CNMS for Coastal Risk Management, What communities need to know

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What is CNMS?

- FEMA’s CNMS is a collection of procedures for the identification and management of flood hazard mapping requirements.
- It is used to organize, store and analyze flood hazard mapping needs as well as document study reaches that meet FEMA’s validity standards.
- A Geospatial Database that tracks:
  - New, Validated or Updated Engineering (NVUE)
  - Unverified study reaches (need of restudy)
  - Flood mapping requests
- CNMS also provides the framework for performing validation assessment.
Among the challenges associated with managing flood risk is that updates to Flood Insurance Rate Maps (FIRM) will always be necessary due to:

- Changes in the physical environment,
- Climate patterns, and
- Engineering methods.

A significant evolution of CNMS starting in 2015 was the additional of a Coastal framework and a set of coastal study assessment checks.
Coastal CNMS – What you need to know.

- It is hoped that Communities will learn how to identify the factors that can impact the identification of coastal risks and when new study data or significant coastal storm impacts might invalidate as effective study.

- FEMA has invested into new coastal studies for the nation during Risk MAP, hence it is critical to maintain that investment and assess each coastal study on a 5-year basis, and communicate restudy needs with stakeholders and constituents.
CNMS Technical Reference

▸ CNMS Data Development
  • Workflow and process, data input/output

▸ CNMS Data Entry Process
  • Feature class/attribute descriptions, study phase updates

▸ Appendices
  • Validation assessments, data dictionary, QC tool
Where is CNMS?

- 10 Regional CNMS Databases
  - ArcGIS File Geodatabases
- Maintained by each FEMA RSC
  - CNMS lead (PTS provider) within each RSC
  - Contact RTC for copy/info
- Quarterly Rollup to FEMA HQ
  - Due last day of every Fiscal Quarter
  - National rollup used for NVUE metric reporting and program planning
  - Refresh of [CNMS Online Viewer](https://msc.fema.gov/cnms/)
    - Community engagement tool;
    - CNMS requests capture
On April 15, 2019, FEMA launched a new CNMS Viewer to replace the current CNMS application and functionalities (including the map, interactive tools, NVUE Reports, and creation of requests).

The new CNMS Viewer will provide a single location to view Riverine and Coastal inventory of flood hazard studies and mapping needs.

For assistance with the CNMS Viewer, please contact MIP Help at miphelp@riskmapcds.com.
Coastal CNMS Geometry

<table>
<thead>
<tr>
<th>FEMA Region</th>
<th>Coastal CNMS Shoreline Miles</th>
<th>Coastal CNMS Shoreline Miles – Populated Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>4,782</td>
<td>4,771</td>
</tr>
<tr>
<td>II</td>
<td>4,545</td>
<td>4,357</td>
</tr>
<tr>
<td>III</td>
<td>6,637</td>
<td>6,611</td>
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<tr>
<td>IV</td>
<td>11,127</td>
<td>11,127</td>
</tr>
<tr>
<td>V</td>
<td>4,689</td>
<td>4,150</td>
</tr>
<tr>
<td>VI</td>
<td>5,701</td>
<td>5,235</td>
</tr>
<tr>
<td>VII</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VIII</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>IX</td>
<td>3,864</td>
<td>3,310</td>
</tr>
<tr>
<td>X</td>
<td>43,867</td>
<td>3,481</td>
</tr>
<tr>
<td>National Total</td>
<td>85,229</td>
<td>43,076</td>
</tr>
</tbody>
</table>
Coastal CNMS Attributes

Fields of S_Coastal_Ln

<table>
<thead>
<tr>
<th>Background Data</th>
<th>FEMA Tracking</th>
<th>Effective Study</th>
<th>Assessment Checks</th>
<th>Being Studied</th>
<th>Assessment Check Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creach ID</td>
<td>• Source of Line</td>
<td>• Date of Modeling</td>
<td>• Critical Checks</td>
<td>• MIP Case #</td>
<td>• Comments</td>
</tr>
<tr>
<td>• MIP Case #</td>
<td>• Status Type</td>
<td>• Surge Model</td>
<td>• Secondary Checks</td>
<td>• Study Type</td>
<td>• Source</td>
</tr>
<tr>
<td>• FIPS/CID/HUC</td>
<td>• Tiers</td>
<td>• Setup Meth.</td>
<td>• Check Totals</td>
<td>• Surge Model</td>
<td>• URL</td>
</tr>
<tr>
<td>• Study Name</td>
<td>• Risk Products</td>
<td>• Runup Model</td>
<td></td>
<td>• Setup Meth.</td>
<td></td>
</tr>
<tr>
<td>• Study Type</td>
<td>• FBS</td>
<td>• Erosion Meth.</td>
<td></td>
<td>• Runup Model</td>
<td></td>
</tr>
<tr>
<td>• Miles</td>
<td>• Populated Coast</td>
<td>• Overland Model</td>
<td></td>
<td>• Erosion Meth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wave Model</td>
<td></td>
<td>• Overland Model</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Wave Model</td>
<td></td>
</tr>
</tbody>
</table>

FEMA

RiskMAP
Increasing Resilience Together
Mapping Requests/Needs

- CNMS is a repository for mapping requests/needs
- Coastal studies that fail a critical and/or three plus secondary checks will become a need for restudy
- Stakeholders can submit flood or cartographic requests
- Requests are analyzed for future mapping projects
Coastal CNMS Development History

- Mid 2015 (Coastal Kick-off)
- Late 2016 (Coastal Finalized)
- Early 2017 (Coastal Maintenance)
- Late 2017-2021 (Assessments: 5-Year Plan)
Coastal Assessment Checks

Input Coastal Mapped Inventory to CNMS

Study Assessed - Coastal Mileage Valid?

YES

Coastal Mileage Reassess in 5 years

NO

Coastal Mileage Studied (if funded)

Restudy makes Coastal Mileage Valid

Input Unmapped Requests
# Coastal Study Assessment Checks

<table>
<thead>
<tr>
<th>Critical Checks</th>
<th>Secondary Checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 - Storm events SWL exceeds the 1% SWEL</td>
<td>S1 - Starting wave conditions no longer appropriate</td>
</tr>
<tr>
<td>C2 - Statistically significant storm intensity data</td>
<td>S2 - Bathy/topo meet FEMA Standards</td>
</tr>
<tr>
<td>C3 - Changes in ice coverage (Great Lakes Only)</td>
<td>S3 - Significant changes to land use or vegetation</td>
</tr>
<tr>
<td>C4 - Effective models inaccurate</td>
<td>S4 - Repetitive loss properties outside of coastal SFHA</td>
</tr>
<tr>
<td>C5 - Coastal/mapping modeling changes or improvements from effective study</td>
<td>S5 - Patterns of LOMRs indicated from coastal SFHA</td>
</tr>
<tr>
<td>C6 - Shoreline erosion</td>
<td>S6 - High water marks collected since effective study</td>
</tr>
<tr>
<td>C7 - Existing coastal structures adequate in providing flood protection</td>
<td></td>
</tr>
</tbody>
</table>

1 Critical or 3 Secondary Fails = Unverified Study
Example of Coastal Check

Evaluation Process for Coastal Erosion and Long-Term Retreat

1. **Start**
   - Does the landward extent of erosion or long-term retreat touch or fall landward of any coastal protection structures, buildings, or inland flood zone boundaries?
     - Yes → **Sensitivity Test**
     - No → **Pass**

2. **Sensitivity Test**
   - Does the sensitivity test result in significant changes to the floodplain boundaries, zone delineations, or BFIs?
     - Yes → **Fail**
     - No → **Pass**
Coastal Assessment Checks

Coastal Study to be Assessed

One or more critical criteria failed?

Three or more secondary criteria failed?

Valid

Unverified
Study Validity Over Time

- Studies are ideally reviewed for validity starting 5 years after the modeling was conducted.
- Study validity could change in less than 5 years if major events in the area occur.
- The older a study is, the more likely it is to be unverified.
- The older a study is, the higher the possibility of sensitivity tests being necessary to validate some criteria.
- Study validity is primarily affected by 3 types of factors:
  - Event sensitive factors
  - Time sensitive factors
  - Programmatic/Method sensitive factors
Study Validity Over Time

- Some Study aspects are *event sensitive* (i.e. are affected directly by new meteorological occurrences)
  - Tide Gage Data
  - Storm Occurrences
  - Ice Coverage
  - Tsunami Occurrences

- These aspects of a study may remain valid through time if no new events have occurred.

- Lack of occurrence (i.e. storm strikes) over time may bring down the results of statistical analyses, but the study remains valid.

- These factors are not necessarily influenced by time, but the likelihood of occurrence is assumed to increase as the study ages.
Some study aspects are *time sensitive*.

- Shoreline/Land use change
- Topo/Bathy data
- Structural condition
- Repetitive loss/LOMR data

Though there are no direct time constraints on how long a study is valid, changes in ground conditions occur that may affect the study.

Newer technologies make better data available that may indicate an issue that was previously not considered.

Structure deterioration and shoreline conditions will likely cause impacts to the study area.

More data for RepLoss/LOMRs would be accumulated over time, which could lead to a potential change in status.
Study Validity Over Time

- Some study aspects are **programmatic/method sensitive**.
  - Model acceptance/validity
  - Model/Mapping Guidance changes

- Any major changes to the modeling or mapping procedures or guidance could impact the study status.

- Over time, flaws are discovered in models or they are determined to not produce high enough accuracy results for program needs.

- These factors do not necessarily increase in risk over time, although as programs age, guidelines and methods may evolve as well.
### 5-Year Plan

#### Regional Studies and Calendar Year due

<table>
<thead>
<tr>
<th>CY 2017</th>
<th>CY 2018</th>
<th>CY 2019</th>
<th>CY 2020</th>
<th>CY 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIMP Surge Study</td>
<td>CT Tidal Gage</td>
<td>Cape Tidal Gage</td>
<td>Boston Surge</td>
<td>Central ME Tidal Gage</td>
</tr>
<tr>
<td>MS Surge Study</td>
<td>Nantucket Tidal Gage</td>
<td>Essex Tidal Gage</td>
<td>NH Tidal Gage</td>
<td>Dukes Tidal Gage</td>
</tr>
<tr>
<td>USACE AS Surge Study</td>
<td>HI Surge Study</td>
<td>RI Tidal Gage</td>
<td>Region 3 Surge Study</td>
<td>Plymouth Tidal Gage</td>
</tr>
<tr>
<td>USACE GU Surge Study</td>
<td>PR Surge Study</td>
<td>Region 3 Surge Study</td>
<td></td>
<td></td>
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<tr>
<td>USACE NMI Surge Study</td>
<td></td>
<td>NWFLWMD FWJ Surge Study</td>
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<tr>
<td>USVI Surge Study</td>
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<td>LA USACE Surge Study</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2, R4, R9</td>
<td>R1, R2, R9</td>
<td>R1, R3, R4, R6</td>
<td>R1, R3</td>
<td>R1, R2, R3, R4, R6</td>
</tr>
</tbody>
</table>

#### 2022 and Beyond

<table>
<thead>
<tr>
<th>NE ME Tidal Gage</th>
<th>Lake Ontario Surge Study</th>
<th>ECCFL Surge Study</th>
<th>Washington Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW ME Tidal Gage</td>
<td>Lake Erie Surge Study</td>
<td>SFL Surge Study</td>
<td>Oregon Studies</td>
</tr>
<tr>
<td>SC Surge Study</td>
<td>Lake Michigan Surge Study</td>
<td>SWFL Surge Study</td>
<td>California Studies</td>
</tr>
<tr>
<td>GA-NEFL Surge Study – GA</td>
<td>Lake Huron Surge Study</td>
<td>WFL Surge Study</td>
<td>NWFLWMD PanHandle Surge Study</td>
</tr>
<tr>
<td>Lake Superior Surge Study</td>
<td>Lake St. Clair Surge Study</td>
<td>Big Bend Surge Study</td>
<td></td>
</tr>
</tbody>
</table>
Questions?

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