National Pollution Discharge Elimination System Storm Water Permits

Effects on Urban Planning and Building

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PREFACE

The purpose of this paper is to introduce the concept of reducing impervious surface coverage by using compact development. Compact development can be used to meet the pollution reduction requirements of the Clean Water Act as implemented through the National Pollution Discharge Elimination System (NPDES) storm water discharge permitting process. Various court cases and laws have been cited to give background to development of the NPDES permit. Information has been garnered through the Internet and published resources.

Insights to the NPDES storm water permitting process were gathered by attending meetings of the State of California Regional Water Quality Control Board for Region II (the San Francisco Bay area) on December 18, 2002, January 22, 2003 and February 19, 2003. Public hearings were held at these meetings regarding the inclusion of the treatment of runoff from new development and redevelopment in the Phase 1 NPDES storm water discharge permits for Contra Costa County, Alameda County, and San Mateo County. Four supplemental stakeholder meetings were are also attended where discussions were held on new development and redevelopment storm water treatment permit requirements that were being considered by the Regional Board. These meetings were scheduled in response to the extensive public testimony at the December 18 hearing. A one-day workshop entitled "Storm Water Pollution Prevention Sustainable Strategies Workshop" sponsored by Association of Bay Area Governments (ABAG) was also attended on January 30, 2003.

INTRODUCTION

Urban storm water runoff has been recognized as a major contributor to water pollution. Impervious surfaces created in conventional development through the addition of paved streets, sidewalks, roofs, conventional storm water sewers and parking lots disrupt the natural hydrology of an area. Impervious surface coverage disrupts the natural hydrology by increasing the discharge rates and volumes of storm water runoff, eroding and incising waterways, adding pollutants to the waterways, increasing flooding potential, and diminishing the recharge of aquifers from rainfall (Largo 2001, 75).

The federal government has also recognized this immense problem. The US Environmental Protection Agency issued Storm Water Phase 1 (1990) and Phase 2 (1999) Final Rules under the Clean Water Act (1972) for all urbanized areas across the country to develop Storm Water Management Programs under the National Pollution Discharge Elimination System (NPDES) using Best Management Practices (BMPs). The California State Water Resources Control Board administers this rule in California as authorized by the Porter Cologne Water Quality Act (2002).

All communities across the country are required to develop best management practices for removing pollutants from storm water runoff to the maximum extent practicable. The most commonly used BMPs are storm water detention basins. However, these basins prolong peak flows during storm events causing more erosion of waterways.

Communities are beginning to recognize that the design of the community can help alleviate these problems. The Metro, the regional governing agency of the Portland, Oregon area, has recognized this potential and is implementing its "Green Streets" program to help alleviate the runoff from impervious surfaces. The Metro's "Green Streets" program implemented a highly connected multimodal transportation system that preserves or restores streams and wild life corridors (Metro June 2002, 1).

The States of Maryland, Florida and more recently Wisconsin, Michigan and New Jersey are also taking the lead in implementing statewide goals and principles in protecting their watersheds

from urban runoff with strong governor support and initiative. These states and other areas of the country are also recognizing the importance of reducing impervious surfaces in protecting the nation's waterways.

The combination of environmental protection and urban design is a recognized method for achieving the goals set forth in the Storm Water Phase 1 and 2 Rules. Environmentally aware urban design also establishes a sense of place for residents of communities and allows for a greater potential for citizen participation in environmental restoration projects and maintenance of these projects. The question is then posed: can the NPDES Storm Water Final Rules promote the reduction of impervious surfaces through urban design?

The decision to use urban design to mitigate storm water runoff needs to be made by local elected officials, builders, planning departments, public works, fire departments and residents. Maintaining the natural habitat and the region's hydrology during development is the primary role of site design in treating runoff. This design works best with cluster style development of homes and businesses. The idea of cluster design shares ideals with the Neo-traditional and New Urbanist concepts of compact development.

Elected officials and community residents can embrace compact /cluster developments by incorporating it into their general plan. In California, the Cities of Salinas and Marina have done this. General plans could also specify that storm water systems must encourage percolation to recharge aquifers locally. This was done in the Marina General Plan. Compact development will reduce the amount of infrastructure needed for development, hence saving the City and the developer construction and maintenance costs. Adopting more open styles of storm water conveyance and treatment, such as the use of swales instead of curb and gutter, will also save on development and maintenance costs. This style of development was used very successfully at Village Homes in Davis, California.

If the public desires compact development, then zoning and building ordinances must be rewritten to encourage it. Strict single use zoning codes favor conventional building styles and methods, making it difficult for different building styles to be used. Determined builders have

used planned development agreements, which would allow them the freedom to design compact styles of developments such as cluster development and New Urbanist communities. Compact design has been used in communities such as Village Homes; Reston, Virginia; Prairie Crossing, Illinois; and Columbia, Maryland. Planned Development Agreements (PDAs), which are development agreements between a municipality and the developer normally resulting in density bonuses for the planned development, are not by-right developments. By-right development allows development that meets the zoning standards for a parcel or parcels, i.e. medium density residential at 5 units per acre. Changing the zoning to increase the density requires a public hearing, which can be expensive, time consuming and often is denied. In order for environmentally sensitive, cluster style development to become the norm as opposed to conventional style development, the demand for compact/cluster development needs to be created by elected officials, financial institutions, planners, builders, public works departments and residents.

Civil engineers and public works departments also need to realize the advantages of cluster development that limits the creation of impervious surfaces through narrowing streets and using storm water systems other than conventional Municipal Separate Storm Water Sewer Systems (MS4s). "Green Streets" programs favor narrow streets and landscaped areas through which to convey storm water runoff. In "Green Streets" programs vegetated swales are used in place of conventional underground storm drains. These green areas can be used for multiple uses such as runoff conveyance, percolation, nutrient uptake, habitat, bicycle trails and footpaths. However, winning over the bureaucrats in the public works and public safety departments to favor alternatives other then wide streets with curb and gutter has been a challenge.

It can be argued that developing the same number of units on less land is a win-win situation for both the community and the builder. The infrastructure costs would be reduced, significantly lowering the overhead for the builder and additionally their profit margin for the smaller lots is increased, while also satisfying the pollution reduction clause in the Storm Water Management Program required by the Clean Water Act.

PROBLEM DEFINITION

Understanding the potential implication of the NPDES Storm Water Final Rules in promoting the reduction of impervious surfaces through urban design requires the understanding storm water runoff and its relationships to the hydrologic cycle and the environment.

Storm Water Runoff

To understand the effects of impervious surface on the environment, the hydrologic cycle must be understood. In urbanized communities the natural ground cover of roots, leaf litter, forests or grasslands are replaced with impervious surfaces such as roadways, curbs and gutters, sidewalks, roofs, parking lots and other hardened or compacted surfaces. Where once natural ground cover allowed rainfall to slowly percolate and infiltrate into aquifers, streams and lakes; rainfall now runs off the roadways, sidewalks, rooftops and other compacted surfaces disrupting the natural hydrological cycle. Evapo-transpiration and underground interflow between the soil and bedrock, and base flow within an aquifer are greatly reduced with impervious surfaces (Fig. 1).

Impervious surfaces are the hardened surfaces of urbanized communities that prevent natural infiltration into the soil during rainfall events. Rainfall is not absorbed through the hardened surfaces, therefore impeding the removal of pollutants from runoff. Percolation removes pollutants in the top six inches of soil (BASMAA 1999, 37). The runoff from these hardened surfaces contains a multitude of pollutants and sediments compared to predevelopment runoff.