E0317: Comprehensive Data Management for Hazus

Student Manual

Date Released: 07/2019

Contents

Lesson 1: Introduction and Course Overview

Visual 1: Lesson 1: Introduction and Overview

Visual 2: Let's Get Acquainted!

Participant introductions

- Name
- Organization
- Role in organization
- GIS and hazard analysis experience
- Goals and expectations for this class

Instructor introduction

Visual 3: Course Overview

Goal:

Explore methods for updating Hazus inventory using Comprehensive Data Management System (CDMS).

After completing this class, you will be able to:

- Update the default Hazus inventory
- Update the Study Region inventory
- Identify inventory components that have a significant impact on Hazus loss estimates

Visual 4: Prerequisites

- Complete the Basic Hazus course or have equivalent knowledge.
- Complete the ArcGIS for Emergency Managers course and/or have basic working knowledge of ArcGIS.
- Ideally, have some familiarity with database and risk assessment concepts.

Visual 5: Course Outline

Lesson 1 Introduction and Course Overview
Lesson 2 Hazus Database Structure
Lesson 3 CDMS Structure
Lesson 4 Site Specific Inventory Updates
Lesson 5 Aggregate Inventory Updates
Lesson 6 Mapping Schemes
Lesson 7 Study Region Editing
Lesson 8 Data Management Strategies and Capstone Exercise
Lesson 9 Wrap-Up

Visual 6: Course Tools

Tools used in this course will include those easily accessible to the majority of Hazus users.

- Hazus
- CDMS
- ArcGIS Desktop (or ArcGIS Pro for non Hazus work)
- Microsoft Access
- Microsoft Excel
- Microsoft SQL Management Studio

Visual 7: Course Documentation

- Student Guide
- Hazus Technical and User Guidance Documents
- CDMS User Guidance
- CDMS Data Dictionary
- CDMS Help
- Hazus Metadata

Visual 8: Hazus Data Dictionary

The CDMS Data Dictionary has been included with the CDMS installation and is found in the CDMS installation folder.

- C:\Program Files (x86)\Hazus-MH\CDMS is the default location

The data dictionary provides detail on the datasets and fields for the inventory within CDMS.

Visual 9: Hints for Success

Ask LOTS of questions! There are NO "silly" questions.

Share your experiences with the rest of the class - they will learn from you and you from them.

Try to apply the concepts presented in class to your own needs. If you don't see applicability, ask for an example.

Practice the skills that you learn in class right away.

- In class (exercises and "experiments")
- After class (use it or lose it)

Visual 10: Course Activities

Multiple hands-on activities throughout the course.

Activities are oriented around a storyline.

- Based on a GIS coordinator that collects data from local communities or organizations and uses it to improve the Hazus provided inventory.
- Most activities focus on updating the state databases.

Activities will not show you how to update every type of inventory. They focus on showing you strategies that can be applied to the entire inventory.

Visual 11: Source Data Conventions

The following conventions have been used throughout the CDMS course:

Activity materials are found in:

C:\E0317_ActivityData\ActivityX_X

C:\E0317_ActivityData\Reference

File name convention is:

<State>_County>_<Facility>_<Hazard>.xxx

e.g., UT_SaltLake_MedicalFacilities_EQFL.xls

Visual 12: Activity 1.1

The Instructor will lead the class to:

- Explore activity data organization
- Review file naming conventions used in the course
- Explore Hazus inventory documentation

Visual 13: Hazus Review

- Estimates social and economic impacts of hurricanes, flood, tsunami, and earthquake hazards.
- Uses damage information to estimate direct dollar losses for:
  - Buildings
  - Lifelines
  - Regional economy
- Answers “What if…?” questions:
  - Building code modifications
  - Levee or flow regulation structure
  - And much more…

Visual 14: Secret to Successful Analysis

- Credible Hazard Data
- Credible Damage Functions
- Credible Inventory (the focus of this course)

Visual 15: How Does Hazus Estimate Losses?

Visual 16: What is a Study Region?

Input data for hazard analysis

- Sub-set of the Hazus statewide databases.
- No relationship exists with the state data once a Study Region is created.
- Size of Study Region is determined by what needs to be analyzed and by database limitations.

Visual 17: Activity 1.2

The Instructor will demonstrate how to update the State database using CDMS.

- Compare the before and after versions—how do they differ?

Visual 18: Review

- What are the four hazards that Hazus supports?
- List the steps of a Hazus loss estimate study.
- Hazus uses damage information to estimate direct dollar losses for what three categories?

Visual 19: Questions?

Lesson 2: Hazus Database Structure

Visual 1: Lesson 2: Hazus Database Structure

Visual 2: Goal and Objectives

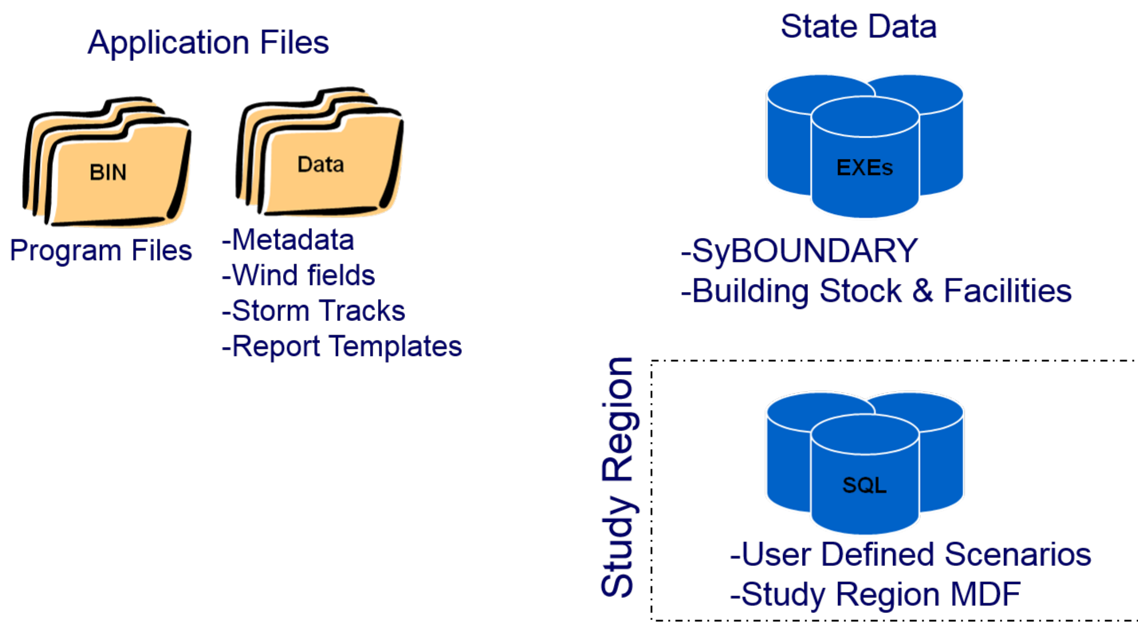
Goal:

Discover the structure and contents of the inventory that is provided with Hazus.

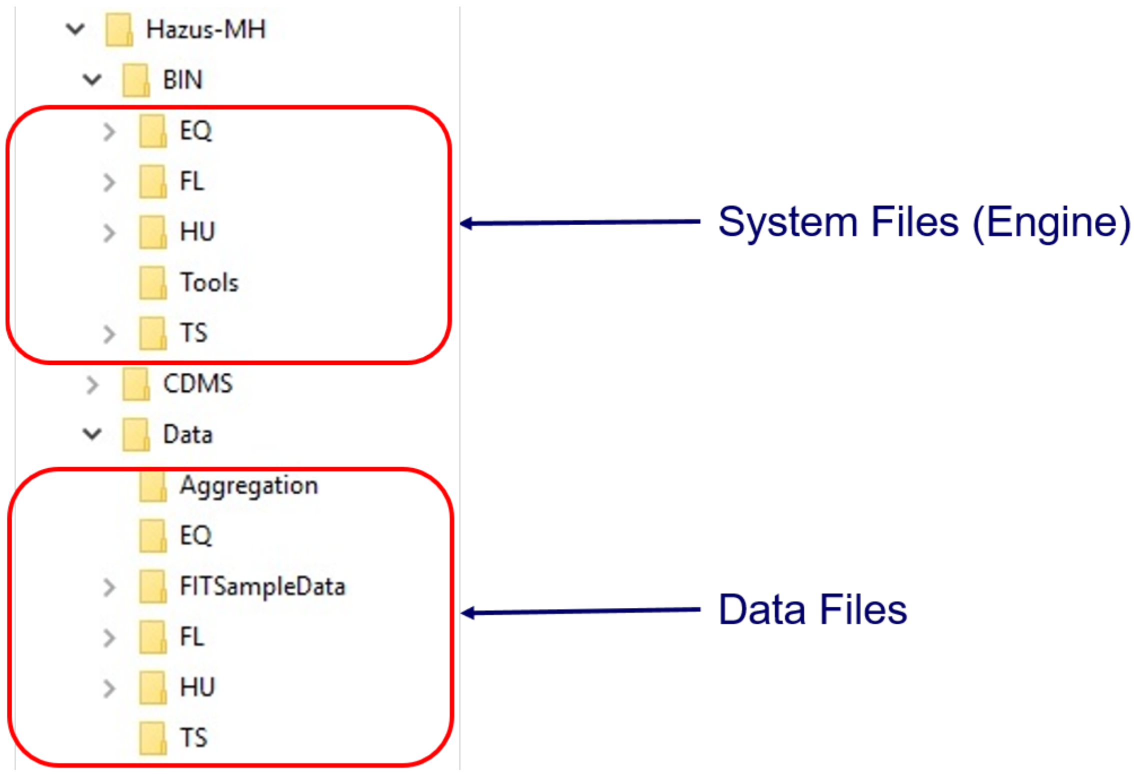
After completing this lesson, you will be able to:

- Navigate the default site specific data sets
- Navigate the default General Building Stock
- Navigate the default mapping schemes

Visual 3: Organization of Hazus Data

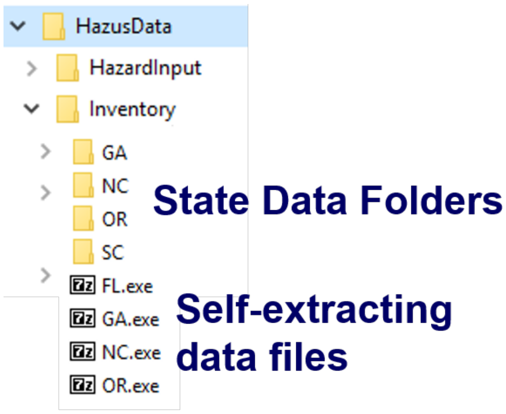


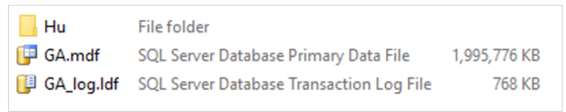
Visual 4: Hazus Folder Structure



Visual 5: State Data

Hazus data sets are downloaded as self extracting Zip files for each state (e.g. SC.exe).





Every State folder has SQL Server Database where the data is stored. Hurricane States have an additional folder for hurricane hazard information (Hu folder)

Visual 6: Structured Query Language (SQL)

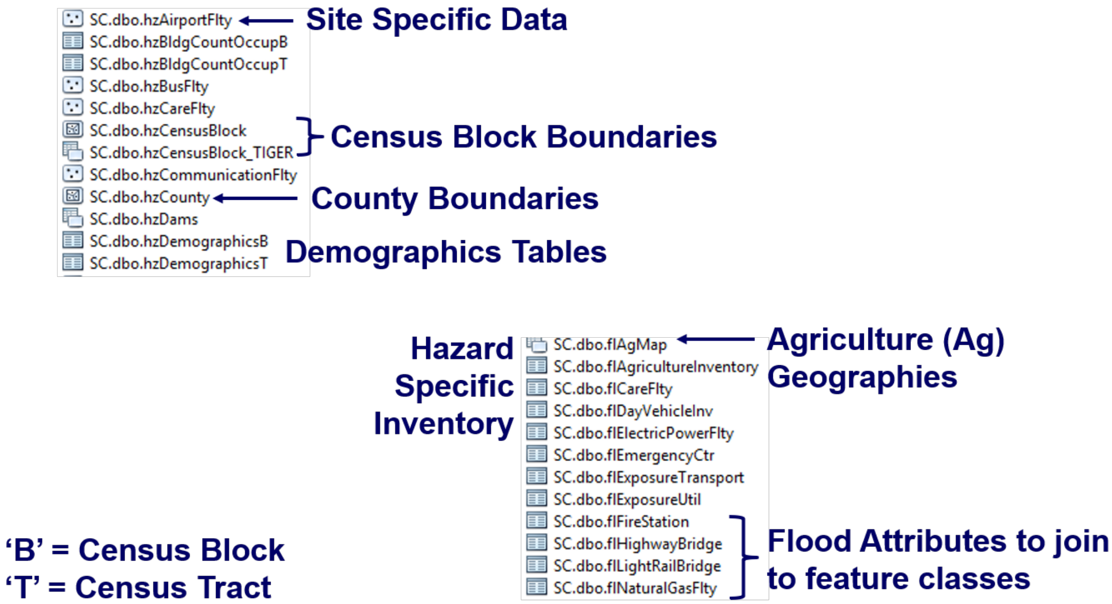
- Hazus uses SQL Server as its database engine to manage all the data and the relationships between the data.
- SQL queries are:
  - the standard language for relational database management systems
  - used to communicate with the State and Study Region database
- Users can access the Hazus State and Study Region databases using ArcCatalog.

Visual 7: Table Nomenclature

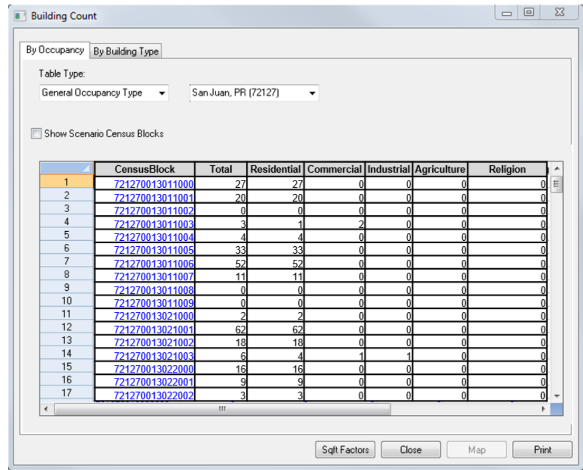
Users can interpret database content in part based on the table naming convention.

- HZ Common hazard table
  Shared between earthquake, flood, hurricane and tsunami
- FL Flood-specific table
- EQ Earthquake-specific table
- HU Hurricane-specific table
- TS Tsunami-specific table
- cl Lookup tables - domains

Visual 8: State Data Contents



Visual 9: General Building Stock (GBS)



The GBS is an engineering based estimation of structures by occupancy.

Reported by:

- Square footage
- Dollar exposure
- Building count

Relationships

- Linked during development
- Not linked in software

Visual 10: GBS Reporting by Model

Reported by Census Geography

- Flood Model – Census Block
  - Dasymetric – mapping removes undeveloped areas such as areas covered by other bodies of water, wetlands, or forests, from the Census blocks, changing their shape and reducing their size in these areas
- Earthquake Model – Census Tract

Tract Boundaries for Charleston, SC

Dasymetric Block Boundaries for Charleston, SC

Visual 11: GBS Reporting by Model (cont.)

- Hurricane Model – Census Tract (unless combined with a flood model, in which case it uses census block)
- Tsunami Model – USACE National Structure Inventory (NSI) point data (developed with FEMA)

Note: If a user make changes to the GBS, be sure that all changes to the Block geographies are rolled-up to the Tract. Also, if point analysis is to be done, the point inventory should ideally match the aggregate inventory.

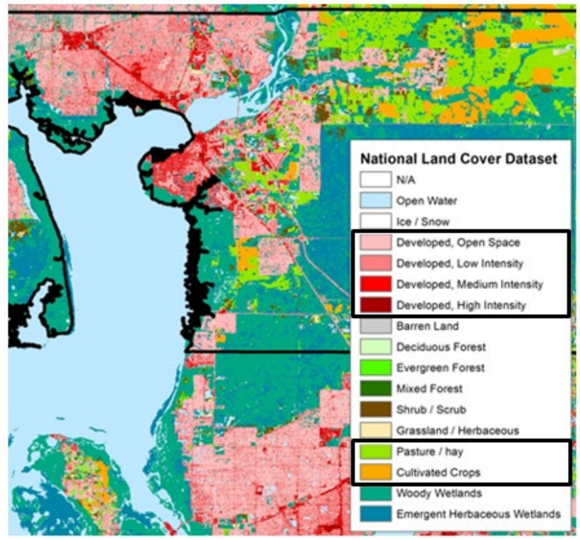
Visual 12: National Structure Inventory (NSI)

- U.S. Army Corp of Engineers' National Structural Inventory point data. Developed with FEMA.
- Creates notional structures, or 'points,' in the developed portion of each census block to represent the numbers and types of buildings that occur based on size, occupancy type, construction materials, etc.

Visual 13: Flood-Specific Inventory

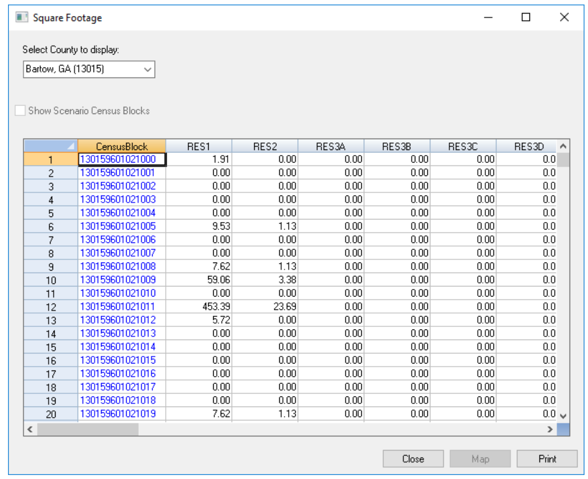
Dasymetric Inventory:

- Assumes building exposure only exists within areas which satellite and land-use confirm there exists a built environment.
- 2011 National Land Cover Dataset (NLCD)
- Highlighted classes in legend are kept.



Visual 14: General Building Stock (GBS)

- All square footage values are reported in thousands of square feet.
- Basis of all subsequent GBS tables such as value and count.
- The square footage data and the valuations are the most critical information in the aggregate inventory.

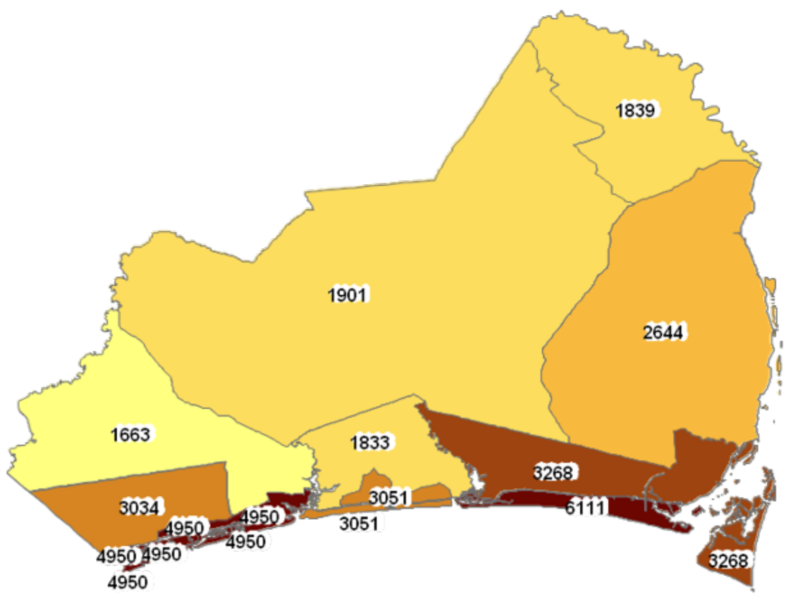


	CensusBlock	RES1	RES2	RES3A	RES3B	RES3C	RES3D
1	130159601021000	1.91	0.00	0.00	0.00	0.00	0.0
2	130159601021001	0.00	0.00	0.00	0.00	0.00	0.0
3	130159601021002	0.00	0.00	0.00	0.00	0.00	0.0
4	130159601021003	0.00	0.00	0.00	0.00	0.00	0.0
5	130159601021004	0.00	0.00	0.00	0.00	0.00	0.0
6	130159601021005	9.53	1.13	0.00	0.00	0.00	0.0
7	130159601021006	0.00	0.00	0.00	0.00	0.00	0.0
8	130159601021007	0.00	0.00	0.00	0.00	0.00	0.0
9	130159601021008	7.62	1.13	0.00	0.00	0.00	0.0
10	130159601021009	59.06	3.38	0.00	0.00	0.00	0.0
11	130159601021010	0.00	0.00	0.00	0.00	0.00	0.0
12	130159601021011	453.39	23.69	0.00	0.00	0.00	0.0
13	130159601021012	5.72	0.00	0.00	0.00	0.00	0.0
14	130159601021013	0.00	0.00	0.00	0.00	0.00	0.0
15	130159601021014	0.00	0.00	0.00	0.00	0.00	0.0
16	130159601021015	0.00	0.00	0.00	0.00	0.00	0.0
17	130159601021016	0.00	0.00	0.00	0.00	0.00	0.0
18	130159601021017	0.00	0.00	0.00	0.00	0.00	0.0
19	130159601021018	0.00	0.00	0.00	0.00	0.00	0.0
20	130159601021019	7.62	1.13	0.00	0.00	0.00	0.0

Visual 15: GBS - Building Count

Reported in actual number of buildings:

- Count by Occupancy
  - General Occupancy
  - Specific Occupancy
- Count by Building Type
  - General Building Type
  - Specific Building Type



Total Single Family Dwellings

Visual 16: GBS - Building Count (cont.)

Most of the building counts in the General Building Stock are derived from the square footage factor table that provides average square footage for each specific occupancy determined from the Census and DOE data.

* RES1 (single family homes) and RES2 (manufactured housing) are derived from Census housing unit counts.

Occupancy	Square Footage
RES1*	1,800
RES2*	1,475
RES3A	2,200
RES3B	4,400
RES3C	8,000
RES3D	15,000
RES3E	40,000
RES3F	80,000
RES4	135,000
RES5	25,000
RES6	25,000
COM1	110,000
COM2	30,000
COM3	10,000
COM4	80,000

Occupancy	Square Footage
COM5	4,100
COM6	55,000
COM7	7,000
COM8	5,000

Visual 17: General Building Stock

Valuations:

Valuation models based on industry standard cost data* (Square Foot Costs)

Occupancy	HazusDefinition	OccupancyExample	MeansCost
RES1	Single Family Dwelling	Refer to hzRES1ReplCost	
RES2	Manufactured Housing	Manufactured Housing	41.97
RES3A	Multi Family Dwelling – small	Duplex	113.69
RES3B	Multi Family Dwelling – small	Triplex/Quads	99.95
RES3C	Multi Family Dwelling – medium	5-9 units	179.48
RES3D	Multi Family Dwelling – medium	10-19 units	168.80
RES3E	Multi Family Dwelling – large	20-49 units	184.58

RES1 is subdivided

Description	HeightClass	AverageBaseCost	FinishedBasementCost	UnfinishedBasementCost
Economy	1 story	84.03	25.50	8.80
Economy	2 story	90.11	14.35	5.80
Economy	3-story	90.11	14.35	5.80
Economy	Split level	83.59	14.35	5.80
Average	1 story	115.20	30.80	10.55
Average	2 story	112.40	19.75	6.90
Average	3-story	118.19	15.60	5.40
Average	Split level	104.01	19.75	6.90

Finished basements

	Econ.	Avg.	Custom	Luxury
Total finished base-ment cost/SF of main	$14.25	$18.10	$26.10	$32.30
Total Structure Cost/ SF, including basement	$69.00	$96.88	$125.63	$152.55
Basement as a % of Total	21%	19%	21%	21%

*published by R.S. Means 2018

Visual 18: GBS - Building Valuations (cont.)

- RSMeans published replacement values represent a national average
- When applied locally, costs are adjusted using local/regional multipliers (typically range from 0.7 to 1.4)
- General effect: GBS valuations in southern U.S. are reduced, while valuations along West Coast and Northeast increase

Visual 19: GBS - Inventory

Occupancy Categories

- 7 General Occupancy Types
- 33 Specific Occupancy Types

View the categories from the Inventory menu

Visual 20: GBS - Occupancy Class Mapping

Residential Class Example

General Occupancy Class	Specific Occupancy Class	Specific Occupancy Class Description
Residential	RES1	Single Family
Residential	RES2	Mobile Home
Residential	RES3A	Multi-family Duplex
Residential	RES3B	Multi-family 3-4 Units
Residential	RES3C	Multi-family 5-9 Units
Residential	RES3D	Multi-family 10-19 Units
Residential	RES3E	Multi-family 20-49 Units
Residential	RES3F	Multi-family 50+ Units
Residential	RES4	Hotel/Motel
Residential	RES5	Institutional Dormitory/Group Housing
Residential	RES6	Nursing Home

Visual 21: Specific Occupancy Classes

- Specific Occupancy Categories are defined by Standard Industrial Codes (SIC)
- 33 Specific Occupancy Types
    - Residential (11)
    - Commercial (10)
    - Industrial (6)
    - Religion/Non-profit (1)
    - Government (2)
    - Education (2)
    - Agriculture (1)

Visual 22: GBS - General Building Types

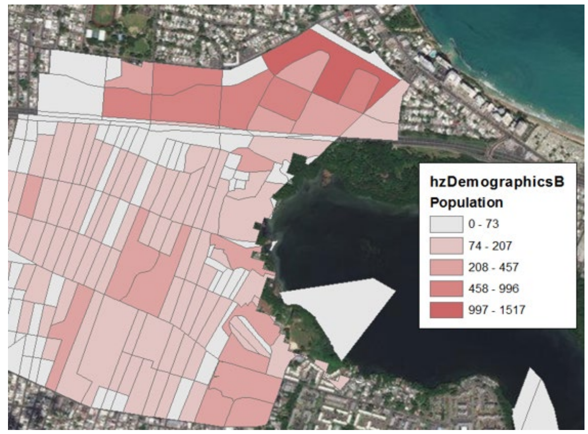
- Used to provide a foundation from which to facilitate comparison of risks posed by the four hazards within a region.
- Additional complexities are added in each model as necessary to understand specific hazards.

General Building Type	Description
Wood	Wood Frame Construction
Masonry	Reinforced or unreinforced masonry construction
Steel	Steel frame construction
Concrete	Cast-in-place or pre-cast reinforced concrete construction
Manufactured Homes	Factory-built residential construction

Visual 23: Demographics Data

Population Data Detailed by 2010 Census:

- Age
- Income
- Ethnicity
- Ownership
- Gender



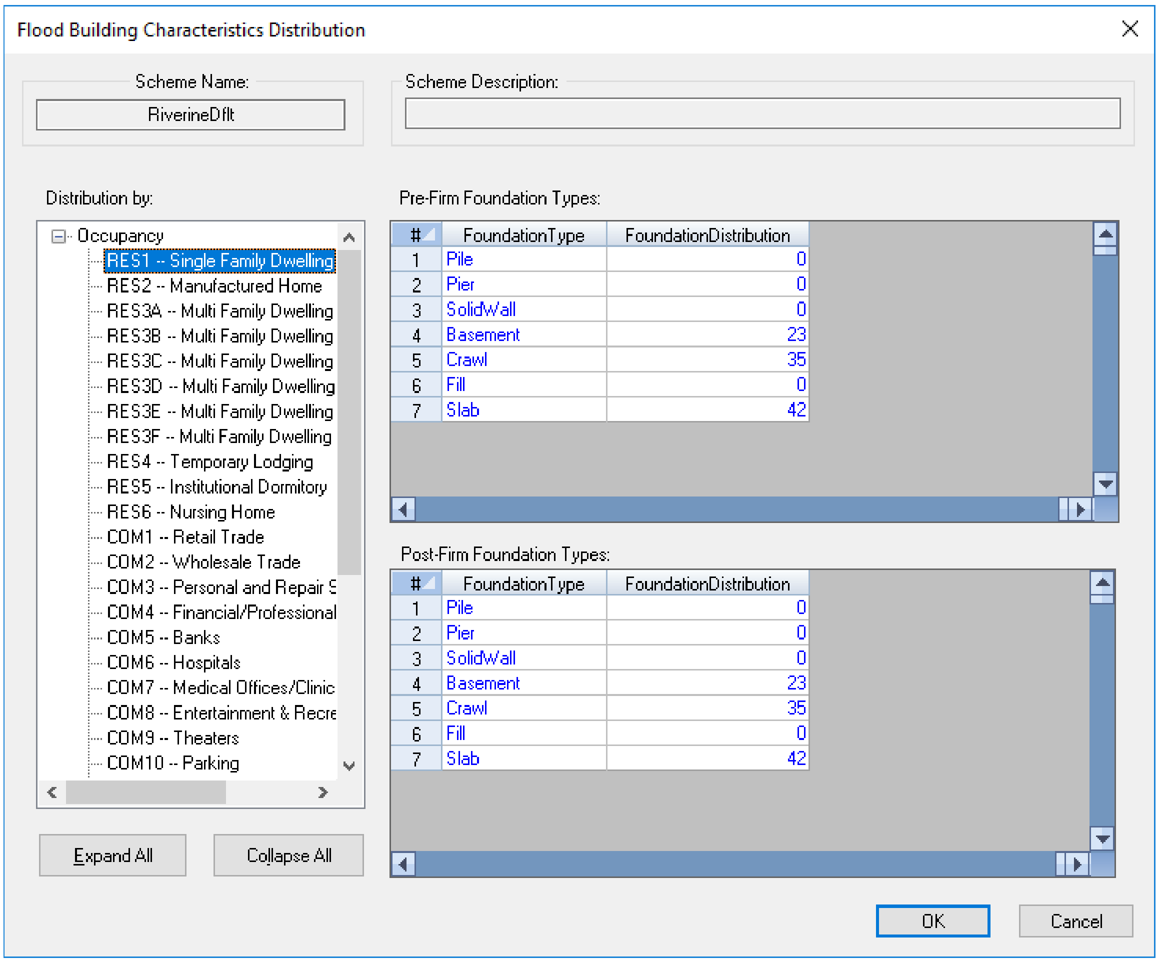
Visual 24: Update Demographic Data

Why is it important to update demographic data?

- Growing or shifting population means changes in hazard risk
- Diverse population may have a variety of needs
- Short-term shelter requirements
- When using outdated data, if the actual population is larger than the estimated population then modelled casualties and/or injuries may be underestimated.

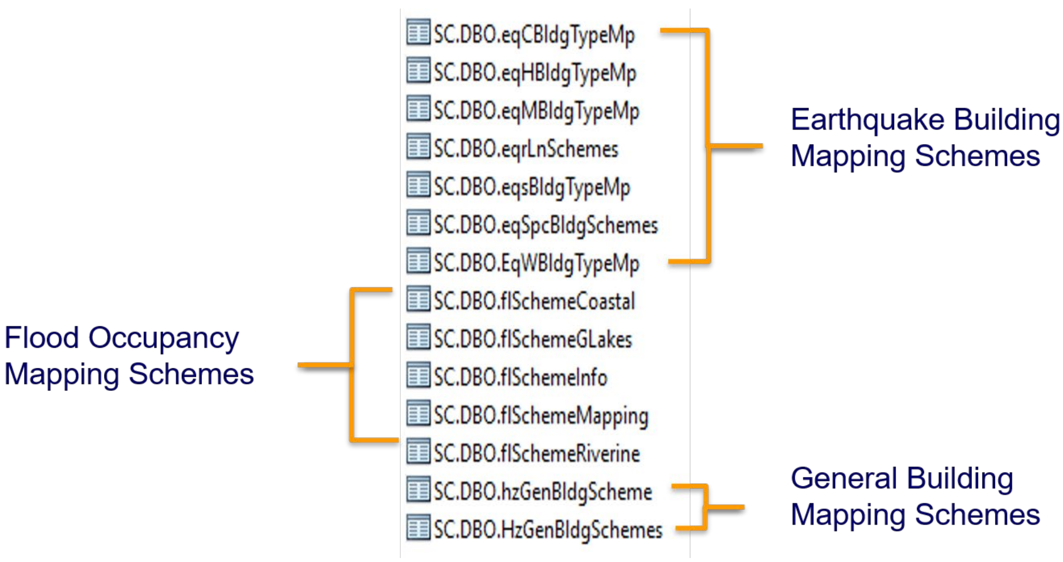
Visual 25: GBS - Mapping Schemes

- Define additional characteristics of structures found in Census tracts or Census blocks
- Unique to each hazard
- Discussed in detail later in the course (Lesson 6)



Visual 26: GBS - Mapping Schemes (cont.)

Earthquake, flood and general building mapping schemes are stored in the following tables in each state SQL database.



Visual 27: Hazus Inventory

Summary of Databases in Hazus:

- Hazus inventory consists of hazard data, boundary map data and a proxy for the general building stock (GBS) in the continental United States, Hawaii and the U.S. held Territories.
- Additionally, Hazus contains national data for essential facilities, high potential loss facilities, selected transportation and lifeline systems, agriculture, vehicles and demographics.

Visual 28: Activity 2.1

Group Activity

Discuss the advantages and disadvantages of updating the default data in Hazus.

Questions:

- Why update the default data in Hazus?
- Where would you find data for inventory updates?
- What are the model specific requirements?

Visual 29: Review

1. Where are the Hazus statewide tables located?
2. What is General Building Stock?
3. Name four types of information about buildings found in the General Building Stock?
4. In which feature class would you find schools?

Visual 30: Questions?

Lesson 3: CDMS Structure

Visual 1: Lesson 3: CDMS Structure

HAZUS®

EARTHQUAKE • WIND • FLOOD • TSUNAMI

Visual 2: Goal and Objectives

Goal:

Introduce the Comprehensive Data Management System (CDMS)

After completing Lesson 3, you will be able to:

- Understand CDMS concepts
- Navigate the CDMS menus

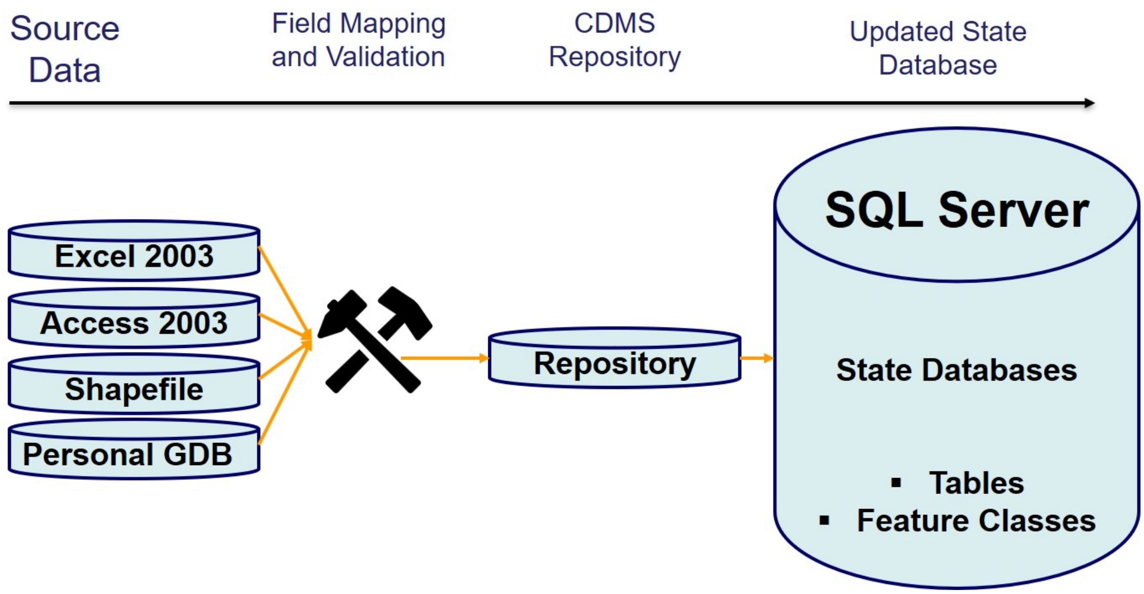
Visual 3: What is CDMS?

CDMS, or Comprehensive Data Management System, is a tool developed by FEMA to support integration of locally developed inventory data into the Hazus loss estimation process.

Primary functions:

- Support transfer of data into and out of the master Hazus state databases
- Provide validation of user supplied data
- Allow users to query inventory information
- Provide a graphic interface for non-SQL users

Visual 4: What is CDMS?



Visual 5: What is CDMS?

Supports a variety of methods for managing Hazus data types:

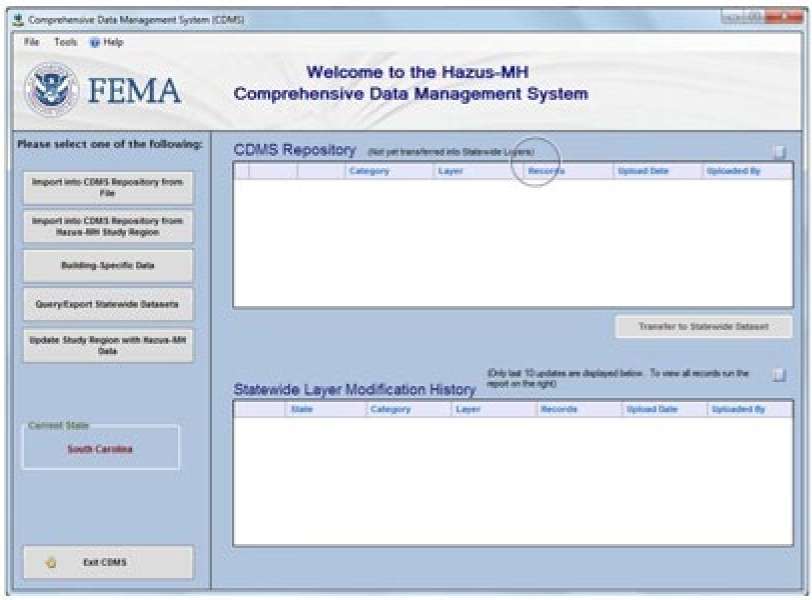
- Site Specific inventory
- Aggregated General Building Stock (GBS)
- Building Specific inventory
- User-Defined Facilities (UDF)

Visual 6: CDMS Home

File menu

Tools menu

Help menu



Visual 7: Activity 3.1

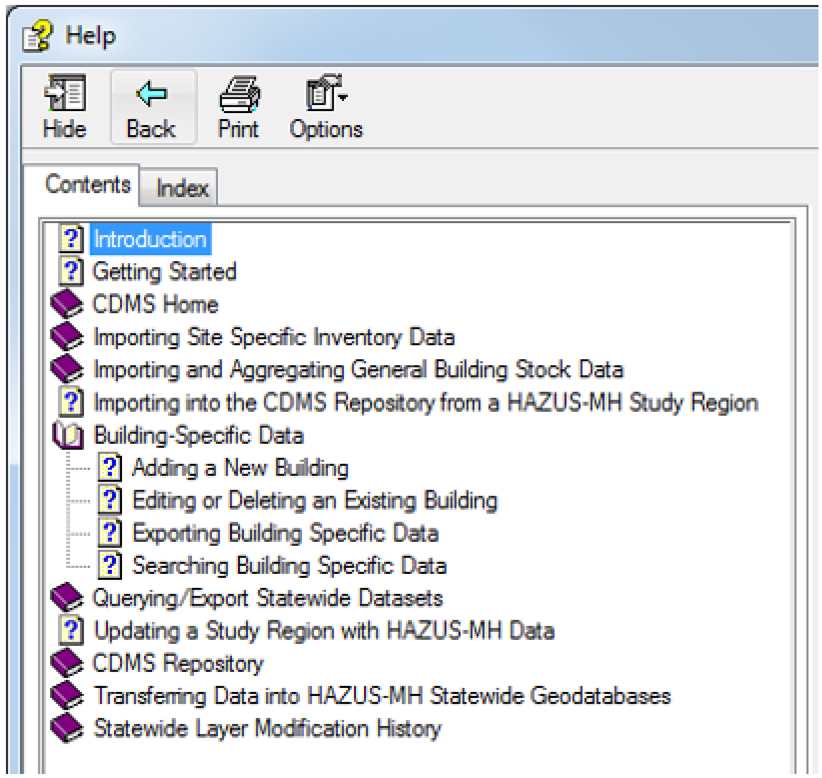
The Instructor will explore the CDMS Home screen options:

- Help
- Point to state database location
- Package state databases
- Query statewide data
- Export statewide data

Visual 8: Help

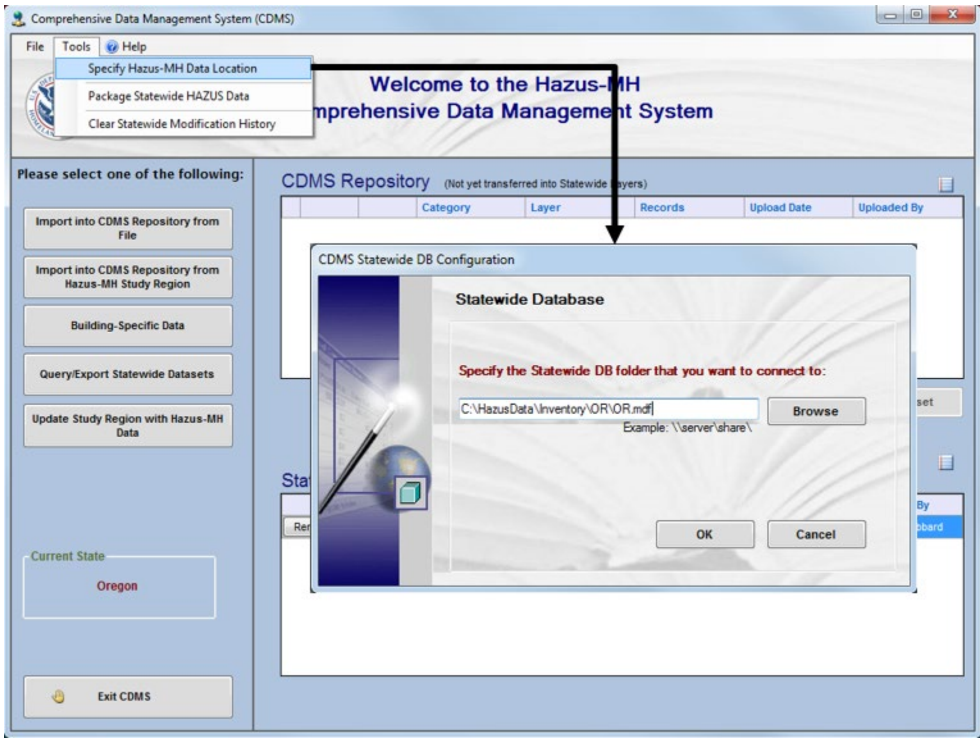
A compiled CDMS Help file is provided and useful for reviewing concepts and definitions.

- Getting Started Instructions
- Searchable
- Querying, Importing, Exporting, and Updating step-by-step instructions



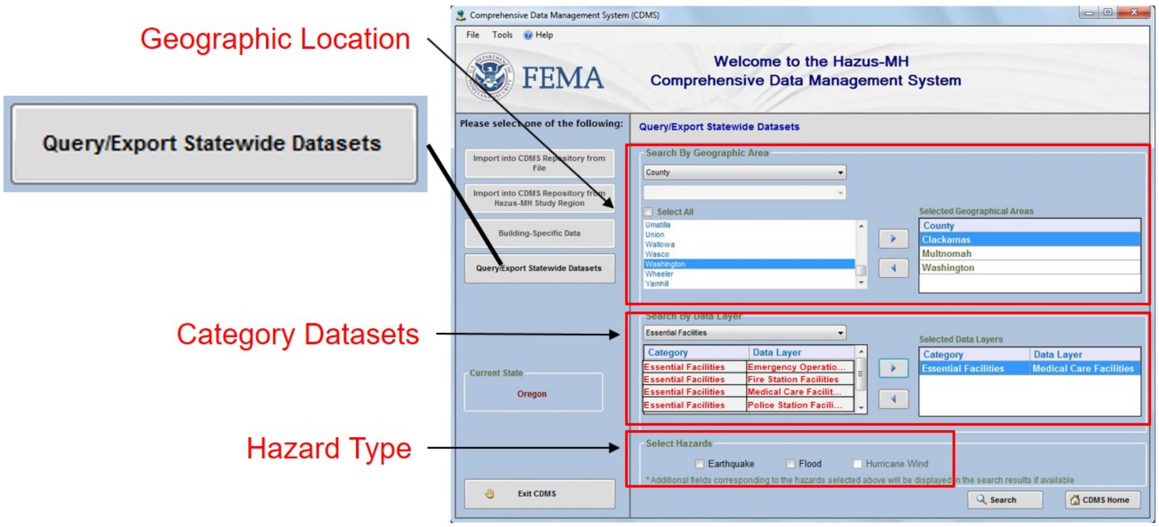
Visual 9: Default State Database

- The first time that CDMS runs, the user must specify a default statewide database location on a local drive
- User will need to update by state if updating data for different states
- Be sure to verify that you have read/write access to the data



Visual 10: Querying Statewide Datasets

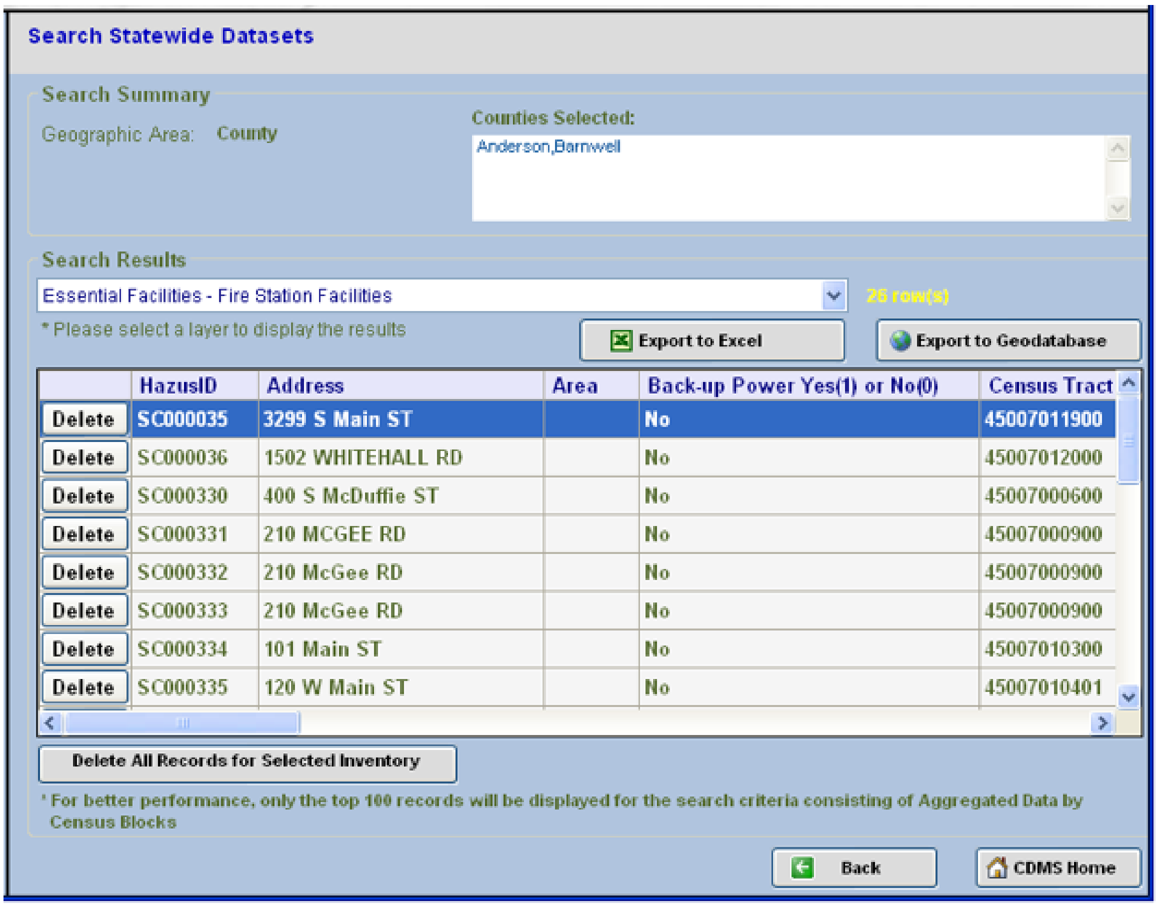
CDMS allows users to query existing state data by State, County, Census Tract, or Census Block.



Visual 11: Export Options

- Delete one or more records*
- Export results to Excel or personal Geodatabase

**This is often a useful step prior to updating the inventory*



Visual 12: Backing Up Data

It is a good practice to export the data of interest BEFORE changing it, so that:

1. You can report the differences between the original “before” and updated “after” records.
2. If something goes wrong, you can always go back to the “before” snapshot.

Visual 13: Hazus-ID

- Hazus relates tables based on a unique ID value - either create this or have CDMS do so.
- Unique ID must be data type text and eight (8) characters in length in the form (SSxxxxxx) where SS is the state name abbreviation (Upper Case) and xxxxxx is a sequential number from 000001 to 999999.
- CDMS only matches Hazus-IDs within the same Census Block.

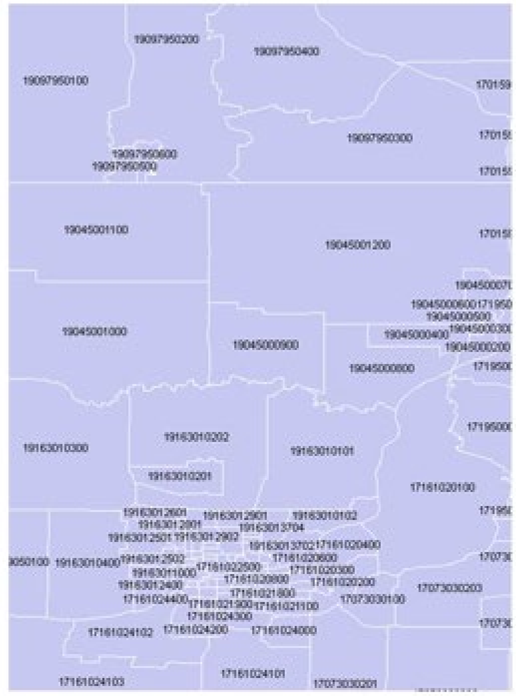
hzFireStation

OBJECTID	FireStationId	EfClass	Tract	Name	Address	City	Zipcode
1	GA000064	EFFS	13319960400	Allentown Volunteer Fire Department	Allen AVE	Allentown	31003
2	GA000065	EFFS	13317010101	Danburg VFD	118 Euel Saggus RD	Tignall	30668
3	GA000066	EFFS	13317010102	TYRONE FIRE DEPARTMENT	4965 GREENSBORO RD	WASHINGTON	30673
4	GA000067	EFFS	13315960100	Abbeville Fire/Rescue	215 S Depot St	Abbeville	31001
5	GA000068	EFFS	13315960200	Pineview Fire Department	103 Warren ST	Pineview	31071

Visual 14: <u>Census ID</u>

Each record in a table must have a Census tract AND block number:

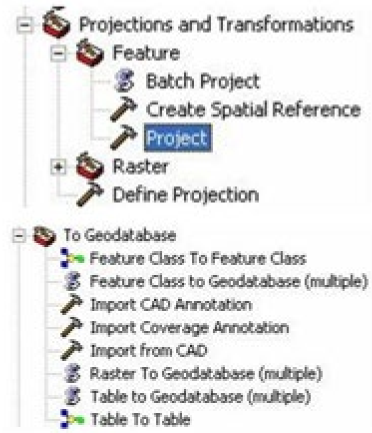
- Must be full Census ID
- State (2 characters) + County (3 characters) + Tract (6 characters) + Block (4 characters)
  - e.g., 180973301021234
- This is CDMS assigned if not provided by user



Visual 15: Coordinate Information

Existing data frequently needs to be ‘massaged’ to make it Hazus compatible:

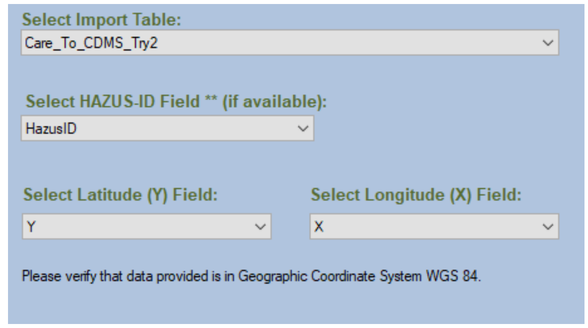
- Transform coordinate system to Geographic WGS 1984
- Convert to CDMS accepted format – if in coverage, CAD, etc.



Visual 16: General CDMS Update Process

1. Select the source data file and destination category
2. Define source data parameters
3. Match fields
4. Categorize data
5. Validation
6. Review results in CDMS repository
7. Transfer to state database

Visual 17: Source Data Parameters

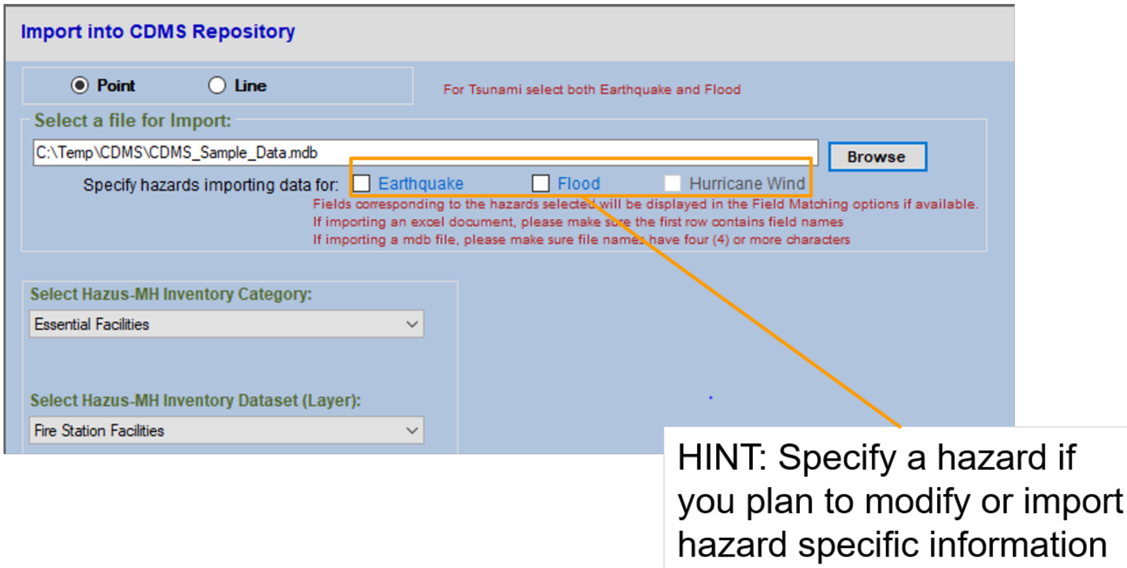


Specifies:

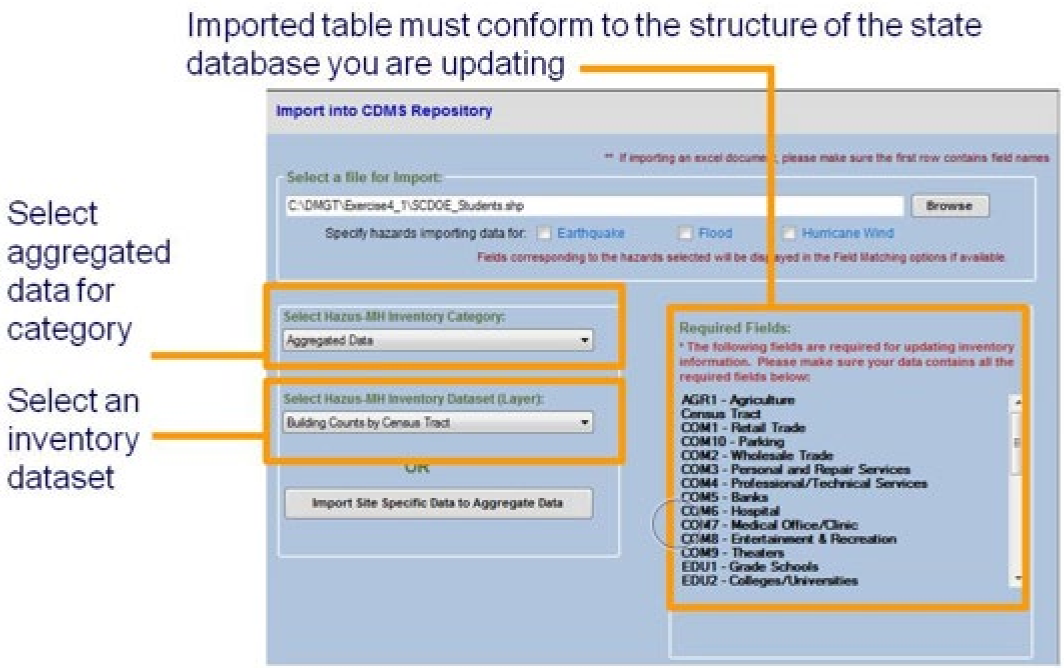
- Table containing data
- Hazus-ID field
- Coordinate fields (dependent on data type)

Visual 18: Source Category and Dataset

File name and location, category, and inventory dataset.

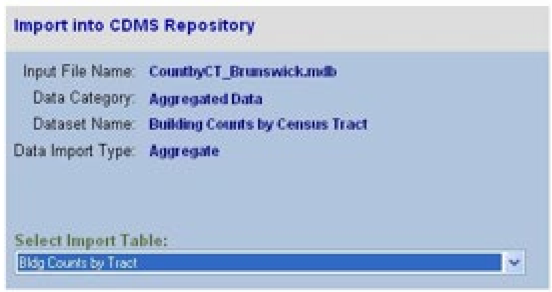


Visual 19: Source To Destination Dataset - Example



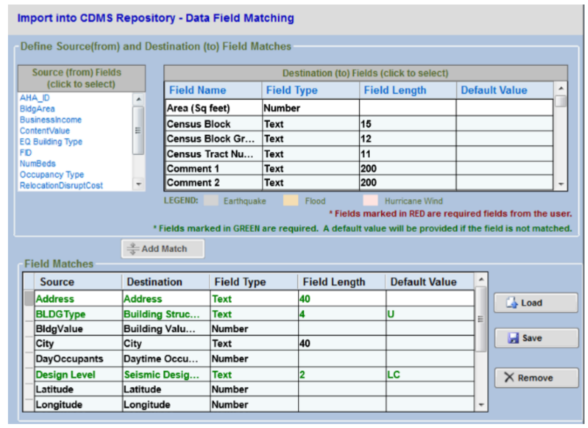
Visual 20: Import Table or Worksheet

- If the import is from a Shapefile, the import table is automatically selected.
- If the import is an MS Access or MS Excel file, the user has to specify the table or worksheet that contains the data.

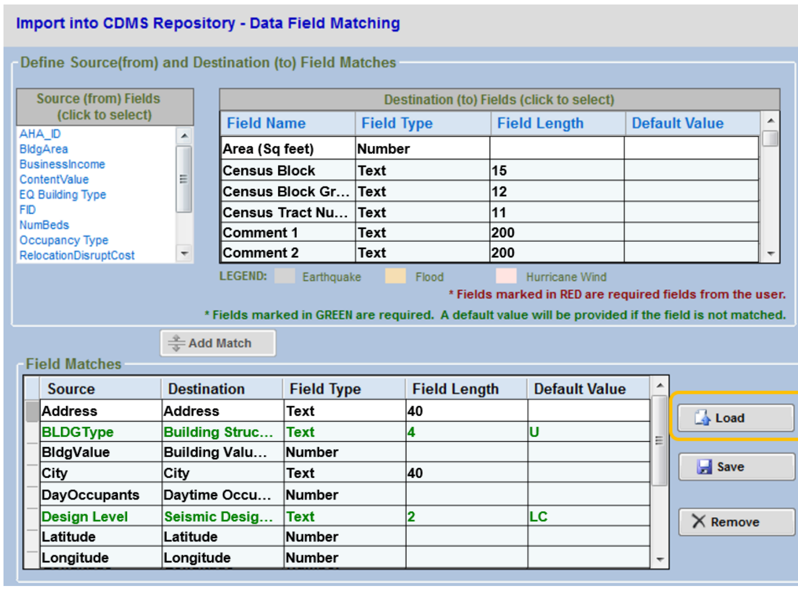


Visual 21: Field Matching

- Specifies how fields in your input table are related to fields in the Hazus inventory.
- CDMS auto-matches fields with the same name and characteristics.
- Colors indicate which fields are required or can have defaults auto-assigned.

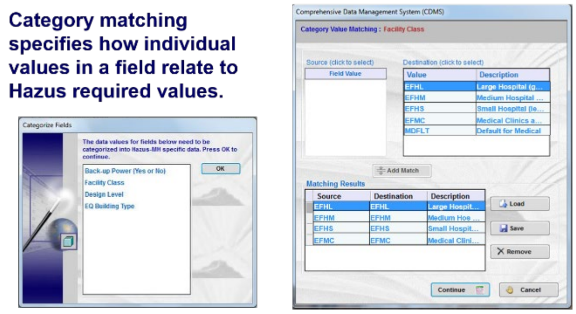


Visual 22: Field Matching (cont.)



Templates save on setup time in cases where you will be importing data on a recurring basis.

Visual 23: Categorizing Data

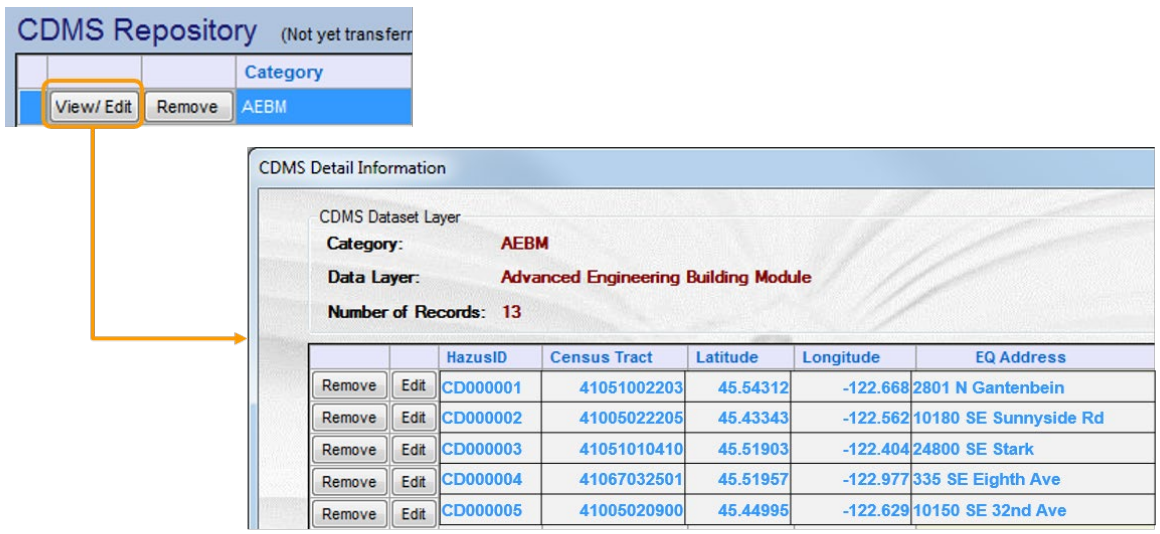


Visual 24: Validation

- The validation process confirms that records have valid values, and that fields match correctly.
- A report is generated as soon as an error is found. Validation may take several passes.
- All errors must be corrected before any records are imported into the CDMS Repository.

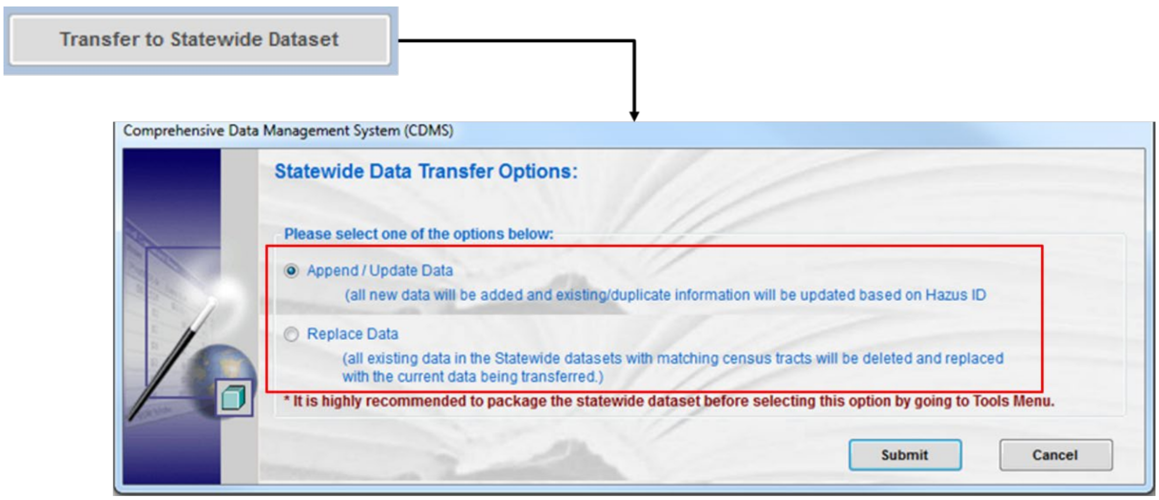
Visual 25: Data Review

- Verify that your data has imported into CDMS correctly before proceeding
- You have the option to remove unwanted records



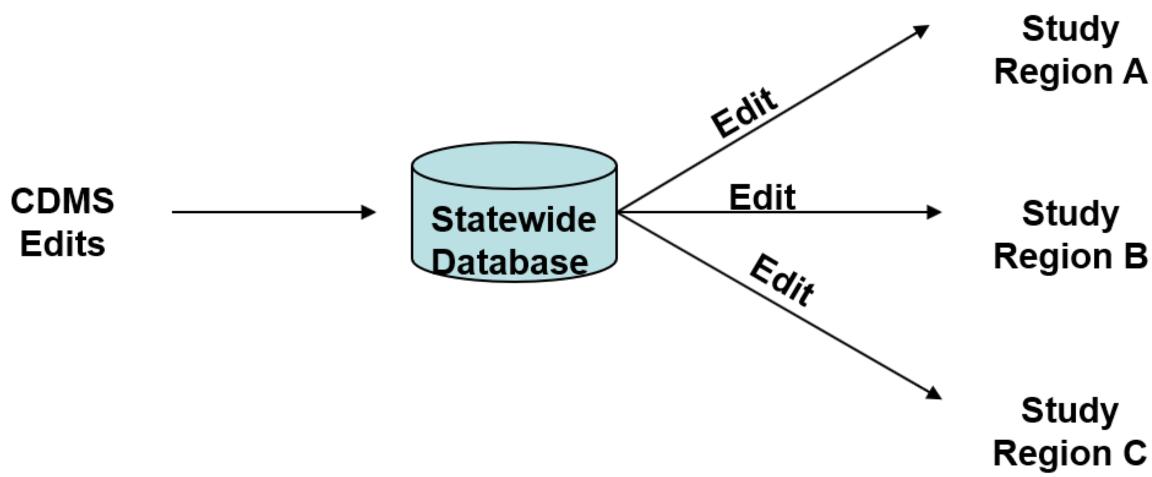
Visual 26: Transferring Data to State Databases

- CDMS stores all imported data in the Repository until you transfer the results to the state dataset
- Two transfer options:
  - Append/Update
  - Replace Data



Visual 27: Editing CDMS vs Study Region

- Updating a statewide database using CDMS is different than updating a study region in Hazus
- Editing a statewide database using CDMS will result in that edit appearing in any study region built using that database



Visual 28: Review

1. Name one of the primary functions of CDMS.
2. What are the options available on the CDMS Home screen?
3. What are the general steps in the CDMS update process?
4. When editing a statewide database using CDMS, where will the edits appear?

Visual 29: Questions?

Lesson 4: Site Specific Inventory Updates

Visual 1: CDMS Site Specific Inventory Updates

Visual 2: Goal and Objectives

Goal:

Learn to use CDMS to update and maintain Site Specific data.

After completing Lesson 4, you will be able to:

- Use CDMS to review and update Site Specific data by type and region.
- Identify strategies for gathering data that can be used to update Site Specific Inventory.
- Describe issues that apply to Site Specific Inventory updates.

Visual 3: <u>Site Specific vs General Building Stock</u>

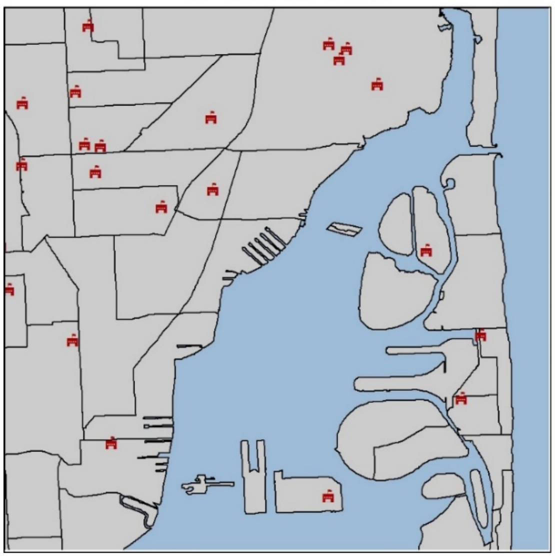
Site Specific

- Provides point locations of buildings

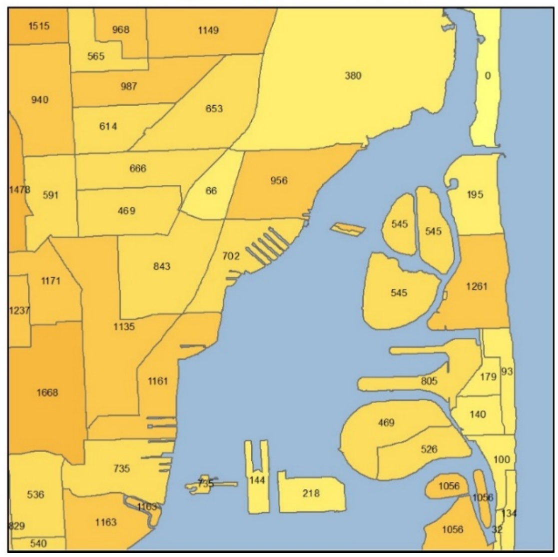
General Building Stock (GBS)

- Aggregated locations

Site Specific (Schools)



GBS (Building Counts By Tract)



Visual 4: Site Specific Update Process

1. Select source data file and destination category
2. Define source data parameters
3. Match fields
4. Categorize data
5. Validation
6. Review results in CDMS repository
7. Transfer to state database

Visual 5: Activity 4.1

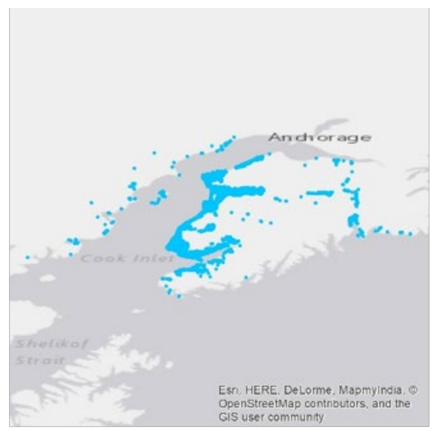
Student Activity

- CDMS Navigation - Site Specific Inventory Updates

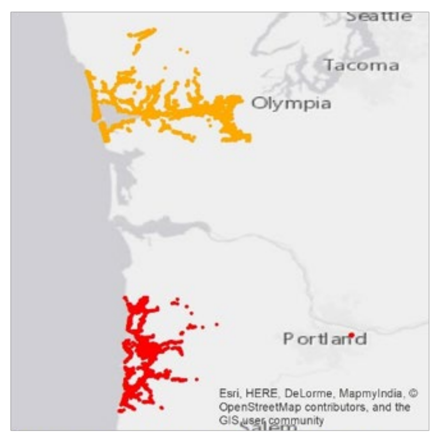
Visual 6: Site Specific Inventory Types

- Essential Facilities: medical, fire, police, etc.
- High Potential Loss Facilities: dams, nuclear, military
- Transportation Systems: bridges, highways, rail, airports, etc.
- Utility Systems: water, oil, gas, electric, etc.
- Hazardous Material Sites
- User Defined Facility (UDF)
  - Only portions of WA, OR, AK come packaged with UDF data
- Advanced Engineering Building Model (AEBM)

Users are encouraged to develop their own UDF data.



State of Alaska UDF Data

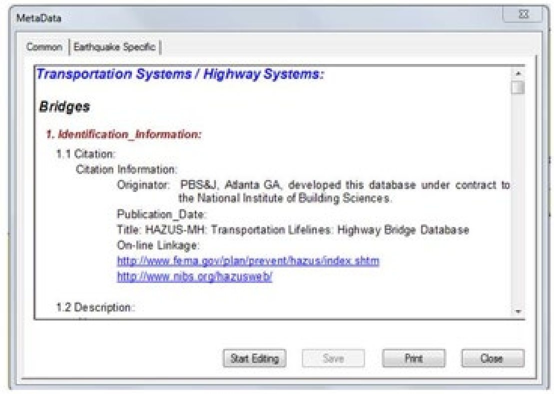


States of Oregon and Washington UDF Data

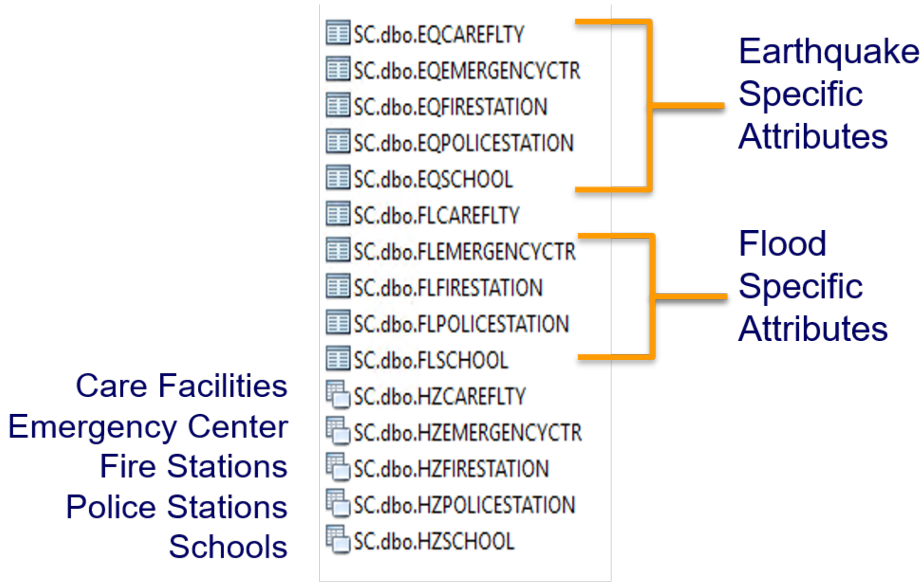
Visual 7: Site Specific Inventory Sources

Sources:

- Vary by inventory type
- The metadata for each inventory component provides information about its source



Visual 8: Site Specific - Essential Facilities



All tables are located in the State database.

Visual 9: Improving Site Specific Data

The next section will discuss ways to improve Site Specific data.

Visual 10: Hazus Site Specific Inventory - Discussion

If you wanted to improve the Hazus Site Specific inventory, where might you obtain the following data?

- Essential Facilities (fire, police, EOCs, schools, medical care facilities)
- Utilities
- Transportation Facilities
- High Potential Loss Facilities

Where could you obtain information about homes and businesses?

Visual 11: Property Assessor Data

- Often available from individual county assessors offices, GIS or land information/planning offices, or in a few cases, a state agency.
- Computer Aided Mass Appraisal (CAMA) data is often an excellent resource for improving Hazus building inventory.
- Some agencies may still charge for and/or restrict use of property data.

Visual 12: Property Data

Property data often uses appraisals for costing information:

- Building replacement costs often need to be separately calculated.
- Building content costs often need to be separately calculated.

Occupancy	Content Cost
RES1 to RES6 & COM10	Cost *0.5
COM1 to COM5, COM8, COM9, IND6, AGR1, REL1, GOV1 and EDU1	Cost*1.0
COM6, COM7, IND1 to IND5, GOV2 and EDU2	Cost*1.5

**See Chapter 5 in the Flood Technical Manual for more information.*

Visual 13: Property Data Considerations

- Look for the following information in your data:
    - Square footage
    - Duplicate data entries
    - Structural type, age, condition, and height of buildings
- While some Hazard specific information is likely not included (e.g. hurricane specific building type), user can use a system of classifying buildings that will have to be 'mapped' to Hazus building types.
- If users only have location, occupancy and building area, CDMS will add the replacement cost fields.

Visual 14: Property Data Considerations (cont.)

Other considerations when using your local data:

- Physical property address information vs a billing address.
- Search for non-taxed properties (e.g. government buildings, schools, churches, etc.).
- In agricultural areas, a single property parcel may have multiple buildings with assessments.
- Mobile homes and/or manufactured housing may not be identified as individual structures (personal property).

Visual 15: Property Data Processing Strategies

The effort required to process property data can vary – a lot!

- There are many different types of CAMA software – some have simple table structures while others are very complex.
- Hazus requires a very specific data structure and values all in a single input table.
- Consider automating processes.

Visual 16: Raster Imagery

Pictometry
LIDAR
Aerial Photos

- Inventory
  - Changes
  - Land use
- Modeling
  - Overlay losses

Visual 17: Ortho and Oblique Photography

Use Google Earth and Bing Maps to verify building stock characteristics at the Census Block level

- Building counts
- Number of stories
- Occupancy
- Roof Type

Visual 18: Google Streetview / Bing Streetside

- Can be useful in filling out missing structure attributes
- Can help determine attributes such as:
    - Number of stories
    - First floor elevation
    - Occupancy type
    - Basement

Example:

- Occupancy = RES1
- Number of Stories = 2
- Basement = no
- First floor = 3 (4 steps x 8 inches per step)

Visual 19: Field Data Collection Methods

Drive-by Surveys

- Wall construction
- Number of stories
- Roof shape and cover
- Garage
- Shutters (unknown impact resistance)

Pros/Cons

- Larger number of homes to sample
- Rapid data collection
- Cannot collect all desired info

Inspections

- Roof deck
- Roof-wall connection
- Shutters (Verified impact standards)

Pros/Cons

- Detailed info
- Less homes sampled per $$

Visual 20: Expert Assistance

- State and local GIS departments
- Universities
- Private consultants
- Engineers
- Tax Assessors
- Hazus user groups

Visual 21: EQ and FL Table Values

Users can either populate the EQ and FL tables with default values, or they can enter correct values

- See the CDMS Data Dictionary for valid domains

Table B.3 Earthquake Foundation Type

Label	Description
0	Unknown
1	Slab
2	Perimeter (shallow)
3	Combined Footing
4	Single column footing
5	Pile
6	Drilled pier
7	Elevated pier
8	Caisson
9	None

Table C.3 Flood Foundation Type

Label	Description
1	Pile
2	2Pier
3	Solid Wall
4	Basement/Yard
5	Crawl Space
6	Fill
7	Slab on Grade

Visual 22: Occupancy Classification

- Occupancy class is one of the most critical fields to populate correctly. Damage functions are selected based on this value.
- Occupancies are largely based on SIC codes.

HINT: It is frequently necessary to make decisions about how a local occupancy category applies to a Hazus Occupancy Class.

Hazus Label	Occupancy Class	SIC Codes
RES1	Single Family	
RES2	Mobile Home	
RES3	Multi-Family Dwelling	
RES3A	Duplex	
RES3B	3-4 Units	
RES3C	5-9 Units	
RES3D	10-19 Units	
RES3E	20-49 Units	
RES3F	50+ Units	
RES4	Temporary Lodging	70
RES5	Institutional Dormitory	
RES6	Nursing Home	8051, 8052, 8059
COM1	Retail Trade	52, 53, 54, 55, 56, 57, 59
COM2	Wholesale Trade	42, 50, 51
COM3	Personal and Repair Services	72, 75, 76, 83, 88

Hazus Label	Occupancy Class	SIC Codes
COM4	Professional/Technical Services	40, 41, 44, 45, 46, 47, 49, 61, 62, 63, 64, 65, 67, 73, 78 (except 7832), 81, 87, 89

Visual 23: Creating a User Defined Facilities (UDF) Database

- Minimum required attributes for a default update are Occupancy and Square Footage.
- CDMS will attribute the rest based on default or derived values.
- A default import process will take longer due to the processing required.
- A more fully derived database can be created with user-provided data and will result in a more accurate database.

Visual 24: User Defined Inventory Data

Attribute	Description	Why is it needed?
Record Identifier (ID)	A unique identifier for each record. Hazus will create its own primary key (it does not prompt the user for one since there is no guarantee it is unique). Map this identifier to any column that is not used. COMMENT is a good candidate.	Hazus will output all results keyed by the ID it generates on import. If a join to the original data is needed, this attribute will be the only way to link the results to the original data.
Occupancy	Occupancy type per the Hazus classification. Map it to OCCUPANCY.	Analyses are based on the occupancy and/or building type.
Building Type	Building type per the Hazus classification. Map it to BLDGTYPE.	Analyses are based on the occupancy and/or building type.
Design Level	Seismic Design Level. Map to DesignLevel. CDMS default is PC.	To assess lateral strength of structure - for building damage
First Floor Height	Top of finished floor relative to adjacent grade (ft). Map to FirstFloorHt. CDMS default is 1, which represents slab on grade.	To assess content damage
Building Replacement Cost	Cost ($) to replace the building in case of damage. Used by economic loss model. Map it to COST. CDMS will estimate based on RS Means table.	To assess building economic loss
Content Replacement Cost	As above (in Building Replacement Cost) relating to building content. Map to	To assess content economic loss

Attribute	Description	Why is it needed?
	Content Cost. CDMS will estimate based on % of building replacement.	
Location	The location of the structure/facility can be supplied as latitude/longitude (in that case, Hazus will create the geospatial points), or directly when the table imported is a feature class.	Hazus needs location of structure to calculate the hazard. Hazus uses the location at import to filter the points that do not fall within the study region (i.e., discarding any point that falls outside the study region).

Visual 25: Append

Option 1: Append/Update Data

- This option should be used when importing a subset of data into a Hazus state dataset.
- The system will try to match the Hazus-ID to the user-specified ID.
    - If a match is found, an update of record will take place.
    - If a match is not found, a new record will be added to the state dataset.

Visual 26: Replace

Option 2: Replace Data

- This option should be used when a total replace of state data is needed.
- This option will remove all features residing in a Hazus state dataset for the selected layer.

Visual 27: Activities 4.2 and 4.3

- Do EITHER activity 4.2 OR 4.3
- You may elect to do the exercise you did not choose outside of class if you like.

Visual 28: Activity 4.2

Student Activity

- Update inventory data from county provided records and import data into CDMS and transfer them to the state database using Append

Visual 29: Activity 4.3

Student Activity

- Update inventory data from county provided records, import data into CDMS and transfer them to the state database using Replace.

Visual 30: Flood Model

There are Site Specific attributes in the "fl" table that are unique to the flood model.

Visual 31: Flood Modeled Inventory

Modeled Site Specific Inventory

- User defined facilities
- Essential facilities
- Transportation systems (bridges)
- Utilities

Visual 32: fl User Defined Facilities

- Useful for analyzing individual structures that are normally modeled only as general building stock inventory.
- You must assign one of the existing specific occupancy classes to each facility. User defined facilities are not appropriate for every type of structure!
- For CDMS: Import format must be a shapefile, Excel spreadsheet, or MS Access/personal geodatabase.
- For Hazus: must be a table within a MS Access/personal geodatabase.

Visual 33: fl User Defined Facilities (Cont.)

Hazus requires minimal construction design characteristics to select the correct damage curve for damage and loss analysis for each facility:

- Area
- Foundation Type (specifically, basement)
- Number of stories
- First floor elevation
- Specific occupancy

Visual 34: fl User Defined Facilities (Cont.)

User Defined Facility losses reported by Hazus:

- Building losses and percent damage
- Content losses and percent damage
- Inventory losses and percent damage
- Direct Economic losses

Visual 35: fl Essential Facilities

All Essential Facilities are analyzed in the flood model:

- Care Facilities
- Fire Stations
- Police Stations
- EOC
- Schools

Table 3.16 Essential Facilities Classification

HAZUS Label	Occupancy Class	Description
Medical Care Facilities		
MDFLT	Default Hospital	Assigned features similar to EFHM
EFHS	Small Hospital	Hospital with less than 50 Beds
EFHM	Medium Hospital	Hospital with beds between 50 & 150
EFHL	Large Hospital	Hospital with greater than 150 Beds
EFMC	Medical Clinics	Clinics Labs Blood Banks
Emergency Response		
FDFLT	Default Fire Station	
EFFS	Fire Station	
PDFLT	Default Police Station	
EFPS	Police Station	
EDFLT	Default EOC	
EFEO	Emergency Operation Centers	
Schools		
SDFLT	Default School	Assigned features similar to ESF1
EFS1	Grade Schools Primary/ High Schools	
EFS2	Colleges/Universities	

Visual 36: fl Essential Facility Attributes

Required Attributes:

- Latitude/Longitude
- Building type
- Design level
- Foundation type
- First floor height

*Other attributes are listed in the CDMS Data Dictionary

Visual 37: fl Essential Facility Assumptions

- Basements - It is assumed that EFFS, EFS1, and EFS2 facilities do not have basements, and that all other classes do have basements.
- First Floor Elevation - It is assumed that EFE0, EFFS, EFS1, and EFS2 are at grade. All other facilities are assumed 3 feet above grade.
- Number of stories - All EFS1, EFHS, EFMC, EFFS, EFPS, and EFEO are assumed low rise structures, and the EFHM and EFHL are mid-rise structures.
- Damage Functions - Comparable damage functions to General Building Stock are used to determine damage.

Visual 38: Earthquake Model

There are Site Specific attributes in the "eq" table that are unique to the earthquake model.

Visual 39: Earthquake Modeled Inventory

Modeled Site Specific Inventory:

- User defined facilities
- Essential facilities
- High potential loss facilities
- Transportation systems
- Utilities

Visual 40: eq User Defined Facilities

Required attributes for earthquake model UDFs:

- Latitude / longitude
- Specific occupancy
- Building type
- Design level
- Year built

Visual 41: eq Essential Facilities

All Essential Facilities are analyzed in earthquake model:

- Care Facilities
- Fire Stations
- Police Stations
- EOC
- Schools

Table 3.16 Essential Facilities Classification

HAZUS Label	Occupancy Class	Description
	Medical Care Facilities	
MDFLT	Default Hospital	Assigned features similar to EFHM
EFHS	Small Hospital	Hospital with less than 50 Beds
EFHM	Medium Hospital	Hospital with beds between 50 & 150
EFHL	Large Hospital	Hospital with greater than 150 Beds
EFMC	Medical Clinics	Clinics Labs Blood Banks
	Emergency Response	
FDFLT	Default Fire Station	
EFFS	Fire Station	
PDFLT	Default Police Station	
EFPS	Police Station	
EDFLT	Default EOC	
EFEO	Emergency Operation Centers	
	Schools	
SDFLT	Default School	Assigned features similar to ESF1
EFS1	Grade Schools Primary/ High Schools	
EFS2	Colleges/Universities	

Visual 42: eq Essential Facility Attributes

Required attributes:

- Earthquake building type
- Design level
- Soil type
- Liquefaction susceptibility category
- Landslide susceptibility category
- Number of hospital beds (Care)
- Number of fire trucks (Fire stations)

Other attributes are listed in the CDMS Data Dictionary.

Building type, foundation type, and design level are NOT the same attributes as those used for flood.

Visual 43: Introduction to AEBM Capabilities

Advanced Engineering Building Module (AEBM) allows site-specific analyses for a portfolio of buildings:

- Ground shaking and ground failure quantification
- Damage state probabilities assessment
- Economic loss computations
- Casualties estimates

Inventory items can be entered individually or imported through CDMS into State or Study Region databases.

Provides building-specific loss estimation tools for use by experienced seismic/structural engineers or users with more detailed inventory available.

Visual 44: Advanced Engineering Building Module (AEBM)

- User creates an AEBM inventory record and identifies the AEBM Profile for each building of interest.
- These sets of linked inventory and profile data define unique properties for each building of interest.
- AEBM develops an initial “profile” of building response, damage, and loss parameters based on default Hazus values corresponding to the occupancy class, building type, and seismic design level of the building or group of buildings of interest.
- At a minimum, users must provide these three building characteristics to run the AEBM data.

Visual 45: AEBM: Choose or Define a Profile

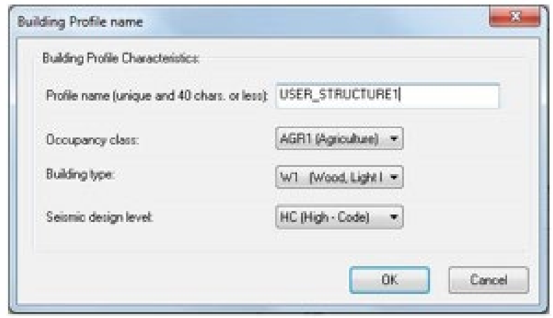
Choose from over 16,000 unique building characteristic profiles

Based upon:

- Occupancy
- Building type
- Design level

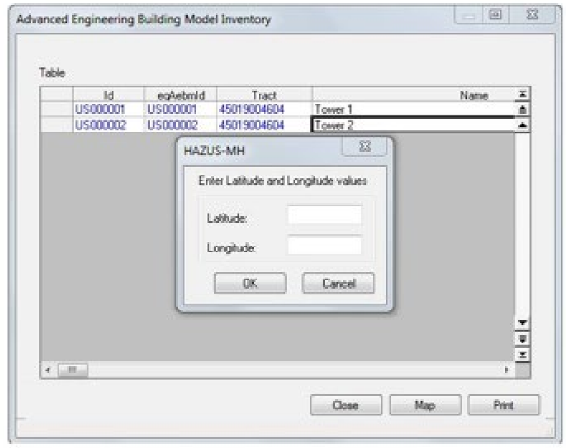
Linked to:

- Capacity curves
- Fragility curves
- Socio-economic parameters



Visual 46: AEBM: Creating a Portfolio

- Location-specific
- Must be linked to a previously created profile
- Input for square footage, number of occupants, and economic values (replacement value, content value, and business income)



Visual 47: Merits of AEBM

- Can model any desired type or use of a building
- Total flexibility on defining the properties of buildings
- Fastest and most comprehensive way to analyze portfolio of buildings with different characteristics
- Only site-specific inventory option in Hazus that provides both social and economic impacts
- Very powerful tool for estimating the benefits of a given mitigation strategy

Visual 48: Activity 4.4

Student Activity

- Import User Defined Facilities and AEBM Facilities into CDMS

Visual 49: Hurricane Model

There are Site Specific attributes in the "hu" table that are unique to the hurricane model.

Visual 50: Hurricane Modeled Inventory

Modeled Site Specific Inventory:

- Essential facilities
- User defined facilities

Visual 51: hu Essential Facilities

Required attributes:

- ID - supplied when create new record
- Lat/Long
- Essential Facility Class - default assumed

Optional information for more accuracy:

- Wind building scheme name
- Hurricane building type - (SBT - Appendix A SUM)
- Number of beds - (hospitals only)

Visual 52: hu User Defined Facility

Required attributes:

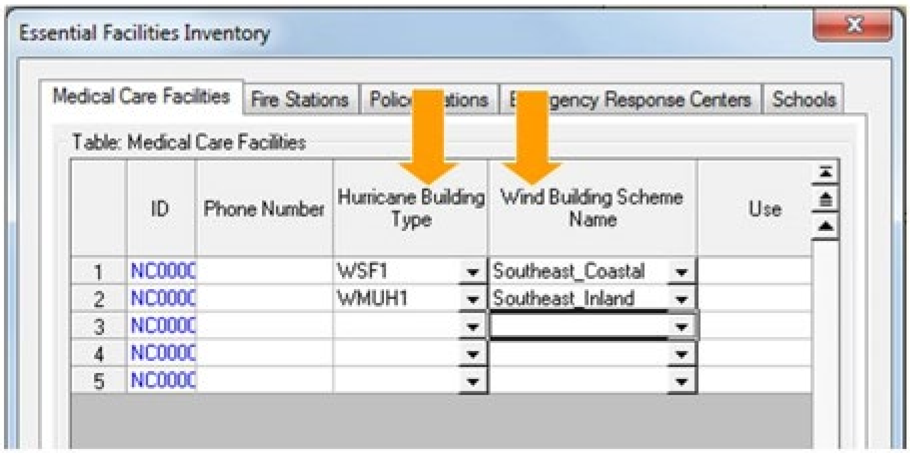
- ID - supplied when create new record
- Lat/Long
- Occupancy - default assumed = RES1

Optional information for more accuracy:

- Wind building type - (SBT- Appendix A SUM)
- Wind building scheme name

Visual 53: hu Building Type

Users may assign a unique Specific Building Type and Wind Building Scheme to each facility record.



Visual 54: Tsunami Modeled Inventory

- The Tsunami model does not directly use the aggregated Census Tract or Block GBS data used by other models.
- Essential facilities - At this time, the tsunami loss model capability is not available for essential facilities, however, essential facilities are integrated into the GBS information and can be assessed using the UDF capability.
- UDFs - Best option where damage is evaluated on a building-by-building basis for this class of structures.

Visual 55: Review

1. What are the supported Site Specific file formats that CDMS can export?
2. The two options for transferring Site Specific records from the Repository into Hazus are Replace and Append. When should we use Append? When should we use Replace?
3. What is the required Site Specific projection system for the data to be imported into CDMS?
4. What considerations need to be made if the FL, EQ, TS and/or HU model values are not provided in the source data?
5. User Defined Facilities are a unique type of Site Specific. What makes UDFs unique?

Visual 56: Questions?

Lesson 5: Aggregate Inventory Updates

Visual 1: Lesson 5: Aggregate Inventory Updates

Visual 2: Goal and Objectives

Goal:

Introduce the method for updating Hazus aggregate inventory using CDMS.

After completing this lesson, you will be able to:

- Export Aggregate data by type
- Export Aggregate data by region
- Replace Aggregate data

Visual 3: Why Update the Aggregated Data?

- Local governments will most likely have more accurate data about the local characteristics, such as demographics or building data.
- *Using this data will lead to better analysis results.*

Community Data → CDMS → General Building Stock

Tract *	TotalExp	RESI	COMI	INDI	AGRI	RELI	GOVI	EDUI
06001400100	773497	729346	32035	5242	355	2289	0	4230
06001400200	459725	380464	52970	15471	192	6314	0	4314
06001400300	805305	641406	129022	22324	2574	5532	0	4447
06001400400	627459	558459	55332	2166	115	5929	99	5359
06001400500	430532	383139	35038	4104	412	2402	0	5437
06001400600	206506	184437	12065	1512	141	7561	0	790
06001400700	516792	428361	39325	33166	331	11751	0	3858
06001400800	447043	355711	55398	15866	107	13481	0	6480
06001400900	262242	222689	21868	9221	0	7064	0	1400
06001401000	680915	539912	114837	9900	212	13957	0	2097
06001401100	549474	411557	111564	3519	311	17354	4884	285
06001401200	440532	363548	64945	2438	331	5904	0	3366
06001401300	861858	443671	333225	7109	0	12839	597	64417
06001401400	471891	377661	62575	8283	107	18792	0	4473
06001401500	384256	301560	49430	22761	374	8815	0	1316
06001401600	280386	164892	63988	38931	0	10633	0	1942
06001401700	638861	292472	245624	89256	1240	5235	2929	2105

Visual 4: General Building Stock

The core elements of the General Building Stock in each of the Hazus models are identical:

- Building area (in 1,000 sqft)
- Building count
- Building exposure (in $1,000s)
- Content exposure (in $1,000s)

All are categorized by type and occupancy.

The primary source for updating this information is property tax (CAMA) data as discussed earlier in the course.

Visual 5: Should I Update?

- Losses derived from GBS inventory are most reliable for regional studies - not small area studies!
- Many Hazus outputs - debris, building los estimates, etc. - are dependent on the GBS inventory.
- Prioritization of updates to GBS inventory should be determined with these facts in mind.

Visual 6: Demographic Data

Used for the following purposes in Hazus:

- Estimation of social loss (shelter needs) due to displaced households
- Casualties (earthquake model only)
- Estimation of building space (square footage) for certain occupancy classes in the Hazus-provided inventory

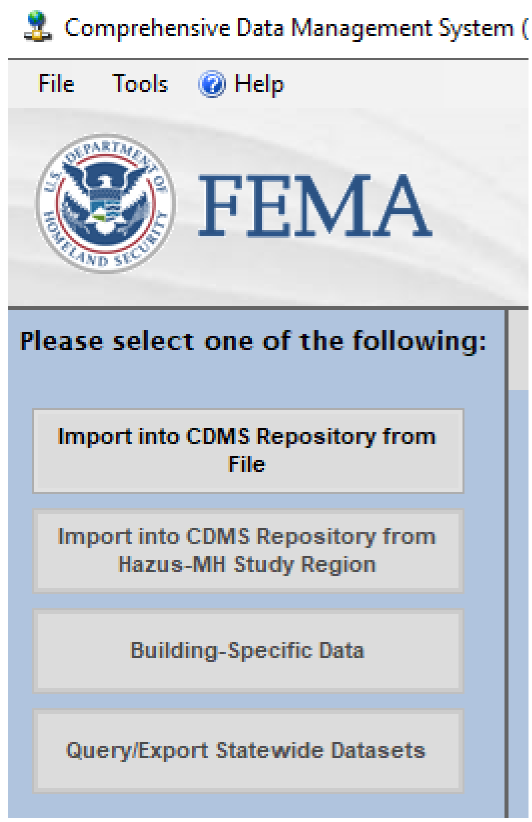
Visual 7: Updating From Aggregated Data

GBS tables can be updated from aggregated data:

- Building counts by Census Block/Tract
- Demographics by Census Block/Tract
- Building area by Census Block/Tract
- Structure exposed by Census Block/Tract
- Exposure content by Census Block/Tract

Visual 8: Aggregated Data Update Process

1. Select the source file to import
2. Specify the destination category and table to update
3. Specify the table to import
4. Field matching
5. Validation
6. View results
7. Transfer to state database



Visual 9: Activity 5.1

Student Activity

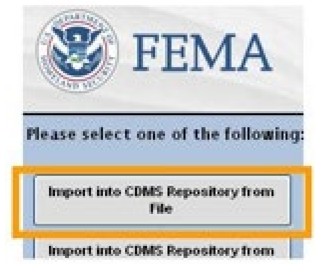
- CDMS Navigation – Use CDMS to Update Aggregate Data in the Inventory

Visual 10: Converting Site Specific to Aggregate

The next section will discuss the process for converting Site Specific data to aggregate form.

Visual 11: Site To Aggregate Process

1. Select file to import
2. Specify the destination category and table to update
3. Specify input table
4. Field matching
5. Categorize data
6. Validation
7. View results
8. Transfer to state database



Similar to other imports already covered.

HINT: This option is ideal for users that have building data with necessary structural information.

Visual 12: Aggregating Building/Parcel Data

General Building Stock may also be updated from "non-aggregated" point data.

- Lesson 4 describes a workflow to “sync-up” the Hazus aggregate data from Site Specific point data. For example, EDU1 information in the GBS can be updated from Site Specific schools.
- Lesson 5 describes a similar strategy to update the Hazus aggregate data from building inventory. A common source for building inventory is parcel centroids or building footprints (potential building locations) linked to assessor records (building improvements).

Visual 13: Requirements - Aggregated Data

Imported table must conform to the structure of the state database table you are updating. At minimum you must have:

- Area (square feet)
- Building Value
- Content Value
- Building Type
- Occupancy Class
- Height of the structure OR its Number of Stories
- Age OR Years of Construction OR Building Quality
- Census Tract OR Census Block OR Latitude/Longitude

The rest of the fields will be attributed with Hazus default values if none are provided by the user.

Visual 14: Field Matching

Field matching differences from Site Specific:

- Required user provided fields
- Fields that can be populated with a default value
- Fields in which only one of two or more fields must be provided (example - building quality, age, or year of construction)

WARNING: If there is any aggregate data already in the CDMS Repository, it is deleted and replaced with the new data.

Visual 15: Activity 5.2

Student Activity

- Update Aggregate Inventory from Site Specific Data

Visual 16: Hazard-Specific Inventory Updates

This section will discuss hazard-specific aggregate inventory that can be updated.

Visual 17: Flood-Specific Inventory

- Considers both full and depreciated value of structures
- Uses General Building types and not detailed structural categories
- Agricultural inventory
- Vehicle inventory

Visual 18: Flood Specific Inventory: Full vs. Depreciated Replacement Value

Full replacement value = the engineering cost to rebuild a structure

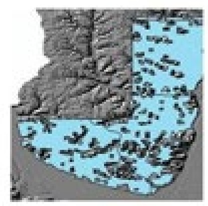
- Not the assessed value, market value, or the retail value of new structures
- Does not include the value of the land

RSMeans full replacement cost models upon which Hazus provided data were derived are based on construction:

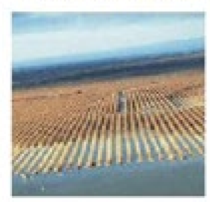
- Economy
- Average
- Custom
- Luxury

Visual 19: Flood Specific Inventory: Agriculture - National Resources Inventory (NRI) Data

- National Resources Inventory generated every 5 years by NRCS
- http://www.nrcs.usda.gov/Technical/NRI
- Data on crop types and crop quantities (bushels)
  - Top 20 crops for each NRI Regions
  - Does not include livestock
- Only agricultural areas considered: using land use - land cover data, Hazus removes urban areas, wetlands, forests, etc.
- Not available in Alaska and U.S. territories



Boundaries represent the intersection of the county boundary with the 8-digit Hydrologic Unit code boundaries



Visual 20: Flood Specific Inventory: Agriculture - National Agriculture Statistics Service (NASS)

Users should update the out-of-the-box values provided by Hazus by consulting the NASS website prior to performing an agriculture loss assessment.

http://www.nass.usda.gov/index.asp

Visual 21: Flood Specific Inventory: Agricultural Updates

Approaches:

- Edit within study region
- Update by County FIPS code in CDMS

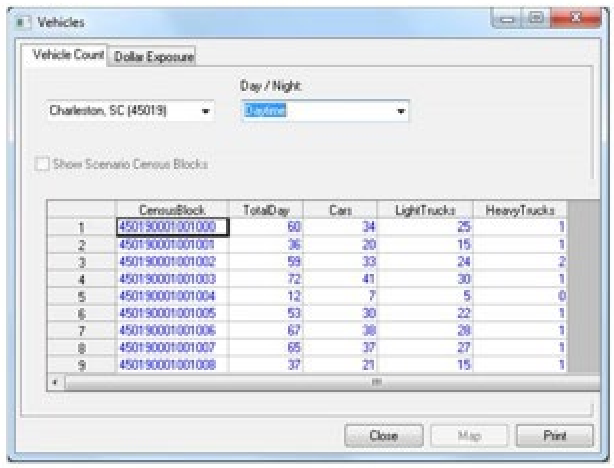
Visual 22: Flood Specific Inventory: Vehicles - Default Inventory

Data developed using standard traffic models for planning

- Based on Census Block floor area by Specific Occupancy (e.g., RES1, COM1)
- Valuation based on average new and used vehicles
- Three "occupancy" classifications: Car, LtTrk (light truck), and HvyTrk (heavy truck)

Visual 23: Flood Specific Inventory: Vehicles - Default Inventory

- Estimates based in part on typical building square footage to vehicle ratios as used by Metropolitan Planning Organizations (MPO)
- Includes day and night estimates



Visual 24: Flood Specific Inventory: Vehicles - Modifying the Inventory

Vehicle inventory updates are generally not a high priority

- Possible source – MPO’s or other agencies that address transportation planning needs

Approaches

- Edit within Study Region (discussed in next lesson)
- Update by census block in CDMS

Visual 25: Activity 8.1

Student Activity

- Aggregate Inventory from Site Specific Data Scenario

Visual 26: Review

- What are two types of data that can be used by CDMS to update GBS inventory?
- CDMS requires that the user provide an Occupancy Code for each record. Can we update the GBS if we only have records for a Specific Occupancy Code?

Visual 27: Questions?

Lesson 6: Mapping Schemes

Visual 1: Lesson 6: Mapping Schemes

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Visual 2: Goal and Objectives

Goal:

Understand how building mapping schemes were created and why they are important.

After completing this lesson, you will be able to:

- Understand the hazard-specific mapping schemes for Flood, Earthquake and Hurricane
- Modify the General Building Stock Mapping Schemes

Visual 3: Flood Model Mapping Schemes

The next section of this lesson will address the Flood Model Mapping Scheme requirements.

Visual 4: General Building Types

The Hazus Flood model relies upon the General Occupancy Mapping Schemes to determine how structures are distributed based upon the type of material from which they were constructed.

- Material types are not involved in damage analysis.

Visual 5: Key Inventory Elements

Key fields to be populated to model flood damage:

- Foundation type
- First floor elevation
- Pre/Post-FIRM relationships
- General Building Type (GBS analysis only)
- Specific occupancy class
- Census block
- Flood hazard zone

These elements are controlled in the Flood Specific Occupancy Mapping in the GBS.

Visual 6: Flood Model Mapping Schemes

Modeled distribution of foundation types and first floor heights:

- Models differ for Riverine, Coastal, and Great Lakes census blocks and by region
- Models differ for Pre-FIRM and Post-FIRM structures

Applies only to GBS inventory

Visual 7: Post-FIRM Distribution Guidelines

Slab-on-Grade: Typically not allowed in SFHA Post-FIRM development. Establish the Post-FIRM distribution to match what is actually occurring in the regulated areas.

Fill: Use when the BFE plus freeboard is less than 2 feet above grade. If the BFE plus freeboard is greater than 2 feet above grade, typical construction practice is to use other foundation types such as crawlspace, piers, solid walls, or piles.

Crawlspaces: Use when the BFE plus freeboard is less than 4 feet above grade. If BFE plus freeboard is greater than 4 feet above grade, typical construction practice is to use other foundation types such as piers, solid walls, or piles.

Visual 8: Post-FIRM Distribution Guidelines

Basements: Typically not allowed in SFHA Post-FIRM development. Establish the Post-FIRM distribution to match what is actually occurring in the regulated areas.

Piers: Use when the BFE plus freeboard is less than 6 feet above grade. If BFE plus freeboard is greater than 6 feet above grade, typical construction practice is to use other foundation types such as solid walls or piles.

Solid Walls: Use when the BFE plus freeboard is less than 8 feet above grade. If the BFE plus freeboard is greater than 8 feet above grade, typical construction practice is to use piles.

Piles: Use when the BFE plus freeboard is 8 feet or greater above grade.

Visual 9: Activity 6.1

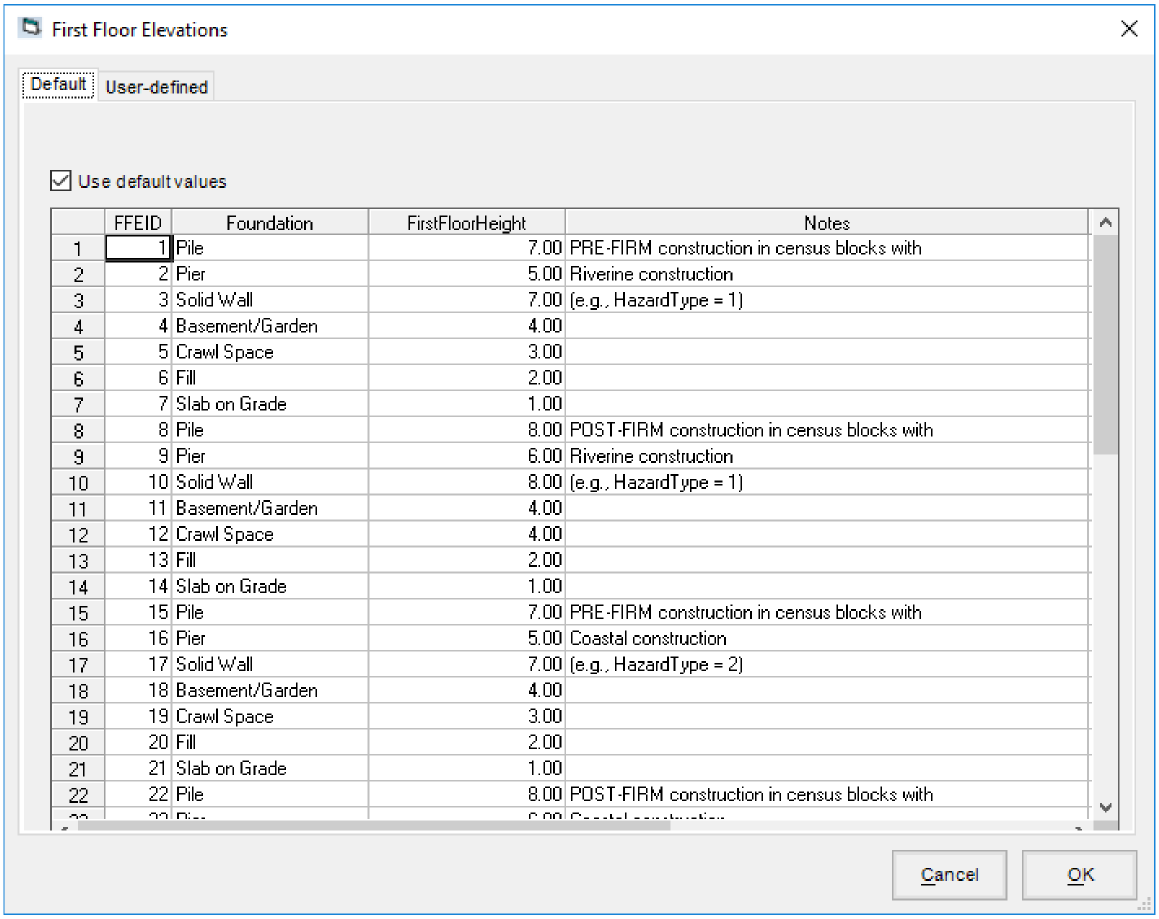
The Instructor will guide students to:

- View the Flood Specific Occupancy Mapping
- Copy and Modify a new Flood Specific Occupancy Mapping Scheme

Instructor Note	**Instructor Led Activity** Demonstrate the following to the students: 1. Open a Hazus flood study region 2. Review the Flood Specific Occupancy Mapping window within a study region. 3. Review the primary components of the mapping schemes (e.g., Block, Foundation, First Floor Height) 4. Demonstrate how to Copy/Create a new mapping scheme, edit that scheme, and then apply it to a Census Block.

Visual 10: First Floor Elevations

You can modify the assumptions about first floor height if you have reason to do so.



	FFEID	Foundation	FirstFloorHeight	Notes
1	1	Pile	7.00	PRE-FIRM construction in census blocks with
2	2	Pier	5.00	Riverine construction
3	3	Solid Wall	7.00	(e.g., HazardType = 1)
4	4	Basement/Garden	4.00	
5	5	Crawl Space	3.00	
6	6	Fill	2.00	
7	7	Slab on Grade	1.00	
8	8	Pile	8.00	POST-FIRM construction in census blocks with
9	9	Pier	6.00	Riverine construction
10	10	Solid Wall	8.00	(e.g., HazardType = 1)
11	11	Basement/Garden	4.00	
12	12	Crawl Space	4.00	
13	13	Fill	2.00	
14	14	Slab on Grade	1.00	
15	15	Pile	7.00	PRE-FIRM construction in census blocks with
16	16	Pier	5.00	Coastal construction
17	17	Solid Wall	7.00	(e.g., HazardType = 2)
18	18	Basement/Garden	4.00	
19	19	Crawl Space	3.00	
20	20	Fill	2.00	
21	21	Slab on Grade	1.00	
22	22	Pile	8.00	POST-FIRM construction in census blocks with

Visual 11: Regional Variation

The Hazus provided GBS accounts for regional variations in Foundation types and First Floor Heights.

Table 3.10 Distribution of Foundation Types for Single Family and Multi-Family* Residences

US Census Region	States within the Region	Foundation Types						
		Pile	Solid Wall	Pier/ post	Basement/ Garden Level	Crawl-space	Fill	Slab-on-Grade
Northeast – New England	CT, MA, ME, NH, RI, VT	0	0	0	81	10	0	9
Northeast – Mid Atlantic	NJ, NY, PA	0	0	0	76	10	0	14
Midwest – East North Central	IL, WI							
Midwest – West North Central	IA, NE							
South – South Atlantic	DE, MD, VA							

Table 3.11 Default Floor Heights Above Grade to Top of Finished Floor (Riverine)

Foundation Type	Pre-FIRM	Post-FIRM
Slab	1 ft	1 ft[1]
Fill	2 ft	2 ft
Crawlspace	3 ft	4 ft
Basement (or Garden Level)	4ft	4 ft[1]
Pier (or post and beam)	5 ft	6 ft
Solid Wall	7 ft	8 ft
Pile	7 ft	8 ft

Visual 12: Earthquake Model Mapping Schemes

The next section of this lesson will address the Earthquake Model Mapping Scheme requirements.

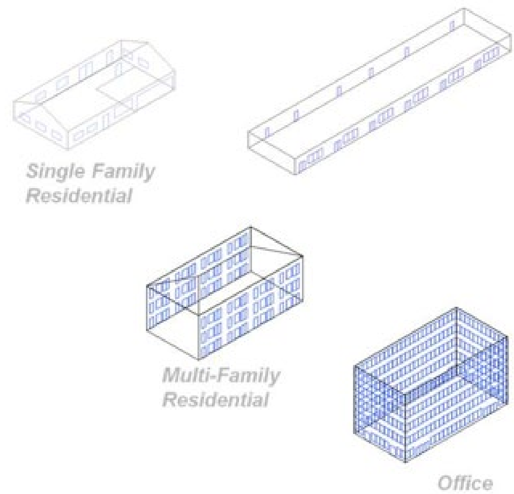
Visual 13: General Building Types

Earthquake model breaks the building inventory up into 5 General Building Construction Types:

- Wood
- Steel
- Concrete
- Masonry
- Manufactured Housing (Mobile Home)

Visual 14: Importance of Specific Building Type

- Occupancy, use, or type of facility
- General building type category (hazard independent)
- Earthquake-specific building type



Visual 15: Earthquake Specific Building Types

- The basic model building types are based on FEMA-178 (FEMA, 1992) building classes.
- Building height subclasses were added to reflect the variation of typical building periods and other design parameters with building height.
- Manufactured homes, which are not included in the FEMA-178 classification, were also added.

Visual 16: Earthquake Specific Building Types

Subdivide General Building Type by:

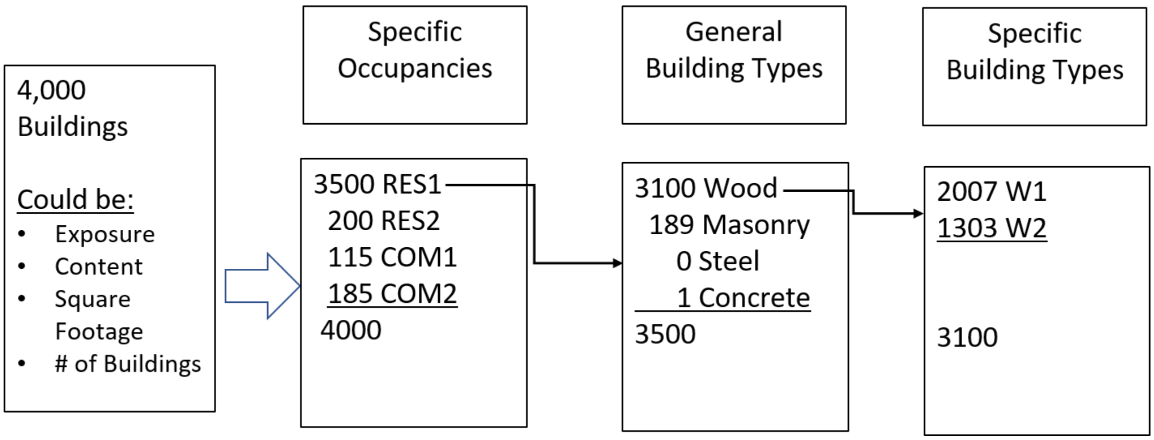
- Number of stories
- Engineered / Non-engineered (design level, building quality)

Other implicit critical characteristics:

- Design base shear
- Configuration
- Bracing
- Regional

Visual 17: Mapping Schemes

Distributes building information into Specific Building Types



Visual 18: Height Classifications

Low Rise:

- 1-3 stories
- (except URM 1-2 stories)

Mid Rise:

- 4-7 stories
- (except URM 3+ stories)

High Rise:

- 8 stories or more

Visual 19: Design Level

- Pre-code
- Low Seismic - Code
- Moderate Seismic - Code
- High Seismic - Code
- Low Seismic - Special
- Moderate Seismic - Special
- High Seismic - Special

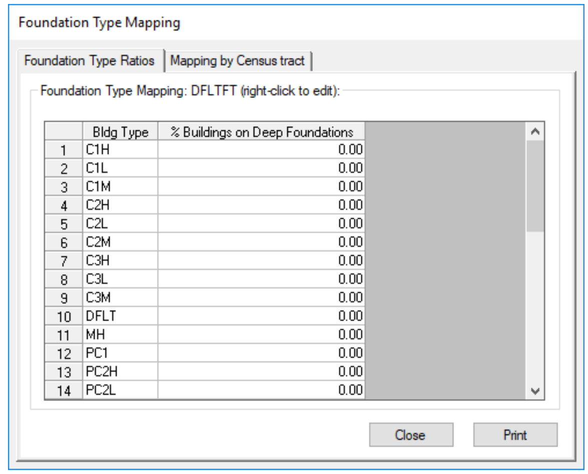
Visual 20: Specific Building Type (SBT) Example - W1

Wood, light frame

- Usually residential
- Repetitive framing
- Often "conventional construction"
- Wood, plywood diaphragms
- Plywood, oriented strand board, wood, stucco, plaster, or gypsum board shear walls

Visual 21: Foundation Type Mapping

Users have the ability to modify the default assumption that no buildings are on deep foundations.



Visual 22: Required Inventory Information

Occupancy Mapping

- By building type
- By age (year of construction)
- By seismic design level (low, moderate, high, pre-code)
- By quality (inferior, typical, superior)

Visual 23: Building Classification Limitations

Assumes Average Characteristics

- Overestimates damage for better buildings and underestimates damage for poorer buildings.

Grouped At Centroid of Census Tract

- In large tracts, both soil type and other hazard information changes.
- Distance to event source could vary dramatically

Visual 24: Building Classification Limitations (cont.)

Atypical buildings are not explicitly modeled:

- Mixed systems
- Unusual configurations
- Undefined systems

These types of buildings can be modeled in the AEBM.

Visual 25: Activity 6.2

The Instructor will guide students to:

- View the Earthquake General Building Type Mapping Schemes
- Copy and Modify a new Earthquake Specific Building Type Mapping Scheme

Visual 26: Hurricane Model Mapping Schemes

The next section of this lesson will address the Hurricane Model Mapping Scheme requirements.

Visual 27: General Building Types

Like the Earthquake model, the Hurricane model also breaks the building inventory up into 5 General Building Construction Types:

- Wood
- Steel
- Concrete
- Masonry
- Manufactured Housing (Mobile Home)

Visual 28: Specific Building Types (SBTs)

*Unique to hurricane model

Sub categories of General Building Types (example)

- Wood
    - Single family homes, 1 story
    - Single family homes, 2 story
    - Multi-unit housing/hotel/motel, 1 story
    - Multi-unit housing/hotel/motel, 2 story
    - Multi-unit housing/hotel/motel, 3+ stories

SBT's generally subdivide GBT by

- Number of stories
- Primary usage (residential/commercial)
- Engineered/non-engineered

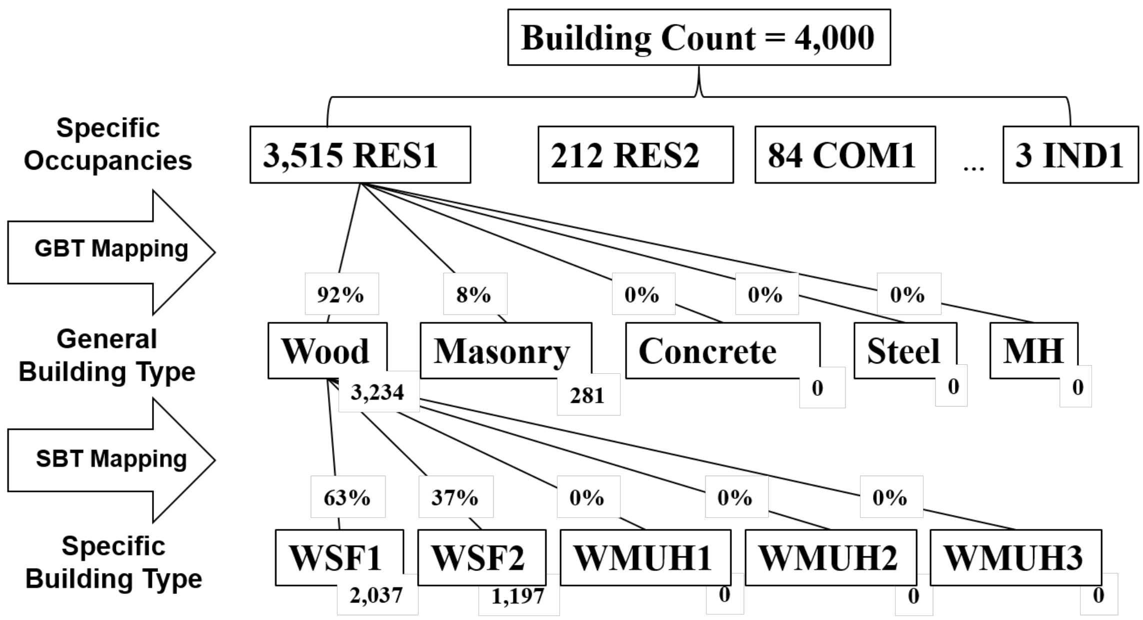
Visual 29: Specific Building Type (SBT)

Sample of Specific Building Types. Also available under the **View>Classifications** menu in a hurricane study region.

General Building Type	Specific Building Type	Specific Building Type Description
WOOD	WSF1	Single Family Homes, 1 Story - Wood
WOOD	WSF2	Single Family Homes, 2 or More Stories - Wood
WOOD	WMUH1	Wood Multi-Unit/Hotel/Motel, 1 Story
WOOD	WMUH2	Wood Multi-Unit/Hotel/Motel, 2 Stories
WOOD	WMUH3	Wood Multi-Unit/Hotel/Motel, 3 or More
MASONRY	MSF1	Single Family Homes, 1 Story - Masonry
MASONRY	MSF2	Single Family Homes, 2 or More Stories - Mas
MASONRY	MMUH1	Masonry Multi-Unit/Hotel/Motel, 1 Story
MASONRY	MMUH2	Masonry Multi-Unit/Hotel/Motel, 2 Stories
MASONRY	MMUH3	Masonry Multi-Unit/Hotel/Motel, 3 or More
MASONRY	MLRM1	Low-Rise Mas Strip Mall, Up to 15ft high

General Building Type	Specific Building Type	Specific Building Type Description
MASONRY	MLRM2	Low-Rise Mas Strip Mall, More than 15ft high
MASONRY	MLRI	Low-Rise Mas Warehouse/Factory, 20ft high
MASONRY	MERBL	Masonry Eng Res Bldgs, 1-2 Stories
MASONRY	MERBM	Masonry Eng Red Bldgs, 3-5 Stories
MASONRY	MERBH	Masonry Eng Res Bldgs, 6 or More Stories

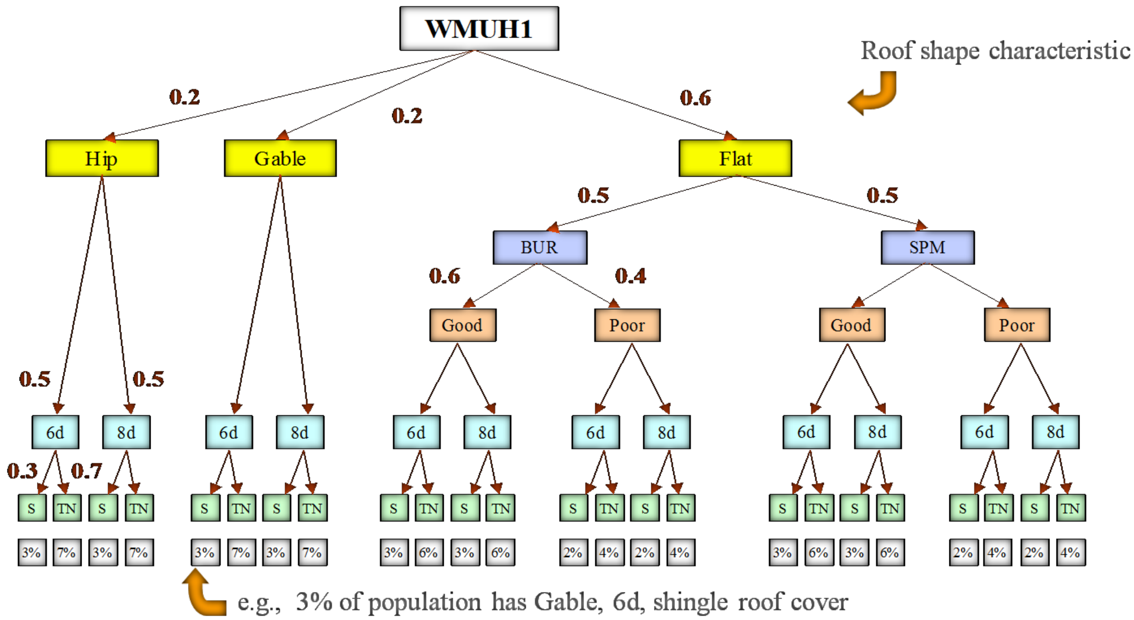
Visual 30: Hurricane Model Mapping Schemes



Visual 31: Wind Building Characteristics (WBC)

Characteristic	Value1	Value2	Value3	Value4
Roof Shape				
- Roof Shape I	Hip	Gable		
- Roof Shape II	Hip	Gable	Flat	
Roof Cover				
- Roof Cover Type	Built-Up	Single Ply		
- Roof Cover Quality	Good	Poor		
- Secondary Water Resistance	Yes	No		
Roof Deck				
- Roof Deck Attach. I	6d Nails @ 6/12	8d Nails @ 6/12		
- Roof Deck Attach. II	6d Nails @ 6/12	8d Nails @ 6/12	6d/8d Mix @ 6/6	8d @ 6/6
- Roof Deck Age	New or Average	Old		
Roof Frame				
- Roof Frame System	Wood Truss	Steel Joist		
- Joist Spacing	4 ft.	6 ft.		
- Roof-Wall Conn.	Toe-Nail	Strap		
Fenestrations				
- Window Area	Low	Medium	High	
- Shutters	Yes	No		
- Garage I (Unshuttered Houses)	None	Weak Door	Standard Door	
- Garage II (Shuttered Houses)	None	SFBC 94		
Other Characteristics				
- Wind Debris	Residential	Res./Comm. Mix	Varies by Direction	No Missiles
- Units Per Floor	Single-Unit	Multi-Unit		
- Masonry Reinforcing	Yes (RM)	No (URM)		
- Tie Downs	Yes	No		

Visual 32: Mapping Schemes (cont.) - WBC



Visual 33: Example - Wood, Single Family

- Usually residential
- Repetitive framing
- Number of Stories
  - WSF1
  - WSF2

Visual 34: Example - Masonry, Multi-Unit

Masonry walls

- Reinforced
- Marginally engineered or non-engineered

Typical usage

- Multi-family building (apartments
- Hotels/motels

Number of stories

- MMUH1 - 1 story
- MMUH2 - 2 story
- MMUH3 - 3 stories or more

Visual 35: Example - Manufactured Homes

5 Categories

Categorized by Department of Housing and Urban Development standard (HUD code)

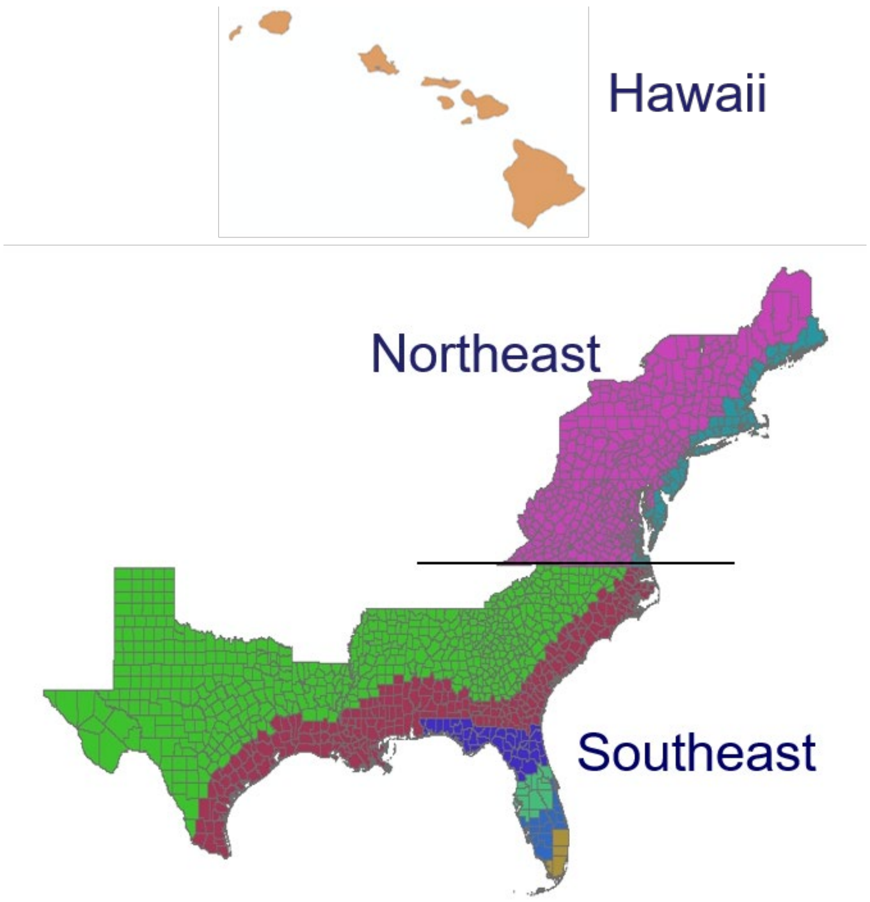
Category	HUD Code
Pre HUD - built before 1976	MHPHUD
HUD 76 - built 1976-1994	MH76HUD
HUD 94 - built 1994 and later	
Region I	MH94HUD-I
Region II	MH94HUD-II
Region III	MH94HUD-III

Visual 36: Building Stock Models - 9 Regions

- 4 regions in Florida
- 4 regions for other 21 states
- 1 region in Hawaii

Based on:

- Review of building codes in effect in each area
- 2010 census data
- Aerial photos review
- Inspection data in Florida
- Real Estate & tax data samples



Visual 37: Review

1. Flood Specific Mapping Schemes distribute the Foundation Types across Census Blocks for each Occupancy Class. Are the default distributions the same for each Census Block, or different?
2. Can a Census Block have more than one Flood Specific Mapping Scheme? What about a Census Tract?
3. What is the difference between General Mapping Schemes and Specific Mapping Schemes?
4. How can CDMS be used to update the Mapping Schemes?

Visual 38: Questions?

Lesson 7: Hazus Study Region Editing

Visual 1: Lesson 7: Hazus Study Region Editing

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Visual 2: Goals and Objectives

Goal:

Explore options for editing the databases within a Study Region.

After completing this lesson, you will be able to:

- Edit the Study Region inventory
- Edit the Study Region Mapping Schemes
- Post changes from a Study Region to the Hazus state databases
- Post changes made to the Hazus state databases to a Study Region

Visual 3: What is a Study Region?

- Population and inventory are defined for whole region.
- Hazard may affect part of region, or whole region.
- No damage assessment is performed outside of the Study Region.

Visual 4: Study Region Size

Study Region database size has been extended to support larger Study Region geographies and more detailed analysis.

The 10GB limit typically allows multi-hazard analysis for a county, and flood Average Annualized Loss (AAL) analysis for a multi-county area (e.g. watershed based Risk MAP projects).

The full version of Microsoft SQL Server must be used if these limits will be exceeded.

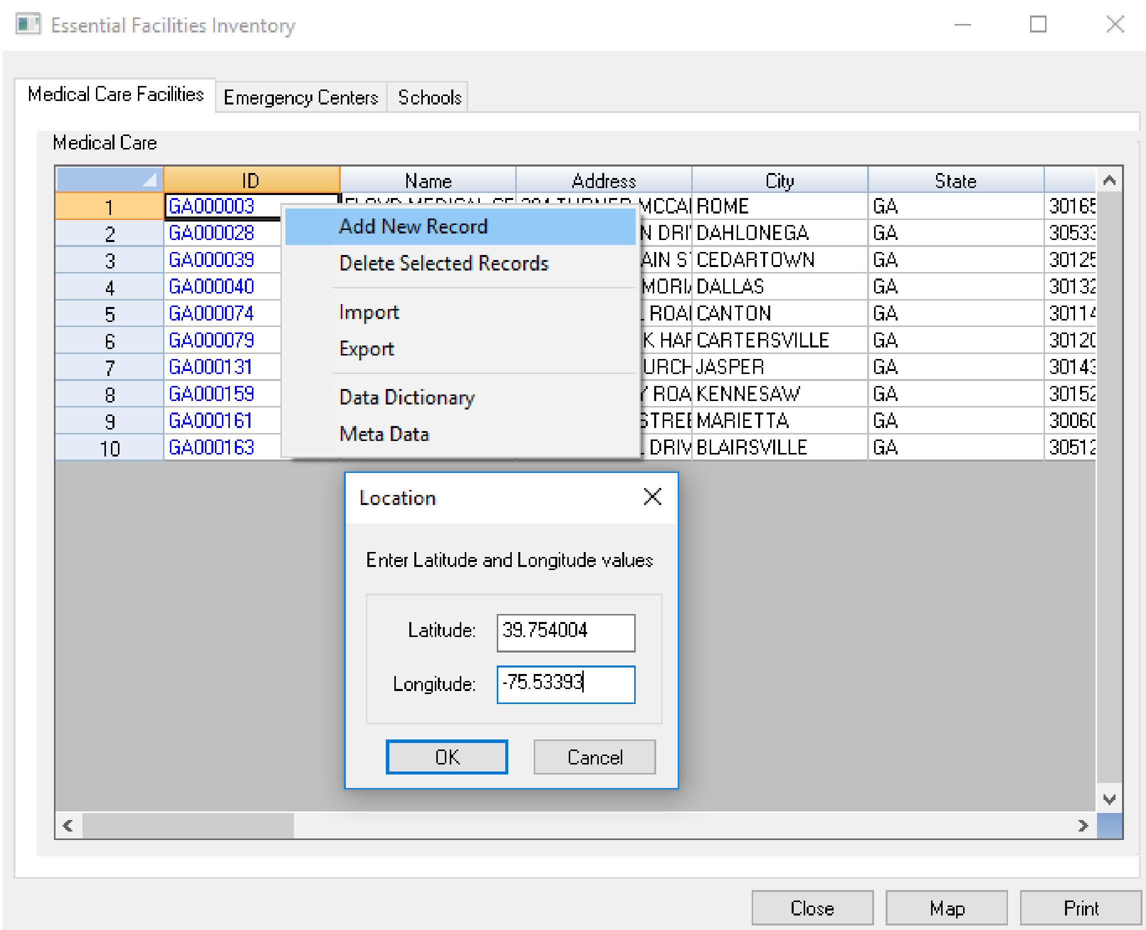
Visual 5: Study Region Site Specific Edits

There are three main ways that the Site Specific inventory within a Study Region may be updated:

- Option 1 - Database edits
- Option 2 - Import data
- Option 3 - Update using CDMS

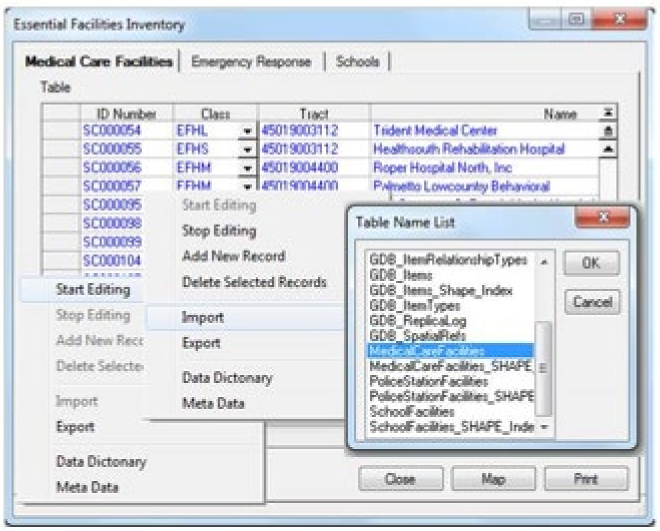
Visual 6: Option 1: Database Edits

Add one record at a time.



Visual 7: Option 2: Import Data

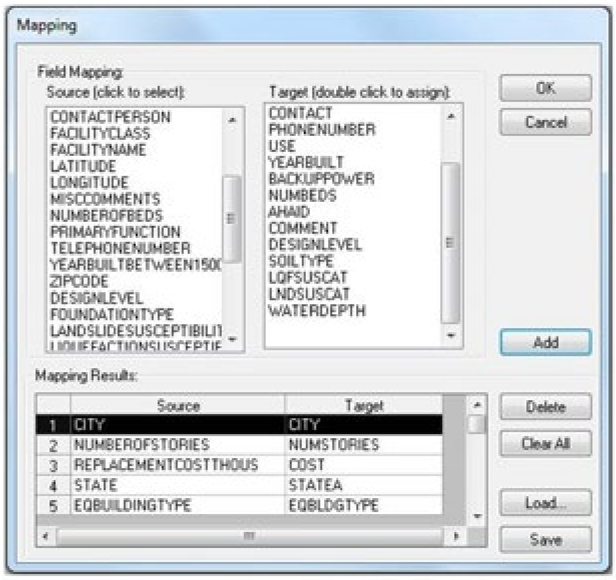
1. Open Site Specific inventory table
2. Right-click | Start Editing (EQ/HU models only)
3. Right-click | Import Data
4. Choose GDB and feature class containing records to be imported.



Note: Only MS Access 2003 / ESRI Personal Geodatabases are supported.

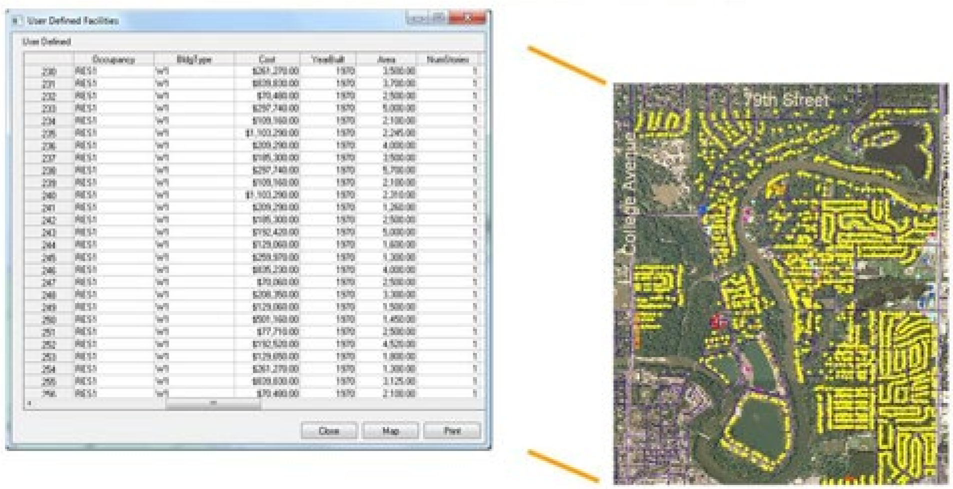
Visual 8: Option 2: Import Data (Cont.)

5. Map the fields in the Source feature class to the fields in the Target feature class.

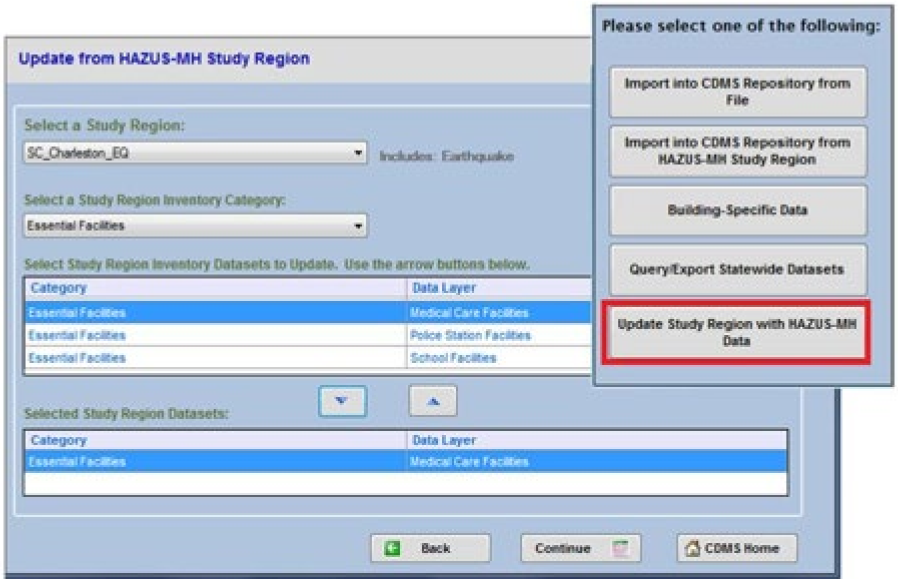


Visual 9: Option 2: Import Data - UDFs

- User Defined Facilities are supported in a Study Region
- These can be imported either through CDMS or through the study region GUI



Visual 10: Option 3: Update using CDMS



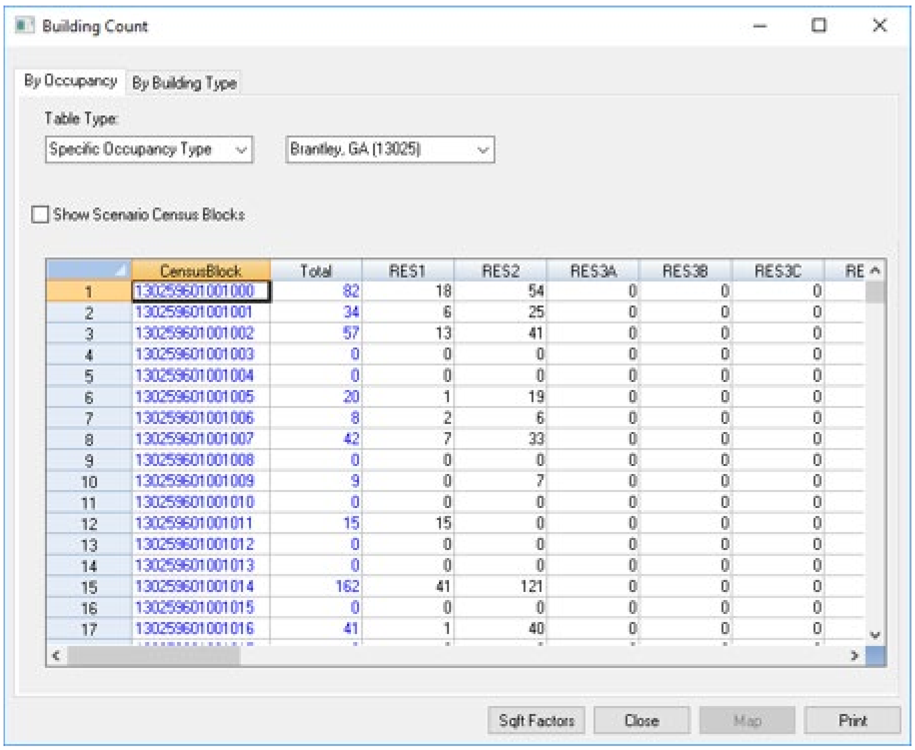
Visual 11: Aggregate Inventory Updates

The next section of this lesson will discuss options for making aggregate inventory updates.

Visual 12: Individual Record Updates

Individual records in the GBS can be edited within the Study Region.

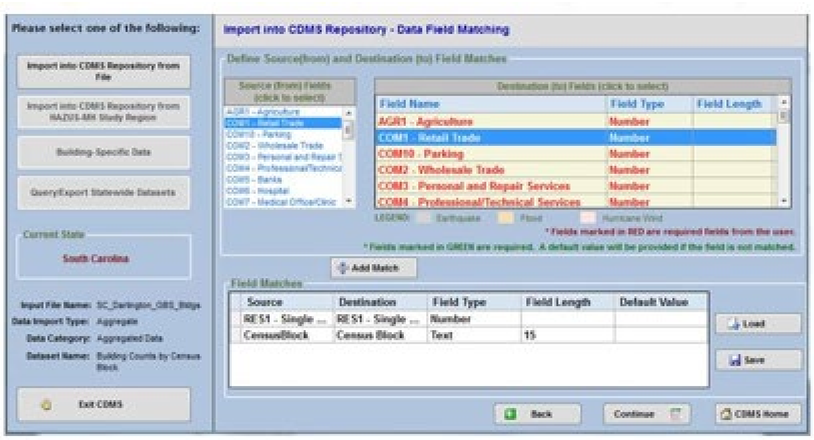
In the flood model, you must set the table type to specific occupancy and then you can edit the editable fields.



Visual 13: Bulk Updates

CDMS can bulk update the Hazus GBS state tables:

- Regional or local updates
- From aggregate data or Site Specific data by occupancy class



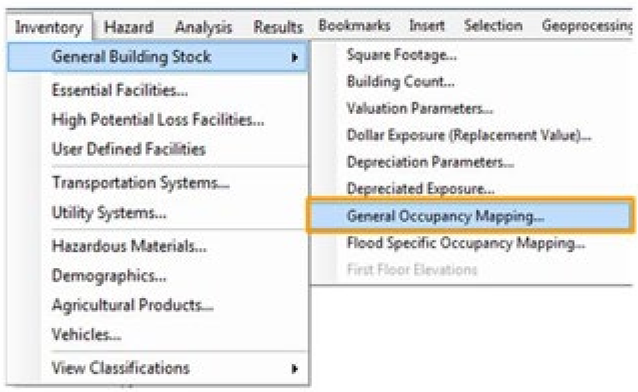
Visual 14: Earthquake Model: Occupancy Mapping

Describes the distribution of structures in each Census Tract based on the construction characteristics.

New Mapping Schemes may be created in a Study Region.

Visual 15: Flood Model Mapping Schemes

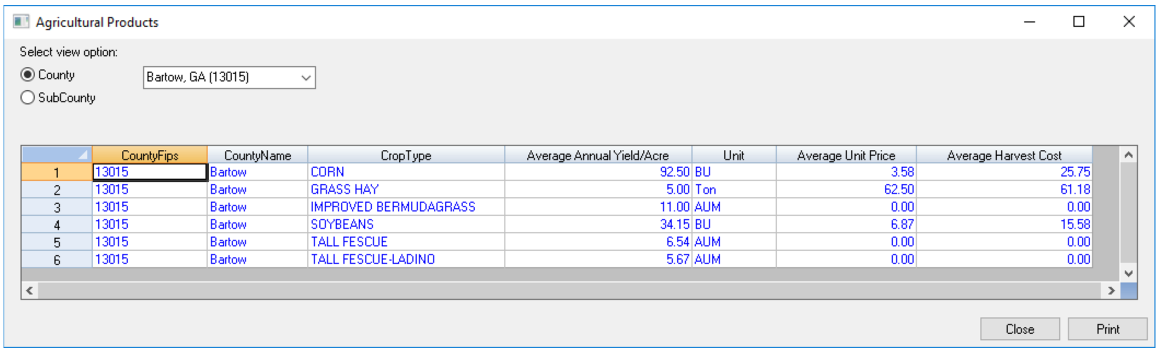
- General Occupancy Mapping: Describes distributions of buildings by construction
- Flood Specific Occupancy Mapping: Describes distributions of foundations
- First Floor Elevations: Describes distribution of first floor elevations by foundation type
- Mapping Schemes may be duplicated and edited to better reflect local conditions within one or more Census Blocks.



Visual 16: Flood Model: Agricultural Inventory

Only applies to the Flood model

Can be updated through CDMS



	CountyFips	CountyName	CropType	Average Annual Yield/Acre	Unit	Average Unit Price	Average Harvest Cost
1	13015	Bartow	CORN	92.50	BU	3.58	25.75
2	13015	Bartow	GRASS HAY	5.00	Ton	62.50	61.18
3	13015	Bartow	IMPROVED BERMUDAGRASS	11.00	AUM	0.00	0.00
4	13015	Bartow	SOYBEANS	34.15	BU	6.87	15.58
5	13015	Bartow	TALL FESCUE	6.54	AUM	0.00	0.00
6	13015	Bartow	TALL FESCUE-LADINO	5.67	AUM	0.00	0.00

Visual 17: Hurricane Model: General Building Type Mapping

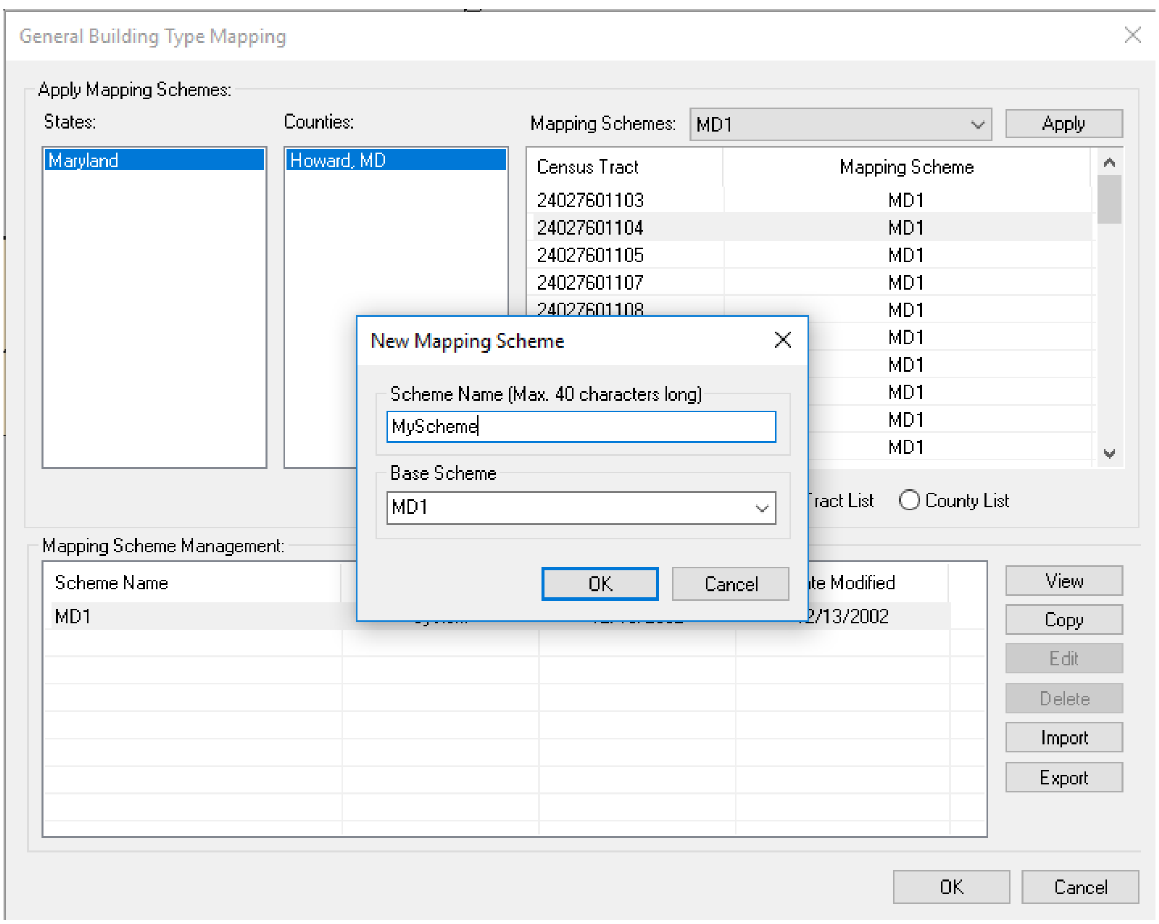
Describes the distribution of structures based on General Building Type.

Options:

- Create new schemes based upon an existing scheme
- Edit user defined schemes
- Import
- Export

Edit scheme descriptions for each occupancy type.

Schemes can be assigned to individual Census Tracts.

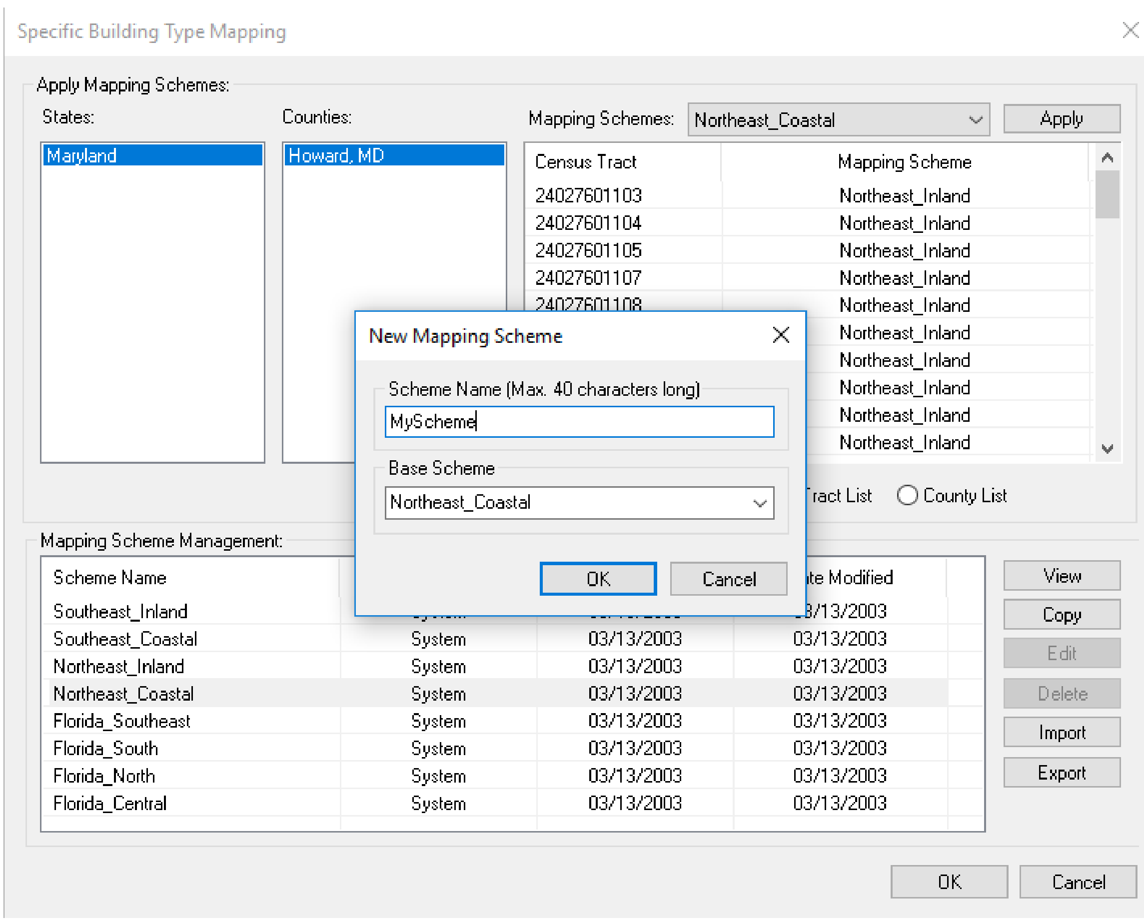


Visual 18: Hurricane Model: Specific Building Type Mapping Distribution

Describes the distribution of structures based on wind Specific Building Type (e.g., WSF1, WSF2).

Options:

- Create new schemes based upon a default scheme
- Edit user defined schemes
- Import
- Export

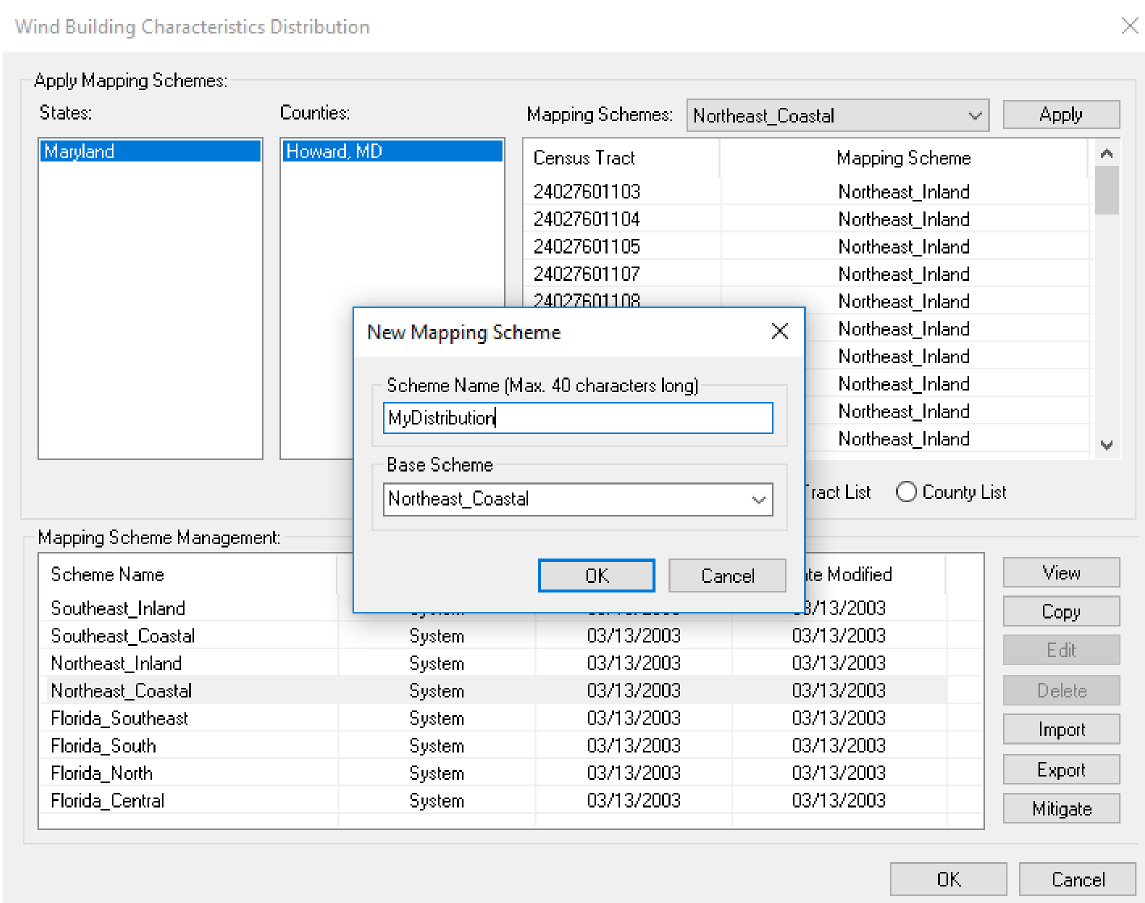


Visual 19: Hurricane Model: Wind Building Characteristics Distribution

Allows detailed engineering characteristics of buildings to be defined.

Options:

- View
- Copy
- Edit
- Delete
- Import/Export (how file)



Example of WSF1 building distribution

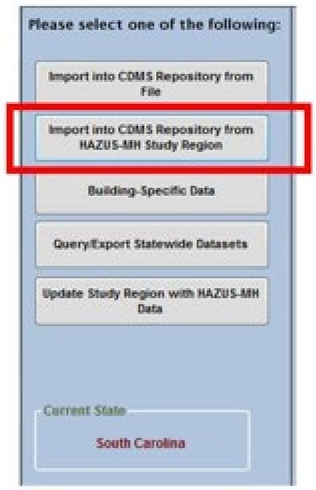
Visual 20: Migrating Study Region Data to CDMS

The next section of this lesson will discuss the process for migrating Study Region data to CDMS.

Visual 21: Process - Step 1

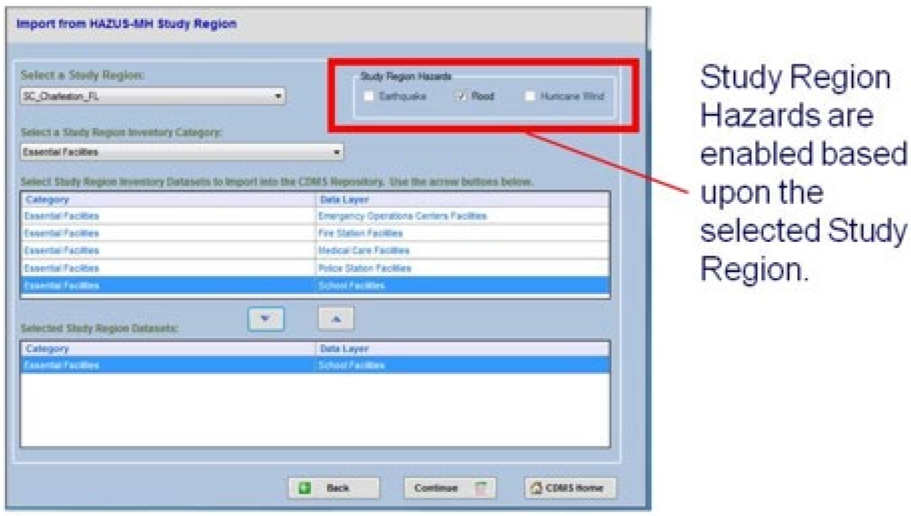
1. Click Import into CDMS Repository from Hazus Study Region

HINT: 'Current State' must be set to the same state in which the Study Region is found.



Visual 22: Process - Step 2

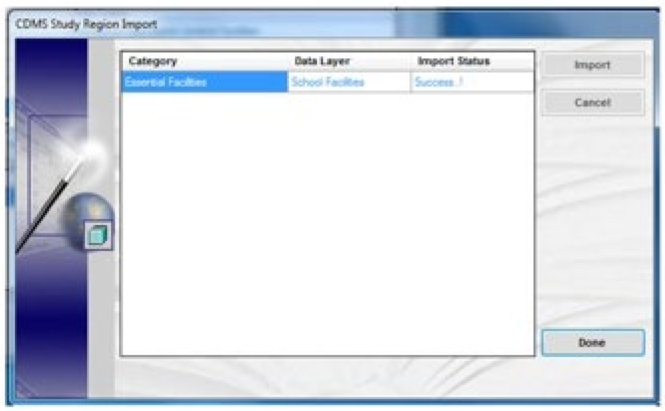
2. Select the inventory to import into the CDMS Repository.



Visual 23: Process - Steps 3 and 4

3. CDMS will report the status of each data layer. Successful data layers will be imported to the CDMS Repository.

4. View, Remove or Transfer the inventory from the Repository into the Hazus statewide databases.



Visual 24: Activity 7.1

Student Activity

- Updating a Study Region from Hazus Inventory

Visual 25: Activity 7.2

Student Activity

- Updating Hazus Inventory from a Study Region

Visual 26: Review

This lesson describes some ways that a Hazus user can edit data within a Study Region. CDMS can also be deployed to post Study Region changes back to the Hazus statewide tables.

- What are the benefits to posting edits to a Study Region back to the Hazus statewide tables?
- What are the benefits of posting changes to the Hazus statewide tables back to a Study Region?
- How can a user transfer changes from Hazus into a Study Region?

Visual 27: Questions?

Lesson 8: Data Management Strategies and Capstone Exercise

Visual 1: Data Management Strategies and Capstone Exercise

HAZUS®

EARTHQUAKE • WIND • FLOOD • TSUNAMI

Visual 2: Goal and Objectives

Goal:

Discuss strategies for implementing effective data management within your community. You will then test your skills with a final capstone activity.

After completing this lesson, you will be able to:

- Identify strategies for data management to consider for your community
- Apply your data management skills to update the inventory

Visual 3: Data Collection Strategies

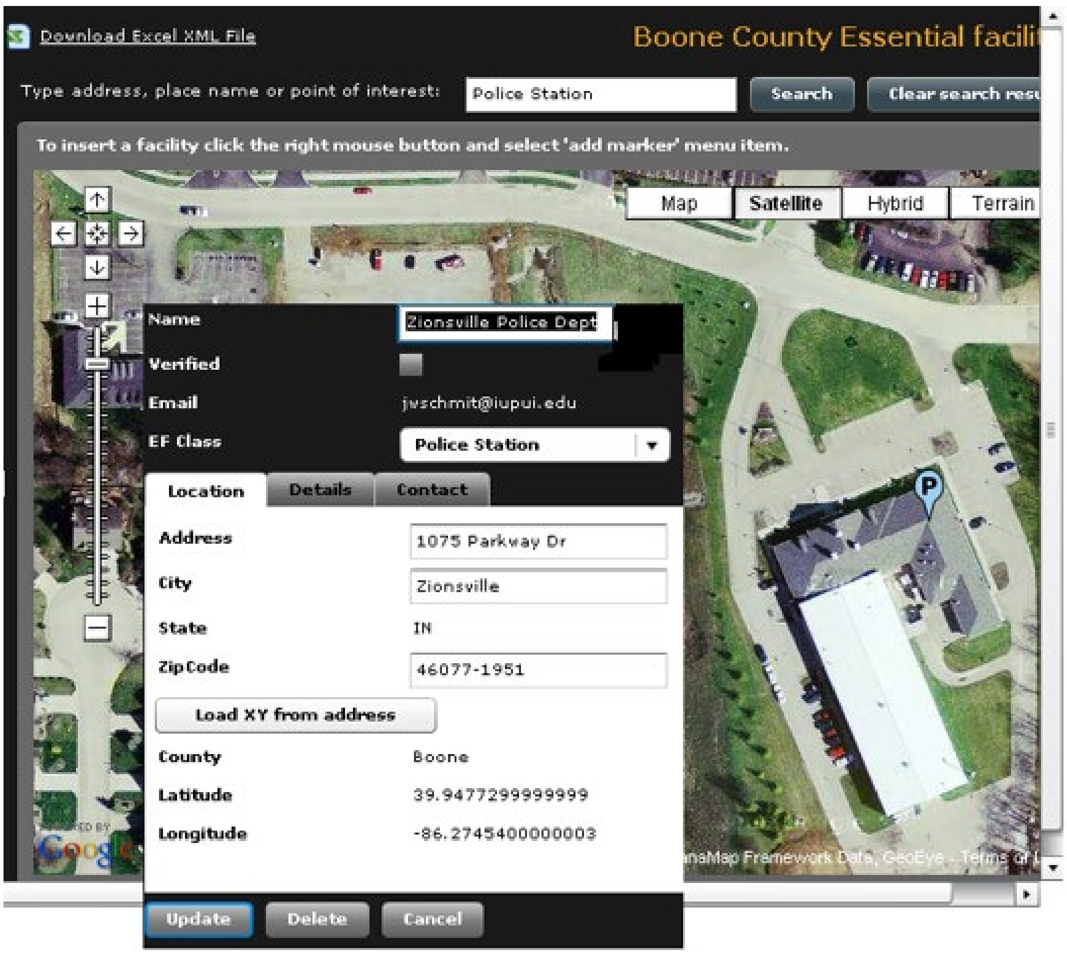
If you are collecting data from source providers:

- Do not assume GIS competency
- Expectations for updating attributes should be kept to a minimum
  - Hazard attributes (soil type, liquefaction potential, etc.) are likely not known
  - Do not ask provider to supply Hazus values unless they know Hazus
  - Be prepared to ‘translate’ what you are provided or to seek subject matter experts for things you do not know

Visual 4: Advanced Options

Web-based data collection tools offer many features:

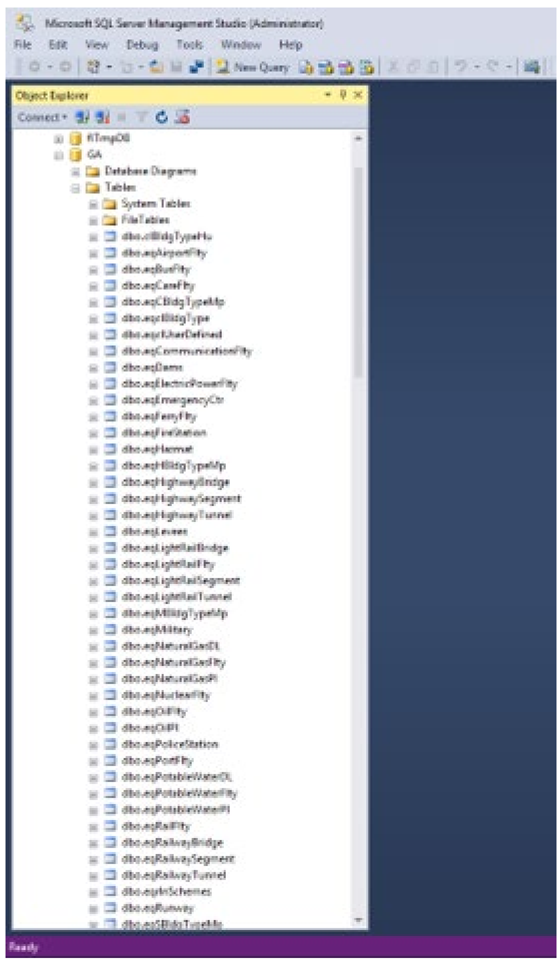
- Short learning curve
- Streamlined and rapid data collection



Visual 5: Advanced Options

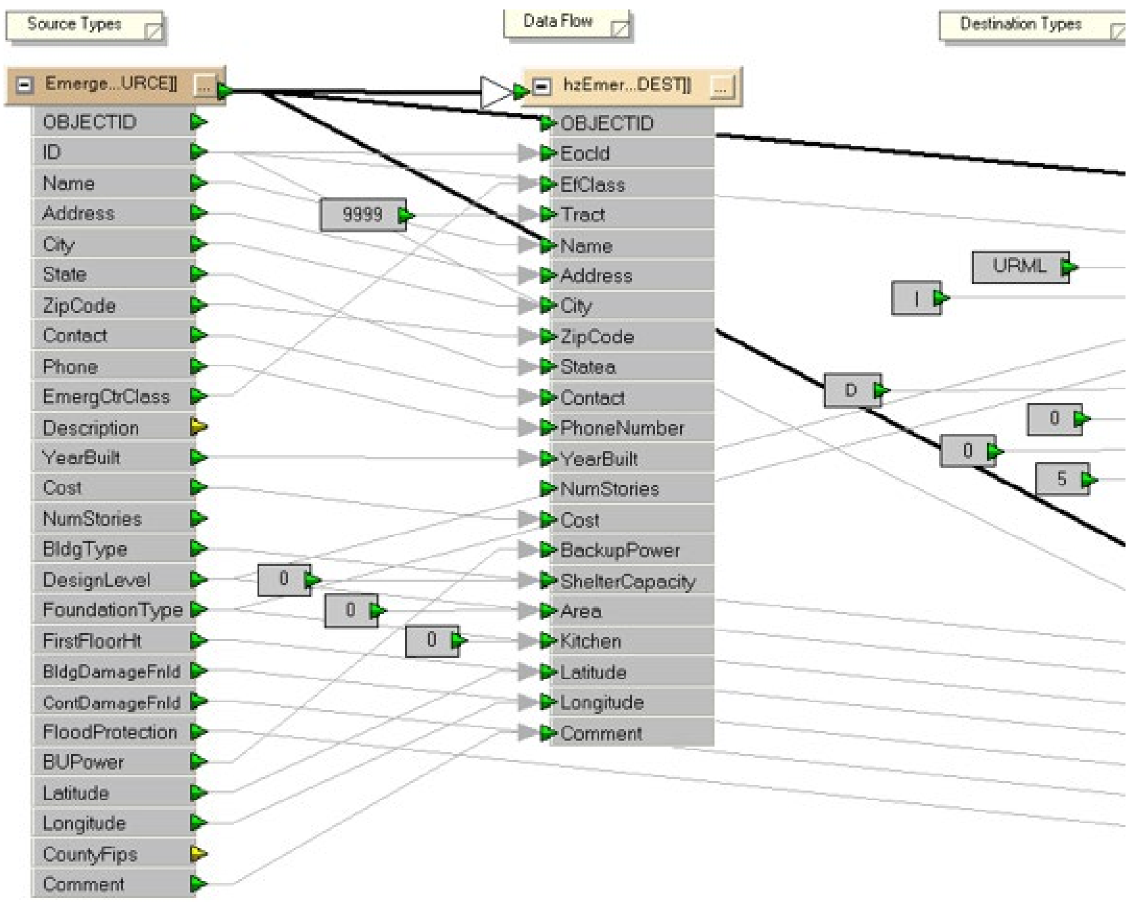
MS SQL Server Management Studio may be used to manage the data directly. This solution provides additional capabilities:

- Compress large MDF files
- Run SQL scripts
- Update the data directly
- Manage/backup MDFs between projects



Visual 6: Advanced Options

Commercially available data management tools such as FME provide rich options for power users.



Visual 7: Capstone Exercise

Scenario:

Your team has been assigned to help a local government update Hazus and then present to the Board how you made the updates, what difference the updated data makes in the results, and recommendations for how they could manage the data moving forward.

Deliverable:

PowerPoint Presentation targeted to a non-Hazus audience

Visual 8: Capstone Exercise

PART I: Develop a plan for updating the Hazus inventory.

- Define the purpose of conducting the Hazus run in order to make decisions about what to update and why.
- What are the priority inventory components?
- Where will you find the data that you need?
- What challenges / opportunities do you perceive that you will find as you update your inventory?

PART II: Work on updating a least one type of inventory.

PART III: Prepare the PowerPoint and plan your group presentation to the local Board.

Visual 9: Capstone Exercise

Data Management questions to consider:

- Where is Hazus inventory best maintained – local, state, regional, federal?
- What are some potential challenges – and strategies – for implementing a regional or state-wide coordination effort to manage inventory?
- Possible options for Master data maintenance:
  - by the state and distributed to locals
  - by the locals and rolled-up to the state
  - by local/state and rolled-up to Federal

Visual 10: Resources

Your resources for these exercises include:

- Your course materials
- Your own (or collective) experiences
- Your instructors (if you are nearing panic)

Visual 11: Questions?

Lesson 9: Course Wrap-Up

Visual 1: Lesson 9: Course Wrap-Up

Visual 2: Goals and Objectives

Goal

Review the major themes of the course and discuss opportunities for learning more about Hazus.

After completing this lesson, you will be able to:

- Identify the courses that are available for enhancing your Hazus skills
- Identify additional resources that are available for you to explore to enhance your Hazus experience

Visual 3: Course Wrap-Up

There are many approaches available for collecting, maintaining and sharing Hazus data.

- Use CDMS to transfer data to and from Hazus
- Alternate solutions may be needed
- Consult with subject matter experts
- Draw from the Hazus user community

Visual 4: Additional Training

Classroom Courses:

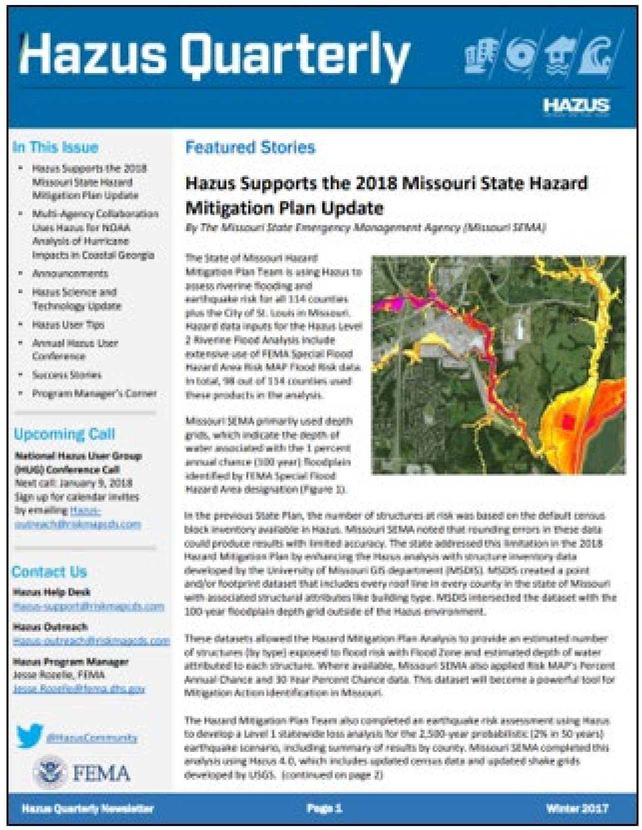
- E0190: ArcGIS for Emergency Managers
- E0313: Basic Hazus
- E0170: Hazus for Hurricanes
- E0172: Hazus for Floods
- E0174: Hazus for Earthquake and Tsunami
- E0179: Applications of Hazus in Disaster Operations
- E0317: Comprehensive Data Management for Hazus
- E0177: Advanced Hazus Applications

Visual 5: Become A Hazus Expert!

- Hazus Trained User
  - E0190 ArcGIS for Emergency Managers (or prior GIS experience may substitute)
  - E0313 Basic Hazus
  - E0317 Comprehensive Data Management (CDMS)
  - Minimum of Two of the follow:
    - E0170 Hazus for Hurricanes
    - E0172 Hazus for Floods
    - E0174 Hazus for Earthquakes and Tsunami
- Hazus Practitioner
  - E0190 ArcGIS for Emergency Managers (or prior GIS experience may substitute)
  - E0313 Basic Hazus
  - E0317 Comprehensive Data Management (CDMS)
  - Minimum of two of the follow:
    - E0170 Hazus for Hurricanes
    - E0172 Hazus for Floods
    - E0174 Hazus for Earthquakes and Tsunami
  - E0177 Advanced Hazus Applications
  - E0179 Hazus for Disaster Operations

Visual 6: Hazus Community Participation

- Annual Hazus User Conference Hazus
- Quarterly Newsletter
- National Hazus User Group calls
- Local Hazus User Groups
- Hazus Outreach Email: hazus-outreach@riskmapcds.com



Hazus Quarterly

HAZUS

In This Issue

- Hazus Supports the 2018 Missouri State Hazard Mitigation Plan Update
- Multi-Agency Collaboration Uses Hazus for NOAA Analysis of Hurricane Impacts in Coastal Georgia
- Announcements
- Hazus Science and Technology Update
- Hazus User Tips
- Annual Hazus User Conference
- Success Stories
- Program Manager's Corner

Upcoming Call

National Hazus User Group (HUG) Conference Call
Next call: January 9, 2018
Sign up for calendar invites by emailing Hazus-outreach@riskmapcds.com

Contact Us

Hazus Help Desk
Hazus-support@riskmapcds.com

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@HazusCommunity

FEMA

Featured Stories

Hazus Supports the 2018 Missouri State Hazard Mitigation Plan Update

By The Missouri State Emergency Management Agency (Missouri SEMA)

The State of Missouri Hazard Mitigation Plan Team is using Hazus to assess riverine flooding and earthquake risk for all 114 counties plus the City of St. Louis in Missouri. Hazard data inputs for the Hazus Level 2 Riverine Flood Analysis include extensive use of FEMA Special Flood Hazard Area Risk MAP Flood Risk data. In total, 98 out of 114 counties used these products in the analysis.

Missouri SEMA primarily used depth grids, which indicate the depth of water associated with the 1 percent annual chance (100 year) floodplain identified by FEMA Special Flood Hazard Area designation (Figure 1).

In the previous State Plan, the number of structures at risk was based on the default census block inventory available in Hazus. Missouri SEMA noted that rounding errors in these data could produce results with limited accuracy. The state addressed this limitation in the 2018 Hazard Mitigation Plan by enhancing the Hazus analysis with structure inventory data developed by the University of Missouri GIS department (MSDIS). MSDIS created a point and/or footprint dataset that includes every roof line in every county in the state of Missouri with associated structural attributes like building type. MSDIS intersected the dataset with the 100 year floodplain depth grid outside of the Hazus environment.

These datasets allowed the Hazard Mitigation Plan Analysis to provide an estimated number of structures (by type) exposed to flood risk with Flood Zone and estimated depth of water attributed to each structure. Where available, Missouri SEMA also applied Risk MAP's Percent Annual Chance and 30 Year Percent Chance data. This dataset will become a powerful tool for Mitigation Action identification in Missouri.

The Hazard Mitigation Plan Team also completed an earthquake risk assessment using Hazus to develop a Level 1 statewide loss analysis for the 2,500-year probabilistic (2% in 50 years) earthquake scenario, including summary of results by county. Missouri SEMA completed this analysis using Hazus 4.0, which includes updated census data and updated shake grids developed by USGS. (continued on page 2)

Hazus Quarterly Newsletter Page 1 Winter 2017

Visual 7: Getting Help

Hazus Help Desk - email

hazus-support@riskmapcds.com

Consult the User Manuals and Technical Manuals

https://www.fema.gov/hazus-mh-user-technical-manuals

Visual 8: Questions?

Handouts: Reference Material

Handouts Outline

The table below contains the type, number, and description of each handout. The data needed column identifies major datasets required to complete the activity. The data provided column identifies if that dataset is provided in the zip folder E0317_ActivityData for download.

Type	Number	Data Needed	Data Provided?
Activity	4.1	Salt Lake County Medical Facilities	Yes
Activity	4.2	MXD, MDB, Shapefiles	Yes
Activity	4.3	MXD, MDB, Shapefiles	Yes
Activity	4.4	AEBM.xls, AEBM.fmp	Yes
Activity	5.1	MXD, Shapefiles	Yes
Activity	5.2	MXD, MDB	Yes
Activity	5.3	MXD, MDB, Shapefiles	Yes
Activity	7.1	xls, hpr	Yes
Activity	7.2	Activity7_2.hpr	Yes

Data Dictionary

The table below contains the type, number, and data file name for each exercise. The data provided can be found in the zip folder E0317_ActivityData for download.

Type	Number	Data File(s) Provided	Folder Location
Activity	4.1	UT_SaltLake_Medic	E0317_ActivityData\

Type	Number	Data File(s) Provided	Folder Location
		alFacilities_New.xlsx	Activity_4_1\Student
Activity	4.2	MXD, MDB, Shapefiles	E0317_ActivityData\Activity_4_2\Student
Activity	4.3	MXD, MDB, Shapefiles	E0317_ActivityData\Activity_4_3\Student
Activity	4.4	AEBM.xls, AEBM.fmp	E0317_ActivityData\Activity_4_4\Student
Activity	5.1	MXD, Shapefiles	E0317_ActivityData\Activity_5_1\Student
Activity	5.2	MXD, MDB	E0317_ActivityData\Activity_5_2\Student
Activity	5.3	MXD, MDB, Shapefiles	E0317_ActivityData\Activity_5_3\Student
Activity	7.1	xls, hpr	E0317_ActivityData\Activity_7_1\Student
Activity	7.2	Activity7_2.hpr	E0317_ActivityData\Activity_7_2\Student

A Note on Understanding Images

Please note that many of these documents contain images that assist in the completion of the activities. These images are explained both by the surrounding text and by the alt text provided with the image. For individuals accessing the course with the relevant technology, please read the surrounding text and the alt text to gain a full understanding of the image.

Activity 4.1 - CDMS Navigation - Site Specific Inventory Updates

Type: Student Activity

Time: 45 minutes

Background

This activity will help you begin exploring ways that CDMS can support your data collection for Site Specific inventory. In this scenario, there is no reliable single source for Medical Care Facilities for Salt Lake County, Utah. In addition, while the local communities have better information, it is not available in a GIS format. You will find this to be the case in many states across the nation.

As the person responsible for improving the Hazus provided inventory data, you will begin your work by reviewing the Hazus provided Medical Care Facilities for Salt Lake County, Utah. You will then work with an Excel spreadsheet provided by the local health department that contains information for local medical facilities. The updated Excel files will then be used to update the Medical Facilities in the Hazus state database.

Comments that are shown in *italics* are tips.

Task 1: Setup CDMS State Data Location

Hazus organizes information on a state-by-state basis. CDMS works with one Hazus statewide data set at a time. For this activity, we will work with the default data for Utah.

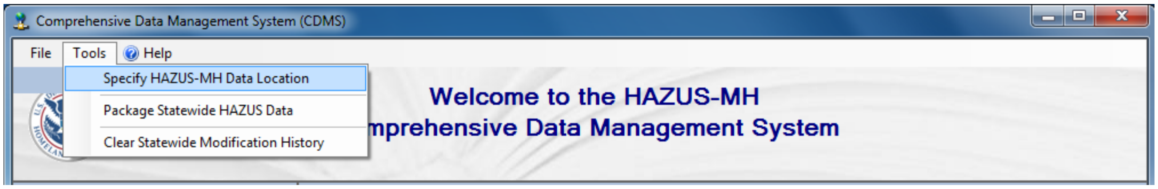
You can open CDMS from the Start menu, choose All Programs>FEMA Risk Assessment System >CDMS to start CDMS.

Hint – Right-click on CDMS and choose Create Shortcut to add a shortcut to your desktop that you can click to start CDMS for subsequent activities.

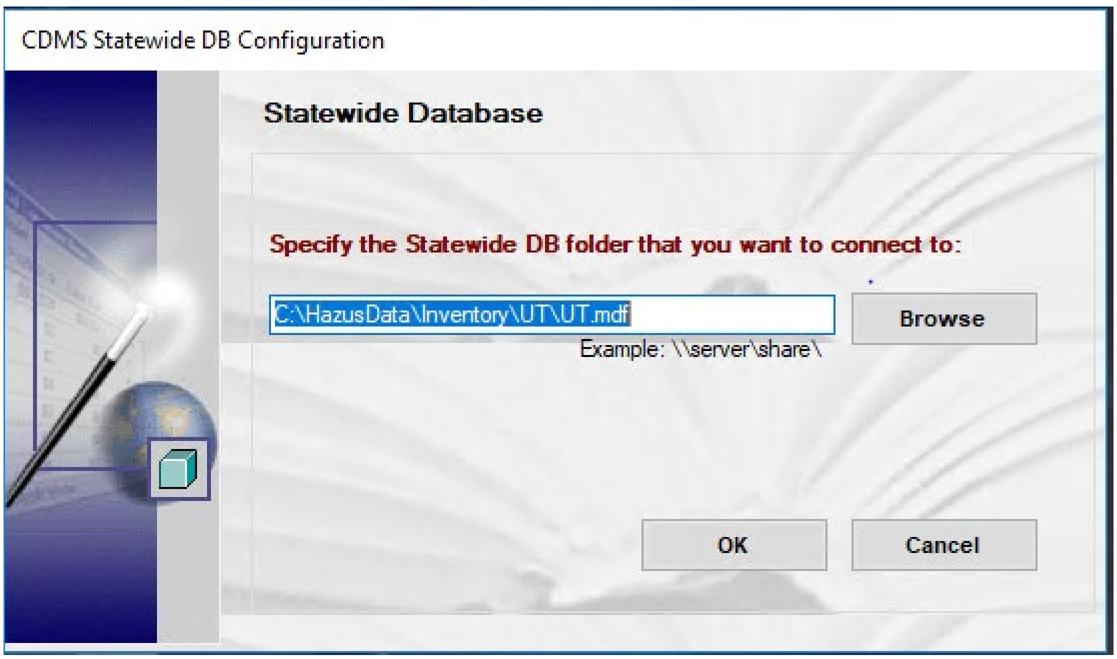
OR

Double click the CDMS icon on the desktop to start CDMS.

From the Tools menu, choose Specify Hazus Data Location.



From the CDMS Statewide DB Configuration box, click Browse.



Browse to the following location: C:\HazusData\Inventory\UT

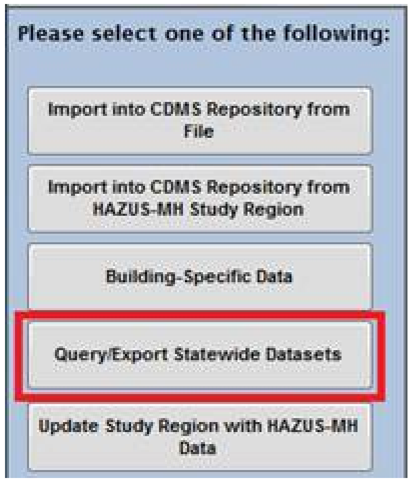
Click OK on the CDMS Statewide DB Configuration dialog box.

CDMS will retain the connection to the Utah state data location until you point to another state data folder. This activity is built on the Utah data sets located in C:\HazusData\Inventory\UT.

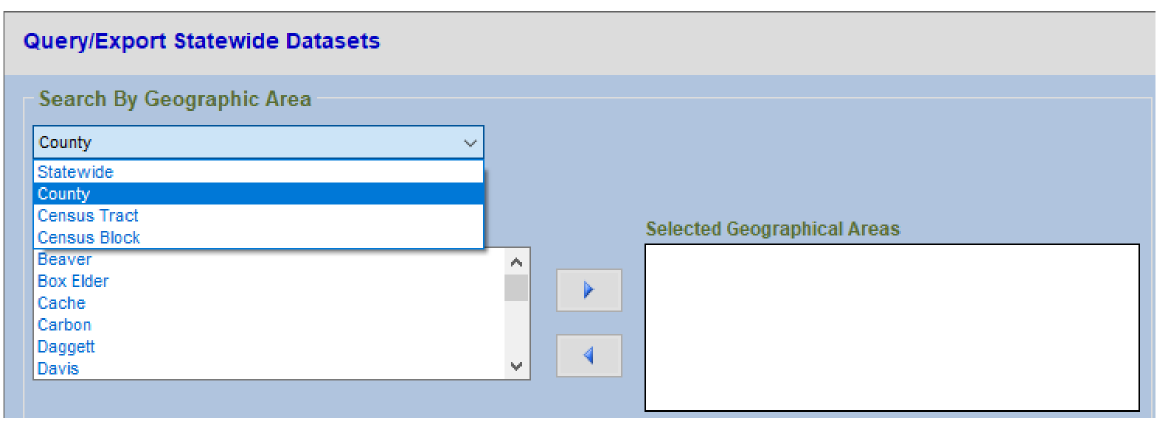
Task 2: Review Hazus Provided Salt Lake County Medical Facilities

In the next few steps, you will review the Hazus provided Medical Care Facilities for Salt Lake County using CDMS. You will then export the inventory to a Microsoft Excel file and review it in Excel.

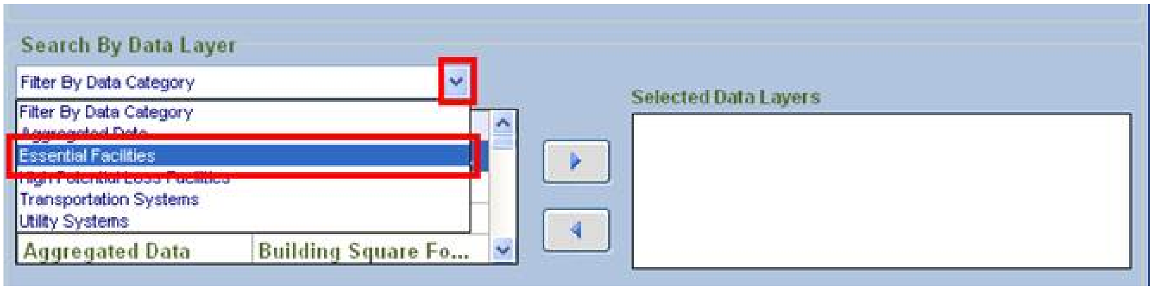
Click the Query/Export Statewide Datasets button.



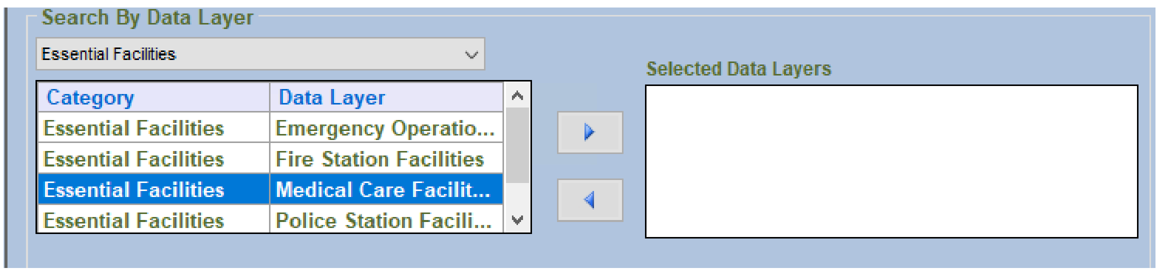
Click the Search By Geographic Area dropdown button and select County.



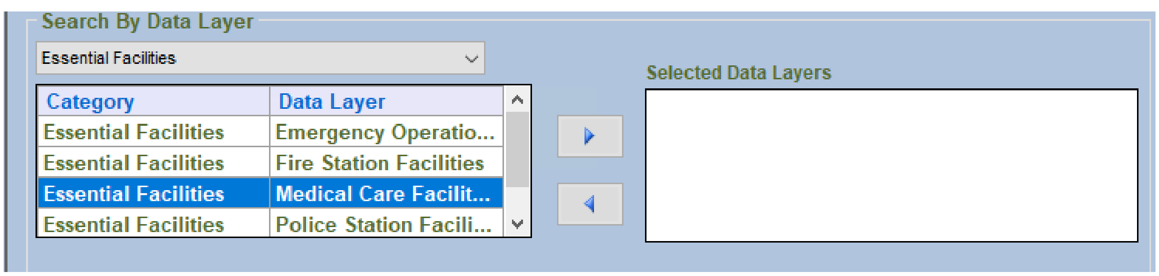
Scroll down and click Salt Lake and then click the right arrow to move that county to the Selected Geographical Areas window.



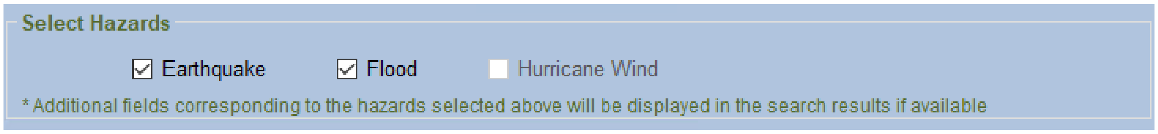
Click the Search By Data Layer dropdown box and select Essential Facilities.



Select the Medical Care Facilities data layer and then click the right arrow to the right of the data layer list to move that layer to the Selected Data Layers window.



Indicate that you want to query information for two of the Hazus supported hazards by checking the boxes next to Earthquake and Flood. (*You would select flood and earthquake for the tsunami hazard*.)



Click the Search button.

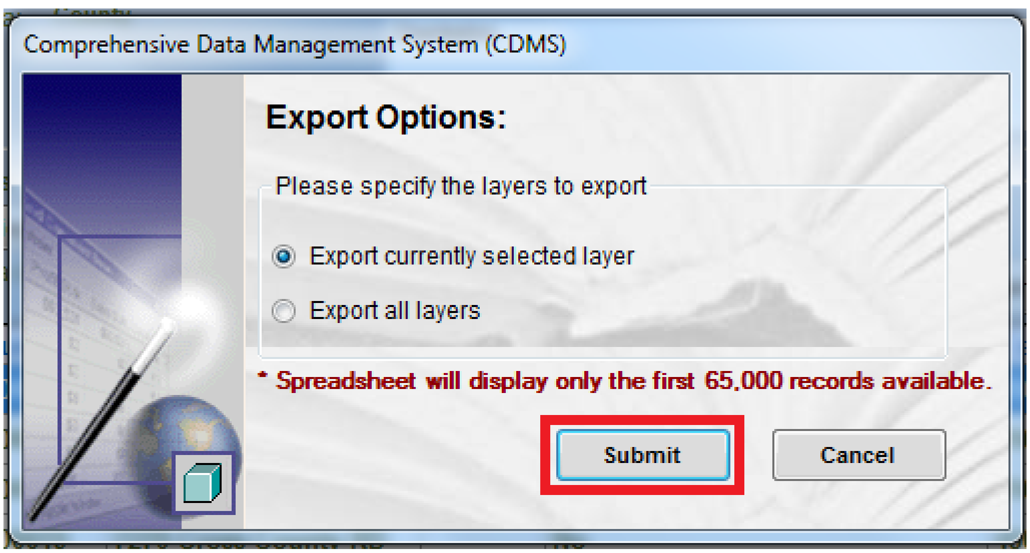
The list of medical facilities in Salt Lake County should appear.

Click the Export to Excel button.

From the Export Options dialog, select Export currently selected layer.

The option to export all layers is useful when you have queried multiple layers.

Click the Submit button.



Navigate to the C:\E0317_ActivityData\Activity4_1 folder and name the file UT_SaltLake_MedicalCenter_FLEQ_Default.xls.

The file name convention is <State>_<Region>_<Class>_<Model>_<Version>

Click Save and click OK when prompted to recognize that the file has been successfully created.

Hint: CDMS will write Microsoft Office 2003 XLS format, regardless of which version of Office is installed. The CDMS user must convert XLSX files to 2003 format before CDMS will be able to read it.

Click OK after excel file has been successfully created.

Click the Export to Geodatabase button.

From the Export Options dialog, select Export currently selected layer.

Click the Submit button.

Navigate to the C:\E0317_ActivityData\Activity4_1 folder and name the file UT_SaltLakeCounty_Care_Before.mdb.

This is our backup of the original data exported from CDMS that can be used to reset the database back to default after edits were made. We also will be using it in Activity 4.2.

Click the CDMS Home button.

Next, we will review the table that you exported in Microsoft Excel. Leave CDMS open since you will use it again shortly.

Start Microsoft Excel and open the UT_SaltLake_MedicalCenter_FLEQ_Default.xls file that you saved to the C:\E0317_ActivityData\Activity4_1 folder.

Use the UT_SaltLake_MedicalCenter_FLEQ_Default.xls file to answer the following questions.

The format of these fields is important when importing data into CDMS.

Questions	Answers
1. How many Medical Facilities are there in Salt Lake County?	
2. What is the default Back-up Power for each Medical Facility?	
3. What is the format of the latitude and longitude values?	
4. What are the default FL and EQ Building Types?	
5. What is the format of the HazusID?	
6. When was the last Medical Facility built?	

Leave the UT_SaltLake_MedicalCenter_FLEQ_Default.xls file open for the next part of the activity.

Task 3: Review New Salt Lake County Medical Care Facilities in Excel

A Microsoft Excel file has been provided by the local Health Department Officer. Excel is useful for content validation by people who do not have familiarity with or access to Microsoft Access or to tools that support more complex GIS formats.

Open the Excel file titled UT_SaltLake_MedicalFacilities_New.xlsx located in the C:\E0317_ActivityData\Activity4_1 folder.

Note: As previously stated, .xlsx is not compatible with the current version of CDMS. This will be modified in the following steps to be used with CDMS.

Compare the data in the Medical Facilities tab in the UT_SaltLake_MedicalFacilities_New.xlsx to the contents of the exported Hazus UT_SaltLake_MedicalCenter_FLEQ_Default.xlsx file. Use both worksheets to answer the following question.

Questions	Answers
1. What are the issues with the worksheet provided by the local Health Department that will need to be addressed before importing into Hazus? *Hint: What are the differences between the "Default" and "New" Excel files?*	The issues with UT_SaltLake_MedicalFacilities_New.xlsx are typical of non-Hazus data sets: • No FL, EQ or HU modeling values • No HAZUS_IDs • Differences in Units • Coordinates in Degrees, Minutes and Seconds. • Costs (Assessed values, building values versus replacement values) • Field formats are different • File formats are different

Select the Medical Care Facilities HZ worksheet from UT_SaltLake_MedicalFacilities_FLEQ_New.xlsx.

Corrections have been made that allow the records to be imported into Hazus.

Review the Replacement Cost (x$1000) column in the Medical Care Facilities HZ worksheet.

The replacement costs have been re-calculated in $x 1,000.

Review the Latitude and Longitude columns in the Medical Facilities*.*

Coordinates have been converted to decimal degrees

Select Excel 97-2003 Workbook from the File Save As options.

CDMS does not support Office 2007 or 2010. Since this spreadsheet is in an Office 2007 format it must be saved back to Office 2003.

Click Save**.**

This action keeps the same file name and saves the file to the C:\DMGT\Activity4_1 folder. A copy of the new medical care facilities records with an .xls extension is now available to be imported into CDMS so that you can update the inventory.

Close Microsoft Excel.

Hint: As a future reference, use the following links to help convert from degrees, minutes and seconds (GPS output) to decimal degrees:

http://www.anycalculator.com/decimaltodegree.htm

http://www.calculatorcat.com/latitude_longitude.phtml

Task 3: Review New Salt Lake County Medical Care Facilities in Excel

A Microsoft Excel file has been provided by the local Health Department Officer. Excel is useful for content validation by people who do not have familiarity with or access to Microsoft Access or to tools that support more complex GIS formats.

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Note: As previously stated, .xlsx is not compatible with the current version of CDMS. This will be modified in the following steps to be used with CDMS.

Compare the data in the Medical Facilities tab in the UT_SaltLake_MedicalFacilities_New.xls*x* to the contents of the exported Hazus UT_SaltLake_MedicalCenter_FLEQ_Default.xlsx file. Use both worksheets to answer the following question.

Questions	Answers
1. What are the issues with the worksheet provided by the local Health Department that will need to be addressed before importing into Hazus? *Hint: What are the differences between the “Default” and “New” Excel files?*	

Select the Medical Care Facilities HZ worksheet from UT_SaltLake_MedicalFacilities_FLEQ_New.xlsx.

Corrections have been made that allow the records to be imported into Hazus.

Review the Replacement Cost (x$1000) column in the Medical Care Facilities HZ worksheet.

The replacement costs have been re-calculated in $x 1,000.

Review the Latitude and Longitude columns in the Medical Facilities.

Coordinates have been converted to decimal degrees

Select Excel 97-2003 Workbook from the File Save As options.

CDMS does not support Office 2007 or 2010. Since this spreadsheet is in an Office 2007 format it must be saved back to Office 2003.

Click Save.

This action keeps the same file name and saves the file to the C:\DMGT\Activity4_1 folder. A copy of the new medical care facilities records with an .xls extension is now available to be imported into CDMS so that you can update the inventory.

Close Microsoft Excel.

Hint: As a future reference, use the following links to help convert from degrees, minutes and seconds (GPS output) to decimal degrees:

http://www.anycalculator.com/decimaltodegree.htm

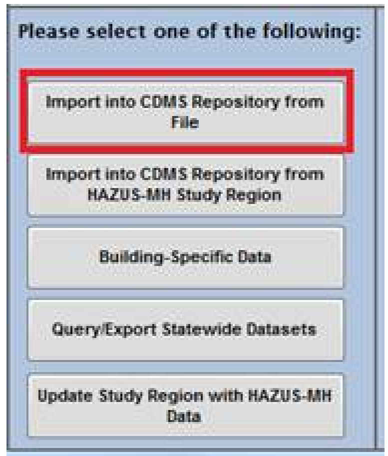
http://www.calculatorcat.com/latitude_longitude.phtml

Task 4: Import Salt Lake County Medical Facilities into CDMS

In the next few steps you will import the correctly formatted Microsoft Excel spreadsheet into CDMS. CDMS will validate the Medical Care Facilities records before allowing the new data set to be added to the CDMS Repository. Once in the Repository, data sets can be moved into the Hazus state database by either replacing or appending to the current contents. In this scenario, you are going to append the new Medical Facilities to your current Hazus data set.

Start CDMS if it is not already open. From the CDMS Home menu, select Import into CDMS Repository from File.

You will import the modified Medical Facilities records into CDMS, but first it needs to pass validation.



Click the Browse button to the right of the Select file to Import box.

Browse to the C:\E0317_ActivityData\Activity4_1 folder.

This is where the file containing the new Medical Facilities is located.

From the Files of Type dropdown box, select Microsoft Excel File (xls.).

This will allow you see the .xls file you created in the Activity 4_1 folder.

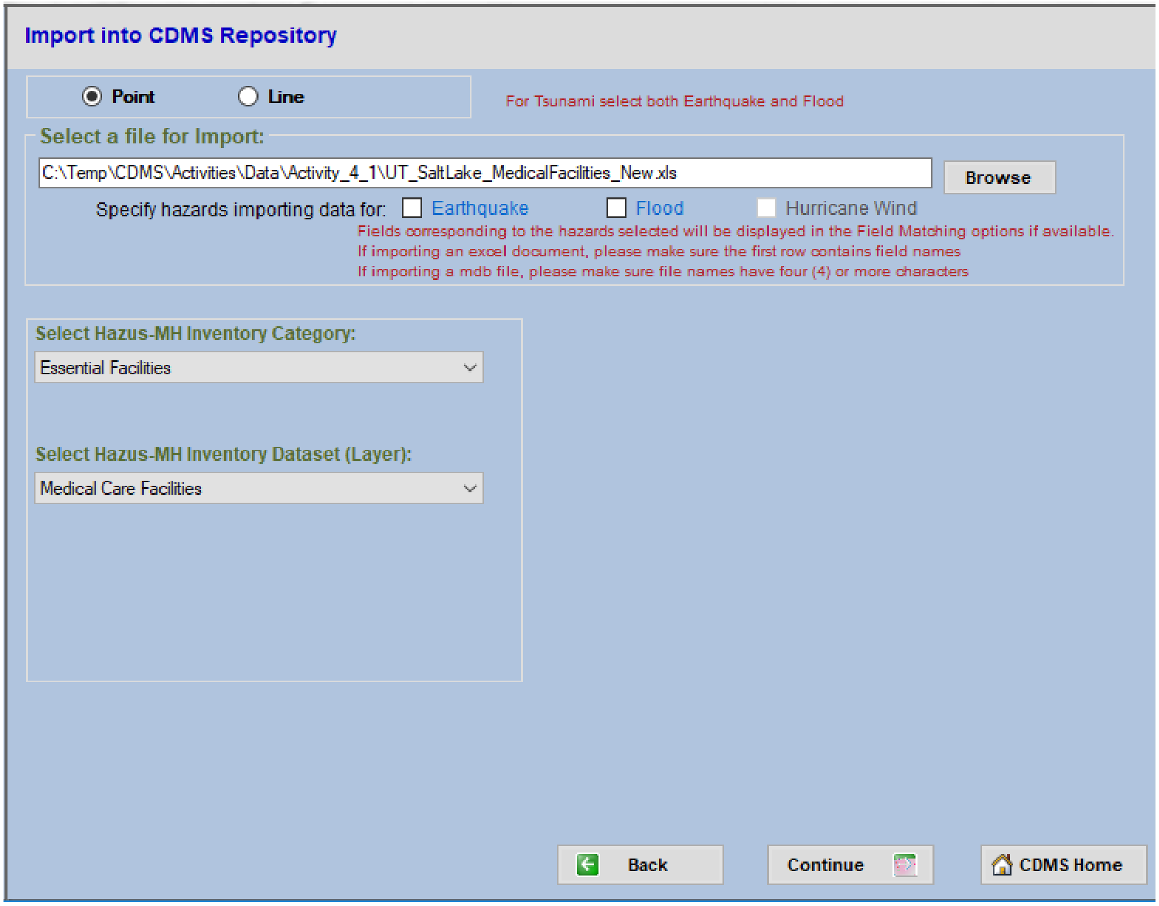
Select UT_SaltLake_Medical_Facilties_New.xls.

Click Open.

Uncheck the Earthquake and Flood boxes.

The Health Department was not able to provide these details.

Select Essential Facilities as the Inventory Category and select Medical Care Facilities as the Inventory Dataset.



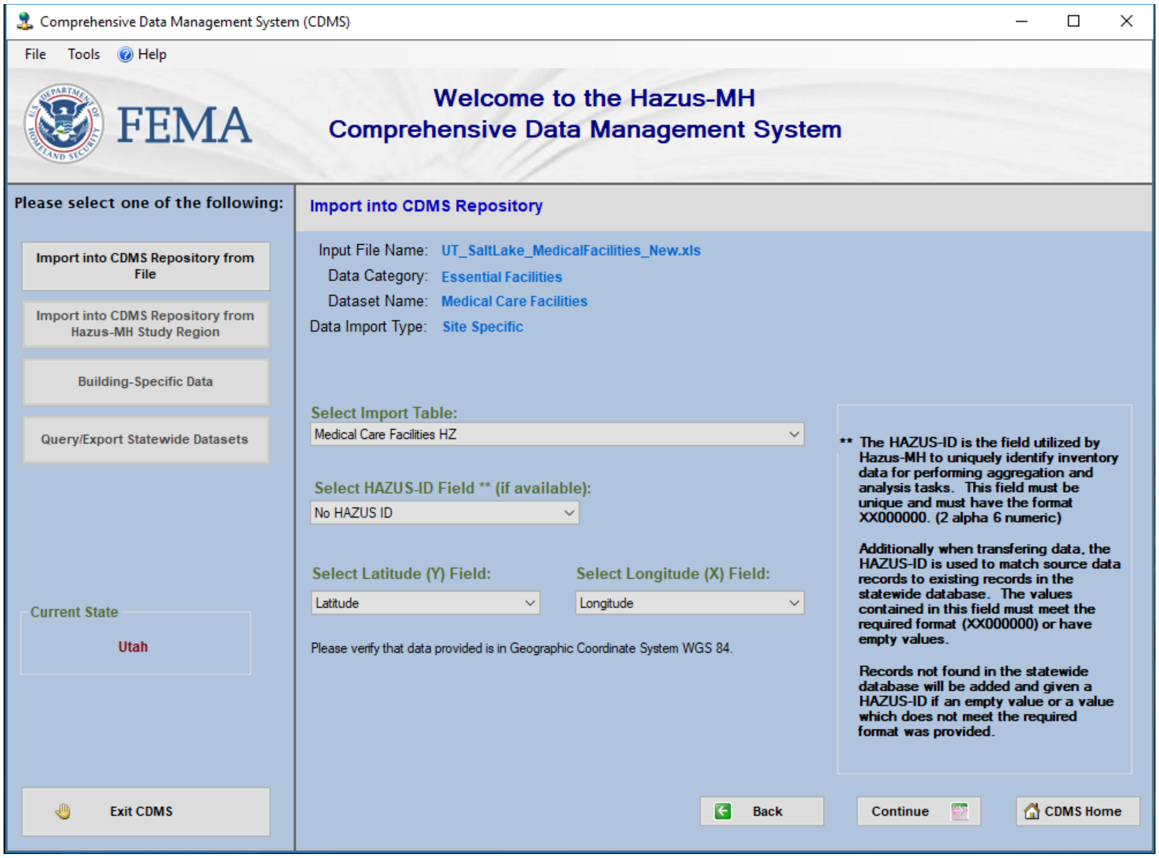
Click the Continue button to advance to the next window.

From the Select Import Table dropdown, select Medical Care Facilities HZ.

From the Select Hazus-MH-ID Field dropdown, select NO Hazus_ID.

This action tells CDMS to assign a new ID value to each of the imported Medical Care Facilities.

From the Latitude (Y) Field dropdown, select Latitude. From the Longitude (X) Field dropdown, select Longitude.

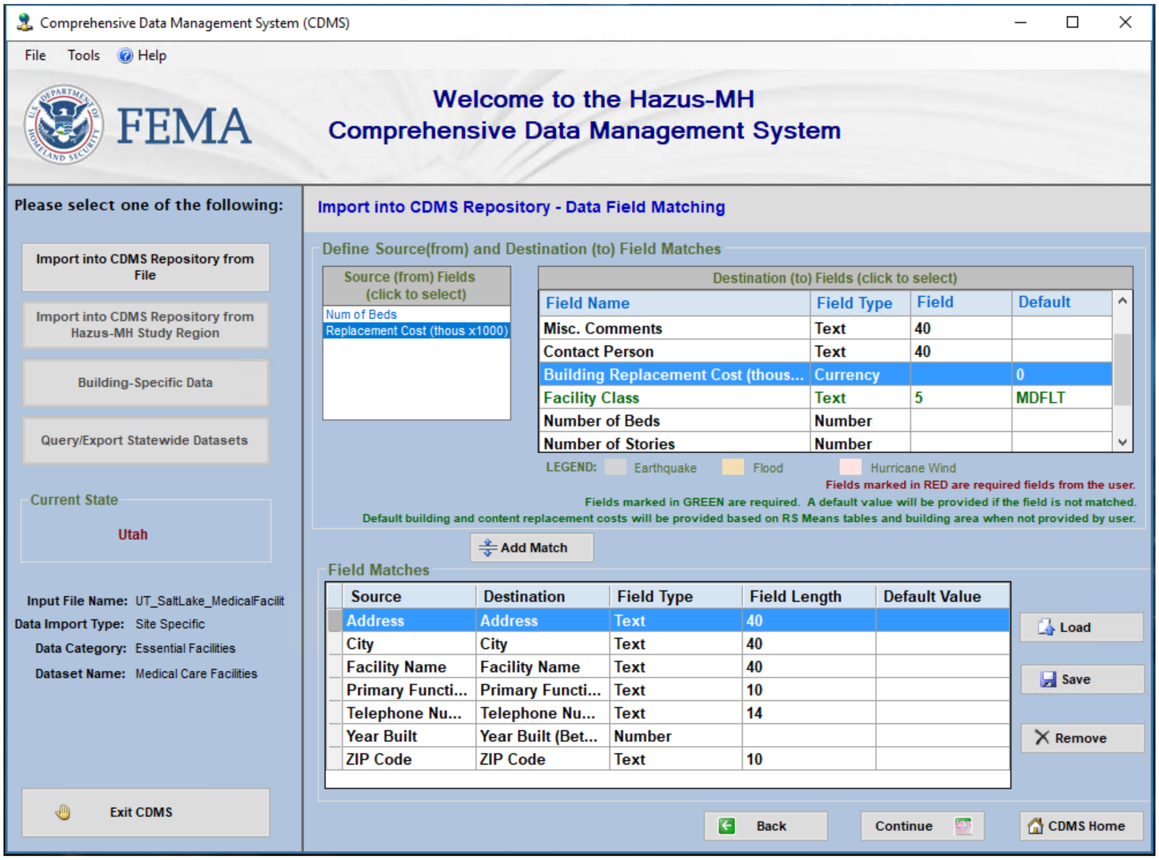


Click the Continue button to advance to the next window.

Select Replacement Cost (x$1000) from the Source (from) Fields box.

CDMS will match fields wherever it can; however, user defined fields must be matched manually.

Select Building Replacement cost (thous. $) from the Destination (to) Fields box.



Click the Add Match button.

Interactively match the following fields the same way as above:

Num of beds-> Number of Beds

Click the Save button to save this as a template.

The saved mapping template can be re-used for the same data set and file format.

Navigate to C:\E0317_ActivityData\Activity4_1. Name the template UT_SaltLake_MedicalCareFacilities_FLEQ_New_XLS.

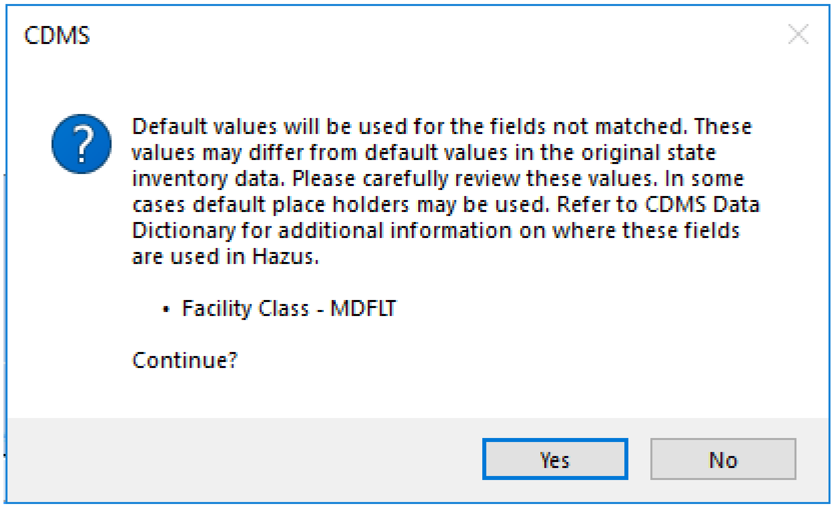
The saved field matching template is a ".fmp".

Click the Save button.

Click the Continue button to advance to the next window.

Click Yes to accept the default value for Facility Class.

The fields not provided by the Health Department will be defaulted by CDMS. If you wanted different values, you would need to add a new column to the XLS for each field and add the appropriate values.



A pop-up window will open when the data has imported successfully. Click OK.

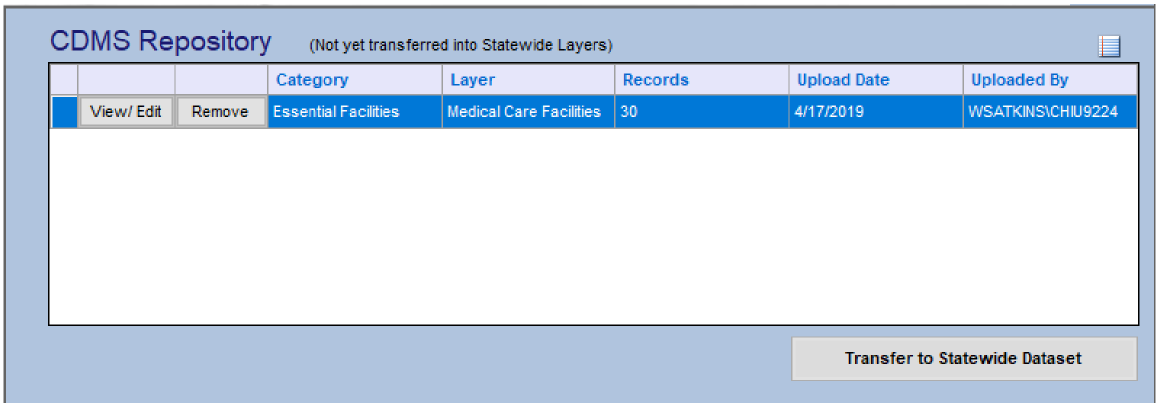
An error report will display if the validation is unsuccessful. The validation report displays the source fields with validation errors.

Task 5: Transfer Medical Care Facilities from CDMS Repository to Hazus

At this point, the new Medical Care Facilities have passed CDMS validation and are now temporarily residing in the CDMS Repository. They are valid Hazus features, but not yet in the Hazus state databases. New Study Regions will not contain the updated Medical Care Facilities until the records have been transferred to the state databases.

From the CDMS Repository window, click View/Edit to the left of the Medical Facilities row to view the Medical Care Facilities inventory.

This is your last opportunity to review your work before transferring it to the Hazus state database.



The contents of the CDMS Repository can be reviewed one last time. View the contents of the Medical Care Facilities table in the CDMS Detail Information window to answer the following questions.

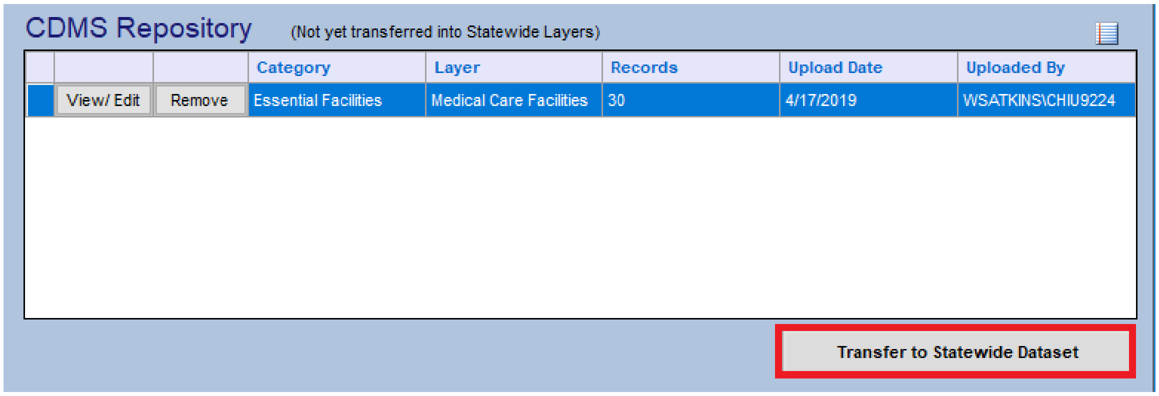
Notice that all fields required by Hazus have been loaded by CDMS regardless of whether you provided them or not.

Questions	Answers
1. What is the format for the Hazus_ID?	
2. For which hazards did CDMS provide default hazard data?	

From the CDMS Detail Information window click the Close button.

Last chance to check the data - once transferred to the state tables, there is no UNDO!!!

Click the Transfer to Statewide Dataset button.

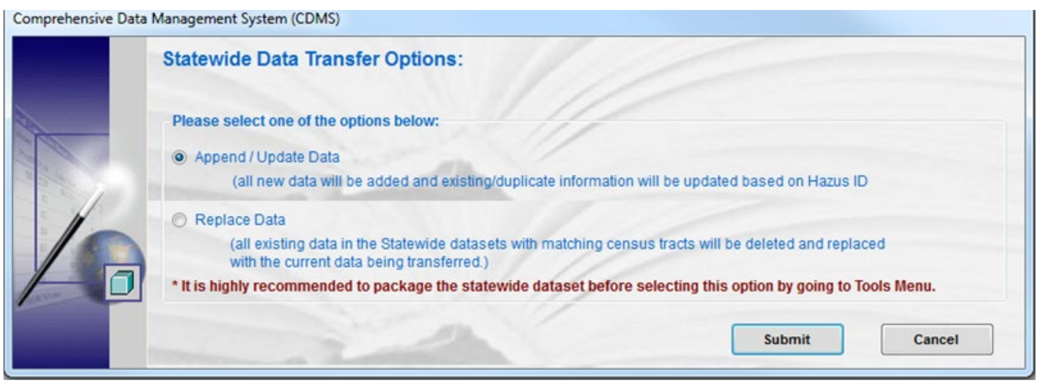


From the Statewide Data Transfer Options window select Append/Update Data.

The Append/Update Data option adds the new Medical Care Facilities to the existing records. If the HAZUS_IDs match, the old records will be deleted.

The Replace Data option purges any existing Medical Care Facilities and replaces them with the new data set within the same Census Block.

Select the Append/Update Data option and click Submit.



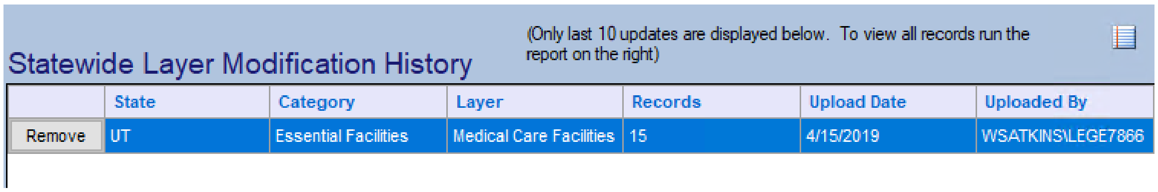
Click Yes to confirm transfer to statewide dataset.

Click OK to close the Statewide data transfer complete dialog box.

The data has now been successfully transferred to the Hazus Utah state database.

The dataset is no longer seen in the CDMS Repository. It is now shown in the Statewide Layer Modification History. All transactions of data import transactions will be recorded over time, unless user deleted the transactions manually.

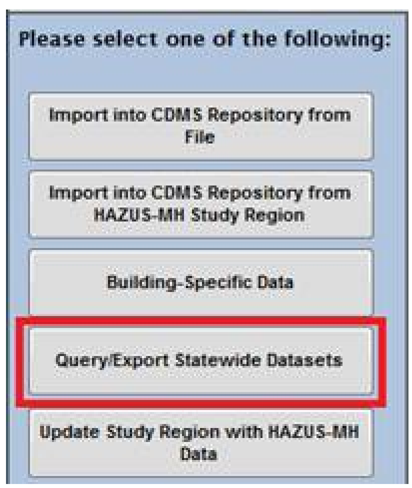
The Statewide Layer Modification History transactions report can be found by clicking the paper icon on the right. Users are recommended to utilize the function when the number of entries *becomes large for tracking purpose. The Statewide Layer Modification History entries may also be manually deleted. If a CDMS user switches to another state, the records must be removed first. Once the entries are deleted, those records will no longer appear in the report. Only entries currently in the State Layer Modification History will appear in the report.*



Task 6: Verify Salt Lake County Medical Care Facilities in CDMS

It is always good practice to verify the results. This practice will be repeated throughout the course. So far in Activity 4.1, we exported the default Medical Care Facilities from Hazus into Excel, then we added some new Medical Care Facilities from an Excel file provided by the Salt Lake County Health Department. We will now view the updated Medical Care Facilities.

Select Query/Export Statewide Datasets from the CDMS Home page.



Select County from the Search By Geographic Area drop-down.

We want to export the data by County (not Tract, Block or State).

Select Salt Lake County and move the selected item into the Selected Geographical Areas frame by clicking the right arrow button.

The only records we want to export are in Salt Lake County.

Select Essential Facilities from the Search By Data Layer drop-down.

Medical Care Facilities are a sub-set of Essential Facilities.

Select Medical Care Facilities and move the selected item into the Selected Data Layers frame by clicking on the right arrow button.

The only records we want to export are Medical Care Facilities.

Check all the available hazards from the Select Hazards panel.

We want to include the Earthquake and Flood values in the exported data set.

Click Search when all the parameters are set according to the figure below.

Select Export to Excel from the Search Statewide Datasets screen.

Set the Export Option to Export Currently Selected Layer in the pop-up dialog box.

This pop-up always shows up to determine if we what to export all layers, or just the layer we are currently looking at.

Save the new Hazus Medical Care Facilities to C:\E0317_ActivityData\Activity4_1\ as UT_SaltLake_MedicalFacilities_FLEQ_Updated.xls

Notice the file naming conventions: the _Default and _Updated suffixes will be used throughout E0317 to designate data sets that have changed. The _Default is our backup. The _Updated is (hopefully) the improved version.

Changes to the Hazus data can also be reviewed using ArcCatalog. The difference is that your edits may be harder to find since the Hazus data is compiled for the whole state, not just Salt Lake County.

Open the original data that came with Hazus (UT_SaltLake_MedicalFacilities_FLEQ_Default.xls), the data you used for the update (UT_SaltLake_MedicalFacilities_FLEQ_New.xlsx) and the newly updated data that is now a part of the state data that you just viewed in CDMS UT_SaltLake_MedicalFaciltіes_FLEQ_Updated.xls) to answer the following questions.

Questions	Answers
1. What MedicalFacilties_IDs were assigned to the new Medical Facilities?	
2. How many Medical Facilities are there in Salt Lake County after the Append?	
3. Why aren't the "UT" values loaded for State in the new Medical Facilities?	
4. Why are the new Facility Class values set to "MDFLT" and not "EFHL" or "EFHM" or "EFHS"" like the existing records?	

Compare the default Salt Lake County Medical Facilities with the new Salt Lake County Medical Facilities and answer the following questions.

Questions	Answers
1. What was the value for EQ Design Level in the Salt Lake County Medical Facilities exported from Hazus in the first part of the activity?	
2. What is the value for EQ Design Level in the Medical Care Facilities in the new data?	

Close MS Excel and exit CDMS.

Conclusions

The relevant lessons learned from Activity 4.1 include the following:

1. CDMS can be used to review the Site Specific data sets in Hazus.

2. CDMS can be used to export the Site Specific data sets from Hazus. The export formats supported are Excel (Office 2003 format) and Esri personal geodatabase.

3. Exported data sets can be edited in Excel or Esri ArcMap.

4. CDMS can be used to import the Site Specific data sets from Hazus. The import formats supported are Excel (Office 2003 format), Esri Shape and Esri personal Geodatabase.

5. It is good practice to export the EQ and FL values, even if these values are not changed. CDMS loads default EQ and FL values based upon pre-existing records in Hazus if they are not provided in the source data.

6. There are two options for transferring Site Specific data from the CDMS Repository to Hazus:

a. Append
All transferred records are added to Hazus. This option is intended to be used for new facilities.

b. Replace
Records are transferred to Hazus by Census Block. CDMS will delete the old records in the Census Block before adding the new records. This option is intended to update geographies (e.g. an entire county or entire state).

7. Be cautious when updating Excel worksheets. Excel is not a database, but CDMS treats each row as a separate record:

a. Sorting must be performed on the entire worksheet, not individual columns.

b. Spatial coordinates cannot be checked in Excel, so double-check entries made by hand.

c. When deleting a record, delete the entire row (not just part of a row).

Rows or columns without data entries will result in CDMS validation errors. This can happen when copying formulae into blank cells. Before importing an Excel worksheet into CDMS, test for blank records by <Ctrl> <End>. The cursor will move to the last record. If there are blank lines, the fix is to delete the offending blank rows and/or columns, and then Save.

Activity 4.2 - Inventory Requirements for Site Specific Data (Append Option)

Type: Student Activity

Time: 60 minutes

Scenario

The goal in Activity 4.2 and 4.3 is to update the Hazus Medical Care facilities in Salt Lake County from data sets provided by the Utah Department of Health (UDOH). The workflow is similar to Activity 4.1, except that this time you will:

1. Work with "non-Hazus" source data.
2. Work with a sub-set of the statewide data.
3. Update all the facilities, not just import new ones.

The workflow is typical of approaches used to update the inventory from "Level 1" to "Level 2". Students involved in local mitigation planning activities may be familiar with similar efforts to update the default critical facilities in Hazus from more accurate sources.

There are two approaches we could take. Depending on the activity time available, try one approach, or attempt both approaches. The results at the end should be the same:

1. Activity 4.2: Modify the new information from UDOH to Hazus requirements. Manually delete the old Hazus records and add new Hazus records through append.
2. Activity 4.3: Export the Hazus data and modify it based upon the new information from UDOH. Replace the records.

In both activities, the source data from UDOH is the same. Unfortunately, UDOH does not maintain Hazus data. The hospital records have been exported by UDOH into an Access table from an Oracle asset management system. The records are for the entire state. As is typical, there are no FL or EQ values provided.

Once the modified Medical Care Facilities have been validated and imported into the CDMS Repository, you will transfer the updated records into Hazus as Essential Facilities using the CDMS Append option.

Task 1: Export Default Salt Lake County Hospitals from Hazus

The Hazus provided hospital records for Salt Lake County will be reviewed first. You will determine how Medical Care Facilities are currently populated in Salt Lake County and compare the results to the hospital records provided by UDOH. The intent is to make sure that we are adding value to the current Hazus data set.

Navigate to the C:\E0317_ActivityData\Activity4_1 folder and copy the file UT_SaltLakeCounty_Care_Before.mdb to the UT\E0317_ActivityData\Activity4_2 folder.

Open the CDMS_Activity_4_2.mxd map document which is located in the C:\E0317_ActivityData\Activity4_2 folder.

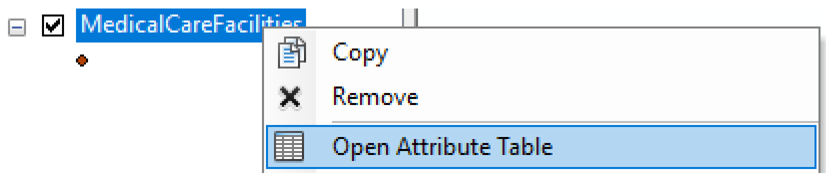
Navigate to the UT_SaltLakeCounty_Care_Before.mdb.

This is the original data we exported in Activity 4.1.

Set the data source MedicalCareFacilities and SaltLake Co features to the mxd.

Set the data source for the UDOH_Hospitals table in the mxd.

Right click on the MedicalCareFacilities to open attribute table.



Review the attribute table and answer the following questions.

Questions	Answers
1. How many Care Facility records exist in the default data for Salt Lake County?	
2. What are the EQ Building_Type values for the Care Facility records in the default data for Salt Lake County?	
3. What are the FL Building_Type values for the Care Facility records in the default data for Salt Lake County?	

Since the Salt Lake County Medical Care Facilities have been backed-up, the old records can be safely deleted from Hazus. The new Medical Care Facilities will be loaded from the UDOH hospital records if they pass inspection.

Deleting all Medical Care Facility records will remove previous edits from previous exercises

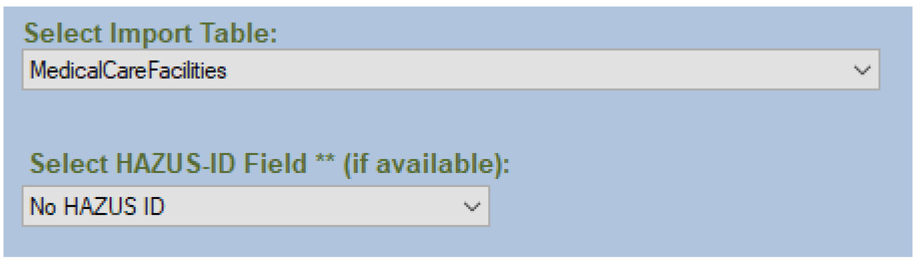
Select Delete All Records For Selected Inventory from the Search Statewide Datasets panel and click Yes when prompted to indicate that you want to delete the records.

We will be loading the original Medical Facilities data exported in Activity 4.1.

Next, click the CDMS Home button to go back to the home page.

Click the Browse and navigate to UT_SaltLakeCounty_Care_Before.mdb in the C:\E0317_ActivityData\Activity4_1 folder. Select Essential Facilities as the Inventory Category and select Medical Care Facilities as the Inventory Dataset, click Continue.

Use the default MedicalCareFacilities for Select Import Table and No HAZUS ID for Select HAZUS-ID field.



Click Continue.

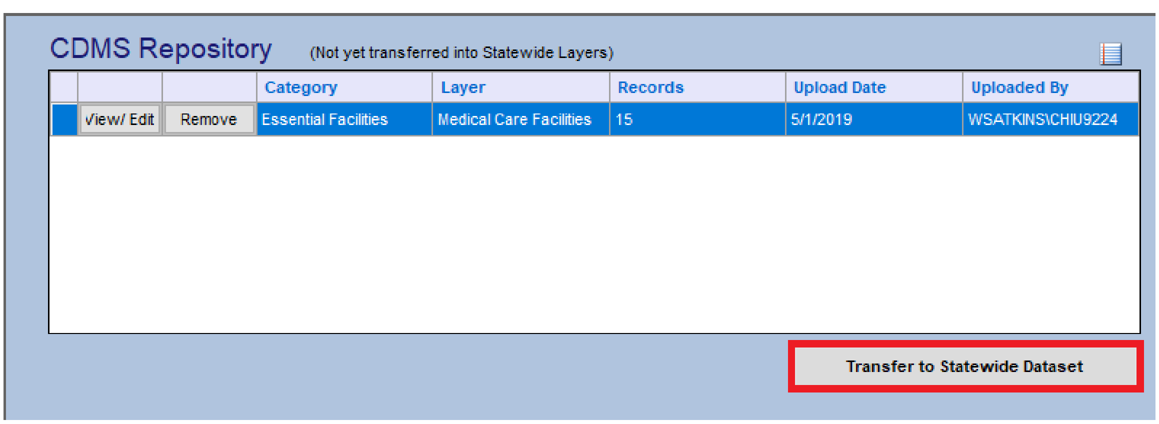
Click Continue again.

Click OK to Categorize Fields.

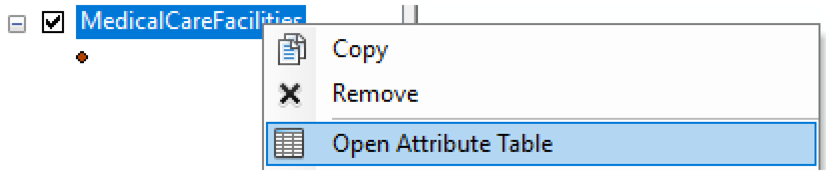
Click Continue for Back-up Power and Facility Class to accept default.

Click Ok when Data Import Success window prompted.

Click Transfer to Statewide Dataset button to update Medical Facilities in CDMS.



Click Submit to Append/Update Data.



Click Yes to confirm transfer layer to Statewide Dataset.

Exit CDMS.

Task 2: Review Hazus Care Facilities and UDOH Hospital Records in ArcGIS

The default Medical Care Facilities have been exported from Hazus in Activity 4.1. The information provided by the Utah Department of Health (UDOH) will be compared with the default records to determine where the gaps are.

The UDOH hospital records do not contain all the information you need to update the Hazus state data.

1. The records are for the entire state. We are only interested in hospitals in Salt Lake County.

2. The records are tabular. There are no Lat | Long fields, so the data cannot be imported directly into CDMS.

3. The records need to be cleaned up for importing into Hazus. Examples include:

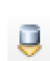
- *Replacement Cost recalculated in $1x1,000 (divided by 1,000)*
- *Essential Facilities (EF) Class is determined based upon the size of the hospital*

You will review the hospital data in ArcGIS to determine which records are in Salt Lake County. You will also modify the records so that they can be imported into CDMS.

Close the Hazus Care Facilities attribute table when you are done exploring the attributes.

You will now open the UDOH hospital records that were provided in an Access table and compare them to the MedicalCareFacilities already displayed on the map.

To view the Hospitals inventory from UDOH, select the List By Source button directly beneath the Table of Contents title.



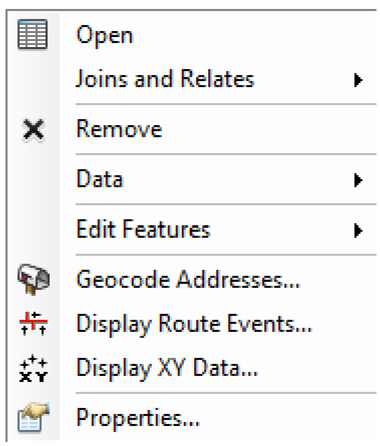
Right-click on the UDOH_Hospitals table and select Open to view the attributes.

The UDOH hospital records cannot be viewed on the map – they are in an Access table. The records do not contain spatial information (X,Y values in State Plane coordinates) which can be used to display the hospital locations in ArcGIS.

[Note – If the X,Ys were Latitude and Longitude, we could have potentially imported the records directly into CDMS. Even so, it is always a good idea to map the data first – these steps provide a quick way of doing that].

Close the Hospitals table.

Right-click on the Hospitals table in the Table of Contents and select the Display XY Data option.



Select X from the X Field dropdown menu.

Select Y from the Y Field dropdown menu.

Click the Edit button on the Display XY Data form.

This will open a set of dialog boxes that will be used to describe the projection of the X, Y coordinates. The GCS NAD83 projection currently displayed on the Details panel is not correct. This is the projection of the ArcGIS Frame, not the source data. The XY Coordinate System needs to be set to WGS 1984.

Select Projected Coordinate Systems-> State Plane-> NAD 1983 (US Feet)-> NAD83 StatePlane Utah Central FIPS 4302 (US Feet)

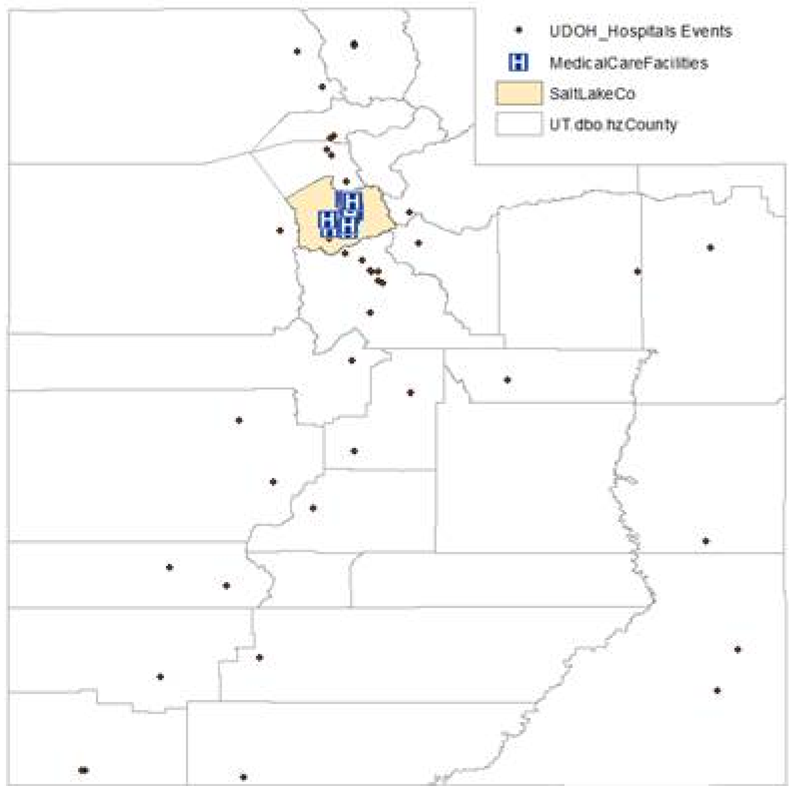
You may have to scroll up or down to find the Projected Coordinate Systems

Click the OK button.

Select OK on the Display XY Data form.

A temporary feature class named Hospital Events has been added to the ArcGIS map frame. Temporary feature classes cannot be imported by CDMS. It must be saved as a permanent feature class first.

There are 58 records displayed on the map. These are NOT records for Salt Lake County - they are all the Hospitals in Utah. You will use the ArcGIS Clip tool to extract the records within the Salt Lake County boundary. The map below shows the extent of new Hospitals Events layer.



From the Geoprocessing menu choose Clip to open the Clip tool.

Select Hospitals Events from the Input Features dropdown menu.

Select SaltLakeCo from the Clip Features dropdown menu.

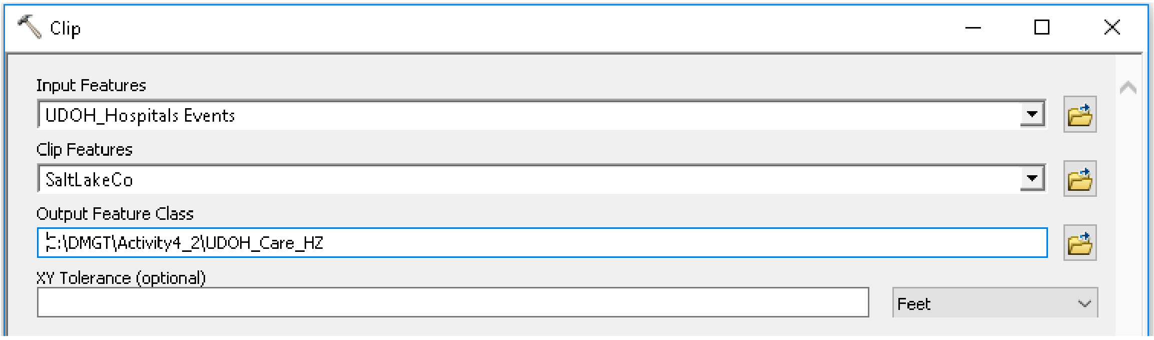
This is the boundary to be used for clipping.

Set the Output Feature Class to C:\E0317_ActivityData\Activity4_2\UDOH_Hospitals.

The clipped records will be stored in the backup GDB.

Name the Output Feature Class UDOH_Care_HZ and click Save.

This is the name of the permanent feature class that will be imported into CDMS.



Click OK on the Clip dialog box.

Click Close on the Clip tool information window when the Clip process has finished.

Right-click on the UDOH_Care_HZ layer and select Open Attribute Table to view the attribute table.

Use the open UDOH_Care_HZ attribute menu to answer the questions below.

Questions	Answers
1. How many Medical Care Facility records exist in the provided UDOH data for Salt Lake County?	
2. What is the total Building Cost for the Medical Care Facility records in the UDOH data for Salt Lake County?	

Task 3: Edit UDOH Hospital Records in ArcGIS

Typically, non-Hazus GIS data sets do not contain all the information you may need. Very often this data needs to be supplemented from other sources (e.g. County Assessor).

*In this activity, you will Add a field and re-populate two fields named **Use_Code** and **Bldg_Value** in the UDOH_Care_HZ layer. We will map these fields to EF Class and Replacement Cost during the import into the CDMS Repository. The model results will be enhanced with this information. For example, Replacement Cost is used by Hazus to determine the economic impact of a disaster.*

There are several other fields that could be populated if we had the values. Examples include Number of Stories, Contact Person, etc. For purposes of this activity, you will perform the following edits:

1. *Re-calculate the building values in thousands of dollars.*
2. *Load EF Class values based upon the size of the hospital.*

Item 1 is required for Site Specific data. You may remember from earlier in the course that CDMS provides an option to modify the dollar and area values to thousands during the import process. Site Specific imports offer no such option - the input data must be in thousands.

For Item 2, the allowed EF Class values are provided in Appendix A of the CDMS Data Dictionary.

Hazus Label	Occupancy Class	Description
MDFLT	Default Hospital	Assigned to features similar to EFHM
EFHS	Small Hospital	Hospital with less than 50 beds
EFHM	Medium Hospital	Hospital with beds between 50 & 150
EFHL	Large Hospital	Hospital with greater than 150 beds
EFMC	Medical Clinics	Clinics Labs Blood Banks

Select the Bldg_Value column from the UDOH_Care_HZ attribute menu.

Right-click on the Bldg_Value column and select Field Calculator. Click Yes to do this outside of an edit session.

The Bldg_Value entries are denominated in dollars. Hazus requires these values in thousands of dollars. We will use the ArcGIS Field Calculator to change the values.

Add the following script to the Bldg_Value = panel on the Field Calculator dialog.
[Bldg_Value]/1000

The script will divide the current Bldg_Value entries by 1,000. – Don’t run this script more than once!

Check to make sure that the Bldg_Value values are in 1 x $1,000.

The Field Calculator will also be used to modify the Use_Code values so that they may be used to designate the hospital class (Item 2 changes). First, we will set Use_Code = EFHS for small hospitals with less than 50 beds.

Click OK on the Field Calculator dialog.

Add a field in the attribute table *"Use_Code"*, input Text for Type and enter 10 for Length.

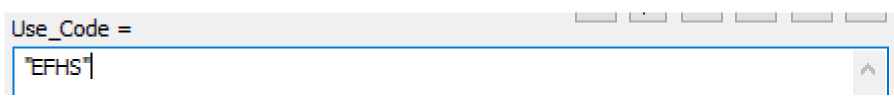
Use the Select by Attributes tool to select records in the UDOH_Care_HZ layer where Beds < 50.

Hint: There are tjree records.

Right-click on the Use_Code column and select Field Calculator.

Indicate in the Field Calculator that you wish to update the Use_Code value with "EFHS".

The script will load "EFHS" into the selected record.



Click OK on the Field Calculator dialog.

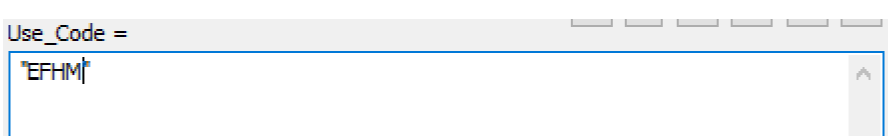
Select records where [Beds] >= 50 AND [Beds] <= 150 from the UDOH_Care_HZ feature class.

Hint: There are ten records.

Right-click on the Use_Code column and select Field Calculator.

Indicate in the Field Calculator that you wish to update the Use_Code value with "EFHM".

The script will load "EFHM" into the selected record.



Click OK on the Field Calculator dialog.

Finally, select the facilities with more than 150 beds and populate the Use_Code column with the value “EFHL”.

Hint: There are five records.

The UDOH records for Salt Lake County are (nearly) ready to be loaded into CDMS.

Unselect all of the UDOH_Care_HZ facilities, close the UDOH_Care_HZ attribute table, and close the Select by Attributes window if it is still open.

Save your map. Minimize ArcMap but leave it open. *There are CDMS errors that will need to be fixed.*

Task 4: Validate Salt Lake County UDOH Care Facilities Using CDMS (Try 1)

CDMS will validate the new hospital records before allowing the new data set to be added to the Utah Hazus statewide tables.

Open CDMS. From the CDMS Home menu click the Import into CDMS Repository from File button.

You will attempt to import the modified feature class to CDMS.

Click the Browse button and navigate the C:\E0317_ActivityData\Activity4_2 folder.

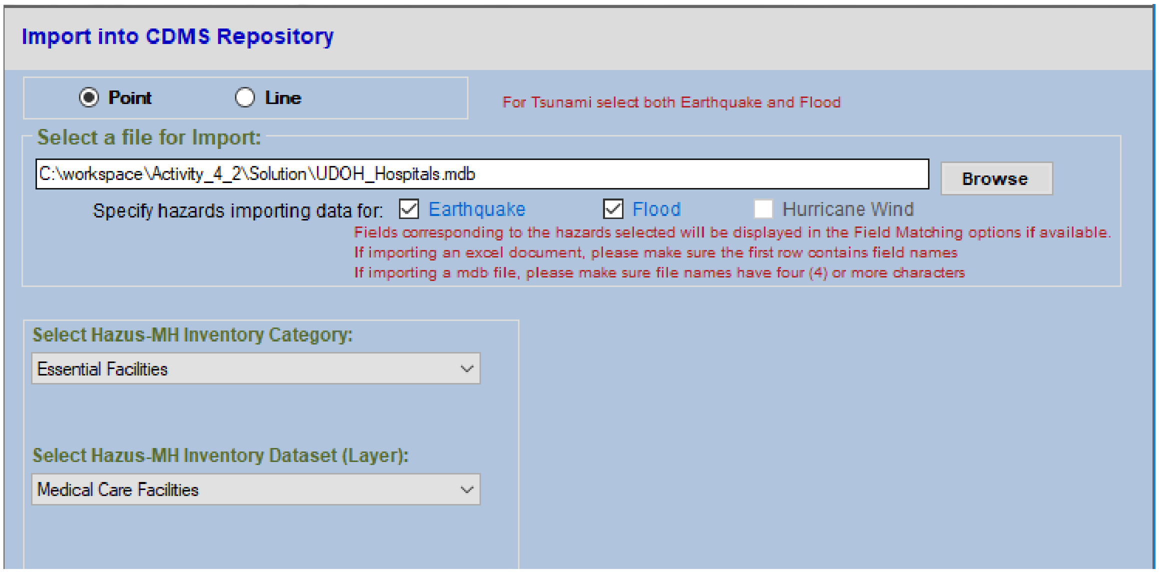
Select Microsoft Access\Geodatabase File (*.mdb) from the Files of Type dropdown menu.

Select the UDOH_Hospitals.mdb and click Open.

Indicate that you do not have data for any of the Hazus hazards by unchecking the boxes next to Earthquake and Flood.

Select Essential Facilities as the Hazus Inventory Category.

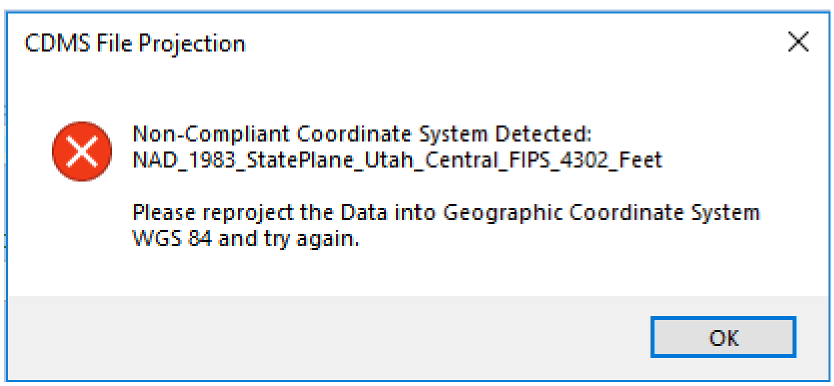
Select Medical Care Facilities as the Hazus Inventory Dataset.



Click the Continue button.

Select UDOH_Care_HZ from the Select Import Table dropdown.

CDMS will return a message telling you that the projection system of the input source is not supported by CDMS. This is a very common error message when working with GIS data sets that do not originate from Hazus. Hazus requires that all feature classes are projected in WGS 1984.



Click OK to close the CDMS File Projection box.

Click the Exit CDMS button.

Task 5: Re-project the Salt Lake County UDOH Care Facilities

CDMS requires all feature classes to be projected in WGS 1984. You must re-project the UDOH Care Facilities to pass CDMS validation.

Start ArcMap and open the CDMS_Activity_4_2.mxd map if it is not already open.

Create a new Personal Geodatabase named "UT_SaltLake_Care.mdb" in the C:\E0317_ActivityData\Activity4_2 folder.

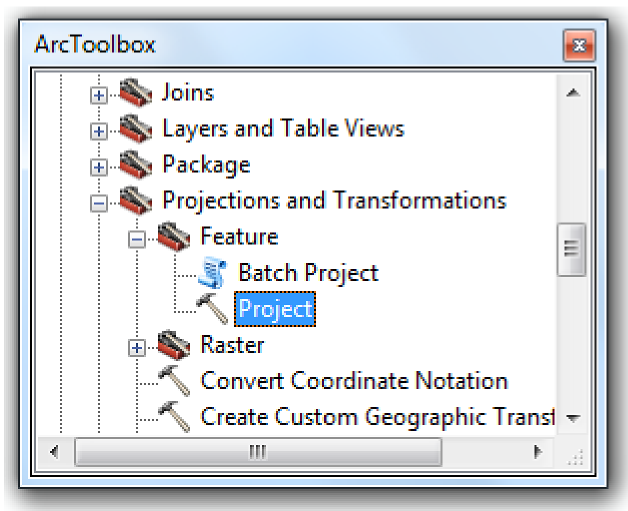
Open ArcToolbox by clicking the toolbox button.

Click the plus sign beside Data Management Tools to see the list of Data Management tools.

Click the plus sign beside Projections and Transformations to see the list of Projections and Transformations tools.

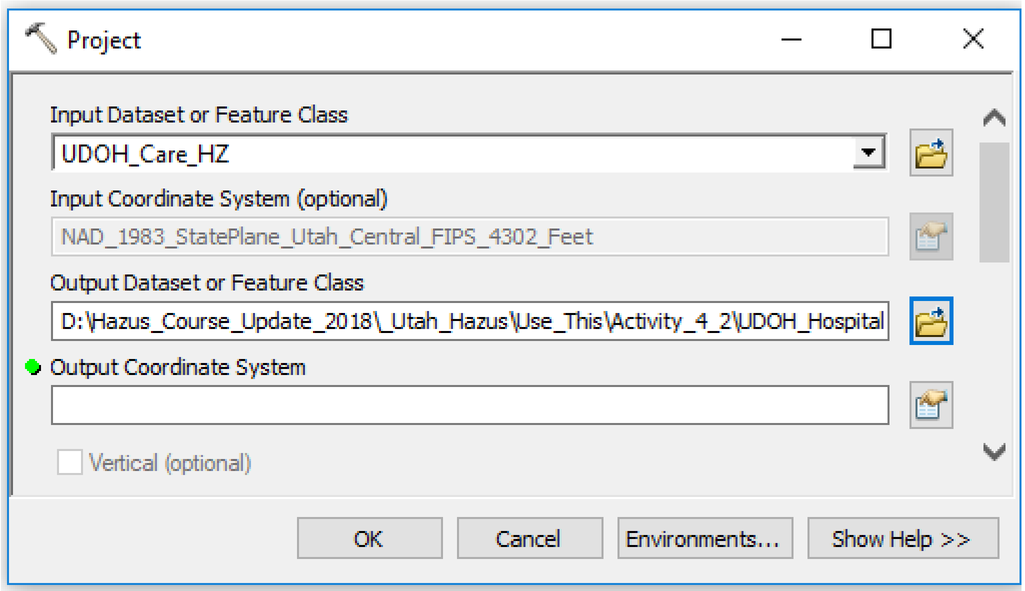
Click the plus sign beside Feature to see the list of Feature tools.

Double-click Project to view the Project dialog window.



Select UDOH_Care_HZ as the Input Dataset or Feature Class.

Name the output feature class UDOH_Care_HZ_GCS and store it in the UT_SaltLake_Care.mdb that was created in the C:\E0317_ActivityData\Activity4_2 folder. *Compare your Project window with the one shown below.*



Click the button beside Output Coordinate System. This will open the Spatial Reference Properties dialog to select the output coordinate system – same steps as before.

Click Select from the Spatial References Properties dialog box.

Select Geographic Coordinate Systems-> World-> WGS 1984

Click the OK button.

Click OK to start the Project tool.

If prompted, click Close when the projection is complete.

Save the map document and then exit ArcMap.

Task 6: Import the Salt Lake County UDOH Care Facilities into CDMS (Try 2)

You will now import the re-projected UDOH Care Facilities into the CDMS Repository. Once in the Repository, the records will be moved into the Hazus state database. In this activity, you will append the UDOH hospitals to the Utah statewide dataset. The old records in Salt Lake County have been deleted.

Open CDMS.

From the CDMS Home menu, click the Import into CDMS Repository from File button.

Select Browse and navigate the C:\DGMT\Activity4_2 folder.

Select Microsoft Access/Geodatabase (*.mdb) from the Files of Type dropdown menu.

Select the UT_SaltLake_Care_GDB database and click Open.

Uncheck the boxes next to Earthquake and Flood.

Select Essential Facilities as the Hazus Inventory Category.

Select Medical Care Facilities as the Hazus Inventory Dataset.

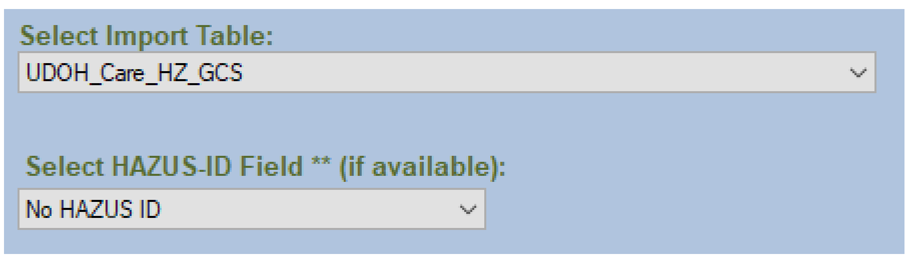
Click the Continue button.

From the Select Import Table dropdown menu, select UDOH_Care_HZ_GCS.

Make sure you select the feature class that was projected to GCS. Notice that this time you are not prompted for Lat and Lon values like you were in Activity 4.1. This is because you are providing GIS data sets (in the correct projection system). CDMS will populate the correct Latitude, Longitude, and census tract values using GIS tools 'behind the scenes.'

Select No HAZUS ID.

There are no HAZUS-IDs in the UDOH records. CDMS will assign new HAZUS-ID values.



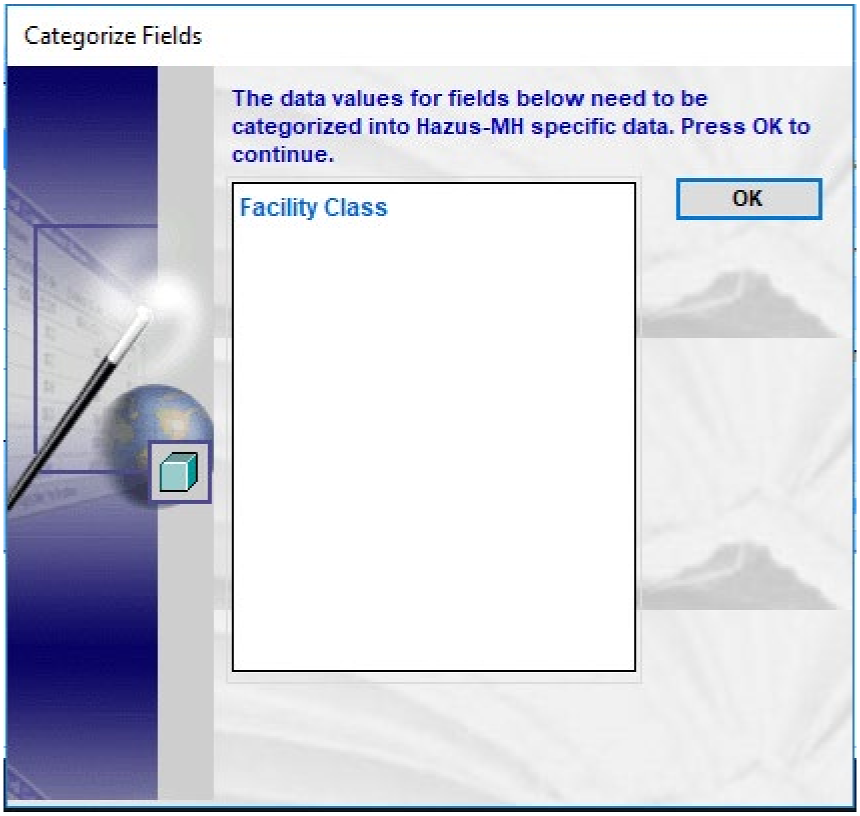
Click the Continue button.

If needed, Match the following fields from the Data Field Matching screen:

Source	Destination	Field Type	Field Length	Default Value
Address	City	Text	40	
City	City	Text	40	
State	State	Text	2	
NAME	Facility Name	Text	40	

Source	Destination	Field Type	Field Length	Default Value
FACID	AHA ID	Text	7	
Beds	Number of Beds	Number		
Bldg_Value	Building Replacement Cost (thous. $)	Currency		
Use_Code	Facility Class	Text	5	
Construction_Date	Year Built (Between 1500 and 2100)	Number		
ZIP	ZIP Code	Text	10	

Click the Continue button to accept default values for fields not matched.
Click the Continue button again.
Click OK to continue with categorize Facility Class fields.



Click the Continue button.

When the data is imported successfully, click OK to close the successful import box.

If there are errors, continue fixing the reported variances until validation passes.

Task 7: Transfer Medical Care Facility Facilities from CDMS Repository to the State Database

The new Medical Care Facility facilities have passed CDMS validation and are now residing in the CDMS Repository. They are valid Hazus features but not yet in the Hazus state database. Your updated Care Facilities will not be available to new Study Regions until you transfer the records to the Hazus state database.

From the CDMS Repository window, click the View button to the left of the Medical Care Facilities row to view the medical care facilities inventory.

This is your last opportunity to check your work before transferring it to Hazus.

View the contents of the table in the CDMS Detail Information window.

Review the values. Notice that all fields required by Hazus have been loaded, regardless of whether you provided them or not. In a real inventory updating activity you would ideally want to populate these extra fields with correct values rather than accepting the defaults.

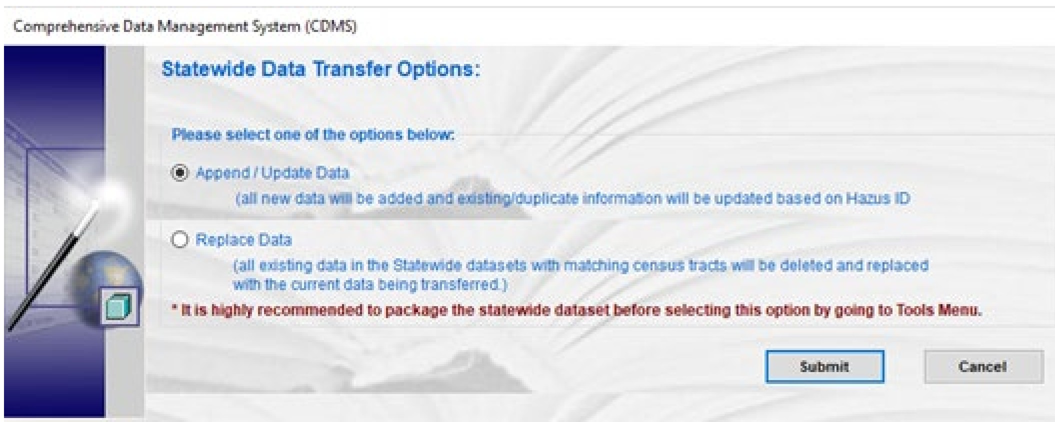
From the CDMS Detail Information window, click the Close button.

Last chance - once transferred to the state tables, there is no UNDO!!!

Click the Transfer to Statewide Dataset button.

From the Statewide Data Transfer Options window, select Append/Update Data.

The old Care Facilities in Salt Lake County were deleted. The new UDOH Care Facilities will be assigned new HAZUS_IDs and appended to the current Hazus essential facilities data.

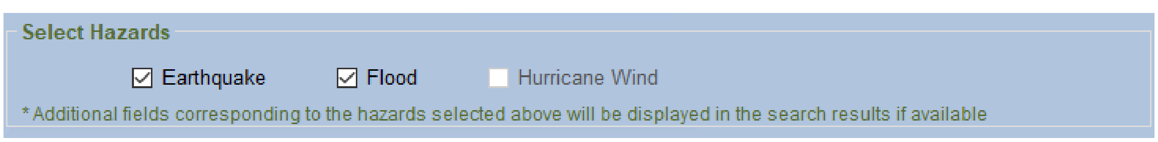


Click the Submit button.

Click Yes to confirm the transfer to statewide dataset, then click OK to close the Statewide data transfer complete dialog box.

After data trasfer completed, click on *Query/Export Statewide Datasets-> Export to Geodatabase* button to export data to the Activity 4.2 folder, named as "UT_SaltLakeCounty_Care_After.mdb."

Make sure check both Earthquake and Flood Hazard box at the bottom.



Review your work and answer the following questions:

Questions	Answers
1. How many Medical Care Facility records prior to the update for Salt Lake County?	
2. How many Medical Care Facilities records after the update for Salt Lake County?	
3. What is the total Replacement Cost for the Care Facility records after update for Salt Lake County?	
4. What are the FL Building_Type values for the Care Facility records in the updated data for Salt Lake County?	
5. What are the EQ Building_Type values for the new Care Facilities?	
6. What HAZUS IDs were assigned to the new Care Facilities?	

Exit CDMS. Congratulations! Activity 4.2 is complete.

Conclusions

The relevant lessons from Activity 4.2 include the following:

1. It is possible to modify source data so that it complies with Hazus requirements. CDMS field matching helps with different field names. The CDMS categorization capabilities help to modify field values to their Hazus equivalents. Activity 4.3 will work the other way – modify the Hazus data to match the source data.
2. GIS data sets imported to CDMS must be projected to WGS 1984. In this Activity we re-projected the feature class. In Activity 4.4 we will calculate the Lat and Lon values instead.
3. FL and EQ default values may be different between CDMS and Hazus if records are not present in the statewide database from which to obtain the running defaults. In this activity, CDMS provided FL and EQ values for the new Salt Lake County Care

Facilities, and they match the old Care Facilities. In practice, populate FL and/ or EQ values in the source data or plan to change them in Hazus after the fact.

4. This activity uses the Append option. We exported all the Care Facilities from Hazus, deleted them from Hazus, updated the Care Facilities outside of Hazus and then re-inserted them. Advanced users might want to re-do the activity after the end of the class, this time using the Replace option. Are the results the same? We'll use the Replace option in Activity 4.3.

Activity 4.3 - Inventory Requirements for Site Specific Data (Replace Option)

Type: Student Activity

Time: 60 minutes

Scenario

CAUTION: If you already completed Activity 4.2, use CDMS to restore the default Care Facilities in the Hazus database. Use the UT_SaltLakeCounty_Care_Before.mdb that were backed-up in Activity 4.2.

- *First, delete the current Medical Care Facilities for Salt Lake County before importing the default records. Use the Append/Update option to transfer the records to Hazus.*

The scenario for Activity 4.3 is the same as Activity 4.2. The input data sources are the same, but the approach will be different.

To review, the two approaches are:

1. Activity 4.2: Modify the new information from UDOH to Hazus requirements. Delete the old Hazus records and add new Hazus records. This approach will ONLY replace Medical Care Facilities that have new data in the same Census Tract.
2. Activity 4.3: Export the Hazus data and modify it based upon the new information from UDOH. Replace the records.

The source information has been exported by UDOH into an Access table from an Oracle asset management system. The records are for the entire state. As is typical, there are no FL or EQ values provided.

The workflow in Activity 4.3 differs from Activity 4.2 in two significant ways:

1. The exported Hazus data will be updated to match the source data. In Activity 4.2, the source data was changed to ingested by Hazus.
2. The Hazus data will be replaced. In Activity 4.2, the source records were added to Hazus, which required that the old records were deleted first.

The 4.2 option is typical of projects where source data is available, and it is known to be better/more current than the default Hazus data sets. This option is “out with the old, in with the new”.

The 4.3 option is typical of local hazard mitigation projects where local experts are asked to validate/update the Hazus critical facilities. This is a “data sharing” workflow.

There is no “correct” method. Either option may be used. CDMS has been available since 2008 and provided users an alternative other than relying on default Hazus datasets.

Once the updated Medical Care Facilities have been validated and imported into the CDMS Repository, you will transfer the updated records into Hazus as Essential Facilities using the CDMS Replace option.

Task 1: Export Default Salt Lake County Medical Care Facilities from Hazus

The Hazus provided medical care facility records for Salt Lake County will be reviewed first. You need to see what kind of Care Facility data is used by Hazus, verify how many Care Facilities are currently populated in Salt Lake County.

Start CDMS.

From the CDMS Home window, select the Query/Export Statewide Datasets button.

From the Query/Export Statewide Datasets window, query the Hazus database for Salt Lake County Medical Care Facilities, then click Search.

There should be 33 rows for Salt Lake County in the search result window. Select Delete All Data Records for

Selected Inventory to delete changes we made in Activity 4.2.

Select CDMS Home to go back to the home page.

Click on Import into CDMS Repository from File to import default Hazus data into CDMS repository.

Navigate to Activity 4.3 Student folder and select UT_SaltLakeCounty_Care_Before.mdb as file for import.

Be sure to check Earthquake and Flood box.

In the drop down box under Select Hazus-MH Inventory Category, select Essential Facilities.

Select Medical Care Facilities for Select Hazus-MH Inventory Dataset (Layer) drop down box.

For Import into CDMS Repository window, choose MedicalCareFacilities for import table drop down box, and HazusID for Select Hazus-ID field drop down box.

Click Continue to accept all Data Field Matching.

Click OK to Categorize Fields.

Click Continue to accept default for all, except:

EQ Deep Foundation Type, Match Null (Source) with 0 – Unknown (Destination)

Click OK for Data Import Success window, then Transfer to Statewide Dataset.

Click Submit to accept Append/Update Data option, then Yes to confirm the transfer.

Query Hazus database for Salt Lake County Medical Care Facilities, then click Search.

You will receive fewer hints and step-by-step instructions from this point forward in the course. Review the steps from Activity 4.1 if needed.

Review the data in the window to answer the following questions. After you are finished, exit CDMS.

Questions	Answers
1. How many Care Facility records exist in the default data for Salt Lake County?	
2. What is the total Replacement Cost for AHA ID 6870260 in the default data for Salt Lake County?	
3. What are the FL Building_Type values for the Medical Care Facility records in the default data for Salt Lake	

Questions	Answers
County?	

Task 2: Review Hazus Care Facilities and UDOH Hospital Records in ArcGIS

The default Care Facilities have been exported from Hazus. The information provided by UDOH) will be compared with the default records to determine where the gaps are.

The UDOH hospital records do not contain all the information you need to update the Hazus state data.

1. *The records are for the entire state. We are only interested in hospitals in Salt Lake County.*
2. *The records are tabular. There are no Lat | Lon fields, so the data cannot be imported directly into CDMS.*
3. *The records need to be cleaned up for importing into Hazus. Examples include:*

- *Replacement Cost recalculated in $1x1,000 (divided by 1,000)*
- *EF Class loaded based upon the size of the hospital*

You will review the hospital data in ArcGIS to determine which records are in Salt Lake County. You will also modify the records so that they can be imported into CDMS.

Start ArcMap. Open the CDMS_Activity_4_3.mxd map document which is located in the C:\E0317_ActivityData\Activity4_3 folder.

Right-click on the MedicalCareFacilities layer, UDOH_Hospital table and SaltLakeCo feature to set data source.

The map shows the locations of the default Medical Care Facilities that we used to set CDMS data back to default earlier.

You will open the UDOH hospital records that were provided in an Access table and compare them to the Medical Care Facilities already displayed on the map.

Close the *MedicalCareFacilities* table after you have finished viewing the attributes.

Select the List By Source button directly beneath the Table of Contents.

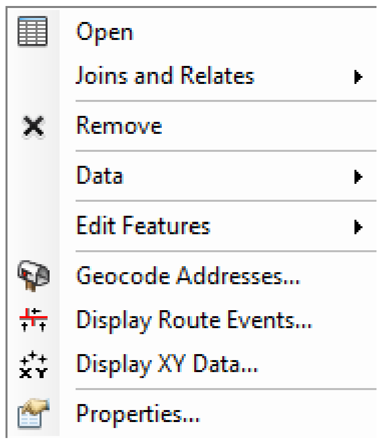
Right-click on the UDOH_Hospitals table and select Open to view the attributes.

The UDOH hospital records cannot be viewed on the map – they are in an Access table. The records contain spatial information (X,Y values in State Plane coordinates) which can be used to display the hospital locations in ArcGIS.

[Note – If the X,Ys were Latitude and Longitude, we could have potentially imported the records directly into CDMS. Even so, it is always a good idea to map the data first – these steps provide a quick way of doing that].

Close the Hospitals table after you have finished viewing the attributes.

Select the Hospitals layer from the Table of Contents and right-click to select the Display XY Data option.



Select X from the X Field dropdown menu and Y from the Y Field dropdown menu.

Click the Edit button on the Display XY Data form.

This will open a set of dialog boxes that will be used to describe the projection of the X, Y coordinates. The XY Coordinate System needs to be set to State Plane NAD83.

Click the Select button on the Spatial References Properties dialog box.

You will see the Browse for Coordinate System dialog.

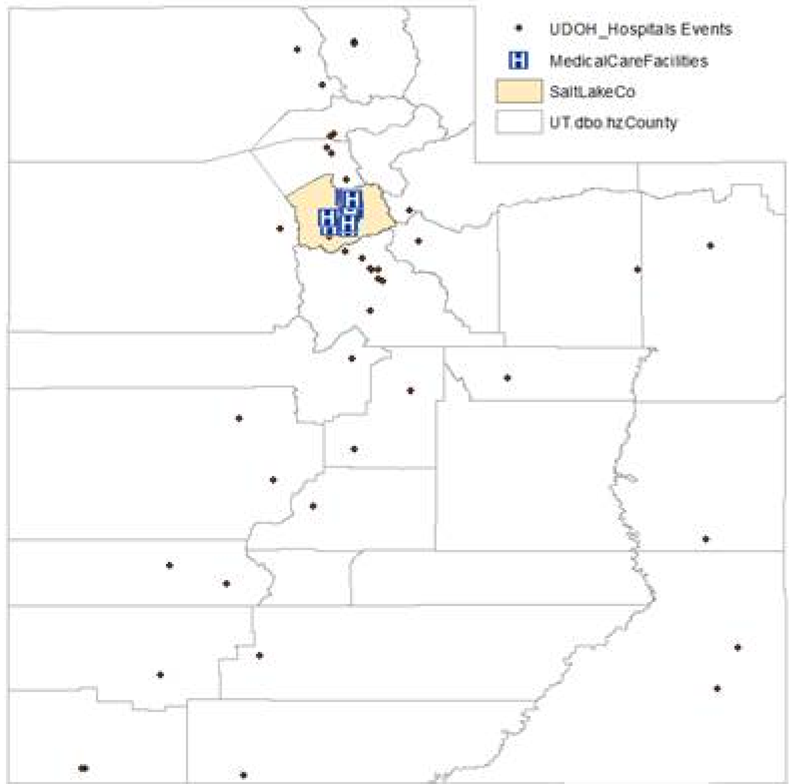
Select Projected Coordinate Systems -> State Plane-> NAD 1983 (US Feet)-> NAD83 1983 State Plane Utah Central FIPS 4302 (US Feet).prj.

Click the OK button.

The correct State Plane projection system should now be displayed under the Details panel of the Spatial Reference Properties form.

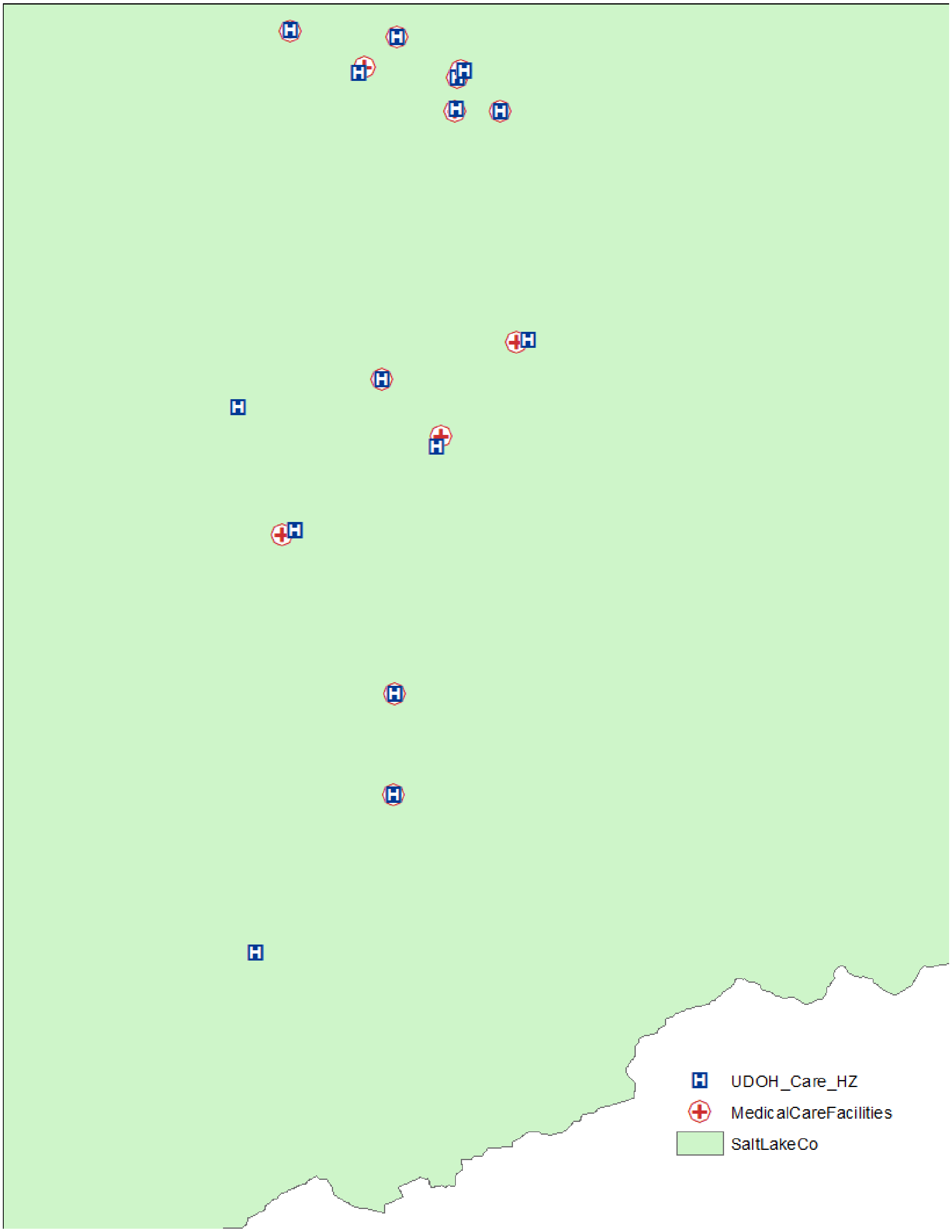
Select OK on the Display XY Data form.

A temporary feature class named UDOH_Hospital Events has been added to the ArcGIS map frame. A temporary feature class cannot be imported by CDMS - it must be saved as a permanent feature class first.



Task 3: Edit UDOH Hospital Records in ArcGISitle

For data to imported into CDMS, it requires the data coordinate system in WGS 1984. In this activity, since UDOH Hospital records will not be imported, so re-projecting the points is not needed. However, you can see from the map that the UDOH Hospitals are not in the same locations as the Hazus Medical Care Facilities. You will use the ArcGIS Geometry Calculator to determine the UDOH Lat and Lon values from the State Plane X,Ys.



Task 4: Edit Hazus Care Facilities in ArcGIS

You will modify the exported Hazus Medical Care Facility records to replicate the UDOH Hospitals. There are many approaches. One method is to move and edit the HZ records manually to make them match the UDOH records. We will take a different approach to limit the editing effort. This approach is preferred for larger data sets.

One of the obvious differences is the Landmark Hospital. This record will need to be added to the Hazus Care Facilities. You could add this record manually using the ArcGIS editor; however, here, you will use the ArcGIS Append function to transfer the new record from UDOH_Care_HZ.

In the Attribute Table of the UDOH_Care_HZ layer, select the record with the Name "LANDMARK HOSPITAL OF SALT LAKE CITY".

Close the UDOH_Care_HZ attribute table.

Right-click on the UDOH_Care_HZ layer and select Data | Export Data.

Choose the Selected Features option from the Export: dropdown menu.

Set the Save as Type: drop down menu to File and Personal Geodatabase feature classes.

Set the Output feature class to:
C:\E0317_ActivityData\Activity4_3\UT_SaltLake_Care_GDB.mdb\Landmark.

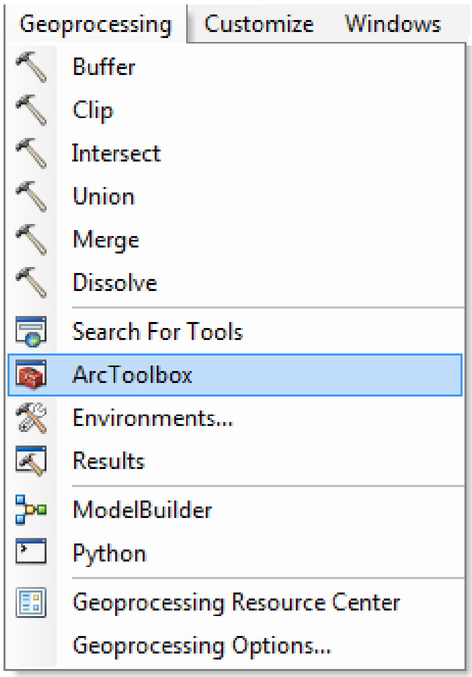
Click OK to complete the export process and choose Yes when asked if you wish to add Landmark hospital to the map frame.

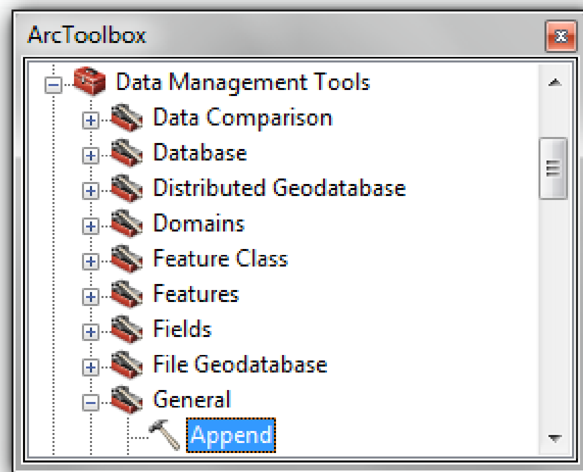
Clear all selected records. The exported Landmark record can now be appended to the MedicalCareFacilities layer.

Select ArcToolbox from the Geoprocessing dropdown menu.

Click the Plus sign beside Data Management Tools to see available tools.

Click the Plus sign beside the General toolbox and then double-click Append to view the Append tool dialog window.





Add Landmark to the Input Datasets by selecting it from the dropdown items.

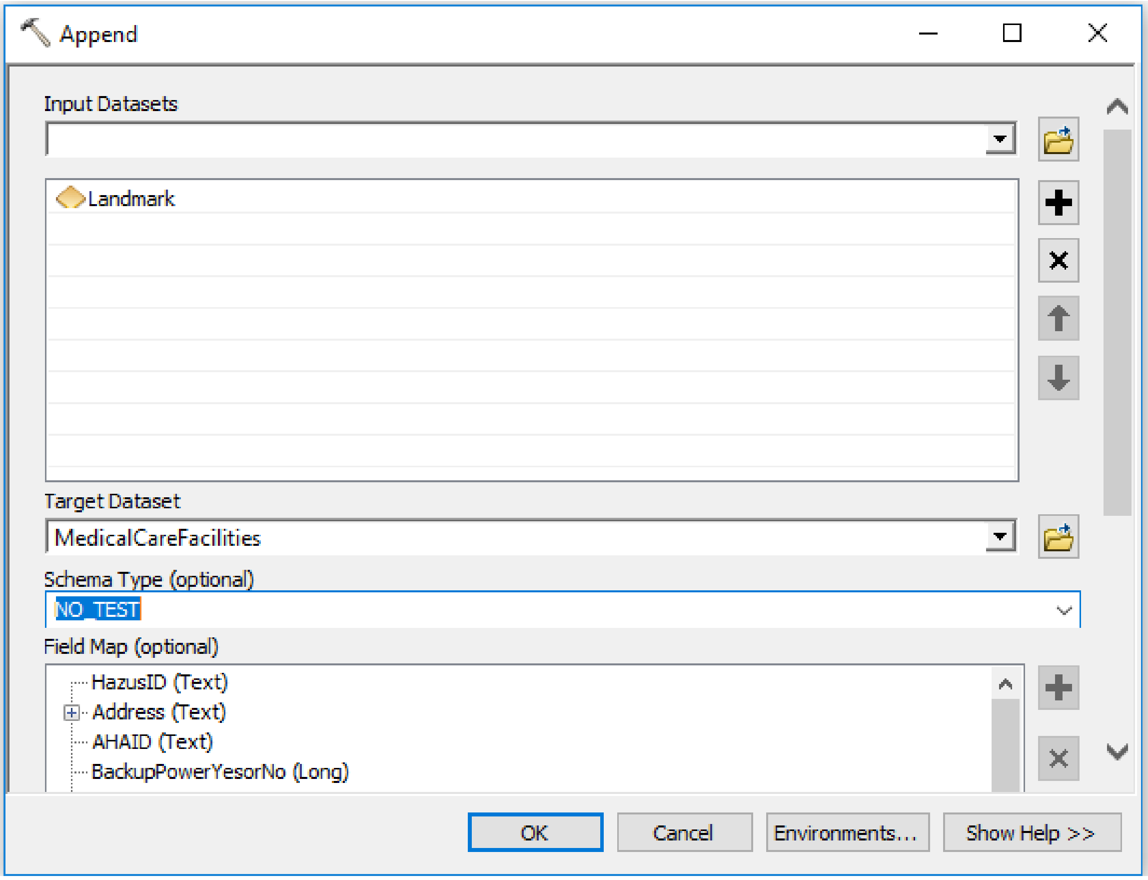
These are the records that will be added.

Add MedicalCareFacilities to the Target Dataset by selecting it from the dropdown items.

This specifies where the records will go.

Select NO_TEST as the Schema_Type option.

This option must be selected when the Target and Input schema definitions are not the same.



You may be wondering why we don't append ALL the UDOH records. The answer is that we don't want to lose the existing Hazus values – specifically the FL and EQ values that we exported earlier.

ArcTools | Append is a useful tool when merging records between datasets that have different schema definitions. (For matching schemas, you would have used the TEST *option). Since you used the NOTEST option, you now have an opportunity to match the Input and Target fields. Similar field names (Address and City) are already matched (shown by the icon).*

In this activity, we will match Bldg_Name to FacilityName.

From the Field Map, right-click on the FacilityName field and select the Add Input Field option.

Scroll down the Available fields on the Add Input dialog box and select the Landmark.Name field.

The values in the input field called Landmark. Name will be loaded into the target field FacilityName.

Click OK on the Add Input dialog box.

Click OK on the Append dialog box and then, if prompted, close the Append status window when the process has completed.

Landmark Hospital is now added to the MedicalCareFacilities layer. The FacilityName, Address and City values are populated, but many of the other fields are still blank. We will populate them in the upcoming steps.

Task 5: Update Hazus Care Facilities in ArcGIS

You will join the UDOH_Care_HZ layer to the MedicalCareFacilities layer. The attribute values from the UDOH records can then be migrated to the HZ records.

We will re-populate Replacement Cost, Latitude, Longitude, AHAID and NumberofBeds. Although these fields are NOT required by Hazus or CDMS, the model results will be enhanced with this information. For example, Replacement Cost is used by Hazus to determine the economic impact of a disaster.

There are several other fields that could be populated if we had the values. Examples include Number of Stories, Contact Person, FL Building Type, etc. For purposes of this activity, you will perform the following edits:

1. *Re-calculate the building values in thousands of dollars.*
2. *Load new values for Latitude and Longitude*

Item 1 is required for Site Specific data. You may remember from Lesson 4 that CDMS provides an option to modify the dollar and area values to thousands during the import process. Site Specific imports offer no such option - the input data must be in thousands.

Item 2 is needed to reflect the new locations of the UDOH hospitals. We did not do this in Activity 4.2 because the UDOH records were imported (the Hazus records were not used).

Select the MedicalCareFacilities layer from the Table of Contents.

These are the MedicalCareFacilities that you exported using CDMS in the first part of the activity.

Right-click and select the Joins and Relates | Join option.

Select Join attributes from a table from the What do you want to join to this layer dropdown.

Select FacilityName from the Choose the field in this layer that the join will be based on dropdown.

Select UDOH_Care_HZ from the Choose the table to join to this layer dropdown.

Select NAME from the Choose the field in this table to base the join on dropdown.

Select the Join Option to Keep all records.

Click OK on the Join Data dialog box and choose No when prompted to create an index.

Review the results of the Join.

Right-click on the MedicalCareFacilities layer and select the Open Attribute Table option.

These are the MedicalCareFacilities joined with the UDOH Hospitals that share a common name. Joining on Name fields is usually not a good idea. The AHAID field is intended to be used as a unique identifier, but it is not populated in Hazus.

There should be 16 records, with 14 fields added from the UDOH Care Facilities feature class. The join is temporary – you cannot edit values in the joined columns, and you cannot import related tables into CDMS. You must export the results to a new file first.

At this point, you could transfer the field values from the UDOH columns over to the HZ columns using the ArcGIS Field Calculator. Instead, you will export the joined tables to a new feature class called Care_To_CDMS. You will then import Care_To_CDMS to Hazus, remembering to import values from the UDOH columns, not the old HZ columns.

Close the Hazus Care Facilities attribute table when you are finished viewing the attributes.

Right-click on the MedicalCareFacilities layer and select the Data | Export Data option.

Set the Output feature class to C:\E0317_ActivityData\Activity4_3\UT_SaltLake_Care_GDB.mdb\Care_To_CDMS

Click OK on the Export Data dialog box. Indicate that you wish to add the exported data to the map when prompted.

You may now edit the values that need to be changed. For example, Bldg_Value entries are denominated in dollars. Hazus requires these values in thousands of dollars. We will use the ArcGIS Field Calculator to change the values.

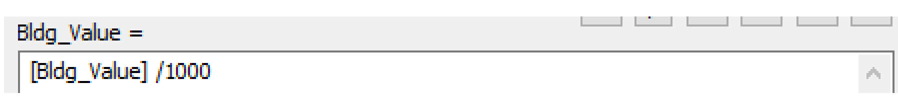
Open the Care_To_CDMS layer attribute table.

Right-click on the Bldg_Value column and select Field Calculator.

Use the Field Calculator to replace the values in the Bldg_Value field with [Bldg_Value] /1000.

The script will divide the current Bldg_Value entries by 1,000. – Don't run this script more than once!

Check to make sure that the Bldg_Value values are now in 1 x $1,000. The UDOH records for Salt Lake County are (nearly) ready to be loaded into CDMS.



Save changes to the map document and then exit ArcMap.

Task 6: Import Salt Lake County HZ Care Facilities to CDMS Repository

CDMS will validate the updated HZ Care Facilities before allowing the new data set to be added to the CDMS Repository. Once in the Repository, the records will be transferred into the Hazus state database. You will replace the Salt Lake County Care Facilities currently residing in the Hazus statewide tables.

Open CDMS.

From the CDMS Home menu, click the Import into CDMS Repository from File button.

Select Browse and navigate the C:\E0317_ActivityData\Activity4_3folder.

Select Microsoft Access/Geodatabase (*.mdb) from the Files of Type dropdown menu.

Select the UT_SaltLake_Care_GDB database and click Open.

Check the boxes next to Earthquake and Flood.

The source data contains EQ and FL hazard data.

Select Essential Facilities as the Hazus Inventory Category.

Select Medical Care Facilities as the Hazus Inventory Dataset.

Click the Continue button.

From the Select Import Table dropdown menu select Care_To_CDMS.

Select HazusID for the Hazus-ID field.

The source data contains HAZUS-IDs since the records originated from Hazus.

Click the Continue button.

CDMS will auto-match field names where it can. In this activity, the Hazus fields contain the "old" values, and they need to be "un-matched". The UDOH source fields containing the new values need to be re-matched to the destination fields.

Remove the auto-matches from the Field Match panel for the following Destination fields:

- AHA ID

- Building Replacement Cost
- Number of Beds
- Primary Function
- Year Built Between 1500 and 2100

These are the Hazus fields that contain default data that need to be updated.

Re-match the following Source fields based on the figure below:

- AHA_ID
- Bldg_Value
- Beds
- Function
- Construction_Date

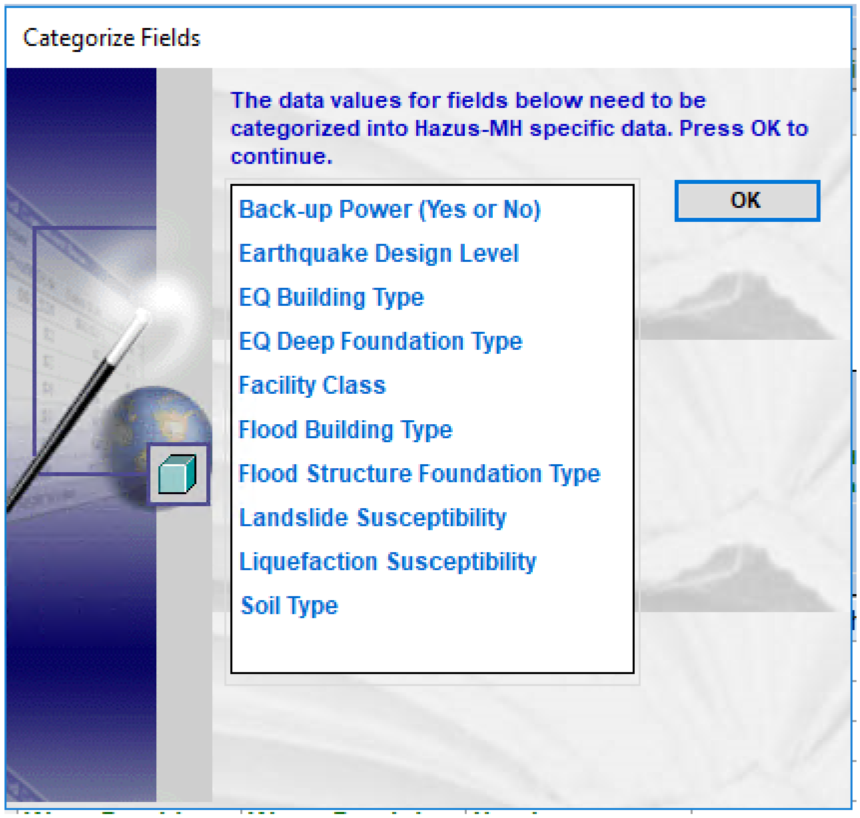
These are the UDOH fields that were joined to the Hazus Care Facilities earlier in the activity. These fields contain the updated data.

Hint: Save your settings – you will need the matching schemes again later in this activity.

Source	Destination	Field Type	Field Length	Default Value
AHA_ID	AHA ID	Text	7	
Bldg_Value	Replacement Cost (thous. $)	Currency		
Beds	Number of Beds	Number		
Function	Primary Function	Text	10	
Constructi	Year Built (Between 1500 and 2100)	Number		

Click the Continue button.

Click OK on the Categorize Fields dialog box.



There are several fields that need to be categorized. Most of these fields are associated with the EQ and FL hazard values that were not touched.

The Back-up Power (Yes or No) matching window will appear.

Select <NULL> from the Source Field Value panel.

Select NO from the Destination Value panel.

Click Add Match.

Click Continue on the Category Value Matching dialog box for Back-up Power (Yes or No).

The Earthquake Design Level matching window will appear.

Select <NULL> from the Source Field Value panel.

Select PC from the Destination Value panel.

Use the same value as the previously matched results.

Click Add Match.

Click Continue on the Category Value Matching dialog box for Building Type.

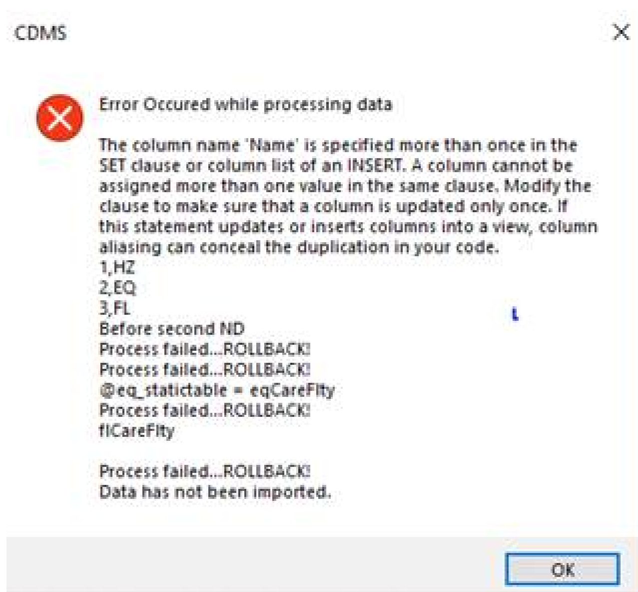
Where are all the <NULL> values coming from? Design Value was not populated for Landmark when it was added to our source dataset. The other records are populated from Hazus. We'll take advantage of the existing values and set the Landmark values the same.

Continue the Categorization process <u>using your best judgment</u> to appropriately match values as necessary.

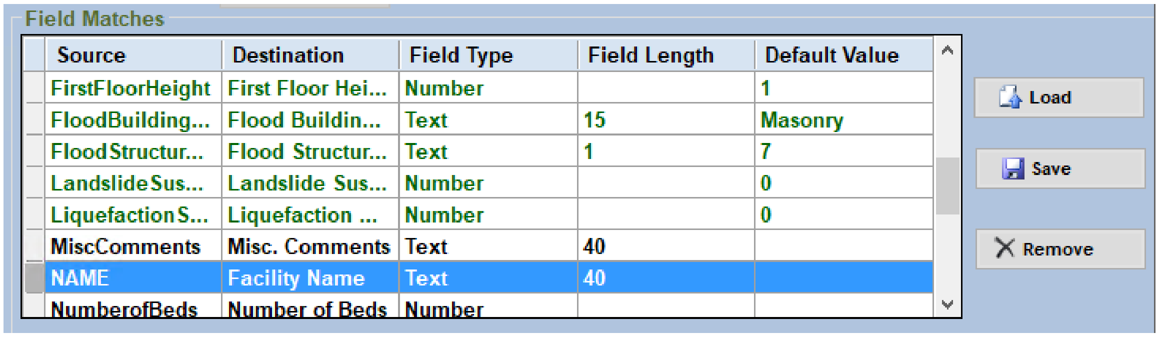
Yes, we asked you to use your best judgement instead of just telling you what to do! This is a realistic example of the type of decision you will often need to make. When you are updating your own data, be sure to document the basis of your decisions so that others can understand your reasoning.

When the data is imported successfully, click OK to close the successful import box.
If there are errors, continue fixing the reported variances until validation passes.

After all fields are matched, an error message will appear indicating the column "Name" used more than once in the list.



This can be resolved by remove Name record in the Field Match List:



Field Matches

Source	Destination	Field Type	Field Length	Default Value
FirstFloorHeight	First Floor Hei...	Number		1
FloodBuilding...	Flood Buildin...	Text	15	Masonry
FloodStructur...	Flood Structur...	Text	1	7
LandslideSus...	Landslide Sus...	Number		0
LiquefactionS...	Liquefaction ...	Number		0
MiscComments	Misc. Comments	Text	40	
NAME	Facility Name	Text	40	
NumberofBeds	Number of Beds	Number		

Load

Save

Remove

Select Continue to match fields again.

Task 7: Transfer Care Facility Facilities from CDMS Repository to the State Database

The new Medical Care Facility facilities have passed CDMS validation and are now residing in the CDMS Repository. They are valid Hazus features, but not yet in the Hazus state database. Your updated Medical Care Facilities will not be available to new Study Regions until you transfer the records to the Hazus state database.

From the CDMS Repository window, click the View button to the left of the Care Facility Facilities row to view the medical care facilities inventory.

This is your last opportunity to check your work before transferring it to Hazus.

View the contents of the table in the CDMS Detail Information window.

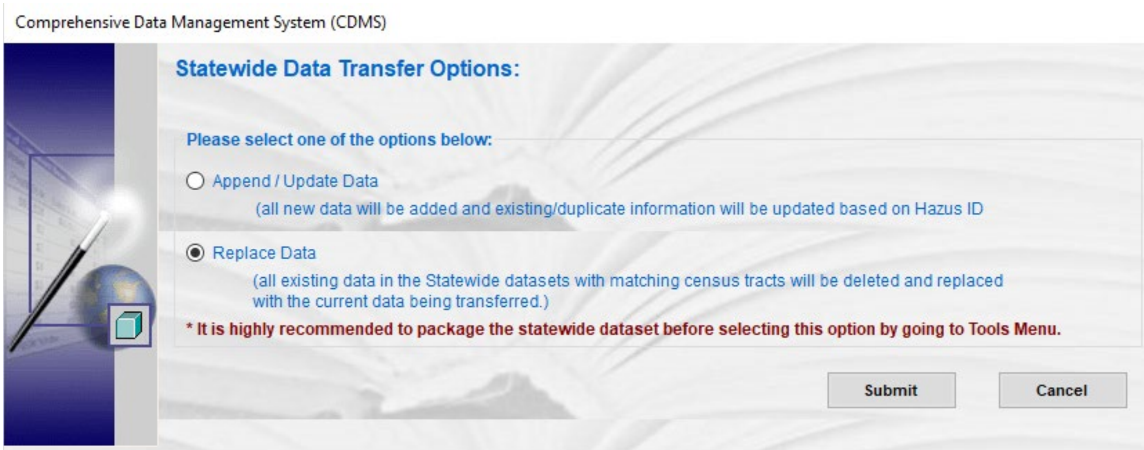
From the CDMS Detail Information window, click the Close button.

Last chance - once transferred to the state tables, there is no UNDO!!!

Click the Transfer to Statewide Dataset button.

From the Statewide Data Transfer Options window, select Replace Data.

The old Medical Care Facilities will be replaced with the new Medical Care Facilities in the UT.mdf database.



Click the Submit button.

Click Yes to confirm the transfer to statewide dataset.

Click OK to close the Statewide data transfer complete dialog box.

Select Query/Export Statewide Datasets to export Salt Lake County Medical Care Facilities as Geodatabase.

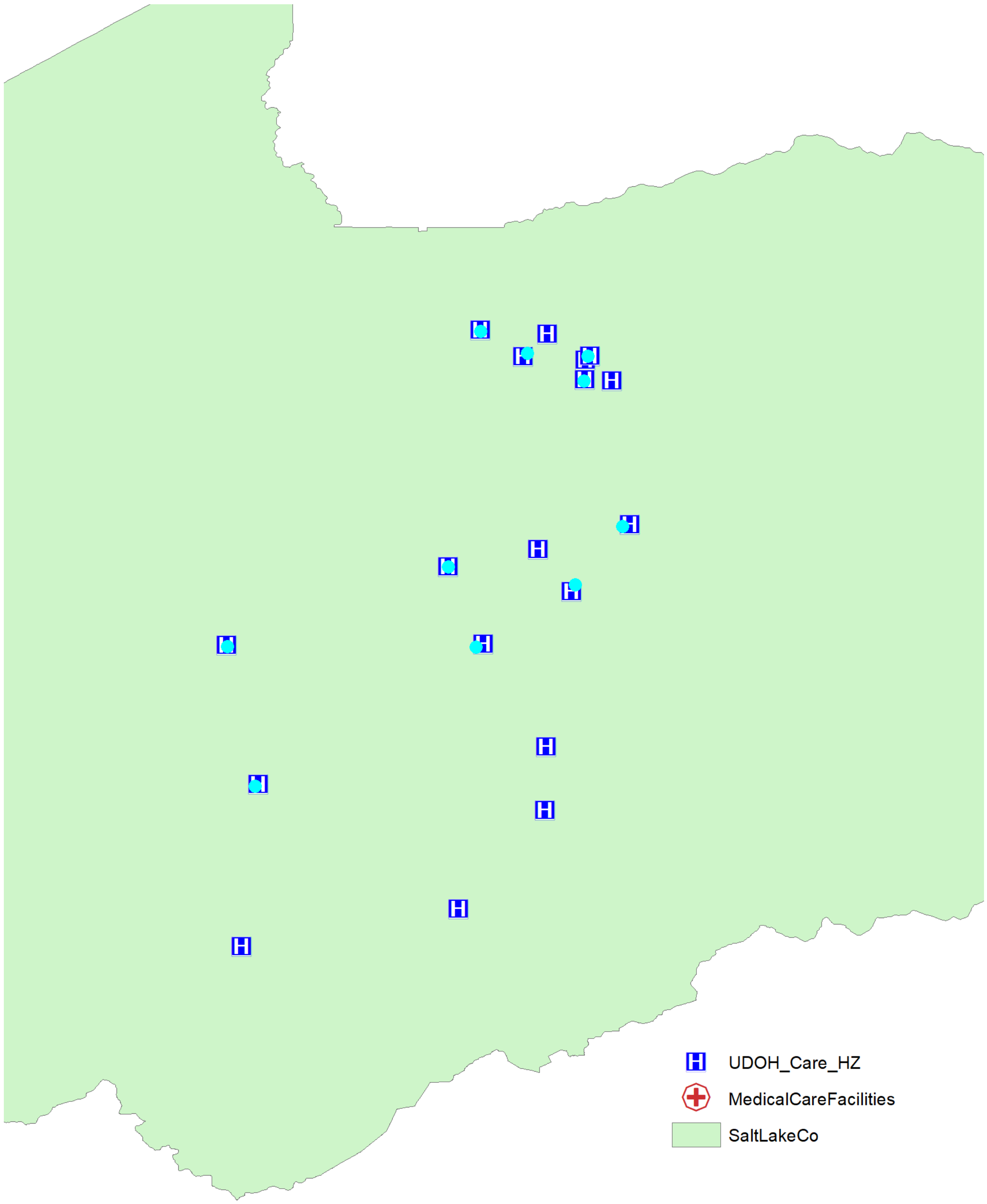
Review your work and answer the following questions:

Questions	Answers
1. How many Care Facility records exist in the updated data for Salt Lake County?	
2. What is the total Replacement Cost for the Care Facility records in the updated data for Salt Lake County?	
3. What are the FL Building_Type values for the Care Facility records in the updated data for Salt Lake County?	
4. Do the locations of the UDOH_Care_HZ line up with the new Hazus Care Facilities?	

Exit CDMS.

The records pass CDMS validation and they have been imported into Hazus. However, they are not in the correct locations. The HZ records (10) still need to be moved.

You will not see the results in Hazus until a Study Region is created. To see where the new Salt Lake County Care Facilities ended up, open CDMS_Activity_4_3.mxd and look at the Care_To_CDMS feature class – they should line up with the default Hazus care Facilities – and they need to be at the UDOH_Care_HZ locations.



Task 8: Move Salt Lake County Care Facilities

The workflow used in this activity will demonstrate how CDMS treats spatial data differently than tabular data.

The UDOH Lat and Lon values contain the true locations, but they were not used by CDMS in Task 6. When importing a spatial dataset (in this case GDB), CDMS figures out the locations based upon the mapped coordinates. The mapped locations have not yet been changed. One obvious solution is to move the 3 HZ points in ArcGIS so that they line up with the UDOH locations. But, there is an easier way.

Instead, we will export the existing Care_To_CDMS feature class to an Excel workbook. This trick separates the attribute data from its spatial component. You will import the spreadsheet using the UDOH Lat and Lon values.

Open UT_SaltLake_Care_GDB.mdb using Microsoft Access. *The database is located in C:\E0317_ActivityData\Activity4_3.*

Right-click on the UDOH_Care_HZ table and select the Export | Excel option.

You will export the table from UT_SaltLake_Care_GDB *geodatabase to a dBase Table named Care_To_CDMS_Try2.dbf. Attributes only - the spatial information will be left behind.*

From the Export-dBase Table dialog box, browse to the C:\E0317_ActivityData\Activity4_3 folder.

Name the exported file Care_To_CDMS_Try2.dbf.

Close the Export Steps dialog. Do not save the export steps.

Open Excel and navigate to Care_To_CDMS_Try2.dbf file location.

Delete column Latitude and Longitude.

These were the incorrect coordinates from Hazus, to avoid confusion, let's delete them before import into CDMS.

Save the .dbf file as "Care_To_CDMS_Try2.xls".

Make sure it is save as .xls (Office 2003 version).

Task 9: Import the Salt Lake County Care Facility Excel Worksheet into CDMS Repository (Try 2)

The Care_To_CDMS records have been exported into an Excel workbook. The workbook is named Care_To_CDMS_Try2. You will import the data in that file using the Lat and Lon values to specify the correct locations of the Medical Care Facilities. The steps are nearly identical to Task 6.

CDMS will validate the Medical Care Facility records before allowing the new data set to be added to the CDMS Repository. Once in the Repository, the records will be transferred into the Hazus state database. You will replace the Salt Lake County Medical Care Facilities imported into the Hazus statewide tables in Task 6.

Open CDMS.

From the CDMS Home menu click the Import into CDMS Repository from File button.

Select Browse and navigate the C:\E0317_ActivityData\Activity4_3 folder.

Select Microsoft Excel File (*.xls) from the Files of Type dropdown menu.

Select the Care_To_CDMS_Try2 workbook and click Open.

Check the boxes next to Earthquake and Flood. *The source data contains EQ and FL hazard data.*

Select Essential Facilities as the Hazus Inventory Category.

Select Medical Care Facilities as the Hazus Inventory Dataset.

Click the Continue button.

From the Select Import Table dropdown menu, select Care_To_CDMS.

Select HazusID for the Hazus-ID field.

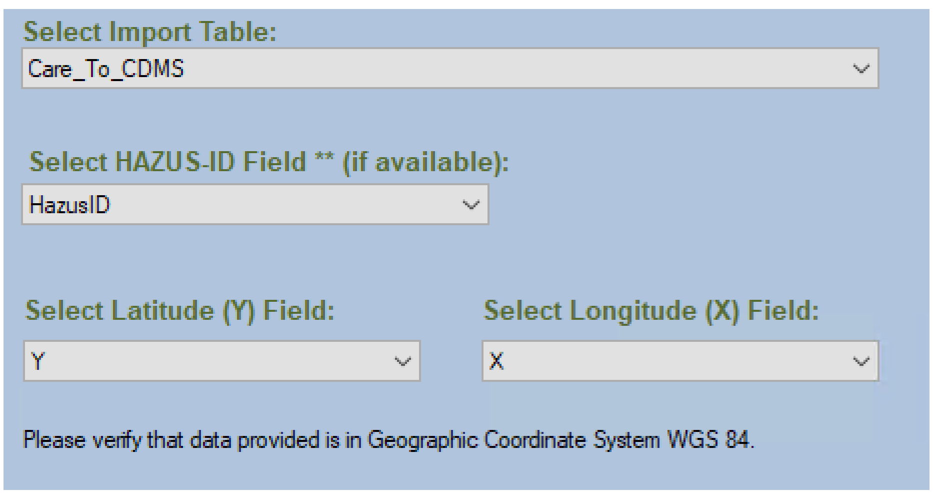
The source data contains HAZUS-IDs since the records originated from Hazus.

Select Lat from the Latitude (Y) Field dropdown menu.

Y values were from the X coordinates from UDOH

Select Lon from the Longitude (Y) Field dropdown menu.

X values were from the X coordinates from UDOH



Click the Continue button.

CDMS will auto-match field names where it can. In this activity, the Hazus fields contain the "old" values, and they need to be "un-matched". The UDOH source fields containing the new values need to be re-matched to the destination fields.

Remove the auto-matches from the Field Match panel for the following Destination fields:

- Name

There is a duplicate field already exists.

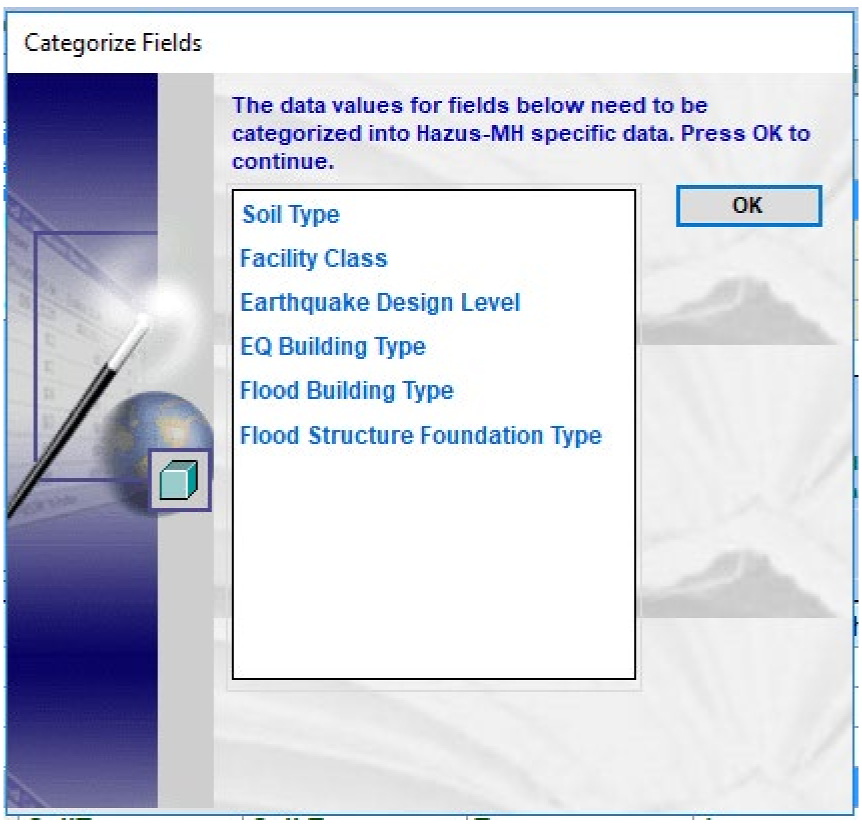
Re-match the following source fields based on the figure below:

- Bldg_Value
- Beds
- Use_Code
- Construction_Date

Source	Destination	Field Type	Field Length	Default Value
Bldg_Value	Building Replacement Cost	Currency		
Beds	Number of Beds	Number		
Function	Primary Function	Text	10	
Constructi	Year Built (Between 1500 and 2100)	Number		
FacilityCl	Facility Class	Text	5	MDFLT
Earthquake	Earthquake Design Level	Text	2	PC
EQBuilding	EQ Building Type	Text	4	URML
FloodBuild	Flood Building Type	Text	15	Masonry
FloodStru	Flood	Text	1	7

Source	Destination	Field Type	Field Length	Default Value
c	Structure Foundation Type			

Click Continue and then click OK on the Categorize Fields dialog box.



There are several fields that need to be categorized.

The Soil matching window will appear.

Use the same value as the previously matched results.

Click Add Match.

When the data is imported successfully, click OK to close the successful import box.

If there are errors, continue fixing the reported variances until validation passes.

Task 10: Transfer Medical Care Facilities from CDMS Repository to the State Database

The new Medical Care Facility records have passed CDMS validation and are now residing in the CDMS Repository. They are valid Hazus features and are ready to be transferred to the Hazus state database.

From the CDMS Repository window click the View button to the left of the Medical Care Facilities row to view the inventory.

This is your last opportunity to check your work before transferring it to Hazus.

View the contents of the medical care facilities table in the CDMS Detail Information window.

Review the values. All fields required by Hazus have been loaded.

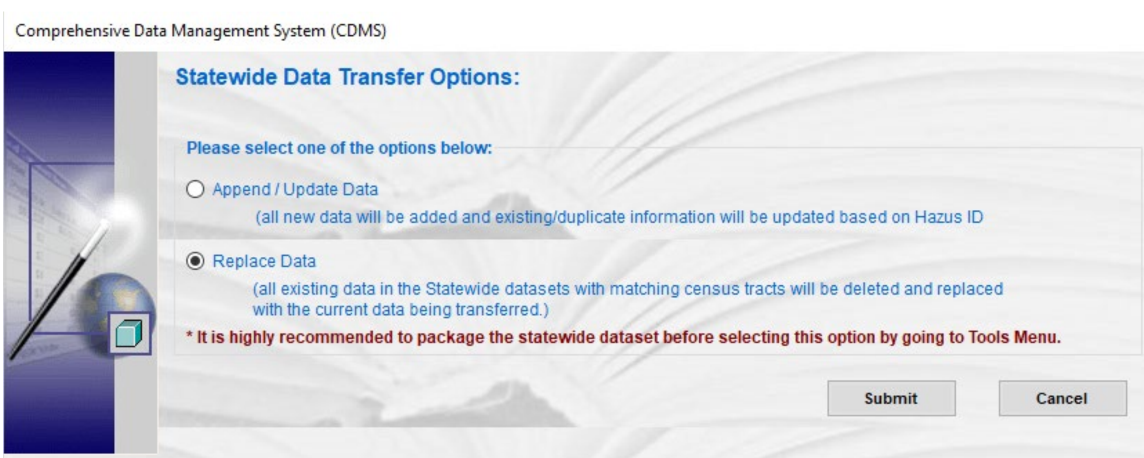
From the CDMS Detail Information window, click the Close button.

Last chance - once transferred to the state tables, there is no UNDO!!!

Click the Transfer to Statewide Dataset button.

From the Statewide Data Transfer Options window, select Replace Data.

The Task 6 Care Facilities will be replaced with the Try 2 Care Facilities.



Click the Submit button.

Click Yes to confirm the transfer to statewide dataset.

Click OK to close the Statewide data transfer complete dialog box.

Export Medical Facilities from CDMS and answer the following questions:

Questions	Answers
1. How many Care Facility records for Salt Lake County?	
2. What is the total Replacement Cost for Salt Lake County?	
3. What are the FL Building_Type values for Salt Lake County?	

Exit CDMS. Congratulations! Activity 4.3 is complete.

Conclusions

The relevant lessons from Activity 4.3 include the following:

1. You may wonder why we exported the EQ and FL values for the Medical Care Facilities, when we didn't add or modify any of these values.
2. Just because data passes validation doesn't mean that it is correct. In Activity 4.3 the Care Facilities imported OK, user still needs to verified data accuracy.
3. Be clear on the differences between spatial and tabular input sources. CDMS will use the mapped X,Ys to determine the point locations from spatial formats (GDB and SHP). The user must provide Lat and Lon values when importing from tabular data formats (XLS and MDB).
4. The feature names, field names and field formats between CDMS and Hazus are different.
5. Be clear on the difference between the Append and Replace options during the transfer from the Repository to Hazus. In Activity 4.2 we used the Append option after deleting the old records first. Activity 4.3 uses the Replace option. We exported the Salt Lake County Care Facilities from Hazus, updated them and then replaced them.

Activity 4.4 – Import User Defined Facilities and AEBM Facilities into CDMS

Type: Student Activity

Time: 20 minutes

Background

You may have occasions in which you want to model the impacts of earthquakes on specific types of structures that are only available in the Hazus provided building inventory as aggregate data - also known as General Building Stock. Examples might include residences, religious structures, and so forth. Hazus provides a user defined facility and AEBM (Advanced Engineering Building Module) tables that you can use to import your own data for the purpose of modeling losses to these types of facilities. It is generally not practical to create user defined facilities for every structure in a community because the type of information required for a user defined facility or AEBM is not always readily accessible. However, it can be a useful analysis tool for specific buildings.

Task 1: Import Table

This portion of the activity will lead you through the steps to import a table containing over 3,000 user defined facilities into the state database.

Click the Import into CDMS Repository from File Button.

Click the Browse button on the right side of the screen.

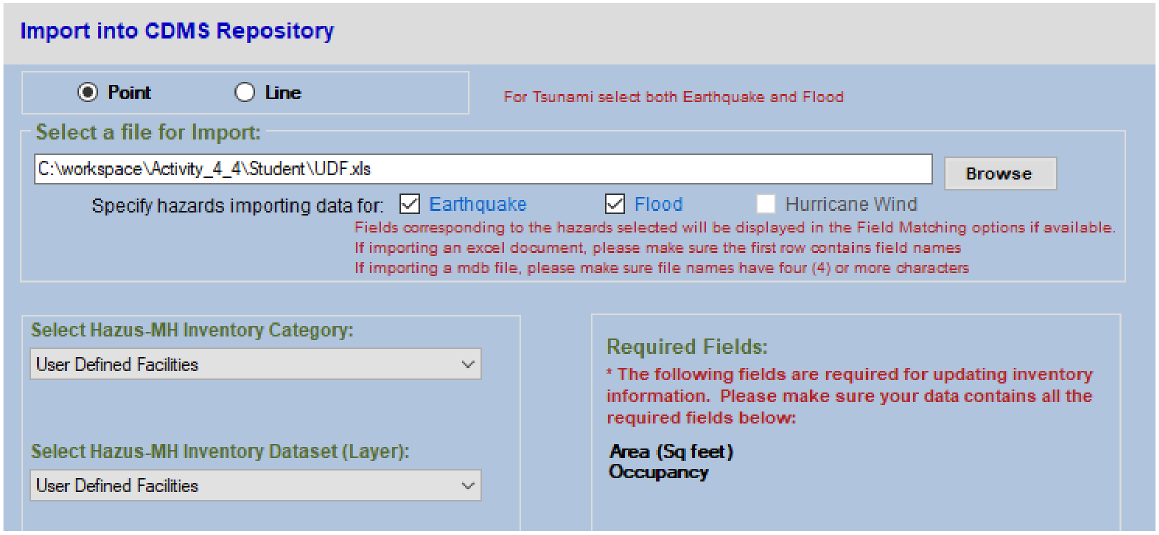
Browse to the C:\E0317_ActivityData\Activity4_4 folder and select the UDF.xls file. Make sure to change the file type from Microsoft Access/Geodatabase file to Microsoft Excel File (*.xls) or you will not see the data set.

Click Open.

As noted above, this Excel file was prepared specifically for this activity. However, be aware that creation of a Hazus compliant dataset can be a time-consuming process.

Keep all hazards checked.

Select User Defined Facilities from the Select Hazus-MH Inventory Category drop down list.

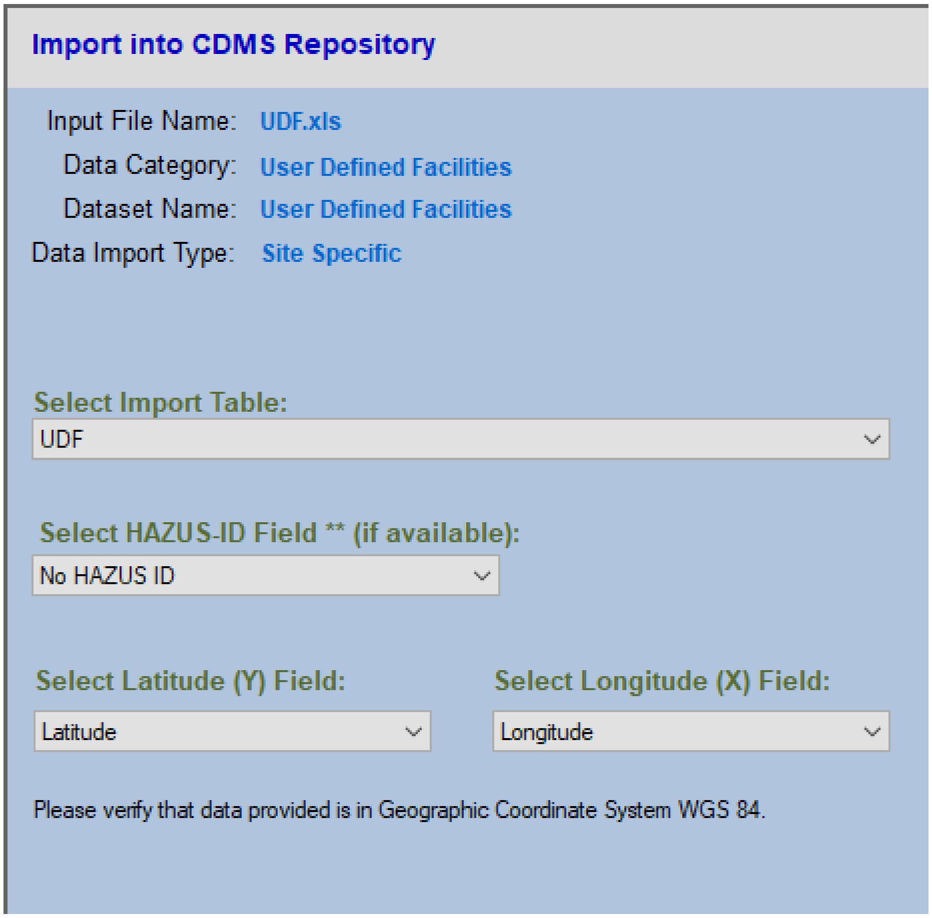


Select User Defined Facilities from the Select Hazus Inventory Dataset drop down menu.

Click Continue and then select UDF from the Select Import Table drop down window.

Select No HAZUS ID from the Select HAZUS-ID Field drop down menu.

Select Latitude from the Latitude drop down menu and Longitude from the Longitude drop down Menu.



Click Continue.

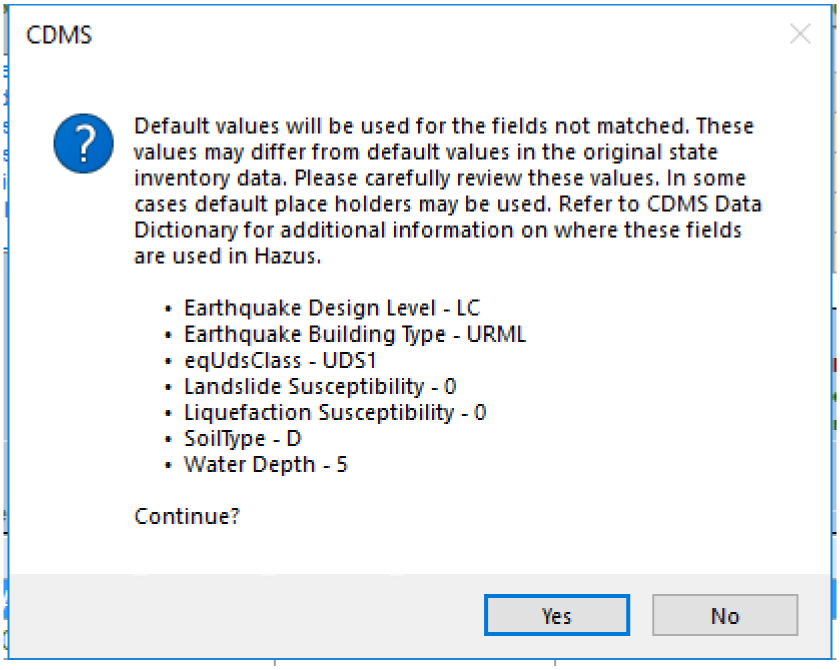
Click the Load button in the lower right corner of the window to open the browse window.

Navigate to the C:\E0317_ActivityData\Activity4_4 folder, select the UDF_Matching.fmp file and click Open.

In order to save you time, a field matching file has already been prepared for you that you will import.

Click Continue.

Click Yes to accept default values for unmatched fields.



Click OK to proceed to Categorizing Fields.

Match slab with 7 – Slab on Grade and hit Continue.

Once in the repository, click the View button to examine the imported UDF facilities.

Recognize the UDF facilities and the values that have been imported. Notice those values that have been populated by CDMS that were required, but not supplied by the spreadsheet.

Exit the CDMS repository view table.

Click the Transfer to Statewide Dataset button once the import process has completed.

There are two options to select from at this point. Append/Update Data adds new data to the statewide database. Replace data replaces everything in the statewide database with the new information that you select.

Select the Append / Update Data option and then click the Submit button. Click Yes when prompted to indicate that you are certain that you want to update the statewide database.

It may take a few minutes to complete the update process.

Task 2: Import AEBM facilities into the State Inventory

The Advanced Engineering Building Module (AEBM) inventory can be used to model detailed impacts to individual buildings. This is a more powerful option than the User

Defined Facility inventory. Its use will be explored in this course. In this activity you will be importing a table of hospital locations.

Click the Import into CDMS Repository from File button to view the Import into CDMS Repository options.

Only select the Earthquake hazard option.

Click the Browse button on the right side of the screen.

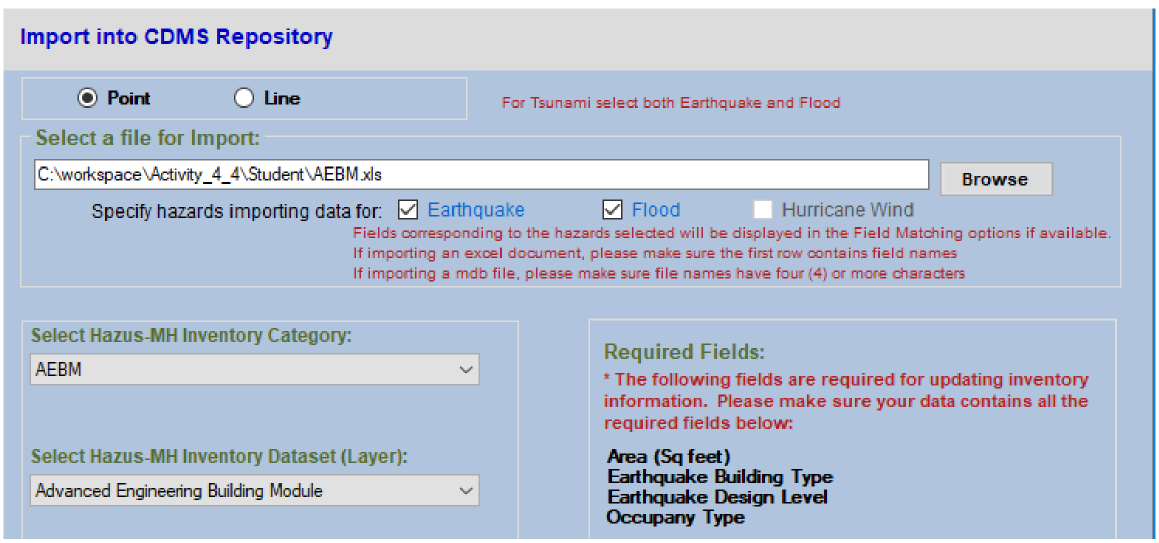
Browse to the C:\E0317_ActivityData\Activity4_4\ folder and double-click the AEBM.xls file. Make sure you change the file type from MS Access\Geodatabase database to Microsoft Excel file or the file will not show up on the screen.

HINT: If you are a user of Office 2007 or later, you must save your files to Office 2003 format before they can be imported into CDMS. That step was already completed for this activity.

Select AEBM from the Select Hazus-MH Inventory Category drop down menu.

Select Advanced Engineering Building Module from the Select Hazus-MH Inventory Dataset drop down menu.

The CDMS window should appear as follows.



Click the Continue button in the lower right corner of the CDMS window.

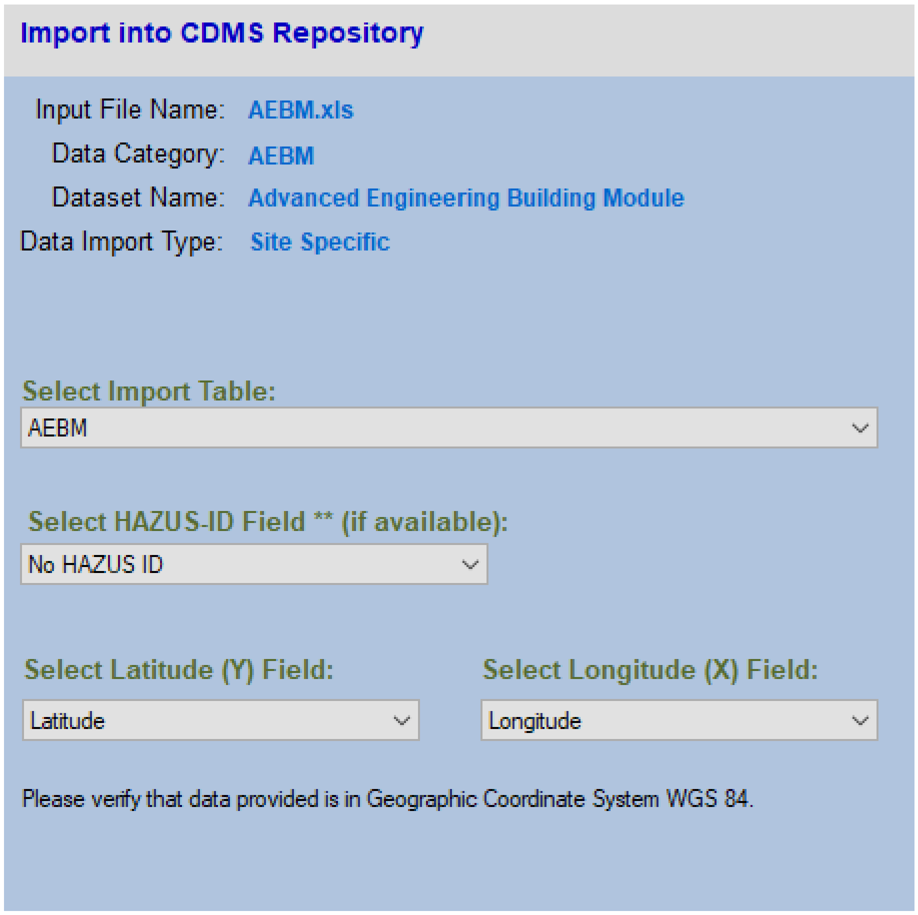
Verify that AEBM is identified as the Select Import Table.

The AEBM table automatically appeared since it is the only table in the database.

Select No HAZUS ID for the Select HAZUS-ID field option.

All site-specific inventory records must have a unique identifier. This can either be created by Hazus or it can be provided by the user as long as it is in a Hazus compliant format. More information about this is provided on the right side of the CDMS window.

Select Latitude for the Latitude (Y) Field and Longitude for the Longitude (X) Field.



Click the Continue button to view the Data Field window.

Field matching is the process of telling CDMS how the fields in your table match up to those required by Hazus. CDMS is smart enough to match fields that are similar in name. You can then manually match any fields that do not auto-match or you can unmatch fields that are incorrectly matched. In this example all fields matched correctly.

Also observe that there are several fields in the top half of the window that are shaded green. These are required fields, but CDMS will populate these with a default value if you do not provide a field in your table that contains the required information. Therefore, you are ready to move to the next step of the process.

Click the Load button.

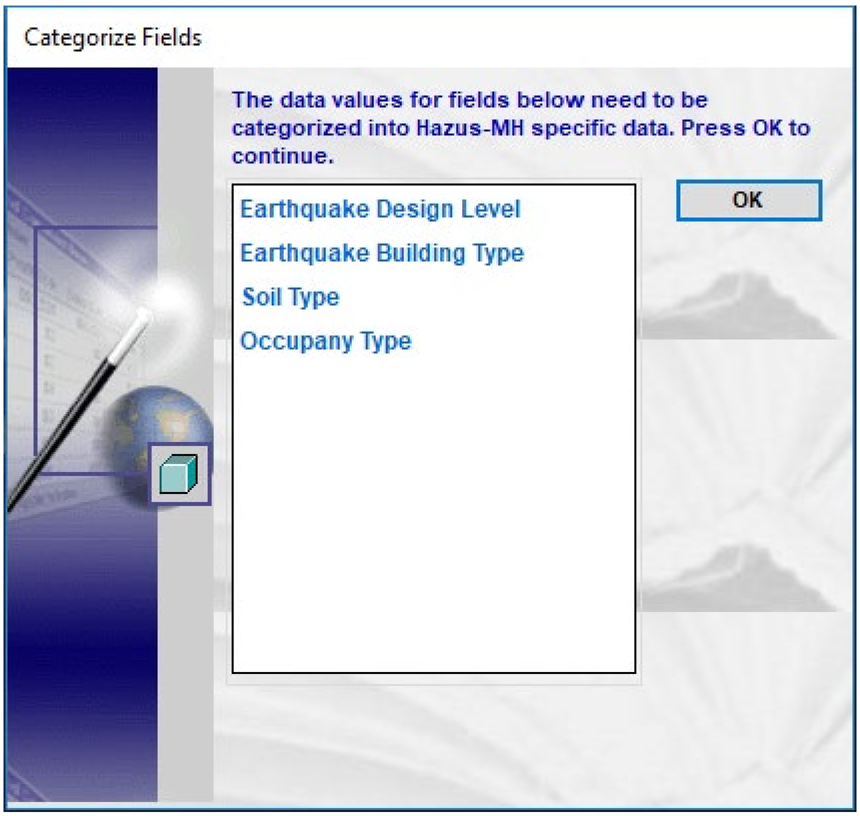
Navigate to C:\E0317_ActivityData\Activity4_4 and double-click AEBM.fmp.

Once you double-click on AEBM.fmp, the window will match the source fields to the destination fields.

Click the Continue button.

The Categorize Fields window will appear that shows the fields that need to be categorized.

Categorizing is a process that involves telling CDMS how the values in your table related to the Hazus required values.



Click the OK to move to the Earthquake Design Level category value matching window.

Click the Continue button to move through value matching window. Select Continue again and then click OK when the window appears reporting a successful import.

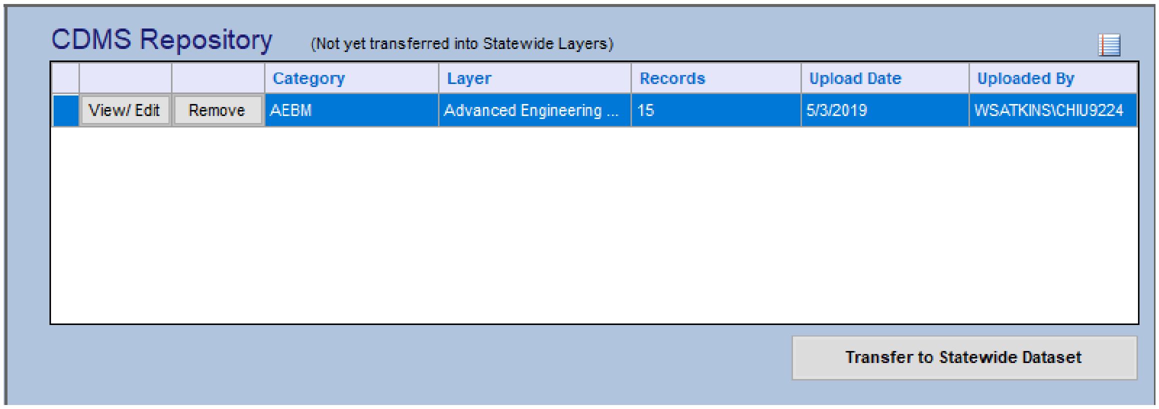
CDMS automatically matched the values to the Hazus values.

When asked if you would like to apply Shake Map Betas, answer Yes.

The import process will take a few moments to complete.

When the process has completed, the CDMS Repository window will appear, listing the medical care facilities table that you just imported.

After the import has completed click OK.



Click the View/Edit button to open a window that shows each of the medical care facilities that you imported.

Answer the following questions while the CDMS Detail Information window is open.

Questions	Answers
1. How many records are in the CDMS Detail Information table?	
2. What are the EQ Building Type listed in the table?	

From this window, you can remove individual medical care facilities that you do not want to import into the state database.

Click the Close button to close the CDMS Detail Information window.

Click the Transfer to Statewide Dataset button to view the Statewide Data Transfer Options.

There are two options to select from at this point. Append/Update Data adds new data to the statewide database. Replace Data replaces everything in the statewide database with the new information that you select.

Select the Append / Update Data option and then click the Submit button. Click Yes when prompted to indicate that you are certain that you want to update the statewide database.

It will take a few minutes to complete the update process.

If prompted, click OK when prompted to acknowledge that the update process is completed.

Note that the AEBM inventory containing the medical care facilities have now been moved from the CDMS Repository window to the Statewide Layer Modification History window.

Close CDMS.

Activity 5.1 - CDMS Navigation – Use CDMS to Update Aggregate Data in the Inventory

Type: Student Activity

Time: 50 minutes

Background

Aggregate data is information that is normalized or tallied together based upon a common geography. In Hazus, the majority of the aggregate information is compiled by Census Tract and Census Block. This allows much faster computations of the hazards that are modeled over large areas. If detailed analysis is needed on smaller areas, using Site Specific data sets will generate more accurate results.

In this scenario, the Utah Division of Emergency Management (DEM) has secured funds to harden schools to earthquake risk in Utah. You have been asked to perform an earthquake study to determine which schools are most vulnerable.

You have contacted the Utah State Board of Education (USBE) to learn that many schools have undergone renovations and many new schools have been built. The EDU1 replacement costs, content values and building sizes in the Hazus General Building Stock (GBS) are probably not valid. School records in the Essential Facilities (EF) database will need to be updated as well. This will be done in Activity 5.2.

Fortunately, the USBE has Hazus and has maintained the school records in the EF statewide database. This source is considered very accurate. The USBE has used CDMS to export school student counts into a shapefile.

In this scenario, you will use current Utah State Board of Education (USBE) enrollment information to update the Student Counts in the Hazus Demographics inventory.

Task 1: Review Utah State Board of Education Enrollment Data

The USBE has provided enrollment figures for each school. Your goal is to figure out how to use this information to update the Hazus Demographics inventory. More specifically, Demographics inventory in Hazus is aggregated data – the Student Counts are tallied by Census Tract – the aggregation level of both the earthquake and hurricane models.

It is unusual to receive source data sets that are pre-aggregated. Workflows must be designed to figure out the counts for each Census Tract. To kick-start this activity, we already know the locations of the schools. From the locations, we can determine the census tract that each school lies within.

[This activity provides instruction for aggregating data. CDMS will automatically perform the aggregation to Census Tracts and Census Blocks if the Lat and Lon values are known. This ability is very useful for updating the GBS; however, the functionality has not been extended to Demographics in the current version of CDMS – so we'll have to perform the aggregation ourselves before importing the results back into CDMS].

Start ArcMap. Open the CDMS_Activity_5_1.mxd map document which is located in the C:\E0317_ActivityData\Activity5_1 folder.

Right-click on the USBE_Students layer and set data source.

Select Open Attribute Table to view the attribute table for that layer.

The layer points to a shapefile which contains the School Name and Student Count for each School.

Answer the following questions using the USBE Students table.

Questions	Answers
1. According to USBE, how many schools are there in Utah?	
2. According to USBE, what is the total student population in Utah?	

Close the USBE Students attribute table.

Task 2: Export the Demographic Data from Hazus

Task 2: Export the Demographic Data from Hazus

The demographic inventory for Utah, which contains information about student enrollments, needs to be exported from Hazus so it can be updated according to the information received from the Board of Education.

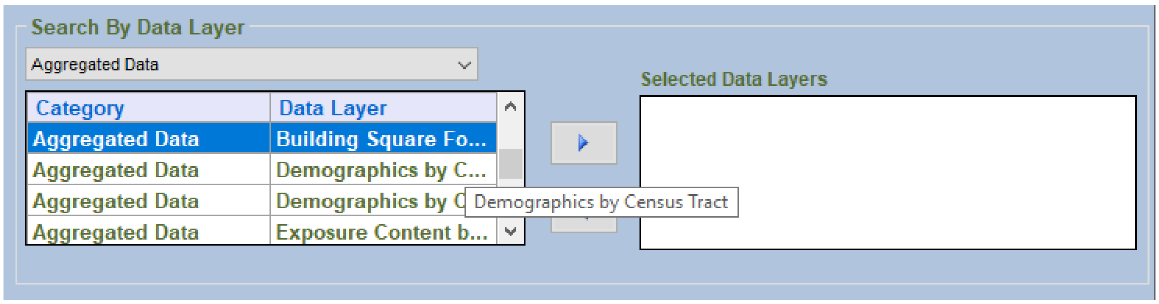
Start CDMS. From the CDMS Home window, select the Query/Export Statewide Datasets button.

From the Query/Export Statewide Datasets window, select Statewide as the Geographic Area.

Select Aggregated Data from the Search by Data Layer dropdown.

Select Demographics by Census Tract as the Data Layer.

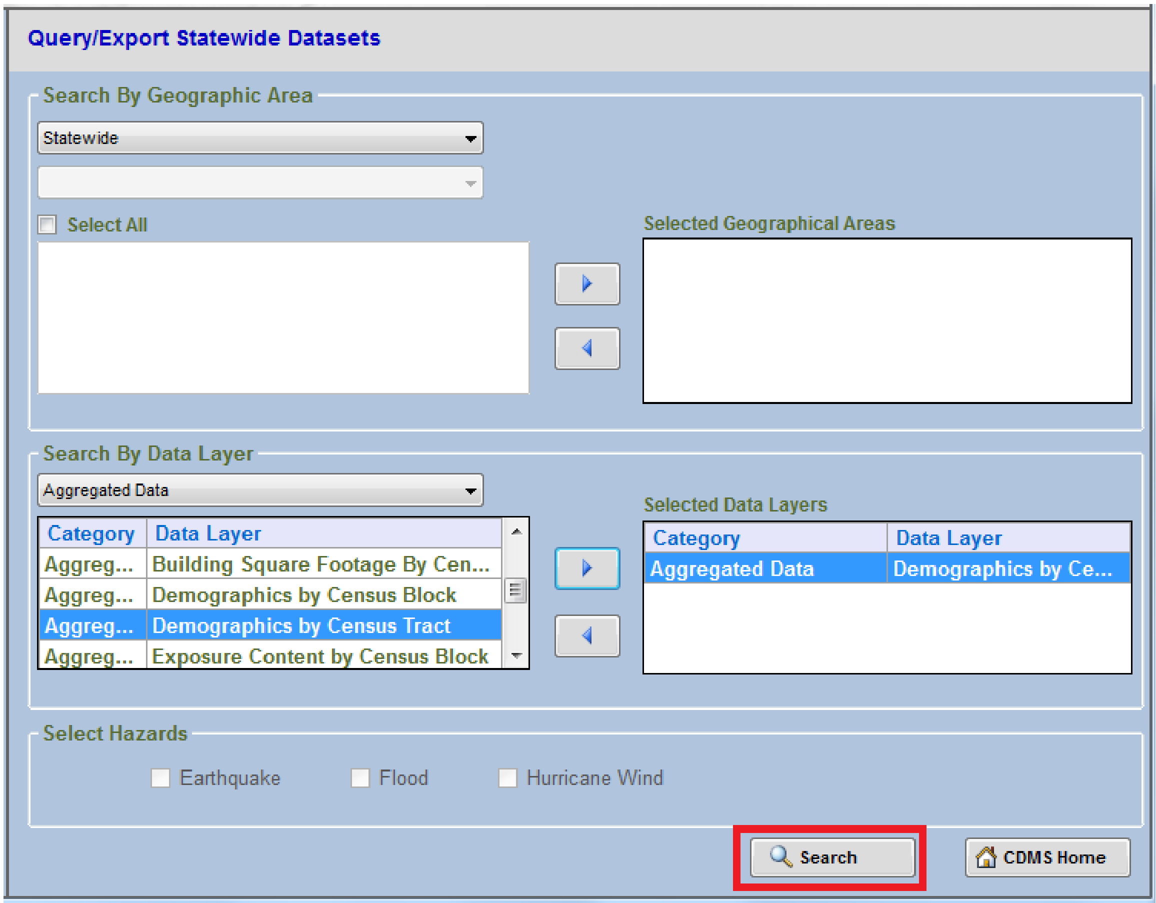
If unable to see entire Data Layer name column, you can move the cursor hover on top of each row, a pop-out text box with full name of the Data Layer will appear.



Reminder: to select the data layer, simply click the right arrow button.

This table contains information about the population of Utah by Census Tract. In this activity, you will update the school enrollment figures that are found in this table.

Click the Search button.



Click the Export to Geodatabase button.

Choose to Export currently selected layer and click the Submit button.

You have an option to export all layers – this is useful if you are exporting Blocks as well.

Save the Demographics by Census Tract feature class to a new geodatabase named UT_Demographics_HZ in the C:\E0317_ActivityData\Activity5_1 folder.

The type of file you are saving is an Esri (personal) Geodatabase File (*.mdb). Note – when this is exported, it will name the feature class Demographics by Tract.

Click the Save button to save the geodatabase file, then click OK when prompted to acknowledge that the file was successfully saved.

The Demographics By Tract table is exported from Hazus to UT_Demographics_HZ.mdb. There are 588 Tracts in Utah. Each row of data provides a breakdown of the demographic characteristics for each Tract.

Click the CDMS Home button to close the search results and return to the CDMS home page.

Click the Exit CDMS button to close CDMS.

You will return to CDMS after you make some revisions to the Demographics geodatabase file you just exported.

Open the exported UT_Demographics_HZ geodatabase in Access or ArcGIS and answer the following questions using the Demographics By Tract table. Close MS Access or ArcGIS when you are done.

Questions	Answers
1. What is the total student count in Utah according to the default Hazus GBS Demographics?	
2. How many Tracts have no students enrolled through high school?	
3. Which Tract has the most students enrolled through high school?	

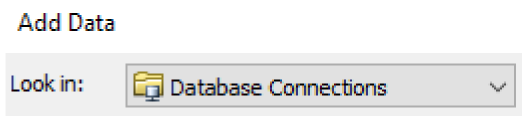
School information is also provided in Hazus as Site Specific inventory. Advanced users may be interested to compare the enrollment counts between the Demographics inventory and the Site Specific inventory.

Questions	Answers
1. What is the total student count in Utah according to the default Hazus Site Specific School Facilities?	

Task 3: Create a new SQL database connection in ArcMap

Return to the CDMS_Activity_5_1 map document in ArcMap.

Click the Add Data button and select Database Connections from the Look in: dropdown menu.



Double-click on Add Database Connection to create a link to the SQL Utah state database.

Choose the Database Platform as SQL Server.

Choose the instance as [PC Name] \ **HAZUSPLUSSRVR** .

The Hazus instance should automatically populate in this window. If it does not, you will need to find the name of the PC you are working on and add that value.

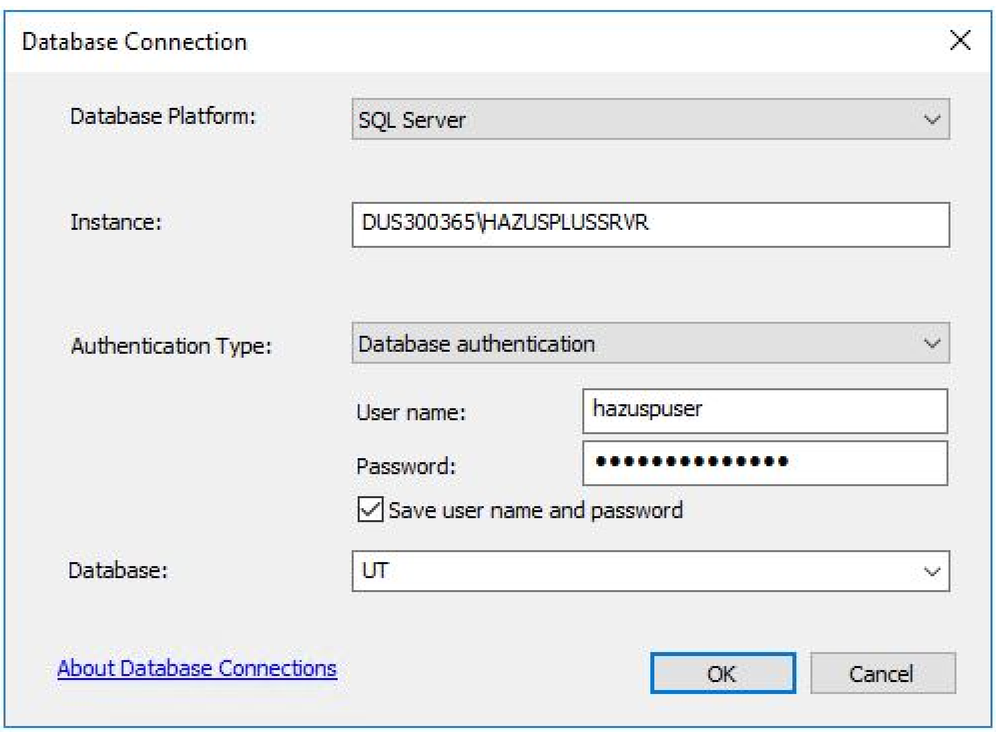
For the Authentication Type choose Database Authentication.

For the User Name choose **hazuspuser**

For the Password enter **Gohazusplus_02**

Check to Save the user name and password.

Click the dropdown menu next to the Database field and select UT.



Click OK

Double click the new database connection that is named Connection to [PC Name].sde.

Double click the UT.dbo.hzTract layer.

Task 4: Join Utah School Enrollments to Tracts in ArcMap

The USBE Students shapefile does not include any information about which Census Tract the schools are located within. You will need to figure out the relationship between Schools and Tracts so that you can tally up the student counts in each Tract. This is a standard approach for aggregating data.

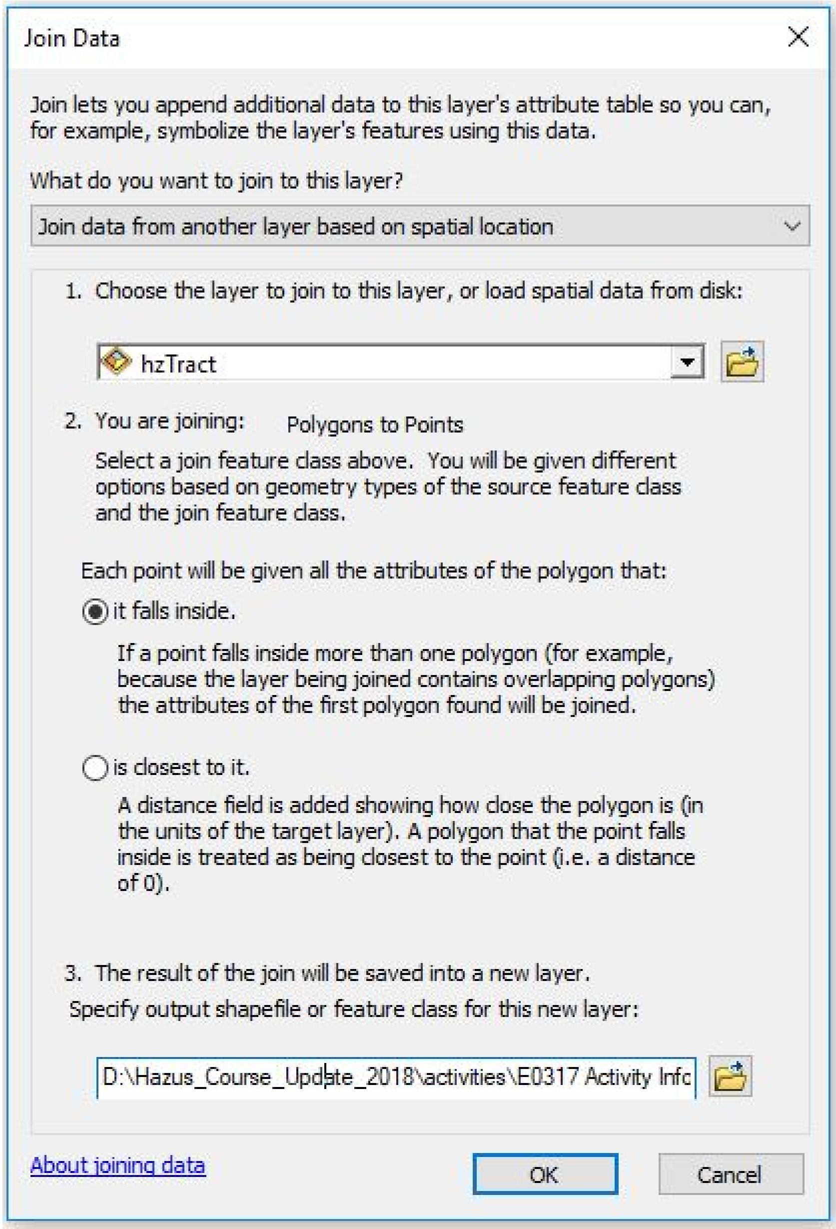
You will spatially join the USBE Students layer with the Utah Tracts layer in order to associate the Census Tract information to the schools.

Right-click on the USBE Students layer and select Joins and Relates -> Join.

Select Join data from another layer based on spatial location from the “What do you want to join to this layer” dropdown.

Select UT.dbo.hzTract as the layer to join to.

Select the “it falls inside” radio button.



Click the Browse button next to the output shapefile or feature class option at the bottom of the Join Data window and navigate to the C:\E0317_ActivityData\Activity5_1 folder.

Select File and Personal Geodatabase feature classes as the file type.

Save this feature class to the UT_Demographics_HZ.mdb geodatabase you exported from CDMS earlier.

Double-click the UT_Demographics_HZ.mdb geodatabase.

Name the output feature class USBE_Students_Tracts. Click the Save button.

Click OK to spatially join the data.

The newly joined data has been added to your map.

Right-click on the USBE_Students_Tracts layer and select Open Attribute Table to view the attribute table.

The new feature class contains both the NumStudent (which contains the number of students in each tract) and Tract fields. These are the fields of interest for this activity.

Close the USBE_Students_Tracts attribute table.

Task 5: Aggregate USBE School Enrollments By Tract

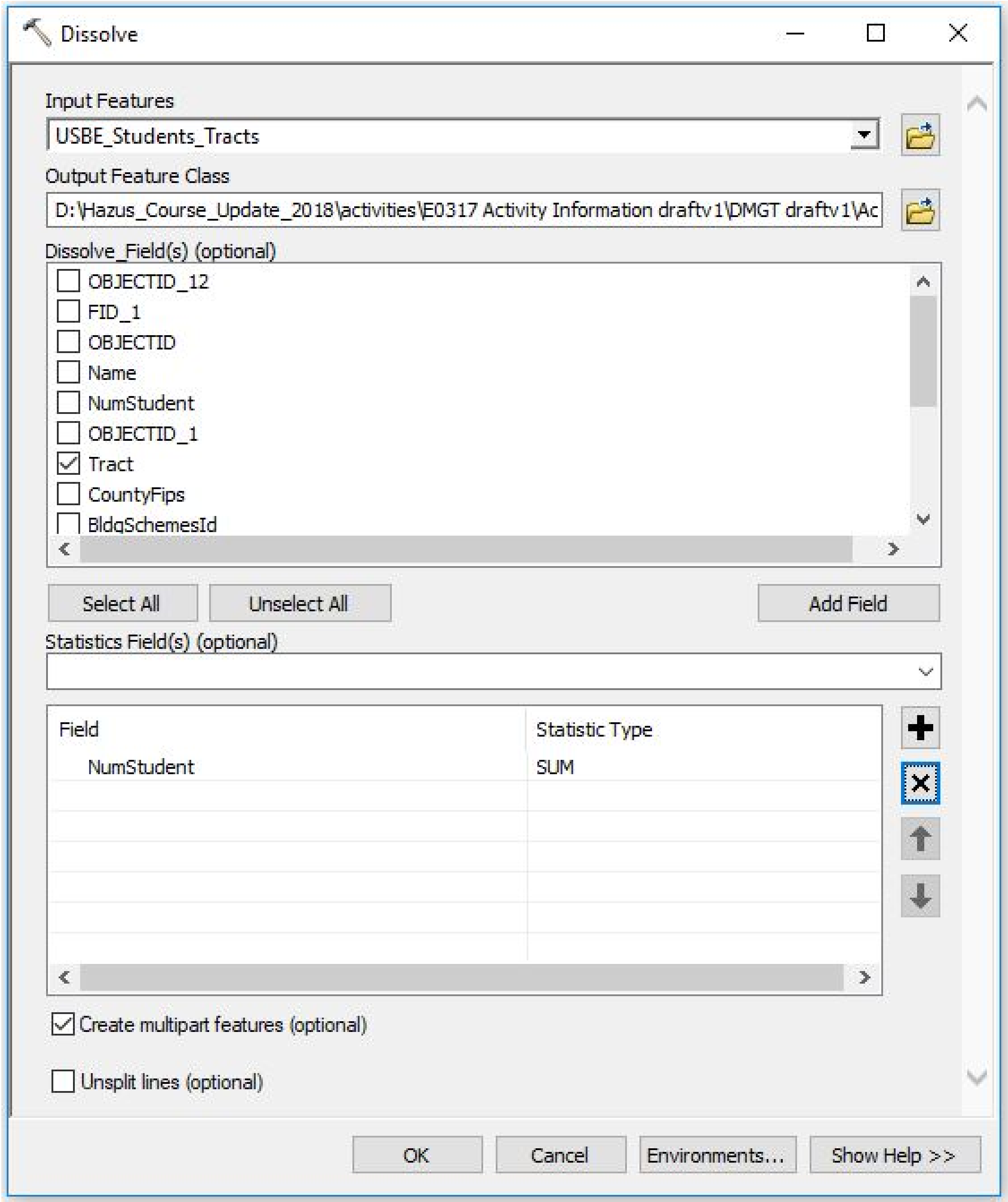
The schools and tracts have been spatially joined in ArcMap; however, the data is not aggregated. We need to determine the number of students within each Census Tract (not within each school).

Open the Dissolve tool from the Data Management Tools | Generalization toolkit and select USBE_Students_Tracts from the Input Features dropdown list.

Navigate to C:\E0317_ActivityData\Activity5_1 and set the Output Feature Class to USBE_Enroll_Tracts in the UT_Demographics_HZ geodatabase.

Select Tract as the Dissolve Field.

Add NumStude to the Statistics Field and set the Statistic Type to SUM.



Click OK to run the Dissolve tool. The new USBE_Enroll_Tracts feature class will automatically be added to the map. Close the Dissolve tool status window and ArcTools when the process has completed.

There should be 169 records in the USBE_Enroll_Tracts layer attribute table (one for each Tract) as shown below. The SUM_NumStudent field will contain the student enrollment numbers for each Tract.

Answer the following questions using the USBE_Enroll_Tracts table.

Questions	Answers
1. According to USBE, what is the total student count in Utah?	
2. How many Tracts have no students enrolled through high school?	
3. Which Tract has the most students enrolled through high school?	

Close the USBE_Enroll_Tracts layer attribute table.

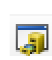
Task 6: Update Demographics from Utah School Enrollments

The USBE_Enroll_Tracts table contains the new enrollment data aggregated by Tract. The information needs to be updated in Demographics By Tract. Why? It is not possible to import SchoolEnrollmentuptoHighSchool into CDMS by itself – all the other Demographic fields are needed as well. You will modify the student counts in the exported UT_Demographics_HZ file – all other fields will retain their original Hazus values.

Add the Demographics_By_Tract table to the map.

The table was exported earlier to C:\E0317_ActivityData\Activity5_1\ UT_Demographics_HZ.mdb

If necessary, click the Catalog button at the top of the ArcMap screen to open the Catalog window on the right side of the ArcMap screen.



In the Catalog window, navigate to the DMGT\Activity5_1 folder, expand the UT_Demographics_HZ geodatabase.

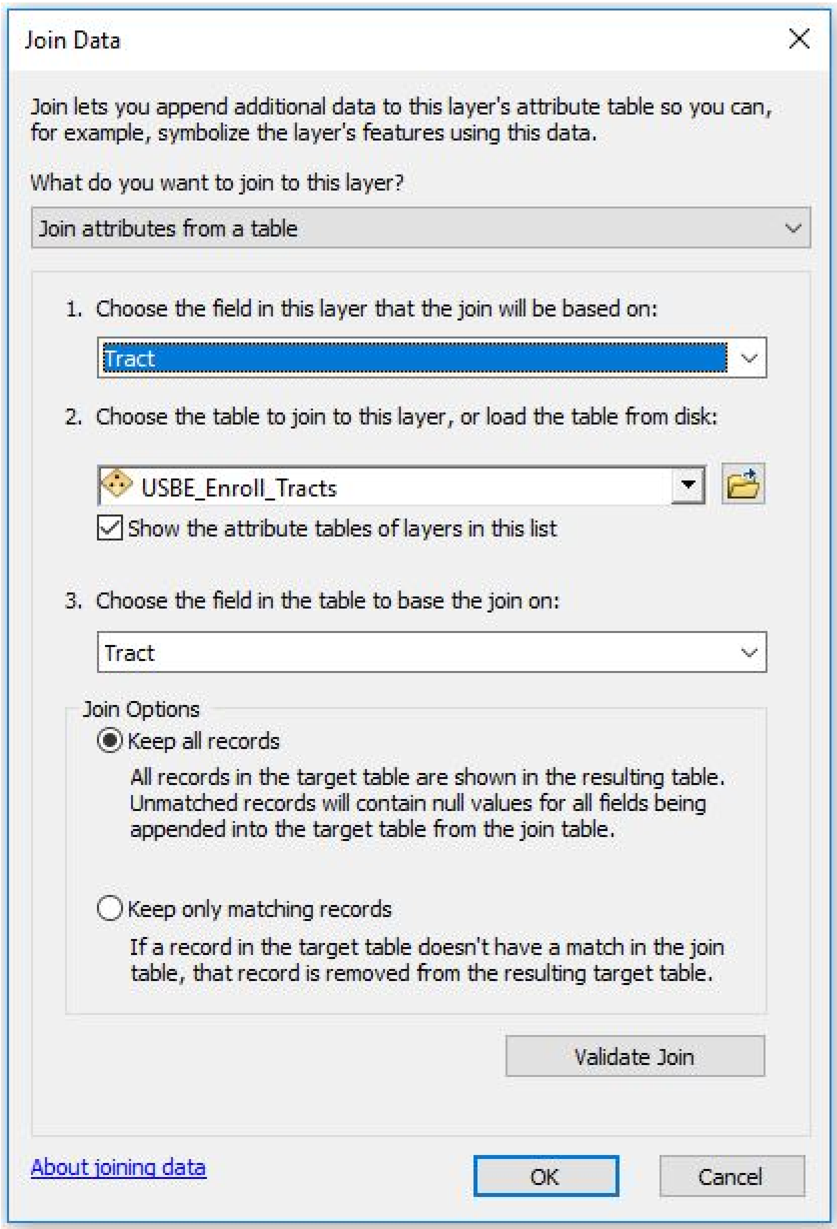
Note, you may need to refresh the UT_Demographics_HZ database in order to see the Demographics by Tract table.

Click Yes when prompted to acknowledge that this operation will add an integer Object ID field to the table.

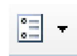
You may either leave the Catalog window open or close it.

Select the Demographics By Tract in the Table of Contents, right-click and choose Joins and Relates | Join.

Set up a join to USBE_Enroll_Tracts on the common Tract number. Keep all records. Then, click the OK button. If it asks if you agree to indexing, click Yes.



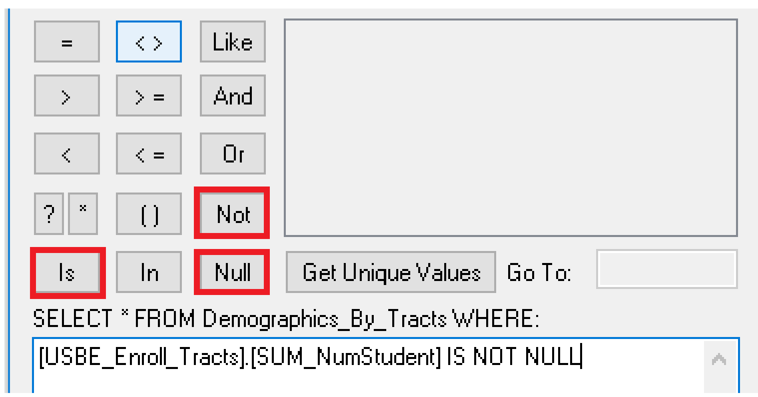
Open the Demographics By Tract attribute table and choose the table menu button.



Select the option Select by Attributes.

Find [USBE_Enroll_Tracts_SUM_NumStudent] from the field list window and double click it. It should appear in the window at the bottom.

Next Click the Is button, the Not button, and the Null button , as shown on the image below.



Click Apply.

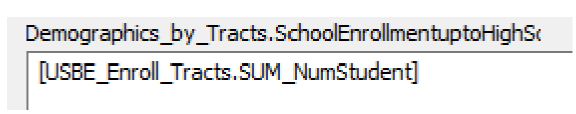
Right-click the SchoolEnrollmentoHighSchool field and select Field Calculator.

SchoolEnrollmentuptoHighSchool contains the old values.

Click Yes to perform calculations outside of an edit session.

Double click the [USBE_Enroll_Tracts.SUM_NumStudent] field.

SUM_NumStudent contains the new values.



Click OK to complete the calculation.

If Field Calculator doesn't work, Right-click the USBE_Enroll_Tracts layer, select Data->Export Data, then perform the calculation on the exported table.

Close the Demographics By Tract attribute table.

Select Demographics By Tract from the Table of Contents, right-click and choose Joins and Relates | Remove Join(s) | USBE_Enroll_Tracts. If records are still selected click Clear Seleted Features.

The Demographics By Tract values have been updated – the Join is no longer needed.

Answer the following questions using the updated Demographics by Tracts table.

Questions	Answers
1. How many students are enrolled up to high school?	
2. Why are the Board of Education and updated Demographics totals different?	

If the USBE student counts are considered accurate, then the calculation performed above needs to be re-done. The Join should have been made to ALL records, not just the matching records. In this case, the Field Calculator will populate the unmatched records with '0'. This concept will be re-visited throughout the course – users must always consider the geographical extent of the data. In this case, we updated 169 Tracts. There are 588 Tracts in Utah.

Save your changes and exit ArcMap.

Task 7: Import Updated Demographic Inventory into The CDMS Repository

The modified demographics inventory containing the updated school enrollment numbers will be imported into the CDMS Repository. CDMS will validate the new records before allowing them to be imported. All records must pass.

Once in the Repository, the aggregate data sets can be moved into Hazus by replacing the current contents (there is no Append option). In this scenario, you are going to replace the Demographics By Tract data in Hazus with the new values populated in the Demographics By Tracts table.

Open CDMS

From the CDMS Home menu, click the Import into CDMS Repository from File button.

You will import the modified file to CDMS, but first it needs to pass validation.

Click the Browse button and navigate the C:\E0317_ActivityData\Activity5_1 folder.

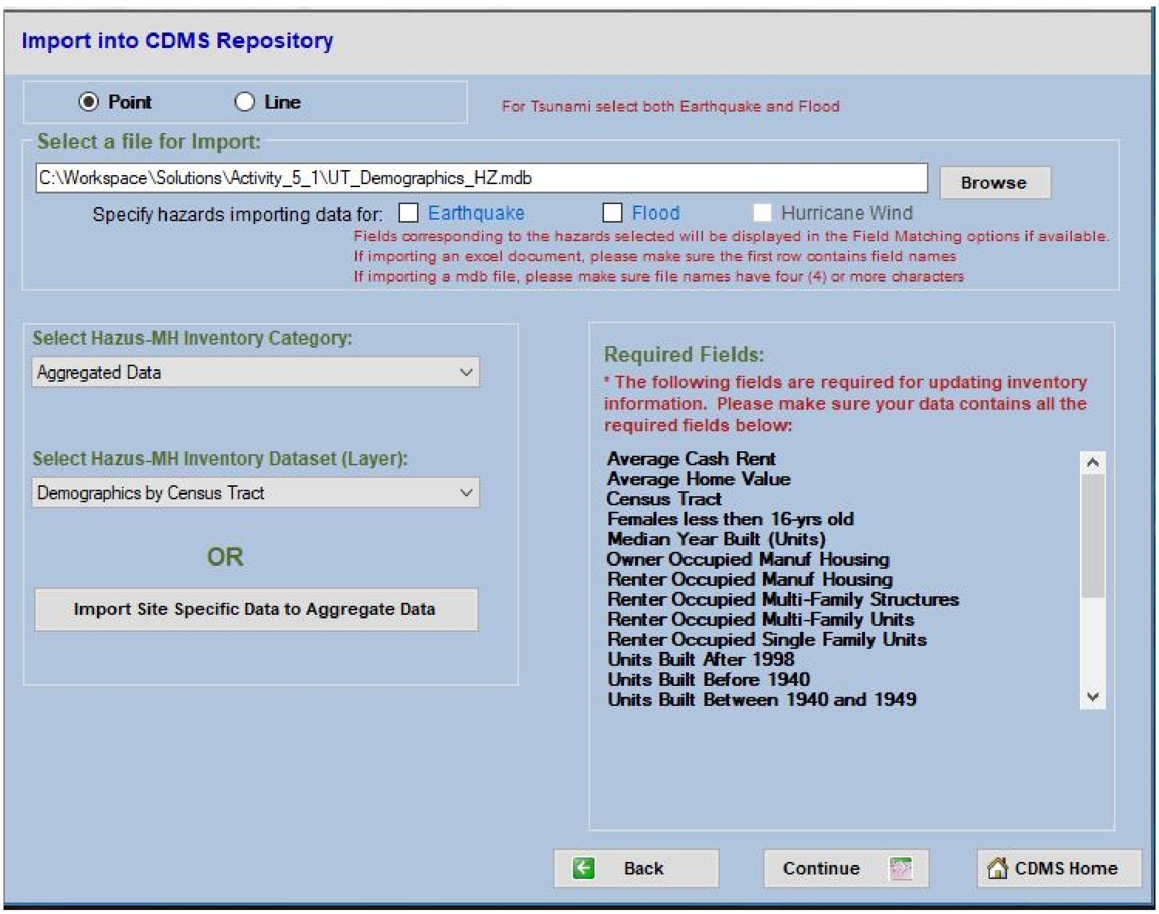
Select Microsoft Access/Geodatabase File (*.mdb) from the Files of Type dropdown menu.

Select the UT_Demographics_HZ file and click Open.

Indicate that you do not want to query information for any of the Hazus supported hazards by unchecking the boxes next to Earthquake, Flood and Hurricane.

Select Aggregated Data as the Hazus Inventory Category.

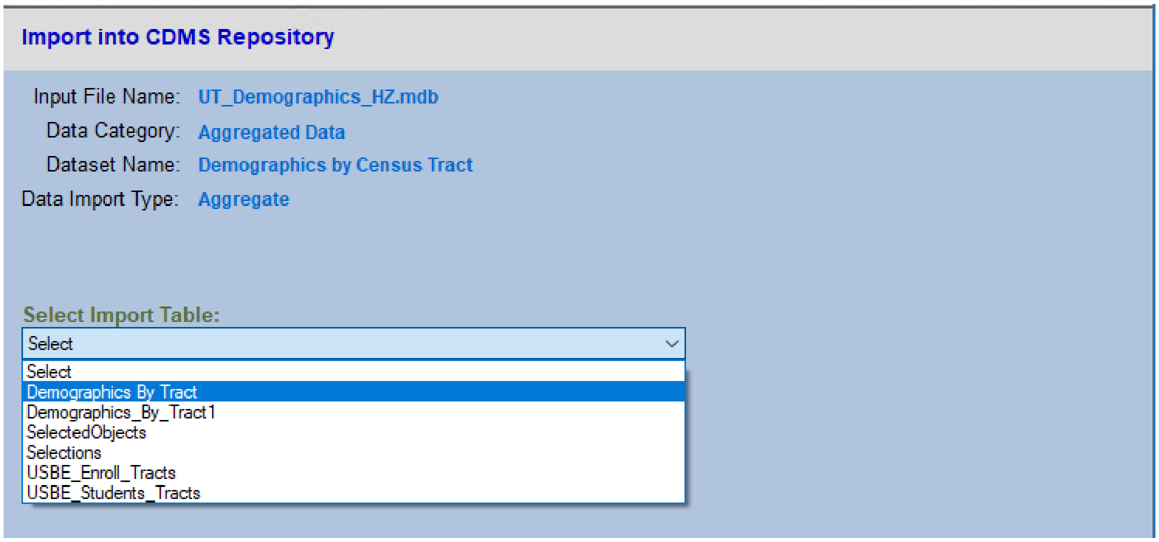
Select Demographics by Census Tract as the Hazus Inventory Dataset.



Click Continue and then acknowledge the warning that tells you that census tracts and census blocks will be out of sync by clicking OK.

You are only updating Census Tract data. If you were to do this activity with your own data, you would be well advised to also update the Census Block data. The Hazus flood model uses Census Blocks. The hurricane and earthquake models use Census Tracts.

From the Select Import Table dropdown menu select Demographics_By_Tract.



Click the Continue button.

No Field Matching is required, so click the Continue button to begin the import process.

CDMS will match fields wherever it can. Notice that since this data originated from Hazus, all the field names are properly matched by CDMS. No user defined fields will be needed.

When the data is imported successfully, click OK to close the successful import box. You may choose to view the imported data if you wish.

If the data was not imported successfully, you will see a validation error report. You must fix all validation errors for the import to be successful.

Task 8: Transfer Demographics From CDMS Repository to Hazus

The updated Demographics By Tract records have passed CDMS validation and are now residing in the CDMS Repository. They are valid Hazus records but have not yet been integrated into the Hazus state database.

Click the Transfer to Statewide Dataset button.

Last chance - once transferred to the state tables, there is no UNDO!!!

Click Yes to confirm the transfer to statewide dataset.

Click OK to close the Statewide data transfer complete dialog box when prompted to acknowledge that the process was completed.

Task 9: Review the School Records in CDMS or ArcCatalog

Check to make sure that the new Demographics reflect the Utah State Board of Education enrollments.

The instructions for how to view this data in ArcCatalog can be found in Activity 4.1. If you want to use CDMS to view the data, simply query the statewide dataset.

Answer the following questions using the updated Demographics information in the Hazus Statewide database.

Questions	Answers
1. What is the total student count in Utah based on the Demographics by Tract table?	
2. What is the total student count in Utah based on the Demographics by Block table?	
3. Why are the Block and Tract enrollment totals different?	

Close CDMS when you are finished.

Conclusions

The relevant lessons learned from Activity 5.1 include the following:

1. The aggregate data in Hazus is called General Building Stock.
2. Aggregated data can be updated using CDMS. Any aggregate data already in Hazus is replaced with the new data – there is no Append.
3. Caution - Block records are not updated when importing Tract records. Tracts may be updated from Blocks (user option).
4. Exporting Aggregated data to a geodatabase using CDMS does not create feature classes. Tables are created instead. This is a CDMS deficiency.
5. Be aware of the geographic extent of source data. In Activity 5.1, we updated 169 Tracts (data for which we had information); however, there are 588 Tracts in Utah. The remaining Census Tracts still contain the default Hazus provided data.
6. The Aggregated data can be updated from three different sources:

a. Pre-aggregated data (Hazus Tract and/or Block data must be known)

b. Site Specific data (CDMS can calculate the Census Tract and Block values as long as the Lat and Lon values are known)

c. Building-Specific data (export the records first and import as Site Specific).

Activity 5.2 - Update Aggregate Inventory from Site Specific Data

Type: Student Activity

Time: 60 minutes

Scenario

The Utah Division Emergency Management (DEM) has secured funds to harden schools from earthquake risk in Utah. You have been asked to perform an earthquake study to determine which schools are most vulnerable. You have contacted the Utah State Board of Education (USBE) to learn that many schools have undergone renovations and many new schools have been built. The Hazus provided EDU1 replacement costs, content values and building sizes in the GBS are probably not valid. Fortunately, the USBE has maintained a personal geodatabase of schools originally exported from the Hazus database with CDMS. They have also maintained the original Hazus data structure. This source is considered very accurate.

The modeling results from Hazus are largely dependent upon the aggregate data sets. You will use the USBE information to update the building counts, area and exposure (content and replacement) for EDU1 records in the aggregated General Building Stock.

This activity highlights a couple of scenarios:

1. The ability to update the aggregate data from the Site Specific data so that the two inventories match for the same occupancy class.
2. Techniques to share Hazus data sets between users. In this case, the data exchange format is an Esri personal geodatabase.

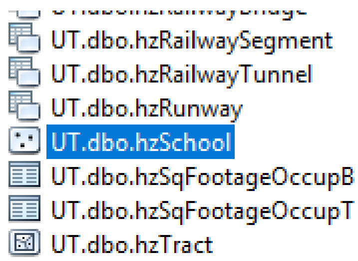
You could also import the USBE Schools as Essential Facilities to replace the default Hazus inventory.

Task 1: Review USBE Schools in ArcGIS

It is good practice to review the data before loading it into CDMS. This data set should be OK because it came from Hazus, but there are questions that need to be answered. For example, *did the provided USBE records include EQ values? This information may be important if the data is going to be used for an earthquake analysis.*

Using ArcGIS, open the CDMS_Activity_5_2.mxd located in C:\E0317_ActivityData\Activity5_2. *The map is pre-configured to show the USBE Schools.*

Add the default hzSchool from Hazus by selecting Add Data and then navigating to the Database Connection you completed in Activity 5.1. Add the UT.dbo.hzSchool layer.



Add the default GBS By Tract Replacement Cost and GBS By Tract Building Count tables that are also included in the UT database and can be accessed through the Database Connection. The tables are named UT.dbo.hzExposureOccupT and UT.dbo.hzBldgCountOccupT.

Reference the lecture materials or ask your instructor for assistance if you cannot figure out which tables contain replacement cost and building count values for Census Tracts.

Let's compare the default UT.dbo.hzSchool layer to the USBE Schools to make sure that we are really improving the data. Some Schools have been moved, some have been added, and some have been deleted.

Use ArcGIS and the attached tables and feature classes to answer the following questions:

Questions	Answers
1. How many Schools are in the default Hazus EF inventory?	
2. How many Schools are in the updated USBE inventory?	
3. How many Schools are in default Hazus GBS inventory? Hint: Look at the EDU1 and EDU2 inventories	

Questions	Answers
4. What is the total Replacement Cost of all Schools in the default Hazus EF inventory?	
5. What is the total Replacement Cost of all Schools in the USBE inventory?	
6. What is the total Replacement Cost of all Schools in default Hazus GBS inventory?	

The USBE data set has been updated from the Hazus default data but is not yet ready for prime time. We need to understand the potential limitations in the updated USBE Schools data before rolling it up as GBS and/or Site Specific. Are the records suitable for earthquake analysis?

The following questions need to be answered before we can import the data.

Questions	Answers
1. Do the records contain information about building area? If so, what are the units? If not, what are our options?	
2. Do the records contain information about building costs? If so, what are the units? If not, what are our options?	
3. Do the records contain information about content costs? If so, what are the units? If not, what are our options?	
4. Were the EQ values exported with the data? If so, are they all defaults? If not, what are our options?	

Task 2: Calculate Building Data in ArcGIS

USBE has not been maintaining the Area and Content Cost information, likely because this data is difficult to obtain. The information is not required for Site Specific analysis, but it is important if we intend to use these records to update the GBS. In this task, you will calculate the Area and Content values based upon the Replacement Costs.

To determine Area, the School building costs (in $/sq ft) need to be known. Fortunately, there are good sources that provide local building costs for different building types-- Hazus, RS Means and International Code Council (ICC) are common references:

The ICC Building Valuation Data PDF is provided in C:\E0317_ActivityData\Reference\Documentation. For the purpose of this activity, let's assume a construction cost of $158/sq ft.

Group (2009 International Building Code)	IA	IB	IIA	IIB
A-1 Assembly, theaters, with stage	211.15	203.98	198.73	190.05
A-1 Assembly, theaters, without stage	193.16	185.99	180.74	172.06
A-2 Assembly, nightclubs	163.22	158.56	154.17	148.00
A-2 Assembly, restaurants, bars, banquet halls	162.22	157.56	152.17	147.00
A-3 Assembly, churches	195.10	187.93	182.68	174.00
A-3 Assembly, general, community halls, libraries, museums	163.81	156.64	150.39	142.71
A-4 Assembly, arenas	192.16	184.99	178.74	171.06

Group (2009 International Building Code)	IA	IB	IIA	IIB
B Business	164.76	158.78	153.49	145.97
E Educational	176.97	170.85	165.64	158.05

Hint: Hazus also provides Valuation Parameters used in the GBS. In this case, the Hazus cost multipliers are well below the estimated costs provided by ICC: The EDU1 replacement value is $173.88 / sqft for Salt Lake County, Utah--that value can be found in the Inventory > Valuation Parameters window.

Right-click the USBE Schools layer and choose Open Attribute Table.

Select the Area column, right-click and select Field Calculator from the context menu. Click Yes to do this outside of an edit session.

Add the following formula to calculate new Area values:

[ReplacementCostthous]/158

Click OK to run the Field Calculator. *Check the results.*

To determine Content Costs, the relationship between building and content values needs to be known. FEMA has provided guidance in the software technical manuals. This material has been extracted into hazus2_ch6_flum PDF and provided in C:\E0317_ActivityData\Reference\Documentation. According to the information provided in Table 6.5, the ratio between Replacement and Content values for EDU1 Occupancy Codes is 1.0.

Click the Table Options button and select Add Field.

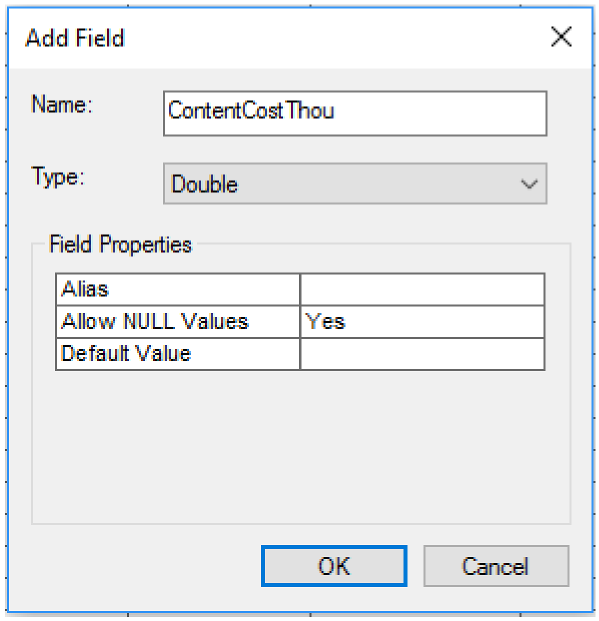
Site Specific inventory does not include content values. A new field must be added.

Enter the Name of the new field as ContentCostThou.

Set the Type from the dropdown list to Double.

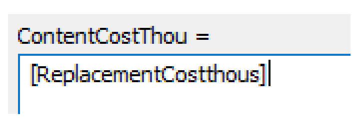
The format is set to match ReplacementCostThou.

Click OK to close the Add Field dialog box.



Select the ContentCostThou column, right-click and choose Field Calculator. Choose Yes to perform this calculation outside of an edit session.

Add the following formula to calculate new ContentCostThou values: [ReplacementCostthous]



Click OK to run the Field Calculator. *Check the results.*

The USBE_School attributes have been improved to better support the GBS and Site Specific analysis. Next up, the earthquake attributes.

Task 3: Calculate Hazard Data in ArcGIS

USBE has not been maintaining the Earthquake information, likely because this data is hard to obtain. Accurate hazard information is important if we intend to use these records to update the GBS mapping schemes or if we want to run Site Specific analysis on the Schools.

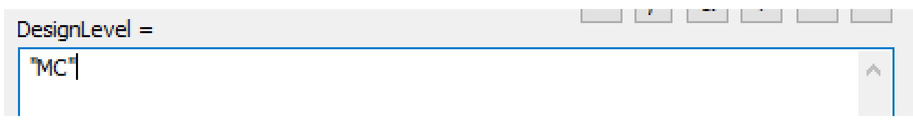
The following information was gleaned from the Hazus Data Dictionary provided in C:\E0317_ActivityData\Reference\Documentation\hazus2_appf.PDF. The guidance will be used to enhance the hazard information in this activity:

1. Foundation Type (e.g., slab, pile) is not used in the earthquake model. It is a placeholder for future extensibility and does not need to be populated.
2. Design Level may be established based upon the Year Built. In general:
   <= 1940 is Pre-Code (“PC”)
   > 1940 < 1973 is Moderate-Code (“MC”)
   >= 1973 is High-Code (“HC”)

Select the DesignLevel column, right-click and choose Field Calculator to open the Field Calculator dialog box.

Add the following formula to calculate new DesignLevel values: “MC”

All values will be changed from “PC” to “MC”



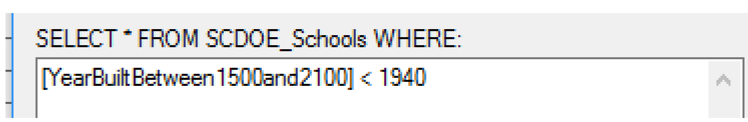
Click OK to run the Field Calculator. *Check the results.*

Click the Table Options from the USBE_Schools table and select Select By Attributes.

The Design Level will be changed on a subset of records.

In the SELECT * FROM query text box toward the bottom of the window, enter YearBuiltBetween1500and2100] <= 1940 as shown below.

The query will select buildings built before 1940.



Click Apply to run the select query and Close to finish the window.

Click the Show Selected Records icon at the bottom of the USBE Schools Table.

We only want to update the Design Level values in the current selection.

Select the DesignLevel column, right-click and choose Field Calculator to open the Field Calculator dialog box.

Add the following formula to calculate new DesignLevel values: ”PC”

All selected values will be changed from “MC” to “PC”

Click OK to run the Field Calculator. Check the results. All building built prior to 1940 should be set to “PC”.

Repeat the above steps to set the Design Level to “HC” for Schools built after 1973.

For purposes of this activity, the USBE School records are ready to update the Hazus GBS.

Click the Show All Records button. Notice that design level now reflects the condition appropriate to the year the school is built for each school.

Exit ArcGIS.

The mapping portion of the activity is done, but save the MXD just in case.

Hint: The effort to replace default values with more appropriate values is not complete. For example, all Soil Types are set to “D”. A spatial intersect with a soils map could determine better values. In general, the EQ and FL values are harder to come by than the building values.

Task 4: Import USBE Schools into the CDMS Repository

You will now try to import the USBE School data into the CDMS Repository for the purposes of updating the General Building Stock. CDMS will validate the new records before allowing the data set to be added to the CDMS Repository. Once in the Repository, data sets can be transferred to the Hazus statewide databases.

Open CDMS.

From the CDMS Home menu, click the Import into CDMS Repository from File button.

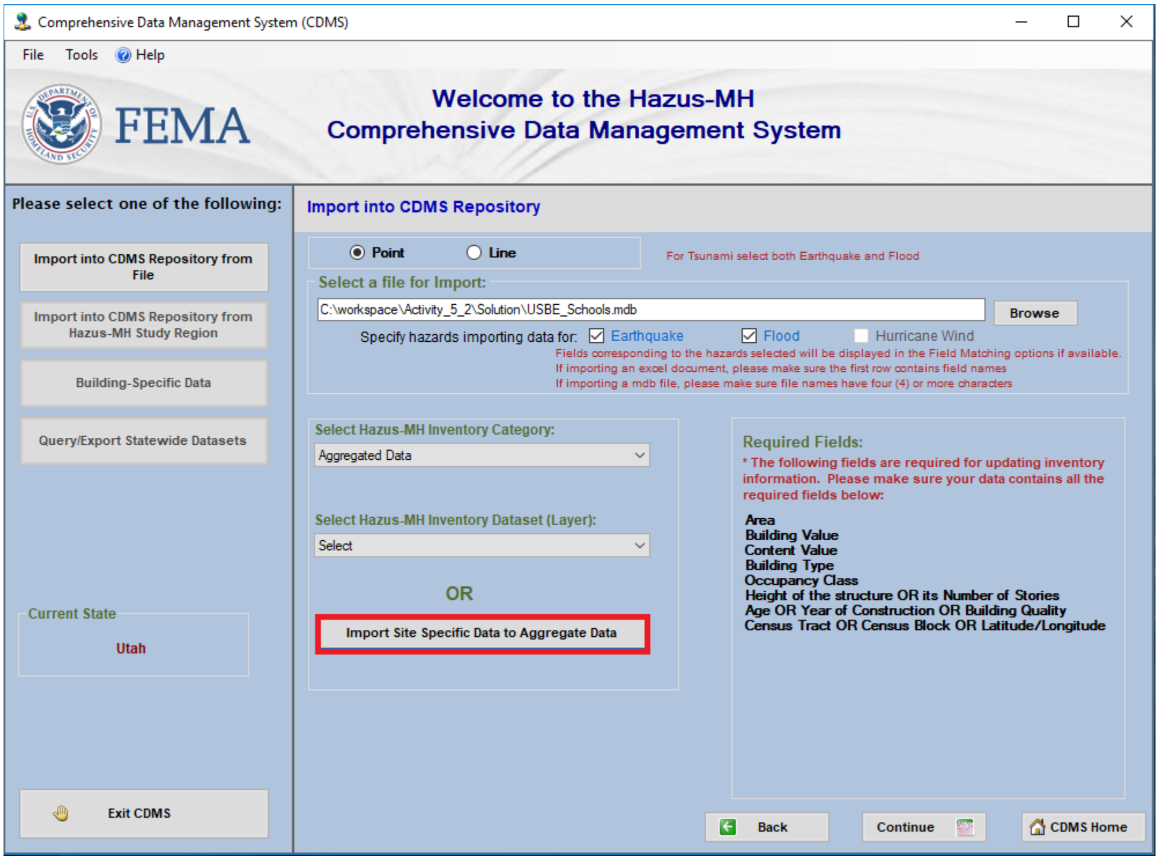
Click the Browse button and navigate to the C:\E0317_ActivityData\Activity5_2 folder.

Select Microsoft Access/Geodatabase File (*.mdb) from the Files of Type dropdown menu.

Select the USBE_Schools database and click Open.

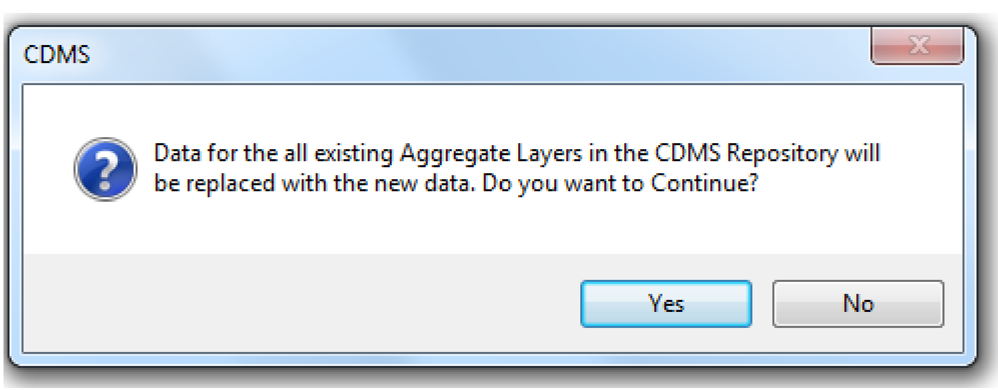
Uncheck the Hazus hazard boxes next to Flood. *The source data contains Earthquake information.*

Select Aggregated Data as the Hazus Inventory Category.

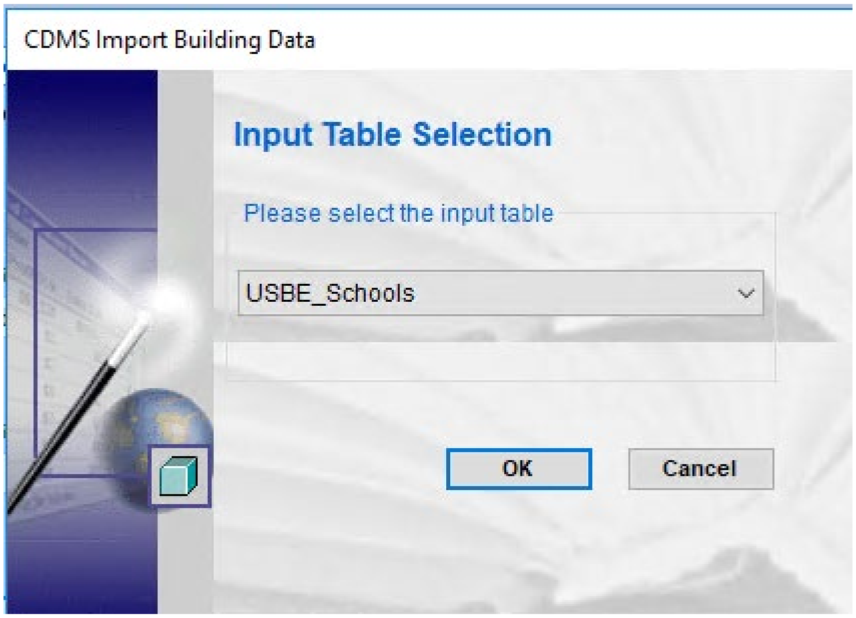


Click the Import Site Specific Data to Aggregate Data button.

A box will pop open stating that all existing Aggregate Layers in the CDMS Repository will be replaced. Click Yes to continue.



Select USBE_Schools as the input table and click OK.



Match the following fields:

ReplacemenetCostthou - Building Replacement Cost (thous. $)
ContentCostThou - Content Replacement Cost (thous. $)
Design Level - Earthquake Design Level
FacilityClass - Occupancy
NumberOfStories - Num Stories

Save the field matching scheme as USBE_Schools.fmp in the C:\E0317_ActivityData\Activity5_2 folder.

Save the field matching template just in case.

Click the Continue button.

If your data was not prepared properly, a validation report will be shown. Fix any errors and re-try if needed.

Click Yes to contiue with the default design level.

A Categorize Fields box will open stating which fields need categorization. Click OK.

The Categorization process is easy since the data source is Hazus.

For the Area Field Type, select the radio button next to “Field is numeric and in thousands of square feet. Use as is.”

The building area values were calculated in 1,000s of square feet. It is important that you present the data to CDMS in the proper units.

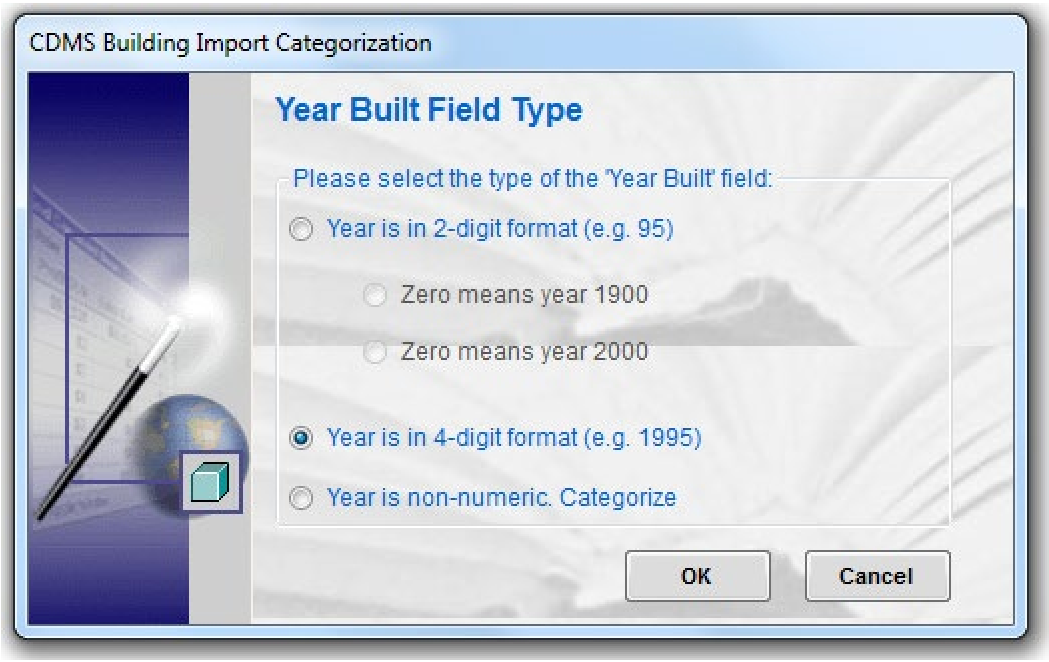
Click OK to continue.

Click OK to accept the “Field values are in thousands of dollars. Use the default settings “Use as is” for the Building Value and Content Value.

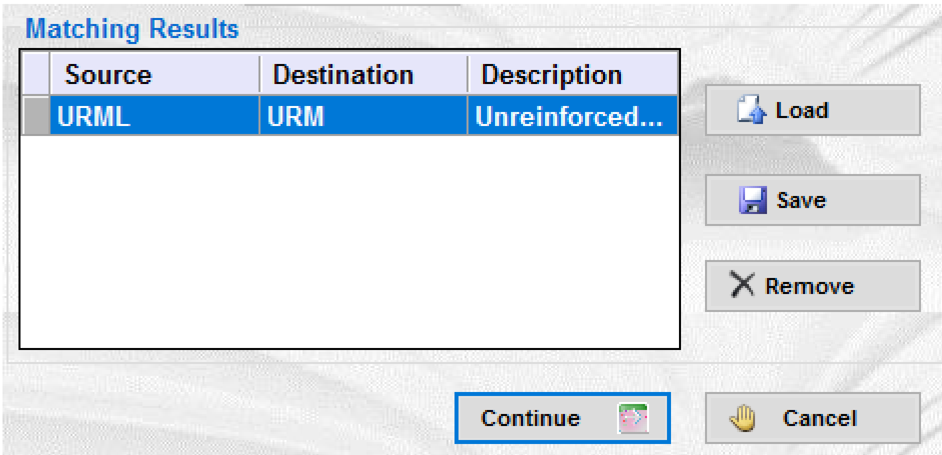
The Building Value and Content Value fields are also calculated in thousands of dollars, no conversion factor needed.

Click OK to accept the “Field is numeric. Use as is. for the Number Of Stories Field Type.

Select the “Year is in 4 digit format (e.g. 1995)” radio button for the Year Built Field Type. Select OK.



Match the URML source field value to the URM destination field on the EQ Building Type Category Value Matching window. Select Add Match.



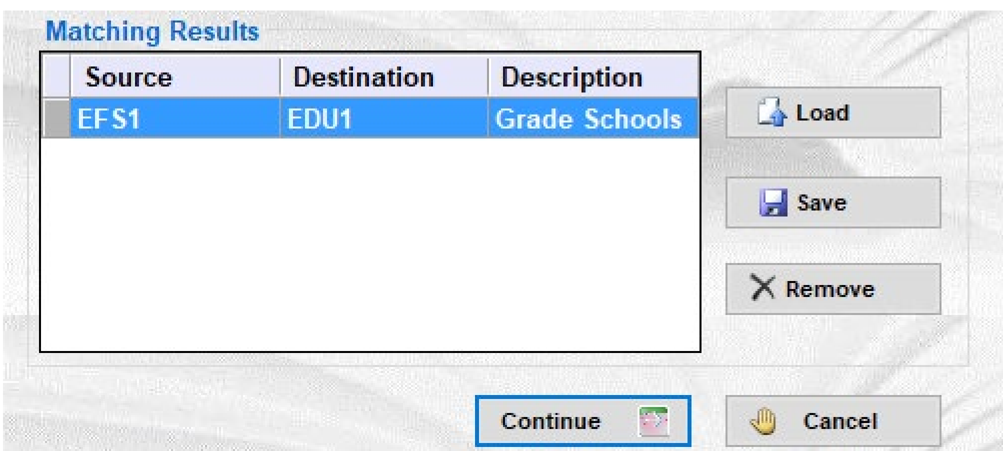
Click Continue.

EQ Design Level values are auto-matched by CDMS. Click Continue.

The values PC, MC and HC are recognized by CDMS and auto-matched.

Match the NULL source field value to 0 (Unknown) destination field on the FL Design Level.

Match the EFS1 source field value to the EDU1 destination field on the Occupancy Class Category Value Matching window. Select Add Match.

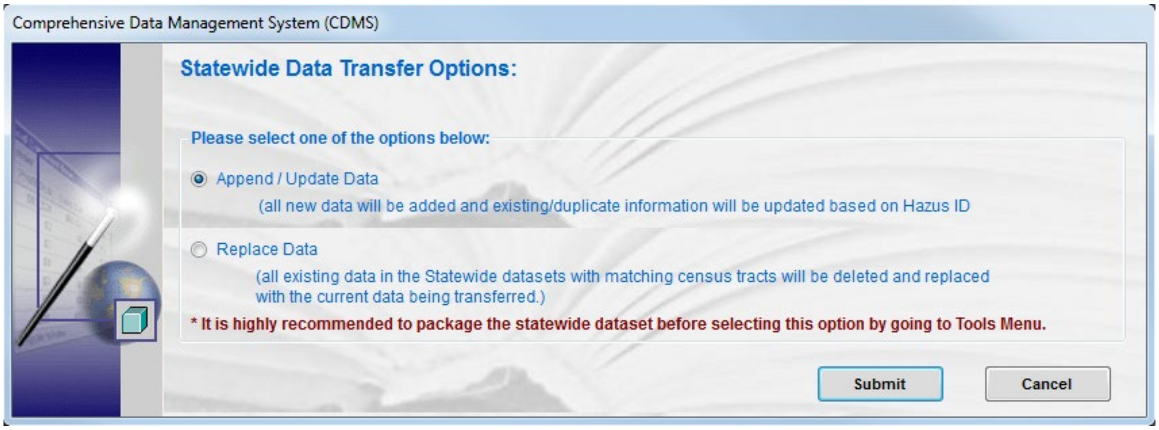


Click Continue to accept the settings.

CDMS recognizes that there is Earthquake data that may be used to update the General Building Type Mapping Schemes. The user is prompted with two options for handling the mapping schemes for the Occupancy Classes that are not included in the source data.

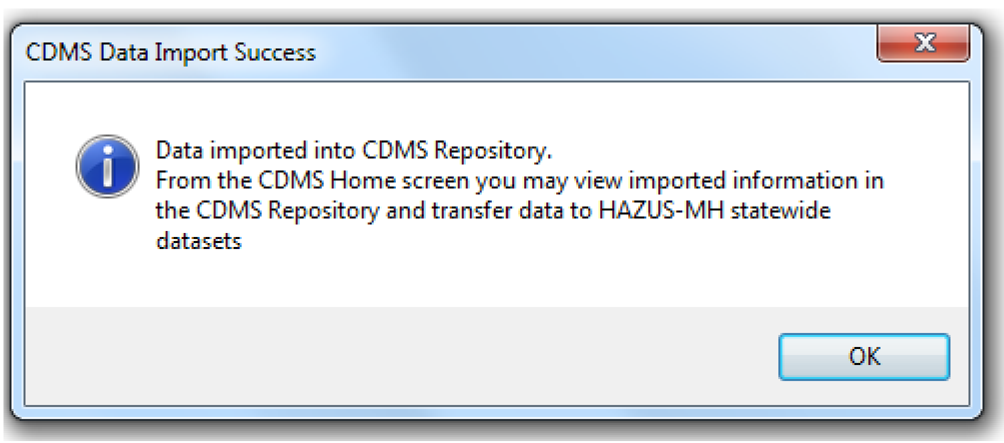
Select the option to Use system defaults for General Building Type Mapping Schemes.

Hint: The workflow shows one way to update the Mapping Schemes. This topic is covered in more detail in Lesson 6.



Click Submit.

Click OK when prompted to acknowledge the successful import.



Task 5: Transfer General Building Stock from CDMS Repository to the Hazus State Database

The updated buildings have passed CDMS validation and are now residing in the CDMS Repository as aggregated data (one record per Tract). They are valid Hazus records, but not yet reflected in the Hazus statewide databases.

From the CDMS Repository window click the View button to the left of the Aggregated Data row to view the data.

This is your last opportunity to check out your work before transferring it to Hazus.

View all of the tables by selecting each table from the Select a table to display the data dropdown menu.

There are no Block records and all values for non-EDU1 fields are set to "0".

Click the Close button to close the CDMS Detail Information window.

Click the Transfer to Statewide Dataset button.

Click Yes to confirm the transfer.

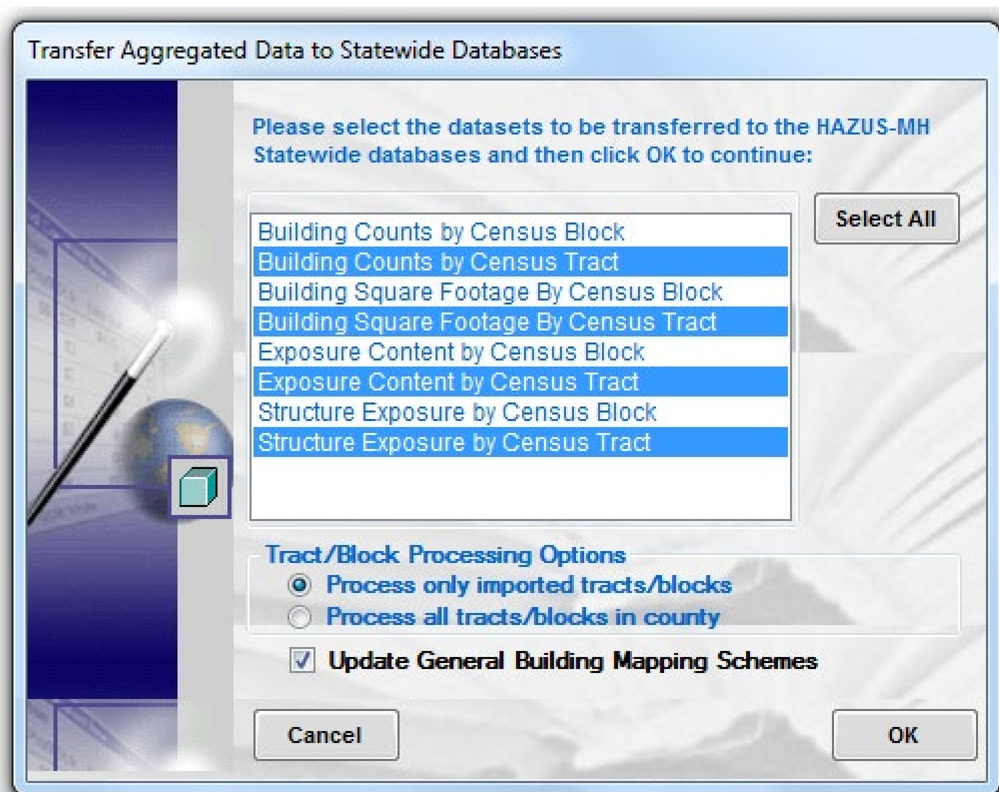
Select the Process only imported tracts/blocks option.

We are providing data for all Tracts in Utah.

Hold down your CTRL key and click the four Tract aggregate datasets to be loaded into Hazus.

We provided Tract values only. The GBS values for Blocks will not change.

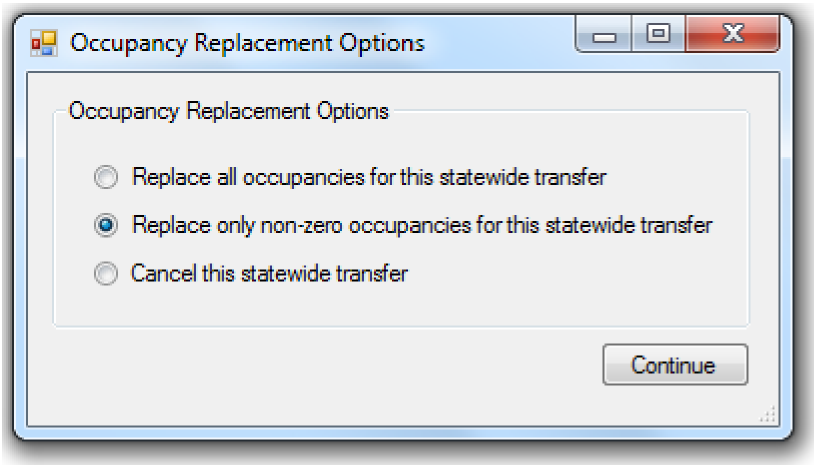
Do NOT check the checkbox to Update General Mapping Schemes.



Click OK.

Select the Replace only non-zero occupancies for this statewide transfer option and click Continue.

We only want to change the EDU1 values in Hazus. The other Occupancy Classes in our source data will be ignored.



Click Continue to start the transfer of data.

This process should just take a few moments to complete.

Click the OK button if prompted to verify you are aware that Tract and Block data will be out of sync.

Click OK to close the Statewide Data Transfer Complete dialog box.

Task 6: Review the Updated General Building Stock Records

Next, we will review the results and verify that:

1. The purpose of Activity 5.2 was to match the GBS EDU1 inventory with the EF EFS12 inventory. Did we succeed?

2. The source data only contained EDU1 values. All other Occupancy Classes should be the same before and after the activity. Verify that the non-EDU1 values are not '0'.

3. Since you did not provide Block data, verify that there are no changes to the GBS Census Block inventory.

Query the statewide database and review the Aggregated Data – Building Counts by Census Tract. Export the updated GBS records using the same steps as Activity 4.1. Answer the following questions using the following data sets:

1. *GBS EDU1 Tract records prior to Activity 5.2*
2. *Updated EF Schools provided by USBE used in Activity 5.2*
3. *GBS EDU1 Tract records after Activity 5.2*

Questions	Answers
1. How many Schools in the updated Hazus GBS inventory (by Tract)?	
2. How many Schools in the updated Hazus EF inventory?	
3. Are the GBS and EF counts the same? If not, why?	

Exit CDMS. Activity 5.2 is complete.

Conclusions

The relevant lessons from Activity 5.2 include the following:

1. For demonstration purposes, the Tracts were updated in the GBS, not the Blocks. CDMS will prompt you to update the Tracts from the Blocks, but not the Blocks from the Tracts. In this activity, Blocks and Tracks in the GBS are no longer in sync.
2. The updated Tract GBS values can be used for Earthquake analysis. If this data is to be used for a Flood analysis, advanced users may want to re-step through this activity with the intent of updating the Blocks as well as the Tracts.
3. The workflow demonstrates updating the GBS from Site Specific data; however, the School records should also be used to update the Essential Facilities as shown in Activity 4.1.
4. The workflow shows how to update the GBS for one specific Occupancy Class (in this case EDU1); however, CDMS requires all Occupancy Classes to be populated in the Repository. The user is prompted to instruct CDMS how to handle the unpopulated Occupancy Classes. This happens during the transfer from the Repository to the Statewide. Any misunderstanding here will result in very different results in Hazus.
5. Tracts for which no data exists will retain their original values. If the intent is to completely replace the GBS (all 867 Tracts), there are two options:

a. Zero out all the Tracts (and Blocks) first.

b. Select the option to **Process all tracts/blocks in the county** during the transfer from the CDMS Repository.

6. The workflow also shows one way to update the Mapping Schemes. This topic is covered in more detail in Lesson 6.

Activity 5.3 - Aggregate Inventory from Site Specific Data Scenario

Type: Student Activity

Time: 60 minutes

Background

Site Specific data provides point locations of buildings at risk to hurricane, flooding, earthquake or tsunami induced damage. As a general rule, Site Specific data will yield more accurate results at all scales, but especially when detailed analysis is needed on smaller areas.

As part of its default data, Hazus provides many examples of Site-Specific inventory representing buildings and other parts of the built environment as points. This type of inventory includes essential facilities, utilities, and transportation facilities. However, Hazus does not provide point data for many other types of buildings such as homes, businesses, or industrial building sites. Inventory that describes those types of buildings is extracted from Census data and other sources and aggregated to the Tract and Block.

Since Census data is only updated every ten years, intermediate releases of Hazus rely on projections. If the user has access to more current data, it is possible to update the General Building Stock. Typically, the most accurate and complete source for aggregate data updates is assessor Computer Assisted Mass Appraisal (CAMA) data. These data contain parcel records, along with assessed valuations for the land and any improvements.

Assessor CAMA records cannot be used to update General Building Stock unless they can be correlated to a geographic location, including the Census tract and Census block within which they are located. Assessor records usually contain information that can be used to determine their spatial locations. Examples include Addresses (which can be geo-coded), Parcel IDs (which can be located on a parcel map) or GPS X,Ys. In Activity 5.2, GIS data sets with known locations for each building were available to determine the corresponding Census Tract and Census Block. In this activity, you have to do more of the work in preparing the data to get it to that point.

You will use a simulated example of Parcel and Assessor data in Salt Lake County to update the aggregated General Building Stock in Hazus. To limit data processing times, you will focus on a 5,000-parcel area named Miller Creek that has seen lots of new development.

Task 1: Review Salt Lake County GIS Parcel and Assessor Data

The Salt Lake County Surveyor's Office has provided a geodatabase with the parcel polygons for the whole county. These polygons have been clipped to the Miller Creek boundaries.

Start ArcMap and open the Activity_5_3 MXD located in the C:\DMGT\Activity5_3 folder.

Open the attribute table for the Miller Creek Parcels layer.

These are typical of parcel records available in many US counties.

Open the attribute table for the Miller Creek Assessor records.

These are typical of Assessor records available in many US counties – although much simpler in details as well as file structure than you may find some counties.

Hint: These are not GIS records. Therefore, you may need to click the List by Source tab to be able to see the table in the Table of Contents so that you can open it.

Use the open attribute tables to answer the following questions.

Questions	Answers
1. How many Parcels are in Miller Creek?	
2. How many records are in the Assessor data?	

Close all attribute tables.

Task 2: Create Miller Creek Parcel Points in ArcMap

From the assessor data (structure information) and the parcel data (location information), we are attempting to create a building inventory for Miller Creek. If we had building footprints, we would use them. In our case, parcel polygons are OK, but parcel centroids are better:

1. They can be used to approximate building locations. If the centroid locations are not good enough, they could be moved using aerial photography.

2. Points can be associated with a specific Block or Tract. Parcels cannot. Parcels cross Block boundaries.

ALERT!

In this task you will use the Feature to Point tool in ArcToolbox to create parcel points from parcel polygons. An ArcInfo license is required to access this tool. If you do not have access to the tool, skip Task 2 and continue at the beginning of Task 3. The Miller_Creek_Parcel_Point feature and Miller_Creek_GBS_Points feature classes created in Task 2 are available in a geodatabase named:

C:\E0317_ActivityData\ActivitySolutions\Activity5_3\Building_Inventory.mdb.

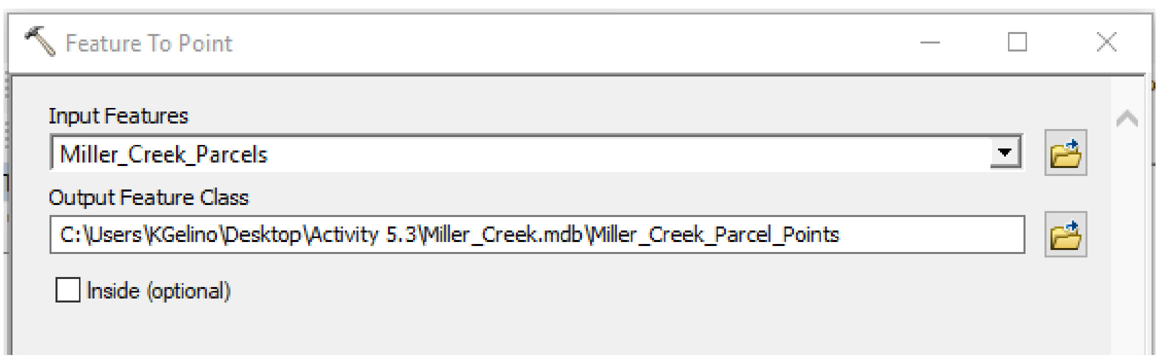
Open ArcToolbox unless it is already open.

Navigate to the Data Management Tools toolbox and from the Features toolkit double-click the Feature to Point tool to open it.

Select Miller_Creek_Parcels from the Input Features dropdown.

Click the Browse icon to the Output Feature Class. Navigate to C:\E0317_ActivityData\Activity5_3 and double-click the Miller_Creek.mdb geodatabase.

Save the Output Feature Class as Miller_Creek_Parcel_Points.



Click OK on the Feature To Point dialog box to run the tool and then, if prompted, close the Feature to Point status window when the process has completed.

Close ArcToolbox.

The Miller_Creek_Parcel_Points layer has been added to the MXD.

You need to spatially join the Parcel Points to the Census Blocks layer in ArcMap. This is a necessary step when aggregating data.

Right-click on the Miller_Creek_Parcel_Points layer and select Joins and Relates -> Join.

Select Join data from another layer based on spatial location from the What do you want to join to this layer? dropdown.

Select Salt Lake County Blocks as the layer to join to.

Select the “it fallsinside” radio button.

Click the Browse button next to the Specify output shapefile or feature class option at the bottom of the Join Data window. Navigate to the C:\E0317_ActivityData\Activity5_3 folder.

Select File and Personal Geodatabase feature classes as the file type.

Double-click the Salt_Lake_Building_Inventory.mdb geodatabase.

Name the output feature class Miller_Creek_GBS_Points.

Click OK to spatially join the data.

Right-click on the Miller_Creek_GBS_Points layer and select Open Attribute Table to view the field values.

The joined data has been added to the map. GBS Points now have Tract and Block values in them.

Task 3: Fix GBS Points

If you skipped Task 2, add the Miller_Creek_GBS_Points and Miller_Creek_Parcel_Points feature classes from:
C:\E0317_ActivityData\Activity_5_3\Solution\Salt_Lake_Building_Inventory.mdb
to your map.

Every GBS Point must have Census Block and Census Tract values to pass CDMS validation. Typically, there will be thousands of points in the source data. It only takes one bad record for CDMS to reject the entire data set.

Questions	Answers
1. How many GBS Points have missing or blank CensusBloc values?	
2. How many Blocks will be updated from the Miller Creek GBS Points?	
3. How many Tracts will be updated from the Miller Creek GBS Points?	

The GBS Points that were generated from the parcels will be used as approximate locations of the buildings. The centroids, especially for large or irregular shaped parcels, may be located outside the Census Blocks or coincident with a Block boundary.

The fix is generally to move the offending centroids and recalculate the Census Tract and Census Block values. This is especially important for flood models, especially if water features (rivers, lakes and streams) are the reason for the misalignment.

NOTE:
CDMS needs either Latitude | Longitude or Census Block values to update the GBS (not both). In the case that Census Block extent does not cover parcel extents (as shown in the screenshot above), instead of performing a spatial join to figure out the Census Block values, we could have used the ArcGIS Calculate Geometry tool to calculate the Latitude and Longitude. Every record will have valid Lat and Lon values, which allows CDMS to assign Census Tract and Census Block values during import. If ArcGIS cannot determine Census Block values, neither can CDMS. Better to provide valid Census Tract and Block values going into CDMS to avoid surprises.

Be mindful of the geographic extents of the source data. The GBS Points are derived from Salt Lake County parcels - they have been clipped to the Miller Creek boundary, not the Census Block boundaries. In the example above, the GBS Points in Block xxx2007 will replace <u>all</u> the buildings in GBS Block xxx2007 in Hazus. To avoid this problem, make sure that the source and destination geographic extents are the same.

Ideally, the GBS Points with <Null> CensusBloc values would be moved inside the Census Blocks, and the spatial query re-run until all CensusBloc values are populated. For purposes of this *activity, we will delete GBS Points with the missing CensusBloc values so that GBS points with valid CensusBloc values will import into CDMS.*

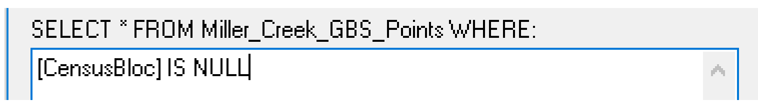
Click the Table Options button on the Miller_Creek_GBS_Points table and choose to Select By Attributes.

Double-click CensusBloc from the list of fields.

By double-clicking on the field, you are adding it to the query/expression.

Type IS NULL in the query builder box.

The expression finds records where the Census Block values are not populated.



Click the Verify button to verify the expression. Click OK to close the Verify Expression box.

Your expression should verify successfully. If not, confirm that you entered it correctly.

Click the Apply button and then click the Close button if necessary to close that window.

The GBS Points with empty Block values are highlighted.

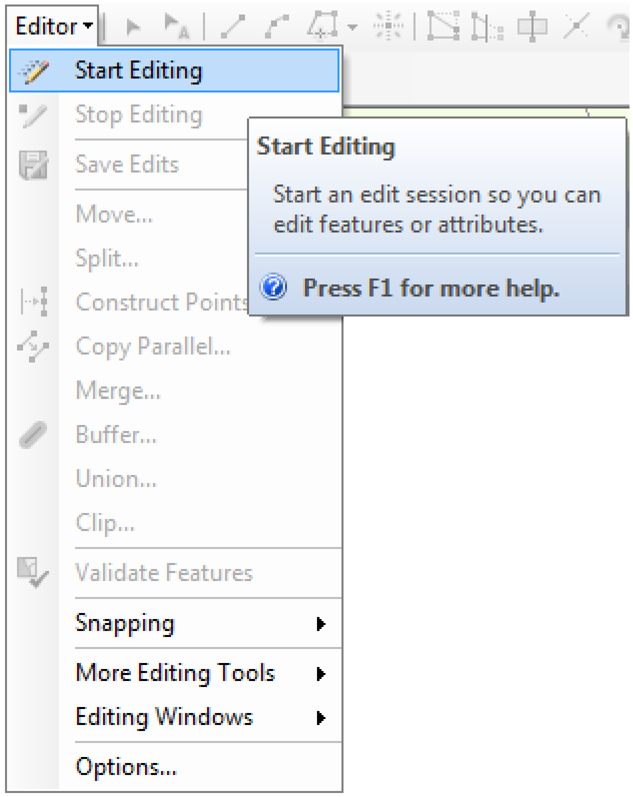
Click the Show Selected Records button on the Miller_Creek_GBS_Points attribute table.

The GBS Points that have NULL Blocks will be displayed.

From the Customize menu choose Toolbars> Editor to open the Editor toolbar.

An edit session must be started to delete the GBS Points without Blocks.

Select Start Editing from the Editor toolbar dropdown menu.



Choose to edit the Miller_Creek_GBS_Points.

Click OK to start the edit session and Close the Create Features dialog box.

Choose the Delete Selected icon at the top of the window.

Click the Show All Records button at the bottom of the attribute table to show all records.

From the Editor dropdown menu, select Stop Editing. Select Yes when prompted to save edits.

Close the Miller_Creek_GBS_Points attribute table.

Task 4: Join Miller Creek GBS Points to Assessor Records in ArcMap

The GBS information is based upon replacement costs, types, and sizes of the individual buildings. Typically, much of this information is not available from parcel data sets. Fortunately, the Salt Lake County Assessor's Office has provided you with this data in the Miller_Creek_Assessor table. A link between these two datasets must be established. You will use the common parcel number to establish this link.

Note: For future reference, if parcel data is unavailable, it may be possible to geocode the assessor records to Street Centerlines or E911 Address Points. The property address values (not owner address) must be current and accurate. Typically, the results are better using the method described in this activity.

You will now perform a table join from the GBS Points to the Assessor records.

Right-click on the Miller_Creek_GBS_Points layer and select Joins and Relates -> Join.

Select Join attributes from a table from the What do you want to join to this layer dropdown.

Select Parcel_Number as from the Choose the field in this layer dropdown.

This is the common parcel identification number.

Select the Miller_Creek_Assessor table from the Choose the table to join to this layer dropdown.

Select Parcel_Number from the Choose the field in this table pulldown.

Choose the Keep only matching records Join Option.

The Join Options is set to Keep Matching Records because you don't want to hold onto GBS Points that don't match the Assessor data. Blank values will cause problems later. Building Inventory will not import into the CDMS Repository unless all required fields are loaded with proper values – blank fields are not allowed.

Click OK to join the data.

Open the Miller_Creek_GBS_Points attribute table and observe that the GBS Points are now linked to the Assessor information.

Close the Miller_Creek_GBS_Points attribute table.

The join is temporary. CDMS does not support related or joined tables. The Miller_Creek_GBS_Points layer must be exported as a new feature class so that it can be imported into CDMS.

Right-click on the Miller_Creek_GBS_Points layer and select Data -> Export Data.

Select All features from the Export dropdown menu to export all features.

Choose to use this layer's source data for the coordinate system.

Click the Browse button next to the output feature class option and navigate to C:\E0317_ActivityData\Activity5_3 folder.

Select File and Personal Geodatabase feature classes as the file type.

Save the output feature class to the Salt_Lake_Building_Inventory.mdb database as Miller_Creek_GBS_To_CDMS.

Click OK to start the export and click Yes when asked if you wish to add the feature class to your map.

Use the attribute tables for the data sets developed to this point to answer the following questions.

Questions	Answers
1. How many points are in the Miller_Creek_GBS_To_CDMS file?	
2. How many records did not join?	
3. How many records matched between Parcel and Assessor?	

Task 5: Calculate the Replacement Costs in ArcMap

Because of the recent development in Salt Lake County, the replacement costs for each building need to be re-calculated. Replacement costs are different from the home sale price and the appraisal values provided in the assessor records. The building replacement and content replacement costs are needed to determine the risk exposure (i.e. how much would it cost to rebuild the properties vulnerable to major flooding?).

First, you will remove the parcels without any buildings on them. We'll use $5,000 as the cutoff to remove the backyard barns and sheds for this activity. Then you will calculate the replacement and content costs. Note – the decision to remove buildings based on the $5,000 figure is arbitrary. You may elect to apply a different metric when processing your own data after the class.

Right-click on the Miller_Creek_GBS_To_CDMS layer and select Open Attribute Table to view the attribute table.

Click the Options button and choose to Select By Attributes.

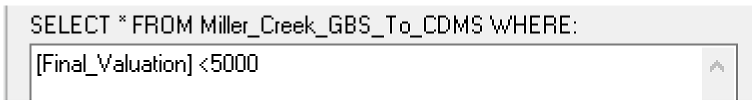
Double-click Final Valuation.

By double-clicking on the field, you are adding it to the query/expression.

Click the "Less Than" symbol button to add it to the query.

You are building an expression to find records where the Final Valuation is less than $5,000.

Type 5000.



Click the Verify button to verify the expression. Click OK to close the Verify Expression box.

Your expression should verify successfully. If not, confirm that you entered it correctly. There should be 27 records selected.

Click the Apply button to apply the expression and then click the Close button on the Select by Attributes window to close that window.

The GBS Points where the Final Valuation is less than $5,000 are highlighted.

Click the Show All Records button to show all records.

From the Editor toolbar select Start Editing from the Editor dropdown menu.

An edit session must be started to delete GBS Points without buildings.

Choose to edit the Miller_Creek_GBS_To_CDMS layer.

Click OK to start the edit session and Close the Start Editing dialog box.

Click the Show Selected Records button on the Miller_Creek_GBS_To_CDMS attribute table.

The selected GBS Points that have no significant structures on them will be shown on the menu.

Click the Delete Selected button that is toward the top of the window.

Click the Show All Records button to show all records.

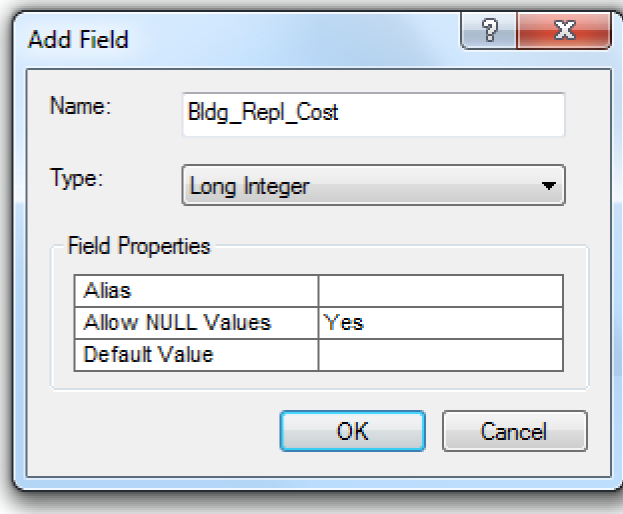
From the Editor dropdown menu, select Stop Editing. Select Yes when prompted to save edits.

Next, you will add a field to the attribute table. You cannot add fields while in an edit session.

Select Add Field from the Options dropdown on the Miller_Creek_GBS_To_CDMS attribute table.

Name the field Bldg_Repl_Cost and select Long Integer as the Type.

This field will contain the building replacement cost values for each parcel.



Click OK to add the field.

Repeat the steps to add another field:

Name:Cont_Repl_Cost

Type: Long Integer

This field will contain the content replacement cost values for each parcel.

Right-click on the Bldg_Repl_Cost field and select Field Calculator.

You will now calculate the Building Replacement Cost.

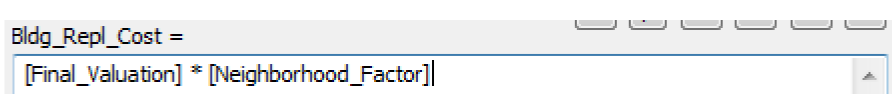
If prompted, click Yes to continue outside of an edit session.

Double-click the Final_Valuation field to add it to the expression.

Click the multiply button to add it to the expression.

Double-click the Neighborhood_Factor field to add it to the expression.

Neighborhood Factor is used to adjust the market value to replacement value.



Note: Many assessor CAMA databases do not provide a neighborhood factor. In these instances, you may be best advised to apply a different approach for determining replacement cost. For example, you may wish to consult RS Means building construction costs and apply those to the square footage of your structure based on occupancy and other variables to derive an appropriate replacement value.

Click OK to update the Building Replacement Cost field.

Use the Field Calculator to calculate the value of the Cont_Repl_Cost field to [Bldg_Repl_Cost] *0.5

Content value is 50% of the building replacement value.

Check the results in Miller_Creek_GBS_To_CDMS. Remember some of the lessons learned from previous activities:

1. *Issues with blank or <Null> values.*
2. *FEMA guidance recommends that where content values are unavailable, they can be determined from Occupancy and Building Replacement Cost. For RES1 records, the formula is [Bldg_Repl_Cost] * 0.5. Other Occupancy Classes use different formulae.*

Use the attribute tables for the data sets developed to this point to answer the following questions.

Questions	Answers
1. How many Parcels are in Miller Creek?	
2. How many records matched between Parcel and Assessor?	
3. How many buildings will be modeled in Miller Creek?	
4. How many records were exempt from property tax?Hint: these records were deleted with Final Valuation is less than $5,000.	

Save the map and close ArcGIS.

Task 6: Import Miller_Creek_GBS_To_CDMS into CDMS

Miller_Creek_GBS_To_CDMS records now represent buildings valued more than $5,000. You will use this file to import the buildings into the CDMS Repository for purposes of aggregating the General Building Stock inventory. Once in the Repository, data sets can be moved into Hazus. There is no Append or Replace option for GBS – all Blocks and Tracts represented in the source data will be replaced.

Since the data sets did not originate from Hazus, many of the category types will not match. You will match the assessor values to the Hazus values. If you can't find an exact match, use the default or closest value. CDMS will validate the new GBS records before allowing the new data set to be added to the CDMS Repository.

HINT: This is a good time to back-up your existing Salt Lake County GBS.

Start CDMS. From the CDMS Home menu click the Import into CDMS Repository from File button.

Click the Browse button and navigate to the C:\E0317_ActivityData\Activity5_3 folder.

Select Microsoft Access/Geodatabase File (*.mdb) from the Files of Type dropdown menu.

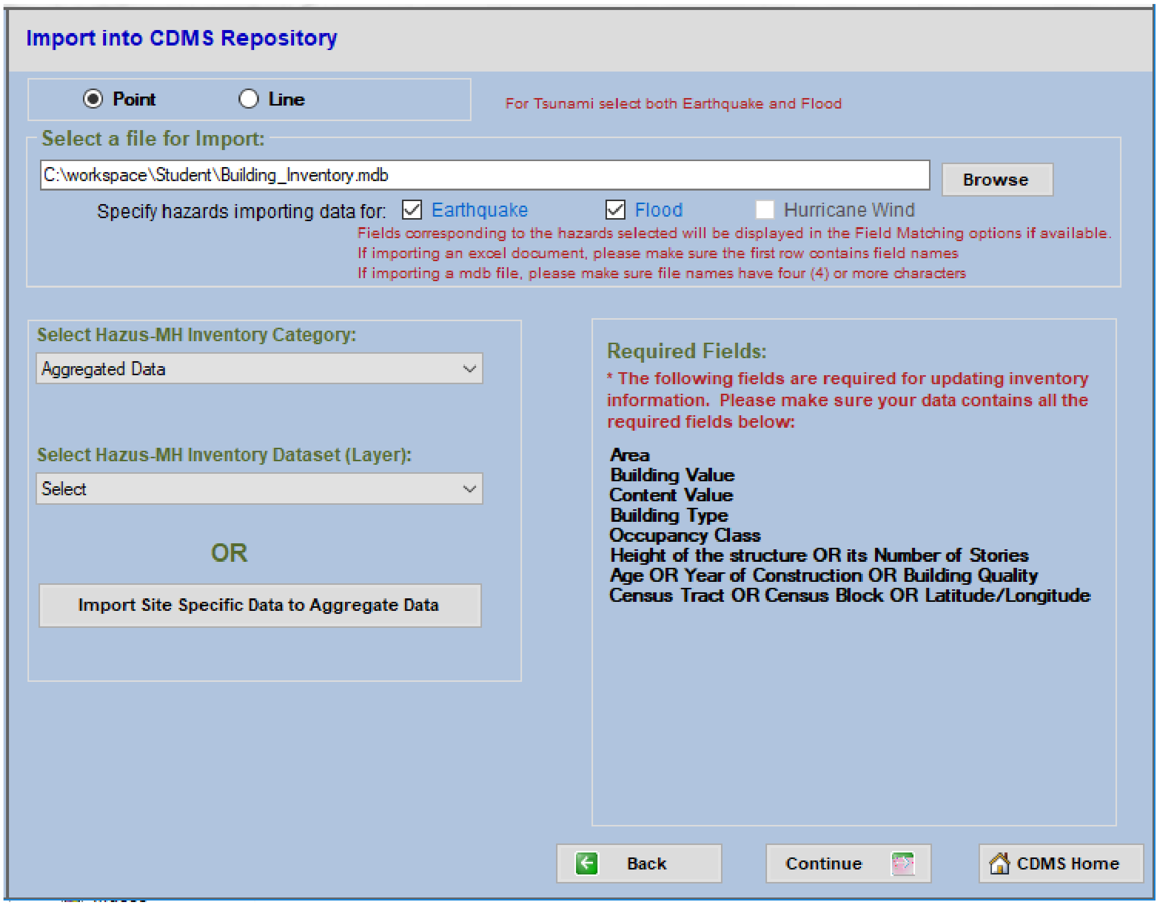
Select the Salt_Lake_Building_Inventory database and click Open.

Uncheck the boxes next to Earthquake, Flood and Hurricane.

Our data does not contain the hazard information needed to update the hazard specific GBS Mapping Schemes.

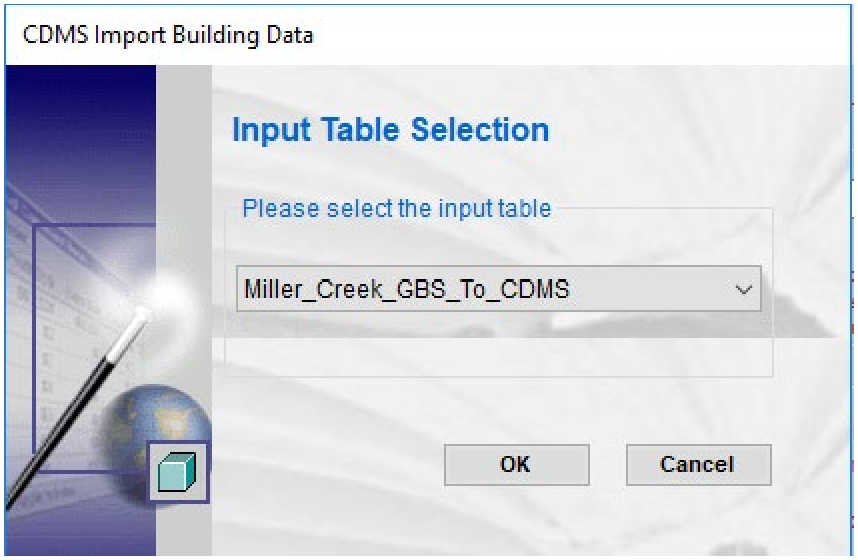
Select Aggregated Data as the Hazus Inventory Category.

Click the Import Site Specific Data to Aggregate Data button.



A box will pop open stating that all existing Aggregate Layers in the CDMS Repository will be replaced. Click Yes to continue.

Select the Miller_Creek_GBS_To_CDMS as the input table and click OK.

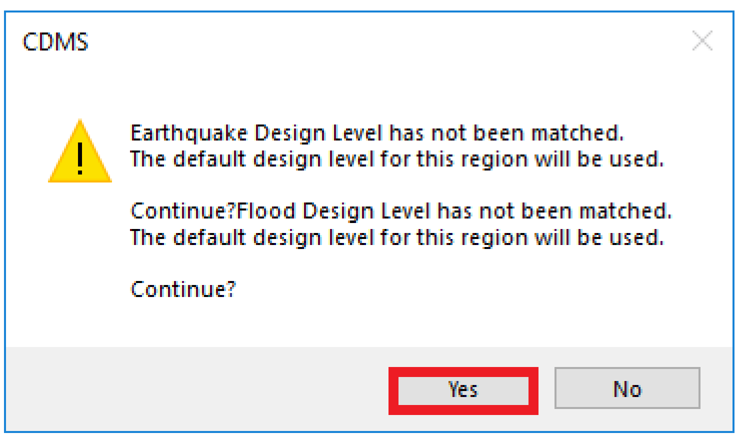


Click the Load button to load a field matching file. *A field matching file has been prepared to save you time.*

Navigate to the C:\E0317_ActivityData\Activity5_3 folder and select the GBS_Points.fmp file.

Click the Open button to apply the file.

A window with appear that Earthquake Design Level and Flood Design Level havent been matched, default value for the region will be used. Click Yes to accept.



Let’s review the field matching that has just occurred.

1. It is sometimes difficult to determine the common fields between source and target, especially when the source data does not originate from Hazus (e.g. Use_Code will be used to determine Occupancy).

2. Not all fields are matched. Several fields provided in the Assessor's data are not needed. Similarly, several fields that Hazus could use were not available.

3. All fields marked in red in CDMS must be matched.

4. There are a number of fields listed on the Destination side that are not needed for aggregation. Examples include Address and Zip Code. These fields can be ignored.

5. Notice that the Latitude and Longitude fields are in purple. They are not needed in this scenario because we are providing the Block and Tract values.

6. Be aware of the units. Are cost values in $1s, or $1,000s? Is area in sq. feet or 1,000s of sq. feet?

7. Make sure that matched fields have valid values (e.g. Year Built). Use defaults if needed or populate them based upon "nearest neighbor".

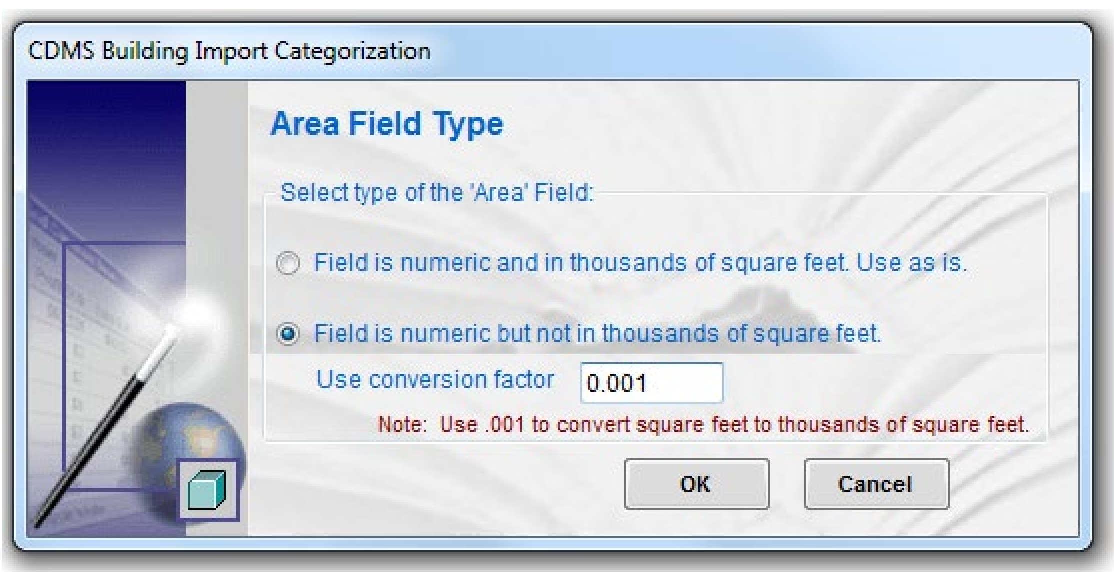
Click the Continue button. *Repair any validation errors that may be generated and re-try.*

A Categorize Fields box will open stating which fields need categorization. Click OK.

Select the radio button next to Field is numeric but not in thousands of square feet from the Area Field Type categorization menu.

Building area must be in 1,000's of square feet.

Type 0.001 in the Use conversion factor box. Click OK to continue.



The Building Value and Content Value fields also need to be set in thousands of dollars. Use the conversion factor 0.001 for these fields and click OK when you are done.

Select the Field is numeric. Use as is. radio button from the Number Of Stories categorization menu. Click OK.

Categorize the Building Quality source values to the allowed destination values. Click Continue.

High = S (Superior): Medium = C (Code)

Click the Continue button to accept default values in EQ Building Type and EQ Design Level.

For FL Design Level window, select Null for Field Value and 0 (Unknow) for Destination value.

Categorize the Occupancy Class source values to the allowed destination values. Click Continue.

Source	Destination	Description
COM	COM	Commercial Unknown
GOV	GOV	Government Unknown
IND	IND	Industrial Unknown
SFR	RES1	Single Family Dwelling
DUP	RES3A	Duplex
MH	RES2	Manufactured Homes
TWH	RES1	Single Family Dwelling
VCR	RES1	Single Family Dwelling

Use System defaults for General Building Type Mapping Schemes, then click Submit.

Task 7: Transfer General Building Stock from CDMS Repository to Hazus

The updated buildings have passed CDMS validation and are now residing in the CDMS Repository as aggregated data. They are valid Hazus records, but not yet in Hazus.

From the CDMS Repository window click the View/Edit button to the left of the Aggregated Data row to view the data.

This is your last opportunity to check your work before transferring it to Hazus.

View all of the tables by selecting each table from the Select a table to display the data dropdown menu.

CDMS has aggregated the 359 buildings into 1 Tracts and 13 Blocks.

Click the Close button to close the CDMS Detail Information window.

Click the Transfer to Statewide Dataset button.

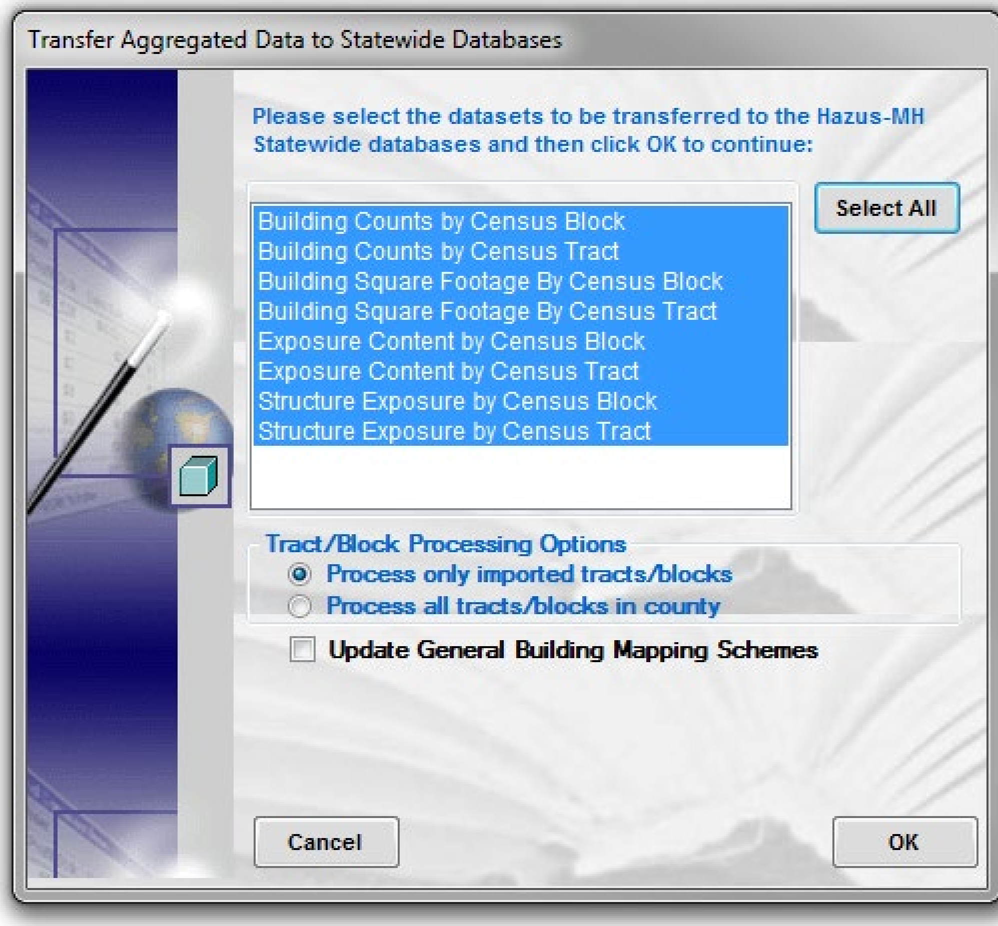
Click Yes to confirm the transfer to statewide dataset.

Click the Select All button to select all of the tables to transfer to statewide database.

Make sure the option to Process only imported tracts/blocks is selected.

You are importing one tract worth of buildings within Miller Creek. If you process all tracts/blocks in the county, all tracts for Salt Lake County for which you have no data will be set to ‘0’.

The source records do not contain sufficient information to update the General Building Mapping Schemes.



Click OK to close the Transfer Aggregated Data to Statewide Databases dialog box.

Select the option to Replace all occupancies for this statewide transfer. Click Continue.

You are not asked whether to Replace or Append the data – GBS is always Replace. The source data includes all occupancy classes. The Append option could be used if we just had RES1 data.

Task 8: Review the Updated General Building Stock

Review the updated Hazus GBS records using CDMS.

Exit CDMS.

Conclusions

The relevant lessons from Activity 5.3 include the following:

1. To calculate the Tract and Block values for Assessor records, there must be a way to determine the spatial locations of records. This activity shows one possible workflow, but it requires Parcel data. In the absence of Parcel data, there are also possible solutions based upon the following scenarios:

a) Linking to E911 address points

b) Linking to building footprints

c) Geocoding the Assessor addresses to street centerlines

2. Points used for aggregation must be within a Census Block.

3. Always be aware of the geographic extents of the source data, especially when working with clipped data sets.

4. Be cautious about <Null> values. Queries based upon math functions will fail on empty fields.

5. All fields marked in red in CDMS must be matched.

6. There are a number of fields listed on the Destination side that are not needed for aggregation. These fields can be ignored.

7. GBS transfers from the Repository to Hazus always Replace.

8. In Activity 5.3, the GBS Points were used to update the General Building Stock. However, the GBS Points can be used as individual buildings – no aggregation needed. For example, buildings at risk to flooding may be imported as User Defined Facilities into a Study Region.

Activity 7.1 - Updating a Study Region from Hazus Inventory

Type: Student Activity

Time: 40 minutes

Background

Editing the inventory within a Study Region is cumbersome. One or two updates are OK, but the tools are not really intended to be used to maintain data.

Fortunately, CDMS provides the ability to download feature classes from the Hazus statewide tables into an existing Study Region. This means that edits can be done in ArcGIS, imported into CDMS and then downloaded to the Study Region as needed. CDMS overcomes some of the limitations of editing data within a Study Region.

Fire Stations cannot be imported the way we did for Schools in Activity 5.2 because:

1. Updates were provided by Salt Lake Fire Department as XLS. Hazus import tools only support MDB.
2. The records do not contain Hazus data. The Hazus import tools will not re-characterize the values like CDMS.

Activity 7.1 provides a way to update the Fire Station inventory from Hazus without having to recreate the Study Region. A new Study Region would negate the changes made to the Fire Stations in this study region.

CDMS provides tools for maintaining the inventory between Study Regions and Hazus:

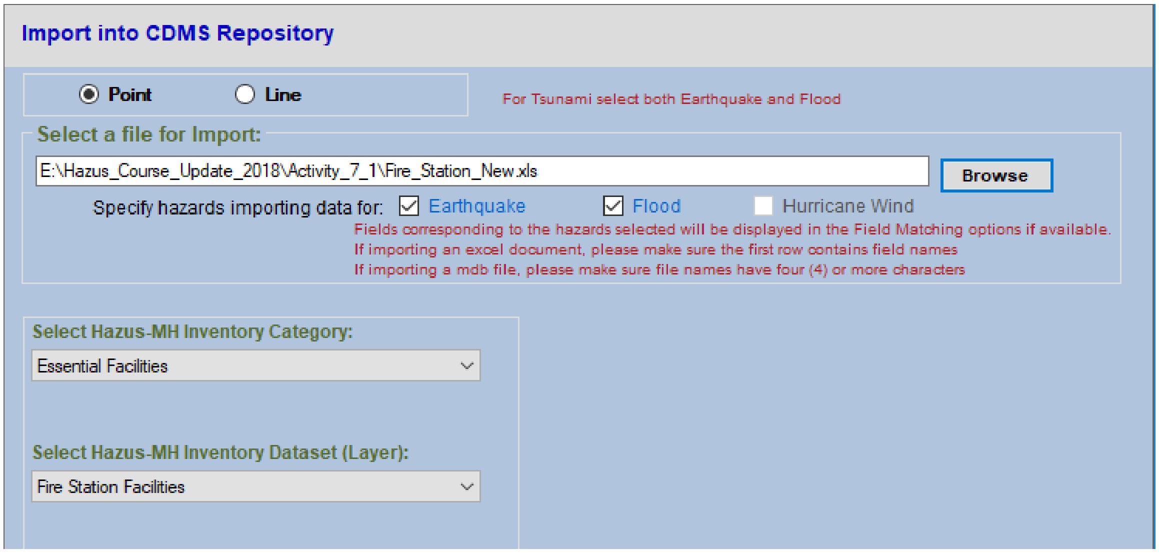
- Update a Study Region from Hazus inventory (Activity 7.1).
- Update the Hazus inventory from a Study Region (Activity 7.2).

Task 1: Update CDMS with new Fire Station data

Open CDMS, then click Import into CDMS Repository from File.

Select Browse and go to C:\E0317_ActivityData\Activity7_1.

Select Microsoft Excel File (.xls) if needed and select Fire_Station_New.xls.



In CDMS, select Essential Facilities as the Inventory Category and Fire Station Facilities for the Inventory Dataset.

Click Continue.

Select Fire Stations HZ as the Import Table, No HAZUS ID and Latitude and Longitude. Click Continue.

Field Matching, if needed:

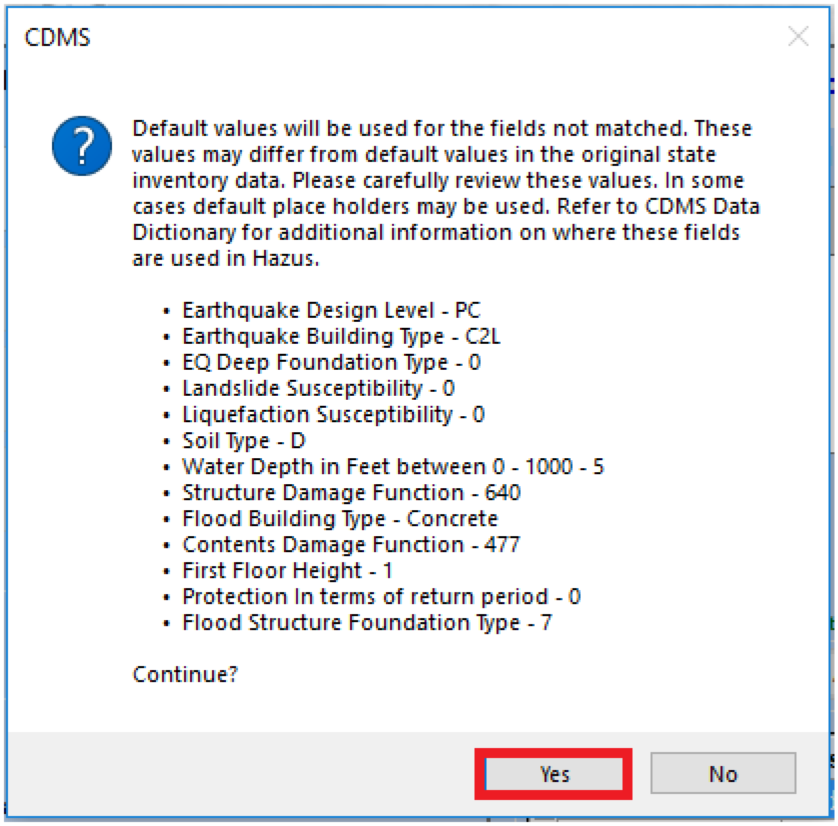
BuildingRe -> Building Replacement Costs (thous. $)

Use_Code -> Facility Class

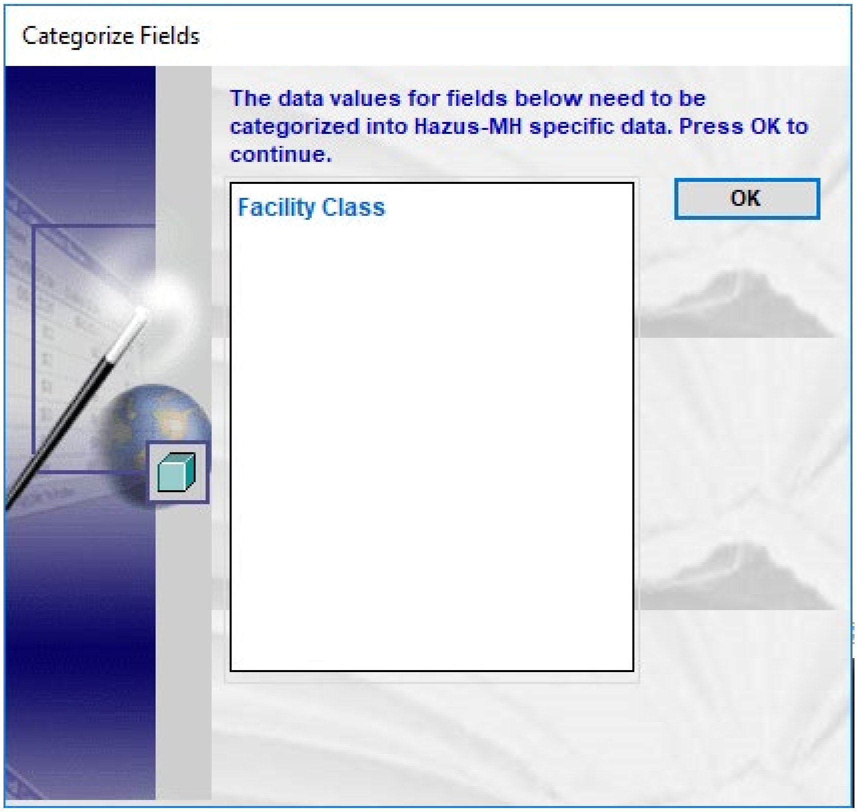
CensusTrac -> Census Tract

PhoneNumbe -> Telephone Number

ZIP_Code -> ZIP Code



Click Continue. Click Yes to accept the Default values.



Click OK to accept continue categorize fields.

Click Continue for Facilities Class.

Click OK after the data has finished importing.

Click Transfer to Statewide Dataset and keep the selection to Append / Update Data.

Click Yes to confirm the transfer.

The state database has now been updated.

Task 2: Import and Open a New Study Region

Start Hazus and select Import a Region.

Browse to C:\E0317_ActivityData\Activity7_1 and locate the HPR file named UT_SaltLake_Act7_1.hpr

An Earthquake HPR called UT_SaltLake_Act7_1 has been created from the default Hazus state tables.

Use the following name and description:

Name: Activity7_1
Description: Activity 7_1 Study Region Edits

Hint: You cannot re-use Study Region names and you cannot name the Study Region the same as the HPR. Use a different name if the import fails.

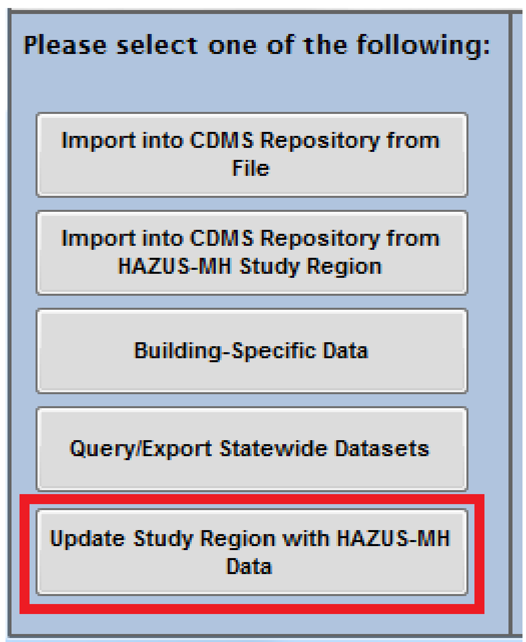
Once imported, open the study region.

Task 3: Download Updated Fire Stations from Hazus Using CDMS

The current Fire Station records in the study region are old. The Fire Stations were updated by Utah Department of Public Safety, but they are not reflected in this Study Region.

Let's use CDMS to replace the Fire Stations in our Study Region from the updated inventory in Hazus.

Open CDMS. Select Update Study Region with Hazus Data from the CDMS Home page.



Select Activity7_1 from the Select a Study Region dropdown.

Select Essential Facilities from the Select a Study Region Inventory Category dropdown.

Select Fire Stations from the Select Study Region Inventory Dataset panel.

Click the down arrow icon to add Fire Stations from the Select Study Region Inventory Dataset panel to the Selected Study Region Datasets pane.

Click Continue.

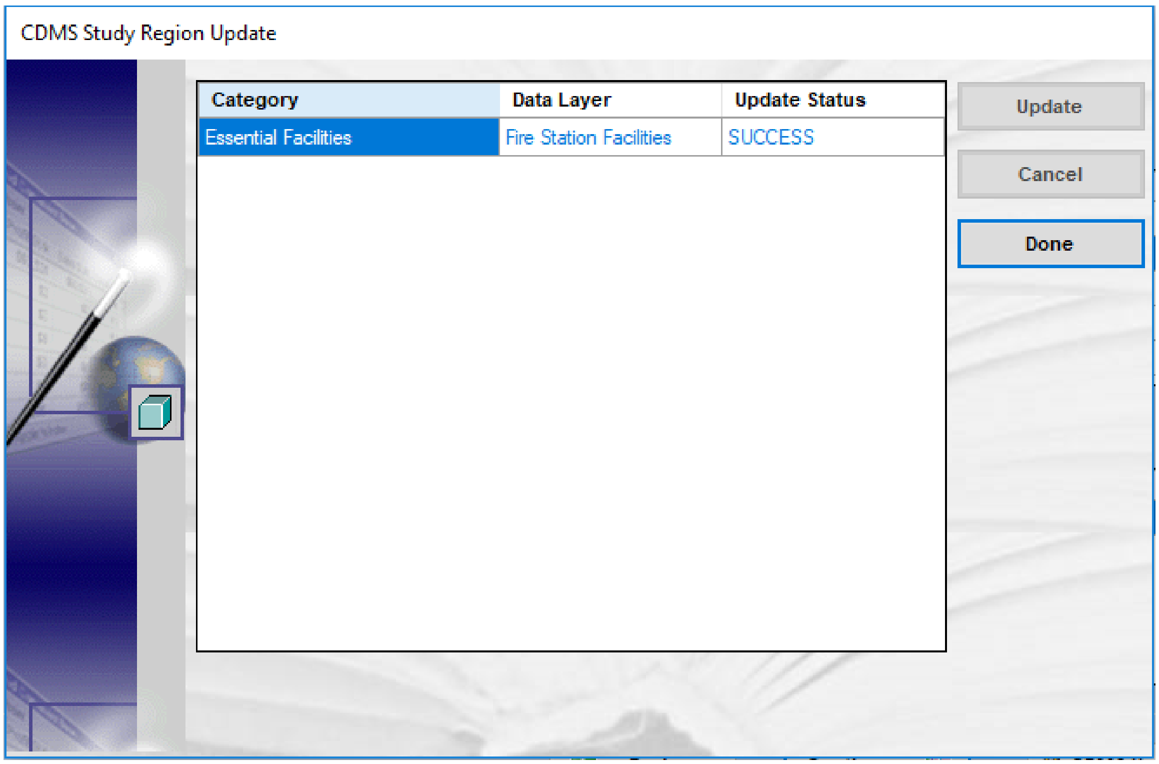
Click OK on the CDMS pop-up to confirm that you have made a backup of the Study Region.

A backup has already been made for you. See the instructor if you need it.

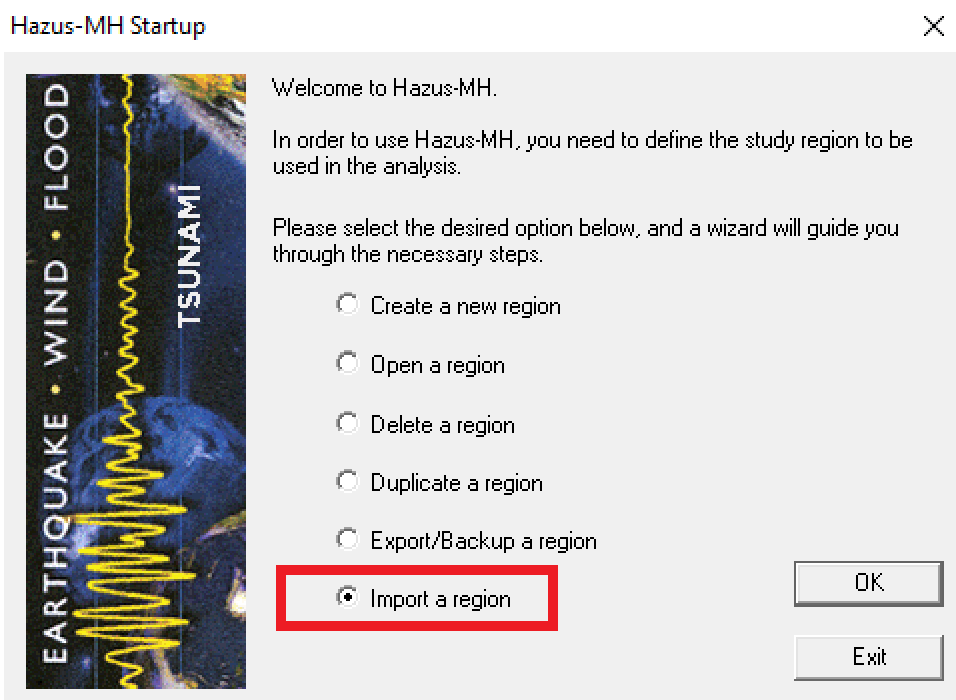
Click Update from the CDMS Study Region Update dialog box.

Click Done from the CDMS Study Region Update dialog box after the process has successfully completed.

The Update Status will be set to SUCCESS at the end of the data transfer.

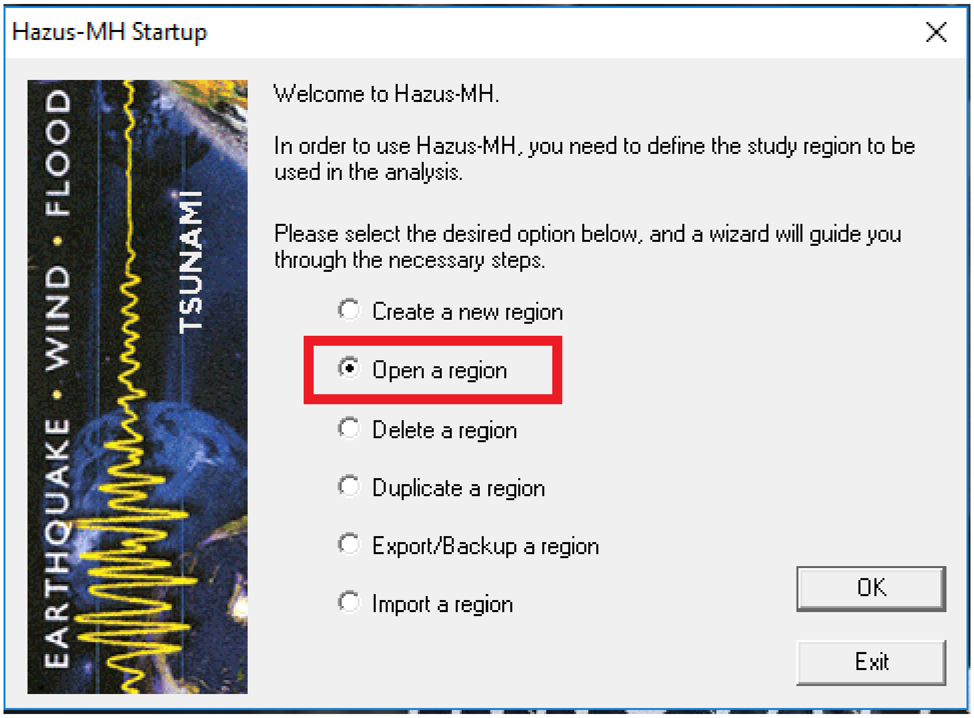


Use Hazus to import the Study Region named Activity7_1.



Navigate to Activity7_1.hpr to open for Hazus to import.

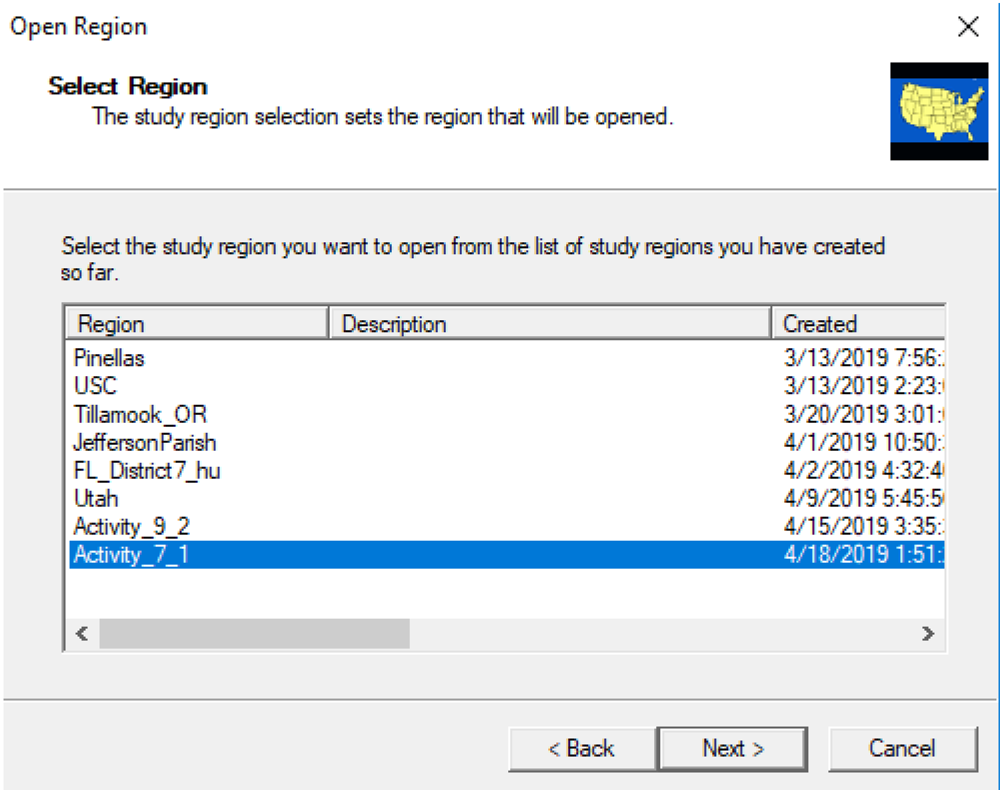
After Hazus has successfully import the hpr, Select Open a region in the startup window.



Click OK button.

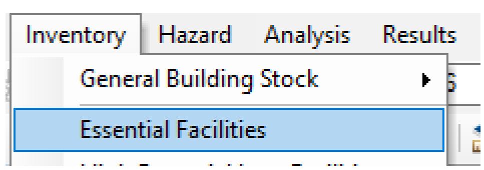
Click Next button to continue with the Open Region Wizard.

Highlight Activity_7_1 to continue.



Click Finish button to open the region.

To open Fire Stations, navigate to on the top menu Inventory-> Essential Facilities



Click on the **Emergency Response** tab, table type **Fire Station**.

Table type: Fire Stations

Table

	ID Number	Class	Tract	Name	
1	UT000002	EFFS	49035111500	South Salt Lake City Fire Department	2600 S Main ST
2	UT000003	EFFS	49035111600	Salt Lake County Fire Department	3380 S 900 W
3	UT000004	EFFS	49035112100	Murray City Fire Department	40 E 4800 S
4	UT000005	EFFS	49035112501	Midvale City Fire Department	607 E 7200 S
5	UT000006	EFFS	49035112700	Sandy City Fire Dept	9010 S 150 E
6	UT000007	EFFS	49035102100	Salt Lake City Fire Department	315 E 200 South
7	UT000010	EFFS	49035114300	W.Jordan F.D.	7602 S JORDAN LANDING BL
8	UT000027	EFFS	49035113011	South Jordan City Fire Department	10758 S Redwood RD
9	UT000028	EFFS	49035113310	West Valley City Fire Department	3600 S Constituion BLVD
10	UT000058	EFFS	49035112810	Bluffdale City Fire Dept	14175 S Redwood RD
11	UT000065	EFFS	49035980000	151 CES/CEF Utah Air National Guard Fire	765 N 2200 W ST
12	UT000187	EFFS	49035113907	Alliant Techsystem Fire Department	5000 S 8400 W
13	UT000189	EFFS	49035111500	South Salt Lake City Fire Department	2600 S Main ST
14	UT000190	EFFS	49035111600	Salt Lake County Fire Department	3380 S 900 W
15	UT000191	EFFS	49035112100	Murray City Fire Department	40 E 4800 S
16	UT000192	EFFS	49035112501	Midvale City Fire Department	607 E 7200 S
17	UT000193	EFFS	49035112700	Sandy City Fire Dept	9010 S 150 E
18	UT000194	EFFS	49035102100	Salt Lake City Fire Department	315 E 200 South
19	UT000195	EFFS	49035114300	W.Jordan F.D.	7602 S JORDAN LANDING BL
20	UT000196	EFFS	49035113011	South Jordan City Fire Department	10758 S Redwood RD
21	UT000197	EFFS	49035113310	West Valley City Fire Department	3600 S Constituion BLVD
22	UT000198	EFFS	49035112810	Bluffdale City Fire Dept	14175 S Redwood RD
23	UT000199	EFFS	49035980000	151 CES/CEF Utah Air National Guard Fire	765 N 2200 W ST
24	UT000200	EFFS	49035113907	Alliant Techsystem Fire Department	5000 S 8400 W

Open the Fire Station records to answer the following questions. Exit Hazus when you are done.

Questions	Answers
1. How many Fire Stations in the default database for Salt Lake County? *Hint: Import "Ut_SaltLake Act7_1.hpr" in Hazus-MH Startup.*	
2. How many Fire Stations in the updated Salt Lake County?	
3. When was the most recent Fire Station built in the updated Salt Lake County database?	

Conclusions

The relevant lessons from Activity 7.1 include the following:

1. The Fire Stations downloaded to a Study Region were replaced. There was no need to delete the Fire Station records from the Study Region first. 57 new records were added.
2. Sometimes CDMS will issue “Failed - GIS Error #3” errors in the Update Status box. This is an unknown error.

Activity 7.2 - Updating Hazus Inventory from a Study Region

Type: Student Activity

Time: 20 minutes

Background

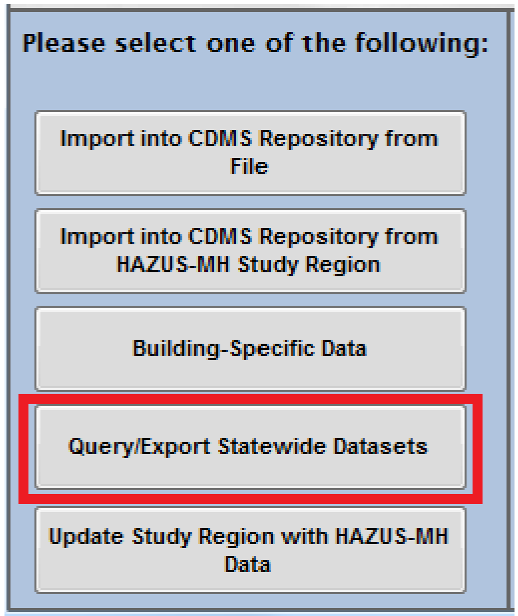
In Activity 7.1, fire stations were updated from the data provided by the State of Utah using CDMS for the study region. For this activity, fire station will be reset back to the original default prior to Activity 7.1. In a real-life scenario, this method provides a quick alternative for user to update data in a Study Region using hpr files.

Task 1: Open CDMS and Delete Salt Lake County Fire Stations

Before uploading the original Hazus fire stations from the Activity7_2 Study Region, we will export and delete the current Salt Lake County fire station records from the Hazus statewide tables.

Open CDMS.

Click the Query/Export Statewide Datasets button.

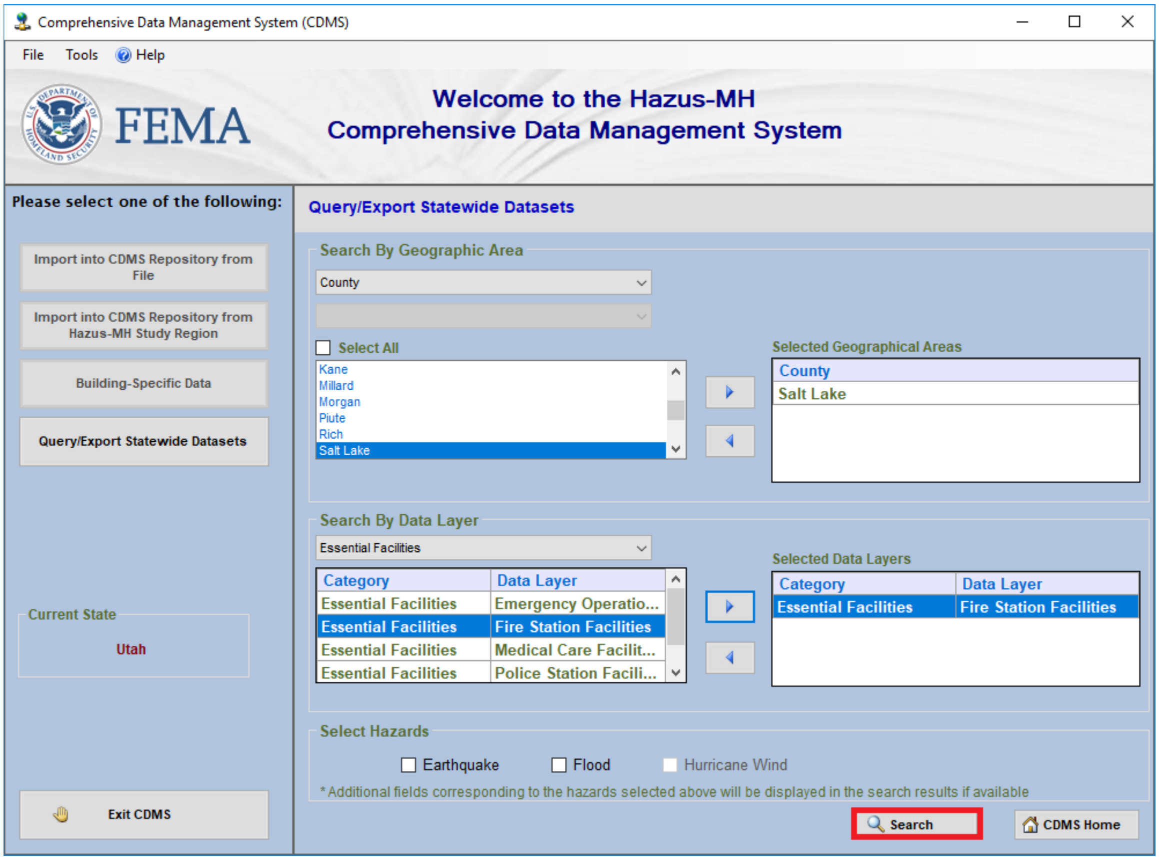


Select County from the Search By Geographic Area dropdown.

Select Salt Lake from the Search By Geographic Area panel. Click the right arrow icon to add Salt Lake County to the Selected Geographical Areas panel.

Select Essential Facilities from the Search By Data Layer dropdown.

Select Fire Station from the Search By Data Layer panel. Click the right arrow icon to add Fire Station to the Selected Data Layers panel.



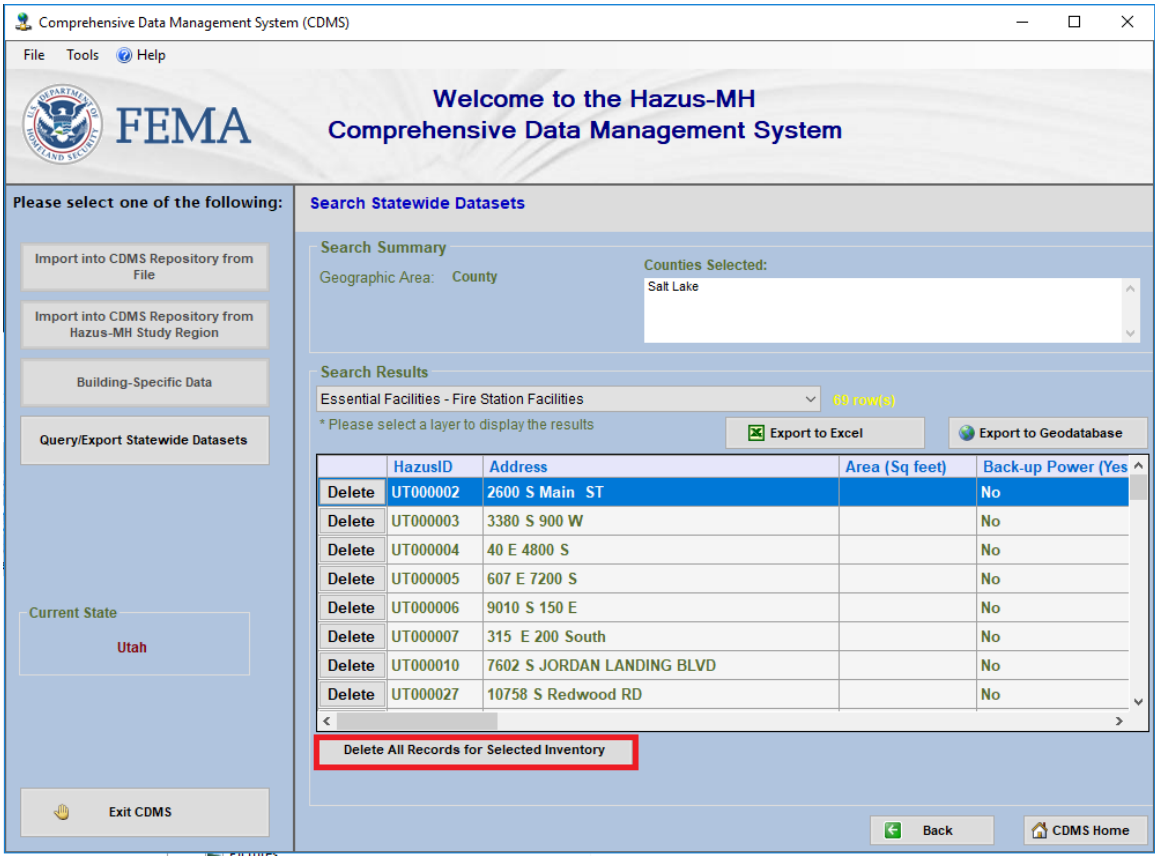
Click Search.

Click Export to Geodatabase button to export data before the activity.

Navigate to Activity 7.2 folder, named the output database *SaltLakeCo_Fire_Station_Before.mdb*.

Click Delete All Records For Selected Inventory from the Search Statewide Datasets window.

Salt Lake County Fire Stations are deleted from Hazus. New records will be imported from the Study Region. We don't want duplicate records.



Click Yes to close the Confirm Record Removal dialog box.

Click the CDMS Home button to close the Search Statewide Datasets window.

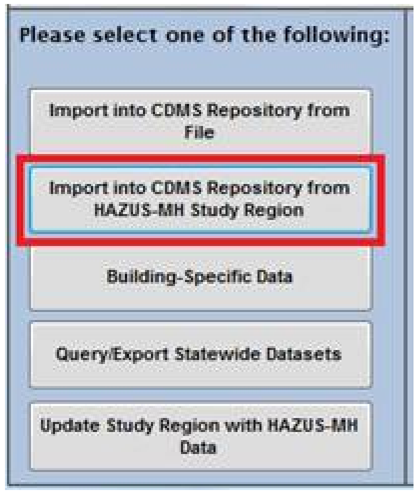
Task 2: Upload the Fire Stations from the Study Region

The fire station records in Salt Lake County were inaccurate, and they have now been deleted from the Hazus statewide inventory. The hpr file used in this exercise contains the original data exported before the update was made in Activity 7.1.

Using Hazus, import the Activity7_2.hpr file located at C:/E0317_ActivityData/Activity7_2.

In CDMS, click the Import into CDMS Repository from Hazus Study Region button.

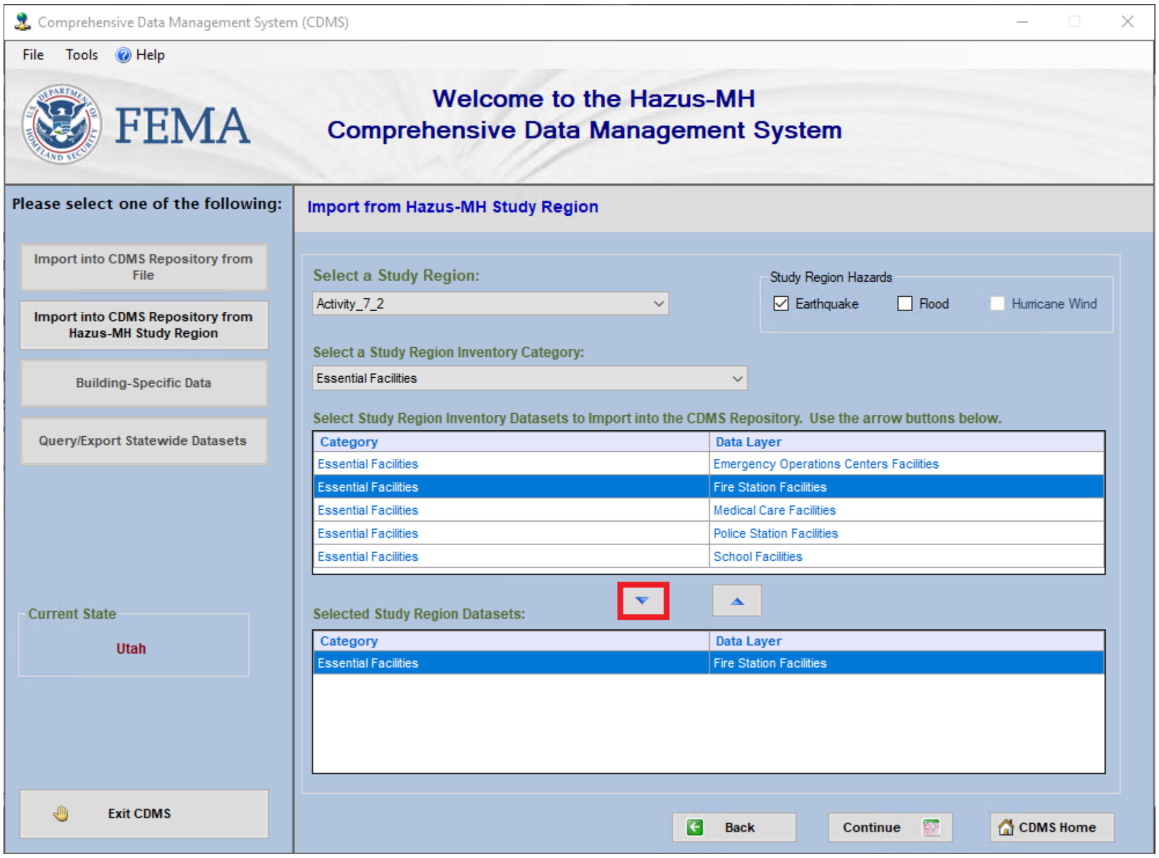
Imports will only work from a Study Region created in Hazus 4.2. If you have an older Study Region, upgrade it by importing it into Hazus first.



Select Activity7_2 from the Select a Study Region dropdown.

Select Essential Facilities as the Study Region Inventory Category.

Click on the Fire Station dataset and then click the down arrow to add it to the Selected Study Region Datasets.

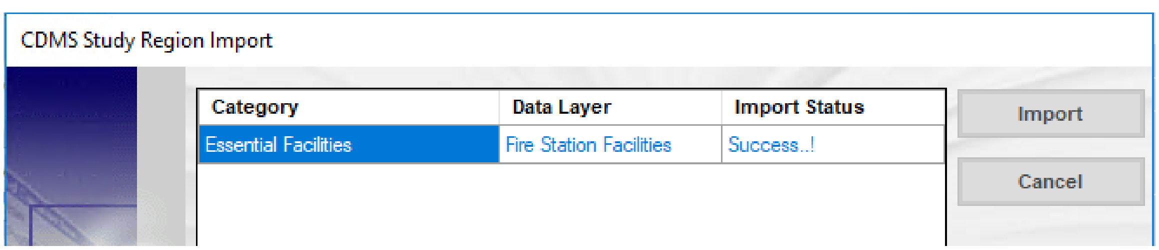


Click the Continue button.

Click the Import button on the CDMS Study Region Import window.

When the process has completed, the Import Status will say ‘Success..!’

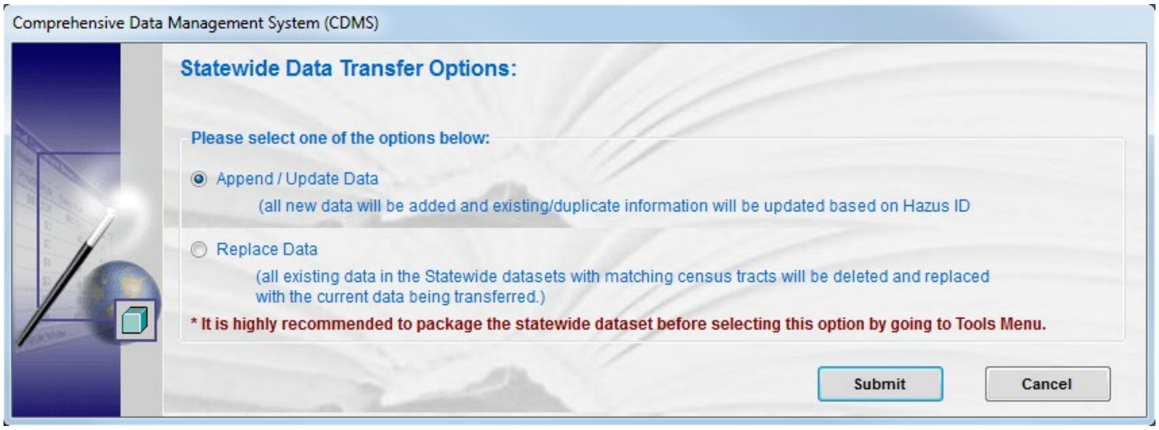
Click the Done button on the CDMS Study Region Import window.



Click on the Transfer to Statewide Dataset button to transfer the Fire Station from the CDMS Repository to the Hazus state databases.

The newly imported facilities are now listed in the CDMS Repository.

Select the Append option from the Statewide Data Transfer Options window. Click Submit.



Click Yes to Confirm Transfer to Statewide Datasets.

Click OK to confirm Statewide Data Transfer Complete.

After transfer is completed, export the modified fire station data to the Activity 7.2 folder and named the database *"SaltLakeCo_Fire_Station_After.mdb."*

Compare data before and after the update and answer the questions below.

Questions	Answers
1. How many Salt Lake County Fire Stations are in the exported database prior to the update?	
2. How many Salt Lake County Fire Stations are in the updated table?	