Water Quality Regulatory Dynamics of Development

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This paper represents my observations and experiences serving as the Executive Officer for the California Regional Water Quality Control Board, San Diego Region for the past 10 years. It is not intended to represent the opinions of the Board Members.

The San Diego Regional Water Quality Control Board (Regional Board) regulates various water quality impacting discharges and activities in eleven coastal watersheds in Orange, Riverside and San Diego Counties. In the past 80 years these watersheds have been subject to extensive urban and agricultural development so that today large portions of these watersheds are considered "built out" or fully developed. However, in the remaining undeveloped areas, increasing pressure for development is focused on any remaining sites that might be suitable for construction. The high value of coastal real estate fits the well known "location, location, location" reputation and it is this high value that drives developers to build on any site that can be obtained, even when there are significant environmental impacts and inadequate infrastructure to support the new development. For every development project the Regional Board engages in an environmental review process that is expected to adequately consider and mitigate water quality resources impacts.

The Regional Board provides regulatory oversight of development through NPDES permits, Waste Discharge Requirements, 401 Water Quality Certifications and enforcement orders. The Regional Board however, has relatively limited resources to invest in avoiding or preventing water quality problems that are caused by development. Most water quality regulatory resources are dedicated to controlling wastes that are the result of development. The Regional Board does not have land use authority to control development, but it can review the process and impose requirements to protect water quality and beneficial uses. The Regional Board must assume that by reviewing each project there can be sufficient regulatory action identified to mitigate immediate and long-term impacts to water quality caused by each project. As development in the watershed reaches a higher and higher percentage, this assumption becomes questionable unless the Board is able to keep pace with the dynamic of the development within the watershed. For example, it is estimated that less than 5-10% of the original coastal wetlands and streams remain. How should this reality be integrated into the limited Regional Board regulatory oversight concerning development? This paper will examine the project review process in the context of the overall development within the watershed and discuss the water quality regulatory implications.

The MICRO versus the MACRO development process

The micro development or project-by-project level of the development process takes place within the context of a project site and the immediate surroundings. Micro development considers the individual development project and takes place within a larger scale of development within a watershed or region. Ideally, each project that takes place over time should be carefully considered in the context of the watershed or regional stage of development. This task can be challenging because the tools to objectively analyze the near and long-term impacts from a proposed development project can be extremely complex and difficult. The resources to plan and move a new development project through the approval process are usually plentiful, but the resources to track the cumulative environmental impacts of multiple projects in the watershed over time are sparse.

With very limited resources, the Regional Board must identify and evaluate water quality impacts for each development project and determine appropriate mitigation and regulatory oversight that will ensure that adverse impacts are adequately addressed. The Regional Board must rely on CEQA reports, developers, environmental consultants and other regulatory agencies to obtain needed information to thoroughly evaluate water quality impacts. Frequently, various aspects of the project are undecided and become negotiable as considerations for water quality impact mitigation. Projects are usually on a tight timeline with funding, permitting and scheduling pressures. Once the Regional Board acts on the 401Water Quality Certification, it does very limited review or follow-up action. The Regional Board has many water quality concerns to address for each development project which include the following:

1. Water supply source and sanitary sewage disposal
2. Loss of or impacts to wetlands caused by construction
3. Construction storm water discharges
4. Post construction waste discharges in urban runoff
5. Post construction storm water runoff flow rate and duration

Each of these concerns is related to each specific project in a unique way that is determined by many factors including the topography, geology, size, design and location of the project site. These project criteria are then analyzed in comparison to the relative status of development in the watershed as a whole. The Regional Board must decide how the water quality impacts caused by each project can best be reduced and mitigated within existing conditions in the watershed. The conditions in the watershed continuously change over time as new projects are constructed, the Regional Board must keep pace with this larger scale dynamic of macro-development.

The macro-development level of consideration includes the watershed and regional scope of development. The task is to reasonably determine the relative status of the water quality impacts from previous development within the watershed so that each new project can be accurately evaluated and adequately mitigated given the existing water quality conditions in the watershed. The macro-development water quality status for a watershed includes many factors including the following:

1. Impacts from water polluting discharges from existing development.
2. Impacts from hydromodification to the original creeks, streams, rivers, lagoons and bays
3. The amount and location of watershed area that has been covered with impervious surfaces
4. Successful planning and development efforts to protect water quality resources in the watershed

Each of these considerations represents different impacts that combine to define the condition of the water quality resources within the watershed. The Regional Board must evaluate this overall condition in the watershed for every new development project. Our current water quality regulations are expected to define and measure the additional impacts from a new development project and describe and quantify the appropriate mitigation. That mitigation must then be achieved in a watershed that has diminishing water quality resources due to development. The Regional Board must rely on mitigation, monitoring, waste discharge requirements and it acts on the assumption that these requirements will actually protect the beneficial uses of the waters in the watershed. The resources of the Regional Board are not sufficient to continuously and adequately evaluate the water quality impacts of most projects nor can it properly track the success or failure of the regulatory actions imposed as a condition of project certification. The remainder of this paper will more closely examine this challenge.

The Challenges of Regulating the Micro-Development Process

1. Water Supply and Sanitary Sewage Wastewater Disposal.

Regional Board evaluation of new development projects will need to consider the water supply source and sanitary sewage disposal methods to be used. Although the Regional Board does not oversee water connections and delivery, it does oversee the protection of the beneficial uses that involve use of surface or ground water at the new development site. In the San Diego region most water use is supplied with imported water, but in some cases, the direct use of local water is required and must be evaluated. It may also require that water rights be evaluated to supply water to a new development.

Disposal of sanitary wastewater disposal requirements for new development projects in the San Diego region is usually satisfied by incorporating the discharges into existing sewage systems if feasible. About 85% of all sanitary sewage wastewater generated in the San Diego region is discharged into the ocean. The remaining is discharged to inland surface waters or ground water. New developments that will use a dedicated septic system or local community sewage treatment system may raise significant concerns for impacts to local ground water. Wastewater discharges with salt from imported water supplies is an increasing problem in some inland areas that also use local ground water for some supply needs. Fortunately, other planning and land use agencies have well established oversight of public health concerns for water supply and septic waste disposal that augment the efforts of the Regional Board. Extensive public health regulations have existed for many years as well. The Regional Board normally also has extensive experience and dedicated resources to address this concern.

2. Loss of or impacts to wetlands caused by construction.

Cumulative impacts to water quality resources in the San Diego Region from the loss of wetlands are significant and the regulatory programs to address this concern are relatively new and limited. Development projects that impact wetlands may require a USACOE 404 Permit and subsequently a 401 Water Quality Certification. Additionally, California requires additional oversight of some wetlands not regulated by the USACOE. No project may cause a net loss of wetlands. These regulatory requirements can be significant challenges for developers who wish to develop sites for projects that will impact wetlands. Projects in the San Diego region are increasingly designed or re-designed specifically to avoid this problem. Where impacts do occur, the resulting mitigation can be costly and cause scheduling and coordination difficulties that may delay projects for a considerable time.

Recent efforts to evaluate the success at mitigation sites required by the Regional Board indicates that many sites do not successfully mitigate the impacts as intended. However, in all cases the development and commensurate impacts to the wetlands do occur. In most cases where mitigation for wetlands impacts caused by development is required by the Regional Board, there are mitigation implementation, monitoring and reporting requirements imposed on the developer, but these requirements are not sufficient to ensure that the mitigation is successful. To fully assess the cumulative water quality impacts from a proposed development project, the Regional Board must do a thorough review of the project CEQA documents and other reports and information. Considering the few remaining wetlands in the San Diego region, and given the current severe limitations for the Regional Board to thoroughly track the cumulative impacts from development to California's wetlands, the regulatory process intended to protect these wetlands is insufficient to ensure that water quality will be protected.

3. Discharges of waste and storm water during construction

The construction phase of development projects involves grading of the site and an increase in the threat to water quality from discharges of waste. Waste discharges from construction sites in California are regulated by a general construction storm water permit that is required for graded sites of one acre or more. The permit requires the site to have a Storm Water Pollution Prevention Plan or SWPPP that will control pollution discharges through best management practices or BMPs that utilize the best current technology. The pollutant wastes that typically come from construction sites include sediments, trash, debris, paint, adhesives, concrete products, oils and fuels, nutrients, pesticides and other chemicals. Pollutants can be discharged to surface or ground waters and can have short or long term impacts. The Regional Board assessment to determine how to properly regulate construction sites includes consideration of the size, location, soils and topography, existing drainage, duration of construction and, receiving waters and other off-site considerations. The proximity of the site to a sensitive water body or other water resources may dictate strict requirements whereas some sites void of water resources may cause only minimal concern for the Regional Board.

The task of evaluating a new development project to determine the BMPs needed to prevent waste discharges during construction must be done by the developer and usually consists of the SWPPP. On some occasions the Regional Board may impose additional waste discharge requirements to supplement the construction storm water permit. Recent BMP compliance rates at most sites in the San Diego region are much improved, however construction storm water permit violations at some of these sites have resulted in significant fines in the past 2 years. Continued enforcement can be anticipated if violations persist. The water quality regulatory oversight of construction sites is well established and increasingly effective. Although there are insufficient resources for the Regional Board to inspect every site, local municipal and county oversight programs are assisting in these efforts. The regulation of the construction phase of development concludes when the Notice of Termination is completed and occupancy of the new tenant occurs. This begins the post construction phase of development.

4. Post construction waste discharges in urban runoff

Once the occupancy phase of development begins, the Regional Board relies on the Municipal Separate Storm Sewer System or MS4 permit to regulate waste discharges in urban runoff. The typical MS4 will collect, convey and discharge urban runoff in dry and wet weather with great efficiency. This will often ensure that pollutant wastes that are within the urban landscape will be discharged to receiving waters. The typical MS4 serving most urban areas in the San Diego region does not have any means to treat or remove wastes. Increasingly, the MS4 is connected to the sanitary sewage system to divert some dry weather urban runoff wastes to sewage treatment plants for treatment. These diversions do not function in the high flow conditions during rain events. The historical assumption for most development projects has been to simply incorporate each new project into the existing MS4 design and focus on the adequacy of flow capacity to take the runoff away from the new development. Pollutants in the runoff that might be collected or retained in the MS4 system would be whisked away downstream with the next rainstorm. This assumption is no longer valid in the San Diego region.

Upon occupancy at the site, pollutant discharges from all new developments must be reduced to the maximum extent practicable before discharge to waters of the state or entering the MS4. The Regional Board has implemented standard urban storm water mitigation plans or SUSMPs to ensure this is accomplished. These requirements are expected to be included in the design phase

of the project or the Regional Board may add them during project certification. Oversight of post construction waste discharges is increasingly subject to public scrutiny. The growing list of 303d impaired water bodies and the imposition of total maximum daily loads for certain pollutants is causing some development projects to include significant post construction design features to limit some pollutant discharges. The Regional Board believes that over time the requirement for SUSMPs for all significant new development and re-development sites will gradually reduce waste loads of urban pollutants and better control unnaturally high storm water runoff rates. At some sites, the concern about increased runoff flow rates during storm events is very significant.

5. Post construction storm water runoff flow rate and duration

Development projects normally include construction of new impervious surfaces. These surfaces will modify the runoff characteristics of the site and will cause a cumulative effect of increasing rainfall runoff amounts. The runoff duration and hydraulic energy can cause significant impacts to receiving waters within a watershed. In the past, projects in the San Diego region did not always adequately consider the impacts of large impervious areas included in development projects. Today, all significant development projects must include design features that will control the runoff flow amounts and duration to emulate natural runoff conditions from the site. In several San Diego region watersheds, inland development has dramatically altered the landscape and caused one-year storms to exhibit downstream flows events previously considered as 5 or 10-year storm flows. At many locations in the region, downstream development is at greater risk due to increased runoff flows caused by additional impervious surfaces created by new development upstream. This problem is further aggravated by the reengineering of downstream creeks and streams to make them part of a flood control system that relies on high velocity in a narrow channel. These modified streams and rivers have been stripped of their natural capability to manage high flows by spreading and infiltrating into wetlands. When flooding does occur, the usual reaction is to increase the carrying capacity by "re-engineering" the stream even more. It may be more effective to take actions to remove the encroachments and restore the natural stream width and depth and to reduce the causes of the increased flows at upstream locations. One long-term solution to this dilemma is to require low impact development. This could dramatically improve the ability of the Regional Board to regulate water quality aspects for development in the San Diego region. For now, the reliance on SUSMPS will have to suffice for most sites.

The Challenges of Regulating the Macro-Development Process

The water quality considerations for each development project must be evaluated in the context of the existing conditions in the watershed and the region. The following discussion will consider several significant water quality considerations as watersheds are developed over time.

1. The cumulative impacts from water polluting discharges from existing development.

The impacts from discharges of waste to the soil, water and air in a developed watershed can be extensive. The impacts can be caused by past or ongoing discharges and they can impair beneficial uses of ground and surface waters. These water quality impacts from previous development can in fact limit additional new development. The USEPA Brownfield program exists for this reason. Pollution of ground water by inadequate sewage disposal systems, fuel tank leaks, solid waste dumpsites and dumping of toxic wastes are a few examples that can limit the use of ground water as a water supply source. Sediments accumulated in lakes, streams and

bays can be laden with pesticides, metals and nutrients that can significantly impact future beneficial uses of these areas. The reuse of contaminated soils from on-site excavation may be restricted due to pollutant levels that may threaten water quality. Cleanup of some sites may take decades and prevent their use for development. The Regional Board review of proposed development must include a thorough investigation to ensure that any impacts to soils and ground water within the watershed are considered.

Waste discharges to surface waters can likewise impair beneficial uses that can support new development. Excessive sediment discharges over time can cause flooding and trash and debris can fill in and spoil once attractive rivers and streams. Air emissions can cause polluting metals and chemicals to accumulate in water and soils. In locations where these pollutant discharges have exceeded the assimilative capacity of surface waters, total daily waste loads have been or may be imposed on all dischargers including new developments. Aesthetic and habitat impacts to water quality resources can add a complexity to urban or industrial blight that makes it too costly and difficult to cleanup. Restoration of water resources heavily impacted by pollutants must compete with resources to protect those waters that are not yet impacted. As new development takes place the Regional Board may elect to mitigate new impacts by requiring restoration of sites previously impacted by pollutant discharges. Although invasive species of plants and animals are not considered a pollutant, they can have a significant impact on the beneficial uses of waters in the region. They can dramatically alter the natural riparian ecosystem and impact existing and future development. Pollutant discharges are but one measure of the water quality impacts from development. The modification of natural water bodies as a result of development is another critical concern.

2. The impacts of hydromodification to the original creeks, streams, rivers, lagoons and bays

Hydromodification pertains to manmade impacts to natural wetland features in a watershed. It includes bridges, dams, deepening, narrowing, straightening, filling, culverting and sometimes even putting a stream underground. In several San Diego regional watersheds the impacts are severe and cause damaging floods, erosion and significant loss of the benefits of natural water bodies. The development process within a watershed can be carefully planned and regulated with full regard for hydraulics to ensure that flooding is minimized, but without also considering the hydrology of the watershed, it can be challenging to add new development into a watershed without causing even more impacts from hydromodification.

Engineering practices of building bridges with less expensive shorter spans may result in higher risks that bridges and abutments may be damaged in high flow conditions. Dams can pose a threat of flooding in the event of failure and culverts can restrict flows, especially when obstructed with debris or sediments. Roadways and sewer lines are frequently built along rivers and streams to take advantage of the natural grade. These locations can flood or be inaccessible during times of high flow. The bays and lagoons in the San Diego region have been systematically modified to accommodate development. They have been intentionally filled in for construction of residential and commercial developments and they all have road, railroad and other infrastructure constructed within them to the extent that these water bodies retain only a fraction of their original natural water quality resource value. San Diego Bay has been filled in to provide shore-side facilities for heavy industry and commercialization. It has been repeatedly dredged to maintain navigation channels. We all enjoy the economic benefits of these modifications, but we also bear the burden of maintaining them as natural hydrological forces constantly try to reclaim natural conditions.

Wherever hydromodification for development has impacted watersheds, the Regional Board must include this concern in the evaluation of water quality impacts from new development. Another significant form of hydromodification can occur in the tributary areas that drain to rivers, creeks and streams. It is in the form of man made impervious surfaces that are abundantly present in almost all existing and new development projects. These impervious surfaces can dramatically alter the watershed.

3. The amount and location of watershed area that has been covered with impervious surfaces

Impervious surface areas resulting from development can dramatically alter the hydraulics and hydrology of a watershed. Knowledge of the actual characteristics and location of these impervious areas offers a measure of the impacts to water quality within the watershed. As new development projects are planned and constructed, it is extremely important to evaluate the impacts from the existing impervious surfaces and ensure that new development does not add to problems of increased runoff and pollution transport. Any roads, parking lots, walkways, rooftops and even some landscaping treatments within a watershed must be considered when water quality impacts from new development are assessed. In some cases, a small percentage increase in impervious areas can result in a tenfold increase in hydraulic energy in receiving streams. Additionally, reductions in natural erosion caused by this same impervious surface can cause the stream to be more vulnerable to in-stream erosion due to loss of the natural bed load of sand and gravel. Impervious surfaces will also prevent natural recharge of rainwater. Thus, impervious surfaces have multiple impacts on the receiving streams.

During dry weather, impervious surfaces cause increased runoff of urban wastes that are present on impervious surfaces. These wastes can be mobilized by intentional and unintentional use of water for irrigation and washing. Many San Diego streams are ephemeral and are naturally dry during summer months, however, the flows actually increase due to urban runoff from landscape irrigation. This has altered the aquatic ecosystem in the streams and caused high levels of pollution, such as bacteria and nutrients to be transported to the lower watershed and beaches. In considering new development it would be prudent to limit the impervious areas created for each project site. Re-development projects present the opportunity to remove previously constructed impervious surfaces or replace them with pervious materials.

4. Do planning and land use decisions in the watershed protect water quality resources?

When assessing the status of the watershed level of development it is essential to be aware of the model or pattern of development that has been used. In some cases this will reveal an extensive array of previous development decisions specifically intended to protect and preserve water quality related resources. It is not uncommon for cites to historically set aside areas for parks and green space and some include wetland areas as well. In San Diego there have been some efforts to set aside areas for river parks, nature preserves, conservancy areas and protected species habitat areas. This practice prevents or discourages future use of these areas for development. These same areas can offer mitigation sites for development in other locations. If a planning and development model that places a high value on water quality resources has been or is currently in use, new development projects will likely be more easily evaluated for water quality impacts within the watershed. If the "highest and best use" of wetlands are considered to be the natural functions that they offer, then this model will work in concert with the Regional Board purpose. If there is a pattern of relegating a low value to water quality resources however, it will be more difficult for the Board to succeed in protecting water quality and beneficial uses.

Development that has occurred without a high regard for water quality resources will create conditions that make it difficult to accommodate increased pressures for more development. In this case the highest and best use of wetlands may be to serve as a parking lot or a concrete lined storm drain. The needs to put more people, traffic, industry or agriculture into a watershed that has already lost most of its natural resources base due to development may support arguments to not change the pattern and assumptions of placing low value to wetlands. If the highest and best use of water resources such as creeks and streams is for floodwater conveyance, then the natural resource functions and value may be permanently lost. The mission of the Regional Board is to protect and preserve water quality resources for present and future generations. The existing beneficial uses of waters in many San Diego area watersheds are based on water resources that have been significantly impacted by existing development. It is never too late to begin the process of restoring water quality resources as land use decisions for development projects are considered. In some jurisdictions where water quality considerations have been a low priority in the past, recent decisions have emerged that indicate a desire to seek restoration and protection of water quality resources. As the pressure to create new development continues, the Regional Board will increasingly encourage developers, cities and environmental consultants to develop low impact projects that support sustainable natural conditions in the waters of the region.

Conclusions and Recommendations

1. The San Diego regional has a critical need to develop and implement a regional information system that collects, stores and processes information about urban development impacts on water quality resources in the San Diego region watersheds. This will enable the Regional Board to more reliably and efficiently protect those resources.
2. The Regional Board should strive to expand and improve its internal capabilities to evaluate and mitigate watershed impacts from urban development, pollutant sources and runoff, watershed hydromodification, and land use policies and planning that are used in the region. This will improve the assessment, assignment and tracking of mitigation needed to ensure that new development projects do not reduce or impair the water quality resources in the region.
3. Jurisdictions with planning and land use decision authority within the San Diego region should be encouraged to adopt policies and practices that protect and restore water quality resources. This can prevent and reduce adverse impacts to water quality resources caused by development or redevelopment. This will assist the Regional Board in its efforts to protect water quality and beneficial uses for present and future generations.