencies consulted, and feasible mitigation measures identified to avoid or reduce the impacts. The CEQA process is intended to be a communication tool to avoid the surprises that an applicant might face when reaching the project permitting stage, which takes place after project design and CEQA review.

Compliance with CEQA entails three basic steps, which are discussed below in the context of water quality and hydrology:

- Identify changes to water quality and hydrology resulting from the proposed project.
- Assess the significance of the impacts caused by the proposed project.
- If the impacts are found to be significant, identify feasible alternatives and/or feasible mitigation measures that will reduce the project's impact below significance.

Identify Changes to Water Quality and Hydrology

Potential surface water quality impacts of a development are closely related to existing site conditions, the amount of impervious area added, and the sensitivity of the receiving water. Sections 15063(d)(2), 15124 and 15125 of the CEQA Guidelines require a description of the project's existing setting. Further, several questions in the Appendix G Environmental Checklist Form ask whether the proposed project would alter existing drainage patterns such that amount or rate of runoff may cause erosion or flooding. (CEQA Guidelines, Appendix G, VIII(b)-(e).) The following are just some examples of site conditions that should be considered when identifying the potential adverse water quality effects of a proposed project.

- **Existing Soil Types, Slopes, and Vegetation**. These factors help determine how much runoff could increase after roofs and paving are added. Undeveloped sites that are flat, forested or have sandy soils generally produce less runoff than undeveloped sites with steep slopes, clay soils, or sparse vegetation.

- **Imperviousness**. Imperviousness can be a useful indicator linking urban land development to the degradation of aquatic ecosystems and it can be quantified, managed, and controlled during land development. At the site scale, imperviousness can be a reasonable proxy for loadings of runoff pollutants. In other words, an increase in imperviousness can indicate the degree of potential changes in hydrology. Evaluation of potential hydrologic

or water-quality impacts should, therefore, include an estimate of impervious area before and after the project is built. Estimates should be consistent with preliminary or conceptual site plans available at the time of review. For projects with more than one runoff discharge point—particularly where a project encompasses, or discharges to, more than one stream or waterway—these estimates should be broken down by watershed in order to accurately evaluate potential impacts to each potentially affected resource.

- **Receiving Water Bodies**. If project-related runoff will not be contained on-site, the receiving water body, such as streams (including ephemeral streams or drainageways), wetlands, or other waters of the state, should be identified. If a project will drain to an existing storm drain system, such as a private or municipal storm drain, the water body ultimately receiving the site's discharge should be noted. The existing quality of the receiving water body should also be known in order to assess the potential impact of the project's runoff. If the project discharges to an existing storm drain system, hydrologic impacts may be less of a concern; however, LID may still protect water quality.

Assess the Significance of Impacts

Although the CEQA Guidelines, at Appendix G, provide a checklist of suggested issues that should be addressed in an environmental document, neither the CEQA statute nor the CEQA guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. This is left to lead agency judgment and discretion, based on factual data and guidance from regulatory agencies and other sources where available and applicable. A threshold of significance is a standard or set of criteria that represent the level above which a lead agency finds a particular environmental effect of a project to be significant. (State CEQA Guidelines, § 15064.7.)

Lead agencies are encouraged, but not required, to adopt thresholds of significance for environmental impacts. A lead agency may also consider a project's compliance with a regulatory standard (for example, an air quality or water quality standard) to determine whether a project may have a significant impact on the environment, either individually or cumulatively. (See, e.g., State CEQA Guidelines, § 15064(h)(3).) An environmental document must, however, include sufficient information to support a conclusion that compliance with existing regulatory standards will reduce a project's impacts to a less than significant level. (State CEQA Guidelines, §§ 15063, 15151.)

Stormwater NPDES permit design standards and other water quality requirements may, therefore, be a good place to start in evaluating whether a project may have a significant effect on water quality and hydrology. Municipal stormwater NPDES permits may include criteria for determining whether LID or other controls

must be incorporated into a project. A lead agency may also evaluate a project's consistency with provisions of the applicable Water Quality Control Plan (Basin Plan), which NPDES permits are intended to implement. Criteria in the appropriate local stormwater ordinance, drainage ordinance, or other ordinance may also be used if appropriate. As explained in greater detail below, however, this information must also accompanied by specific information about the proposed project.

Identify Alternatives and Mitigation Measures

Mitigation of a project's water quality and hydrologic impacts may comprise:

- Application of source control measures to prevent pollutants from specific facilities or activities from entering runoff. Examples of such measures include covering wastes and other materials so they are not exposed to rain.
- Treatment of runoff prior to discharge from the site.
- Control of runoff rates and durations to mimic pre-project hydrology.

LID is increasingly used to achieve runoff treatment and flow-control. Some NPDES permits require LID be employed solely or in combination with other treatment and flow-control methods. LID features detain, treat and infiltrate runoff by minimizing impervious area, using pervious pavements and green roofs, dispersing runoff to landscaped areas, and routing runoff to rain gardens, cisterns, swales, and other small-scale facilities distributed throughout a site.

In practice, each project must be evaluated on a case by case basis, but common LID measures that can be implemented on a development site include:

- **Make Sensitive Choices in Site Layout.** Identify the most sensitive natural areas and, where possible, leave them undeveloped. To the extent possible, set back development from creeks, wetlands, and riparian habitats. Preserve significant trees. Conform the site along natural land forms, avoid excessive grading and disturbance of vegetation and soils, and mimic the site's natural drainage patterns. Where possible, concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration. To the extent possible, limit overall coverage of paving and roofs by designing compact structures, narrower and shorter streets and sidewalks, smaller parking lots, and indoor or underground parking. Where possible, detain and retain runoff throughout the site. Use drainage design elements such as depressed landscape areas, vegetated buffers, and bioretention facilities (consisting of a shallow surface reservoir, a layer of imported planting medium, and a gravel underlayer with perforated pipe underdrains) as amenities and focal points within the site and landscape design.

- **Use Pervious Surfaces.** In new buildings and major retrofits, evaluate the technical and economic feasibility of green roofs. Identify where permeable pavements, such as crushed aggregate, turf block, unit pavers, pervious concrete, or pervious asphalt could be substituted for impervious concrete or asphalt paving.

- **Disperse Runoff to Adjacent Pervious Areas.** Where possible, direct roof downspouts across pervious areas. A maximum 2:1 ratio between impervious and pervious surfaces is recommended. Receiving pervious areas should be relatively flat, and soils should be amended as needed to promote infiltration. Similarly, parking areas should be designed so that runoff can sheet flow to landscaped areas. Where feasible, use curb cuts or no curbs to allow runoff to flow to vegetated areas.

- **Direct runoff to bioretention facilities, flow-through planters, dry wells, or cisterns.** On densely developed sites, and where runoff from impervious roofs and paved areas cannot be dispersed to landscaping, consider directing runoff to facilities designed to detain and treat runoff before letting it seep away slowly. Dry wells or infiltration basins may be used if soils are sufficiently permeable and geotechnical considerations allow. Bioretention facilities can be a suitable option for many sites.

Some municipalities provide guidance to applicants for designing LID features to comply with criteria in the locally applicable NPDES permit, and some require submittal of an LID design that is certified by an architect, landscaped architect, or engineer. Lead agencies and project applicants can benefit from considering LID early in the project planning and design, and prior to completion of a draft CEQA document, in order to avoid significant water quality and hydrologic impacts and to be proactive in meeting anticipated permit requirements.

Design Detail for CEQA Review

To be most practicable and effective, the size and location of LID features must be planned during initial layout and configuration of the project. Effective mitigation of water-quality impacts often requires careful coordination of LID features with the location of buildings, traffic circulation, landscaping, aesthetics, and other features subject to CEQA review. For example, it may be very difficult to revise an approved site plan to re-route drainage from on-site parking and circulation areas to landscaped areas for dispersal, infiltration, and treatment. Lead agencies and developers can avoid this type of design challenge by incorporating LID into the initial site planning and landscape design.

While CEQA allows lead agencies to identify performance standards that will govern the development of specific mitigation measures, sufficient information must

be provided in order to evaluate whether the project as designed can achieve the identified standard. Further, CEQA requires that environmental documents contain a greater degree of specificity for construction projects than for planning-level decisions. (State CEQA Guidelines, § 15146.) Depending on the project, therefore, a conceptual LID design or a preliminary design of LID facilities may be needed to meet CEQA's requirement that mitigation measures are feasible and enforceable, and that they are not deferred. Sufficient information regarding LID and other water quality protection measures is also required to ensure any potential adverse effects resulting from such measures are discussed. (State CEQA Guidelines, § 15126.4.)

LAND USE POLICIES TO SUPPORT LID

Analysis and mitigation of project-specific impacts—as accomplished through CEQA review and the implementation of NPDES permit requirements for development review—can be more effective if those efforts are supported and supplemented by watershed-scale plans and policies. Implementing LID at the site or project scale can complement plans and programs at the watershed scale.

Sustainable Development Policies

General plans and local policies that encourage redevelopment, infill, and compact, mixed-use, transit-oriented development reduce the amount of impervious area needed for buildings and streets. As described in Chapter 2 of the OPR *General Plan Guidelines*[1], these sustainable development policies have the additional benefits of protecting open space and working landscapes, protecting environmentally sensitive lands, creating strong local and regional economies, promoting energy and resource efficiencies, and promoting equitable development.

Experience has shown LID stormwater design can be successfully integrated into higher-density urban developments. It preserves some natural hydrologic functions and can also reduce heat island effects, improve air quality, and improve the livability of urban spaces. LID can therefore be a complementary means of promoting many environmental and land use objectives of a local community.

Stream Corridor Planning

Integrated planning for stream corridors can help protect life and property against flood damages, improve opportunities for active and passive recreation, and preserve and enhance stream and riparian habitats.

Streams can be damaged by disruptions to their flow regime (for example, increased volume or velocity of runoff from increased impervious areas) and by disruptions in sediment supply. For some coastal streams, preservation of the upper watershed—and connectivity of the upper and lower watersheds so that coarse

1 *General Plan Guidelines*, Governor's Office of Planning and Research, 2003.

sediments are transported downstream—are essential to maintaining sediment balance and preventing downcutting and erosion. In other streams, an excess of sediment from upstream agricultural areas contributes to poor water quality and stream habitat quality in downstream, urbanized areas. Therefore, management of upstream sediment sources is an important consideration when applying LID on development sites within an urban area.

Consistent with the discussion of the Conservation Element in Chapter 4 of the OPR *General Plan Guidelines,* general plans should integrate, coordinate, and align land use planning with local plans and policies to preserve and enhance floodplains and riparian corridors, including floodplain management policies and ordinances, storm drain master plans, and plans for parks, open space, and recreational uses within streamside areas. General plans should also carefully coordinate land use planning and policies with state and Federal agencies' plans to address pollutant issues and habitat needs within streams and riparian areas. These plans may include Habitat Conservation Plans/Natural Community Conservation Plans and amendments to Water Quality Control Plans (Basin Plan Amendments) that the Regional Water Quality Control Boards may adopt to implement Total Maximum Daily Load processes (TMDLs). Applying LID on development sites, and promoting the retrofit of existing urban drainage systems with LID, can be part of a lead agency's integrated approach to protecting and enhancing stream corridors.

SELECTED RESOURCES

Further Information and Background About Low Impact Development

- California Ocean Protection Council (2008). Resolution Regarding Low Impact Development. http://www.opc.ca.gov/webmaster/ftp/pdf/docs/Documents_Page/Resolutions/LID%20resolution.pdf

- Geosyntec Consultants (2008). Evaluation of Post-Construction Hydromodification Requirements Contained in the Preliminary Draft General Construction Permit. http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/constpermits/comments/cbia_hydromod.pdf

- Low Impact Development Center: http://www.lowimpactdevelopment.org/

- Prince George's County, Maryland (1999). *Low Impact Development Design Strategies: An Integrated Design Approach.* Department of Environmental Resources, Programs and Planning Division. 150 pp. http://www.epa.gov/nps/lidnatl.pdf

- State Water Resources Control Board (2007). California LID Policy Review. http://www.waterboards.ca.gov/water_issues/programs/low_impact_development/

- USEPA Low Impact Development webpage: http://www.epa.gov/owow/nps/lid/

- USEPA (2003). *Protecting Water Quality from Urban Runoff.* Fact Sheet, 2 pp. http://www.epa.gov/owow/nps/toolbox/other/epa_nps_urban_facts.pdf

- USEPA (2007). *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices.* EPA 841-F-07-006. http://www.epa.gov/owow/nps/lid/costs07/

Practical Guidance for Designing Development Sites with LID

- Bay Area Stormwater Management Agencies Association (1999). *Start at the Source: Design Guidance Manual for Stormwater Quality Protection.* http://www.cleanwaterprogram.org/uploads/SAS_Manual_index.pdf

- California Asphalt Pavement Association (resources for porous asphalt pavements): http://www.californiapavements.org/stormwater.html

- Concrete Promotion Council of Northern California (resources for permeable concrete pavements): www.concreteresources.net.

- Contra Costa Clean Water Program (2008). *Stormwater C.3 Guidebook: Stormwater Quality Requirements for Development Applications.* 4th Edition. http://www.cccleanwater.org/c3-guidebook.html

- Ferguson, Bruce K. (2005). *Porous Pavements.* ISBN 0-8493-2670-2.

- Marin County Stormwater Pollution Prevention Program (2008). *Guidance for Applicants: Stormwater Quality Manual for Development Projects in Marin County. A Low Impact Development Approach.* http://mcstoppp.org/acrobat/GuidanceforApplicantsv_2-5-08.pdf

- Prince George's County, Maryland. *Bioretention Manual.* Department of Environmental Resources, Programs and Planning Division. http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/Bioretention/pdf/Bioretention%20Manual_2009%20Version.pdf

- Puget Sound Action Team (2005). *Low Impact Development Manual for Puget Sound.* http://www.psparchives.com/publications/our_work/stormwater/lid/LID_manual2005.pdf

- San Diego County (2007). *Low Impact Development Handbook: Stormwater Management Strategies.* http://www.sdcounty.ca.gov/dplu/docs/LID-Handbook.pdf

- Schueler, Tom. 1995. *Site Planning for Urban Stream Protection.* Environmental Land Planning Series. Metropolitan Washington Council of Governments. 232 pp.

Information and Examples for Watershed Management and Stream Corridor Planning

- Center for Watershed Protection. 2002. Watershed Vulnerability Analysis. http://www.cwp.org/Resource_Library/Center_Docs/USRM/Vulnerability_Analysis.pdf

- Federal Interagency Stream Restoration Working Group. 1998. *Stream Restoration: Principles, Processes, and Practices.* http://www.nrcs.usda.gov/technical/stream_restoration/newgra.html

- Natural Resources Conservation Service. 2007. *Stream Restoration Design.* Part 654, National Engineering Handbook. http://www.nrcs.usda.gov/technical/eng/stream-docs.html

- Santa Clara Basin Watershed Management Initiative (2003) *Watershed Action Plan.* http://www.valleywater.org/_wmi/Actiondraft0803.htm

- Surfrider Foundation, Ventura County Chapter (2008): *Solving the Urban Runoff Problem: A Vision for the Urban Watershed, Ventura, California.* http://www.surfrider.org/Ventura/reports/Solving%20the%20Urban%20Runoff%20Problem%20-%20Ventura.pdf See also the *City of Ventura General Plan.* http://www.cityofventura.net/vision/general_plan, and the Local Government Commission's Watershed-Based Strategy for Ventura County Communities, http://water.lgc.org/ventura.

- The River Project (Los Angeles Basin): http://www.theriverproject.org