



COUNTY OF HUMBOLDT

AGENDA ITEM NO.

C-20

For the meeting of: December 2, 2014

Date: November 21, 2014

To: Board of Supervisors

From: Thomas K. Mattson, Public Works Director *# for T.M.*

Subject: Agreement with the Federal Emergency Management Agency for a Detailed Flood Hazard Study of Humboldt Bay

RECOMMENDATIONS:

That the Board of Supervisors:

1. Approve and ratify the attached Mapping Activity Statement No. 2 with the Federal Emergency Management Agency for Public Works to implement a detailed flood hazard study of Humboldt Bay; and

2. Adopt the following supplemental budget (4/5 vote) for Fiscal Year 2014-2015:

Revenues:	1100251-589000	FEMA MAS No. #2 (Hum Bay)	\$ 200,000
Expenditures:	1100251-2118	Professional & Special Services	\$ 175,000
	1100251-3928	Expense Transfers	\$ 25,000

SOURCE OF FUNDING:

General Fund Water Management (1100251)

DISCUSSION:

The attached Mapping Activity Statement No. 2 contains an agreement with the Federal Emergency Management Agency (FEMA) for Public Works to implement a detailed flood hazard study of Humboldt Bay. The purpose of the study is to develop updated flood hazard information for Humboldt Bay using the best available data, analytical methods, and mapping

Prepared by Hank Seemann

CAO Approval *Cheryl Dillingham*

REVIEW:

Auditor _____ County Counsel Sm Personnel _____ Risk Manager _____ Other _____

TYPE OF ITEM:

Consent
 Departmental
 Public Hearing
 Other _____

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT

Upon motion of Supervisor Lovlace
 Seconded by Supervisor Bass
 And unanimously carried by those members present,
 The Board hereby adopts the recommended action
 Contained in this report.

PREVIOUS ACTION/REFERRAL:

Board Order No. _____

Meeting of: _____

Dated: Dec. 2, 2014
 Kathy Hayes, Clerk of the Board

By: *for Huntwell*

techniques. FEMA proposes to fund this study under its Risk Mapping, Assessment and Planning (Risk MAP) program which supports local partners identify and reduce flood risk. FEMA has prioritized Humboldt Bay, as a large inland water body, for a detailed Risk MAP study along with similar studies for San Francisco Bay and San Diego Bay.

The proposed study for Humboldt Bay is similar to work recently completed by Public Works for the Mad River near the City of Blue Lake and for Redwood Creek near the community of Orick. On July 26, 2011, the Board authorized Mapping Activity Statement No. 1 with FEMA for detailed flood studies associated with these two areas which were prioritized due to the presence of the federal Flood Control Projects (levees). On April 19, 2011, the Board authorized a Cooperating Technical Partners Partnership Agreement which provides the general framework for cooperative efforts between FEMA and Humboldt County regarding flood hazard identification and mapping. By taking the lead on conducting these flood hazard studies, Humboldt County is in a better position to ensure the technical quality and accuracy of the studies and to facilitate communication with the affected communities and other stakeholders. Public Works would retain a consultant to perform the technical analyses and prepare the work products, based on a request for proposal and professional services agreement approved through future Board action.

The detailed study of Humboldt Bay as a sheltered, inland water body will be integrated with the upcoming results of FEMA's California Coastal Analysis and Mapping Project (CCAMP) / Open Pacific Coast (OPC) Study, which will provide new coastal flooding analysis and mapping for the entire Pacific Ocean shoreline.

The Humboldt Bay study will be conducted in accordance with FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners. Based on these standards, the study will focus on current flood risk and not future flood risk associated with projected sea level rise. The study will be able to utilize some of the topographic datasets and results of tide data analysis and hydraulic modeling recently developed for the Humboldt Bay Sea Level Rise Adaptation Planning Project. The study will analyze flood hazards associated with tides, ocean swells, wind waves, and storm surges in accordance with FEMA standards.

In January 2015, FEMA expects to release the preliminary county-wide Flood Insurance Rate Maps and Flood Insurance Studies for public review. The updated Flood Insurance Rate Maps are expected to become effective approximately 18 months after release of the preliminary maps. The preliminary maps released in 2015 will not include the results of any new analysis of Humboldt Bay (or the open coast). The work products from the proposed Humboldt Bay study are expected to be used for future updates of the Flood Insurance Rate Maps for the Humboldt Bay region.

Mapping Activity Statement No. 2 was signed by staff in September 2013 to allow FEMA to allocate funds for the project before the end of the federal fiscal year. It was understood that the agreement would not be ratified without action by the Board. The project has been on hold primarily due to work load and staff capacity limitations. The schedule shown in the attached Mapping Activity Statement No. 2 will need to be updated. With a start date of January 2015, the estimated completion date is by the end of 2016.

Staff from City of Eureka and City of Arcata are supportive of Humboldt County taking the lead on the Humboldt Bay detailed flood study.

FINANCIAL IMPACT:

FEMA will provide full funding for the project, up to \$500,000, with no required contribution from Humboldt County. The estimated expenditures for the rest of Fiscal Year 2014-15 are \$200,000, and the proposed supplemental budget will incorporate this amount into the Water Management budget unit (251). Unspent funds will be incorporated into the budget for Fiscal Year 2015-16.

The requested action will advance three of the County's core roles (provide for and maintain infrastructure, create opportunities for improved safety and health, and protect vulnerable populations). In addition, one of the Board's priorities for new initiatives is to seek outside funding sources to benefit Humboldt County needs.

OTHER AGENCY INVOLVEMENT:

Building and Planning; City of Eureka; City of Arcata; FEMA

ALTERNATIVES TO STAFF RECOMMENDATIONS:

The Board could elect not to sponsor the Humboldt Bay detailed flood study. With this alternative, FEMA would retain a private consultant to implement the study, and FEMA and their consultant would play the lead role in communication and coordination with the affected communities. Humboldt County would serve a limited review role using funds from the General Fund.

ATTACHMENTS:

Attachment #1 – Mapping Activity Statement No. 2 (September 23, 2013)

Attachment #1

Mapping Activity Statement No. 2 (September 23, 2013)



FEMA

**FEDERAL EMERGENCY MANAGEMENT AGENCY -
HUMBOLDT COUNTY
COOPERATING TECHNICAL PARTNERS
RISK MAP PROJECT MAPPING ACTIVITY STATEMENT**

Mapping Activity Statement No. 2

The Risk MAP Project described in this Mapping Activity Statement (MAS) dated September 23, 2013, for Humboldt/Arcata Bay shall be completed in accordance with the Cooperating Technical Partners (CTP) Partnership Agreement dated April 19, 2011, between the Humboldt County Public Works Department (herein referred to as "CTP") and the Federal Emergency Management Agency (FEMA).

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SECTION 1—OBJECTIVE AND SCOPE

The objective of the Risk MAP Project documented in this MAS is to develop and/or support flood hazard data and program related activities for Humboldt County through completing technical risk analysis and mapping activities. These activities may or may not result in a new or updated Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for one or more communities within the project area.

All processes and deliverables shall be completed in accordance with the Federal Emergency Management Agency's (FEMA's) Guidelines and Specifications (G&S) for Flood Hazard Mapping Partners and effective Procedure Memoranda (PMs). These documents can be found on FEMA's website at <http://www.fema.gov/ctp-main/guidelines-specifications-flood-hazard-mapping-partners>. PMs are used to implement updates to the G&S, to provide additional clarification of procedures that are not documented in published guidance documents, and to establish procedures and policies. Should a PM require a scope change, CTPs should work through the change process by submitting a Special Problem Report (SPR) to the appropriate Regional office. Operating Guidance (OGs) documents are also available to assist CTPs. OGs contain best practices and clarifications for the G&S and PMs, and facilitate effective and efficient implementation of these standards. Although the use of best practices in operating guidance documents is recommended, they are not mandatory, except those program standards that are defined elsewhere and reiterated in the operating guidance documents. Alternate approaches that comply with program standards that effectively and efficiently support program objectives are also acceptable. These documents can be found on FEMA's website at <http://www.fema.gov/guidance-cooperating-technical-partners-program/operating-guidance-documents>.

The watersheds and jurisdictions in which Risk MAP projects will be performed, as well as their applicable project type/activities, are summarized in Table 1.1, Risk MAP Project Watersheds and Jurisdictions.

Table 1.1 – Risk MAP Project Flooding Sources and Jurisdictions

Flooding Source	HUC-8 Code	Counties and Communities Included in Project	Project Type
Humboldt/Arcata Bay	N/A	Humboldt County; City of Arcata; City of Eureka	Detailed Coastal Study and Mapping

In addition, the CTP involved in this project will develop updated flood hazard data as summarized in Table 1.2, Total Coastal Mile Counts by Type of Study. The workmap and FIS report data for the flooding source and areas identified in Table 1.2 will be produced in the North American Vertical Datum of 1988 (NAVD88).

Table 1.2 – Total Coastline Mile Counts by Type of Study

Type of Study	Watershed or Jurisdiction	Coastal	Detailed (Enhanced Level 1)	Limited Detailed (Enhanced Level 2)	Approximate (Base Level Study)	Redelineation	Verified Digital Conversion
Updated Effective Studies	Humboldt/ Arcata Bay	45 miles (approx.)	0	0	0	0	0

This Risk MAP Project will be completed by the following entities:

- Humboldt County Department of Public Works (DPW);
- CTP study contractor [to be determined]; and
- FEMA Region IX’s Production & Technical Services (PTS) Contractor (BakerAECOM).

The CTP shall notify FEMA and all applicable parties of all meetings with community officials, and other relevant meetings, at least two weeks prior to the meeting (with as much notice as possible). FEMA and/or its contractor may or may not attend the community meetings.

The CTP shall maintain an archive of all data submitted. All supporting data must be retained for three years from the date a funding recipient submits its final expenditure report to FEMA.

The CTP is responsible for the implementation of an independent Quality Assurance/Quality Control (QA/QC) plan for all assigned activities. The CTP will submit a Summary Report that describes and provides the results of all automated or manual QA/QC review steps. The report should include the process for all assigned activities.

Independent QC review activities will be performed by FEMA’s contractor. Please note FEMA will also be performing periodic audits and overall study/project management to ensure quality. The CTP will be responsible for addressing any and all comments resulting from independent QA reviews, including re-submittal of deliverables as needed to pass technical or quality review.

FEMA will provide download/upload capability for data submittals through the MIP located at <https://hazards.fema.gov>. As each activity is completed, the data must be submitted to the MIP.

The CTP will respond to any comments generated as a result of the mandatory quality control checks by the Production and Technical Services contractor (PTS) as described in PM 42. The PTS QC process is nationally funded and required on each non-PTS study.

In cooperation with the FEMA Project Officer, a Project Management Team (PMT) will be established by the CTP consisting of representatives from the CTP, FEMA’s regional engineer, and other appropriate parties (representatives from the Regional Support Center (RSC) may be included at the discretion of FEMA). The PMT will be responsible for coordinating the activities identified in this MAS. The FEMA Region will be provided with documentation identifying the established PMT.

Earned Value Data Entry: The MIP Workflow is designed to track the Earned Value of Risk MAP projects. This information is automatically calculated by the MIP, using the Actual cost and schedule of work performed, or “actuals”, and comparing them to the expected cost and schedule of work performed, or “baseline”.

Once the FEMA Regional office has funded a project, FEMA or its contractor will complete the “Obligate Project Funds” screen in the MIP. This step establishes the baseline for the project in the MIP, using the cost and schedule information for each task as outlined in this document.

The MIP study workflow allows FEMA and the CTP to manage the status of these projects at a task level. The cost and schedule information, updated monthly by the CTP for each contracted task, is compared to the baseline established for those tasks. This information is rolled up to a project level and monitored by the FEMA Region to assess progress and Earned Value.

Earned Value data entry involves updating cost, schedule and performance (physical percent complete) in the MIP by the CTP each month for each assigned task.

The CTP may contact the Region/RSC to obtain the guidance document *Risk MAP Products in the MIP* which explains how Non-Regulatory Products shall be submitted through the MIP. The guidance also explains how performance will be tracked for Non-Regulatory Products.

Once the baseline has been established in the MIP, the CTP shall input the performance and actual cost to date for all tasks within each project for which the CTP is responsible. This must be completed at a minimum once every thirty days and at the completion of the task. When a task is completed, including all QA/QC activities in this MAS plus the Quality Control Reviews established in PM 42, the CTP shall enter 100% complete, enter the actual completion cost, and the actual completion date within the Manage Data Development, Manage Preliminary Map Production, or Manage Post Preliminary Processing tasks as applicable. The “Manage” tasks remain open and accept updates for up to 90 days after the completion of the last producer task in each module. The MIP shall also be populated with appropriate leverage information regarding who (CTP or community) paid for the data provided and the amount of data used by the Risk MAP Project. The CTP will maintain a Schedule Performance Index (SPI) and Cost Performance Index (CPI) of at least 0.92. Special Problem Reports (SPRs) explaining any variance must be submitted in a timely manner as required.

The Project Officer, as needed, may request additional information on status on an ad hoc basis.

Project Management

Responsible Mapping Partner: Humboldt County DPW

Scope: Project Management is the active process of planning, organizing, and managing resources toward the successful accomplishment of pre-defined project goals and objectives. The CTP will coordinate with the FEMA Regional Office with respect to Project Management activities and technical mapping activities.

Standards: All Project Management work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables:

- Monthly Earned Value data reporting through the MIP with variance explanations to support management of technical mapping activities within specified timeframe, for both Regulatory and Non-Regulatory Products;
- Management of SPI/CPI performance for an organization;
- Overall project QA/QC maintenance information, such as maintaining a QA/QC log and providing a QA/QC approach to FEMA for review and approval; and
- Management of adherence to scope of work and quality of work for an organization.

Public Outreach

Responsible Mapping Partner: Humboldt County DPW and BakerAECOM

Scope: The public outreach activities should begin during the project scoping phase and continue through to project completion. The overarching goal for conducting outreach is to create a climate of understanding and acceptance of the mapping process at the local level. Outreach activities shall be coordinated between Humboldt County and BakerAECOM which is implementing FEMA's California Coastal Analysis and Mapping Project (CCAMP) and Open Pacific Coast (OPC) Study.

Humboldt County will work with the Regional Office during the initiation of this activity to determine an Outreach Plan for implementation throughout the mapping project. The Regional Office will have access to many outreach tools that have been developed for this process that can be utilized or customized.

All communication with local governments will be done in accordance with 44 CFR Part 66.

Deliverables:

- Upon determination of an Outreach and Coordination Approach, the Humboldt County shall deliver the following to the FEMA Regional Project Officer in accordance with the schedule outlined in Section 6 - Schedule:
 - A letter or memo detailing the plan for outreach and coordination activities
 - Backup or supplemental information used in preparing the outreach and coordination plan

Perform Field Survey

Responsible Mapping Partner: Humboldt County DPW

Scope: To supplement any field reconnaissance conducted during the Project Discovery phase of this project, the CTP shall conduct a detailed field reconnaissance of the specific study area to determine conditions along the coastlines, types and numbers of hydraulic and/or flood-control structures, apparent maintenance or lack thereof of existing hydraulic structures, locations of coastal transects to be surveyed, and other parameters needed for the coastal analyses.

The CTP shall also identify items needed for coastal analyses including land cover, vegetation types, housing, dunes, beach nourishment, and coastal structures. The CTP also shall coordinate with other

entities that are involved in the Topographic Data Development process regarding ongoing activities and deliverables.

Standards: All Field Survey work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: The CTP shall make the following products available to FEMA by uploading the digital data to the MIP, in accordance with the schedule outlined in Section 6:

- A report summarizing the findings of the field reconnaissance;
- Maps and drawings that provide the detailed survey results;
- Survey notebook containing cross section and structure data;
- Documentation of the horizontal and vertical datum;
- Digital versions of draft text for inclusion in the FIS report;
- Digital survey data consistent with the DCS (see draft DCS language and coordinate with the Region regarding its appropriate usage) as described in the G&S;
- Metadata file complying with the NFIP Metadata Profiles Specifications;
- Support documentation and Certification of Work;
- TSDN, where appropriate;
- Where paper documentation is required by State Law for Professional certifications, the Mapping Partner may submit the paper in addition to a scanned version of the paper for the digital record. Please coordinate with the Regional and/or State representative to verify state reporting requirements; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the FIRM as outlined in the approved QA/QC Plan.

Develop Topographic Data

Responsible Mapping Partner: Humboldt County DPW

Scope: Topographic/elevation data may be new or existing. New is defined as data that will be flown and processed for the areas specified in this MAS study areas according to the referenced specifications. Existing topographic/elevation data (previously flown and/or processed) may be used to produce flood studies and related products. However, if new data is not to be collected, the FEMA Region should be consulted before leveraging the best available existing topographic to ensure acceptability for the intended level of flood hazard study.

The CTP shall obtain additional topographic data for the floodplain areas to be studied. These data will be used for coastal analysis, floodplain boundary delineation and/or testing of floodplain boundary standard compliance. The CTP shall gather availability, currency, and accuracy information for existing topographic data covering the affected communities in this MAS. The CTP shall use topographic data for work in this MAS only if it is better quality than that of the original study or effective studies. The Mapping Partner will ensure that the FEMA Geospatial Data Coordination Policy and Implementation Guide is followed and the data obtained or to be produced are documented properly as per those policies and guidelines.

Requirements for leveraging existing Topographic Data:

The CTP shall use topographic data for the areas described in the Table 1.5 Summary of Topographic Data table. The source of the topographic data must be listed as well. The CTP shall coordinate with other team members conducting field surveys as part of this MAS. Accuracy for the topographic data shall be evaluated based on the current FEMA requirements for flood hazard study level of detail as documented in G&S Appendix A and Procedure Memorandum 61.

The CTP also shall update the topographic maps and/or DEMs for the subject flooding sources using the data collected under this Topographic Data Development process and via field surveys. In addition, the CTP shall address all concerns or questions regarding the topographic data development that are raised during the independent QC review, or during the PM 42 defined Validation Process.

Table 1.5 – Summary of Topographic Data

Flooding Source	Beginning and End Points of Topo Data Collection	New/Existing OR Leveraged	Accuracy & Year Acquired	Source/ Data Vendor	Contact Information	Use Restrictions
Humboldt/ Arcata Bay	N/A	Leveraged	2010	Public Domain; CA OPC coastal LiDAR data set	NOAA Coastal Services Center *	None

* <http://www.opc.ca.gov/2012/03/coastal-mapping-lidar-data-available/>

Standards: All Topographic Data Development work shall be performed in accordance with the standards specified in Section 5 - Standards.

Deliverables: In accordance with the G&S, the CTP shall make the following products available to FEMA by uploading the digital data to the MIP in accordance with the schedule outlined in Section 6 – Schedule:

- Digital contour data;
- Report summarizing methodology and results;
- Mass points and breaklines data;
- Gridded digital elevation model data;
- TIN data;
- Metadata file complying with the NFIP Metadata Profiles Specifications;

Perform Independent QA/QC: Topographic Data

Responsible Mapping Partner: BakerAECOM

Scope: BakerAECOM shall perform an impartial review of the mapping data defined in Table 1.5 under Develop Topographic Data to ensure that these data are consistent with FEMA standards and standard engineering practice, and are sufficient to prepare the FIRM. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer.

Please note FEMA will also be performing periodic audits and overall study/project management to ensure study quality. The CTP will be responsible for addressing any and all comments resulting from independent QC, including re-submittal of deliverables as needed to pass technical review.

Standards: All Topographic Data Development work shall be reviewed in accordance with the standards specified in Procedure Memorandum 61 and in Section 5 – Standards.

Deliverables: In accordance with the G&S, BakerAECOM shall upload the digital data to the MIP, in accordance with the schedule outlined in Section 6 – Standards:

- A Summary Report that describes the findings of the independent QA/QC review;
- Confirmation of update(s) made to the NDEP;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- TSDN, where appropriate.

Perform Coastal Analysis

Responsible Mapping Partner: Humboldt County DPW

Scope: Humboldt County DPW shall

- Perform a two-dimensional (2-D) hydrodynamic and wave modeling study of Humboldt/Arcata Bay to recreate a 50-year hourly record of water levels and wave conditions along the interior shoreline.
- Utilize the 2-D model time-series output to perform a one-dimensional (1-D) detailed analysis of water levels and wave effects for the approximately 45 miles of Humboldt/Arcata Bay shoreline by:
 - a. Calculating wave heights, wave setup, and wave runup along Humboldt/Arcata Bay wave analysis 1-D transects to create a 50-year hindcast of Total Water Levels (TWLs) along the Humboldt/Arcata Bay shoreline, and
 - b. Performing an extreme value analysis of computed TWLs to determine the base (1-percent-annual-chance) flood and 50-percent, 20-percent, 10-percent, 4-percent, 2-percent, and 0.2-percent-annual-chance flood values.

The following tasks are included in the scope of work for the 2-D study:

1. *Data Review and Compilation*

Two key datasets are available for model setup: a seamless bathymetric and topographic dataset prepared by Dewberry and Fugro EarthData, Inc. (FEDI) for FEMA Regions IX, and the Oceanweather, Inc. (OWI) and Scripps Institute of Oceanography (SOI) 50-year wave hindcast (from 1960 to 2010) for the offshore model boundary conditions. BakerAECOM has also collected all relevant tide gage data in the vicinity, and this data will be provided to Humboldt County DPW. Humboldt County DPW shall research and verify available water-level and wave data sources for model calibration and validation and shall coordinate with the USGS and/or NOAA as needed. Humboldt County DPW shall prepare a recommended list of model calibration and validation simulation periods within the 50-year hindcast period. The data review and compilation task will be documented by Humboldt County DPW in a technical memorandum for inclusion in the TSDN for the FEMA Open Pacific Coast (OPC) Study for Humboldt County.

2. *Bathymetric Grid Generation*

Humboldt County DPW shall generate an appropriate bathymetric grid for the Humboldt/Arcata Bay, with sufficient resolution to resolve the bathymetric features of interest.

3. *Model Calibration and Validation*

Humboldt County DPW shall calibrate the model to the time periods selected under the Data Review and Compilation task. The model will be calibrated through adjustments to the model grid, adjustments to the bed roughness, and other model refinements as needed. Humboldt County DPW will prepare a model calibration technical memorandum and review the model calibration with FEMA. It is anticipated that the model will be calibrated to water level and waves. Although sufficient water level data may be available, if sufficient wave data is not deemed to be available, significant justification will be documented within the technical memorandum to support the use of an unvalidated wave model.

Once it is agreed between Humboldt County DPW and FEMA that the model is sufficiently well calibrated, the model will be validated to the time periods selected under the Data Review and Compilation task. No additional model refinements will be made at this stage. However, if additional model refinements are required, Humboldt County DPW will notify FEMA and the model calibration will be revisited. Once the model is considered sufficiently validated, Humboldt County DPW will prepare a brief model validation technical memorandum for review by BakerAECOM and FEMA.

4. 50-year Hindcast Simulations

The calibrated and validated model will be used to simulate the entire 50-year hindcast, using the OWI hindcast periods from January 1, 1960, to December 31, 2009 (1960-2010). As noted above, the full time series of model outputs will be saved at 15-minute intervals for water levels, and 1-hour intervals for the wave parameters, at select locations along the Bay shoreline. Humboldt County DPW will coordinate regarding the appropriate density of the spacing of model output points as part of the model setup effort. Humboldt County DPW shall also complete an extreme value analysis of the model output data for both water levels and waves at all archived model output locations.

This 2D modeling task shall be documented in a Final Technical Report. Humboldt County DPW shall also prepare a full TSDN for this modeling study. The TSDN shall be compliant with FEMA's Data Capture Standards. The Final Technical Report and TSDN will undergo independent QAQC by BakerAECOM and will be included in Intermediate Data Submittal #3, which will be reviewed by the OPC Study Technical Advisory Panel (TAP). Humboldt County DPW will respond to comments and submit a revised report and TSDN as required.

The following tasks are included in the scope of work for the 1-D study:

1. *Wave Analysis Transects*

The analysis of coastal hazards and the associated mapping of hazard zones shall be carried out for defined wave analysis transects along the Humboldt/Arcata Bay shoreline. Transects shall extend from beyond the breaking depth at the seaward end to an inland distance beyond the anticipated limit of wave runup. The density of wave analysis transects will depend on shoreline variability, wave exposure, and shore-type changes within each reach. Transect elevation data will be extracted along each profile using the best available topography and bathymetry data sources.

2. *Wave Setup and Wave Runup*

Wave setup and wave runup shall be determined for both natural and engineered shorelines in the study area for the full 50-year hindcast period at each wave analysis transect.

3. *Extreme Value Analysis of Computed TWLs*

Humboldt County DPW shall determine a 50-year TWL hindcast for each wave analysis transect that includes the combined effects of coincident water level (tide and surge) and wave effects (wave setup and wave runup). Once the TWL hindcast has been computed at each wave analysis transect, Humboldt County DPW shall perform an extreme value analysis on the data using methods consistent with the *Pacific Guidelines*. The extreme value analysis of the computed TWLs will establish the 1-percent annual-chance and 0.2-percent-annual-chance TWLs for mapping purposes, after considering the effects of profile change due to event-based erosion.

4. *Event-based Erosion*

Humboldt County DPW shall apply dune erosion models consistent with the *Pacific Guidelines* to determine event-based erosion for Type 1 beach settings (sand beaches backed by low berms or dunes) in the study area.

5. *Evaluation of Coastal Structures*

Section D.4.7 of the *Pacific Guidelines* provides guidance on evaluation of coastal structures for wave runup and erosion during the 1-percent-annual-chance (base flood) event. Details of the coastal structures treatment will be included in the Final Technical Report and TSDN.

6. *Wave Overtopping*

Wave overtopping occurs when the potential limit of wave runup is higher than the crest of the controlling topographic feature, such as a dune, bluff, or structure. Following profile adjustment due to event-based erosion, Humboldt County DPW shall conduct overtopping analyses in accordance with Section D.4.5 of the *Pacific Guidelines*.

7. *Extent of Splashdown*

For coastal reaches and transects subject to wave overtopping, the landward extent of splashdown shall be calculated according to the procedures defined in the *Pacific Guidelines*. This involves a determination of the splashdown distance behind the overtopped crest. The calculation of splash zones for vertical coastal structures (seawalls and bulkheads) shall follow *Pacific Guidelines* or U.S. Army Corps of Engineers methodologies. For dune-backed beaches, the landward extent of splashdown and sheet flow areas shall be used to map hazard zones landward of the eroded dune crest if they extend beyond the landward limit of the Primary Frontal Dune VE zone.

8. *Overland Wave Propagation*

In coastal areas where the Still Water Elevation (SWEL) is above the eroded beach profile, the transect may be subject to overland wave propagation. FEMA's Wave Height Analysis for Flood Insurance Studies (WHAFIS 4.0) computer program shall be used to analyze overland wave propagation.

Standards: All work shall be performed in accordance with the standards specified in Section 5 – Standards including the Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States (2005) – Appendix D, Section D.4 of the FEMA Guidelines & Specifications for Flood Hazard Mapping Partners.

Deliverables: Humboldt County DPW shall upload the digital data to the MIP, in accordance with the schedule outlined in Section 6 – Schedule.

Perform Independent QA/QC: Coastal Analysis

Responsible Mapping Partner: BakerAECOM

Scope: BakerAECOM shall perform an internal independent review of the coastal flood hazard analysis to ensure the appropriateness of methods, accuracy of results, and consistency with the *Pacific Guidelines* and related Procedure Memoranda.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 – Standards.

Deliverables: BakerAECOM QA/QC checklist and/or comment form including responses to comments and documenting the resolution of each comment.

Perform Floodplain Mapping

Responsible Mapping Partner: Humboldt County Department of Public Works

Scope for Base Level Study: The CTP shall delineate the 1 percent-annual-chance floodplain boundaries and any other applicable elements for which coastal analyses were performed. The CTP shall incorporate all new or revised coastal modeling and shall use the topographic data acquired under Develop Topographic Data to delineate the floodplain boundaries on a digital work map.

Scope for Coastal Analysis: The CTP shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries and any other applicable elements for the flooding sources for which coastal analyses were performed. The CTP shall incorporate all new or revised coastal modeling and shall use the topographic data acquired under Develop Topographic Data to delineate the floodplain and regulatory floodway boundaries on a digital work map.

The CTP shall address all concerns or questions regarding Floodplain Mapping that are raised during the independent QA/QC review.

Standards: All floodplain mapping work shall be performed in accordance with the standards specified in Section 5 – Standards. The CTP will perform self-certification audits for the Floodplain Boundary Standards for all flood hazard areas.

Deliverables: In accordance with the G&S, and upon completion of floodplain mapping for all flooding sources in this project, the CTP shall make the following products available to FEMA by uploading the digital data to the MIP in accordance with the schedule outlined in Section 6 – Schedule.

- A metadata file complying with the NFIP Metadata Profiles Specifications, must accompany the compliant digital data;
- Support documentation and Certification of Work,
- Digital work map showing the Coastal High Hazard Area (V zone) delineated along the Humboldt/Arcata Bay shoreline, transect locations, 1- and 0.2-percent-annual-chance floodplain boundary delineations, BFEs, flood insurance risk zone designation labels, gutters, PFD, Limit of Moderate Wave Action (LMWA), and all applicable base map features;
- Digital versions of input and output for any computer programs that were used consistent with the Data Capture Standards (DCS) in the G&S;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the FIRM as outlined in the approved QA/QC Plan;
- Any backup or supplemental information including supporting calculations and assumptions used in the mapping required for the independent QA/QC review of Coastal Analyses and Floodplain Mapping consistent with the Data Capture Standards in the G&S;
- An explanation for the use of existing topography for the studied reaches, if appropriate;
- Written summary of the analysis methodologies;
- Digital versions of draft FIS report, including all tables converted to the appropriate datum, as well as any other necessary items for the finalization of the preliminary FIS;

- If automated GIS-based models are applied, all input data, output data, intermediate data processing products, and GIS data layers shall be submitted consistent with the DCS in the G&S; and
- Where paper documentation is required by State Law for Professional certifications, the CTP may submit the paper in addition to a scanned version of the paper for the digital record. Please coordinate with the Regional and/or State representative to verify state reporting requirements.

Perform Independent QA/QC: Floodplain Mapping

Responsible Mapping Partner: BakerAECOM

Scope: BakerAECOM shall perform impartial review of the floodplain mapping submitted by the CTP under Floodplain Mapping to ensure that the results of the analyses performed are accurately represented on the work maps and updated FIS tables. This work shall include, at a minimum, the activities listed below.

- Review the Summary of Stillwater Elevations and Transect Data tables for agreement with the coastal modeling results;
- Review the coastal transects for proper location and orientation on the work maps and agreement with the Transect Descriptions table. Ensure that the transects on the work maps extend to the inland limit of the coastal modeling results used for mapping;
- Review the BFEs and coastal flood zones (both Zones VE and Zones AE) shown on the work maps for proper location and agreement with the results of the coastal modeling;
- Review the PFD and Zone VE/Zone AE boundary delineations to ensure that the PFD delineation is coincident with, or seaward of, the Zone VE/Zone AE boundary;
- For non-revised floodplain areas, the 1- and 0.2-percent-annual-chance floodplain boundaries agree with the floodplain boundaries shown on the FIRM, the contour lines, other topographic information, and planimetric information shown on the FIRM base;
- Road and floodplain relationships are maintained for all unrevised areas;
- Review the flood insurance risk zones as shown on the work maps to ensure the data are labeled properly;
- Review the mapping files to ensure the data were prepared in accordance with the requirements in G&S; and
- Review the metadata files to ensure the data includes all required information shown in the NFIP Metadata Profiles Specifications;

Please note FEMA will also be performing periodic audits and overall study/project management to ensure study quality. The CTP will be responsible for addressing any and all comments resulting from independent QC, including re-submittal of deliverables as needed to pass technical review.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 – Standards.

Deliverables: In accordance with the G&S, the responsible Mapping Partner(s) shall make the following products available to FEMA by uploading the digital data to MIP, in accordance with the schedule outlined in Section 6 – Schedule.

- A Summary Report that describes the findings of the QA/QC review, noting any deficiencies in or agreeing with the mapping results;
- Recommendations to resolve any problems that are identified during the independent QA/QC review;
- An annotated work map with all questions and/or concerns indicated, if necessary; and
- If data changed during review, then updated deliverables for previous tasks will be submitted at this time.

Develop FIRM Database

Responsible Mapping Partner: BakerAECOM

Scope: BakerAECOM shall prepare the database in accordance with G&S, for upload to the MIP. The CTP is responsible for confirming and/or obtaining any revised or updated guidance from the Region or RSC lead. BakerAECOM will prepare the database in accordance with the program and working standards for a Flood Risk Project documented in the G&S. The CTP shall coordinate with BakerAECOM, as necessary, to resolve any problems that are identified during development of the FIRM Database.

Standards: All FIRM Database work shall be performed in accordance with the standards specified in Section 5 - Standards. In addition, appropriate QR activity(ies) shall be performed.

Deliverables: In accordance with G&S, BakerAECOM shall make the following products available to FEMA by uploading the digital data to the MIP.

- FIRM database files, prepared in accordance with the requirements in G&S and in the required format(s); and
- A metadata file complying with the FEMA NFIP Metadata Profile Specifications.

SECTION 2—Technical and Administrative Support Data Submittal

The Project Team members for this Risk MAP Project that have responsibilities for activities included in this MAS shall comply with the data submittal requirements summarized below and in appropriate Procedure Memorandums.

All supporting documentation for the activities in this MAS/SOW shall be submitted according to Appendix M, and will include a flood elevation determination docket (FEDD) folder. Where Technical Support Data Notebook (TSDN) format is used, such shall be submitted in accordance with Section 2 – Technical and Administrative Support Data Submittal. Table 2.1 Mapping Activities and Applicable TSDN Sections indicates the sections of the TSDN that apply to each mapping activity. Submittals must be made to BakerAECOM for a review of required materials. As needed, the CTP will work with BakerAECOM to ensure that all required documents are included in the TSDN and will respond to requests from BakerAECOM for additional information.

If any issues arise that could affect the completion of an activity within the proposed scope or budget, the responsible Mapping Partner shall complete a Special Problem Report (SPR) as soon as possible after the issue is identified and submitted to FEMA. The SPR is to describe the issue and propose possible resolutions. (For additional information on SPRs, refer to the G&S or consult the Region / RSC lead.)

Please refer to Procedure Memorandum 62 – TSDN and FEDD File Protocol for Mapping Projects.

Table 2.1 – Mapping Activities and Applicable TSDN Sections

Mapping Activities	TSDN Section									
	General Documentation	Change Requests	Telephone Conversation Reports	Meeting Minutes/ Reports	General Correspondence	Engineering Analyses	Key to Transect Labeling	Draft FIS Report	Mapping Information	Miscellaneous Reference Information
Perform Field Survey		X	X	X	X		X			X
Develop Topographic Data		X	X	X	X				X	X
Perform Independent QA/QC Topographic Data										
Perform Coastal Analysis		X	X	X	X	X	X	X		X
Perform Independent QA/QC Coastal Analysis		X	X	X	X		X	X		X
Perform Flood-plain Mapping		X	X	X	X		X		X	X
Perform Independent QA/QC Flood Plain Mapping		X	X	X	X		X		X	X
Develop FIRM Database		X	X	X	X				X	X

SECTION 3—PERIOD OF PERFORMANCE

The mapping activities outlined in this MAS will be completed as specified in the Agreement Articles of the Cooperative Agreement. The Mapping Activities may be terminated at the option of FEMA or the CTP in accordance with the provisions of the Partnership Agreement dated April 19, 2011. If these mapping activities are terminated, all products produced to date must be returned and updated into the MIP and the remaining funds from uncompleted activities, provided by FEMA for this MAS, will be returned to FEMA.

SECTION 4—FUNDING/LEVERAGE

FEMA is providing funding, in the amount of \$500,000, to Humboldt County Department of Public Works for the completion of this Risk MAP Project. Humboldt County Department of Public Works shall provide any additional resources required to complete the assigned activities for this Risk MAP Project. Activities associated with any additional needs would be performed based on availability of additional funds. The leverage listed below includes in-kind services and blue book values for acquired information (i.e. base map data, etc.). These values should also be reported in the MIP by the appropriate task owner. The current Blue Book (3.0) is dated January 2011 and can be downloaded from FEMA's Information Resource Library at <http://www.fema.gov/library/viewRecord.do?id=2473>. The CTP shall complete Table 4.1 Contribution and Leverage.

Table 4.1 – Contribution and Leverage

Project Task	FEMA Contribution	Partner Contribution	% Partner Leverage (of total project cost)	Total Project Cost
Field Survey and Topographic Data Development	\$60,000			\$60,000
Flood Hazard Data Development	\$400,000			\$400,000
Project Management and Public Outreach	\$40,000			\$40,000
TOTAL FUNDING AMOUNTS	\$500,000			\$500,000

Final leverage dollars or units shall be entered as applicable within the Manage Data Development task in the MIP workflow. Leverage data shall be an estimate of available leverage data at the time the MAS is prepared.

SECTION 5—STANDARDS

The standards relevant to this MAS are provided in *Tables 5.1 Applicable Standards for Project Activities* and *5.2 Project Activities and Applicable Portions of FEMA Guidelines and Specifications*. Information on the correct volume and appendix of the G&S to be referenced for each mapping activity are summarized in Table 5.2 for convenience. However, all mapping partners working on a Risk MAP Project are responsible for complying with all appropriate requirements in FEMA’s G&S including published draft guidelines and Procedure Memorandums.

These guidelines may be downloaded from the FEMA Flood Hazard Mapping website at <http://www.fema.gov/cooperating-technical-partners-ctp-program/guidelines-specifications-flood-hazard-mapping-partners>. The Geospatial Data Coordination Policy and the Geospatial Data Coordination Implementation Guide are located at <https://hazards.fema.gov> under “Tools & Links.”

Table 5.1 – Applicable Standards for Project Activities

Applicable Standards	Activities									
	Outreach	Perform Field Survey	Develop Topographic Data	Perform Independent QA/QC: Topographic Data	Acquire Base Map	Coastal Analysis	Perform Independent QA/QC: Coastal Analysis	Perform Floodplain Mapping (Perform Independent QA/QC: Floodplain Mapping	Develop FIRM Database
<i>Guidelines and Specifications for Flood Hazard Mapping Partners and Procedure Memorandums</i>		X	X	X	X	X	X	X	X	X
FEMA’s Geospatial Data Coordination Policy			X		X					
FEMA’s Geospatial Data Coordination Implementation Guide			X		X					
Engineer Manual 1110-2-1003, <i>Hydrographic Surveys</i> (USACE), January 1, 2002		X								
“Numerical Models Accepted by FEMA for NFIP Usage,” Updated April 2003						X	X			
NFIP Metadata Profile Specifications			X	X				X	X	X
<i>Document Control Procedures Manual</i>	X									
<i>44 Code of Federal Regulations Parts 65, 66 and 67</i>		X	X	X	X	X	X	X	X	X
<i>Data Sharing Agreement</i>										

Table 5.2 – Project Activities and Applicable Portions of FEMA Guidelines and Specifications

Activity Description	Applicable Volume, Section/Subsection, and Appendix
Outreach	Volume 1 Appendix I OG 4-11: Risk MAP Meetings Guidance
Perform Field Survey	Volume 1 Appendices A, B, C, F, and M
Develop Topographic Data and Perform Independent QA/QC: Topographic Data	Volume 1, Appendices A and M PM 61
Acquire Base Map and Perform Independent QA/QC: Base Map	Volume 1 Appendices A, K, L, N and O Appendices A, B, C, E, F, G, H, and M PM 34, 43, 51, 52, 53, 59, 63
Perform Coastal Analysis Hazard Analyses and Perform Independent QA/QC: Coastal Analysis	Volume 1 Appendices A, B, C, D, H, and M Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States (2005) – Appendix D, Section D.4 Coastal Guidelines Updates” PM 47 OG 7-11: Application of TAW Runup Methodology to FEMA Needs
Perform Floodplain Mapping and Perform Independent QA/QC: Floodplain Mapping (including Redelineation/Digitization)	Volume 1 Appendices C, D, E, F, G, H, K, L, and M PM 51, 52, 53 and 56 CNMS User’s Guide

Activity Description	Applicable Volume, Section/Subsection, and Appendix
	CNMS data model ----- "NVUE: Calculation Guidance under Risk MAP"

SECTION 6— SCHEDULE

The activities documented in this MAS shall be completed in accordance with Table 6.1 Project Activities Schedule, which should drive the schedule within the MIP. If changes to this schedule are required, the responsible Mapping Partner shall coordinate with FEMA and the PMT in a timely manner.

Table 6.1 – Project Activities Schedule

ACTIVITIES	RESPONSIBLE PARTNER	Estimated START DATE	Estimated END DATE	Estimated COST
Project Management	Humboldt Co.	October 2013	February 2015	
Public Outreach	Humboldt Co.	October 2013	February 2015	
Perform Field Surveys	Humboldt Co.	November 2013	April 2014	
Develop Topographic Data	Humboldt Co.	November 2013	April 2014	
Perform Independent QA/QC: Topographic Data	FEMA	February 2013	April 2014	N/A
Perform Coastal Analysis	Humboldt Co.	December 2013	October 2014	
Perform Independent QA/QC: Coastal Analysis	FEMA	August 2014	October 2014	N/A
Perform Floodplain Mapping	Humboldt Co.	August 2014	January 2015	
Perform Independent QA/QC: Floodplain Mapping	FEMA	October 2014	January 2015	N/A
TOTAL COST				\$500,000

FEMA or its designee shall create the Risk MAP Project in the MIP and baseline the project activities with schedule and cost information within 30 days of the funds being awarded.

SECTION 7—CERTIFICATIONS

Data Capture Standards

- **DCS Certification Form** – The DCS are being updated. FEMA will update this MAS accordingly once the DCS update is complete.

Perform Field Surveys and Develop Topographic Data

A Registered Professional Engineer or Licensed Land Surveyor shall provide an accuracy statement for field surveys and/or topographic data used and shall certify these data meet the accuracy statement provided. Data accuracy should be stated used the Federal Geographic Data Committee National

Standards for Spatial Data Accuracy, but the American Society for Photogrammetry and Remote Sensing accuracy reporting standards are acceptable.

Acquire Base Map

- A community official or responsible party shall provide written certification that the digital data meet FEMA minimum standards and specifications.
- The CTP shall provide documentation that the digital base map can be used by FEMA and freely made available to the public. Please note that uploading base map data to the MIP does not constitute agreement that the digital base map can be used by FEMA. Documentation that the digital base map can be used by FEMA is still required.
- Certifications must be made at the time the intermediate data is submitted. For example, if hydrologic data is submitted, certification will be required at the time it is submitted.

Perform Coastal Analysis, and Perform Floodplain Mapping

- A Registered Professional Engineer shall certify hydrologic and hydraulic and coastal analyses and data in accordance with 44 CFR 65.6(f).
- Any levee systems to be accredited will be certified by the levee owner or other appropriate entity in accordance with 44 CFR 65.10.

SECTION 8—TECHNICAL ASSISTANCE AND RESOURCES

Project Team members may obtain copies of FEMA-issued LOMCs, archived engineering backup data, and data collected as part of the mapping needs assessment and/or CNMS process from FEMA and/or the Regional Project Officer.

General technical and programmatic information can be downloaded from the FEMA website at http://www.fema.gov/plan/prevent/fhm/frm_soft.shtm. Specific technical and programmatic support may be provided through FEMA and/or its contractor; such assistance should be requested through the FEMA Project Officer specified in Section 12 – Points of Contact.

Project Team members also may consult with the FEMA Regional Project Officer to request support in the areas of selection of data sources, digital data accuracy standards, assessment of vertical data accuracy, data collection methods or subcontractors, and GIS-based engineering and modeling training.

Please contact the Region/RSC to obtain the most recent version of the Risk MAP Timeline.

Assistance with the MIP may be requested at miphelp@riskmapcds.com

SECTION 9—CONTRACTORS (CTP)

The CTP intends to use the services of [to be determined] as a contractor for this Risk MAP Project. The CTP shall ensure that the procurement for all contractors used for this Risk MAP Project complies with the requirements of 44 CFR 13.36.

Guidance provided in this part includes, but is not limited to, contract administration and record keeping, notification requirements, review procedures, competition, methods of procurement, and cost and pricing analysis. 44 CFR Part 13 may be downloaded in PDF or text format from the U.S. Government Printing Office web site at <http://www.gpo.gov/fdsys/pkg/CFR-2012-title44-vol1/content-detail.html>. Additionally, contractors must not pose a conflict of interest issue.

SECTION 10—REPORTING (CTP)

Financial Reporting: Because funding has been provided to the CTP by FEMA, financial reporting requirements for the CTP will be in accordance with the terms of the Cooperative Agreement Articles for this MAS. The CTP shall also refer to 44 CFR 13.41. The CTP shall provide financial reports to the FEMA Regional Project Officer and Assistance Officer in accordance with the terms of the signed Cooperative Agreement for this MAS.

Progress Reporting: Progress reports will be submitted on a quarterly basis in conjunction with the financial reporting submittals. The CTP shall refer to 44 CFR 13.4 to obtain minimum requirements for progress reporting. The Project Officer, as needed, may request additional information on progress.

The CTP may meet with FEMA and/or its contractor up to bi-weekly, or more frequently if needed, to review the progress of the project in addition to the quarterly financial and status submittals. These meetings will alternate between FEMA's Regional Office, the Humboldt County Department of Public Works office, and conference calls, as necessary.

The CTP shall communicate with communities throughout the life of each project. Continued engagement is necessary and appropriate and will build upon the relationships established or enhanced during Discovery and provide transparency into the Risk MAP process. This may occur through monthly or quarterly updates or project status calls with community leaders, project websites including updates at several milestones or along a specific timeline, or other methods.

Earned Value Data Entry: Once the FEMA Regional Office has issued the MAS, the baseline for the project will be established in the MIP using the cost and schedule information for each task as agreed upon by the FEMA Regional Office and the CTP. The Cost Performance Index (CPI) and the Schedule Performance Index (SPI) in the MIP must be used to monitor partner performance and to determine future funding eligibility. Recipients must adhere to the performance requirements by maintaining a 0.92 score for both CPI and SPI.

The CTP is required to report on the earned value of projects that are in the MIP on a monthly basis and must give explanations for variances outside of the tolerance defined above. FEMA Regional Offices must implement a Corrective Action Plan (CAP) when a CTP partner is outside of the tolerance. A CAP must define the reason for the variance and the intended resolution. FEMA Regional Offices must coordinate with FEMA Headquarters when CAPs are developed.

As Program Management tasks are not conducted in the MIP, cost and schedule performance measures must be defined and documented in the MAS or scope of work statement. These measures must be used to monitor partner performance and to determine future funding eligibility. This exception only applies to tasks not able to be conducted or tracked in the MIP.

SECTION 11—PROJECT COORDINATION


Throughout the project, all members of the Project Team will coordinate, as necessary, to ensure the products meet the technical and format specifications required and contain accurate, up-to-date information. Coordination activities may include:

- Meetings, teleconferences, and video conferences with FEMA and other Project Team members;
- Telephone conversations with FEMA and other Project Team members on a scheduled basis and an ad hoc basis, as required;
- Updates to the MIP and other FEMA status information systems in accordance with requirements in Volumes 1 and 3 of G&S; and
- E-mail, facsimile transmissions, and letters, as required.

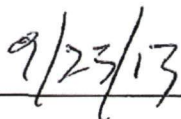
SECTION 12—POINTS OF CONTACT (CTP)

The points of contact for this Risk MAP Project are Edward Curtis, the FEMA Regional Project Officer; Hank Seemann, the Project Manager for Humboldt County Department of Public Works; or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities. When necessary, any additional FEMA assistance should be requested through the FEMA Regional Project Officer.


Each party has caused this MAS to be executed by its duly authorized representative.



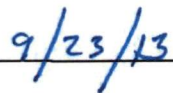
Thomas K. Mattson
Director
Humboldt County Department of Public Works



Date



Edward Curtis
Regional Project Officer
Federal Emergency Management Agency, Region IX



Date