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FLOODPLAIN MANAGEMENT & LIABILITY REPORTER™

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JUDICIAL DEVELOPMENTS

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FEATURE ARTICLE

A LOOK BACK—FLOOD MANAGEMENT IN CALIFORNIA SINCE HURRICANE KATRINA

By Andrea P. Clark

Soon after Hurricane Katrina devastated New Orleans, causing flooding that left over 1,800 people dead and over $100 billion in damages, national attention shifted to California's Central Valley and the growing metropolitan area of Sacramento which, like New Orleans, Louisiana, is protected from flooding by levees. California has since seen an unprecedented level of public funding and legislation aimed at fixing levees and resolving a complicated and broken flood management system. With this funding has come a rare opportunity for the state to protect itself from a Katrina-like disaster. This article summarizes the unique history of California's flood control system, describes major changes in flood management efforts over the past three years, and offers a preliminary assessment of the state's progress toward protecting California's Central Valley residents from the type of catastrophic flooding that occurred in New Orleans.

History

California's flood management problems are rooted in the system's unique history. Starting in mid-nineteenth century, as people began to populate California's Central Valley (Central Valley) floodplain, individuals and local governments built levees to protect farmland from frequent flooding. Landowners could combine resources to create local reclamation districts under state law for the purpose of funding levee construction and maintenance. Levees damaged or destroyed by flooding were rebuilt on top of the old ones to protect residents and farmland from higher flood flows.

In the late 1800s, the California Gold Rush (Gold Rush) and related hydraulic mining generated sediment that filled up rivers in Northern California, reducing the room for flood flows and increasing flood risk. To resolve the river sediment problem, levees were built close to the river channel so that water would move more quickly and effectively through the Central Valley removing sediment. In this way, levees both protected lands from flooding and helped to address sediment build-up in the Central Valley.

The State Reclamation Board was created in 1911 to implement a flood plan in the San Joaquin and Sacramento Valleys in cooperation with the federal government. The Sacramento River Flood Control Project, a collaborative effort between the U.S. Army Corps of Engineers (Corps) and the state, was built over the next half century and encompassed about 1,600 miles of levees, weirs and bypasses to increase conveyance of floodwaters downstream. In 1953, the federal government transferred responsibility for the Sacramento River Flood Control Project to the state. The state then passed operation and maintenance responsibility to local reclamation districts for approximately 80 percent of the levees in the Central Valley flood control system.

Flood Control Challenges

The system suffered major flood events in 1955, 1986, and 1997. Over the past couple of decades, the calls for improving flood control in the Central Valley have grown louder.

Early in 2005, a few months before Katrina, then newly elected Governor Arnold Schwarzenegger released a report—"Flood Warnings: Responding to California's Flood Crisis"—that documented the problems with California's flood control system and

proposed some solutions. This report was one of many that have tackled the Central Valley's flood control problems and called for changes. But this particular report, along with Hurricane Katrina later that year, pushed the state toward a major investment in flood control.

All assessments of California's flood control system, including the governor's 2005 report, agree that the state's flood control system is in crisis. The Central Valley is widely viewed as the urbanized and urbanizing area most at risk in the United States for catastrophic flooding. A panel of flood control experts commissioned by the state in 2007 to offer insights and recommendations to the state concluded that the current flood control system is "incapable of dealing with the threat of severe flooding events, placing its urban centers at considerable risk while incurring significant environmental costs." (A California Challenge—Flooding in the Central Valley," October 15, 2007, Executive Summary).

The governor's own report memorably concluded that the elements of the flood control system's problem "have created a ticking time-bomb for flood management in California." His report estimated that 500,000 people in floodplains, two million acres of cultivated land, and 200,000 structures valued at $47 billion are at risk from flooding. These elements are briefly examined below.

An Aging Levee System

First and foremost, the levees are aging. Many levees are over 100 years old, were improperly built, and/or have been inadequately maintained. Even levees that were not improperly built were designed to protect farmland, not heavily populated urban areas. Levee failures can be caused by overtopping, seepage, instability, burrowing animals, or erosion. Because levees were built close to the river channel in order to flush out sediment and mining debris from rivers, levee erosion is now a serious threat to levee stability. As our understanding of the science of levees improves, we are learning that more of the system's levees, once thought to provide sufficient protection, in fact do not.

For example, the Natomas Basin just north of Sacramento is currently subject to "Floodplain Management Ordinance" moratorium on growth because levees once thought to provide 100-year protection were deemed deficient upon further study by the Corps. Despite its 1998 certification that the levees met 100-year protection criteria, the Corps later determined in a 2006 study that, because the levees appeared to be vulnerable to underseepage, the Corps could no longer stand behind its earlier 100-year certification. The Federal Emergency Management Agency (FEMA) then handed down a flood risk designation that will effectively halt all construction of residences, businesses and public facilities in the Natomas area until the levees, which protect 70,000 residents, can be built up to a 100-year protection level.

Population and Development Trends

California's population continues to grow: currently 6.5 million people live in the Central Valley, and that number is projected to reach 12 million by 2040. Much of the new development to house this growing population has occurred in areas susceptible to flooding. One significant challenge related to population growth is the public's false perception about the safety of living behind levees. This is partly due to the rarity of flooding events, and partly due to past assurances about levee safety, such as in Natomas.

Insufficient Funding

State and local funding for flood prevention and management has diminished significantly over the years. This is a partly a result of the difficulties at the state and local levels to raise funding for flood control projects. California's Department of Water Resources' (DWR) ability to maintain key components of the Sacramento River Flood Control Project at the level that the project has been maintained in the past has been hampered due to the state's continuing fiscal crisis. Nor do local agencies have unfettered discretion to increase assessments, no matter how important the project. "Proposition 218," a state initiative, which was approved by voters in 1996, prohibits local agencies from increasing existing assessments or imposing new assessments without first obtaining majority approval from the affected landowners.

Liability

Liability for the Central Valley's levee system has become a primary concern for the state. A 2003 court decision held the state liable for damages of nearly $500 million due to defects in a Yuba County

levee that failed in 1986, even though the levee had been constructed by local agricultural interests, and then incorporated into the Sacramento River Flood Control Project, and had not been designed or constructed by the state. The *Paterno* case held that when a public entity accepts and operates a flood control system built by someone else, it accepts liability as if it had planned and built the system. (*See, Paterno v. State of California*, Case No. C040553 (Cal.App. 2003).)

Given the billions of dollars of real estate development behind levees in the Central Valley, liability is a major issue for the state. After the *Paterno* case, it was clear that the state could ultimately be held responsible for much of the Central Valley flood control system, including all 1,600 miles of levees, in the event of flooding.

Complicated Governance Structure

Due in part to the history of the system, responsibility for operation of the flood management system is spread among multiple levels of government. While the Corps is responsible for regulating flows in the "waters of the United States," giving it permitting authority over changes to the project levees, the state has assumed responsibility for the operation and maintenance of flood control facilities. DWR staff inspects, evaluates and even performs maintenance activities on some levees, but local agencies perform much of the "on-the-ground" maintenance and operation on the state's behalf, and in areas where there are no state-federal project levees, local landowners or agencies maintain other levees.

As the state and many experts have noted, all of these factors add up to an increasing likelihood that there will be devastating flood damages in the Central Valley and that the state will be forced to step in and address the consequences of the damages on an emergency basis. Hurricane Katrina brought home the potential catastrophe that could ensue in the event of a flood in the Sacramento area and seemed to catalyze a huge investment in California flood management starting in 2006.

The Response—Bond Funding and Legislative Package

Immediately after Katrina, the California Assembly held hearings on flood protection, and DWR identified critical erosion sites subject to potential failure during a flood. In February of 2006, following Hurricane Katrina and a winter with heavy rains and local levee failures in the Central Valley, Governor Arnold Schwarzenegger issued an emergency declaration for the state's levee system and commissioned up to $500 million of state funds to repair "critical" erosion sites.

2006 Bond Funds

In November 2006 California voters approved nearly $5 billion in bond funding for flood protection, primarily in the Central Valley. Proposition 1E, the "Disaster Preparedness and Flood Prevention Bond Act," provided $3 billion for the evaluation, reconstruction or replacement of levees and other facilities in the Central Valley, and nearly $1 billion more for local flood control projects outside the Central Valley and floodplain mapping. Proposition 84 provided $800 million for local assistance and special flood projects in the Sacramento-San Joaquin Delta, mapping efforts, and emergency response. DWR at the time estimated that between $7 billion and $12 billion would be necessary to repair and upgrade the Central Valley and Delta levee systems.

Although DWR has characterized the $5 billion as only a "down payment" on the system repairs, the money represents unprecedented funding for flood control in California. Between 2001 and 2006, annual state funding for flood control maxed out at $270 million. More importantly, passage of the bonds represented a mandate by California residents to fix the levees to prevent the kind of serious catastrophe caused on the Gulf Coast by Hurricane Katrina.

2007 Legislative Package

Following the passage of Propositions 1E and 84 in 2006, the California Legislature followed up in 2007 with a set of laws that primarily address the link between land use planning and flood management.

- Senate Bill 5 (SB 5), the key bill in the package limits building in areas prone to flooding and establishes the 200-year flood event as the minimum level of protection required for urban and urbanizing areas. Although the bill imposes no immediate ban on development, it requires cities and counties to integrate updated flood maps into their general plans. After 2015, SB 5 bans development in most flood-prone

areas of the Sacramento and San Joaquin Valleys unless sufficient flood control protections are in place, or adequate progress is being made, to withstand a 200-year storm. In addition, existing communities have until 2025 to reach 200-year protection. SB 5 also requires that DWR prepare the Central Valley Flood Protection Plan, an "integrated flood management plan" for the State Plan of Flood Control, by January 1, 2012.

- Assembly Bill 70 imposes liability on local governments that "unreasonably" approve certain new development in flood-prone areas. In part this bill seeks to limit liability for flood damage and the state's vulnerability under the *Paterno* decision.
- Assembly Bill 156 requires that local agencies adopt safety plans and submit to DWR an annual report on the performance of project levees. AB 156 also directs DWR to map floodplains and levee protection zones in the Sacramento River and San Joaquin River drainage areas.
- Assembly Bill 5 requires that DWR release maps showing Levee Flood Protection Zones and notify all landowners behind state-federal levees of flood risks.
- Assembly Bill 162 requires that local governments provide specific information in their general plans regarding areas susceptible to flooding and flood control measures.
- Senate Bill 17 reforms the state's Reclamation Board by setting new criteria for members and requiring that the Board establish standards for levee construction, operation and maintenance.

Status of Bond Funding

To date, of the $3 billion in Proposition 1E for evaluation, repair and improvements to Central Valley levees, the state has either spent or has committed to spending approximately $964 million for critical repairs and other critical flood control improvement projects; $283 million in state funds has been spent on actual levee repairs. According to the state's Bond Accountability Service, approximately $1.6 billion of the original $3 billion has been spent or committed overall. The state has begun structural evaluation of 2100 miles of levees in the Central Valley, and evaluation of levees protecting urban areas in the Central Valley is 70 percent complete at this point. In addition, the state has repaired 116 critical sites (related to the 2006 emergency declaration) and 117 non-critical erosion sites.

Most of the money spent so far for repair and improvement has come through DWR's "Early Implementation Project" (EIP) grant program to fund "no regrets" project that are ready for construction in the short term. Five EIPs are currently being funded for a total of $408 million in bond funds ($130 million of which has been paid out). By far the largest chunk of EIP funding actually spent has gone to the Three Rivers Levee Improvement Authority (TRLIA), a joint powers authority located about 40 miles north of Sacramento. Of the $211 million granted for EIPs in fiscal year 2007-2008, TRLIA received $138.5 million for its Feather River Setback Levee Project, which is providing 200-year protection to residents in south Yuba County. The county suffered devastating flooding in 1955, 1986 and 1997, causing hundreds of millions of dollars in damages and resulting in dozens of deaths. In total, more than $405 million is being invested in flood protection improvements by TRLIA, approximately half of which is being paid for by the state with funds from Proposition 1E. South Yuba County projects to be the first urban area in the Central Valley to provide 200-year protection. TRLIA's projects, which include two setback levees, stand out as a major success story in the Central Valley.

"We could not have accomplished this work without support from the state and Proposition 1E funding," notes TRLIA general manager Paul Brunner. In addition to working with Federal and state agencies with permitting authority over its projects, TRLIA also had to conduct a Proposition 218 ballot proceeding to get community support for an assessment in order to ensure funding for levee operation and maintenance.

Another significant area of commitment of funds by the state has been in the Sacramento area where the state has committed nearly $250 million for the Sacramento Area Flood Control Agency's (SAFCA) Natomas Levee Improvement Project. This project, when coupled with federal funds and implementation by the Corps, is supposed to restore the Natomas Basin to the 200 year level of flood protection that it was originally believed to have. As with TRLIA, SAFCA initiated the first successful Proposition 218 election in the region following Katrina.

Although the state has spent or committed to spending close to $1 billion for repairs and other levee improvements, a majority of the funds earmarked

for actual repairs and improvements will not be spent in the near future. DWR's 2007-2008 Bond Expenditure Report for Proposition 1E, which is designed to inform the public about how Proposition 1E money is being spent, stated that over one third of the $3 billion allocated to levee repairs will be held until later and distributed "based on priorities established by DWR" once the State Plan of Flood Control is completed (the timing on this is unclear).

Planning and Information Gathering

The bond funds and legislative bills imposed a tremendous amount of planning and information-gathering programs onto DWR. Through its program called FloodSAFE, which is managing the state's flood control efforts, the state has embarked on multiple planning programs that are difficult to distinguish and appear to overlap.

For example, DWR is creating a "California Flood Plan," a new strategic plan that will "inform long-term policy decisions about flood management" by setting statewide goals and principles for effective flood management. In addition, DWR is drafting the "State Plan of Flood Control," required under Prop 1E, which will essentially inventory the facilities and operations of flood control works in the Central Valley. Separate from the State Plan of Flood Control, but definitely related, is the "Central Valley Flood Protection Plan," which must also be developed by DWR and whose purpose is to identify and recommend actions to improve integrated flood management in the Central Valley. As part of this process, DWR has hired outside consultants to develop work groups—both regional and topical—made up of stakeholders from the public to assist in the development of the plan. Finally, DWR is also working on regional flood management plans to encourage neighboring communities to work together on a regional basis to address flood hazards.

The mapping efforts related to these commitments alone is overwhelming and can be difficult to follow. Moreover, it is difficult to ascertain how much of the funds from Propositions 1E and 84 are being spent on these programs. DWR is producing detailed topographic data for most Central Valley levees, surveys of bridges and structures for major rivers and tributaries in the Central Valley, updates to hydrologic and hydraulic models (for example, to account for new knowledge about underseepage), new maps delineating the 100-, 200-, and 500-year floodplains for the Central Valley, and new maps delineating "Levee Flood Protection Zones" (areas that received protection from project levees). Maps produced by DWR will not necessarily be the same as FEMA's 100-year floodplain maps from its ongoing "Map Modernization Program" because, according to Rod Mayer, Assistant Deputy Director at DWR, DWR's maps may be based on different engineering criteria and be produced for different purposes (such as 200-year floodplains).

DWR is outsourcing much of this information-gathering effort, using approximately $300 million in consultant contracts, compared to less than one-tenth of that capacity in years prior to passage of Proposition 1E, and permanent staff at DWR's Division of Flood Management has roughly doubled.

Conclusion and Lessons Learned

Three years after California voters gave the state a clear mandate to fix the aging and broken levee system, has the state maximized its opportunity to do so? In some ways it has, and in other ways it has not. There are certainly positive programs such as the EIP program that have allowed for success stories such as TRLIA and SAFCA. And according to DWR's Rod Mayer, one key to the success of the EIP program has been DWR's ability to advance funds to local agencies, rather than operating on a strictly reimbursable basis (which is the way nearly all state funded programs work). DWR has been able to do this despite the huge economic downturn in California over the past couple of years. One lesson learned by DWR, notes Mr. Mayer, is that even bond funding, which is historically a safe haven as a funding source, is vulnerable to tough economic times.

The economic downturn notwithstanding, EIP funding is limited and few agencies are in a position to take advantage of it. For instance, local agencies must come up with a significant percentage (up to 50 percent) of the cost of levee improvements on their own in order to obtain funding through the EIP program. Few agencies have the resources or ability to do this—particularly not small agencies during difficult economic times—and good projects that would provide flood protection might be precluded because of this requirement.

In some contrast to the repeated calls for urgent action by the state and the governor and in the

numerous reports assessing California's flood control system, a primary focus of DWR appears to be longer-term planning and information-gathering. Indeed, DWR's 2007-2008 Bond Expenditure Plan lists FloodSAFE's "top priority" as using "an integrated statewide approach for managing California's aging flood systems, considering our changing climate conditions and growing population." Also, the plan describes FloodSAFE as "a long-term strategic initiative developed to reduce flood risk in California." Thus there is a disconnect between the tone of urgency in 2006 coupled with the strong message to the state by voters in the form of a massive amount of money to fix the problem, on the one hand, and the long-term potentially overlapping planning efforts by DWR on the other hand.

Similarly, while the 2007 legislative package does provide some direction for the Proposition 1E and 84 funds, the thrust of the 2007 flood control package was actually improving long-term coordination between state flood control planning and local land-use planning—not fixing levees in the short-term. The new laws set in motion important long-term planning programs that will undoubtedly provide useful information and planning documents at some point in the future. They did not necessarily facilitate the moving of dirt to fix levees. To the extent planning and information gathering takes resources away from immediate, urgent repairs, public safety is not being served in the short-term.

Although the state would reduce its exposure to liability under the *Paterno* case by facilitating more short-term improvement projects that reduce flood risks, much of the state's focus is on longer-term planning efforts. One lesson that other states may take from California's experience is that more resources should be committed early to on-the-ground, dirt-moving projects.

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FLOODPLAIN MANAGEMENT NEWS

U.S. ARMY CORPS LEVEE VEGETATION POLICY SPARKS 'NATIONAL LEVEE VEGETATION RESEARCH PROGRAM' AND 'CALIFORNIA LEVEE VEGETATION RESEARCH PROGRAM'

Policy and technical guidance from the U.S. Army Corps of Engineers (Corps) governing vegetation on federal project levees continue to spark efforts to understand the scientific and engineering basis for the guidance and to implement and comply with the guidance. One such effort is a study being conducted by the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, titled the "National Levee Vegetation Research Program." The western states have been a particular hotbed for this topic as evidenced by on-going activity in California, including a companion "California Levee Vegetation Research Program," conducted by a consortium of California-state and local agencies, and plans for phased implementation through California's Flood System Improvement Framework by the California Levee Roundtable and through the concept of life-cycle management (LCM) of levee vegetation.

Background

As stated in the Corps' "Vegetation Policy Review Fact Sheet #1" (August 2007), levee integrity and flood safety have garnered national attention and heightened scrutiny in the disaster wrought by Hurricanes Katrina and Rita along the Gulf Coast. A National Levee Database Survey was conducted by the Corps to determine the condition of levees and identify deficiencies. The scope of the survey included levees directly operated and maintained by the Corps, those in the Inspection of Completed Works program (projects originally constructed by Corps then subsequently transferred to a local authority for operation and maintenance), and those in the Rehabilitation and Inspection Program (projects originally constructed by a local authority).

The results of the survey were that "vegetation policies and standards for flood damage reduction structures were not being applied and enforced consistently" by the maintaining authority, as stated in the fact sheet. The fact sheet continued:

> …[b]ased on these findings, Corps leadership saw the need to clarify and better communicate requirements for landscape plantings and vegetation management on [Corps] flood damage reduction projects: floodwalls, levees and embankment dams.

In short, the policy and technical guidance call for a vegetation-free zone that includes the levee section and areas within 15 feet of the waterside and landside toes of the levee. This zone is meant to be free from woody vegetation (defined as having a stem diameter of greater than two inches) and other encroachments. Corps' reference documents for the policy and guidance include a white paper from the Chief of Engineers of the Corps on the "Treatment of Vegetation within Local Flood Damage Reduction Systems and Engineering Technical Letter" (ETL) 1110-2-571, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures," which superseded Engineering Manual (EM) 1110-2-301 of similar title.

The National Levee Vegetation Research Program

A separate fact sheet from Corps, entitled "Effects of Woody Vegetation on Levees" (March 2009), describes the state of the science of understanding the effect of vegetation on levees:

> At the request of the Corps Headquarters (HQ), in July 2007, [ERDC] conducted an extensive literature review focusing on the effects of woody vegetation on levees. The findings of the review found that no documented evidence exists to prove trees negatively influence levee integrity; however, research is very limited that specifically addresses woody vegetation on levees. The literature review was then extended

> to include subjects pertaining to root systems, slope stability, hydraulic processes, and wind force that would prove helpful in future [*sic*]. Based on the results of the literature review, the Corps HQ recognized that without further research, the question of the effects of woody vegetation on levees would remain unanswered. In April 2008, Corps HQ requested that ERDC begin research on this issue. The overall objective of the research is to answer what appears to be a simple question: *What is the effect of vegetation, specifically woody vegetation, on levees*?

One of the key issues in understanding the effects of vegetation on levee performance and integrity is the relationship of plant roots with soil. ERDC's National Levee Vegetation Research Program is aiming precisely to understand this topic more fully with a study on root system architecture. As stated in the Corps March 2009 fact sheet:

> …the general root architecture is known for many plant species, but specific root characteristics and their interaction with soil are widely varying, affected by many factors, and not well understood…[f]urthermore, the interaction of a root system with soils on an engineered levee is largely unknown.

ERDC's work plan from the fact sheet includes studying: (1) implications of vegetation roots on levees relative to stability and seepage or piping; (2) forces necessary to overturn trees of various species, age, and substrate; and (3) vegetation community structures likely to optimize performance relative to erosion control, slope stability, inspection requirements, maintenance, and environmental quality.

The fact sheet continued that:

> …[t]he evaluation and interpretation of the gathered data will offer scientific support for Corps levee guidelines…[t]he research will lend scientific support to Corps guidelines for vegetation on levees…[p]revious scientific research ignored safety issues associated with levees; however, the proposed research will address safety concerns in addition to advancing the scientific realm of root system interaction with various soil horizons.

While still in its early stages, ERDC's multi-year study has already included cooperation with many state and local agencies across the country, as well as international coordination. Field research sites have been preliminarily selected, including sites in California where the topic has elicited considerable attention.

California Levees Roundtable

The response in California has taken the form of diverse forums, processes, and products. Notably, the California Levee Vegetation Research Program is a collaborative effort among member agencies of the California Levees Roundtable including Corps, California Department of Water Resources (DWR), California's Central Valley Flood Protection Board, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, Sacramento Area Flood Control Agency (SAFCA), and other federal and local entities. The California participating agencies are advancing the California Levee Vegetation Research Program to complement ERDC's national program through continued collaboration, avoiding duplication of effort, and filling in data gaps to better understand the risk factors associated with woody vegetation on levees.

The program is a component of the FloodSAFE California initiative and is outlined in "California's Central Valley Flood System Improvement Framework" (February 2009), developed by the California Levees Roundtable. As stated in the document:

> Peer reviewed scientific research will be conducted to support development of a technically defensible vegetation management policy in support of California's FloodSAFE initiative. Research will consider both beneficial and harmful impacts of levee vegetation on Central Valley levees. The state acknowledges that the Corps is not likely to make substantial changes to its national guidance on vegetation standards, but expects that scientific research, as well as long-term evaluation and monitoring of vegetation life cycles with respect to performance of project levees in the Central Valley, will support granting of regional variances to the national standards for the Sacramento and San Joaquin levee systems. In addition, research is expected

to identify appropriate engineering actions from a risk perspective to mitigate leaving select vegetation on levees.

Based on negotiation through and acceptance by the California Levees Roundtable of the February 2009 framework document, a set of interim vegetation management standards apply in California's Central Valley, which will be superseded by the Central Valley Flood Protection Plan (CVFPP) in 2012. The CVFPP will be informed by and include the results and recommendations of the California Levee Vegetation Research Program. Research under the program will include studying relationships between levee failure mechanisms and a number of vegetation factors, including tree roots, wind-throw and tree failure, and burrowing rodents.

Other important components of the February 2009 framework document are provision for a phased system-wide plan to address the highest risks to levee stability and public safety first, deference of substantial vegetation removal along levees while the plan is being developed, provision for compliance with applicable environmental regulations for vegetation removal, and interim inspection criteria for compliance. The framework also anticipates a future levee vegetation science symposium, following up after an event co-sponsored by Corps, DWR, and SAFCA in August 2007. The initial symposium attracted diverse speakers from the international flood management, engineering, and scientific communities and more than 400 attendees.

Life-Cycle Management

One specific potential strategy for compliance with and implementation of the vegetation policy and guidance is life-cycle management (LCM), as referenced in the quote above from the February 2009 framework document. LCM is a phased implementation approach which essentially allows for existing vegetation to live through its natural maturity into senescence, followed by removal and rehabilitation of the levee as needed for removal of the plant material. Existing vegetation is removed before reaching maturity if it poses a high level of risk based on site-specific criteria. LCM is viewed as an important potential strategy by organizations such as SAFCA because it facilitates forecasted implementation planning and allocation of levee management resources over time, provides for existing fish and wildlife habitat functions to continue through the life of the vegetation, allows for anticipatory compliance with environmental regulations and mitigation of habitat loss, and it allows the state of the science and engineering to progress and adapt to potentially inform revised guidance. The success of LCM relies on data analysis to understand site-specific risk factors and to monitor levee and vegetation performance over time. It further relies on a nimble management structure and availability of resources to identify and act on changing risk conditions.

Interplay of Efforts

The importance of the efforts outlined in this article are manifold for compliance with and implementation of the policy and guidance. The studies under the National Levee Vegetation Research Program and California Levee Vegetation Research Program are intended to ensure that future policy and guidance are informed by the best available data to provide a sound technical basis, as an outgrowth of public and agency comment that current Corps policy and guidance has lacked such scientific rigor.

A secondary use of the results of these programs may be to correlate vegetation parameters with assessment of flood risk on a site-specific basis to determine appropriateness of variances as a means to comply with policy. A formal variance process is in place, revised in the summer of 2009 by the Corps. It can be reasonably anticipated that local jurisdictions will apply for formal variances as a compliance approach. This is especially true in California and other western states where full implementation of the policy guidance creates challenges from the perspectives of funding, application of staff resources, compliance with environmental regulations (such as the federal Endangered Species Act compliance and state fish and game codes), and social values such as recreation and aesthetics.

Approaches for phased implementation such as California's "Central Valley Flood System Improvement Framework" and the concept of LCM are means to comply with the policy guidance incrementally and systematically over time to at least partially address these challenges. From a cost standpoint, many communities are already employing creative money sources by combining federal and state pots with local assessments, development fees, and private funding

to finance flood improvements that are in response to the Federal Emergency Management Agency's (FEMA's) Map Modernization Program (Map Mod) and revised levee standards and design criteria from the Corps other than vegetation policy. FEMA's Map Mod is a nationwide program to use current data to better understand and communicate flood risk, and, in many cases, the Map Mod results are delineating a greater level of flood risk to communities and are necessitating flood insurance. Regarding other revised levee standards, the science and engineering behind flood management structures continue to evolve and are often, unfortunately, best informed by failure such as that experienced in the Gulf Coast. As communities work to implement safety improvements as spurred by Map Mod and revised levee standards, funding for those efforts may compete with or be complicated by compliance with vegetation policy. Therefore, phased implementation and concurrently planned improvement projects to comprehensively address known deficiencies, including and beyond vegetation and encroachments, are viewed as an important strategy for ultimate compliance.

Conclusion and Implications

As stated in the Corps August 2007 fact sheet:

> [p]rojects will continue to remain eligible for federal rehabilitation assistance when damaged by a flood event, if the local sponsor properly operates and maintains the project.

Therefore a primary implication of non-compliance with Corps operation and maintenance standards is potential loss of eligibility for federal assistance, which is a great risk for many communities that may not recover or at least recovery efforts would be hampered without funding from the federal government. (Chris Elliott/Gregg Ellis)

THE NATIONAL LEVEE DATABASE CONTINUES TO GROW— IN CALIFORNIA A SIMILAR DATABASE TAKES HOLD

In the aftermath of Hurricane Katrina in 2005, Congress directed the U.S. Army Corps of Engineers (Corps) to develop the National Levee Database (NLD), a comprehensive inventory of over 14,000 miles of federally managed levees located across 38 Corps districts nationwide. The levee inventory is the first of three components that comprise the National Levee Safety Program. The other two components are the inspection of levees and technical risk assessments of levees.

Background

Modeled after the National Dam Safety Program, which includes a national dam inventory, the NLD is the foundation of the National Levee Safety Program. It is designed to retain—and facilitate easy access to—critical information about individual levees, thus bolstering efforts to ensure levee safety while assisting other agencies that conduct activities related to floodplain management. The Federal Emergency Management Agency (FEMA) will also have access to the database to support the National Flood Insurance Program.

When completed, the comprehensive NLD will provide access to critical levee conditions that will, in turn, facilitate improved flood risk assessment and better managed levees. As part of an NLD pilot program, the Corps developed the necessary standards for levee field data collection, information research and geodatabase development for the pilot program, which included five districts and over 3,000 miles of levee centerlines. To-date, the inventory includes over 14 districts completed with well over 8,000 miles surveyed with another eight districts in progress or planned.

Levee field data collection includes the capture of vertical elevation and horizontal position points every 100 feet along levee crest and floodwalls as well as noticeable elevation changes and cross-sections at designated points along levees. The collected data is entered into the Corps' Spatial Data Standard for Facilities, Infrastructure, and Environment-compliant database. The database includes information on levee features such as closures, cross drains, relief wells and pump stations. The database also includes recorded inspection ratings to support the Corps' Inspection of

Completed Works (ICW) and the Rehabilitation and Inspection Program (RIP).

However, understanding the number and location of the levees is just one basis for managing levees. Inspecting the levees at a regular interval is critical to maintaining and operating levee systems. The Corps, with funding from the American Recovery and Reinvestment Act of 2009 will begin inspecting all of its levees beginning in fall 2009. The levee inspection effort will be at the periodic level, which is a detail field inspection and review of maintenance and operational plans. These inspections will help assess the condition of the levee system and let local sponsors know where they are deficient and need to make improvements.

The Corps has upwards of 14,000 miles of levees within the federal programs that it oversees— yet, this is only part of the national levee management story. There are countless levees protecting people and infrastructure from flooding outside the federal programs that are operated and maintained by local, state and private entities.

A Parallel California Effort

Understanding the need for better management of levees within the state, California, working with FEMA, initiated the development of the California Levee Database (CLD), a comprehensive digital database of California levees. Built using GIS technology, the CLD program maps most of the existing levees within the state including informal embankments serving as levees with an emphasis on levees in California's Central Valley region.

Currently, the CLD has location information for more than 10,000 miles of levees and flood control structures throughout California including levee centerlines, levee boundaries and feature locations such as high water marks and burrow sites. Additional features stored as reference layers in the database include county boundaries, congressional districts, senate districts, reclamation districts, National Hydrology Dataset (NHD) stream centerlines, USGS 1:24,000 quad Digital Raster Graphics (DRGs), U.S. Geological Service Digital Ortho-Quads (DOQ) and FEMA's Q3 and Digital Flood Insurance Rate Map data (DFIRMs).

The CLD resource library links to an index of existing water resource documents for associated levee segments. These documents include levee-related geotechnical, hydrologic and hydraulic, inspection, operations, maintenance and mapping information. The database is designed to identify information that is critical in determining whether existing levees will meet many of the factors that are required to receive FEMA certification standards and address the most pressing needs for maintenance, rehabilitation and repair.

Like the NLD, the CLD is expected to enhance the maintenance and management of critical levee infrastructure between multiple organizational sectors. The California Department of Water Resources (DWR) will maintain the information associated with California's public levees that do not fall within the Corps' jurisdiction, while the appropriate California Corps District will maintain data associated with levees under federal jurisdiction as part of the NLD. As a local sponsor, DWR is responsible for many of the levees in the Corps' program, therefore the Corps' NLD data has been incorporated into the CLD as part of a data sharing effort.

The DWR anticipates that the CLD will enable meaningful risk analysis and emergency planning as well as delivering the information required to support long-term project planning and large-scale funding strategies. The GIS-based database can be used to support analysis of spending alternatives, public participation and ultimately spending decisions that synergistically address multiple objectives in flood management with each capital investment decision.

In the near future, all California DWR staff will have access to the data through a web-mapping interface. Future plans are to serve the data to a wider audience of users with access controls in place to protect sensitive data within the database.

Conclusion and Implications

Congress and the citizens of the country have been clear in the desire for comprehensive levee management. Development of the National Levee Database is a key element in meeting that desire by placing in a single location all key known information about the nation's levees. (David Maurstad)

LEGISLATIVE DEVELOPMENTS

A LOOK FORWARD TO FLOOD PROTECTION AND THE UPCOMING SESSION OF CONGRESS

The remainder of the first session of the 112th Congress will in large part be preoccupied with the heated deliberation over healthcare reform. The debate over our nation's health system clearly dominates the legislative calendar and drives much of the activity inside the beltway. Despite healthcare's starring role on the national stage there will be opportunities to advance water-related priorities. Those opportunities include the fiscal year 2010 Energy and Water Appropriations Bill, initiation of the Water Resources Development Act (WRDA) of 2010, and a report card on the US Army Corps of Engineers (Corps) stimulus projects.

The Fiscal Year 2010 Energy and Water Appropriations Bill

The annual appropriations process is unpredictable at best. To put it into perspective, it has been a decade since an energy and water appropriations bill has been signed into law before the start of the new federal fiscal year (October 1). Congress, however, may be on track to accomplish that feat this year. Both the House and Senate approved their versions of the fiscal year 2010 energy and water appropriations bills before departing for the month long August recess. This is significant in and of itself as the full Senate has not voted on a Senate Energy and Water Appropriations bill since 2005. This past July a delay in the consideration of healthcare reform in the Senate opened up floor time to consider other legislation. That delay afforded the Senate Appropriations Committee an opportunity to move forward with their suite of bills. The Senate was able to swiftly approve four of their twelve appropriations bills, including the Energy & Water Appropriations bill, all before the August recess.

Overall there is a renewed effort among the democratic leadership on both sides of the Capitol to get the annual appropriations process back on track. This would provide a more reliable funding cycle for agencies such as the Corps who depend on this bill for funding and planning needs. Having the energy and water appropriations bills through both houses of Congress before August greatly increases the likelihood that a bill could be signed into law on or close to the start of the new fiscal year. Those interested in monitoring the progress of the appropriations bills may do so at: http://thomas.loc.gov/home/approp/app10.html

Now it is up to the House and Senate conferees to iron out the billion dollar difference between their two bills. To this end, staff level discussions have already begun. Below is a table highlighting the funding accounts for the Corps.

	HR 3183	S 1436
Total Funding	$33.3B	$34.271B
O&M	$2.5B	$2.45B
Construction	$2.1B	$1.924B
Investigations	$142M	$170M

Water Resources Development Act of 2010

Prior to the turn of the century, Congress reliably approved new water projects every two years through a Water Resources Development Act, (WRDA: pronounced "worda"). WRDA is the first step in securing a federal investment for water projects. Without WRDA approval such projects would not be eligible for federal funds. Examples of such projects include flood damage reduction, navigation improvements, and ecosystem restoration. After a long seven-year hiatus, Congress approved the most recent WRDA bill in 2007. Since that time the committees of jurisdiction (Senate Environment and Public Works, House Transportation and Infrastructure) have been working in earnest to restore the historical biennial schedule.

Prior to the August 2009 recess, the House Transportation and Infrastructure Committee alerted members of the House of Representatives of their intention to initiate work on WRDA 2010. A "Dear Colleague" letter was sent to all representatives to put out a call for members to begin evaluating the water resource needs in their districts and to be ready to

submit formal project requests in the fall. While there is no expectation of any committee action on WRDA 2010 before the start second session of the 112th Congress, it is common practice for the committee to take the pulse of its members in this manner.

Those interested in obtaining authorizations for new water infrastructure and resource priorities should already be working with their congressional delegations and local Corps offices to shape the requests. A copy of the July 29th "T&I Dear Colleague" letter providing guidance on this process can be accessed here: http://transportation.house.gov/Media/file/water/WRDA/WRDA%202010%20Dear%20Colleague%201.pdf Look for a more in-depth discussion on the impact WRDA legislation has on the policy, planning and implementation of water projects in a future article.

Stimulus Report Card

One of President Barack Obama's first acts as the 44th President of the United States was to sign into law the American Recovery and Reinvestment Act (ARRA) on February 17th. The law was intended to provide immediate funding for infrastructure investments and job creation. However, measuring the impact and monitoring the distribution of these funds has become a political hot button issue (and a new favorite pastime for some) in Washington. Ultimately, how the funds are spent will play heavily into any opportunity for Congress to consider a second stimulus bill. Agencies are diligently tracking their stimulus progress with a good deal of Congressional oversight by the committees of jurisdiction.

The Corps was one of the first agencies to put its share of the stimulus funds to work. The Corps is required by law to submit quarterly reports to Congress on the allocation, obligation and expenditures of these funds. The first of such reports was mandated to be received within 45-days of the stimulus law's passage. Less than three months after receiving $4.6 billion for civil works priorities the Corps published its coveted list of lucky recipients. The law stipulated that these funds be provided to shovel-ready projects capable of immediate job creation. The law also provided assistance to projects that needed an additional injection of funds by providing a one-time lift of the "902 limit" (the maximum amount that may be expended on a project under allowable authorization) and provided the Corps with unlimited reprogramming authority.

The Corps set forth additional requirements including that funds go to projects with minimal scheduling risks, projects that could be executed by contract or direct hire of temporary labor, and projects that could complete a phase, the entire project, or provide a useful service that does not require additional funds. In all, the Corps will dispense $2 billion for construction, $2.075 billion for Operations and Maintenance, and $375 million for the Mississippi River and Tributaries. The Corps estimates that the stimulus funds will create 8,000 direct jobs for every $1 billion spent. The Corps is already boasting successes across the country including safety improvements at the Howard Hanson Dam, dredging at the Port of Anchorage, powerhouse rehabilitation for Garrison Dam and ecosystem restoration in Arizona. The Corps' progress can be tracked by visiting: http://www.usace.army.mil/recovery/Pages/default.aspx

Conclusion and Implications

When working with Congress on water priorities it is best to view the process as a marathon, and not a sprint. This article touched on a likely scenario for the fiscal year 2010 energy and water appropriations bills, preparing for WRDA 2010, and tracking the success of the Corps funding in ARRA. Each of these items must be carefully tracked, and where possible influenced, for local and state agencies to assure that Congress is both aware of and responsive to local needs. (Julie Minerva)

CLIMATE CHANGE SCIENCE

RECENT SCIENTIFIC STUDIES OF CLIMATE CHANGE

Climate Change Likely to Increase Extreme Rainfall Events

A recent study from MIT and Caltech concluded global climate change will alter precipitation patterns and cause heavier rainstorms in some regions. The report, authored by MIT's Paul O'Gorman and Caltech's Tapio Schneider and published online in the *Proceedings of the National Academy of Sciences*, examined model simulations that suggest extreme precipitation events will increase by approximately six percent for every one degree Celsius increase in temperature. Since scientists currently estimate there is a ninety percent probability that global surface temperatures will increase between 3.5 and 7.4 degrees Celsius by 2100, this new study provides a basis for understanding future increases in intense rainfall.

There is a general consensus among climate scientists that global warming will impact precipitation patterns. As the atmosphere grows warmer, the atmosphere will hold more water vapor. Precipitation in extreme events is likely to increase because water vapor condenses as rising air cools. However, researchers expect that the warmer climate will also moderate the increase in precipitation because the rate of cooling for rising air decreases in warmer climates.

The anticipated increase in extreme rainfall events will likely impact various regions of the world differently. Current climate models for tropic and sub-tropic regions are problematic because typical weather storms there are less than the size limitations of existing models, so the impact of climate change on precipitation in the tropics is unclear. Outside of the tropics, the patterns clearly and consistently suggest average annual precipitation will increase, along with the frequency and magnitude of extreme rainfall events.

See, Paul A. O'Gorman and Tapio Schneider, "The Physical Basis For Increases in Precipitation Extremes in Simulations of 21st-Century Climate Change," *Proceedings of the National Academy of Sciences*, published online before print August 19, 2009. doi:10.1073/pnas.0907610106. (*see eg*, http://www.citeulike.org/user/tkeitt/article/5658018).

New Study of Climate Change Impacts in the U.S.

Researchers from the Lawrence Berkeley National Laboratory have compiled the most thorough and up-to-date review of observed and anticipated climate-change impacts in the United States. The report forecasts hotter, drier climate conditions with significant effects on agriculture, the environment and human health.

The research shows that areas expecting increased precipitation, will still suffer from greater evaporation rates resulting from higher temperatures. Floods and droughts will become more common and intense. California, which is strongly dependent on spring and summer runoff supply for its residential, commercial and agricultural uses, will be impacted by declining snowpack, reducing runoff and water flows later in the year. Higher temperatures in areas such as California and the entire southwest region also will put increased strain on the demand for energy for cooling.

The researchers note that the insurance industry, is particularly vulnerable to increases in extreme weather events, and thus has taken a lead in helping society manage these risks. In fact, insurance will be one of the primary mechanisms for distributing climate changes costs across society.

According to the researchers, the harshest impacts of future climate change may be avoided, but only if deliberate action is taken soon to reduce greenhouse gas emissions and adapt to the unavoidable impacts of the changing climate.

Adapted from the report "Global Climate Change Impacts in the United States" located at: http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts.

Greenland's Melting Ice Sheet Poses Risk for Northeastern United States

A new study into the effects of Greenland's rapidly melting ice sheet indicates the Northeastern United States may face rising sea levels this century that are greater than those predicted for the rest of the planet. This puts major cities such as Boston and New York City at risk because those cities are located at sea level.

As the rate of melting of Greenland's ice sheet accelerates, scientists at the National Center for Atmospheric Research suggest that northeastern North America could suffer a sea level rise of 12 to 20 inches more than other coastal areas. Greenland's major ice sheet is melting at an increasing rate due to global climate change. Since 1996, the rate of ice melt has increased by seven percent per year. While scientists are optimistic this high rate will not continue indefinitely, Greenland's ice will continue melt as a result of climate change.

The study also notes that sea levels do not rise evenly around the world. For example, the Atlantic Ocean has a dense layer of compact cold water that helps account for the fact that sea level in the North Atlantic is some 28 inches lower than that in the warmer Pacific Ocean. In addition, the study cautioned that the Atlantic Ocean's meridional overturning circulation phenomena, sometimes referred to as the conveyer belt, may be affected as melting ice dumps freshwater into the Atlantic. The researchers also fear that resulting changes is salinity could affect the biology of fresh water river deltas.

For more information, *see*, Hu, A., G. A. Meehl, W. Han, and J. Yin, "Transient Response of the MOC and Climate to Potential Melting of the Greenland Ice Sheet in the 21st Century," *Geophysical Research Letters*, 36, L10707, May 29, 2009; DOI:10.1029/2009GL037998; http://www.agu.org/sci_soc/prrl/2009-17.html. (P. Morrisette)

REGULATORY DEVELOPMENTS

U.S. ARMY CORPS RELEASES EIS FOR FEASIBILITY ON PERMANENT FLOOD CONTROL SOLUTIONS FOR FARGO NORTH DAKOTA-MOORHEAD MINNESOTA METROPOLITAN AREA

On September 22, 2009, the U.S. Army Corps of Engineers, St. Paul District (Corps) made available its "Scoping Document for the Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study Environmental Impact Statement," which identifies issues that will need to be considered during the planning for a flood risk management plan for the Fargo-Moorhead Metropolitan Area. In part, the scoping document includes dozens of proposed alternatives for flood works gathered from the public and interested stakeholders.

Background

Based on recommendations contained in a reconnaissance report for the area approved by the Corps' Mississippi Valley Division on April 08, 2008, the cities of Fargo, North Dakota and Moorhead, Minnesota (together: Cities), and the federal government entered into a "feasibility cost share agreement" dated September 22, 2008 to share costs between the two non-federal sponsors and the federal government to prepare a feasibility study. On May 5, 2009, following a series of flood events, the Corps issued a "notice of intent" in the Federal Register to undertake, in partnership with the Cities, a flood risk management feasibility study that focuses on reducing flood risk in the entire Fargo-Moorhead Metropolitan area and surrounding areas, and evaluates several alternative measures, including levees and floodwalls, diversion channels, non-structural flood-proofing, relocation of flood-prone structures, and flood storage.

The Study Area

The study area is located within an area from approximately 12 miles west to five miles east of the Red River and from 20 miles north to 20 miles south of Interstate Highway 94, which includes the Red River and the downstream portions of the Buffalo River, Wild Rice River, Sheyenne River, Maple River, Rush River and other contributing streams that enter the Red River in the study area. In North Dakota, the study area includes a portion of Cass County and the cities of Fargo, West Fargo, Hickson, Oxbow, Wild Rice, Frontier, Briarwood, Prairie Rose, Horace, Reiles Acres, and Harwood. In Minnesota, the study area includes a portion of Clay County and the Cities of Moorhead, Dilworth, Oakport, Rustad, Kragnes and Georgetown.

The Scoping Document

The scoping document describes the scope of actions, alternatives, and impacts to be studied in the Fargo-Moorhead Metro Environmental Impact Study based on input gathered from meetings with federal, state, local agencies, and other entities, a series of four public meetings, a scoping meeting, and written comments. According to the scoping document, the purpose of the proposed action is "to reduce flood risk, flood damages and flood protection costs related to the flooding in the Fargo-Moorhead Metropolitan area." The objectives include the reduction of flood risk and flood damages in the study area, restoration or improvement of degraded riverine and riparian habitat in and along the Red River of the North, Wild Rice River, Sheyenne River, and Buffalo River, providing additional wetland habitat in conjunction with other project features, and providing recreational opportunities in conjunction with other project features.

Alternatives Being Explored

The scoping document describes a number of alternatives to be evaluated in the environmental impact statement. One measure is the construction of a levee and floodwall plan to protect the City of Fargo's (Fargo) downtown area. Fargo currently is developing a levee/floodwall plan for a large area south of Interstate Highway 94 between the Red River, Wild Rice River and Sheyenne River, which plan is being designed to be certified to the Federal Emergency

Management Agency as providing 100-year level of protection to the area. For the feasibility study, the proposed flood control project will be considered as one potential alternative. Fargo has also investigated levee/floodwall alternatives to provide a continuous line of protection to the entire city at a 100-year level of protection. The feasibility study will evaluate levee and floodwall features alone and in concert with other potential measures as part of a flood risk management system.

Another alternative involves diversion channels used to route flood flows around the metropolitan area, thus reducing stages in the natural channel through town. According to the scoping document, diversions generally provide better risk reduction than levee/floodwall alternatives, because they cannot fail suddenly and catastrophically like a flood barrier. If a diversion fails to perform, flood stages are no higher than they would have been without the project in place, but on the other hand, diversions do not eliminate flood risk, and there is potential for blockage of the channel due to ice and debris.

Nonstructural measures to be considered include: (1) the relocation of structures from high flood hazard areas to areas that are completely out of the flood plain, (2) the buyout and demolition of structures whereby structures are either demolished or sold to others and relocated to a location beyond the flood plain, (3) elevation of structures above a particular flood event, possibly on extended foundation walls, (4) the filling of the existing basement of a structure without elevating the remainder of it if the structure's first floor was above the higher of either the base flood elevation or the design elevation, (5) waterproofing structures, (6) the use of berms, levees and walls no higher than six feet above grade intended to reduce the frequency of flooding, but not eliminate flood plain management and flood insurance, (7) the development and implementation of flood warning/preparedness planning, (8) land acquisition and use as open space via deed restriction that prohibits any type of development that can sustain flood damages or restrict flood flows, (9) flood plain management plans, and (10) consideration of vertical construction for residential occupancy of condominiums within flood plains, where the at-grade floor is used for open-space uses and the upper stories are used for residences.

Additional alternatives to be considered include flood storage measures, boring a series of tunnels underneath the city, bridge replacement or modification, the use of Interstate 29 as an open viaduct during floods, digging the Red River channel deeper and wider will allow for more flow to pass through the Fargo-Moorhead Metro area, the restoration of grassland and wetlands to reduce peak runoff and serve as water storage during flooding events, building cut-off channels across meanders in the Cities, and a sustainability alternative that would include a combination of alternatives.

Conclusion and Implications

In cooperation with the Cities' local officials, the Corps plans to examine suggestions from the public, develop its own solutions, and narrow the list of alternatives to up to six plans, which are scheduled to be revealed on October 19, 2009. (R. Chang)

U.S. ARMY CORPS OF ENGINEERS TO UPDATE 'PRINCIPLES AND GUIDELINES' FOR FEDERAL WATER RESOURCE PROJECTS

The U.S. Army Corps of Engineers (Corps) and the Council on Environmental Quality (CEQ) are in the process of revising the "Principles and Guidelines" originally adopted to guide federal water resources planning studies. The ongoing process is focused on revisions consistent with a number of considerations previously suggested by Congress, the National Research Council, and the public. These considerations include but are not limited to updating the Principles and Guidelines with respect to the role of public safety in project formulation, increasing the minimum economic standard for project justification, and the scope of watershed analysis in project development.

Background—The Historical Basis for Federal Planning

Established pursuant to § 103 of the Water Resources Planning Act of 1965 (Public Law 89-80), the U.S. Water Resources Council adopted the Principles and Guidelines in 1982. These Principles and Guidelines were formally adopted by President Ronald Reagan on February 3, 1983 and superseded what was previously referred to as the 1972 Principles and Standards. The Principles and Guidelines are intended to ensure proper and consistent planning by federal agencies in the formulation and evaluation of water and related land resources implementation studies including the study of project reevaluations and modifications. Although primary associated with the Corps, the Principles and Guidelines also govern water resource studies undertaken by the U.S. Bureau of Reclamation, the National Resource Conservation Service, and the Tennessee Valley Authority

The Principles and Guidelines are comprised of two parts: "Economic and Environmental Principles for Water and Related Land Resource Implementation Studies" and the "Economic and Environmental Guidelines for Water and Related Land Resource Implementation Studies." Together these documents establish a framework for a federal agency to balance economic development and environmental resource needs in the course of planning water resource project implementation.

The Principles and Guidelines serve as the fundamental basis for the planning process practiced by the Corps in each of its civil works projects today. The primary reference document developed by the Corps to guide water resources planning studies, the Planning Guidance Notebook (ER 1105-2-100 dated 22 April 2000), expands and refines the concepts introduced in the Principles and Guidelines for consistent application during development of a water resource planning study. The Planning Guidance Notebook serves to describe concepts fundamental to the Principles and Guidelines. These fundamental concepts include the "federal objective" to contribute to national economic development and the consistent application of a planning process which is responsive to state and local concerns while ensuring that all reasonable alternatives are evaluated.

Legislative and Executive Branch Interest

The Corps originally initiated the process to revise the Principles and Guidelines in response to a Congressional mandate. This mandate came in the form of § 2031 of the Water Resources Development Act of 2007 (Public Law 110-114). This section requires the Secretary of the Army within two years of enactment to issue revisions for use in the formulation, evaluation, and implementation of water resource projects. Congress further included a list of considerations for the Corps to evaluate during the process.

The list of considerations included: the use of the best available economic principles and analytical techniques, including risk and uncertainty analysis; the assessment and incorporation of public safety in the formulation of alternatives and recommended plans; the use of assessment methods that reflect the value of projects for low-income communities; projects that employ non-structural approaches to water resources development and management issues; the evaluation of a project's impacts on and benefits to other water resource projects and programs within a watershed; the use of contemporary water resource paradigms, including integrated water resource management and adaptive management; and, the use of evaluation methods that ensure water resource projects are justified by the public.

The Obama Administration is apparently looking to this process as an opportunity to consider developing uniform planning standards that could be applied by all federal agencies. These uniform standards would continue to apply to the traditional water resource agencies already cited in the Principles and Guidelines; however, consideration will be given to expanding their application to cover any agencies that engage in a water resource development project. CEQ, in coordination with the Office of Management and Budget, is leading an interagency effort to draft these expanded Principles and Guidelines. CEQ currently anticipates that the revision process will be conducted in two phases. The first phase will address revisions to Chapter I of the existing guidelines titled, Standards. The second phase will address revisions to Chapter II through Chapter IV of the guidelines, commonly referred to as the "procedures." Using public feedback received in July, CEQ intends for the initial draft of the revision to be prepared and released for public comment and review by the National Academy of Sciences.

Conclusion and Implications

The Principles and Guidelines are part of the foundation upon which many federal water resource projects are implemented today. The ideas and concepts contained in the Principles and Guidelines fundamentally guide the formulation and evaluation of project alternatives and the selection of a recommended plan. Through its direct connection with the Corps' planning process, revisions to the Principles and Guidelines have the potential to greatly impact not only the Corps' planning process but its decision-making process for years or decades to come. The consideration by CEQ to expand their application beyond the four agencies traditionally identified with water resource project compounds the potential for these revisions to affect water resource planning studies across the country.

To date the process has involved multiple opportunities for public comment on the proposed revisions. The most recent opportunity was provided by CEQ through a notice in the Federal Register on July 1, 2009. Additional opportunities for public comment are anticipated in the coming year. For points of contact at either the Corps or CEQ, updates regarding the Administration's progress, additional information or documentation associated with the Principles and Guidelines, or to submit written comments, visit this topic at the U.S. Army Corps of Engineers website at: http://www.usace.army.mil/CECW/Pages/pgr.aspx or visit this topic at the Council on Environmental Quality's website at http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG/. (Eric Nagy)

DOI SECRETARY SALAZAR ISSUES ORDER ESTABLISHING CLIMATE CHANGE RESPONSE COUNCIL TO EXECUTE STRATEGY TO ADDRESS THE IMPACTS OF CLIMATE CHANGE ON RESOURCES

On September 14, 2009, U.S. Secretary of the Interior Ken Salazar issued under the authority of § 2 of the Reorganization Plan No. 3 of 1950, Secretarial Order No. 3289, addressing "the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources" (Order 3289). Order 3289 replaces a January 16, 2009 order, reinstates the provisions of a January 19, 2001 order, and builds upon a March 11, 2009 order that prioritized development of renewable energy on public lands and offshore waters in order to reduce the country's dependence on foreign oil and to reduce greenhouse gas pollution.

Secretarial Order No. 3289

The stated purpose of Order 3289 is to establish a department-wide approach fro applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural heritage resources that the Department of the Interior (DOI) manages.

Recognizing the dramatic effects of climate change that are occurring worldwide, Order 3289 cites a number of examples that illustrate how climate change requires change in the management of land, water fish and wildlife. For example, Order 3289 points out that (1) new water management imperatives associated with climate change may require restoration of natural systems and construction of new infrastructure to reduce new flood risks or to capture early runoff and (2) strategies to address sea level rise may require acquisition of upland habitat and creation of wetlands and other natural filters and barriers to protect against seal level rise and storm surges. Order 3289 states that in being responsible for helping to protect the nation from the impacts of climate change, DOI must take action, in part, to adapt its water management strategies to address the possibility of shrinking water supplies and more frequent and extended droughts to continue to supply drinking water to more than 31 million people and irrigation water to 140,00 farmers.

A Framework for Coordination

Order 3289 establishes a framework for the coordination of climate change science and resource management strategies, and establishes a Climate Change Response Council comprised of the Secretary, deputy Secretary, Counselor to the Secretary, Assistant Secretaries, Bureau Directors and the Solicitor. The Climate Change Response Council is to implements department-specific climate change activities through three primary mechanisms. First, each bureau an office of DOI "must consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under DOI's purview.

Climate Change Impact Data

Second, eight "Regional Climate Change Response Centers" known as "regional hubs" of the National Climate Change and Wildlife Center will be developed to provide climate change impact data and analysis geared to the needs of fish and wildlife managers as they develop adaptation strategies in response to climate change. These regional hubs will inform management decisions made in response to climate change impacts. Order 3289 states that the Response Centers will synthesize and integrate climate change impact data and develop tools that the departments managers and partners can use to manage land, water, fish, and wildlife resources.

Landscape Conservation Cooperatives

Third, the Climate Change Response Council will guide department bureaus and agencies to stimulate the development of a network of "Landscape Conservation Cooperatives," which will work interactively with relevant Regional Centers to coordinate adaptation efforts. The network of agencies and local and state partners will develop landscape-level strategies to focus on, for example, the effects of climate change

on wildlife migration patterns, wildfire risk, drought, or invasive species that typically extend beyond the borders of any single National Wildlife Refuge, Bureau of Land Management unit, or National Park.

In addition to coordinating DOI's response to climate change impacts, the Climate Change Response Council, will oversee two projects established to mitigate climate change: (1) the DOI Carbon Storage Project, through which DOI is developing methodologies for underground and biological carbon storage, and (2) the DOI Carbon Footprint Project, through which DOI will develop a unified greenhouse gas emission reduction program, including setting a baseline and reduction goal for DOI's greenhouse gas emissions and energy use.

Conclusion and Implications

In light of the unique position that DOI holds, it is anticipated that the strategy announced by Secretary Salazar will go a long way toward addressing the impacts of global warming on public natural resources and wildlife. Through the National Parks Service, U.S. Bureau of Land Management, U.S. Bureau of Indian Affairs, U.S. Bureau of Reclamation, Minerals Management Service, and U.S. Fish and Wildlife Service, DOI oversees one-fifth of the country's landmass and 1.7 billion acres on the Outer Continental Shelf, and supplies drinking water to over 31 million people and irrigation water to 140,000 farmers, and holds trust responsibilities on behalf of the federal government for over 500 tribal nations. In June of this year, DOI also designated approximately 670,000 acres of land to be "fast-tracked" as potential areas for solar energy production. (R. Chang)

JUDICIAL DEVELOPMENTS

TENTH CIRCUIT CLARIFIES PRIVATE PARTY'S RIGHT TO DEVELOP HYDRO-POWER ON U.S. BUREAU OF RECLAMATION PROJECT FACILITIES AND THE BUREAU'S ROLE IN CHANGE APPLICATIONS

Strawberry Water Users Assoc. v. Salazar, ___F.3d___, Case No. 07-4172 (10th Cir. Aug. 12, 2009).

The Tenth Circuit Court of Appeals in its August 12, 2009 decision, brought to a close almost an eight year fight among the U.S. Bureau of Reclamation (Bureau), the Strawberry Water Users Association (SWUA) and the Central Utah Water Conservancy District (CUWCD). At issue was the right, if any, of SWUA to develop hydroelectric power on Central Utah Project (CUP) facilities, retaining the power revenues for its self, and without having to pay any of the costs of constructing the CUP facilities upstream from the potential power plant. Also at issue was the question under federal law and contract whether the Bureau or SWUA had the right to file change application to modify the project water rights appropriated under state law as required by the Reclamation Act.

Background

The Strawberry Valley Project (SVP) was one of the first reclamation projects constructed in the West following the passage of the Reclamation Act in 1902. Its primary feature was the Strawberry Reservoir with capacity of about 270,000 acre-feet. Water from the Colorado River drainage was captured and stored in the reservoir and then imported into South Utah County along the Wasatch front for irrigation purposes. The project also developed federal hydroelectric power facilities. SWUA under series of amendments to the 1902 Reclamation Act and its various contracts with the Bureau, assumed the operation and maintenance obligations of the SVP and in return was entitled to receive the power revenues from the federal power facilities. The opinion recites the evolutionary history of reclamation law and the development of hydroelectric power on Bureau projects, either by the federal government as "Project Power" or by private investment under a "Lease of Power Privilege."

SWUA was organized in 1922 to assume the O&M responsibilities for the SVP and to assume the repayment obligation of the water users. The SVP was completed in 1933. A certificate of appropriation was issued by the State of Utah to the United States for 100,000 acre-feet of water developed by the SVP. In exchange for assuming the O&M and repayment obligations, SWUA was permitted to develop further power facilities on SVP facilities and to receive the power revenues. However, the Hayden-O'Mahoney Amendment adopted in 1939, precluded water users from benefiting from future project power facilities. Instead, power revenues future project power went to the Reclamation fund.

In 1956, the CUP was authorized as part of the Colorado River Storage Project Act. The Bonneville Unit of the CUP, a feature of the CUP, was designed to replace and update much of the older SVP. The CUP included the construction of the new Solider Creek Dam and the enlarged Strawberry Reservoir with capacity of 951,360 acre-feet. The CUP essentially was built over the top of the SVP. The CUWCD was organized in 1964 to repay the project costs of the CUP. SWUA paid no costs for construction of the CUP, but did pay some O&M for the storage and delivery of water to it under contract.

SWUA, CUWCD and the United States entered into an agreement in 1991 to govern how these two projects would co-exist. SVP essentially give up its SVP water rights, in exchange for a guaranteed annual delivery of 61,000 acre-feet to be diverted, stored and delivered by the CUP. The 1991 agreement incorporated a U.S. Solicitor's memorandum of 1986, in which the Solicitor acknowledge that because SWUA had assumed the O&M responsibilities for the SVP, that it had the right to develop additional power on SVP facilities either as Project Power or under Lease of Power Privilege. However, the Solicitor noted that SWUA had no right to develop power on CUP facilities, and that if it did, it would be expected to share proportionately in the costs of developing

upstream facilities. The 1991 Agreement also noted that if future hydroelectric power facilities were to be developed on CUP facilities, it would be the subject of a new agreement among the parties.

CUWCD and SWUA approached the United States for a Lease of Power Privilege to build power on the Diamond Fork System. A Federal Register Notice was issued and gave the successful applicants five years to enter into a lease with the United States. Although successful in winning the right to lease, SWUA and CUWCD were unable to come to an agreement with each other or with the United States within the five years, and the offer to lease was rescinded. Thereafter, SWUA made no effort to submit its own power proposal.

Change Applications

While the power lease negotiations were proceeding, SWUA filed a change application on the SVP water rights to clean up some issues, and to change the use to municipal and industrial. It also sought to add hydroelectric power, as power had been generated with the SVP waters for about 70 years. The Bureau and CUWCD, among others, protested the change application. The Bureau filed its own competing change application. The Utah State Engineer granted both applications in part, but declined to add M&I use. That triggered the first of four lawsuits by SWUA against the United States and the CUWCD.

At the Federal District Court

The first, filed in state court, sought judicial review of the Utah State Engineer's decision. The second, filed in federal court, sought declaratory relief regarding the enforceability of the 1991 agreement, and an affirmation of SWUA's claimed rights to develop power on the Diamond Fork System of the CUP. The United States removed the state court action to federal court and these actions were consolidated. The other two actions were petitions filed in two state court general adjudication suits, seeking a declaration regarding SWUA's ownership of the SVP water rights, since it was a paid out project, and its right to file a change application without federal interference to modify the project water rights.

The District Court held that because SWUA had never presented a plan to develop power other than its failed joint effort with CUWCD, that it was premature for the court to grant the requested prospective relief requiring the United States and CUWCD to bargain in good faith with SWUA in its quest to develop hydropower on CUP facilities. It also held that under federal law and contract, the United States as the owner of the SVP water rights had the right to file change applications, but in doing so it had to take the interests of SWUA and shareholders into account. It also held that SWUA could not act on its own regarding the modification of the project water rights. SWUA then appealed but would need to have the United States' voluntary consent.

The Tenth Circuit's Decision

SWUA claimed the District Court should have declared that it has a property right to develop power in the Diamond Fork System, and that the District Court should have refrained from deciding whether the United States had the right to approve or consent to the filing of a change application on the SVP water rights, as that was a matter of state law.

The Circuit Court in a well-reasoned decision affirmed the District Court's dismissal of SWUA's claim for declaratory relief, holding that SWUA had not presented any power development proposal, and that the court could not provide prospective relief for a power development proposal that was neither formulated nor submitted. The court further held that while SWUA may receive power revenues from the SVP power facilities, it has no right to develop power and receive power revenues from CUP facilities in the absence of a lease of power privilege, which would include payment of its share of the costs to construct upstream facilities.

As to the right of the United States to file change applications, the Tenth Circuit held that the United States retained title to the water rights and the SVP facilities, that federal law and contract reserved to the United States the right to control the SVP water right. However in doing so, the United States cannot act in derogation of the rights and entitlements of the ultimate users of the water, the shareholders of SWUA.

Conclusion and Implications

It is unknown as of this writing, whether SWUA will further appeal this decision. If it stands, it will define the relative rights of SWUA, CUWCD and

the United States going forward regarding any future power development proposal that SWUA may wish to pursue, and it leaves the United States firmly in control of the federal project water rights, even though the Utah Supreme Court held in a related case, *In re Uintah Basin*, 133 P.3d 410 (Utah 2006) held that SWUA may have a right as the user of the water under Utah state law to file a change application. However, the Utah Supreme Court was careful not to rule on the role of the federal government in that regard, since the 1991 agreement was not before the court. It correctly deferred to the U.S. District Court on matters of federal law and contract. (S. Clyde)

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