PROJECT BACKGROUND

The San Joaquin County Flood Contingency Mapping FEMA Pilot Project’s objective is to help mitigate future flood damages throughout the San Joaquin County Delta and surrounding areas. The objective is accomplished by improving flood control operations which are intended to prevent levee failures during a flood, and to limit the flood extent, depth, and duration should a primary flood control structure fail.

In almost every community protected by levees and other flood control structures, opportunities exist to limit flood extent, depth, and duration in the event that a primary protective structure fails, in effect a “Plan B”. A new approach to flood planning is required to ensure that these opportunities can be efficiently and successfully implemented to minimize damages. As a pilot project to be considered nationwide, the San Joaquin County Office of Emergency Services’ “Guide to Flood Contingency Mapping” will help communities develop their “Plan B”.

KJELDSEIN, SINNOCK & NEUDECK, INC.’S ROLE IN THE PROJECT

Kjeldsen, Sinnock & Neudeck, Inc.’s (KSN) role for this FEMA Pilot Project covered the redevelopment and enhancement of the existing San Joaquin County Flood
Contingency Maps. KSN and the San Joaquin County Office of Emergency Services (OES) originally developed these maps for assistance during a flood event. The maps have now incorporated the latest mapping standards developed by a standards committee which included the United States Army Corps of Engineers (USACE), FEMA, the California Department of Water Resources (DWR), OES, and KSN. As part of the standards committee, KSN and OES worked closely on all aspects of updating the Flood Contingency Maps, including conforming to the committee standards for map symbols, map content and map format. KSN also coordinated with the San Joaquin County’s GIS Division to establish map naming and symbology guidelines and standards. KSN developed and provided Preliminary Engineering Designs (PED’s) for emergency berms and relief cuts for the project and assisted in the development of the Flood Contingency Mapping Technical Manual.

**ORIGINAL OR INNOVATIVE APPLICATION OF NEW OR EXISTING TECHNIQUES**

KSN performed extensive research of historical records and documents. Field surveys were performed to verify existing features and to locate new features for each Pilot Flood Contingency Map prepared for the project. KSN worked closely with OES in the development of the standards and procedures for the project. The close communication and coordination between KSN and OES was imperative for the production of the Flood Contingency Maps, since the standards and procedures developed during the production of the Flood Contingency Mapping Pilot Program will become the basis for all future map updates.

KSN prepared individual Pilot Flood Contingency Maps for Reclamation Districts that are located in and around the City of Stockton. This included, Smith Tract, Weber Tract, Roberts Island, Boggs Tract, and Mossdale Landing Reclamation Districts. The following information was included in the maps:

- Critical public and private infrastructure facilities, as identified in meetings with the Reclamation Districts.
- Topographic information and contours.
- 100-year flood elevations.
- Levee miles for each District.
- Levee stationing for each District.
- Spot elevation on primary levees.
- Spot elevations on existing dry land levees.
- Known levee anomalies.
- Historical flood heights and flows with year of occurrence.
Flood history synopsis (cause/date/description).
Location of historical levee breaks.
Extent of flooding (historic or 100 year projections).
Historic water flow patterns and channels.
Reclamation District's patrol plans.
Planned District supply delivery points.
Location of County or City logistics bases.
Special considerations (choke points, past problems, etc.).
Flood contingency options (problem, action/purpose, agency, etc.).
Best location for relief cuts and temporary pumping stations, if applicable.
Potential emergency berms/temporary levees that would limit flooding including required elevation.
Identify structures for evacuation that are located in rural reclamation districts.
Identify hazardous material sites for rural reclamation districts, such as pesticide storage facilities and fuel locations.

KSN also compiled information for the development of the Flood Contingency Mapping Technical Manual, “Guide to Flood Contingency Mapping”. The “Guide” encompasses the standards and procedures created through this project including the standardization of map data elements. This includes topographic, historical, and emergency response information and the development of easily recognized and readable map symbols. The “Guide” serves as a vehicle to assist in creating a Flood Contingency Mapping Program that will ensure a quick and effective response during a flood event.

FUTURE VALUE OF THE ENGINEERING PROFESSION AND PERCEPTION BY THE PUBLIC

A Flood Contingency Mapping Program addresses a significant concern in flood response, the challenge of ensuring that emergency plans can be easily accessed, understood, and shared with responders when a flood crisis arrives. Geographic Information Systems (GIS) and the sophisticated maps they produce offer an alternative to the traditional written and bound plans for displaying and sharing critical information during an emergency. Substituting maps for written plans combines response plans and information with geography, a crucial component during a flood event.

A series of maps covering a targeted flood control system is the final product of a Flood Contingency Mapping Program. These maps display historical information and
topographic data, which are vital to quick analysis and decision making during a flood event. They also show logistical and command procedures for joint flood fight operations, as well as pre-identified options for containing floodwaters in the event of a structure failure. Maps can also be supplemented with additional documents addressing specific issues identified during the map development process.

**SOCIAL, ECONOMIC AND SUSTAINABLE DESIGN CONSIDERATIONS**

The process of developing flood contingency maps creates opportunities for additional pre-planning that will be beneficial in an event. The identification of relief cuts, emergency berms, and other options for responding to a flood event can ensure that specific effective actions can be quickly employed if needed. Applying resources to the development of multiple lines of flood defense would address the residual risk remaining after compliance with existing flood control standards and requirements. Planning and engineering work completed in anticipation of an emergency will save critical hours during a crisis. The engineering and planning work could range from data collections to the development of preliminary engineering designs.

It is difficult to justify the cost of full-scale design work for every possible response option to a levee or other flood control structure failure, since most will probably never be needed. However, preparing a preliminary engineering design (PED) for each option is less costly, will save valuable time, and will help ensure success in an emergency. A PED could determine berm tie-in locations and placement, confirm elevations, and identify culverts and other infrastructure. Since PED’s generally consist of a single sheet technical drawing and text, they can include assumptions and other criteria used to complete the design. Each PED can then be placed with the relevant map for quick access, allowing future engineers to view the preliminary work and rapidly employ a final design based on actual flood conditions.

In many communities protected by flood control structures, valuable infrastructure such as waste treatment plants, water systems, etc., were built without consideration for potential flooding in the construction design. The identification of important infrastructure vulnerable to flooding should be noted on the maps even if there is no practical action that can be taken to protect the asset at the time of a flood event. Noting the vulnerability will help keep a community aware of the issue as an emergency develops, and as opportunities to reduce vulnerability appear during maintenance and reconstruction activities. The Flood Contingency Mapping Program can further mitigate
flood damage by encouraging communities to develop and complete additional “lines of defense” before a flood.

**Complexity of Project**
A Flood Contingency Mapping Program has several essential parts. It includes numerous agencies and organizations from all levels of government, a lead program manager and staff, and GIS resources and technicians. Communication and coordination among all agencies, program staff, and consulting resources and technicians is paramount for smooth completion of map preparation.

Flood control systems typically encompass large areas, involving multiple levee maintaining and support agencies. Dividing the area into individual maps requires meetings and discussions with Flood Control Districts, landowners, and infrastructure owners. Many levee maintaining agencies are interconnected in that a levee failure in one jurisdiction can lead to flooding or an increased threat of flood in other jurisdictions. This information is a key determination of the scope of individual maps and how levee maintaining agencies are grouped together. Transportation systems, access constraints, and mutual aid issues are also factors in determining the coverage of individual maps.

The sheer size of the mapping areas and details required to prepare the Flood Contingency Maps were in themselves complexities of this project. KSN performed in-depth historical data research at several State, County, City, and local agencies and departments. Once obtained, all research material was reviewed and compiled for inclusion on individual maps. KSN coordinated and prepared required access permit packages for survey access within the mapping areas, performed field surveys, and processed field data for approximately 62 square miles. KSN collaborated on the development of the standards and procedures used in the preparation of detailed flood contingency maps for Smith Tract, Weber Tract, Roberts Island, Boggs Tract, and Mossdale Landing Reclamation Districts.
EXCEEDING CLIENT/OWNER NEEDS
KSN was intensely involved in all aspects of the preparation of the Flood Contingency Maps for Smith Tract, Weber Tract, Roberts Island, Boggs Tract, and Mossdale Landing Reclamation Districts. KSN’s efforts included participation in meetings, extensive historical and data research, performing field surveys and data processing, final map preparation, preliminary engineering design, and information research and collection for the “Guide to Flood Contingency Mapping” technical manual.

KSN was able to exceed the needs of our client and is honored by the complimentary letter received from Mr. Ron Baldwin, Director of OES, in connection with this Project.

The Flood Contingency Mapping Program was presented to Brigadier General Donahue of the United States Army Corp of Engineers on August 16, 2010. General Donahue has since implemented the program by issuing a $1 million contract to develop Flood Contingency Mapping for other Counties within the Sacramento/San Joaquin Delta areas.