MEMORANDUM OF UNDERSTANDING

BETWEEN

The Town of Kennebunkport, Maine

AND

The Federal Emergency Management Agency

Working together on a Risk Mapping, Assessment, and Planning (Risk MAP) project, FEMA Region I and the Town of Kennebunkport, Maine, will identify, assess, communicate, plan for, and mitigate against flood risk. Updated flood risk information can enhance local and State hazard mitigation plans, and improve Kennebunkport's ability to raise awareness about flood risk, while making informed decisions that will improve its resilience to flooding.

This project MOU:

- Describes the long-term vision for the community or watershed as previously identified
- Describes the mapping, assessment, and planning information, products, and assistance that FEMA will provide over the course of the project
- Describes the milestones and sets the schedule for when those milestones will be achieved
- Summarizes local flooding concerns and provides a general idea of areas expected to have increased flood hazards
- Describes roles and responsibilities of FEMA and the community throughout the project

Mapping and Assessment

The community has completed a review of its floodplain maps and assessment of products needed to effectively communicate risk to our stakeholders.

MAPPING ISSUES

- FEMA should prepare a separate map delineating those areas that FEMA considers to be "primary frontal dunes" and therefore would have the V-zone carried to the back side of the frontal dune.

- The placement of transect lines appear to have been placed in locations that avoid off-shore ledges. While those particular areas may experience harsher wave conditions, specifically avoiding these natural features does not give an accurate representation of possible wave conditions. In a recent study done by Robert Gerber for Bradley Lown, (a property owner in Cape Porpoise) Mr. Gerber identifies a problem with the proposed Floodplain Maps.
  "FEMA has interpolated zones and elevations between their transects and may have overstated the flood limits, particularly in more protected cove areas."(Gerber)
  "Our report for Kennebunkport gives maps of contoured significant wave heights for offshore 1% annual storm waves propagated from different directions towards the Kennebunkport shore line. Those models used finite-difference grid cells of 75 meters square, which is too crude for analyzing wave refraction in the small cove on the southeast side of Cape Porpoise. Therefore, we created "nested

grids" within the larger grid models for S0E and S45E wind and wave directions, using the larger models for boundary conditions, and simulated the waves with 10 meter square grid cells. For the N45E wave model, we created a new model with 30 meter square cells."(Gerber)

The conclusion that Mr. Gerber comes to for this particular property suggests removing the property from a 16' VE Zone and reclassifying it to an 11'AE Zone. This property is not unique, many others exist that share similar characteristics.

The significance of this drastic change forces one to question the validity of much of the rest of FEMA's study particularly for protected cove areas. Historical evidence based on eyewitness testimony of significant storm events shows that the inside of Cape Porpoise Harbor for example has not sustained a three foot wave, nor does the evidence shown on Mr. Gerber's study for the Lown Property suggest scientific evidence for that type of conclusion as well.

Based on this review it is clear that more transects need to be utilized, along with specific wave refraction studies to accurately represent floodplain conditions within Cape Porpoise Harbor, and the adjacent cove areas. (See attached map showing additional transects that we request FEMA analyze.)

- Additional LIDAR data has been collected that will be available by August 2011 which the town will make available upon receipt. We request that FEMA improve its intertidal elevation database by adding the updated LIDAR dataset where it is available. There may also be additional subtidal bathymetry data available from the Maine Geological Survey (acquired in 2004) that could be used to refine the bathymetric database.

- We note that FEMA assumed a 71 mph, 1-hour duration wind for its restricted fetch analysis, and Mr. Gerber also used that wind velocity in propagating the 1% annual chance offshore wave to the shore with STWAVE3. We would like FEMA to analyze other actual wind data in the area and consider it along with the Gerber analysis of NOAA Buoy 44007 off Cape Elizabeth that was already submitted to FEMA as part of the Casco Bay area wind analysis. Two candidate stations would be NOAA IOSN3 on the Isle of Shoals which has been recording wind data for all years (except 1999) from 1985 to present, and the Laudholm Farms meteorological station in Wells that is part of the National Estuarine Research Reserve data network and has been recording 5-second gust information continuously since 1995.

- FEMA should refine its delineation of AO zones. The depths of AO zones are determined through a complex logic chain that is related, among other things, to wave washover rates. FEMA appeared to generalize many of the AO zones, defaulting them to the conservative AO-3 depth in some cases, and not looking at detailed topography in others.

- FEMA should apply a reasonable "roughness" factor in the wave runup calculations where shown by pictures or field visits that it is warranted such as on rocky bluffs.

- We request that the detailed and general comments of Mr. Gerber relative to his review of the FEMA provisional flood maps of 2009 be carefully considered as FEMA revises its maps as part of Risk MAP. We request that Mr. Gerber be consulted if there are any discrepancies between results obtained from your models compared with his models so that the source of the discrepancies can be understood and the best method chosen.

- Prior to the release of the provisional digital flood maps by FEMA in the summer of 2009 there were several inland areas of Kennebunkport that had A-zones without assigned elevations on the effective FIRMs. These inland un-numbered A-zones are carried forward in the 2009 provisional maps but are still unnumbered. With the use of updated LIDAR we request that these areas be re-delineated with more accuracy and with assigned elevations. Listed below are specific issues identified with these unnumbered A-Zones.

FID_	FLD_AR_ID	FLD_ZONE	
108	1174	A	Mapped Water Features present. Floodplain area and location inconsistent with known data. Developed Properties affected.
160	1243	A	Mapped Water features present. Floodplain area and location inconsistent with known data. Developed Properties affected. Property owner affected by this particular flood plain has registered an appeal.
162	1248	A	Mapped Water features present. Size of features suggests further study warranted. Floodplain area and location inconsistent with known data. Developed Properties affected.
221	1342	A	Mapped Water features present. Size of features suggests further study warranted. Floodplain area and location inconsistent with known data. Developed Properties affected.
347	1562	A	Mapped Water Features present. Floodplain area and location inconsistent with known data. Developed Properties affected.
383	1676	A	Mapped Water Features present. Floodplain area and location inconsistent with known data. Developed Properties affected.
387	1727	A	Mapped Water Features present. Floodplain are and location inconsistent with known data. Does not affect any developed properties.
388	1754	A	Mapped Water Features present. Floodplain area inconsistent with known data. Does not affect any developed properties in Kennebunkport, however appears to affect developed properties in Arundel.

- There are many small streams and wetlands within Kennebunkport that could not have been discerned within the scale of topographic maps available when the effective FIRMs were originally generated. Recent Hydrography data has been acquired as part of Kennebunkports digital parcel mapping process. This data should be used in conjunction with newly acquired LIDAR in establishing a basis for inland A-Zones. Furthermore, because the Maine State Plumbing Code prohibits septic systems from being constructed within the 10% annual chance flood zone, we would like to have those zones established throughout the Town.

- ***Identified Visual Issues:***
  1. Kennebunk River: Visual comparison between the mapped hydrography, (hydro) orthophotography, (orthos) and the mapped AE Zones (including Floodway) mapped inaccuracies become immediately apparent

  - Within 1000' of the entrance of the mouth of the river is a missing segment of riverine floodway.
  - Floodway boundaries do not consistently follow mapped low, mean, or high water boundaries.
  - AE polygon associated with Kennebunk River consistently misrepresents riverine areas that should be identified as floodplain which are not. Polygon appears to be shifted 30 feet (Projection Issue?)
  - AE polygons adjacent to floodway above the RT 9 Bridge do not have any BFE information, even though floodway cross sections have that information identified.

2. Batson River: Visual comparison between the mapped hydrography, (hydro) orthophotography, (orthos) and the mapped AE Zones (including Floodway) mapped inaccuracies become immediately apparent.

- Floodway Boundaries do not consistently follow mapped River boundaries.
- Portions of mapped river boundaries not identified as any type of floodplain
- AE polygons adjacent to mapped floodway do not have any BFE information, even though floodway cross sections have that information identified

3. Smith Brook: Visual comparison between the mapped hydrography, (hydro) orthophotography, (orthos) and the mapped AE Zones (including Floodway) mapped inaccuracies become immediately apparent.

- Floodway Boundaries do not consistently follow mapped or visual River Boundaries
- A zones do not consistently follow any type of visual or mapped water body centerline.
- A zones relating to Smith Brook and any related tributaries appear to follow old USGS Topo Quads with 20' Contour intervals, and not any mapped or visually identifiable water features.

4. Little River: Visual comparison between the mapped hydrography, (hydro) orthophotography, (orthos) and the mapped AE Zones (including Floodway) mapped inaccuracies become immediately apparent.

- Floodway Boundaries do not consistently follow mapped or visual River Boundaries
- Floodway boundaries do not consistently follow mapped low, mean, or high water boundaries.
- Per FIS Little River floodplain areas were identified by a "Detailed Study", yet there are a significant number of areas that are identified as "AE" which do not have any specific BFEs. While the cross sections identify BFE's it would be much clearer if these same

  BFE's were associated with the adjacent AE Zones.

- ***LOMC Issues***

  Letter of map changes that have been approved clearly indicate that there is an error in the designation of a particular area as a floodplain. While it is not reasonable to expect revised maps to be done for every LOMA, it is reasonable to expect that these areas be reviewed with the creation of new maps in order to not recreate the same mistakes.
  The Preliminary FIRM maps provided to the town have not been adjusted to reflect any of the floodplain properties that are entitled to re-validated LOMAS.

LOMC	*Case No.*	*Date Issued*	*Project Identifier*	*Old Panel*	*New Panel*
LOMA	99-01-994A	11/24/1999	TAX MAP 13-LOT 18 18 OLD CAPE ROAD	2301700004B	23031C0602G
LOMA	02-01-1112A	9/5/2002	317 GOOSE ROCKS ROAD	2301700005B	23031C0462G

COMMUNITY PARTICIPATION

Data provided by the community, such as elevation data, detailed property information, or engineering data, allows FEMA to improve the level of detail of the Flood Risk Products and ultimately make the products more valuable to Kennebunkport. Kennebunkport agrees to provide the following data to enhance the Flood Risk Products:

- Digitial orthophotographs taken of Kennebunkport in 2007 with a pixel density of 0.5 foot within one month of signing this MOU
- Gerber STWAVE3 wave model results, WHAFIS calculations, and wave runup analysis by FEMA transect, including report, which has already been submitted to FEMA
- Latest Tax Map ArcGIS database in polygon shapefile format within one month of signing the MOU
- A culvert size and location database within one month of signing the MOU
- Digital Elevation Model (DEM) Data as provided by the Maine Office of GIS
- Detailed wetlands and stream maps provided within one month of signing the MOU

REGULATORY PRODUCTS

FEMA will provide Kennebunkport with the following regulatory products, including maps in ArcGIS format, to support floodplain management and flood insurance ratings.

- **Flood Insurance Rate Map (FIRM)**: Identifies Kennebunkport flood zones, base flood elevations, and floodplain boundaries.
- **Flood Insurance Study (FIS) Report**: Describes Kennebunkport flood history and provides technical information on the study.

FLOOD RISK PRODUCTS

FEMA will also provide Kennebunkport with Flood Risk Products to give a better understanding of flood risk and its potential impact on the community. The products listed below will enable more informed decision making about how to reduce this risk. Where maps are provided, these will be provided in digital ArcGIS format.

- **Flood Risk Report:** Provides a comprehensive understanding of flood hazard and risk exposure within the community, watershed, or other geographic area. The report parallels the FIS report by providing a narrative of the Risk Assessment methodology and results, updated to include low tide LiDAR. This will also include an updated analysis of riverine floodplain delineation and risk.
- **Flood Risk Map**: Depicts county and community boundaries in relation to areas of risk within the study area, emphasizing that risk reduction activities may have an impact well beyond the site.
- **Areas of Mitigation Interest:** Identifies conditions within a watershed that may contribute to the severity of the flood hazard and associated losses. These include areas with a history of flood claims, hydraulic or other structures that contribute to backwater and areas experiencing land use change or development.
- **Flood Risk Database:** Provides access to information collected and developed during the flood-risk assessment process, including data collected, created, and analyzed under Risk MAP, including all the information provided to FEMA by Kennebunkport.

FLOOD RISK DATASETS

Depending on the availability of supporting data and FEMA study funding FEMA will also provide access to one or more of the following datasets in ArcGIS format that underpin the Flood Risk Products described.

- **Changes Since Last FIRM:** Identifies areas where the floodplain and floodway have increased or decreased, and areas where the flood zone designation has changed since the previous flood study. Engineering factors that may have contributed to any changes will also be identified. The built environment affected by the change will be quantified and summarized.

- **Flood Depth and Analysis Grids:** Indicate Kennebunkport's 10%, 4%, 2%, 1%, and 0.2% annual chance riverine flood events and the 1% annual chance events in the coastal zone. They will also be used to depict the percent annual chance of flooding and the percent chance of flooding over 30 years.

- **Flood Risk Assessment:** Highlights areas where risk reduction actions may produce the highest return on investment. A refined HAZUS loss estimation analysis will be conducted for flooding sources using local building stock information provided by the Kennebunkport ArcGIS assessment database.

- **Areas of Mitigation Interest:** Identifies conditions within a watershed that may contribute to the severity of the flood hazard and associated losses. These include areas with a history of flood claims, hydraulic or other structures that contribute to backwater and areas experiencing land use change or development.

Planning

A mitigation plan was completed for York County and has recently been updated and is in review with FEMA. The flood risk information developed through the Risk MAP project will provide communities with analyses they can use in updating county and State mitigation plans. Kennebunkport should use this data to identify risks and vulnerabilities associated with floods, evaluate areas of high mitigation value, and develop long-term planning and implementation activities.

As part of the Risk MAP project, FEMA will offer mitigation planning technical assistance to cover the fundamentals of requirements for communities to develop new or updated county mitigation plans that address priorities and needs and meet requirements established in 44 CFR 201.6. FEMA will also discuss with Kennebunkport how the data and information from the Risk MAP Flood Risk Products can be incorporated into and enhance the flood portion of hazard mitigation plans.

FEMA will share mitigation planning and/or implementation best practices, resources available to support flood mitigation actions, and assist in the development of an action item list to facilitate Kennebunkport mitigation activities.

FEMA Resources to Support Flood Mitigation Actions

FEMA recognizes and encourages floodplain management activities that exceed minimum requirements, through programs such as the Community Rating System. FEMA also offers several Hazard Mitigation Assistance grant programs that provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Information on these programs will be provided along with other related State, Federal, and association resources throughout the project life cycle.

Communication and Coordination

FEMA and Kennebunkport will work together throughout the project to establish a consistent flow of information about the project timeline, status, and next steps. FEMA will coordinate with the community to hold 4 meetings, as described below, and we understand that these meetings may be held concurrently with other near-by municipalities. In addition to providing regular communications, FEMA will work with Kennebunkport to continually enhance local capability to communicate about the hazard and the associated risk to people who live and work within the community. It is the community's ultimate responsibility to communicate to its constituents their risks.

- **Discovery meeting**: available data are discussed and exchanged and the community's needs are explored
- **Flood study review meeting:** the re-calculated preliminary maps will be unveiled prior to the start of what will be a new municipal appeal period
- **Community Coordination Officer (CCO) Meeting/Open House:** Will provide local officials with the FIRM and FIS, information on ordinance requirements for map adoption, as well as the Flood Risk Products described above. The meeting will be closely followed by an open house where FEMA and local officials present project results to local citizens and explain the impact that the results will have on development, planning, and flood insurance. CCO Meetings have already been held with community officials to explain the preliminary maps that were released in 2009. The meeting described here will address any new Risk MAP products and may occur after the revised Flood Insurance Rate Maps and Flood Insurance Study are published.
- **Resilience Meeting:** Will focus on hazard mitigation plan implementation and highlight resources available from the State and Federal governments as well as professional associations to support planning and implementation activities. The meeting should result in action items developed by Kennebunkport to encourage mitigation activities.

Project Milestones and Schedule

The table below provides a schedule of when specific Project Milestones are to be achieved and the party responsible for that milestone. Milestones such as meetings, important administrative milestones such as Letter of Final Determination issuance, and delivery date of products should be listed.

Kennebunkport Provides its Data to FEMA	1 month after MOU signing
Discovery Meeting	1 month after MOU signing
New Preliminary Maps Distributed	January 30, 2012
Flood Study Review Meeting	1 Month after new Prelim Maps
FEMA restarts formal Municipal Appeal Period	June 30, 2012
FEMA ends formal Municipal Appeal Period	Sept. 30, 2012
FEMA delivers new provisional FIRM, FIS, Flood Risk Report, Flood Risk Map, Flood Risk Database, Changes Since Last FIRM, Flood Depth and Analysis Grids, Flood Risk Assessment, and Areas of Mitigation Interest	Dec. 31, 2012
Resilience Meeting	Mar. 31, 2013
New Maps Effective Date	Jun. 30, 2013
Kennebunkport updates its Mitigation Plan	Dec. 31, 2013

Roles and Responsibilities

This Project MOU represents a good-faith effort by all parties to share data, communicate findings, and plan mitigation activities to protect Kennebunkport from flood risk. **It is not legally binding nor does it preclude Kennebunkport from participating in the FIRM appeal process.** The parties listed in the signature block below will collaborate on flood hazard identification activities, risk analysis products, and will consult with each other to integrate contributions into flood hazard identification efforts. It is intended to provide a common strategy to address flood hazards and increase resilience.

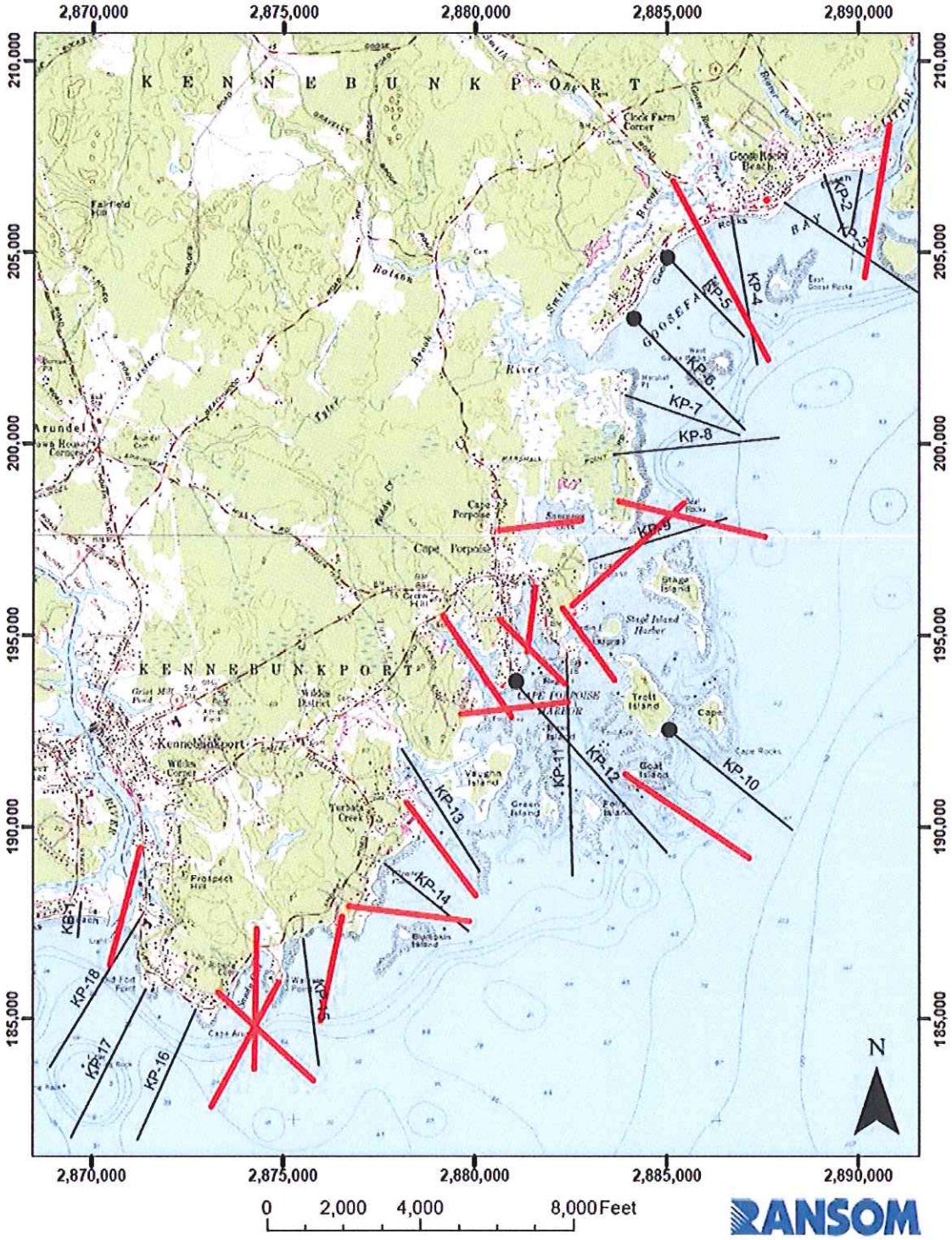
FEMA will provide Kennebunkport officials with regular project status updates, the data and products described above, and outreach guidance to increase local and Tribal awareness of flood risk. These efforts will better enable Kennebunkport to take action to reduce risk, such as through the adoption of the maps, development, or enhancement of mitigation plans, and increased communication with citizens to inform them about their risk and the steps they can take to mitigate that risk.

Kennebunkport will provide input and updates throughout the study process to verify data and ensure that the information accurately represents the community. It is ultimately the community's responsibility to communicate to its constituents their risks.

As referenced above, FEMA or its representative and Kennebunkport officials will communicate at least four times over the course of the project to review project milestones, outcomes, and impacts.

Mike Goetz, Branch Chief FEMA Region 1	Date	Larry Mead Town Manager Town of Kennebunkport	Date
			4/7/11

Sue Baker Maine NFIP Coordinator



Proposed Additional Wave Transects for Town of Kennebunkport, ME
Base Maps are Biddeford & Kennebunkport USGS 7.5' Maps
Grid is Maine State Plane, NAD83, West Zone, ft.
RGG 3-20-11

RANSOM
Environmental
Consultants, Inc.