

Risk MAP CDS

Hazus 4.2.2 (Service Pack 2)

User Release Notes

Version 1.0

February 28, 2019

Document Management History

Revision History

| Version Number | Date | Summary of Changes | Team/Author |
|----------------|------------|--------------------|--------------|
| 1.0 | 02/13/2019 | Initial version | Risk MAP CDS |

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PLEASE READ FIRST IF YOU ARE SEEING THIS AS PART OF THE PATCH INSTALLATION

Hazus 4.2 Service Pack 2 (4.2.2) requires that Hazus 4.2 Service Pack 1 (4.2.1) https://hazus-support.msc.fema.gov/Updates/15.2.0/PATCH/Hazus_4.2_SP01.zip has already been run and successfully installed. Hazus 4.2 Service Pack 2 contains several study region database changes, detailed in the table below. You will be prompted to apply these changes to any existing Flood (FL) or Earthquake (EQ) Hazus 4.2.1 study regions during patch installation, if you choose to do so. You may also decline the changes to existing study regions if preferred. If no valid existing FL or EQ regions are found, the region update tool will automatically close. None of the database changes will be automatically applied – you must apply them using the steps detailed in the table below, depending on data type.

| Data Change Type | How to Apply |
|--|--|
| Database schema changes for existing EQ and FL study regions | <ul style="list-style-type: none"> • When prompted during patch installation, select the existing Hazus 4.2.1 study regions to be updated with these changes. • Any 4.2.1 study regions you do not select will not be updated. • Any new 4.2.2 study regions you create will contain these changes. • If older versions of EQ or FL 4.2.1 study regions are imported later (after Hazus 4.2.2 patch install), the updateDB.exe located typically in C:\Program Files (x86)\Hazus-MH should be run on the newly imported regions. |
| Defect fixes which may impact results data | Open an existing, patched Hazus 4.2.2 study region after installation and re-run analysis to see updated results data. |
| State database updates | Download the new Hazus 4.2.2 state database(s) you wish to work with from the Map Service Center (MSC) https://msc.fema.gov/portal/resources/hazus and aggregate a new study region. |

1. Introduction

Hazus Release 4.2 Service Pack 2 (Hazus 4.2.2) is a service pack release, implementing state database updates as well as defect fixes and major enhancements, detailed below. Hazus 4.2.2 is compatible with ArcGIS 10.5.1 and is supported for 64-bit Windows 7 and Windows 8.1, as well as Windows 10 operating systems.

Hazus 4.2.2 will be released via the automatic update tool in the Hazus software. Users will be prompted to download the patch upon opening the Hazus application. A copy of the patch is also made available at: [FEMA Flood Map Service Center \(MSC\) Hazus download webpage](#) for free public download. Updated state databases are also available for download. The scheduled release date is February 28, 2019.

The purpose of this document is to describe the functional changes and known issues found in the Hazus 4.2.2 release package and associated data updates.

2. Contents of the Release

Shell Items:

- Study Region aggregation time limits (1 hour) were removed for all hazard types and aggregation levels.
- The agricultural feature class clipping process during aggregation was optimized saving significant study region aggregation time, especially for states with complex shorelines (e.g. NC) as shown below:

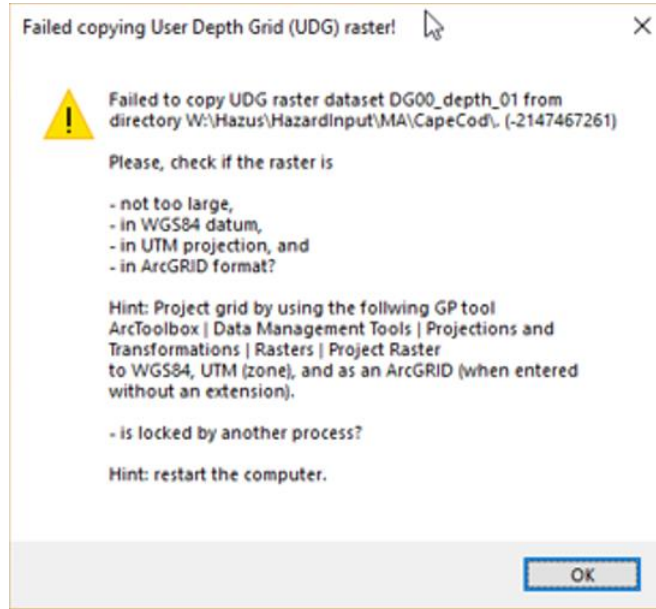
| State | Model | Total time before optimization | Total time after optimization |
|-------|------------|--------------------------------|-------------------------------|
| SC | FL | 56 mins | 12 mins |
| NC | FL | 3 hrs 46 mins | 23 mins |
| SC | EQ, FL, HU | 1 hr 53 mins | 59 mins* |
| NC | EQ, FL, HU | 4 hrs 9 mins | 25 mins |

**Note: large pipeline datasets in SC result in longer EQ aggregation times*
HU-Hurricane TS-Tsunami
FL-Flood EQ-Earthquake

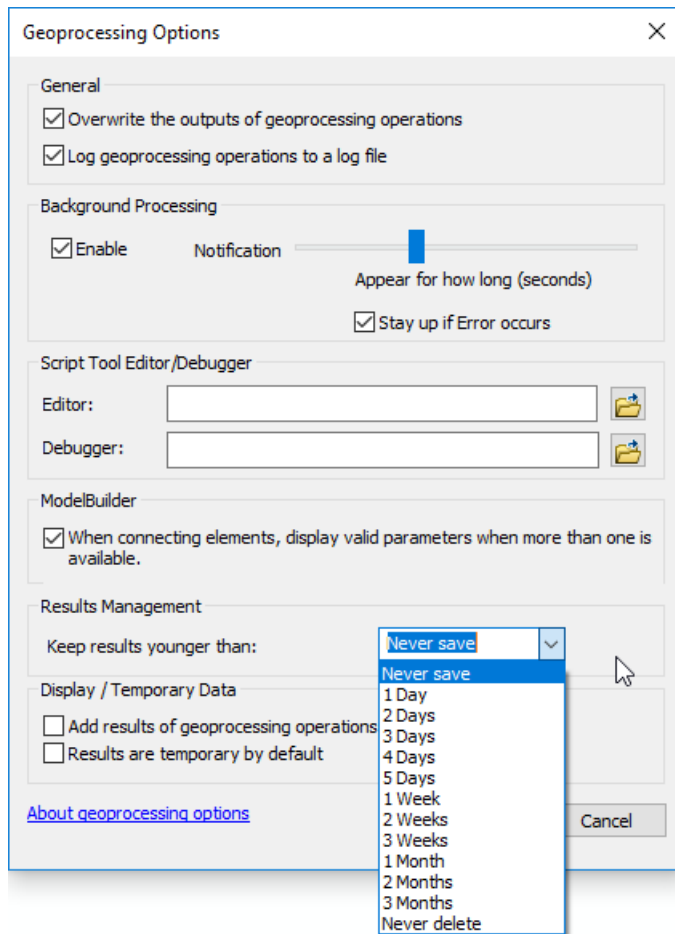
- An error that resulted in reversed county names for St Croix and St Thomas in the Virgin Islands was corrected.

Flood Model:

- User Data/Depth Grid quality assurance and format verification checks are provided. User tips and more user-friendly messaging are provided if a depth grid fails to load as shown below:



- Messaging during user grid import process within User Data Graphic User Interface (GUI) is added to clarify ongoing operations.
- The User Data GUI is updated to communicate that optional return period parameters are required for probabilistic scenarios and the user is prompted to enter a return period.
- Progress label area messaging within User Data GUI is updated to refer to spatial reference systems in plain English.
- Failure to import depth grids no longer corrupts the study region.
- Typos in flood reports were corrected.
- User modified and added custom depth damage functions have been validated to produce expected results.
- New GeoProcessing (GP) option settings for the flood study region .mxd were added to address excessive map template save times after running hydrology and hydraulics. The saving of GeoProcessing results within the GP Results pane of the study region .mxd was resulting in very slow save and reopen times, depending on the extent of GP Results. The setting has been changed from the default value of "Two Weeks" to "Never Save" as shown below:



- A defect was fixed where the sum of damaged building counts pre- and post-NFIP exceeded total inventory building counts in cases of extreme flooding. Building counts are now calculated correctly for such scenarios.

Earthquake Model:

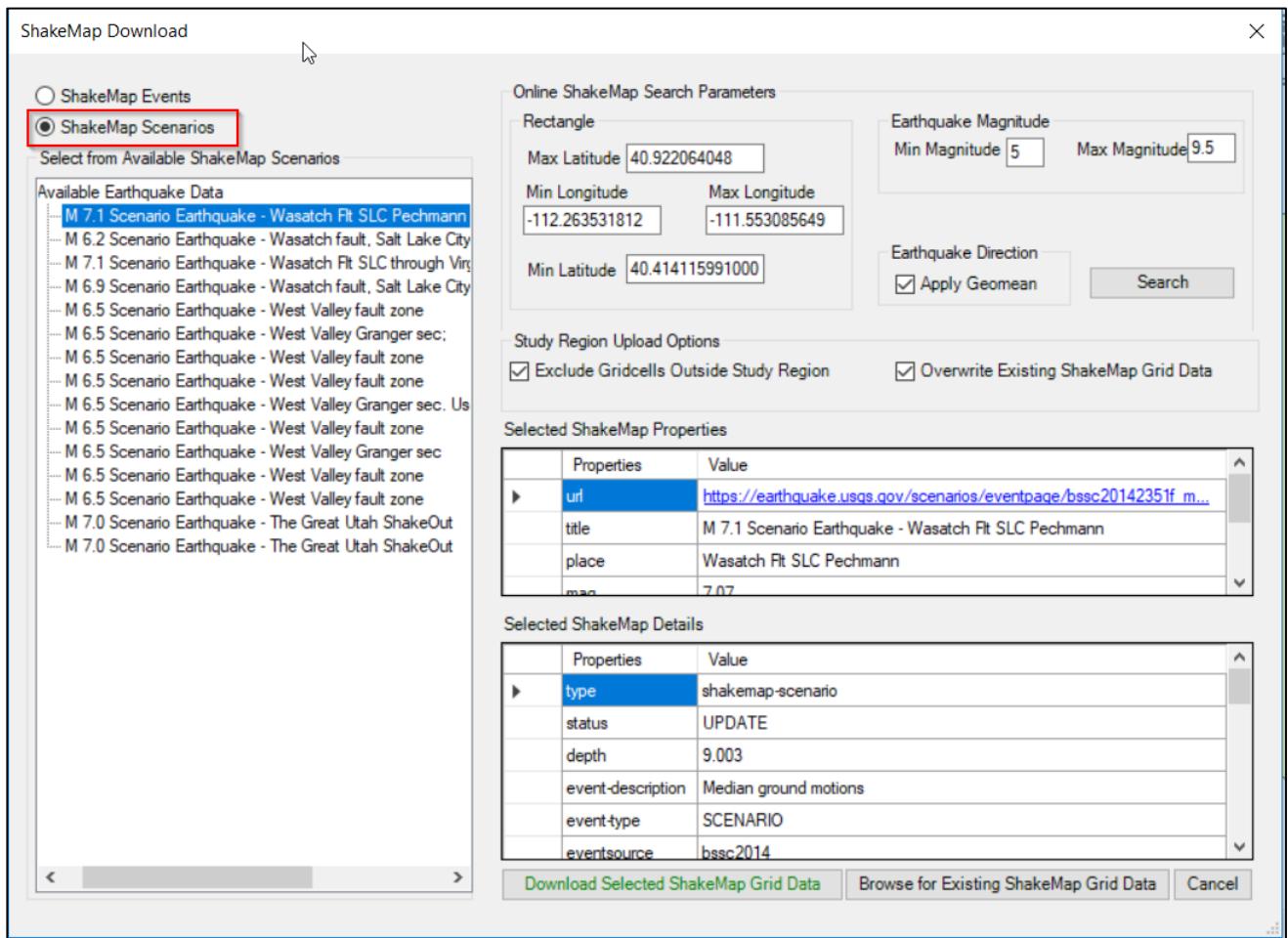
- Supports both a Level 1 and Advanced User option for the treatment of soil amplification with USGS probabilistic ground motion grids:
 - Users with default/no user supplied soils data will automatically use the new site soil characterization data based on USGS 2016 Vs30 now available for probabilistic scenarios (see FEMA P-366 USGS NEIC methodology <https://www.fema.gov/media-library/assets/documents/132305>). In the past, all probabilistic ground motion data were amplified by the overly conservative Type D soft soil category.
 - Users with custom/user-supplied soils data will use the original non-amplified USGS 2016 probabilistic ground motion grid

and Hazus will apply National Earthquake Hazard Reduction Program (NEHRP) soil amplification to ground motions based on the user's soil map data.

- The Advanced Engineering Building Module (AEBM) processing time is substantially optimized as shown below to support large (>1,000) record sets:
 - Runtimes for intersecting large AEBM datasets with ground motion, as well as soils, landslide and liquefaction hazard data is optimized.
 - Runtimes for estimating casualties associated with the large AEBM inventories were optimized by moving the calculation to a SQL table.

| EQ Scenario | Time taken | Ground Motion Optimization | Casualty Optimization | No. of Buildings | Study Region |
|--------------------|-------------------|-----------------------------------|------------------------------|-------------------------|---------------------|
| Probabilistic | 5 hrs 23 mins | No | No | 115,496 | Salt Lake, UT |
| Probabilistic | 2 hrs 40 mins | Yes | No | 115,496 | Salt Lake, UT |
| Probabilistic | 6 mins 12 secs | Yes | Yes | 115,496 | Salt Lake, UT |
| ShakeMap | 4 hrs 23 mins | No | No | 115,496 | Salt Lake, UT |
| ShakeMap | 2 hrs 44 mins | Yes | No | 115,496 | Salt Lake, UT |
| ShakeMap | 4 mins 53 secs | Yes | Yes | 115,496 | Salt Lake, UT |

- Extended the existing automated interface with USGS ShakeMap data to include available USGS ShakeMap scenario earthquake events in addition to actual events:
 - A list of available scenarios from the USGS online library will be presented to the user within the GUI.
 - USGS ShakeMap Scenario Search and Download is automated based on the scenarios available and impacting the users study region.
 - Based on performance testing against recent earthquake events using Hazus and ShakeMap, the “Apply Geomean” check box is selected by default for all ShakeMap events as shown below.



- All damage function parameters for highway, rail and light rail facilities were made to be editable by the user.
- New thematic mapping of facility functionality is provided based on a scale of 0-100% functional associated with a red to green color ramp. This was changed from the frequently misinterpreted use of confidence level mapping where facilities were mapped as functional or non-functional.
- Corrected total households without power or potable water estimates when results from more than one State were reported. In the past, household utility outage reporting with multi-state regions resulted in double counting of households.
- Earthquake hazard mapping (ground motions and hazard maps) have been optimized and symbology was enhanced:
 - Ground motion symbology in Hazus is updated to match the standard ground motion color ramps provided by the official source (USGS ShakeMap).
 - Performance is improved by excluding ShakeMap grids outside the study region and not needed (not felt) from mapping.
 - New message map tips are provided in the ShowMap GUI and

a past issue where the GUI would crash after opening and closing is fixed.

- A correction in the casualty code that can produce erroneously high commercial casualties when commercial square footage inventory is close to 0 was implemented. This was relatively rare since commercial square footage is either 0 or relatively large.

Hurricane Model:

- Ensured that storm track data are mappable and scenario track data are saved for study regions:
 - The probabilistic scenario storm track is now mappable for each representative return period. The track is represented by the probabilistic scenario track that represents the largest general building stock economic loss for each probabilistic return period.
 - Scenario storm track data will always be available and will render when added to the users Table of Contents through the Results → track mapping option.
- Ensured that county boundaries available in the Table of Contents will align with the county boundaries provided by the Hazus system files.
- Prevented deterministic scenario crashing while saving the storm tracks:
 - Geographic limitations for input data were removed for the Hurrevac data import that resulted in scenario crashing with the recent Hurricane Lane.
 - The huStormTrack personal geodatabase feature extent was modified to support a global extent, removing any cutoff related to longitude or latitude.
- Labels for pie charts in the Hurricane Global Summary report were corrected.
- Automatic report and map generation is unchecked by default at analysis runtime to decrease processing time.

Data Changes:

- Missing probabilistic hurricane wind field data for Alabama and Connecticut available in the Table of Contents was corrected.
- Required hurricane state data files were restored in West Virginia reenabling Hazus Hurricane module loss assessment capabilities for the state.
- NULL values in state data for utility distribution line aggregated tract data for potable water, sewer and natural gas were replaced with 0's. When NULL the analysis can produce erroneously high leak and break counts.
- Nuclear Power Plant facilities were removed from High Potential Loss Facility state databases due to potential sharing issues.

3. Known Issues

In addition to items listed above, this section outlines issues that are known to occur in Hazus 4.2.2 but were present prior to Hazus 4.2.2 development. Recommendations to address these issues are provided where applicable.

- Large depth grids (>10GB) or those in State Plane coordinate systems commonly fail during Hazus User Supplied Depth Grid processing and transformations. It is recommended that users in these cases transform their depth grid to their Hazus study region required UTM Zone projected coordinate system, and WGS84 datum. Exporting these as ArcGRID will also save Hazus processing time and prevent the creation of ArcGRID copies in the users HazardInput folder.
- If the user is trying to use a very large (>10GB) or higher resolution or mixed resolution DEM, mosaicing, resampling and transforming to a UTM Zone projected coordinate system, WGS84 datum and exporting as an ArcGRID outside of Hazus may be required.
- Occasionally, running Historic and Hurrevac storms in hurricane with the surge option enabled will cause an error during analysis. This is believed to be caused by incomplete SLOSH basin data, however a more thorough investigation is needed.
- When available, using the Historic storm option in hurricane over those in the Hurrevac database will provide more accurate results.
- Occasionally users have reported crashing at the Fire Following Earthquake analysis step in the earthquake model. Typically reopening and restarting analysis of out of date modules will repair the issue.
- Some users have noted that Hazus closes unexpectedly after running Average Annual Loss for Earthquake. Users can reopen the study region, and results will be populated as expected.
- When mapping Hazus inventory and results, the SQL layer, which is generated by Hazus, may not support ArcGIS modifications. It is recommended that the user right click and export the layer. This new, exported layer can be modified.
- CDMS users at the FEMA's Emergency Management Institute (EMI) and users with similar workstation security settings may be unable to export to Excel. Please contact the Hazus Help Desk for a workaround: hazus-support@riskmapcds.com.