NATIONAL HURRICANE PROGRAM

Delmarva Hurricane Evacuation Study
Transportation Tools Workshop

Training Guide

Version 1.0

May 2010

FEMA

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Purpose

This course provides training on and resources for personnel who require a basic understanding of the Delmarva Hurricane Evacuation Study (HES), Abbreviated Transportation Model (ATM) and how the ATM relates to HURREVAC.

Who Should Attend

This course introduces the Delmarva ATM and provides training on its use and integration into HURREVAC. The course describes the HES process, the development of the ATM, its features and uses and how its results may be used to support evacuation planning. It also demonstrates how model results can be integrated into HURREVAC.

The target audience includes federal, state and local officials involved in hurricane evacuation planning and response activities in the Delmarva region.

Course Objectives

The course objective is to enable participants to demonstrate a basic understanding of the use of the Delmarva ATM and how its results may be used in HURREVAC. Upon completion, course participants should be able to train other users in the use of the ATM.

Training Content

The 6 hour training workshop is comprised of the following lessons:

- Unit 1: Course Overview
- Unit 2: Hurricane Evacuation Study Process
- Unit 3: Basic Features of the Delmarva ATM
- Unit 4: Data Entry Modules — Demonstration I
- Unit 5: Data Results Modules — Demonstration II
- Unit 6: Consequence Management Module — Exercise I
- Unit 7: HURREVAC Integration — Exercise II
- Unit 8: Course Summary

The table below presents the recommended training agenda.

Morning Session 9:00 – 12:00	Unit 1: Course Overview	30 minutes
	Unit 2: Hurricane Evacuation Study Process	45 Minutes
	Unit 3: Basic Features of the Delmarva ATM	45 Minutes
	Unit 4: Data Entry Modules Demonstration I	1 Hour
Afternoon Session 1:00 – 4:00	Unit 5: Data Results Modules Demonstration II	1 Hour
	Unit 6: Consequence Management Module Exercise I	45 Minutes
	Unit 7: HURREVAC Integration Exercise II	45 Minutes
	Unit 8: Course Summary Evaluation Procedures	30 Minutes

Course Materials

Listed below are the materials that you will need in order to conduct this course:

Training Guide: Obtain one copy of the Training Guide for each participant.

PowerPoint Files: Course visuals are presented in PowerPoint format. The presentation materials follow and support the Training Guide.

Delmarva HES ATM: A copy of the Delmarva HES ATM is needed in order to demonstrate its use and to support the training exercises. All participants should make a copy of the Delmarva HES ATM file on their hard drives for use in the training session

HURREVAC: Access to HURREVAC is needed to demonstrate how the outputs from the ATM may be integrated into HURREVAC and to allow participants to undertake an exercise with HURREVAC.

Course Evaluation Forms: The course will be evaluated utilizing a web-based evaluation tool or traditional methods. Participants will be instructed on how to complete the evaluation.

Course Equipment

Computer and Projection Devise: Arrangements need to be made to ensure that the instructors have a computer that can run PowerPoint, the Delmarva HES ATM and HURREVAC.

Workstations: All participants should have access to a personal computer with the ATM and HURREVAC installed in order to work through the training program's demonstrations and exercises.

The following glossary of terms has been compiled. It references many of the terms used in this training workshop as well as other terms related to evacuation planning.

A

Alluvial Soils: Fine-grained sediment, especially of mud or clay particles at the bottom of a river or lake.

ARC: American Red Cross

ASOS: Automated Surface Observing System (NWS & FAA)

ATM: Abbreviated Transportation Model

Average Error Affected List: Lists those counties and/or parishes affected by the currently displayed Average Error Swath. These are the areas that the storm center could cross, given the average forecast error.

Average Error Swath: Represents where the storm could actually end up during the 72 hour forecast period, and is an important consideration when attempting to assess the risk to an area. Technically, according to NHC, there is approximately 60% confidence that the storm will track within the swath.

B

Bathymetry: The measurement of the depth of large bodies of water, for example, lakes, oceans, and seas.

Behavioral Analysis: Determines the expected response of the population threatened by various hurricane events in terms of the percentage expected to evacuate, probable destinations of evacuees, public shelter use, and utilization of available vehicles.

C

CD: Compact Disk

CHART: Coordinated Highways Action Response Team

Clearance Time: The time required to clear the roadways of all evacuating vehicles. It is expressed in hours before the arrival of sustained 34-knot winds, necessary for an evacuation. Clearance times are based on five variables: 1) hurricane category; 2) expected evacuee response; 3) tourist occupancy situation (where applicable); 4) background traffic; and 5) traffic control measures.

CMM: Consequence Management Module. An Excel spreadsheet-based application that interfaces with the ATM and is used for estimating clearance times.

CPHC: Central Pacific Hurricane Center

Critical Facilities: Facilities that may need assistance of special consideration and planning if they are to be evacuated.

CVI: Coastal Vulnerability Index

D

DAE: Disaster Assistance Employee (FEMA)

Decision Arc Method: Assists officials in making evacuation decisions prior to the time at which the radius of sustained 34-knot winds touches the appropriate Decision Arc (Decision Point). For example, with a clearance time of 15 hours, and a hurricane forward speed of 10 knots, the evacuation should be initiated before the sustained 34-knot winds get within 150 nautical miles (15 hours x 10 knots = 150 nautical miles) of the area being evacuated.

Decision Arcs: Clearance times converted to distance by accounting for the forward speed of the hurricane.

DEM: Digital Elevation Model

DHS: Department of Homeland Security

E

EOC: Emergency Operations Center

Evacuation: People leaving their residence to go from a perceived dangerous place to a perceived safer place.

Evacuation Timing: Appropriate start and end times of an evacuation based on storm and traffic conditions.

Evacuation Zone: Designated by local officials and based on the surge inundation maps used in the transportation model. Surge inundation areas are divided up into zones for modeling purposes and evacuation notice dissemination.

F

Fathom: A unit of length equal to 1.83 m (6 ft), used mainly in nautical contexts for measuring the depth of water.

FEMA: Federal Emergency Management Agency

FHWA: Federal Highway Administration

FIRM: Flood Insurance Rate Map

G

Geology: The study of the structure of the Earth or another planet, in particular its rocks, soil, and minerals, and its history and origins.

GIS: Geographic Information Systems

GOES: Geostationary Operational Environmental Satellite

H

HAR: Highway Advisory Radio

Hazards Analysis: Determines the timing and magnitude of wind and storm surge hazards that can be expected from hurricanes of various categories, tracks, and forward speeds.

HAZUS: Hazards United States (Software Program)

HES: Hurricane Evacuation Study

HESE: Hurricane Evacuation Shelter Evaluation

HLT: Hurricane Liaison Team

HURREVAC/HURREVAC 2000: HURRicane EVACuation Tracking and Analysis Software

I

ICCOH: Intergovernmental Coordination Committee on Hurricanes

IFLOWS: Integrated Flood Observing and Warning System

Inland Wind Model: Applies a simple two parameter decay equation to the hurricane wind field at landfall to estimate the maximum sustained surface wind as a storm moves inland. This model can be used for operational forecasting of the maximum winds of land falling tropical cyclones. It can also be used to estimate the maximum inland penetration of hurricane force winds (or any wind threshold) for a given initial storm intensity and forward storm motion.

ITS: Intelligent Transportation Systems

J

K

L

LIDAR: Light Detection And Ranging technology used for determining land elevation.

Loam Soils: According to the proportions of sand, silt, and clay, soils are broadly classified into several arbitrarily defined textural groups. The texture of a soil greatly affects its productivity. Soils with a high percentage of sand are usually incapable of storing sufficient water to provide the best plant growth and lose large amounts of plant-nutrient minerals by leaching to the subsoil. Soils containing a larger percentage of finer particles, for example, the clays and loams are excellent reservoirs for water and contain readily available mineral materials.

M

MEOW: Maximum Envelope of Water; stores the maximum water surface elevation in each SLOSH grid cell for all the hurricane tracks in one direction for a particular forward speed, and storm intensity.

MEOW Affected List: Lists those counties and/or parishes affected by the currently displayed Decay Model MEOW. These lists are typically long, since this is a hypothetical list for all those sufficiently close to the coast to be affected, no matter where the storm strikes.

MH: Mobile/Manufactured Home

Meteorology: The scientific study of the Earth's atmosphere, especially its patterns of climate and weather.

MLW: Mean Low Water

MLLW: Mean Low Low Water

MOMs: Maximums of Maximums; represents the maximum water surface elevation for each SLOSH grid cell regardless of approach direction, forward speed or track.

N

NAD: North American Datum

NAVD: North American Vertical Datum

NAWAS: National Warning System

NFIP: National Flood Insurance Program

NGVD: National Geodetic Vertical Datum

NHC: National Hurricane Center

NHMPP: National Hurricane Mitigation and Preparedness Program

DELMARVADOT: Delmarva Department of Transportation

DELMARVAOEM: Delmarva Office of Emergency Management

DELMARVASP: Delmarva State Police

NOAA: National Oceanographic and Atmospheric Administration

NHP: National Hurricane Program

NOS: National Oceanographic Service

NWS: National Weather Service

O

Overlay Mode: Allows the user to show several advisories for the same storm on the screen at once.

P

PBS&J: Post, Buckley, Schuh and Jernigan

PIO: Public Information Officer

PSN: People with Special Needs

Pre-landfall Hazard Distance: The distance from the radius of tropical storm winds of an approaching hurricane to each jurisdiction.

Public Shelter Demand: The number of evacuees expected to seek public shelter.

Q

R

RAWS: Remote Automated Weather Stations

RMW: Radius of Maximum Winds

ROC: Regional Operation Center

ROLR: Refuge of Last Resort

S

Saffir-Simpson Hurricane Scale: Scale developed to describe the potential storm surge generated by hurricanes:
Category 1. Winds of 74 to 95 miles per hour
Category 2. Winds of 96 to 110 miles per hour

Category 3. Winds of 111 to 130 miles per hour
Category 4. Winds of 131 to 155 miles per hour
Category 5. Winds greater than 155 miles per hour

SCO: State Coordinating Officer

Shelter Analysis: Presents an inventory of public shelter facilities, capacities of the shelters, vulnerability of shelters to storm surge flooding, and shelter demand for each county.

Shoals: An area of shallow water in a larger body of water.

SHP: State Highway Patrol

SLOSH Model: Acronym meaning Sea, Lake and Overland Surges (SLOSH) from hurricanes. SLOSH provides heights of storm surge for various combinations of hurricane strength, forward speed of storm, and direction of storm. SLOSH model is used for real-time forecasting of surges from approaching hurricanes within selected Gulf and Atlantic coastal basins.

SMA: Standard Metropolitan Area (from U.S. Census)

SOC: Statewide Operations Center

Storm Category: **Category 1**. Winds of 74 to 95 miles per hour
Category 2. Winds of 96 to 110 miles per hour
Category 3. Winds of 111 to 130 miles per hour
Category 4. Winds of 131 to 155 miles per hour
Category 5. Winds greater than 155 miles per hour

Storm Surge: The abnormal rise in water level caused by wind and pressure forces of a hurricane. Storm surge produces most of the flood damage and drowning associated with tropical systems - highest surges from a hurricane usually occur on the northeast quadrant of the storm's track.

T

TDR: Technical Data Report (part of Hurricane Evacuation Study)

TMC: Traffic Management Center

TPC: Tropical Prediction Center

Topography/Topographic Features: Features on the surface of land, including natural features such as mountains and rivers and constructed features such as highways and railroads.

Traffic Analysis Zone (TAZ): Small sub-areas of the evacuation zone used by the transportation model to determine how many vehicles will use each roadway.

Transportation Analysis: To determine the time required to evacuate the threatened population (clearance times) under a variety of hurricane situations and to evaluate traffic control measures that could improve the flow of evacuating traffic.

Tropical Cyclones: Defined by the National Weather Service as non-frontal, low-pressure synoptic scale (large-scale) systems that develop over tropical or subtropical waters and have a definite organized circulation.

Tropical depressions are < 33 knots (38 mph).
Tropical storms are 34 to 63 knots (39-73 mph).
Hurricanes are > 64 k Geographical areas affected by tropical cyclones are referred to as tropical cyclone basins knots (74 mph) Atlantic tropical cyclone basin is one of six in the world

and includes much of the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

Official Atlantic hurricane season begins on June 1 and extends through November 30 of each year.

TWC: The Weather Channel

U

USACE: United States Army Corps of Engineers

USGS: United States Geological Survey

UTC: Coordinated Universal Time (Greenwich Mean Time)

V

Vulnerability Analysis: Identifies those areas, populations, and facilities that are vulnerable to specific hazards under a variety of hurricane threats.

Vulnerable Population: Persons residing within the evacuation zones subject to storm surges, and the residents of mobile homes, which may be threatened by hurricane force winds.

W

Wave Setup: An increase in the mean water level on a beach due to the effects of waves running up the beach and breaking. Under some conditions the set-up can be large enough to contribute to local flooding and overtopping of sea defenses.

WFO: Weather Forecast Office

Wind Swath: A display of the NHC or CPHC projected swath of winds for the current advisory you have displayed. The colors follow the pattern for winds elsewhere in the program: blue for 34 knot (40 mph) or greater, yellow for 50 knot (58 mph) or greater, and red for 64 knot (74 mph) or greater. Note that there is no further distinction of winds beyond 64 knots since the NHC or CPHC does not project but the 3 wind groups noted above in their advisory.

X

Y

Z

Unit 1: Course Overview

Objectives

At the end of this unit, the participants should be able to describe the purpose of this course.

Scope

- Unit Introduction
- Course Objectives
- Student Introductions
- Expectations: Student and Instructor
- Course Structure
- Course Logistics
- Successful Course Completion

Methodology

The instructors will welcome the students to the course and introduce themselves and acknowledge their hosts (State / FEMA / USACE). Following instructor and host introductions, each participant will introduce themselves to the rest of the group. After introductions, the instructors will facilitate a discussion about what the group expects to gain from the course.

The instructors will provide guidelines on "housekeeping" issues; emergency exits, special access accommodations, the location of facilities and behavior they expect from each participant. The instructors will also overview the course structure and logistics. Finally they will explain what is required for successful course completion. The instructors will then transition to Unit 2, which will provide an overview of the Hurricane Evacuation Study (HES) process.

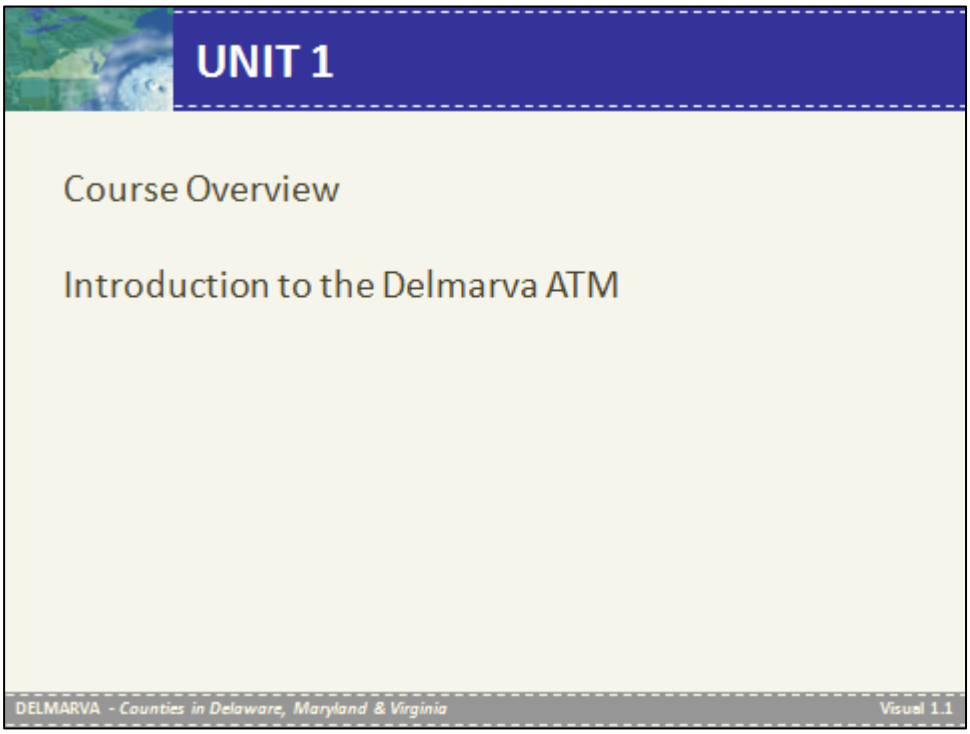
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Course Objective	5 minutes
Introductions and Expectations	15 minutes
Course Structure and Logistics	5 minutes
Summary	5 minutes
Total Time	**30 minutes**

Topic: Unit Introduction

Visual 1.1



Instructors Notes

Welcome participants to the course.

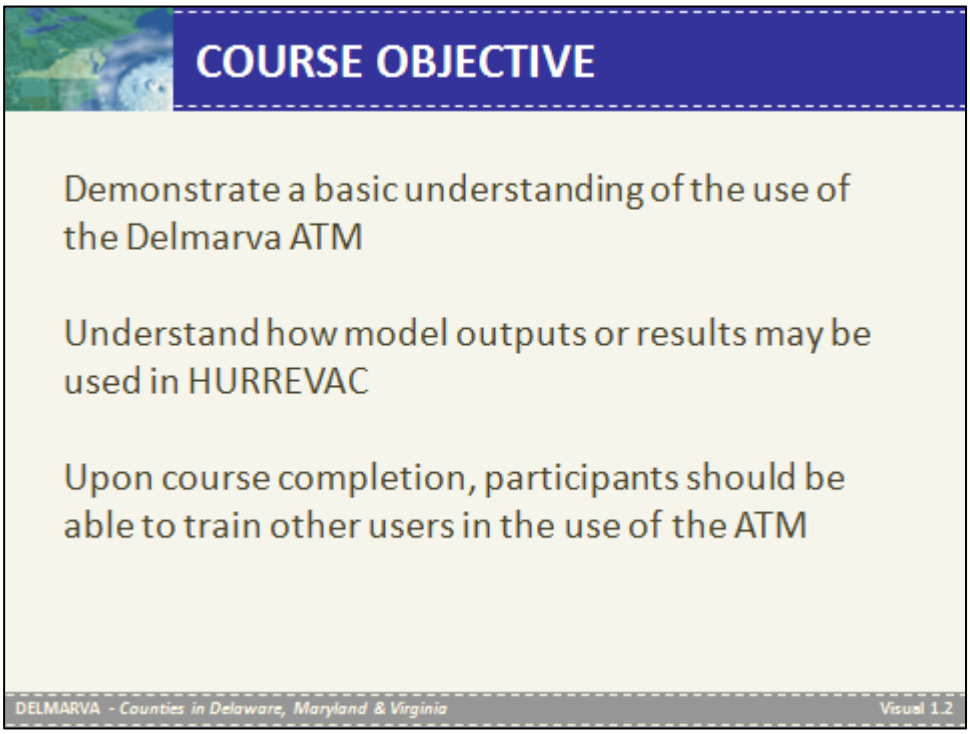
Tell the participants that this course will introduce them to the Delmarva HES ATM and its functionality.

Introduce yourself by providing:

- Your name and organization, and
- A brief statement of your experience.

Topic: Course Objective

Visual 1.2



Instructors Notes

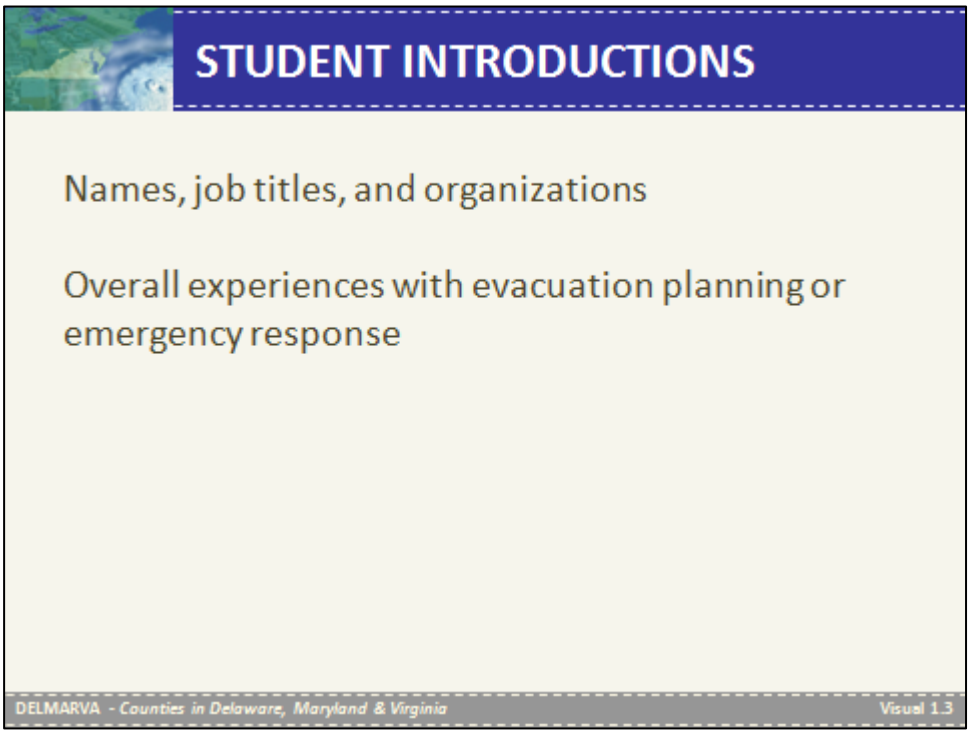
Tell the participants that the objective for this course is to enable participants to demonstrate a basic understanding of the use of the Delmarva ATM and how its results may be used in HURREVAC.

Tell the participants the course describes the HES process, the development of the ATM, its features and uses and how its results may be used to support evacuation planning. It also demonstrates how model results inform and integrate into HURREVAC.

Tell the participants that upon completion, course participants should be able to train other users in the use of the ATM.

Topic: Student Introductions

Visual 1.3



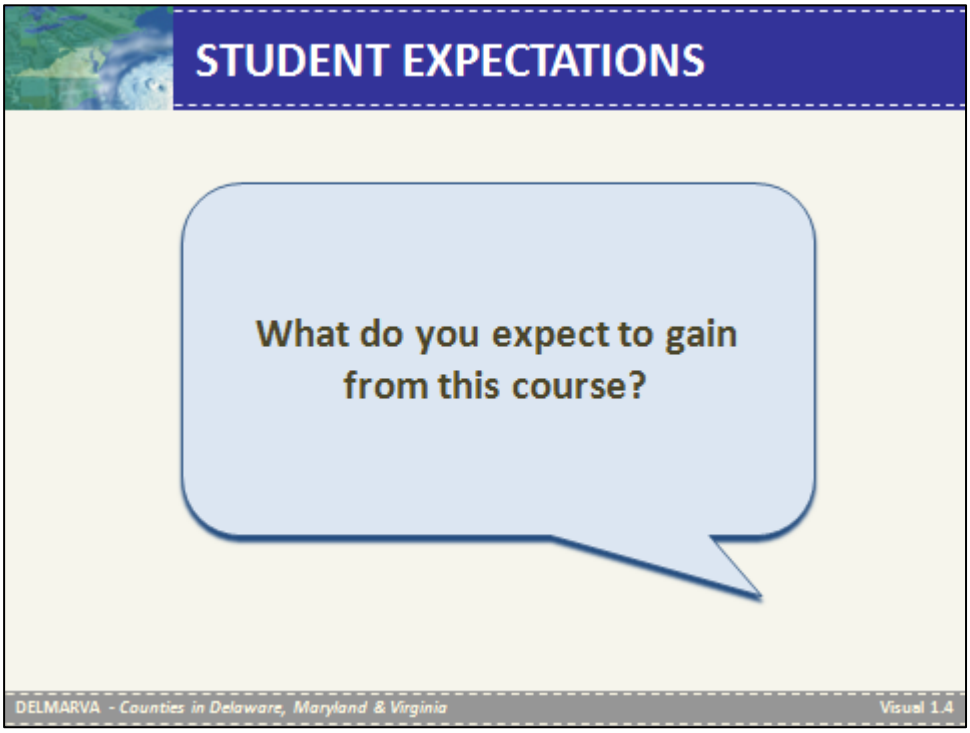
Instructors Notes

Ask the students to introduce themselves by providing:

- Their names, job titles, and organizations.
- A brief account of their overall experiences with evacuation planning or emergency response.

Topic: Student Expectations

Visual 1.4



Instructors Notes

Ask the participants the following question:

What do you expect to gain from this course?

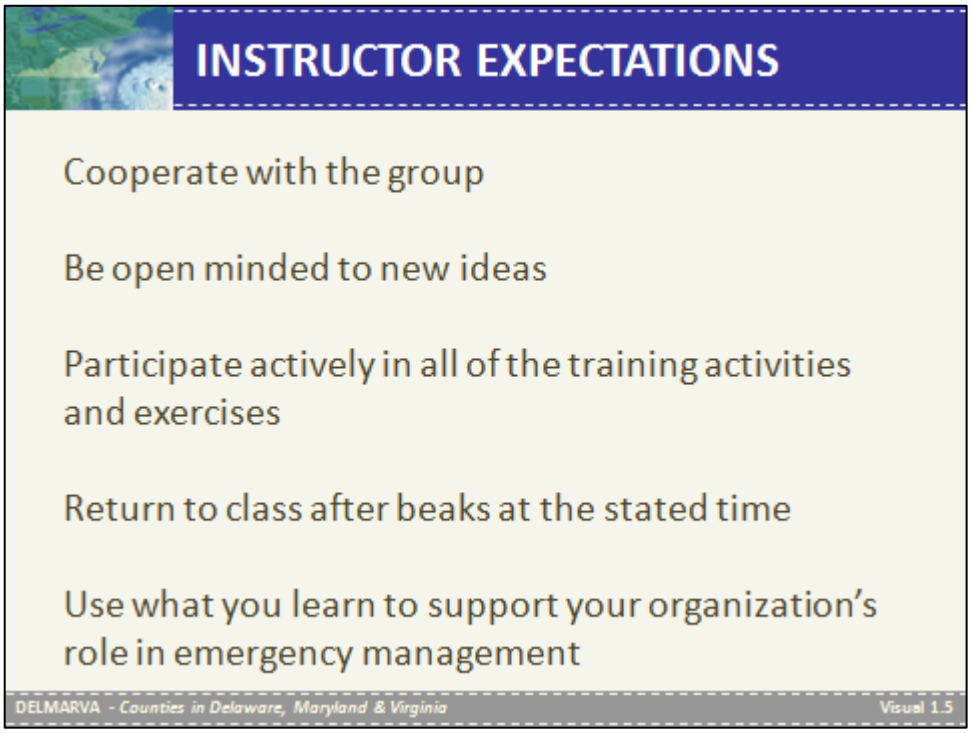
Allow the group time to respond

Record the responses on chart paper

If possible, hang the list of responses in the training room. Revisit the list at the end of the course to ensure that participants have met their learning objectives.

Topic: Instructor Expectations

Visual 1.5



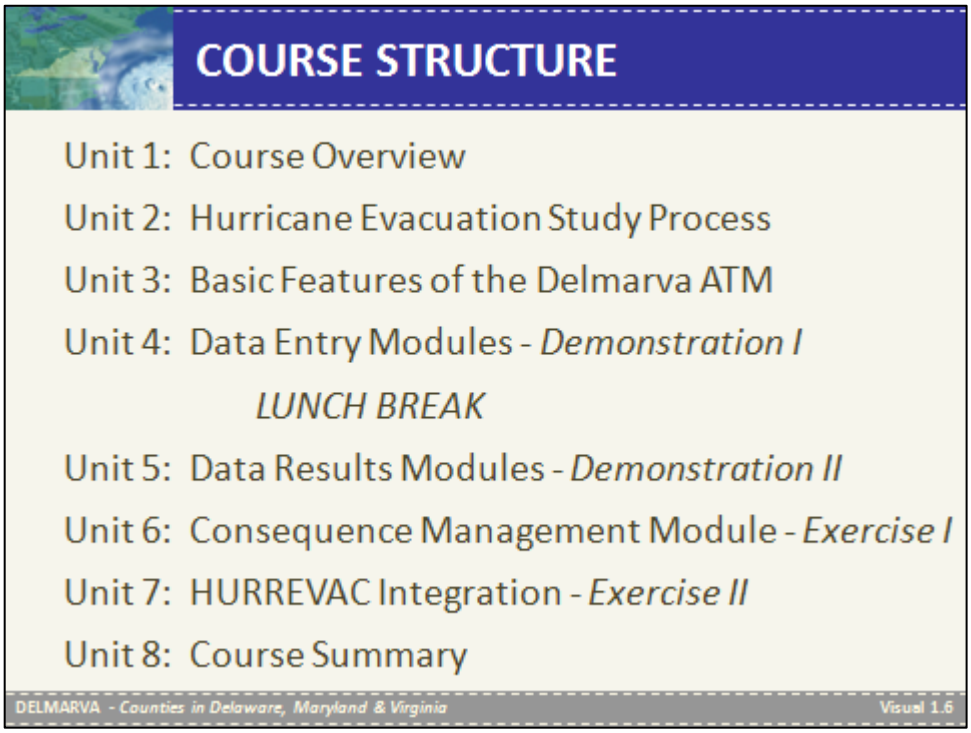
Instructors Notes

Explain the instructor's expectations for the course. You expect that everyone will:

- Cooperate with the group
- Be open minded to new ideas
- Participate actively in all of the training activities and exercises
- Return to class after beaks at the stated time
- Use what you learn in the course to support your organization's role in emergency management

Topic: Course Structure

Visual 1.6



Instructors Notes

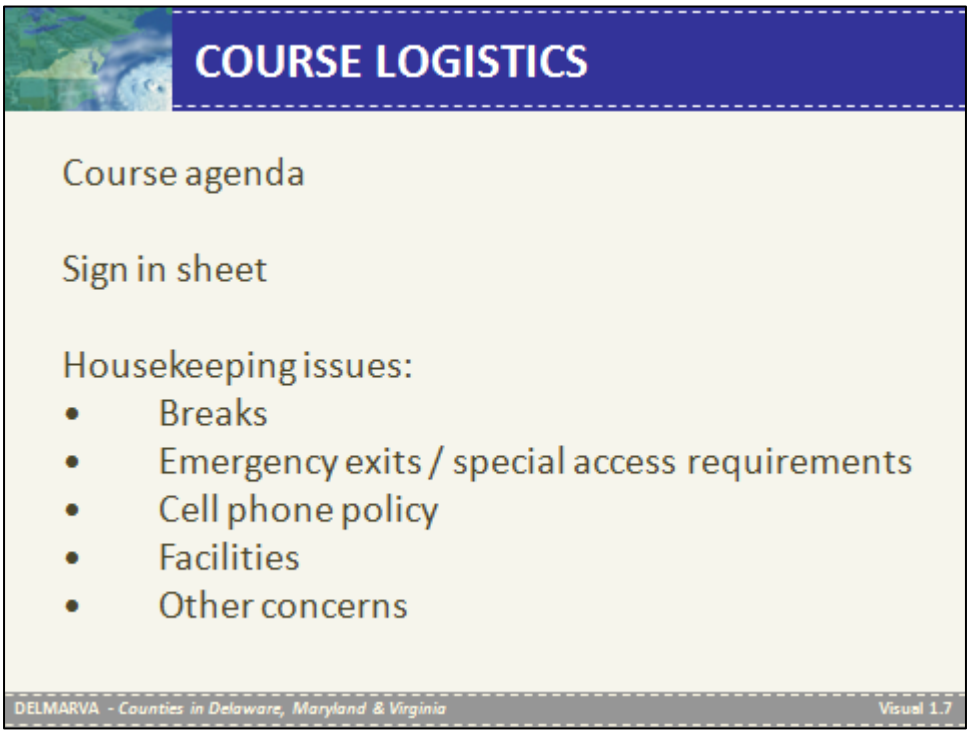
Tell the participants that the course is divided into the following eight units:

- Unit 1: Course Overview
- Unit 2: Hurricane Evacuation Study Process
- Unit 3: Basic Features of the Delmarva ATM
- Unit 4: Data Entry Modules — Demonstration I
- Unit 5: Data Results Modules — Demonstration II
- Unit 6: Consequence Management Module — Exercise I
- Unit 7: HURREVAC Integration — Exercise II
- Unit 8: Course Summary

Let the participants know that Unit 4 and 5 include an instructor led demonstration of the ATM features and that Unit 6 and 7 both include participant exercises.

Topic: Course Logistics

Visual 1.7



Instructors Notes

Review the following information with the group:

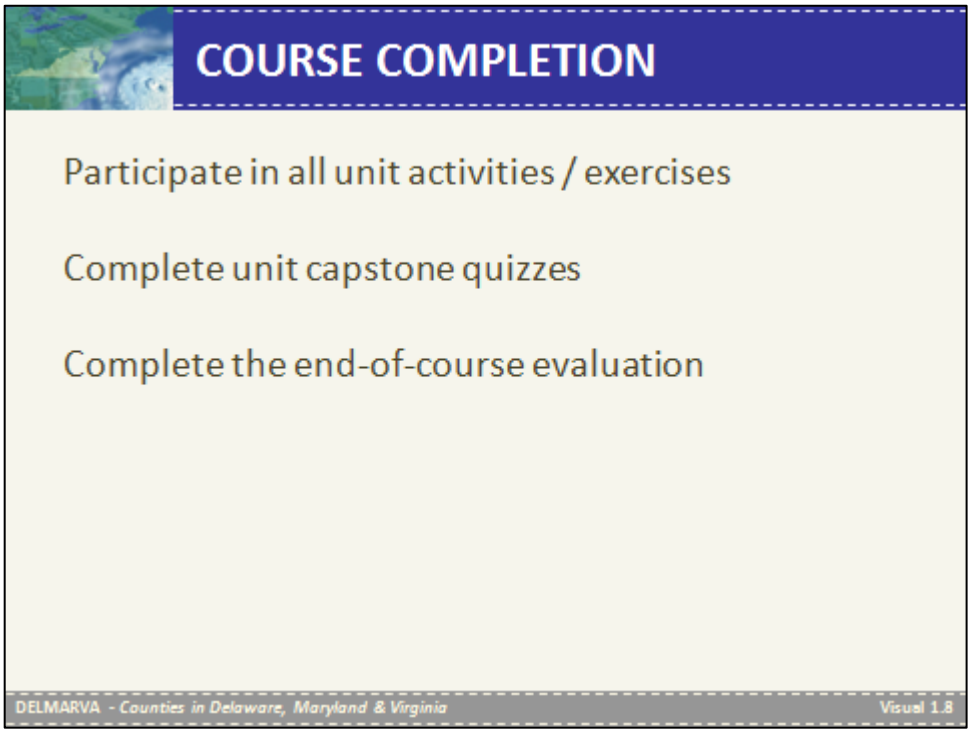
- Course agenda
- Sign in sheet

Review the following housekeeping issues:

- Breaks
- Emergency exits / special access requirements
- Cell phone policy
- Facilities
- Other concerns

Topic: Course Completion

Visual 1.8



Instructors Notes

Tell the participants that in order to successfully complete this course, they must:

- Participate in all unit activities / exercises
- Complete unit capstone quizzes
- Complete the end-of-course evaluation

Participants should coordinate with NHP staff on obtaining course evaluation results

Explain that the next unit will provide an overview of the hurricane evacuation study process

Refer the participants to the glossary of terms. Encourage participants to refer to this glossary throughout the training session.

Topic: Sample Workshop Agenda

Delmarva Hurricane Evacuation Study
Transportation Tools Workshop

May 2010

Morning Session 9:00 – 12:00

- Unit 1: Course Overview (30 minutes)
- Unit 2: Hurricane Evacuation Study Process (45 Minutes)
- Unit 3: Basic Features of the Delmarva ATM (45 Minutes)
- Unit 4: Data Entry Modules / Demonstration I (1 Hour)

Afternoon Session 1:00 – 3:00

- Unit 5: Data Results Modules / Demonstration II (1 Hour)
- Unit 6: Consequence Management Module / Exercise I (45 Minutes)
- Unit 7: HURREVAC Integration / Exercise II (45 Minutes)
- Unit 8: Course Summary / Evaluation Procedures (30 Minutes)

Breaks of 10 minutes will be provided after Unit 2 in the morning and Unit 6 in the afternoon.

Unit 2: Hurricane Evacuation Study (HES) Process

Objectives

At the end of this unit, the participants should be able to:

Understand the background and components of the Delmarva Hurricane Evacuation Study

Identify the seven main steps in the evacuation planning process

Define evacuation clearance time and understand its components

Scope

- Unit Introduction
- Unit Objectives
- Delmarva HES Background and Components
- Evacuation Planning Process
- Clearance Times
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After covering the Delmarva HES background and components, evacuation planning process and clearance times topics, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 3.

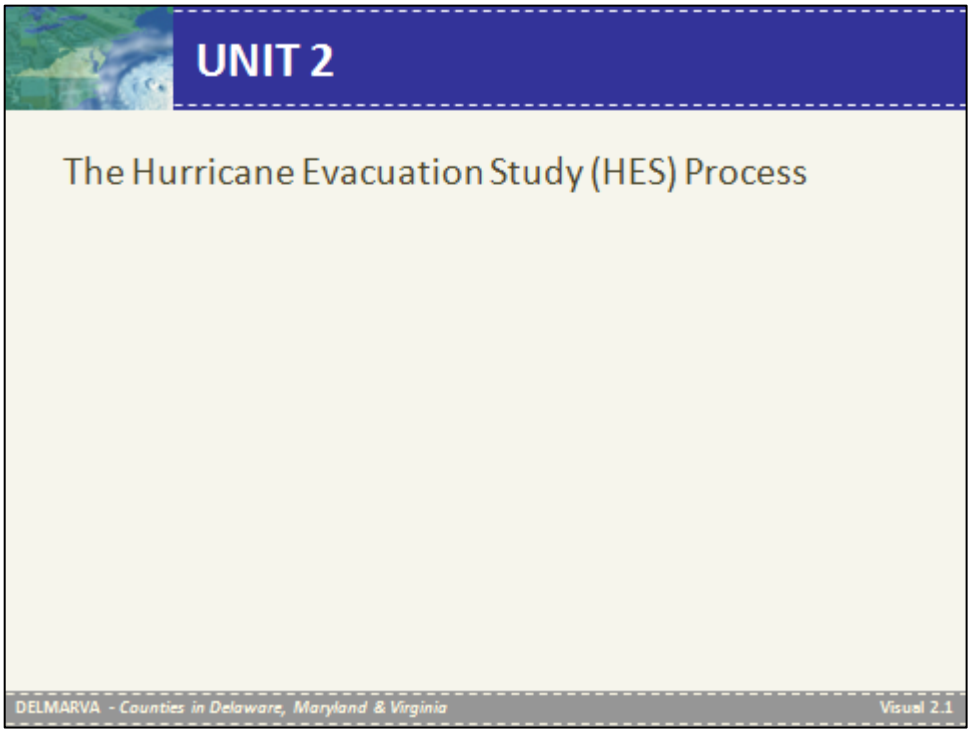
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
Delmarva HES Background and Components	5 minutes
Evacuation Planning Process	15 minutes
Clearance Time	10 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**45 minutes**

Topic: Unit Introduction

Visual 2.1



Instructors Notes

Explain that Unit 2 provides a general overview of the hurricane evacuation study planning process in the Delmarva region. The next visual will outline the objectives for this unit.

Opening Activities:

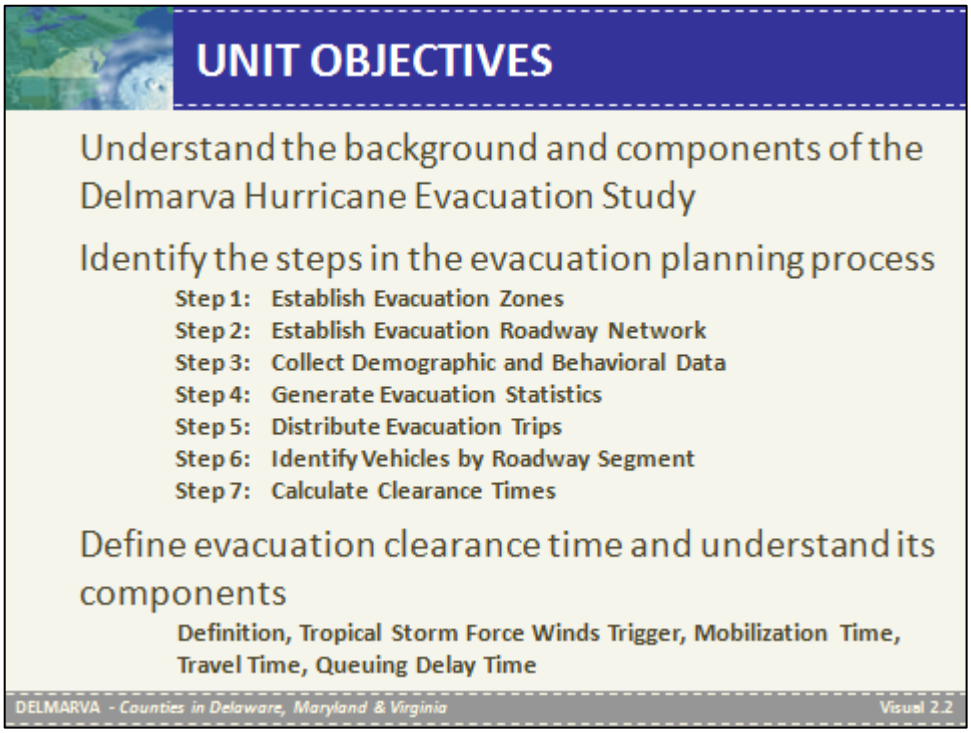
Ask for a show of hands of individuals who have been involved in the state hurricane evacuation study planning process. Ask for the participants to keep their hands raised if they were also part of any prior study efforts. Discuss how staffing turn over impacts the ability of emergency managers to be aware of and use existing data and tools.

Ask the participants to discuss what has changed the most since the prior study. Discuss the impact on changes in demographics, the roadway network, the understanding of risk and other issues raised by the participants may have on evacuation planning.

Ask participants about recent storm events (since the publication of the HES in 2007) including both tropical storms / hurricanes and winter storms, if any. If relevant, ask for a volunteer from the participants to describe how the HES data and tools were used to support emergency management in these events.

Topic: Unit Objectives

Visual 2.2



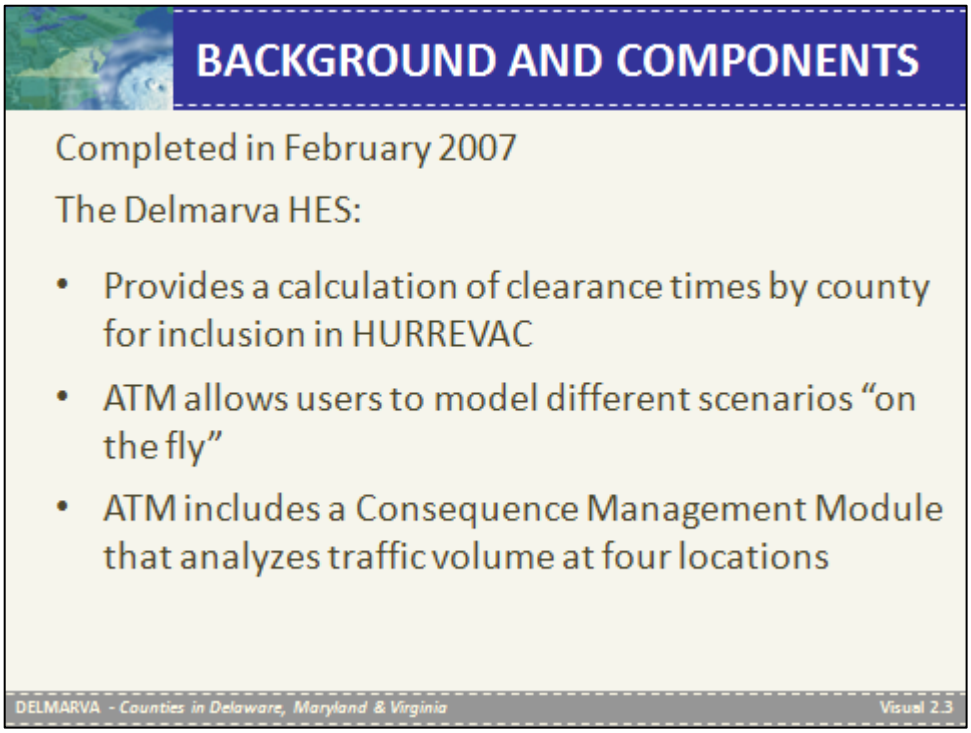
Instructors Notes

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Understand the background and components of the Delmarva Hurricane Evacuation Study
- Identify the seven main steps in the evacuation planning process
    - Step 1: Establish Evacuation Zones
    - Step 2: Establish Evacuation Roadway Network
    - Step 3: Collect Demographic and Behavioral Data
    - Step 4: Generate Evacuation Statistics
    - Step 5: Distribute Evacuation Trips
    - Step 6: Identify Vehicles by Roadway Segment
    - Step 7: Calculate Clearance Times
- Define evacuation clearance time and understand its components
    - Definition and Tropical Storm Force Winds Trigger
    - Mobilization Time
    - Travel Time
    - Queuing Delay Time

Topic: DELMARVA HES Background and Components

Visual 2.3



Instructors Notes

In order for participants to understand the background and components of the Delmarva Hurricane Evacuation Study, go over the following points:

- The most recent HES was completed in June 2007

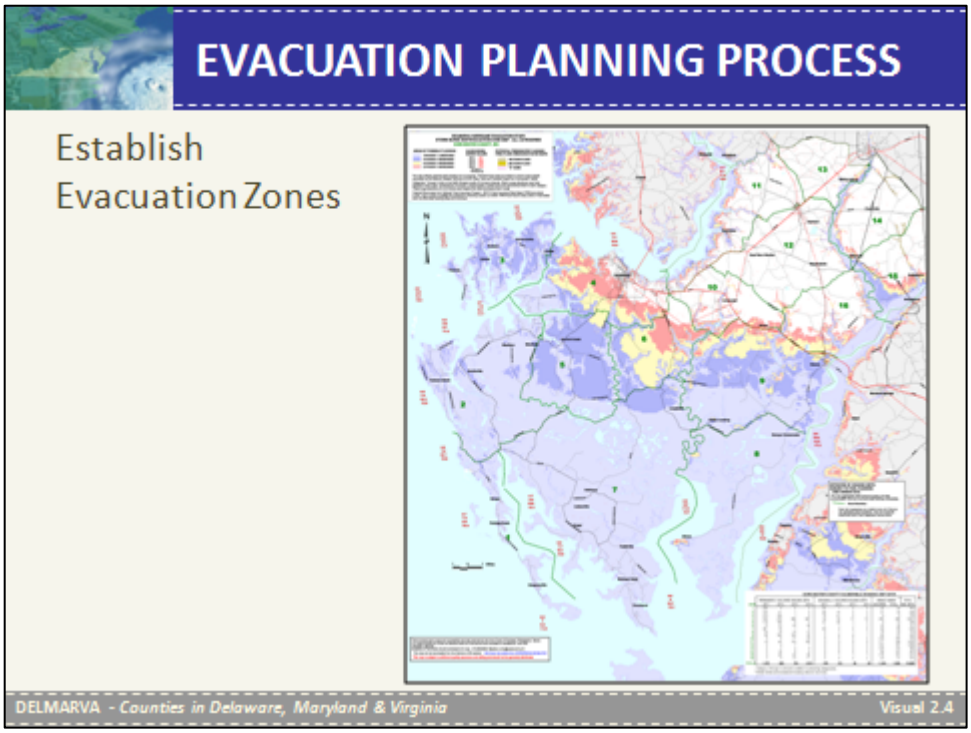
Acknowledge any participant who participated in any earlier study efforts.

- The HES provides a calculation of clearance times by county for inclusion in HURREVAC
- The HES ATM allows users to model different scenarios "on the fly"
- The HES ATM includes a Consequence Management Module that analyzes traffic volume at four bottlenecks

Remind participants that they will be able to work with the ATM and the CM Module during this training.

Topic: Evacuation Planning Process

Visual 2.4



Instructors Notes

Participants will be introduced to the first step in the hurricane evacuation study planning process –

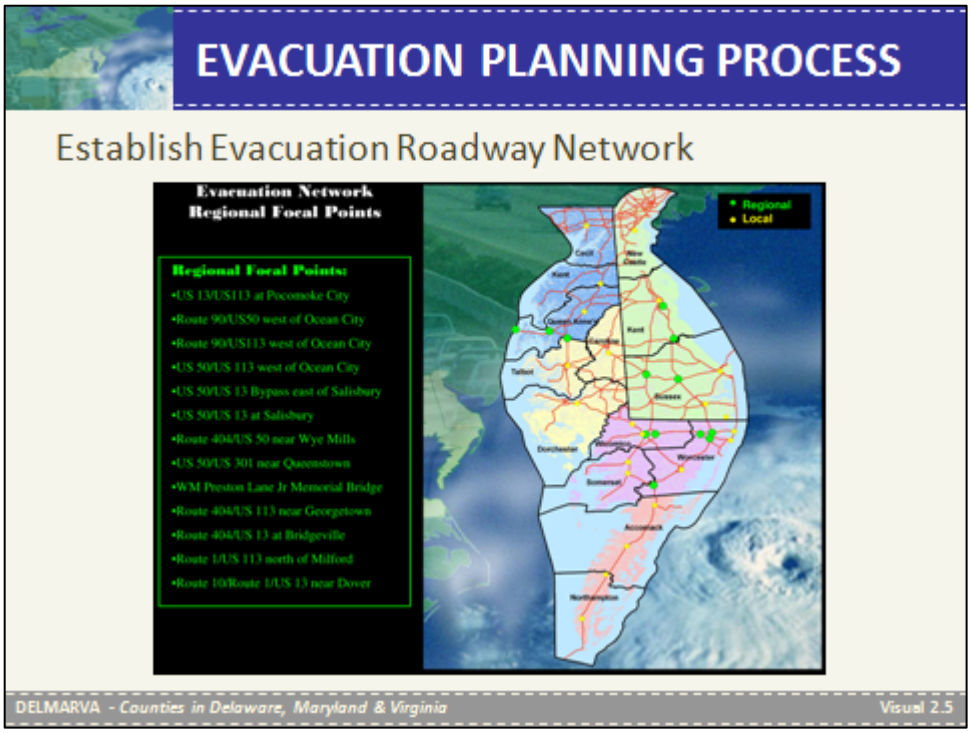
Step 1: Establish Evacuation Zones

Instructors will go over the image and highlight the following:

- Zones should be risk based, easy to communicate and politically acceptable
- Delmarva's zones are based on surge inundation maps developed by the USACE – Philadelphia District
- State and local governments had input into the zone designation process
- Numbered traffic evacuation zones form the building blocks of the evacuation modeling process

Topic: Evacuation Planning Process

Visual 2.5



Instructors Notes

Participants will be introduced to the second step in the evacuation planning process –

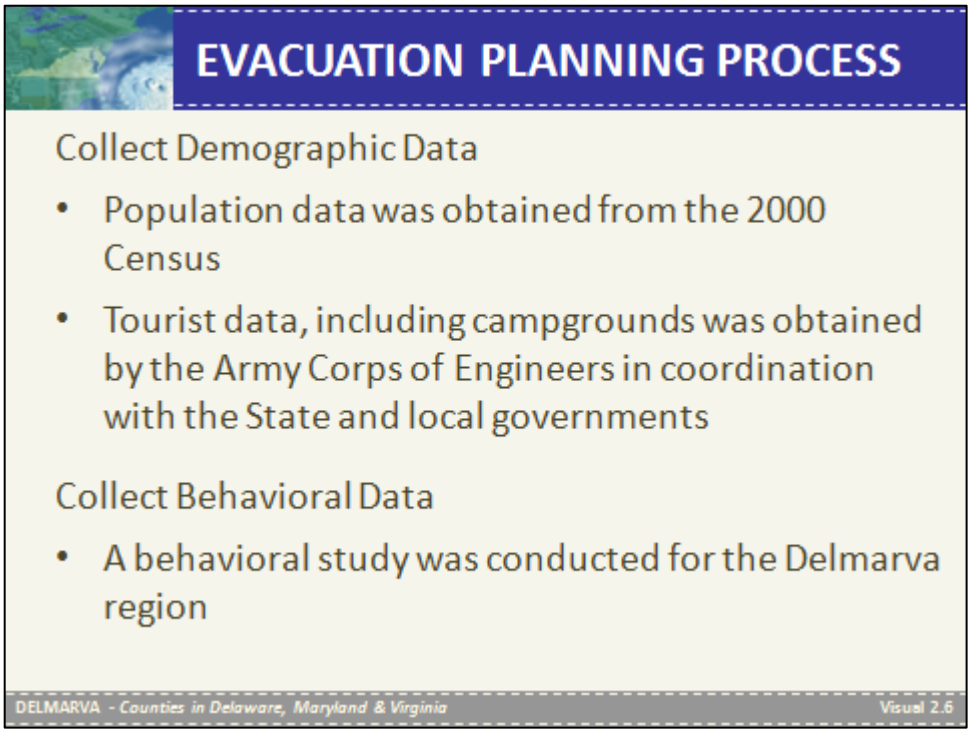
Step 2: Establish Evacuation Roadway Network

Instructors will go over the image and highlight the following:

- Evacuee behavior is non-stochastic (not random) and not optimized; people tend to "follow the leader" along main routes
- The evacuation model includes local and regional focal points
- State and local governments had input into the evacuation roadway network process
- The directional service volume at each focal point is recorded

Topic: Evacuation Planning Process

Visual 2.6



Instructors Notes

Participants will be introduced to the third step in the evacuation planning process –

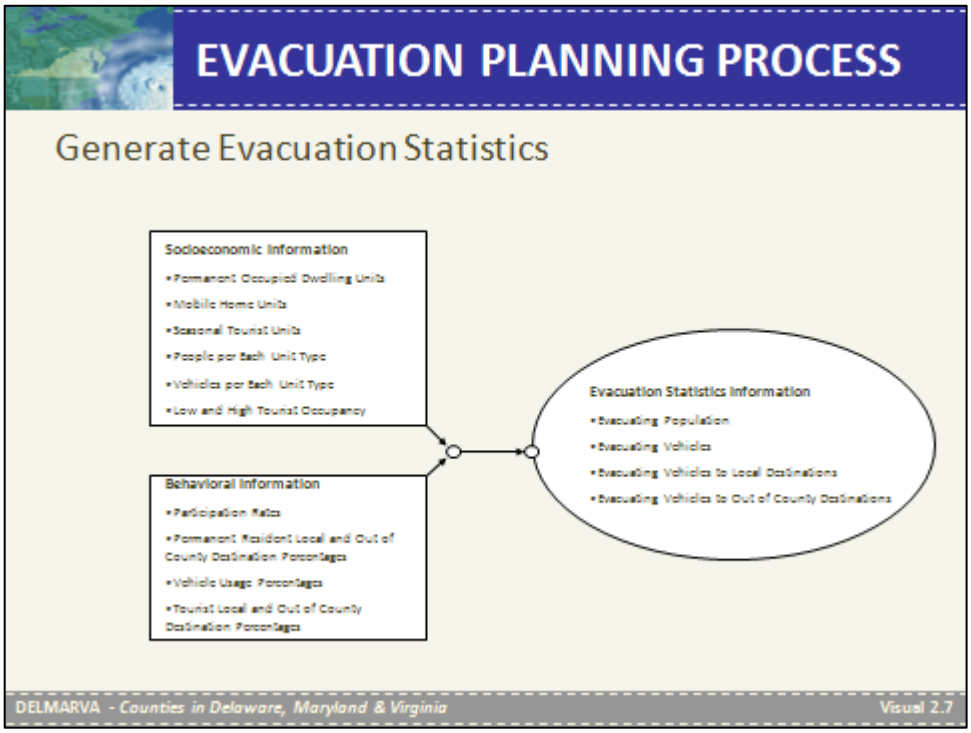
Step 3: Collect Demographic and Behavioral Data

Instructors will go over the following:

- Population data was obtained from the 2000 Census.
- Tourist data, including campgrounds was obtained by the Army Corps of Engineers in coordination with the State and local governments.
- A separate behavioral study was conducted for the current Delmarva HES.
- Users can modify and update all demographic data used in the ATM.

Topic: Evacuation Planning Process

Visual 2.7



Instructors Notes

Participants will be introduced to the fourth step in the evacuation planning process –

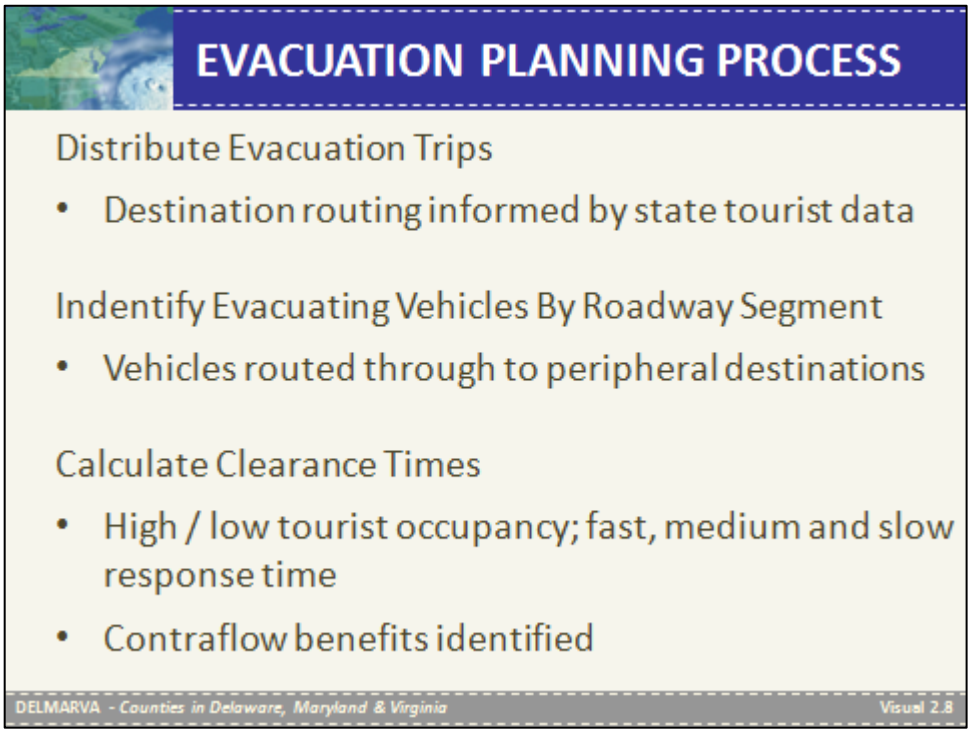
Step 4: Generating Evacuating Statistics

Instructors will go over the following:

- Discuss the components of the socioeconomic data
  - Permanent / mobile home / tourist units
  - People and vehicles per unit
  - Tourist occupancy
- Discuss the components of the behavioral data
  - Participation rates (failure to comply / shadow evacuation)
  - Local versus out-of county destinations for permanent residents and tourists
- Describe the evacuation statistics
  - Evacuating populations and vehicle numbers
  - Vehicles to local versus out-of county destinations

Topic: Evacuation Planning Process

Visual 2.8



Instructors Notes

Participants will be introduced to the fifth, sixth and seventh step in the evacuation planning process –

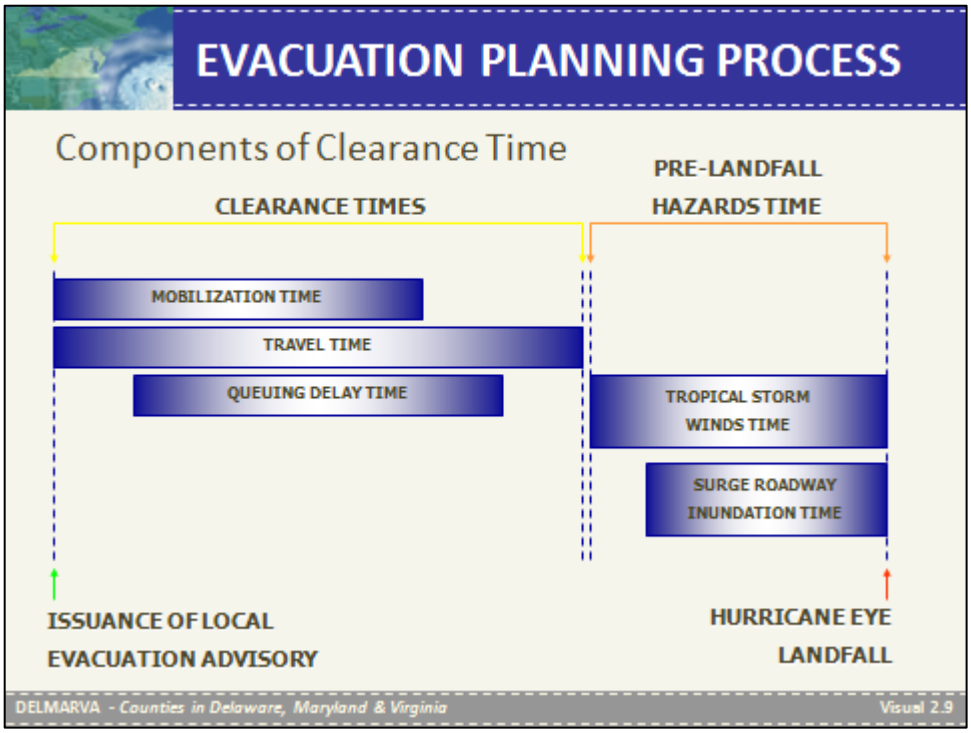
Step 5: Distribute Evacuation Trips
Step 6: Identify Evacuating Vehicles by Roadway Segment
Step 7: Calculate Clearance Times

Instructors will go over the following:

- Distribution of evacuation trips
  - Destination routing informed by statewide tourist data
- Vehicles by roadway segment
  - Vehicles are routed through to a peripheral destination
- Calculate clearance times
  - High and low tourist occupancy, fast medium and slow response time
  - Contraflow benefits / segment service volume variations identified

Topic: Evacuation Planning Process

Visual 2.9



Instructors Notes

Participants will be introduced to the concept of Clearance Time and will be able to define the term.

Clearance time is the length of time beginning when the first person leaves their home until the last person reaches their destination. Clearance times are based upon all evacuation movements completing prior to the onset of tropical storm force (39 mph) winds.

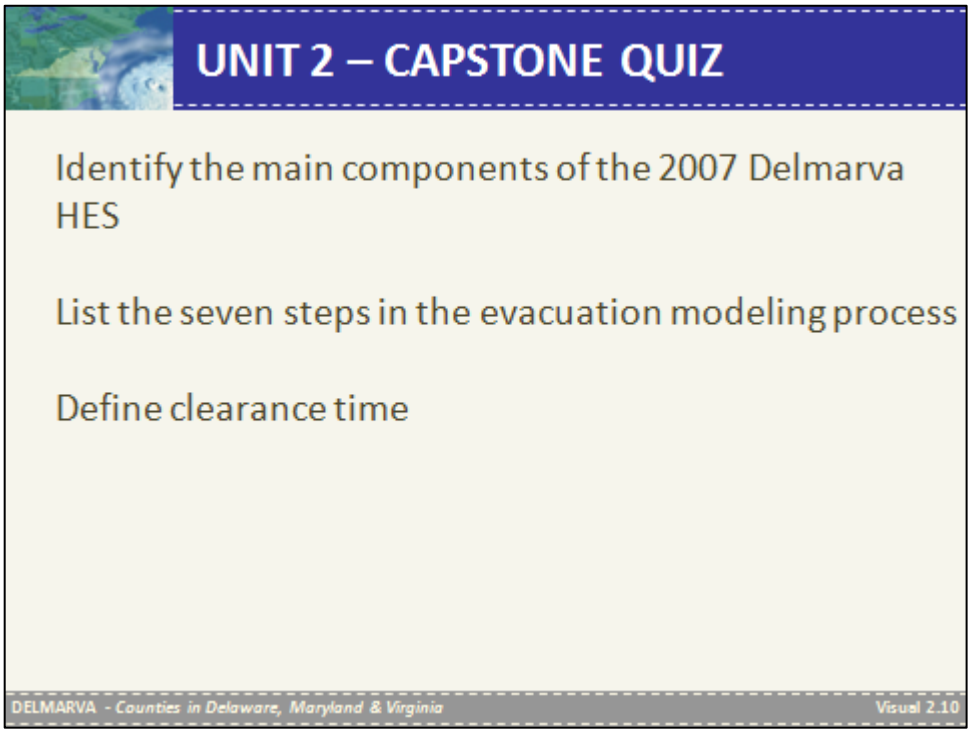
Instructors will go over the following components of clearance time:

- Mobilization time,
- Travel time, and
- Queuing delay time.

After the hurricane clearance time there is a pre-landfall hazards time that anticipates the onset of tropical storm force winds and storm surge-caused roadway impacts.

Topic: Unit Capstone Quiz

Visual 2.10



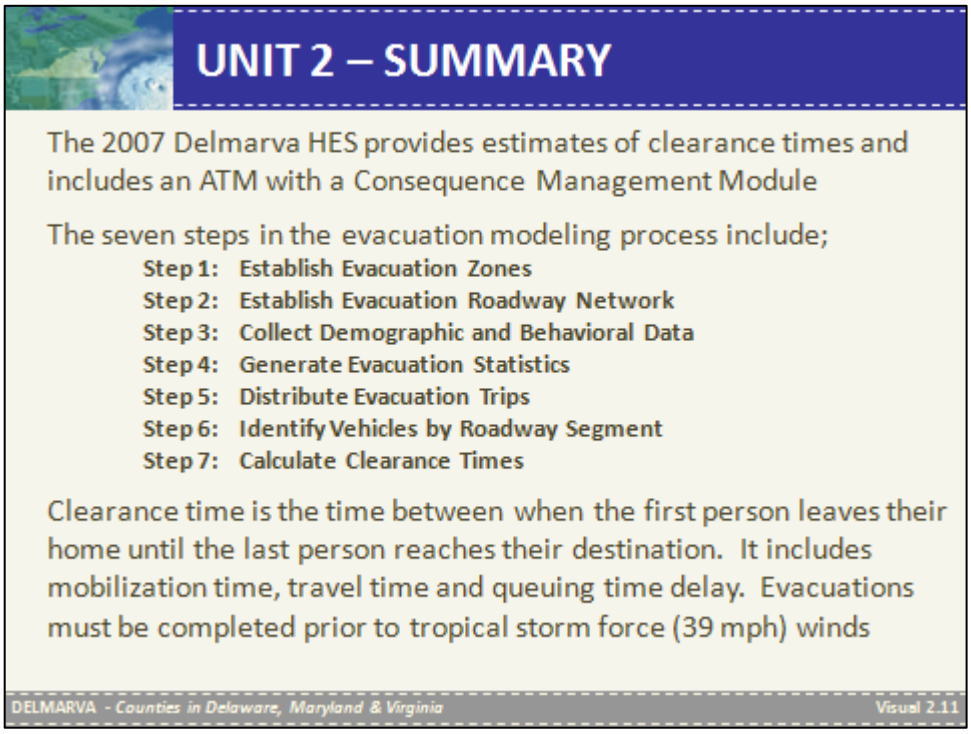
Instructors Notes

Ask participants if they can now:

- Identify the main components of the 2007 Delmarva HES.
- List the seven steps in the evacuation modeling process.
- Define clearance time.

Topic: Summary

Visual 2.11



Instructors Notes

Summarize this unit by reminding the group that:

- The 2007 Delmarva HES provides estimates of clearance times and includes an ATM with a Consequence Management Module.
- The seven steps in the evacuation modeling process include; Step 1: Establish Evacuation Zones, Step 2: Establish Evacuation Roadway Network, Step 3: Collect Demographic and Behavioral Data, Step 4: Generate Evacuation Statistics, Step 5: Distribute Evacuation Trips, Step 6: Identify Vehicles by Roadway Segment, and Step 7: Calculate Clearance Times.
- Clearance time is the time between when the first person leaves their home until the last person reaches their destination. It includes mobilization time, travel time and queuing time delay. Clearance times are based upon all evacuation movements completing prior to the onset of tropical storm force (39 mph) winds.

Ask if anyone has any questions about anything covered in this unit.

Transition to the next unit by explaining that Unit 3 will cover the basic features of the ATM.

Announce a 10 minute break.

Unit 3: Basic Features of the DELMARVA ATM

Objectives

At the end of this unit, the participants should be able to:

- Understand the structure and content of the ATM
- Open the ATM and navigate through the spreadsheet modules
- Understand how to interpret the clearance times worksheet

Scope

- Unit Introduction
- Unit Objectives
- ATM Structure
- ATM Content
- Clearance Times Worksheet
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After covering the ATM structure, content and discussing how to interpret the clearance times worksheet, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 4.

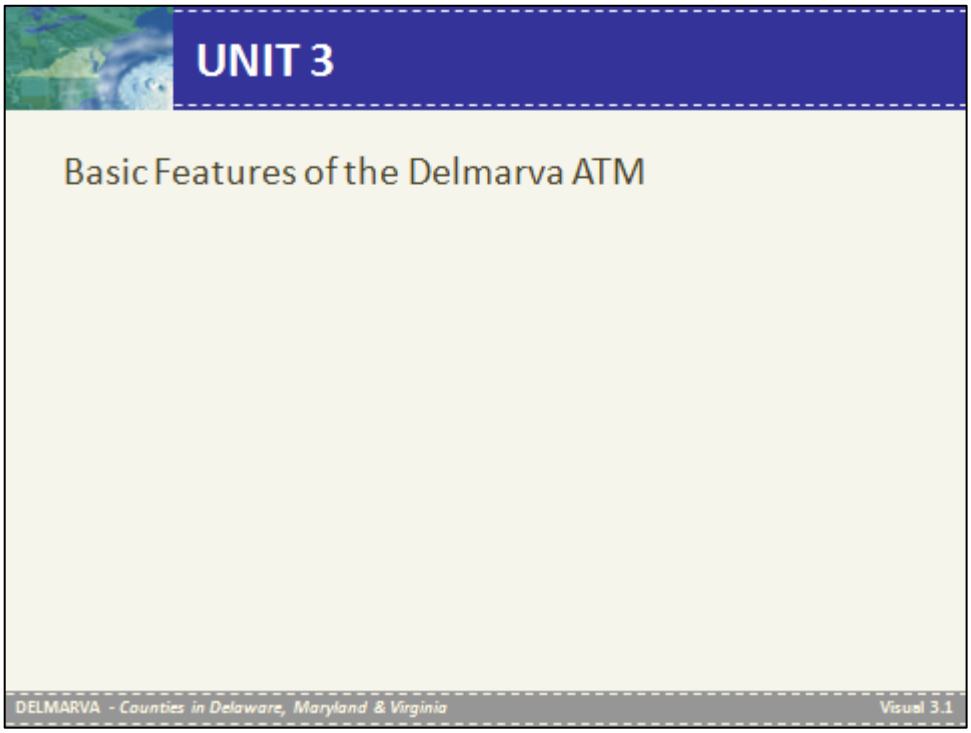
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
ATM Structure	10 minutes
ATM Content	10 minutes
Clearance Time Worksheet	10 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**45 minutes**

Topic: Unit Introduction

Visual 3.1



Instructors Notes

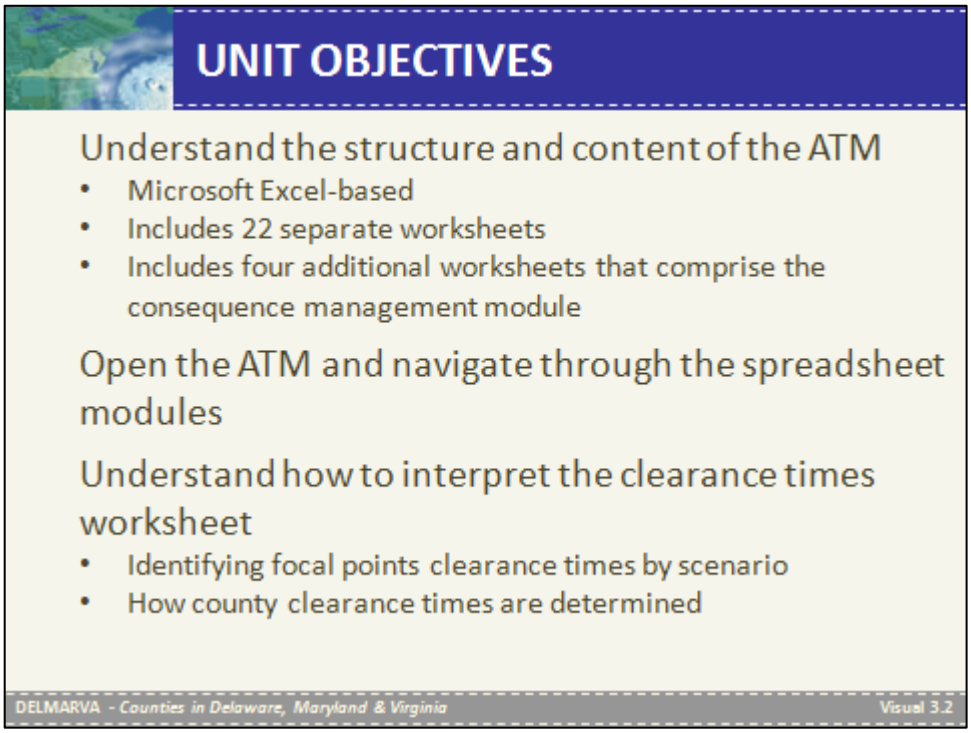
Explain that Unit 3 provides an overview of the basic features of the Delmarva HES ATM. The next visual will outline the objectives for this unit.

Ask for a show of hands of any participant who has previously opened and navigated the ATM. Ask for the participants to keep their hands raised if they used the ATM to check clearance times at specific bottlenecks or regional focal points. Ask if any participants modified input data used in the ATM to tests alternate evacuation scenarios.

Discuss how the ATM is open source and is constructed in a readily available software platform – Microsoft Excel.

Topic: Unit Objectives

Visual 3.2



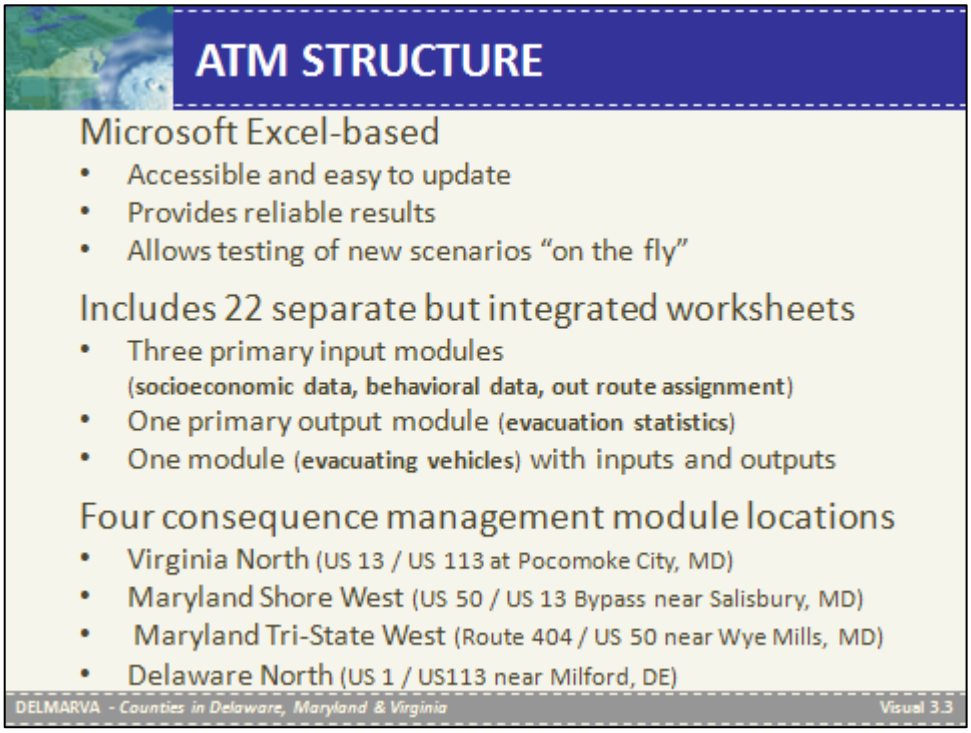
Instructors Notes

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Understand the structure and content of the ATM:
  - Microsoft Excel-based,
  - Includes 21 separate worksheets, and
  - Includes four additional worksheets that comprise the consequence management module.
- Open the ATM and navigate through the spreadsheet modules.
- Understand how to interpret the clearance times worksheet:
  - Identifying focal points clearance times by scenario.
  - How county clearance times are determined.

Topic: ATM Structure

Visual 3.3



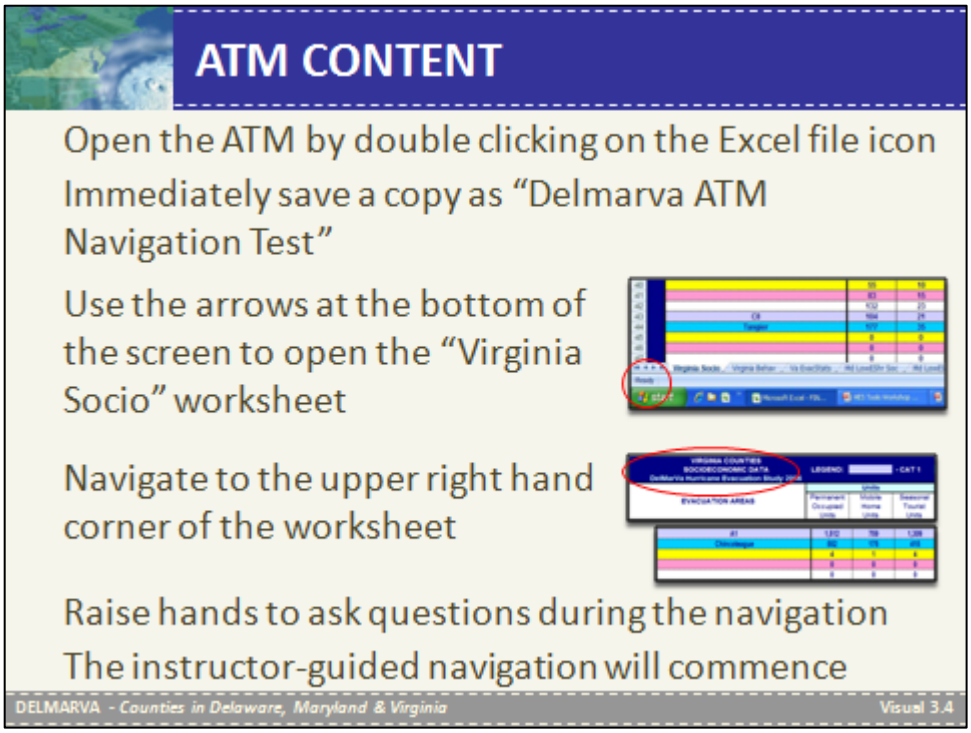
Instructors Notes

In order for participants to understand the structure the Delmarva ATM, go over the following points:

- The model is Excel-based:
  - Accessible platform,
  - Provides reliable results,
  - Easy to update, and
  - Allows testing of new scenarios "on the fly" with negligible processing time.
- Includes 22 separate worksheets in five primary modules:
  - Three primary input modules; socioeconomic data module, behavioral data module, out route assignment module,
  - One primary output module (evacuation statistics module), and
  - One module (evacuating vehicles module) with inputs and outputs
- Includes four additional worksheets that comprise the consequence management module:
  - Cover four consequence management locations; Virginia North, Maryland Shore West, Maryland Tri-State West, Delaware North.

Topic: ATM Content

Visual 3.4



Instructors Notes

Participants will be directed to open the ATM. The instructors shall minimize the slide presentation and open the ATM or open the ATM projected on a different screen.

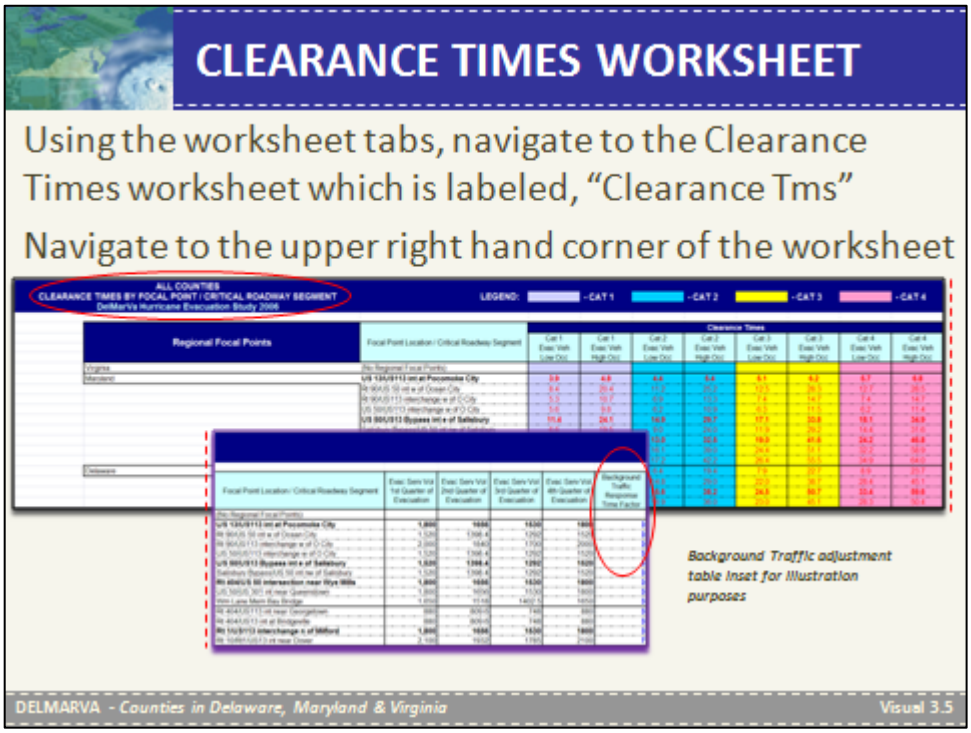
After a brief pause, the instructors will ask if anyone has any difficulty opening the ATM. After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation through the ATM.

Participants should be prompted to save a copy of the Delmarva ATM file using the name "Delmarva ATM Navigation Test" to ensure that the source file remains uncorrupted. The instructors should be mindful to move slowly through the initial navigation to ensure that participants can follow and repeat the navigation on their own. Participants should be reminded that they will continue to work with individual worksheets in other units.

The instructors will navigate through each worksheet, showing which worksheets pertain to the various modules; socioeconomic data, behavioral data, out route assignment, evacuation statistics, evacuating vehicles, and the consequence management.

Topic: Clearance Times Worksheet

Visual 3.5



Instructors Notes

Participants will keep the ATM open and navigate to the Clearance Times worksheet. The instructors shall keep the slide presentation minimized or, if possible, advance the slides with the PowerPoint presentation projected on a different screen.

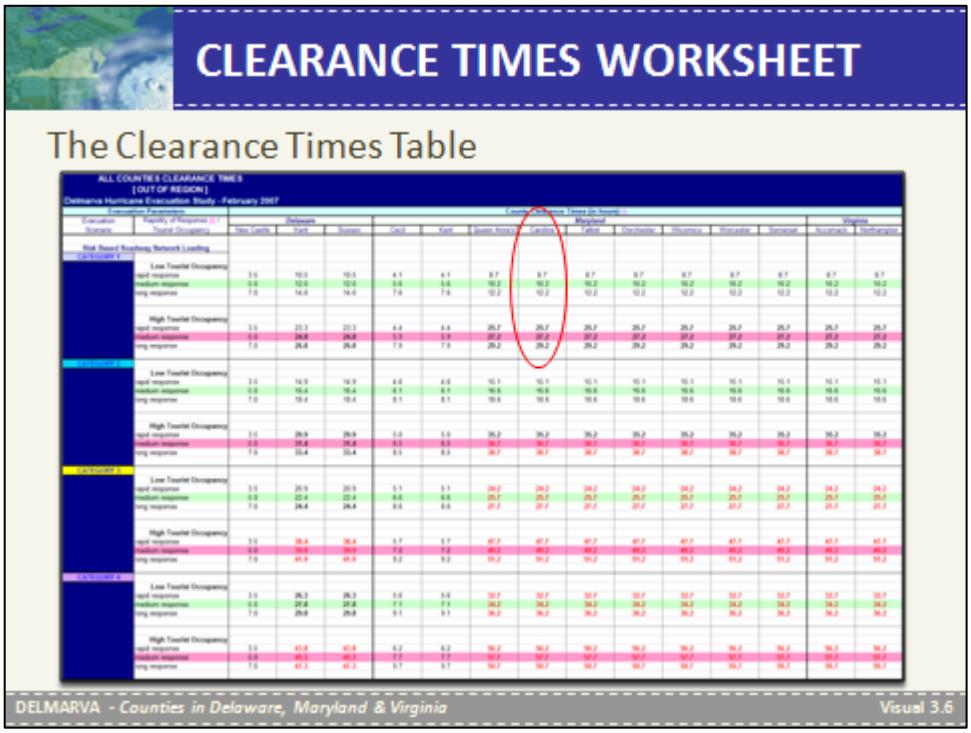
The instructors will show that the clearance times worksheet provides clearance times for a range of scenarios at specific bottleneck location or along critical roadway segments. The instructors will reiterate that this is a function of the number of evacuating vehicles and roadway segment capacity characteristics.

The instructors will ask the participants how they would use these data to estimate a county-specific clearance time, such as is included in HURREVAC.

The instructors will discuss the impact of regional bottlenecks on county clearance times and illustrate the concept of the governing bottleneck.

Topic: Clearance Times Worksheet

Visual 3.6



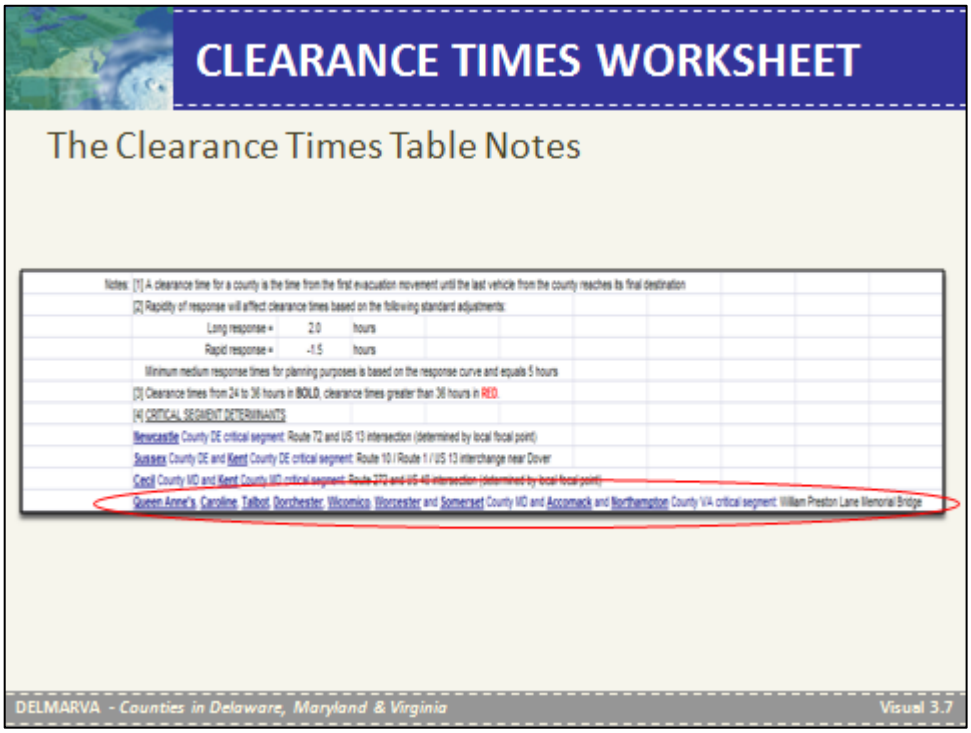
Instructors Notes

Participants should keep the ATM open on the Clearance Times worksheet. The instructors shall advance the PowerPoint presentation to show the Clearance Times table.

The instructors will explain how to read the Clearance Times table and the process through which it is provided to Sea Island Software to update the clearance times in HURREVAC.

Topic: Clearance Times Worksheet

Visual 3.7



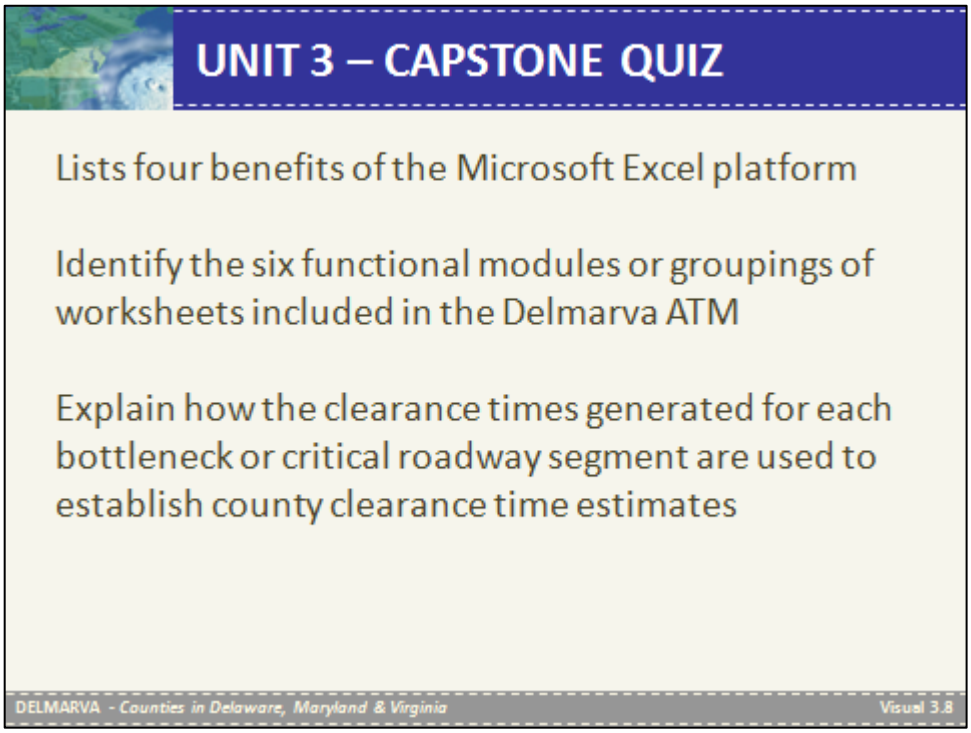
Instructors Notes

Participants should keep the ATM open on the Clearance Times worksheet. The instructors shall advance the PowerPoint presentation to show the Clearance Times table notes.

The instructors will read through the Clearance Times table notes to explain which critical bottlenecks were used to determine county clearance times.

Topic: Unit Capstone Quiz

Visual 3.8



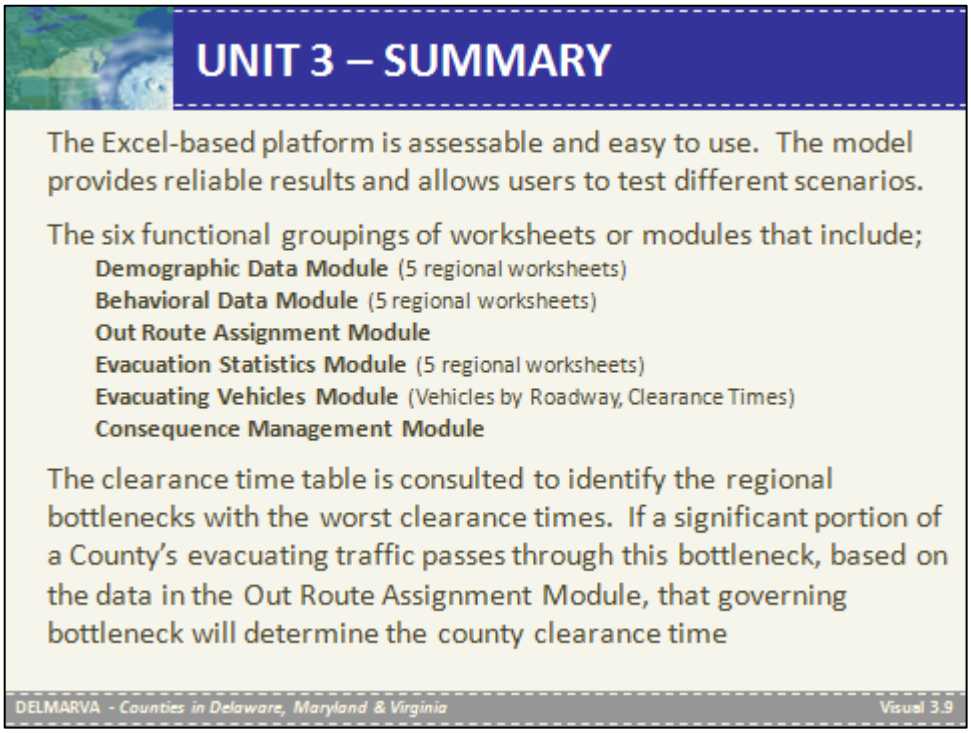
Instructors Notes

Ask participants if they can now:

- Lists four benefits of the Microsoft Excel platform.
- Identify the six functional modules or groupings of worksheets included in the Delmarva ATM.
- Explain how the clearance times generated for each bottleneck or critical roadway segment are used to establish county clearance time estimates.

Topic: Summary

Visual 3.9



Instructors Notes

Summarize this unit by reminding the group that:

- The Microsoft Excel platform is accessible (everyone has a copy), provides reliable results, is easy to update, and allows testing of new scenarios "on the fly" with negligible processing time.
- The six functional modules or groupings of worksheets in the ATM include modules addressing socioeconomic data, behavioral data, out route assignment, evacuation statistics, evacuating vehicles and consequence management.
- The clearance time table is used to identify the regional bottlenecks with the worst clearance times. If a significant portion of a County's evacuating traffic passes through this bottleneck, based on the data in the Out Route Assignment Module, that governing bottleneck will determine the county clearance time.

Ask if anyone has any questions about anything covered in this unit.

Transition to the next unit by explaining that Unit 4 will cover the primary data entry modules and will also include an instructor guided demonstration of the ATM's functionality.

Unit 4: Data Entry Modules

DEMONSTRATION I

Objectives

At the end of this unit, the participants should be able to:

- Understand the structure of the three primary data entry modules
- Identify the data entry features on the Evacuating Vehicles Module and Clearance Times worksheet
- Demonstrate proficiency in adding data to various worksheets

Scope

- Unit Introduction
- Unit Objectives
- Socioeconomic Data Module
- Behavioral Data Module
- Out-Route Assignment Module
- Evacuating Vehicle Module and Clearance Time Worksheet
- DEMONSTRATION I
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After providing an overview of each of the specific data entry modules, the instructors will ask the participants to undertake a demonstration to illustrate their proficiency in adding data to various worksheets. The instructors will set up the scenario and ask each of the listed questions. The instructors will encourage the participants to get started answering the questions, but will walk the class through using the ATM to answer each question.

The instructors will encourage the class to ask questions during the demonstration to ensure they understand how to use the ATM. Once the demonstration has been completed, the results of the changes will be discussed. After this discussion is completed, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 5.

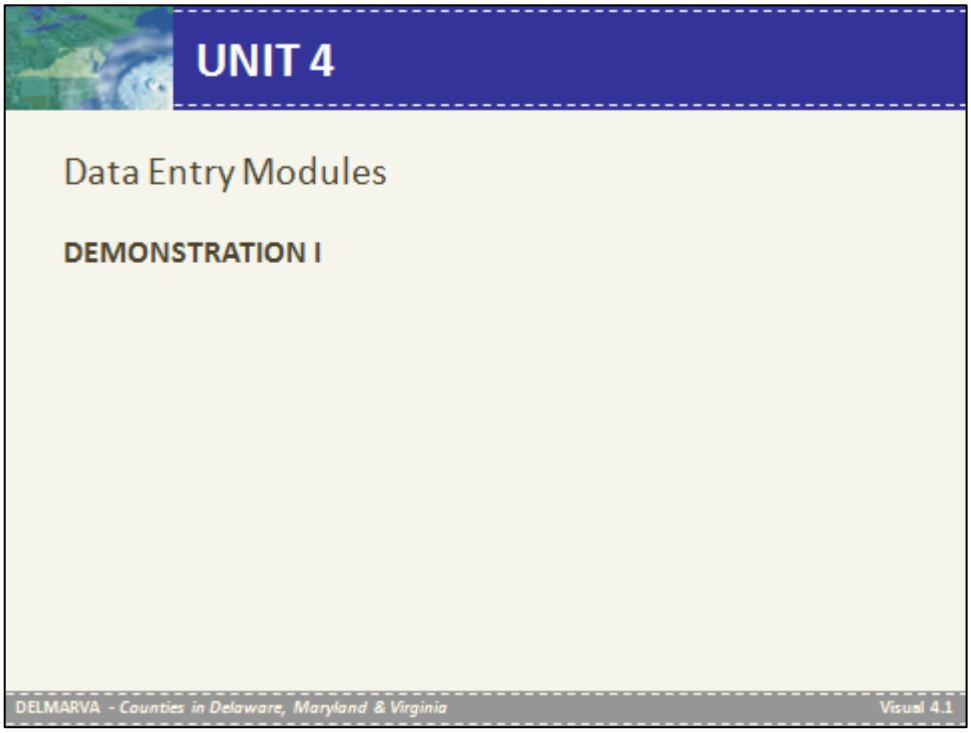
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
Socioeconomic Data Module	10 minutes
Behavioral Data Module	5 minutes
Out-Route Assignment Module	10 minutes
Evacuating Vehicles Module and Clearance Time Worksheet	5 minutes
DEMONSTRATION I	15 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**1 hour**

Topic: Unit Introduction

Visual 4.1



Instructors Notes

Explain that Unit 4 provides a more in-depth review of the data entry modules of the ATM and provides participants with an opportunity to demonstrate their ability to add data to different worksheets. The next visual will outline the objectives for this unit.

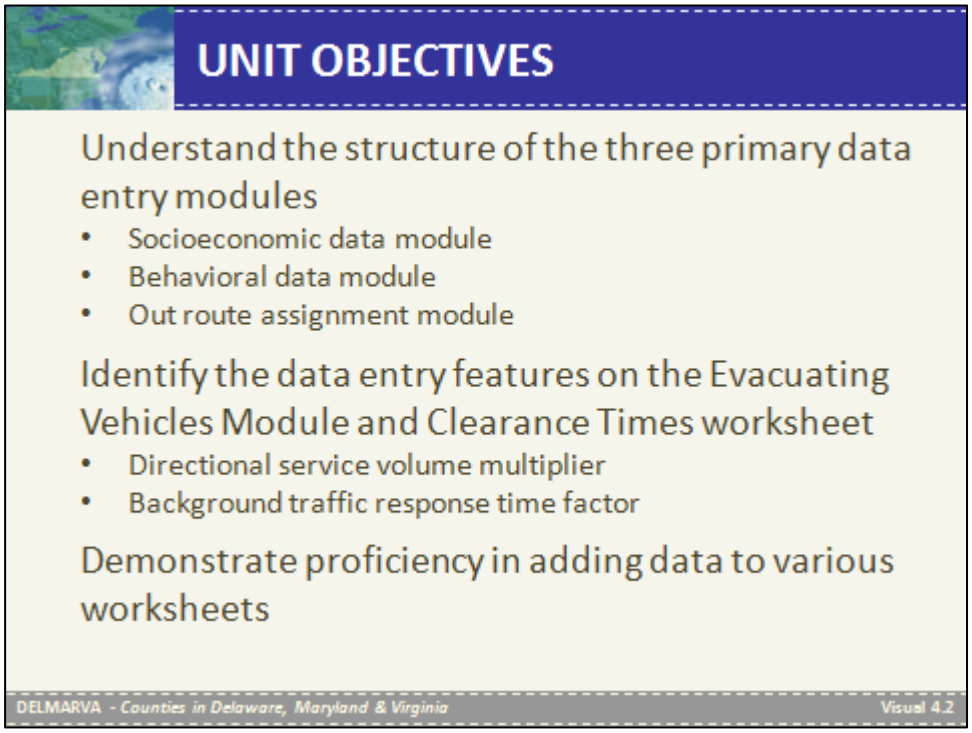
Ask the following questions and ask the participants to raise their hands if they feel that the question might apply to them:

- Do you think that the number of homes or seasonal units in your jurisdiction may have increased since the 2007 study?
- Do you think that the average number people per tourist unit in specific zones might be higher than county averages?
- Are you concerned about shadow evacuation or over evacuation from certain zones?
- Are you concerned that construction could reduce the capacity along certain segments of the evacuation network?

Discuss how the demonstration will allow the participants to modify the model inputs to reflect changes in these areas.

Topic: Unit Objectives

Visual 4.2



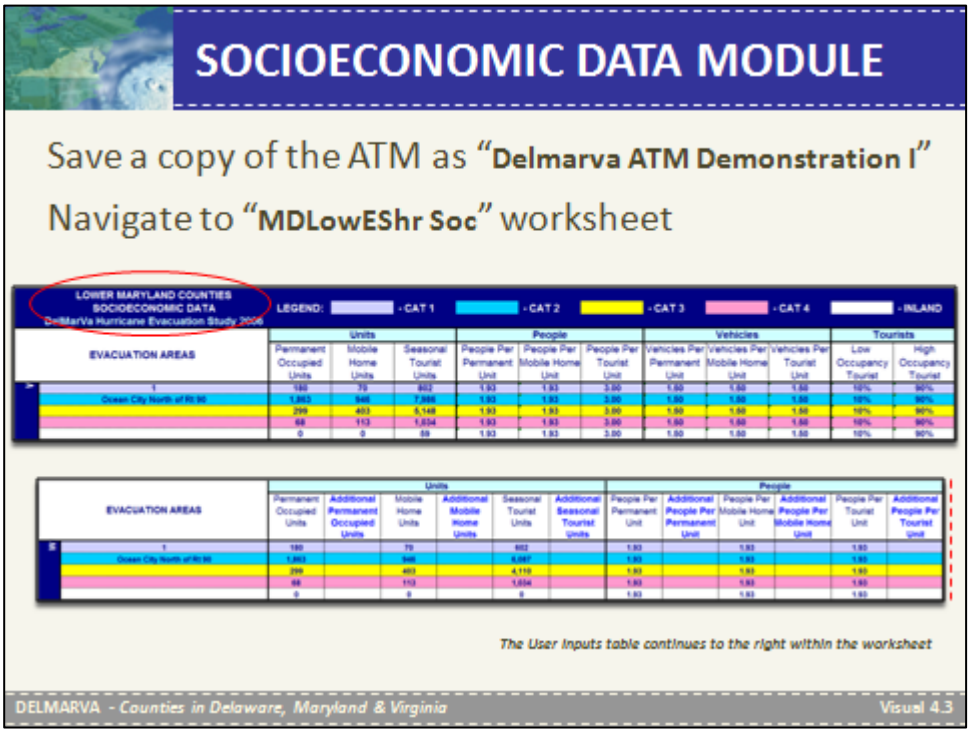
Instructors Notes

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Understand the structure of the three primary data entry modules:
  - Socioeconomic data module,
  - Behavioral data module, and
  - Out route assignment module.
- Identify the data entry features on the Evacuating Vehicles Module and Clearance Times worksheet:
  - Directional service volume multiplier, and
  - Background traffic response time factor.
- Demonstrate proficiency in adding data to various worksheets.

Topic: Socioeconomic Data Module

Visual 4.3



Instructors Notes

Participants should still have their ATMs open from Unit 3. The instructors shall minimize the slide presentation and open the ATM or open the ATM projected on a different screen. Participants should be prompted to save another copy of the Delmarva ATM file using the name "Delmarva ATM Demonstration I" to ensure that the source file remains uncorrupted.
In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Socioeconomic Data Module:

This ATM includes a separate socioeconomic data worksheet for Virginia, three areas in Maryland (Lower, Middle and Upper) and Delaware. These five pages are part of the Socioeconomic Data Module. The Socioeconomic Data Module is a primary data entry module. Rows are established for each of the named and numbered evacuation zones in the region covered by the worksheet. These sets of rows are subdivided by the storm intensity scenario, including storm Category 1, 2, 3, 4, 5 and Inland Areas. The worksheets contain eleven columns of data sets that address housing units, people per unit, vehicles per unit, and seasonal tourist occupancy levels.

The ATM is designed so that the data in the columns may be changed to account for changing local conditions. A convenient data entry table is included below the primary data table to make it easier for users to add additional data as required. These additional figures are added into the totals in the top table, which in turn drive the calculations in the Evacuation Statistics module.

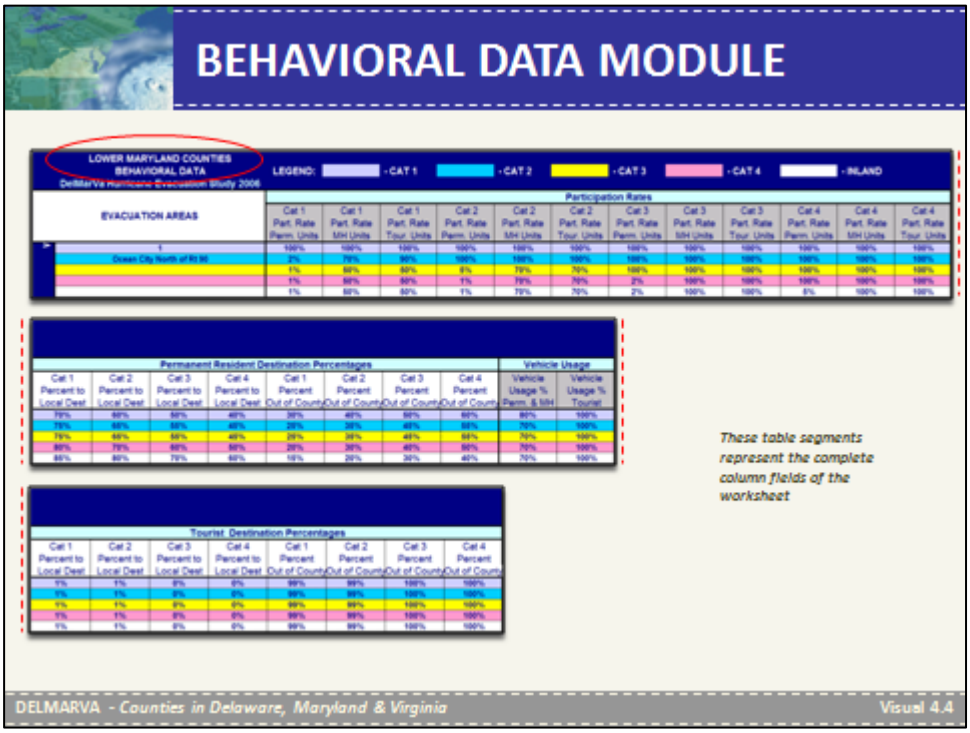
The eleven specific data entry columns in each worksheet include:

- Permanent Occupied Units
- Mobile Home Units
- Seasonal Tourist Units
- People Per Permanent Unit
- People Per Mobile Home Unit
- People Per Seasonal Tourist Units
- Vehicles Per Permanent Unit
- Vehicles Per Mobile Home Unit
- Vehicles Per Seasonal Tourist Units
- Low Occupancy Tourist
- High Occupancy Tourist

After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation of the Socioeconomic Data Module identifying where new data may be entered.

Topic: Behavioral Data Module

Visual 4.4



Instructors Notes

The instructor will direct participants to open the Cape May County behavioral worksheet. The worksheet is labeled “Cape May Behav” on the worksheet tab.
In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Behavioral Data Module:

This ATM includes a separate behavioral data worksheet for Virginia, three areas in Maryland (Lower, Middle and Upper) and Delaware. These five pages are part of the Behavioral Data Module. The Behavioral Data Module is a primary data entry module. Rows are established for each of the named and numbered evacuation zones in the region covered by the worksheet. These sets of rows are subdivided by the storm intensity scenario, including storm Category 1, 2, 3, 4, 5 and Inland Areas. The worksheets contain thirty columns of data sets that address participation rates, permanent resident destination percentages, vehicle usage, and tourist destination percentages. The ATM is designed so that the data in the columns may be changed to account for changing local conditions. The thirty specific data entry columns in each worksheet include:

Participation Rates:

- Category 1 Participation Rates – Permanent Units
- Category 1 Participation Rates – Mobile Home Units
- Category 1 Participation Rates – Tourist Units
- Category 2 Participation Rates – Permanent Units
- Category 2 Participation Rates – Mobile Home Units
- Category 2 Participation Rates – Tourist Units
- Category 3 Participation Rates – Permanent Units
- Category 3 Participation Rates – Mobile Home Units
- Category 3 Participation Rates – Tourist Units
- Category 4 Participation Rates – Permanent Units
- Category 4 Participation Rates – Mobile Home Units
- Category 4 Participation Rates – Tourist Units

Permanent Resident Destination Percentages:

- Category 1 to Local Destination
- Category 2 to Local Destination
- Category 3 to Local Destination
- Category 4 to Local Destination
- Category 1 Out of County
- Category 2 Out of County
- Category 3 Out of County
- Category 4 Out of County

Vehicle Usage:

- Vehicle Usage Percent Permanent and Mobile Home Units
- Vehicle Usage Percent Tourist Units

Tourist Destination Percentages:

- Category 1 to Local Destination
- Category 2 to Local Destination
- Category 3 to Local Destination
- Category 4 to Local Destination
- Category 1 Out of County
- Category 2 Out of County
- Category 3 Out of County
- Category 4 Out of County

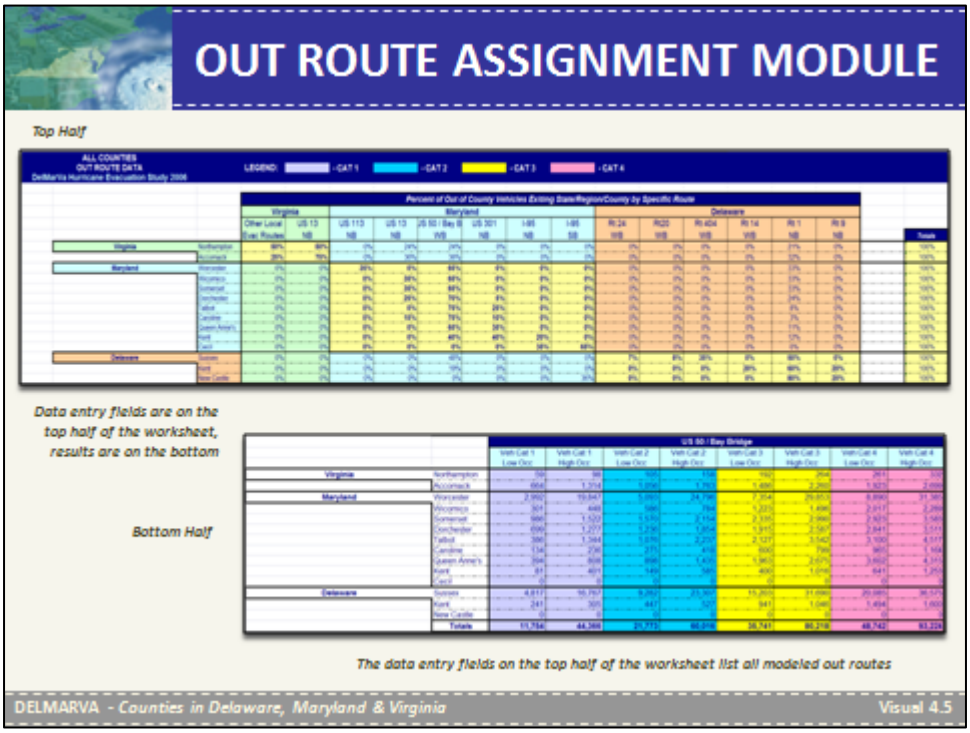
Data in any of these columns may be user defined. It should be noted that all of these data are rates and users should not adjust any one variable below 0% or above 100%. In addition, when adjusting either permanent resident or tourist destination percentages, the sum of the user

defined local destinations and out of county destination for each category of storm must equal 100%. While the model will accept changes that do not sum to 100%, the results of the model will be rendered invalid. Policy changes resulting from modifications to the behavioral assumptions are discouraged without discussion and concurrence between local and state emergency management officials.

After confirming that every participant has opened the appropriate worksheet, proceed with a guided navigation of the Behavioral Data Module identifying where new data may be entered.

Topic: Out Route Assignment Module

Visual 4.5



Instructors Notes

The instructor will direct participants to navigate to the Out Route Assignment Module, which is located on a single worksheet. The worksheet is labeled “Out Route” on the worksheet tab.

In order for participants to understand the structure of the Delmarva ATM, the instructor will provide the following description of the Out Route Assignment Module:

The ATM Out Route Assignment Module includes two components in one worksheet. The top half of the worksheet includes a data entry table to calculate the Percent of Out of County Vehicles Exiting the State/Region/County by a Specific Route. Rows are established for each county in the study area. The worksheet includes fourteen columns corresponding to the major out route possibilities (two for Virginia and six each for Delaware and Maryland). The user can adjust these out route percentages to test different scenarios or alternate public information strategies regarding suggested route usage.

Data in any of these columns may be user defined. It should be noted that all of these data are percentages and users should not adjust any one variable below 0% or above 100%. In addition, when adjusting changing routing assignment percentages, the sum of the out routing percentages for a given state on the major out routes identified for that state must equal 100%. While the model will accept changes that do not sum to 100%, the results of the model will be rendered invalid.

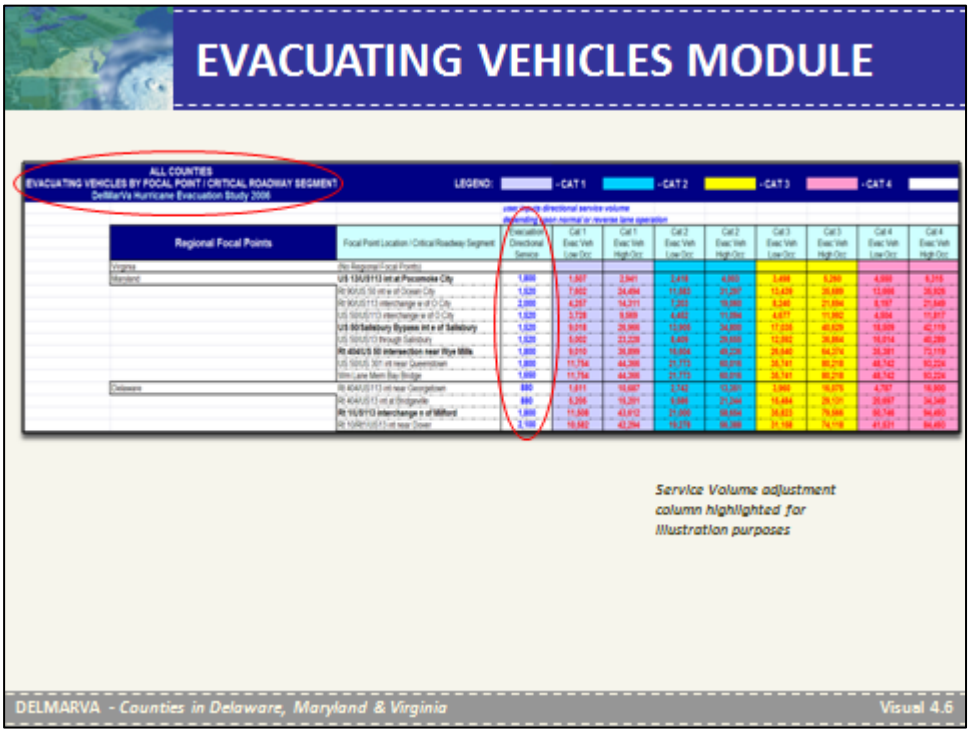
Changes made in out routing percentages are reflected in the lower half of the worksheet which includes a series of data output tables. The tables derive the Number of Out of County Vehicles Exiting the State/Region/County by a Specific Route. A separate table is included for each of the fourteen major out routes identified in the model. Rows are established for each county in the study area. Each table has eight columns, identifying the number of vehicles utilizing the roadway during both high and low tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events.

Changes made in out routing percentages are also reflected in the two worksheets that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet and the Clearance Times worksheet.

After confirming that every participant has opened the appropriate worksheet, proceed with a guided navigation of the Out Route Assignment Module identifying where new data may be entered, emphasizing that it is suggested that only the green labeled numbers be adjusted by everyday model users. More sophisticated reassignments of out routing are possible, but care must be taken to ensure that all traffic is accounted for.

Topic: Evacuating Vehicles Module and Clearance Time Worksheet

Visual 4.6



Instructors Notes

The instructor will direct participants to navigate to the Evacuating Vehicles Module, which is located on a single worksheet. The worksheet is labeled “Vehicles by Rd” on the worksheet tab.

In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Evacuating Vehicles Module:

The ATM’s Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet is primarily a data results module. While its full structure will be explained in Unit 5, it is comprised of two tables; regional and local county focal points that represent the key focal points reviewed in the study. Both tables include rows representing the key focal points in each state, if applicable. The columns include the focal point location or name of the critical roadway segment, the evacuation directional service volume (vehicles per hour) variable on the segment, and eight columns identifying the number of vehicles utilizing the roadway during both high and low tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events.

The evacuation directional service volume (vehicles per hour) variable on the segment column allows for data entry. The directional service volume may be changes to test reverse lane operations or other roadway capacity modification scenarios. The eight columns identifying the number of vehicles utilizing the roadway during both high and low tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events are data output columns derived from the directional service volume data.

After confirming that every participant has opened the appropriate worksheet, proceed with a guided navigation of the Evacuating Vehicles Module identifying where new data may be entered.

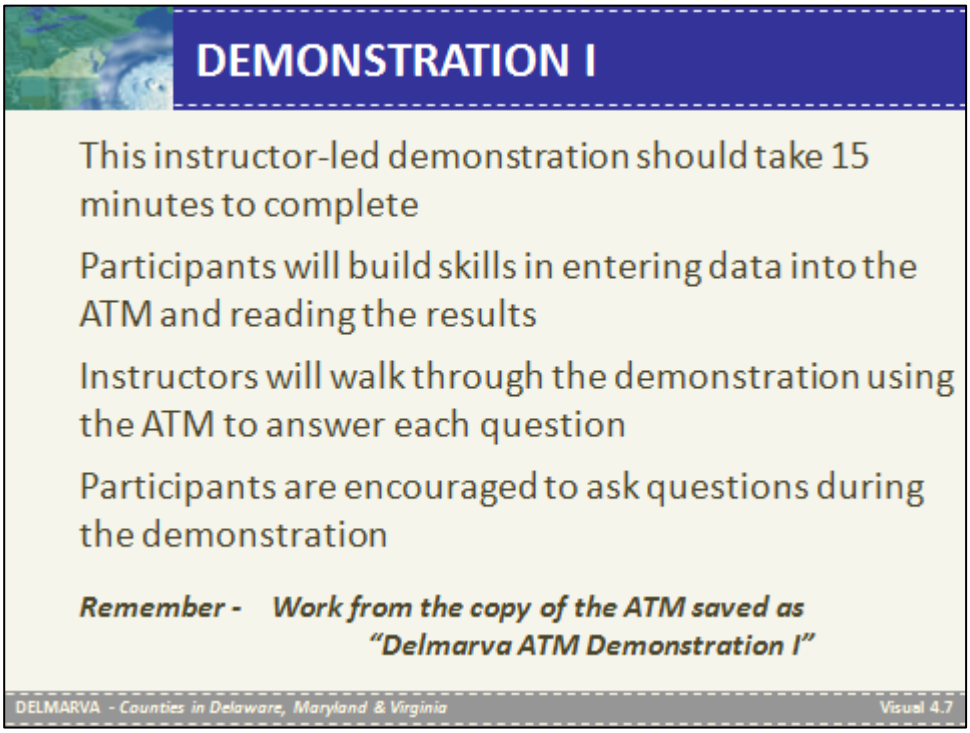
After reviewing the data entry components of Evacuating Vehicles Module, direct the participants to open the Clearance Time Worksheet, which they worked with previously in Unit 3. Provide the following discussion:

The ATM's Clearance Times worksheet is primarily a data output table. The worksheet includes five data columns, the fifth of which allows for the inclusion of a background traffic response time factor, or how many hours it takes the background traffic to clear in the event of an evacuation. This is the sole user defined, data entry component of this worksheet. These data may be modified to test delays associated with roadway repairs or other factors.

After confirming that every participant has opened the appropriate worksheet, proceed with a guided navigation of the Clearance Times worksheet identifying where new data may be entered.

Topic: DEMONSTRATION I

Visual 4.7



Instructors Notes

The instructor will inform the participants that the demonstration is an opportunity to illustrate their skill in entering data into the ATM. It should be noted that this is not an exercise or a test, but rather a skill building opportunity.

Remember, this is an instructor led demonstration that should only take 15 minutes to complete. Note: If the participants were to be provided the demonstration questions in the form of an exercise, it would take much longer to complete.

The instructors will set up the scenario and ask each of the listed questions. The instructors will encourage the participants to get started answering the questions, but will walk the class through using the ATM to answer each question. The instructors will encourage the class to ask questions during the demonstration to ensure they understand how to use the ATM.

Participants should be reminded that they should be working in a file saved as "Delmarva ATM Demonstration I" to ensure that the source file remains uncorrupted. After entering the data into

Demonstration I, they will be able to compare their Clearance Times worksheet to that from the unedited version of the ATM.

Demonstration I, they will be able to compare their Clearance Times worksheet to that from the unedited version of the ATM.

The instructor will read the following scenario to the participants and ask them to modify data in their ATM accordingly.

DEMONSTRATION I:

You are an emergency manager interested in updating plans related to Worchester County, Maryland. Time has passed since the last time the ATM was used and you have concerns regarding changed local conditions. You understand that the regional focal point at the William Preston Lane Memorial Bridge is the determining bottleneck for your county clearance time. You are interested in whether these changing conditions may affect the clearance times.

Address the following by modifying your ATM.

The instructors will actively, but slowly work through solving the questions on a copy of the ATM projected for the class. The instructors will let the participants know that if they need assistance, they should please ask for help.

1) In the wake of a recent major storm, there has been significant post-storm redevelopment. A series of new beach front high rise hotel units have been built. These buildings have contributed to additional units in the following zones:
    a. 1000 additional tourist units in zone 1 (Ocean City North of Rt 90) in category 1
    b. 1200 additional tourist units in zone 2 (Ocean City South of Rt 90) in category 1

2) Due to a new factory opening and resultant job opportunities, the following zones have seen growth in permanent dwelling units:
    a. Zone 22 (Pokomoke City Inland) 300 units in each of the four storm category zones
    b. Zone 23 (Pokomoke City Riverine) 500 units in both the category 1 and 2 zones
    c. Zone 24 (Pokomoke City NE) 1000 units in the category 2 zone.

3) You have obtained new data that suggests that the vehicle per tourist unit estimates county-wide are low. They should be increased by 1.0 in each zone across the board.

4) Due to road construction, the directional service volume at Philadelphia Av / US 50 interchange in Ocean City has been reduced by about half. Construction at the Coastal Highway / Rt 90 interchange in Ocean City has also reduced the service volume by about half.

5) Due to a boat show In Ocean City, the background response rate factor at these two local focal points has been increased to 3.

It is Wednesday, June 23. You are concerned primarily about what the impacts of a moderate level Category 2 storm might be. Based on these changes, answer the following questions:

Question 1: What is the new clearance time for this scenario at the local focal point at the Philadelphia Av / US 50 interchange? Has it gone up?

Question 2: How do things look at the regional focal point at the US 13 / US 113 interchange at Pokomoke City?

Question 3: Has the time to clear Worcester County of traffic gone up?

Question 4: What is impact of these changes on the clearance time at the bottleneck at the US 50 / US 13 bypass East of Salibury, MD?

The instructors will compare the two Clearance Times worksheets and provide the answers to the questions, as listed below:

Answer 1: Due primarily to the construction at the bottlenecks, and somewhat due to an increased number of vehicles leaving Ocean City, the new clearance time has increased tremendously and is at **38.9** hours, up from **9.5** hours

Answer 2: The clearance time at the US 13 / US 113 interchange at Pokomoke City remains unchanged at **5.4** hours

Answer 3: The time to clear Worcester County has gone up from **42.2** hours to **53.7** hours

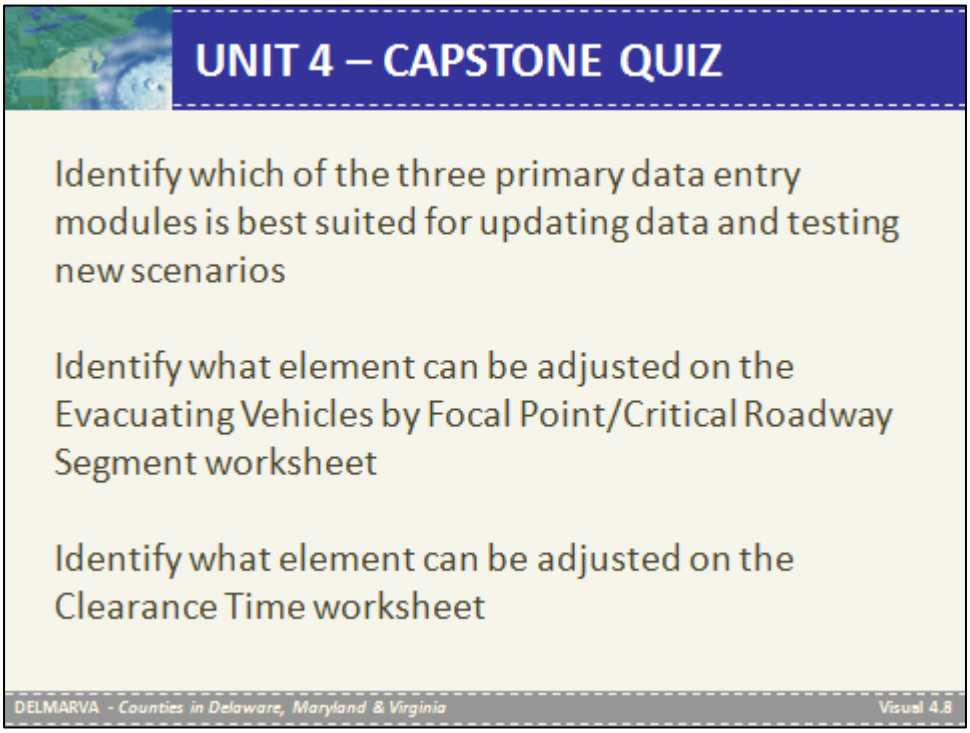
Answer 4: The clearance time at the US 50 / US 13 Bypass East of Salisbury has gone up from **29.7** hours to **41.8** hours.

The instructors will elicit a discussion on the demonstration upon its completion.

One of the issues the instructors should highlight is the impact that reduced service volumes may have on clearance times. Reductions could be caused by construction, of which state and local governments may have some control over the timing of, or emergencies such as traffic accidents, inland flooding, or other factors.

Topic: Unit Capstone Quiz

Visual 4.8



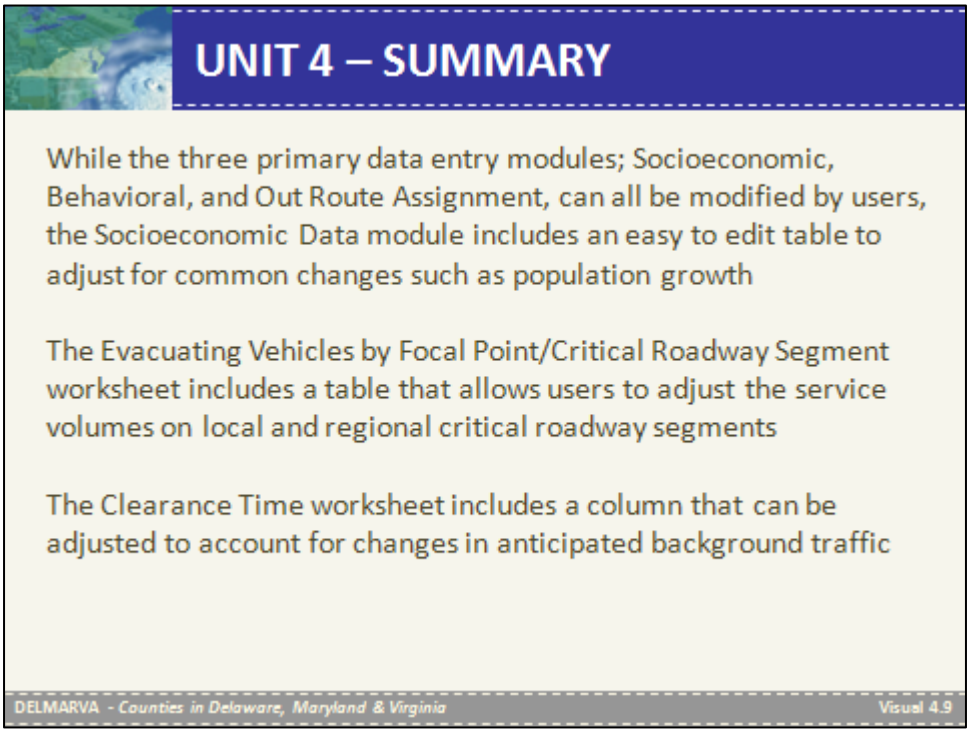
Instructors Notes

Ask participants if they can now:

- Identify which of the three primary data entry modules is best suited for updating data and testing new scenarios.
- Identify what element can be adjusted on the Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet.
- Identify what element can be adjusted on the Clearance Time worksheet.

Topic: Summary

Visual 4.9



Instructors Notes

Summarize this unit by reminding the group that:

- While the three primary data entry modules; Socioeconomic, Behavioral, and Out Route Assignment, can all be modified by users, the Socioeconomic Data module includes an easy to edit table to adjust for common changes such as population growth.
- The Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet includes a table that allows users to adjust the service volumes on local and regional critical roadway segments.
- The Clearance Time worksheet includes a column that can be adjusted to account for changes in anticipated background traffic.

Ask if anyone has any questions about anything covered in this unit.

Transition to the next unit by explaining that Unit 5 will cover the primary data results modules and will include another instructor guided demonstration of the ATM's functionality.

Announce the break for lunch.

Unit 5: Data Results Modules

DEMONSTRATION II

Objectives

At the end of this unit, the participants should be able to:

- Understand the structure of the two primary data results modules
- Interpret the data results portion of the Out Route Assignments module
- Understand the connection between the Clearance Times worksheet and the HES's Clearance Times table
- Demonstrate proficiency in identifying and interpreting data from various worksheets

Scope

- Unit Introduction
- Unit Objectives
- Evacuation Statistics Module
- Evacuating Vehicles Module
- Out Route Assignment Results
- Clearance Times Table Interpretation
- DEMONSTRATION II
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After providing a demonstration of each of the specific data results modules, the instructors will ask the participants to undertake a demonstration to illustrate their proficiency in interpreting data from various worksheets. The instructors will make themselves available to assist participants in data entry.

Once the demonstration has been completed, the answers and interpretations will be discussed. After this discussion is completed, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 6.

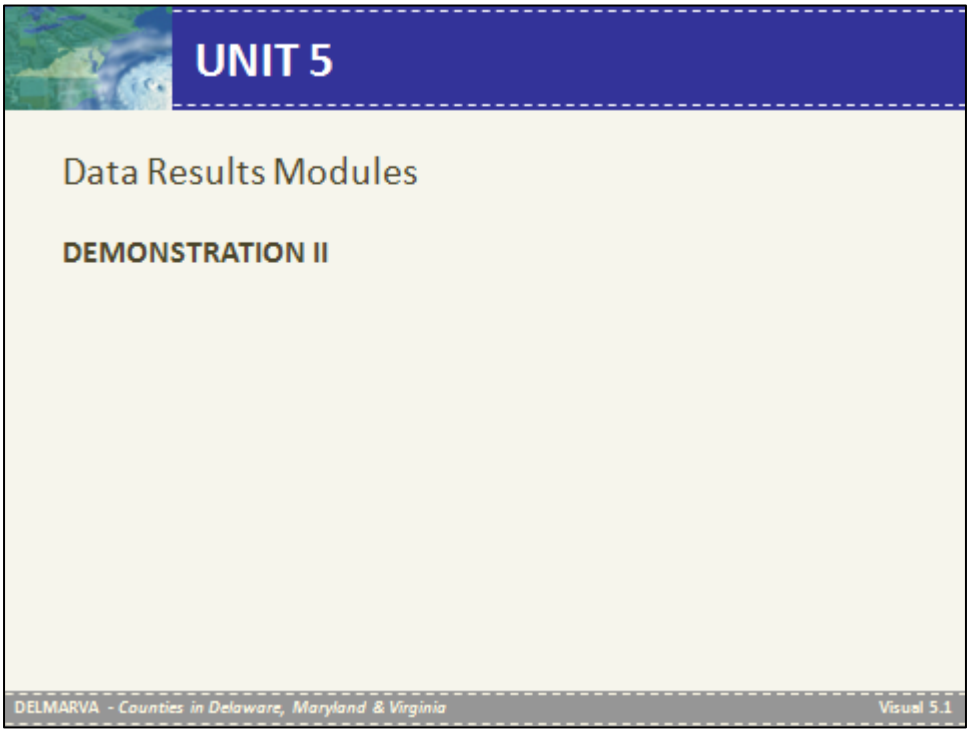
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
Evacuation Statistics Module	5 minutes
Evacuating Vehicles Module	10 minutes
Out Route Assignment Module	5 minutes
Clearance Time Worksheet	10 minutes
DEMONSTRATION II	15 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**1 hour**

Topic: Unit Introduction

Visual 5.1



Instructors Notes

Explain that Unit 5 provides a more in-depth review of the data results modules of the ATM and provides participants with an opportunity to demonstrate their ability to identify and interpret data from different worksheets. The next visual will outline the objectives for this unit.

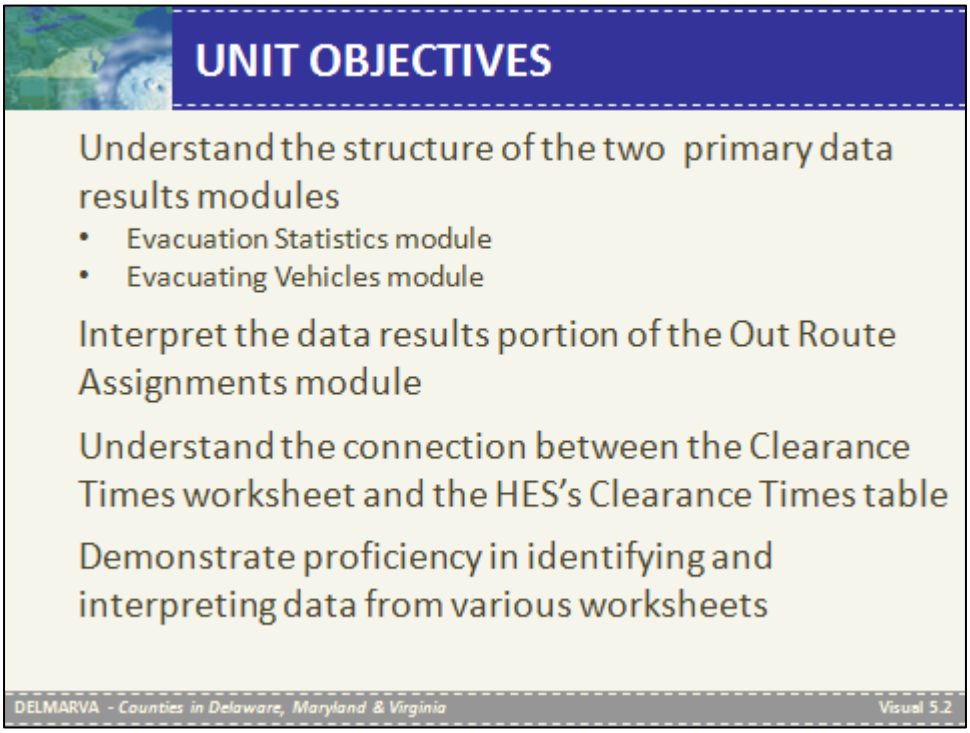
Ask the following questions and ask the participants to raise their hands if they feel that the question might apply to them:

- Do tourism levels in your county differ in August compared to February?
- About what percentage do these levels vary by?
- Do you know what the most congested bottleneck or critical roadway segment is in your county?
- What bottleneck or intersection do you think determines the Clearance Time for your county?
- Could this determining bottleneck be outside of the county?

Discuss how the demonstration will allow the participants to better identify and interpret the model results as it relates to these and other questions.

Topic: Unit Objectives

Visual 5.2



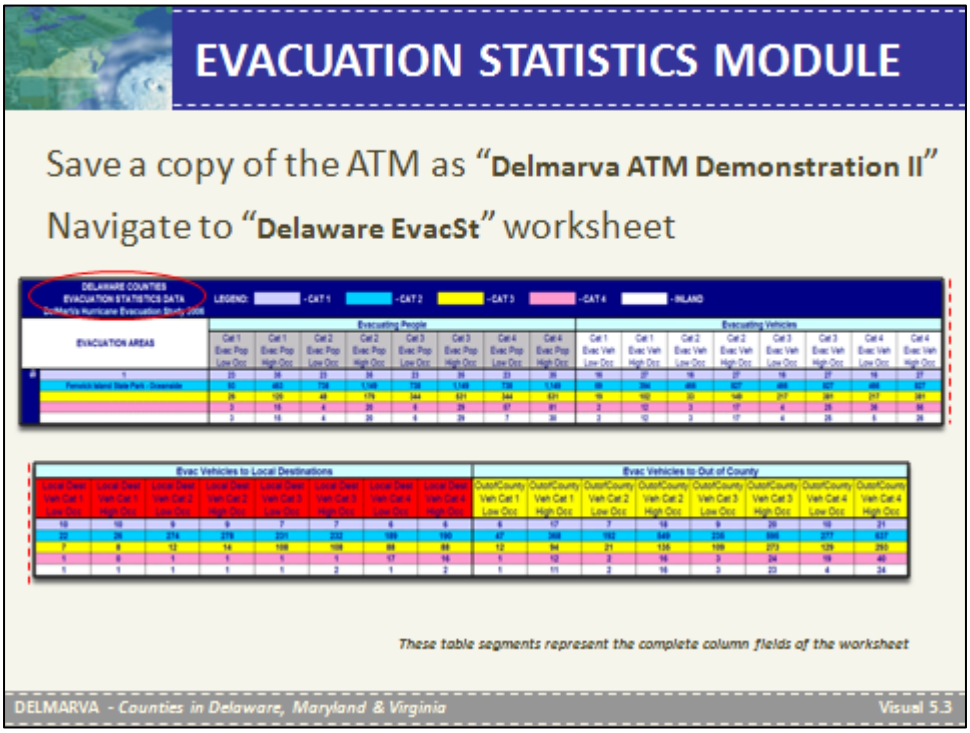
Instructors Notes

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Understand the structure of the two primary data results modules:
  - Evacuation Statistics module, and
  - Evacuating Vehicles module.
- Identify the results components of the Out Route Assignment module.
- Understand the connection between the Clearance Times worksheet and the HES's Clearance Times table.
- Demonstrate proficiency in identifying and interpreting data from various worksheets.

Topic: Evacuation Statistics Module

Visual 5.3



Instructors Notes

The instructors shall minimize the slide presentation and open the ATM or open the ATM projected on a different screen. Participants should be prompted to save another copy of the Delmarva ATM file using the name "Delmarva ATM Demonstration II" to ensure that the source file remains uncorrupted.

In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Evacuation Statistics Module:

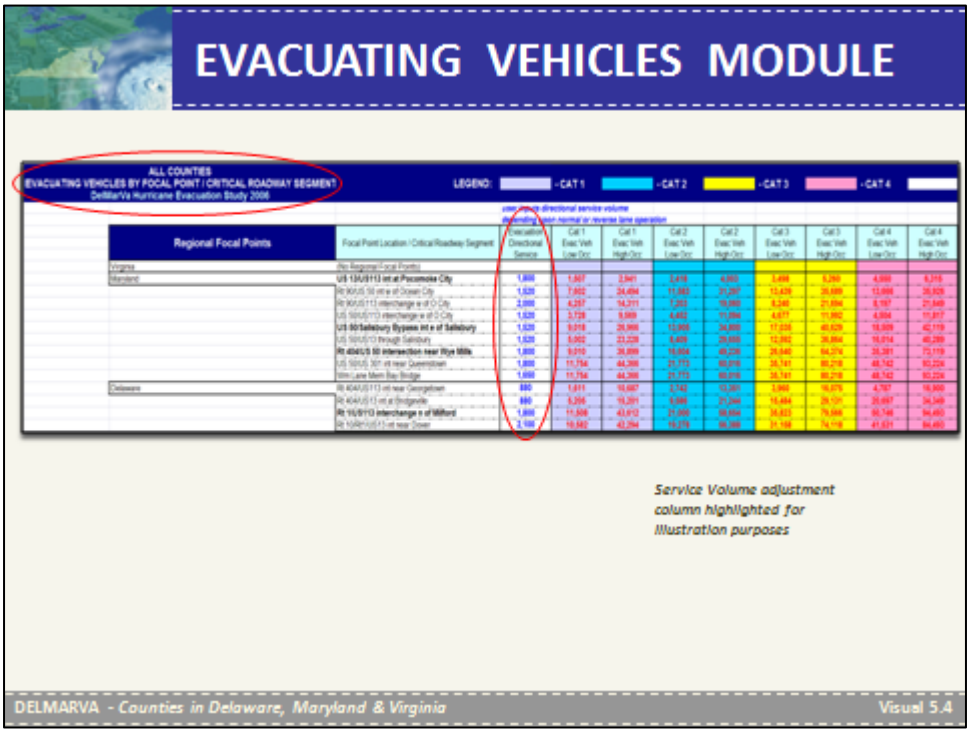
This ATM includes a separate Evacuation People and Vehicle Statistics data worksheet for Virginia, three areas in Maryland (Lower, Middle and Upper) and Delaware. These five pages are part of the Evacuation Statistics Module. The Evacuation Statistics Module is a formula driven, data output module based on the data entered into the Socioeconomic Data Module and the Behavioral Data Module. Rows are established for each of the named and numbered evacuation zones in the region covered by the worksheet. These sets of rows are subdivided by the storm intensity scenario, including storm Category 1, 2, 3, 4, 5 and Inland Areas. The

worksheets contain thirty two columns of data sets that address evacuating people and evacuating vehicles. The total evacuating vehicles are further broken down into evacuating vehicles to local destinations and out of county destinations.

After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation of the Evacuation Statistics Module, identifying each data field.

Topic: Evacuating Vehicles Module

Visual 5.4



Instructors Notes

In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Evacuating Vehicles Module:

First presented in Unit 4, we will provide more detail on the full structure of the ATM's Evacuating Vehicles Module. The Module's Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet is comprised of three tables; regional bottlenecks, local bottlenecks, and other local critical segments corresponding primarily to out routes off the barrier islands. These tables include rows representing the key focal points reviewed in this study. The columns include the bottleneck location or name of the critical roadway segment, the evacuation directional service volume (vehicles per hour) variable on the segment, and eight columns identifying the number of vehicles utilizing the roadway during both high and low tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events.

As was discussed in Unit 4, the evacuation directional service volume (vehicles per hour) variable on the segment column allows for data entry. The directional service volume may be

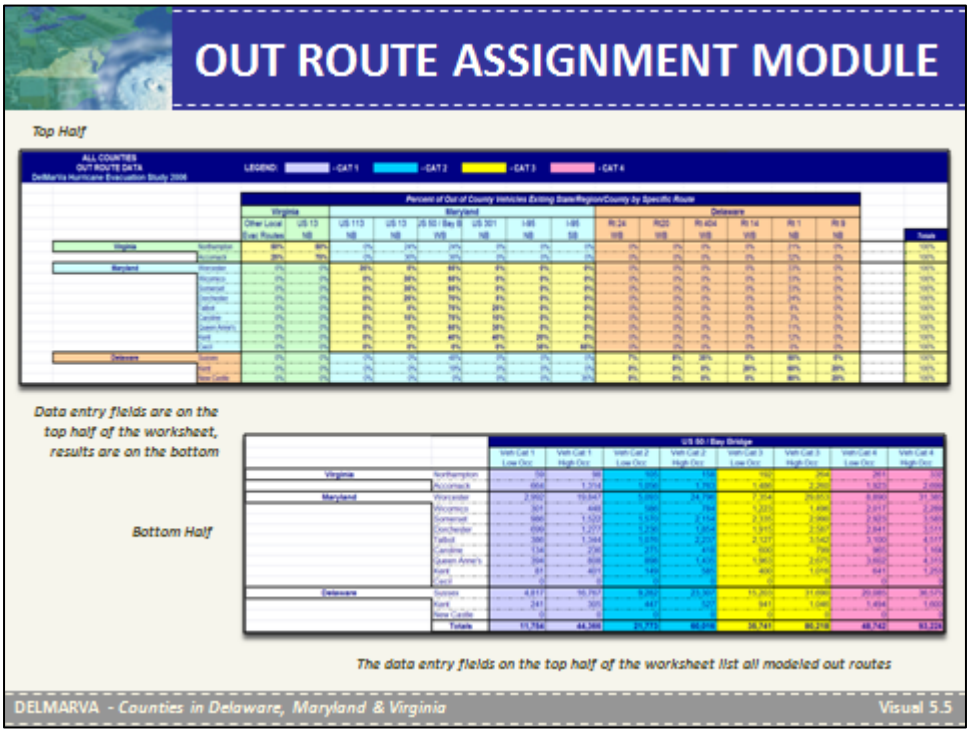
changed to test reverse lane operations or other roadway capacity modification scenarios. These modified figures are adjusted in the totals in the top table, which in turn drive the calculations in the Clearance Times worksheet.

The eight columns identifying the number of vehicles utilizing the roadway during both low and high tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events are data output columns derived from the directional service volume data.

After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation of the Evacuating Vehicles Module, identifying each data field.

Topic: Out Route Assignment Module

Visual 5.5



Instructors Notes

The instructor will note that, like with the Evacuating Vehicles module, the participant will be working with a worksheet they first investigated in Unit 4 – the Out Route Assignment Module. The instructor will direct participants to navigate to the Out Route Assignment Module, which is located on a single worksheet. The worksheet is labeled “Out Route” on the worksheet tab.

In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Out Route Assignment Module:

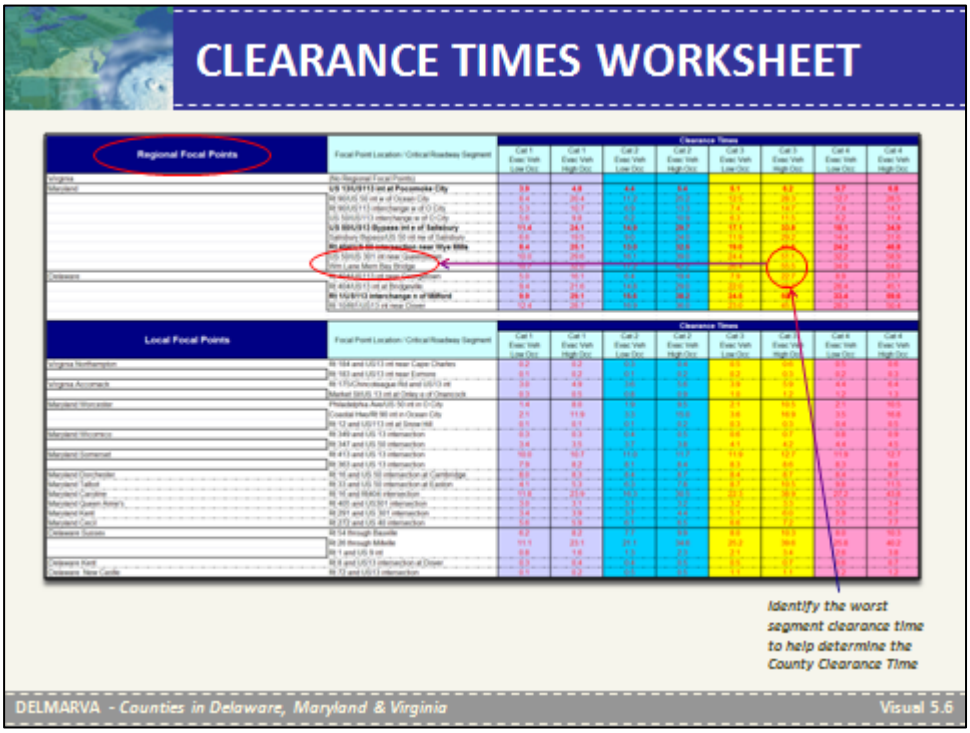
First presented in Unit 4, we will provide more detail on the full structure of the ATM’s Out Route Assignment Module. The ATM Out Route Assignment Module includes two components in one worksheet. As was discussed in Unit 4, the top half of the worksheet includes a data entry table to calculate the Percent of Out of County Vehicles Exiting the State/Region/County by a Specific Route. Rows are established for each county in the study area. The worksheet includes fourteen columns corresponding to the major out route possibilities (two for Virginia and six each for Delaware and Maryland).

The user can adjust these out route percentages to test different scenarios or alternate public information strategies regarding suggested route usage. Changes made in out routing percentages are also reflected in the two worksheet that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet and the Clearance Times worksheet.

After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation of the Out Route Assignment Module, with special focus on interpreting the results from the left hand portion of the worksheet.

Topic: Clearance Time Worksheet

Visual 5.6



Instructors Notes

The instructor will note that, like with the previous two modules, the participant will be working with a worksheet they first investigated in Unit 3 – the Clearance Times worksheet. The instructor will direct participants to navigate to the Clearance Times worksheet, which is labeled "Clearance Tms" on the worksheet tab.

In order for participants to understand the structure the Delmarva ATM, the instructor will provide the following description of the Clearance Times worksheet:

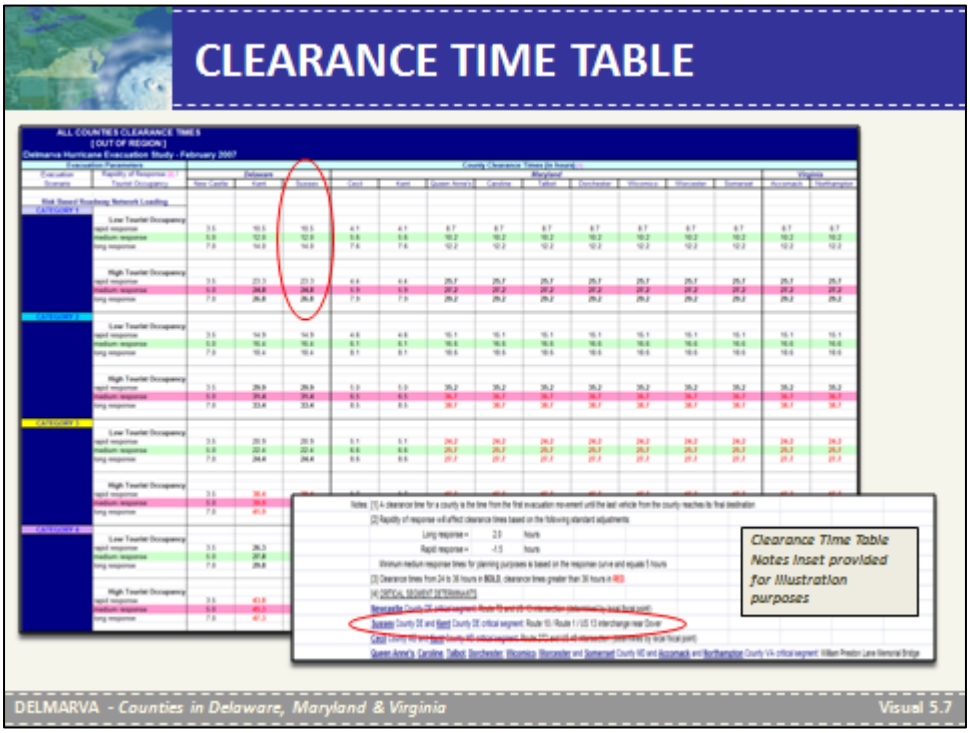
First presented in Unit 4, we will provide more detail on the full structure of the ATM's Clearance Times worksheet. The ATM's Clearance Times worksheet has the same basic structure as the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet, except it does not include a column, like that for the evacuation directional service volume (vehicles per hour) variable, for data entry. It is primarily a data output table. The worksheet calculates hurricane evacuation clearance times at each of the regional and local county focal points during both high and low tourist occupancy scenarios in Category 1, 2, 3 and 4 storm events.

The worksheet includes four additional columns that derive the evacuation service volume for the first, second, third and fourth quarter of the evacuation, respectively. The fifth and final additional column allows for the inclusion of a background traffic response time factor, or how many hours it takes the background traffic to clear in the event of an evacuation.

After confirming that every participant has opened the ATM and is on the home screen, proceed with a guided navigation of the Clearance Time worksheet, with special focus on identifying the clearance times at specific bottlenecks and along key routes.

Topic: Clearance Time Table

Visual 5.7



Instructors Notes

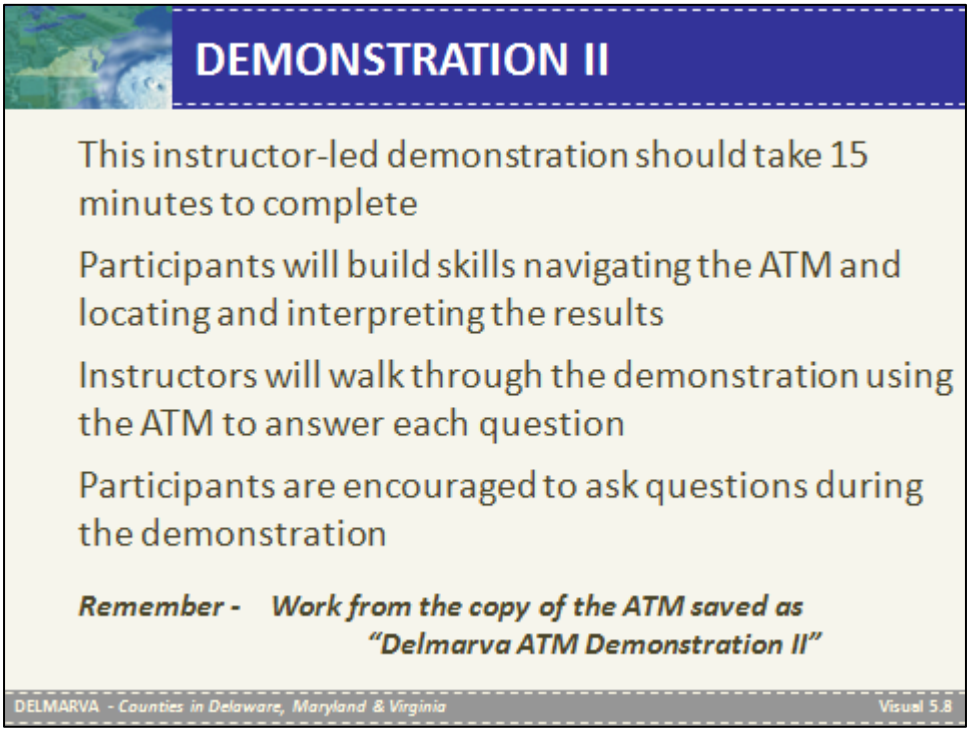
The instructor will tell the participants that the ATM provides clearance times at specific bottlenecks, but that determining a County clearance time, such as those that are used in HURREVAC, requires interpretation. Participants shall be reminded that a County clearance time is based on the least efficient critical roadway segment along which a significant portion of the County's evacuating traffic must pass.
In order for participants to understand how the Clearance Time Worksheet informs the Clearance Time table, the instructors will go over the Clearance Time table delivered as part of the HES.

The instructors will review the top half of the Clearance Time table and explain that the medium response time come directly from the least efficient/ determining bottleneck on the Clearance Time worksheet. The instructors will demonstrate how to review the clearance times for different counties under varying scenarios.

The instructors will discuss the notes portion located at the bottom of the Clearance Time table. This section identifies the determining bottlenecks for each county under different scenarios.

Topic: DEMONSTRATION II

Visual 5.8



Instructors Notes

The instructor will inform the participants that the demonstration is an opportunity to illustrate their skill in navigating the ATM and finding and interpreting key data. It should be noted that this is not an exercise or a test, but rather a skill building opportunity.
Remember, this is an instructor led demonstration that should only take 15 minutes to complete. Note: If the participants were to be provided the demonstration questions in the form of an exercise, it would take much longer to complete.

The instructors will set up the scenario and ask each of the listed questions. The instructors will encourage the participants to get started answering the questions, but will walk the class through using the ATM to answer each question. The instructors will encourage the class to ask questions during the demonstration to ensure they understand how to use the ATM.

Participants should be reminded that they should have opened the ATM and be working in a file version saved as "Delmarva ATM Demonstration II" to ensure that the source file remains uncorrupted. Even though no new data will be entered in this demonstration, it is recommended that users save and rename a working copy of the master version of the ATM every time it is used.

The instructor will read the following scenario to the participants and ask them to modify data in their ATM accordingly.

DEMONSTRATION II:

You are an emergency manager with responsibilities that include or extend to Accomack County, Virginia. While you use HURREVAC, you are interested in checking some of your evacuation statistics as well as the anticipated traffic volumes along different evacuation routes that individuals departing from your county may use.

Answer the following question by navigating through and interpreting the data in your ATM.

The instructors will actively, but slowly work through solving the questions on a copy of the ATM projected for the class. The instructors will let the participants know that if they need assistance, they should please ask for help.

The instructors will introduce the first two questions, which will require the participants to use both the Socioeconomic Data and Evacuation Statistics modules.

Question 1: For evacuation zone A1 (Chincoteague) in a category 3 event:

a. What is the default tourist occupancy rate in February?
b. What is the default tourist occupancy rate in July?
c. Which worksheet would need to be changed in order to adjust these defaults?

Question 2: In a category 3 storm, what is number of evacuating vehicles:

a. Countywide, in February?
b. Countywide, in July?
c. That may be expected to evacuate to a local destination in July?
d. That may be expected to evacuate out of county in July?

At this time, the instructors will show an evacuation route map with the local and regional bottlenecks labeled.

The instructor will cover the next three questions, letting the participants know that they will be asked to interpret the results in the ATM.

Due to the limited number of out-routes, evacuating traffic from Accomack County can head in only one direction – north along the US 13. Travelling northbound along the US 13, evacuees continue to have few out route options. After passing through Pokomoke City, most evacuees will either veer northwest to travel along US 113 north, or continue north / northeast on US 13 north.

Based on these assumptions, answer the following questions:

Question 3: Identify the total number of evacuating vehicles expected to pass through the listed bottleneck during a Category 3 storm occurring in July:

a. At the regional focal point at the Rt 90 / US 113 interchange west of Ocean City
b. At the regional focal point at the US 50 / US 113 interchange northwest of Salisbury

Question 4: In the same storm scenario (Category 3, high tourist occupancy) what is the clearance time:

a. At the local focal point at the Rt 175 / Chicoteague Rd and the US 13 interchange,
b. At the regional focal point at the US 13 / US 113 interchange at Pokomoke City,
c. At the Rt 90 / US 113 interchange west of Ocean City, and
d. At the regional focal point at the US 50 / US 113 interchange northwest of Salisbury.

Question 5: In the same storm scenario, understanding that the bottlenecks listed may not represent the final destinations of evacuees from Accomack County;

a. Are there any listed bottlenecks further north / west along US 50 that have higher clearance times than at the US 50 / US 113 interchange northwest of Salisbury?
b. Which of these bottlenecks exhibits the highest clearance time?
c. What is the estimated County clearance time for Accomack County?

The instructors will provide the answers to the questions

Answer 1: The default tourist occupancy rates are **30%** for February, which is low occupancy, and **90%** for July, which is high occupancy. These defaults may be changed on the Virginia Socioeconomic Data worksheet.

Answer 2: In a category 3 intensity storm, the number of evacuating vehicles expected countywide in February is **8,541**. In July (during high tourist occupancy) **10,692** vehicles would be expected. During high season (July) **4,413** vehicles may be expected to evacuate to a local destination, while **6,279** vehicles may be expected to evacuate out of county.

Answer 3: In a category 3 intensity storm at high tourist occupancy, **21,694** vehicles are expected to pass through the bottleneck at the Rt 90 / US 113 interchange west of Ocean City, while **36,864** vehicles are expected to pass through the bottleneck at the US 50 / US 113 interchange northwest of Salisbury.

Answer 4: In a category 3 intensity storm at high tourist occupancy, the clearance time at the local focal point at the Rt 175 / Chicoteague Rd and the US 13 interchange is **5.9** hours, while the regional focal point at the US 13 / US 113 interchange at Pokomoke City **6.2** hours. At the Rt 90 / US 113 interchange west of Ocean City the clearance time is **14.7** hours. At the regional focal point at the US 50 / US 113 interchange northwest of Salisbury the clearance time is **29.2** hours.

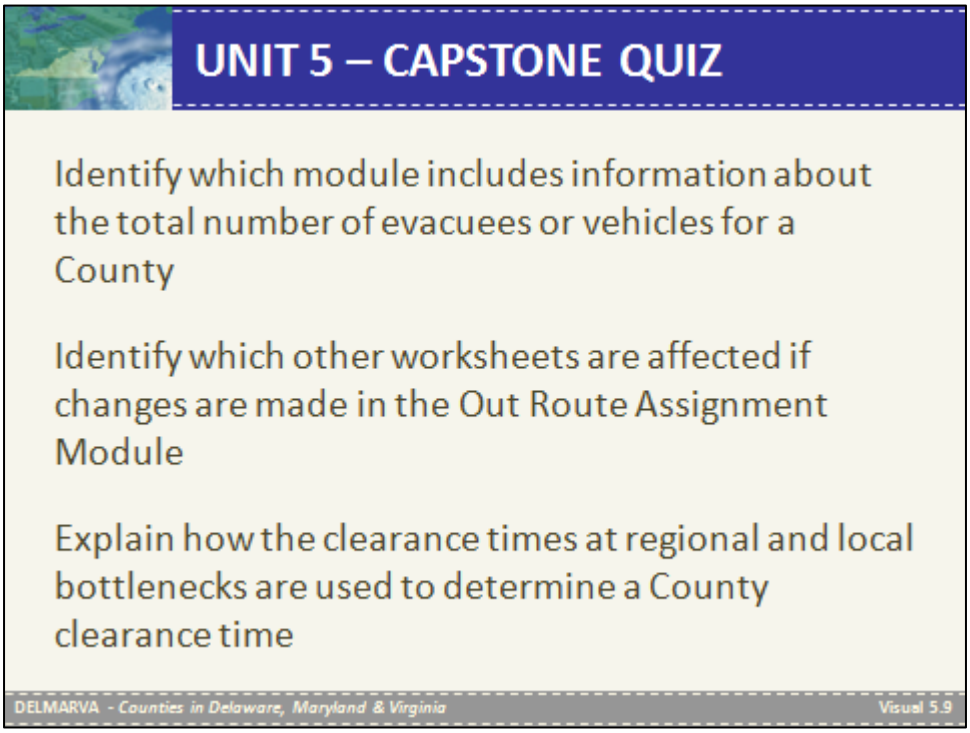
Answer 5: **Yes**, the bottleneck at the **US 50/US 301 interchange near Queenstown** has a clearance time of **51.1** hours. The clearance time for Accomack County is still determined by the bottleneck at the William Preston Lane memorial Bridge, which has a clearance time of **55.5** hours.

The instructors will elicit a discussion on the demonstration upon its completion.

One of the issues the instructors should highlight is how specific bottlenecks anywhere in the evacuation roadway network may determine a County clearance time.

Topic: Unit Capstone Quiz

Visual 5.9



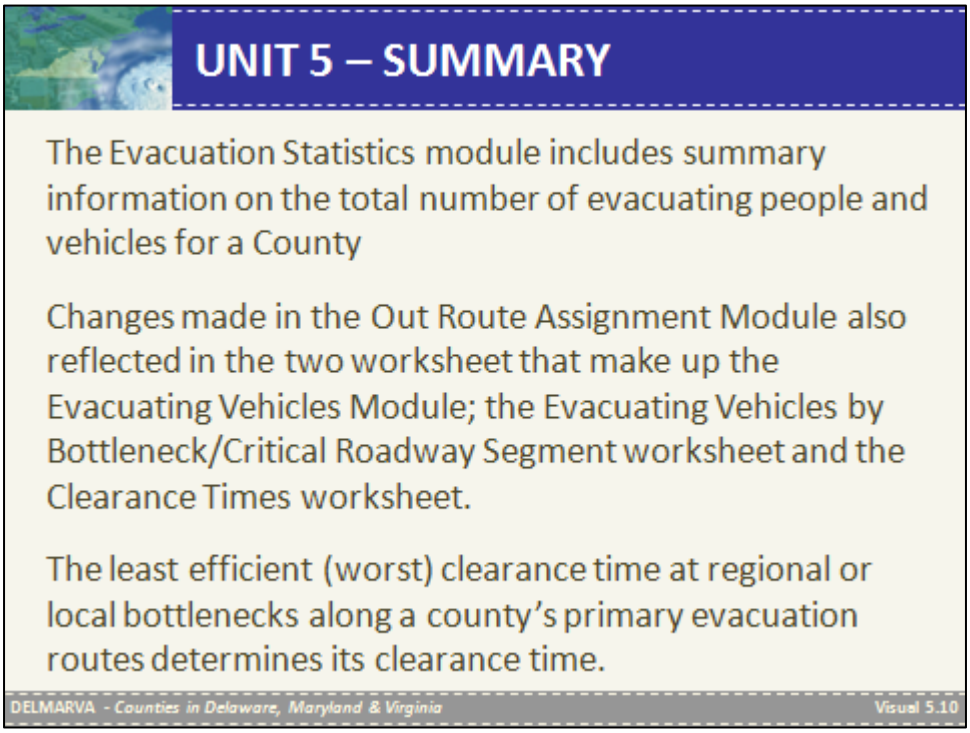
Instructors Notes

Ask participants if they can now:

- Identify which module includes information about the total number of evacuees or vehicles for a County
- Identify which other worksheets are affected if changes are made in the Out Route Assignment Module
- Explain how the clearance times at regional and local bottlenecks are used to determine a County clearance time

Topic: Summary

Visual 5.10



Instructors Notes

Summarize this unit by reminding the group that:

- The Evacuation Statistics module includes summary information on the total number of evacuating people and vehicles for a County
- Changes made in the Out Route Assignment Module also reflected in the two worksheet that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet and the Clearance Times worksheet.
- The least efficient (worst) clearance time at regional or local bottlenecks along a county's primary evacuation routes determines its clearance time.

Ask if anyone has any questions about anything covered in this unit.

Transition to the next unit by explaining that Unit 6 will cover the Consequence Management module. Note that it will also include an exercise to test the participants' use of the ATM and the Consequence Management Module.

Unit 6: Consequence Management Module

EXERCISE I

Objectives

At the end of this unit, the participants should be able to:

- Understand the purpose and use of the Consequence Management module
- Identify the module's data entry features
- Demonstrate proficiency in manipulating and interpreting data from the module

Scope

- Unit Introduction
- Unit Objectives
- Consequence Management module
- EXERCISE I
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After providing a demonstration of the Consequence Management module, the instructors will introduce Exercise I, which will test the participants' proficiency in using the ATM and Consequence Management Module and interpreting the results.

Since this is an exercise, rather than a demonstration, the participants will be expected to navigate the ATM to answer the proposed questions on their own. The instructors will monitor the participant progress and will provide direct instruction to individual participants if they encounter difficulties navigating the ATM or working through specific elements of the exercise.

Once the exercise has been completed, the answers and interpretations will be reviewed. After this review is completed, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 7.

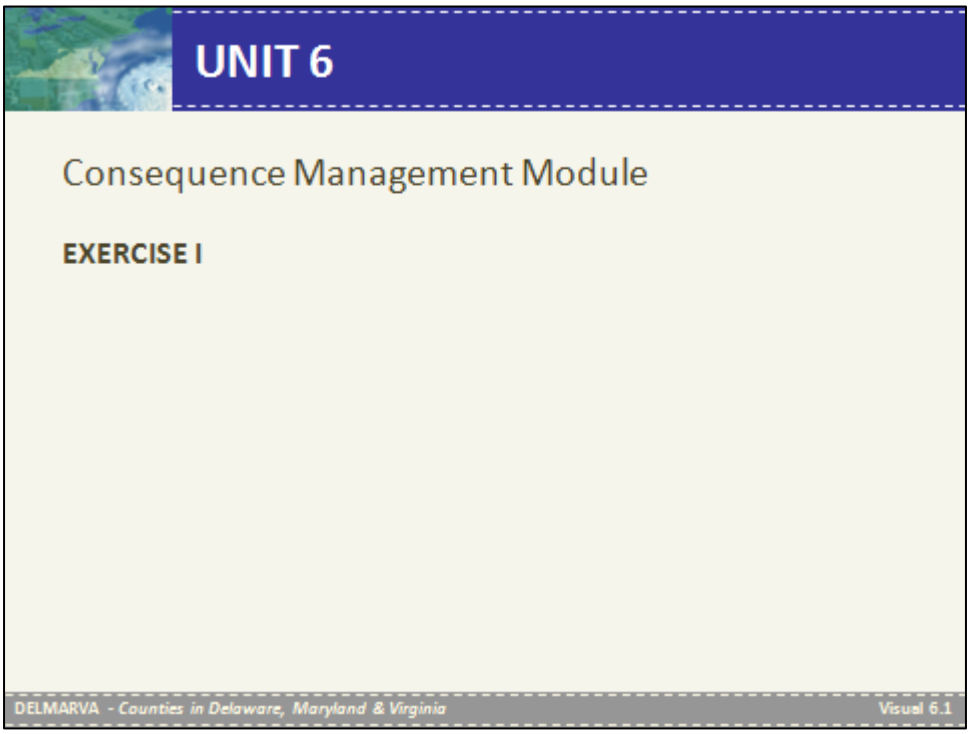
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
Consequence Management Module	10 minutes
EXERCISE I	20 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**45 minutes**

Topic: Unit Introduction

Visual 6.1



Instructors Notes

Explain that Unit 6 provides in-depth instruction on the purpose, features and use of the ATM's Consequence Management Module. This Unit includes a facilitated table top exercise that will test the participants' ability to use and interpret the results of the ATM. The next visual will outline the objectives for this unit.

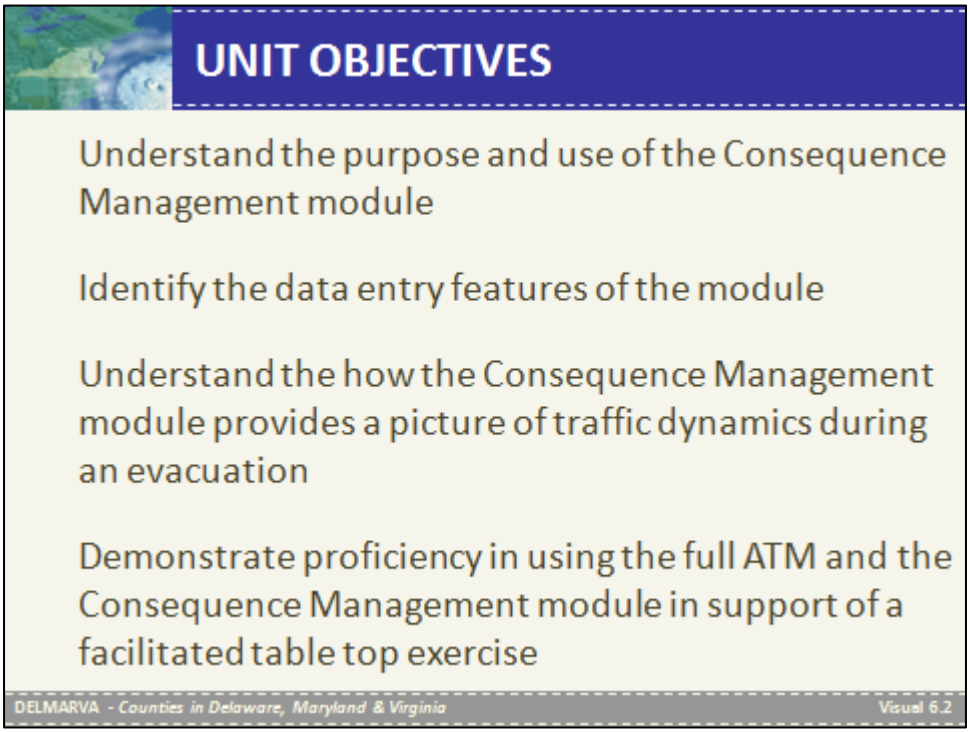
To being the unit, ask the participants to raise their hands in response to the following questions:

- Do any evacuation routes pass through remote areas or areas with limited services?
- Could an accident occurring along an evacuation route after an evacuation started effect a county clearance time?
- What would happen if an accident occurred during an evacuation and caused a predicted County clearance time to increase beyond the time that tropical storm force winds were expected to arrive?
- Does your county have adequate sheltering capabilities to shelter every potential evacuee?

Explain that the exercise will allow the participants work with the ATM and the Consequence Management module as it relates to these and other questions.

Topic: Unit Objectives

Visual 6.2



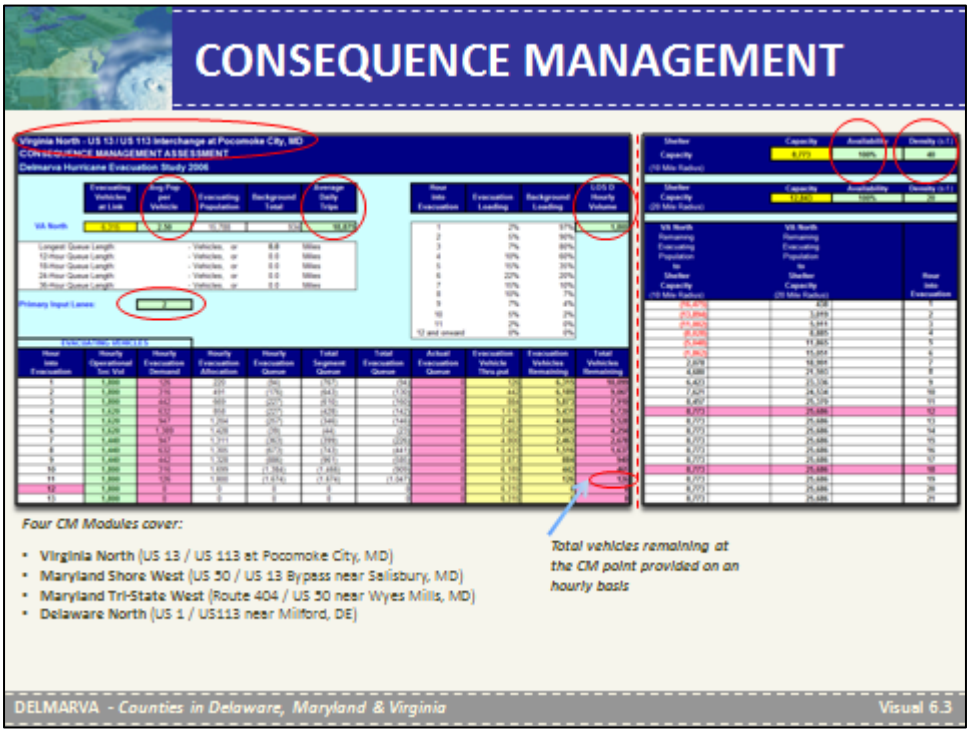
Instructors Notes

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Understand the purpose and use of the Consequence Management module
- Identify the data entry features of the module
- Understand the how the Consequence Management module provides a picture of traffic dynamics during an evacuation
- Demonstrate proficiency in using the full ATM and the Consequence Management module in support of a facilitated table top exercise

Topic: Consequence Management Module

Visual 6.3



Instructors Notes

The instructors shall minimize the slide presentation and open the ATM or open the ATM projected on a different screen. Participants should be prompted to save another copy of the Delmarva ATM file using the name “Delmarva ATM Exercise I” to ensure that the source file remains uncorrupted. After ensuring everyone has the ATM opened, the instructor will toggle between the four Consequence Management worksheets to show that they are identical in format and function.

In order for participants to understand the structure of this component of the Delmarva ATM, the instructor will provide the following description of the Consequence Management Module while walking the participants through the worksheet:

This ATM includes a separate Consequence Management Module. The Consequence Management Module is comprised of four worksheets, each assessing hourly evacuation traffic at one of four critical consequence management points;

- Virginia North (US 13 / US 113 at Pocomoke City, MD)
- Maryland Shore West (US 50 / US 13 Bypass near Salisbury, MD)
- Maryland Tri-State West (Route 404 / US 50 near Wyes Mills, MD)
- Delaware North (US 1 / US113 near Milford, DE)

The module draws input data from the ATM based on the worst case scenario event – a high tourist occupancy Category 4 storm scenario. Each of the worksheets includes a number of input and output functions in a series of tables. The module worksheets meter background and evacuation traffic through the specific consequence management point on an hourly basis and evaluate cue length and the availability of proximate shelter spaces.

There are two tables at the top of each worksheet that allow or data input. The first table has six data parameters;

- Evacuating Vehicles at Link
- Average Population Per Vehicle
- Evacuating Population
- Background Total
- Average Daily Trips
- Primary Input Lanes

The cell shaded in yellow (Evacuating Vehicles at Link) is drawn from the ATM – Evacuating Vehicles Module, and is based on the worst case scenario event – a high tourist occupancy Category 4 storm scenario. Cells shaded in light green (Average Population Per Vehicle, Average Daily Trips, and Primary Input Lanes) are user defined.

The other parameters are derived from these data. This table also includes an output function that provided queue length data in vehicles and miles for the longest queue length as well as at 12, 18, 24 and 36 hours.

The second table at the top of the worksheet has four parameters;

- Hour into Evacuation
- Evacuation Loading
- Background Loading
- LOS D Hourly Service Volume

The table provides evacuation loading and background traffic loading percentages through a full 12 traffic loading cycle. The cell shaded in light green (LOS D Hourly Volume) is derived from the data used in the ATM but may be modified by users.

The Evacuating Vehicles and Background Traffic tables are all formula driven and require no input data modifications. They mirror each other – both include 36 rows, one for each hour into an evacuation. The tables also both have 10 columns, including:

- Hour into Evacuation
- Hourly Operation Service Volume
- Hourly Evacuation (or Background) Demand

- Hourly Evacuation (or Background) Allocation
- Hourly (or Background) Evacuation Queue
- Total Segment Queue
- Total (or Background) Evacuation Queue
- Actual (or Background) Evacuation Queue
- Evacuation (or Background) Vehicle Thru-put
- Evacuation (or Background) Vehicles Remaining
- Total Vehicles Remaining

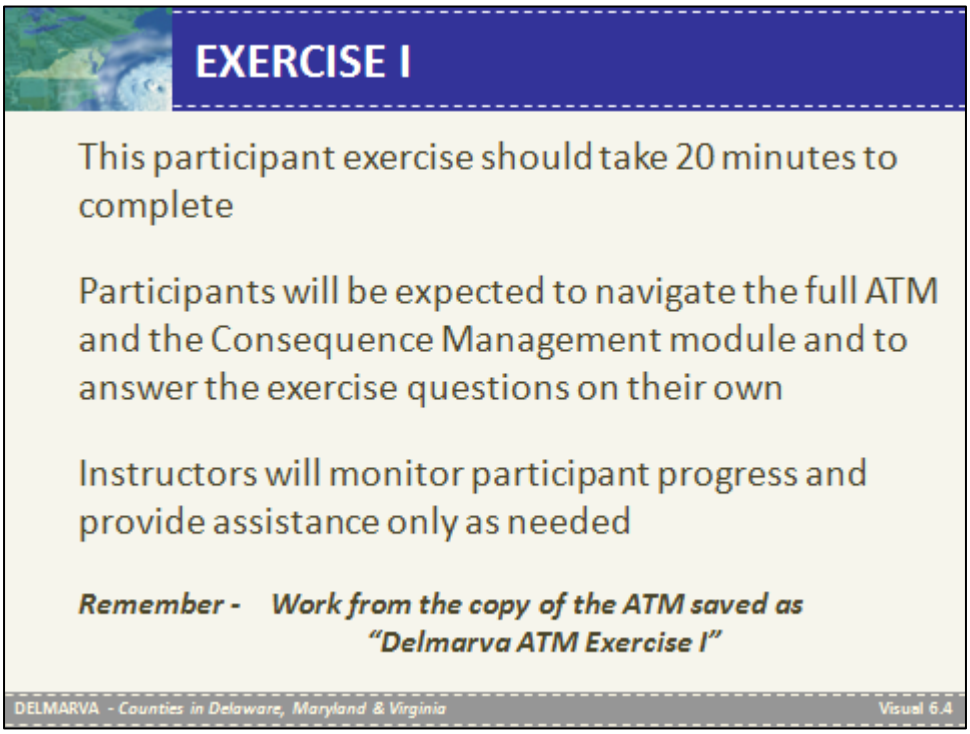
The Total Vehicles Remaining column in both tables sums the total evacuating and background traffic.

A final table, located to the left of the Evacuating Vehicles and Background Traffic tables includes a series of inputs and data outputs related to sheltering capacity. At the top of the table, the quantities in cells shaded in yellow example (Evacuating Vehicles at Link) are taken from source data provided by Delmarva study participants. Data inputs, shaded in light green include Shelter Capacity, Availability and Density (the number of s.f. / person). These parameters can be modified for ARC Shelters and Host Shelters in both a 10 and 20 mile radius of the consequence management point.

Below this table is the primary output table that tracks on an hourly basis the remaining population to host shelter capacity for each of the four sheltering parameters for each hour into an evacuation up to 36 hours. The figures in the columns represent the available shelter spaces, based on the parameter included in the input table, should 100 percent of the vehicles in queue at the consequence management point are directed to area shelters.

Topic: EXERCISE I

Visual 6.4



Instructors Notes

The instructor will inform the participants that this exercise is an opportunity for the participants to fully demonstrate their skill in navigating the full ATM, including the Consequence Management module, and finding and interpreting key data.

This is an exercise, not a demonstration and the full 20 minutes will be required to complete the essential elements. Participants will be expected to navigate the ATM to answer the proposed questions on their own.

The instructors will monitor the participant progress and will provide direct instruction to individual participants if they encounter difficulties navigating the ATM or working through specific elements of the exercise.

Participants should be reminded that they should have opened the ATM and be working in a file version saved as "Delmarva ATM Exercise I" to ensure that the source file remains uncorrupted.

The instructor will read the following scenario to the participants.

EXERCISE I:

You are an emergency manager with the Maryland Office of Emergency Management. It is August 1, 2010. While it has been a somewhat active season, with 5 named storms so far, none have actively threatened the Eastern United States. Your EOC has not been activated yet this hurricane season in response to any of these threats.

Part 1: **This part of the exercise will test your ability to use the ATM to find and record data.**

Inject: It is August 6. A wave that formed off of Africa at the beginning of the month has solidified and has reached tropical storm intensity. It has been named TS Ferdinand. Various early models show the storm track making landfall anywhere between Knott's Island, North Carolina and Sandy Hook, New Jersey.

In order to begin incident action planning, you have been asked to begin to compile some basic information about evacuees and routes.

Answer the following questions by navigating through and interpreting the data in your ATM.

Question 1.1:

What is the default rate for high tourist occupancy for Dorchester, Talbot and Caroline counties?

Answer 1.1: Refer to the Socioeconomic Data worksheets to identify that the default rate for the four counties is 90%.

Question 1.2:

What is the number of potential evacuees from each of these three Middle Maryland Eastern Shore counties?

Answer 1.2: Refer to the Evacuation Statistics worksheets to identify the potential number of evacuees as follows:

	Cat 1	Cat 2	Cat 3	Cat 4
Dorchester	7,080	9,813	12,468	15,884
Talbot	3,921	8,000	12,452	15,038
Caroline	2,066	3,079	4,781	5,958

Question 1.3:

In order to plan possible traffic diversion measures, what are the clearance times along US 50 at the local and regional bottlenecks at the following locations?

Answer 1.3: Refer to the Clearance Times worksheet to identify clearance times at the critical roadway segments, as follows:

	Cat 1	Cat 2	Cat 3	Cat 4
Cambridge	8.3	8.7	8.7	8.7
Easton	5.3	7.8	10.5	11.5
Wye Mill	25.1	32.5	41.6	46.8
Queenstown	29.6	39.0	51.1	58.9

Part 2: **This part of the exercise will test your ability to modify input data in the ATM and interpret the results.**

Inject: After providing the information to your superiors, you were alerted to some changed conditions. You are concerned that these conditions may impact the clearance time calculations and want to modify the ATM to quantify the impacts.

You will be asked to address the changed conditions by making specific changes in the ATM. Answer the following questions by navigating your ATM, modifying data as required, and interpreting the results.

Based on updated local tourism information, the average vehicles per tourist unit for Dorchester County should be increased by 1.0 vehicle per unit across the board.

Building official's data recorded several new developments in Cambridge (Dorchester County, evacuation area 4). Based on your information, there should be an additional 500 units in the category 1 zone, 100 units added in the category 2 zone and 1,000 units added to the category 3 zone.

Because so many evacuees will utilize US 50, you contacted the State of Maryland, DOT and found out that there is some minor construction at the bottleneck near Wye Mill. You feel that to be prudent you should reflect that this facility is operating at 75 percent of capacity.

Question 2.1

What impact, if any, do these changes cause to clearance times at the following bottlenecks?

Answer 2.1: Refer to the Clearance Time worksheet. You will need to compare an unmodified ATM with one that includes the changes made above. The figures below are old v. new

	Cat 1	Cat 2	Cat 3	Cat 4
Cambridge	8.3 v. 8.5	8.7 v. 8.9	8.7 v. 8.9	8.7 v. 8.9
Easton	5.3 v. 5.3	7.8 v.7.8	10.5 v.10.5	11.5 v.11.5
Wye Mill	25.1 v. 32.9	32.5 v. 42.8	41.6 v. 55.2	46.8 v. 62.3
Queenstown	26.6 v. 29.9	39.0 v. 39.3	51.1 v. 51.6	58.9 v. 59.5

Question 2.2

Which bottleneck demonstrates the greatest increase in clearance times as a result of these changes?

Answer 2.2: The Rt 404/US 50 intersection near Wye Mill.

Question 2.3

What impacts would these changes have on Dorchester, Talbot and Caroline counties?

Answer 2.3: Refer to the Clearance Time worksheet. All go up very slightly, since the William Preston Lane Memorial Bay Bridge is their determining bottleneck.

	Cat 1	Cat 2	Cat 3	Cat 4
Wm. Preston Lane Bridge	0.3 hours	0.4 hours	0.6 hours	0.6 hours

Part 3: **This part of the exercise will test your ability to use the Consequence Management Tool to find and record data.**

Inject: It is August 11. Ferdinand has maintained its storm track and has been consistently intensifying. The storm is now clocking 165 mph winds. While the models predict that the storm remains up to a week away from any potential landfall, your office is monitoring the storm closely.

Because this storm could result in a mandatory evacuation in your state, you are interested in finding out more information about route details and sheltering capacity along a potentially congested evacuation route.

Answer the following questions by navigating through and interpreting the data in your ATM, Consequence Management Module.

Remember, these questions relate to a Category 4 intensity storm.

Question 3.1

At the Maryland Tri-State West Consequence Management Point at Route 404 / US 50 Intersection near Wye Mills, MD, what is the total number of evacuating vehicles expected to need to pass through the intersection?

At the very start of the evacuation, what is the total number of vehicles that will need to pass through this intersection?

Why is this number slightly higher?

Answer 3.1: 74,141 evacuating vehicles, versus 83,338 total vehicles. The second figure includes both evacuating vehicles and background vehicles.

Question 3.2

If an evacuation was ordered, once the background traffic had loaded the network, at what hour into the evacuation would you expect to see the longest evacuation queue?

How far might this line of cars back up from the intersection?

Answer 3.2: At hour 10 there would be the longest evacuation queue, which could stretch back south and east some 94 miles.

Note: As an illustration, Ocean City is 91 miles from Wye Mill while Pokomoke City is 97 miles from Wye Mill.

Part 4: **This part of the exercise will test your ability to modify input data in the Consequence Management module and interpret the results**

IDelmarvaect: It is August 15. Ferdinand has shifted slightly north-northwest and appears on track to make landfall in your state. While the storm has weakened to a category 4, it is still a very significant major hurricane. The models predict that the storm could make landfall in two to three days. Your EOC is fully activated.

It is likely that you Governor will call for a mandatory evacuation. You are concerned that the evacuation order may come late and that tourists may not comply since the weather at the shore has been perfect.

Answer the following questions by working with and interpreting the data in your ATM, Consequence Management Module.

Question 4.1

If the evacuation needed to be ended early, you feel as though law enforcement could direct evacuees to shelters in the vicinity of the Route 404 / US 50 intersection near Wye Mills, MD.

What is the shelter capacity in a 10 mile radius?

What is the shelter capacity in a 20 mile radius?

Answer 4.1: There are 3,019 shelter spaces with a 10 mile radius of the intersection. There are 11,262 shelter spaces within a 20 mile radius.

Question 4.2

As you predicted, although a mandatory evacuation was called, the evacuation order may have been issued too late. Due to a greatly increasing forward speed, you believe you may need to call off the evacuation at hour 36.

What is the total number of vehicles that still need to pass through the Route 404 / US 50 intersection?

Answer 4.2: There are 21,958 vehicles needing to pass through the intersection at evacuation hour 36.

Question 4.3

At hour 36, because of the advancing storm, it is has been determined that all evacuees will be directed to shelters within a 10-mile radius.

A)

If this were to occur, what would be the estimated number of people that might not be able to be accommodated?

B)

If a decision was made to "double up", decreasing the square footage requirements per evacuee to 20 s.f., what would be the estimated number of people that might not be able to be accommodated?

C)

There are other "host" shelters with a 20 mile radius that may need to be accessed. If these shelters were opened at the "doubled-up" capacity, would be the estimated number of people that still might not be able to be accommodated?

D)

In this scenario, after what hour would a surplus of spaces first become available?

Answer 4.3: *A) At hour 36, based on the limited capacity of shelters within a 10 mile radius of the intersection, there could be 51,877 evacuees that might not be able to be accommodated.*

B) With a decision to double up, there could still be 48,858 evacuees that might not be able to be accommodated.

C) If the additional "host" shelters within the 20 mile radius were opened, there could still be 32,372 evacuees that might not be able to be accommodated.

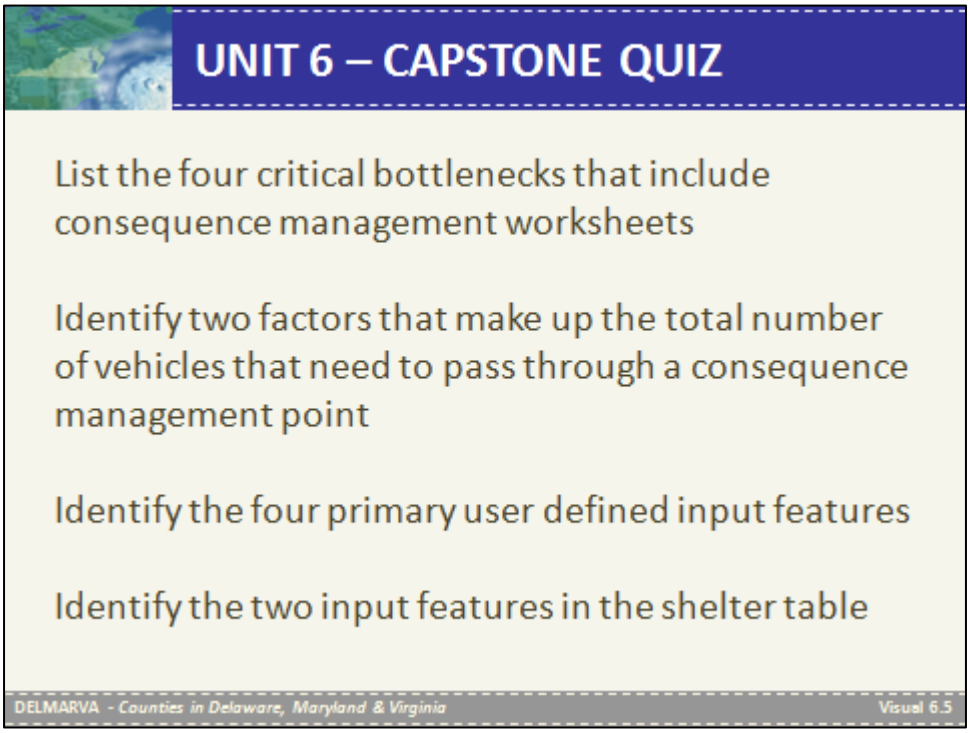
D) It would take until after hour 43 of an ongoing evacuation before there would be any surplus of evacuation spaces available.

EXERCISE CONCLUSION

The instructors will go over the answers to the questions posed by the exercise and answer any additional questions the participants may have.

Topic: Unit Capstone Quiz

Visual 6.5



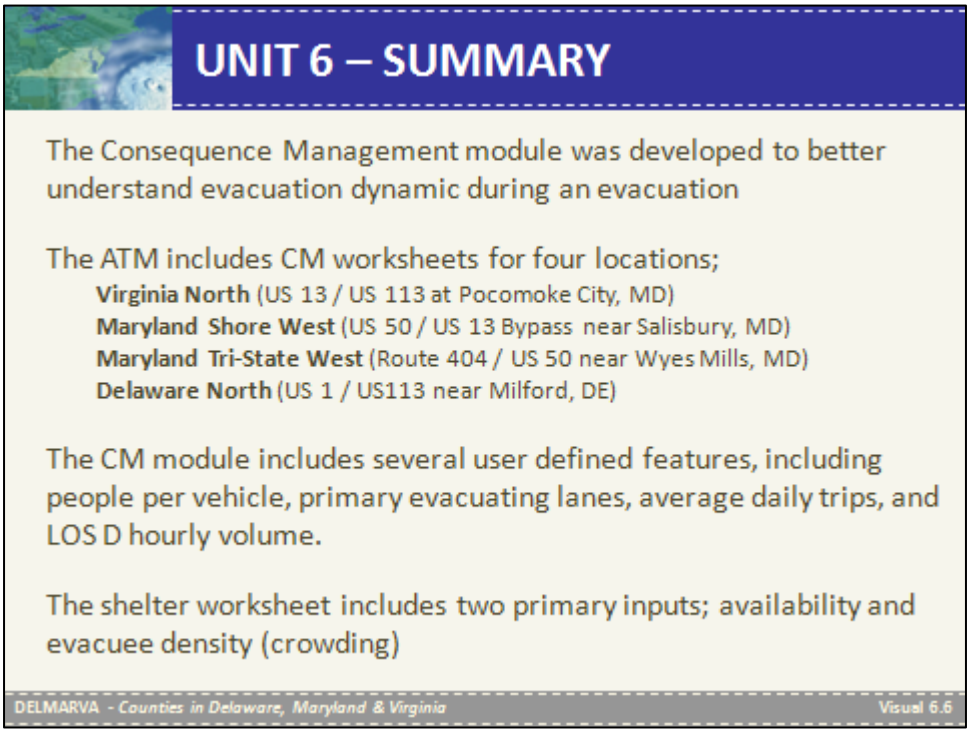
Instructors Notes

Ask participants if they can now:

- List the four critical bottlenecks that include consequence management worksheets
- Identify two factors that make up the total number of vehicles that need to pass through a consequence management point
- Identify the four primary user defined input features
- Identify the two input features in the shelter table

Topic: Summary

Visual 6.6



Instructors Notes

Summarize this unit by reminding the group that:

- The Consequence Management module was developed to better understand evacuation dynamic during an evacuation
- The ATM includes CM worksheets for four locations:
  - Virginia North (US 13 / US 113 at Pocomoke City, MD),
  - Maryland Shore West (US 50 / US 13 Bypass near Salisbury, MD),
  - Maryland Tri-State West (Route 404 / US 50 near Wyes Mills, MD), and
  - Delaware North (US 1 / US113 near Milford, DE).
- The CM module includes several user defined features, including people per vehicle, primary evacuating lanes, average daily trips, and LOS D hourly volume.
- The shelter worksheet includes two primary inputs; availability and evacuee density (crowding).

Ask if anyone has any questions about anything covered in this unit.

Transition to the next unit by explaining that Unit 7 will cover integrating the results of the ATM into HURREVAC. Note that it will also include an exercise to test the participants' ability to identify how to make adjustments within HURREVAC.

Announce a 10 minute break.

Unit 7: Using ATM clearance time results in HURREVAC

Objectives

At the end of this unit, the participants should be able to:

Integrate results from the ATM into the HURREVAC Program to determine the timing of initiating hurricane evacuations in relation to forecast tropical storm wind arrival times.

Scope

- Unit Introduction
- Unit Objectives
- Direct to Point (DTP) Evacuation Timing Assumptions
- Closest Point of Approach (CPA) Evacuation Timing Assumptions
- Decision Arc Evacuation Timing Assumptions
- EXERCISE VII
- Unit Capstone Quiz
- Summary

Methodology

The instructors will introduce the unit by displaying a visual outlining the unit objectives.

After reviewing the unit objectives, the instructors will go through the slides for each unit topic. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After covering the DTP and CPA evacuation timing methodologies as well as Decision Arcs, the instructors will introduce Exercise II, which will test the participants' ability to integrate results from the ATM into HURREVAC.

Since this is an exercise, rather than a demonstration, the participants will be expected to navigate the ATM to answer the proposed questions on their own. The instructors will monitor the participant progress and will provide direct instruction to individual participants if they encounter difficulties navigating the ATM or working through specific elements of the exercise.

Once the exercise has been completed, the answers and interpretations will be reviewed. After this review is completed, the instructors will administer the unit capstone quiz.

After the quiz has been completed, the instructors will go over the correct answers and discuss and questions that the participants may have. After answering these questions, the instructors will summarize the key points from the unit and transition to Unit 8.

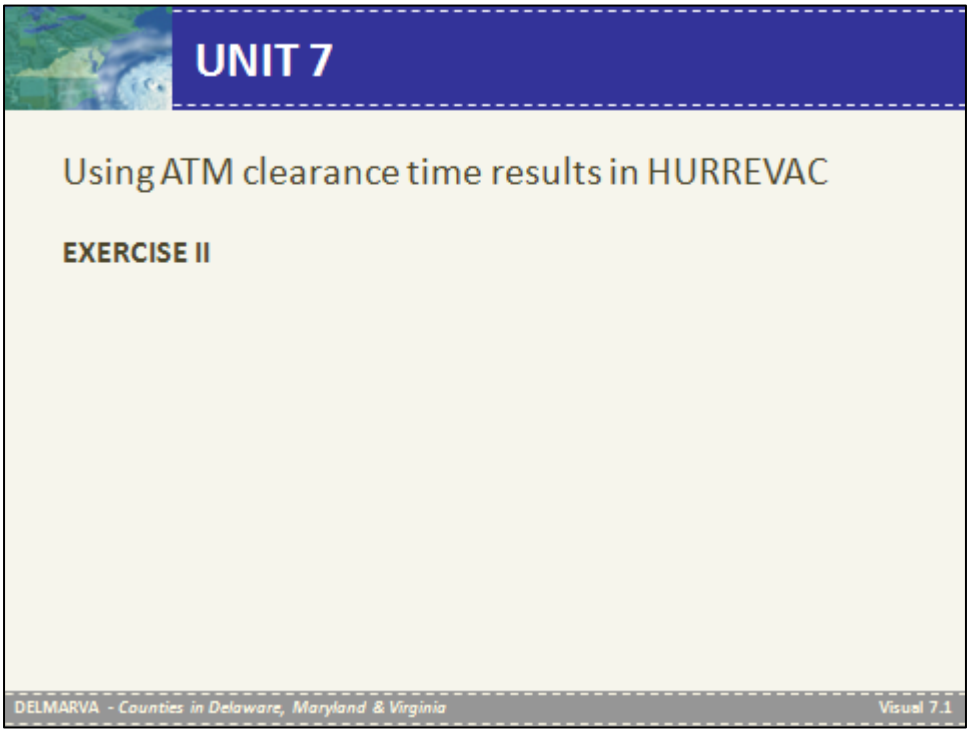
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Unit Objectives	5 minutes
Direct to Point (DTP) Evacuation Timing Assumptions	5 minutes
Closest Point of Approach (CPA) Evacuation Timing Assumptions	5 minutes
Decision Arc Evacuation Timing Assumptions	10 minutes
EXERCISE II	10 minutes
Unit Capstone Quiz	5 minutes
Summary	5 minutes
Total Time	**45 minutes**

Topic: Unit Introduction

Visual 7.1



Instructors Notes

Explain that Unit 7 provides a discussion of how to use the clearance time data from the ATM to develop evacuation timing decisions using HURREVAC. The next visual will outline the objectives for this unit.

Opening Activities:

Ask for a show of hands of individuals who have used HURREVAC to make evacuation decisions in response to an approaching tropical cyclone Discuss how the clearance time results from the ATM can be used to establish the amount of time needed to conduct an evacuation before the arrival time of tropical storm force winds.

To begin the unit, ask the participants to raise their hands in response to the following questions:

- What factors may have an influence on which clearance times are used in determining the time to start an evacuation with HURREVAC?

- What situational occurrences might require the addition or subtraction of time from the ATM clearance times when determining evacuation start times?

- What are the different methods to calculate the time remaining before the arrival of tropical storm force winds?

Explain that the exercise will allow the participants to work with the ATM as it relates to these and other questions.

Review the unit objectives with the group. Tell the participants that by the end of this unit, they should be able to:

- Determine in HURREVAC the time remaining before the forecast arrival of tropical storm force winds.

- Calculate when to start an evacuation using the ATM clearance time figures versus the forecast arrival time of tropical storm force winds based on a direct to point assumption for the storm's approach.

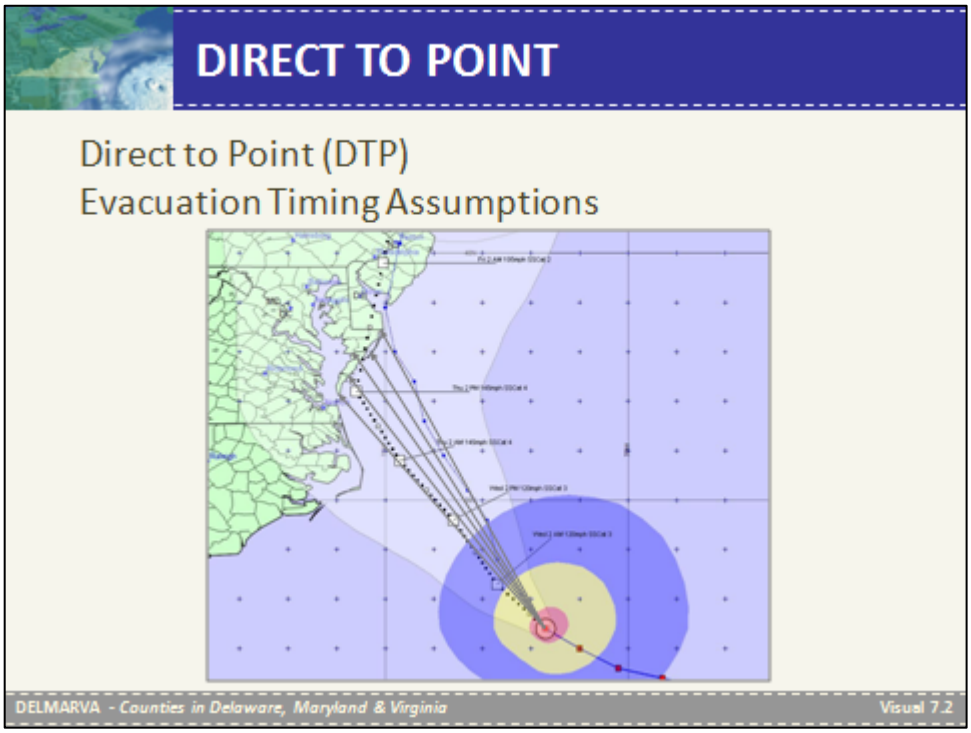
- Establish the time to start an evacuation using the ATM clearance time figures based on a closest point of approach assumption for the storm's forecast track.

- Understand how to use HURREVAC to determine whether additional time will be required from the calculated start time to safely complete an evacuation.

- Use the various decision making tools in HURREVAC to establish possible evacuation start times given different assumptions relative to storm scenario and situational factors.

Topic: Direct to Point (DTP) Evacuation Timing Assumptions

Visual 7.2



Instructors Notes

Using the above slide (Visual 7.2) the instructor will explain the assumptions that characterize the direct to point methodology for calculating evacuation start times. Explain that the direct to point assumption for the approach timing of the hurricane is the most appropriate for communities inside or nearby the average forecast error cone. The direct to point methodology:

- Is the most appropriate approach assumption for any community inside the average forecast error cone and the associated wind ranges.
- Assumes that a tropical cyclone will move in a direct path to the jurisdiction of interest, rather than along the forecast track provided in the advisory.
- Maintains that the hourly forecast forward speed of the tropical cyclone will remain consistent with the advisory data.
- Gives the least amount to the jurisdiction of interest to prepare and execute an evacuation plan before the forecast arrival of tropical storm force winds.

Open HURREVAC 2010, also directing the class participants to do the same, and using the following steps demonstrate how to use the Evacuation Timing function.

- Using Hurricane Ferdinand from the **Exercise** folder in the **Archives** tab, make that storm active by clicking on the storm file name itself.

- Turn on **Hourly Wind Ranges** and **120-Hour Error Swath** using the selections in the **Storm Features** heading in the **Report Menu**.

- Using the **Tool Bar** on the left side of the **Storm Map** click the **ADV** button with the down pointing arrow until Advisory #6 is displayed and allow the class to look at the image.

- In most cases the clearance times in HURREVAC are taken directly from the modeling done by the ATM and therefore those numbers should be the same for any scenario.

- In order to relate the clearance time against the time remaining before the forecast arrival of tropical storm force winds for a jurisdiction, click on the small plus by the heading **Evacuation Timing** under the bolded **Reports** category in the **Reports Menu**.

- Select by clicking directly on the word **single location** under the **Evacuation Timing** header within the **Reports Menu**, a menu box will appear with a list of all the reports available in HURREVAC and click on the **OK** button in the lower right hand corner.

- Another box will open up to allow the user to select a different scenario from the one established as the default by the program based on the advisory forecast intensity at CPA. Highlight the Worcester County standard clearance time line, if is not already selected, by clicking on the heading itself inside the window and then click **Continue**.

- The single point Evacuation Timing table should replace the Map on the HURREVAC display and display the following table:

Explain to the class how to interpret the table, highlighting:

- Each hour over the 72-hour forecast period for advisory 8 is separated out, counting backward from the current advisory time to the 72-hour forecast location of the storm.

- The hours in green identify on the table the period, along the DTP straight line, which evacuations should be occurring based on the clearance time for that scenario.

- The hours shown in light blue, yellow and red in the table correspond to the time periods when tropical storm, 58 mile per hour and hurricane force or greater winds respectively could be prevalent in the selected jurisdiction, based on a direct line approach from the advisory's initial position to the community's closest point to the storm.

- The hours of daylight and darkness, along the right hand side, during which the evacuation may have to occur.

Using the same advisory, select **all locations** from the **Evacuation Timing** under the **Reports** header in the **Reports Menu**.

Explain to the class how to interpret the table, highlighting:

- Every county's direct to point clearance time is calculated and displayed on this table.

- The **Decide** column is the hour which each county must begin its evacuation based on the scenario listed in the column **Cat/Occ/Re**, the clearance time in column labeled **Dur** and the straight line arrival time of tropical storm force winds in the column with the **>34kt(39)** heading.

- The Closest Point of Approach for each county (the nearest distance in each jurisdiction to the actual forecast track) and not the direct to point track, to the storm.

If while using the ATM, the user changes the hourly directional service volume, or some other important variable, which significantly alters the clearance time, the decision time can be recalculated by HURREVAC. Demonstrate and direct the class to:

- Expand the **Utilities** header in the **Reports Menu** and select **Set Evac Options**.

- Once the **Set Evac Options** window opens highlight the clearance time row for Worcester County, choose 3 hours as the **Optional Safety Buffer** and click in the **Use** radio button beside the safety buffer window.

- Then click on **Apply To Selected** and **OK** to close the **Set Evac Options** window.

- Click on the small plus by the heading **Evacuation Timing** under the bolded **Reports** category in the **Reports Menu**.

- Select by clicking directly on the word **single location** under the **Evacuation Timing** header within the **Reports Menu**, a menu box will appear with a list of all the reports available in HURREVAC and click on the **OK** button in the lower right hand corner.

- Another box will open up to allow the user to select a different scenario from the one established as the default by the program based on the advisory forecast intensity at CPA. Highlight the Worcester County with In County Evacuation Time line by clicking on the heading itself inside the window and then click **Continue**.

- The single point Evacuation Timing table should replace the Map on the HURREVAC display and display the table.

Explain to the class how the difference from the earlier table by highlighting:

- Although the community and scenario are exactly the same, the duration time in the table shown in green is three hours longer from 9 to 12 hours.

- As a result of the additional buffer time added, the decision time has now been moved from 10 AM, 17 hours in the future, to 7 AM, which is 14 hours from the time the advisory was issued.

Expand on the point by saying that if the ATM calculates that an additional three hours is needed to clear the ultimate constricting bottleneck in Worcester County as a result of construction at that critical segment, this would be the means by which the DTP clearance timing could be expanded accordingly.

The maximum evacuation clearance buffer time allowed by HURREVAC is an additional 10 hours.

Another method to insert an ATM derived clearance time is to use the timeline function also included in HURREVAC. If a scenario or clearance time calculated by the ATM does not coincide with a clearance times established in the program, the user can use the DTP table to make evacuation decisions based on those figures.

Using HURREVAC, demonstrate and direct the class participants on how the program can be changed to use a different clearance time figure than the ones already included:

- Click on the **Reset** button along the top of the HURREVAC screen and when the **HURREVAC Setup Form** window opens click on the **Timeline** tab.

- Click on the 34 knot radio button to indicate the threshold to be used to make the determination.

- Enter the new clearance time from the ATM, - 30, into the **Time Offset** window of the **HURREVAC Setup Form**.

- In the **Action to be taken** window of the same form, type in the text ATM Clearance.

- Click on the **Add to List** button and then **Save** to lock the entry into the Timeline.

When the HURREVAC Setup Form closes, using advisory #8, show the procedure for using the timeline for evacuation decision making.

- Click on the **Reports** heading in the **Reports Menu** and click on the **single location** selection underneath.

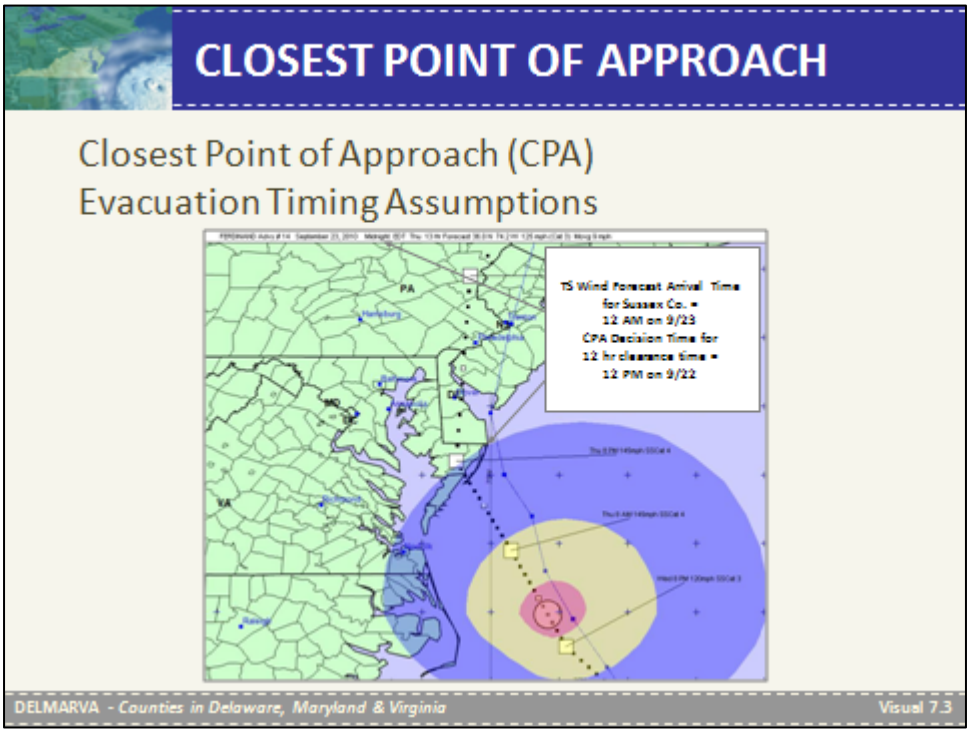
- Click on the **OK** button at the lower right hand corner of the **Analysis / Reports** window and click on the Worcester County Out of Region Evac Time line in the **Selection and Evacuation Type** window.

- When the **Direct Hit** timing window opens, click on the **Timeline** button and the ATM clearance time entered in the **Timeline** tab of the **HURREVAC Setup Form** will appear at the 30 hour increment of the hour by hour timeline.

Point out the 30 hour timeline insert, in white, into the green clearance time portion of the timeline.

Topic: Closest Point of Approach (CPA) Evacuation Timing Assumptions

Visual 7.3



Instructors Notes

Using the above slide, the instructor will inform the participants that there is another way to look at the evacuation timing picture. That assumption is the storm will indeed follow the forecast track and that the arrival time of tropical storm force winds will coincide exactly with the data in the advisory. This assumption relative to evacuation timing is called the Closest Point of Approach.

HURREVAC has a function which allows the user to move the storm at hourly increments along the forecast track of a particular advisory. Therefore to see what time the tropical storm force winds are forecast to arrive at a community, all one has to do is advance the storm along the forecast track until the forward edge of the blue filled tropical storm wind range ellipse touches the coast or boundary of the jurisdiction.

Once the forecast arrival time of tropical storm force winds has been determined, the user can back off the ATM clearance time. As an example, if the forecast arrival time is 2 AM and the

ATM clearance time for the situation is 12 hours, then the evacuation should begin at 2 PM the previous day.

In HURREVAC, the user can back the storm off the time that the tropical storm wind ellipse touches the jurisdiction counting the number of hours needed to conduct an evacuation, or the clearance time, from the ATM. This procedure allows the program to do the math in determining the time to begin an evacuation

This method is cumbersome, especially in the case of clearance times that span many hours to multiple days. Fortunately, the HURREVAC program includes a process to simplify determining the evacuation start time using the Closest Point of Approach assumption.

With the above slide indicate the major problem with using the CPA for evacuation timing decisions is:

- The further a jurisdiction is away from the forecast track, the less accurate the potential arrival time of tropical storm force winds. The greater the distance of the closest point of approach from a community, the greater the inaccuracy relative to when the winds could arrive at a community, especially if it is in the average forecast error cone.

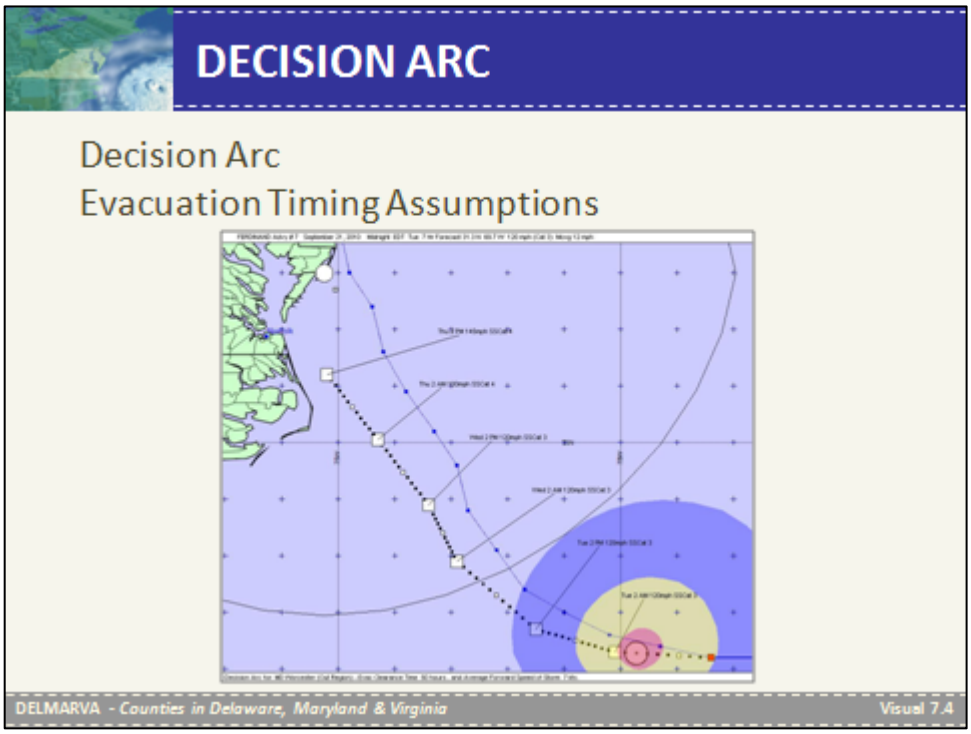
- Hurricanes with relatively small, or irregularly shaped, tropical storm wind ellipses may not touch a community at all, especially if those locations are on the periphery of the average forecast error cone or just outside it. The storm could easily make landfall at any community within the average forecast error cone, but still may not be forecast to receive tropical storm force winds if the storm were to stay on the forecast track.

- Usually the CPA decision time will be after the DTP time, except in cases where those two assumptions are very close together. Therefore, the greater the CPA distance for a community, the larger the disparity between the decision times developed by the two methodologies.

Next, indicate that an easier method exists for calculating the evacuation start decision time using the CPA approach described here. This function in HURREVAC uses the evacuation clearance times from the ATM to determine when an evacuation should begin.

Topic: Decision Arc Evacuation Timing Assumptions

Visual 7.4



Instructors Notes

With Visual 7.4, begin by explaining that the Decision Arc method for determining when to start an evacuation is based on the premise that, unlike the DTP assumption above, the storm will remain on the forecast track as it approaches a community.

This methodology for determining the evacuation start time uses the clearance time and the forward speed of the storm to determine how far out from landfall the decision must be made in order to insure that all vehicles are allowed to get through the most constricted bottleneck in the community.

The clearance time is multiplied by the forward speed of the storm to determine the radius of the Decision Arc.

Use this simplified example:

Clearance Time = 10 Hours
Forward Speed of the Storm = 10 MPH
Decision Arc Radius = 100 Miles from the closest point of the community to the eye of the storm

This means that for each of the 10 hours needed to clear the most critical evacuation bottleneck in the community, the hurricane eye will get closer by ten miles.

Once the Decision Arc radius is determined using the simple equation above, HURREVAC will display that circle from the closest point of a community to the eye of the hurricane. The user will then advance the storm along the forecast track hour by hour until the forward edge of the tropical storm wind ellipse touches the Decision Arc. That instance determines at what time the evacuation must begin in order to complete the evacuation in the allotted clearance time.

In the HURREVAC 2010 program, direct the class to employ the following steps in displaying and using the Decision Arc for determining when to begin an evacuation.

- Still using Ferdinand advisory #8, and the map still displaying the average forecast error cone and initial position wind ranges, click on the **Utilities** function in the **Reports Menu**.
- Click on the small box next to the header **Decision Arc** to expand that selection.
- Click in the **Decision Arc Toggle** box to turn the function on.
- Select **Arc Setup** by clicking directly on the word, and the **Select Location and Evacuation Type** window will appear in the middle of the **Storm Map**.
- If not already selected, scroll and click on the row labeled DE Sussex for the Out Region scenario.
- Click on the **Continue** button and the window will disappear and the **Decision Arc** will display on the **Storm Map.**

Pause to allow the class participants an opportunity to see the Decision Arc displayed in HURREVAC.

- Click repeatedly on the **Move Storm Ahead 1 Hr** button on the **Tool Bar** to move the hurricane eye and forecast windfields along the forecast track in hourly increments.
- Stop advancing the storm when the outside edge of the tropical storm wind range touches or is about to make contact with the Decision Arc circle.

Direct the class participants to look at the information banner at the top and bottom of the Storm Map and highlight the following.

- The date and time of the storm with the eye at the displayed location along the forecast track (Tuesday, September 21, 2010 at 3 AM).
- It is the 4 hour forecast position.
- The storm is currently a category 3 hurricane, but forecast to intensify to cat 4 at CPA.
- The current forward speed of the storm used is 12 MPH.

Direct the class participants to look at the information banner at the bottom of the Storm Map and highlight the following:

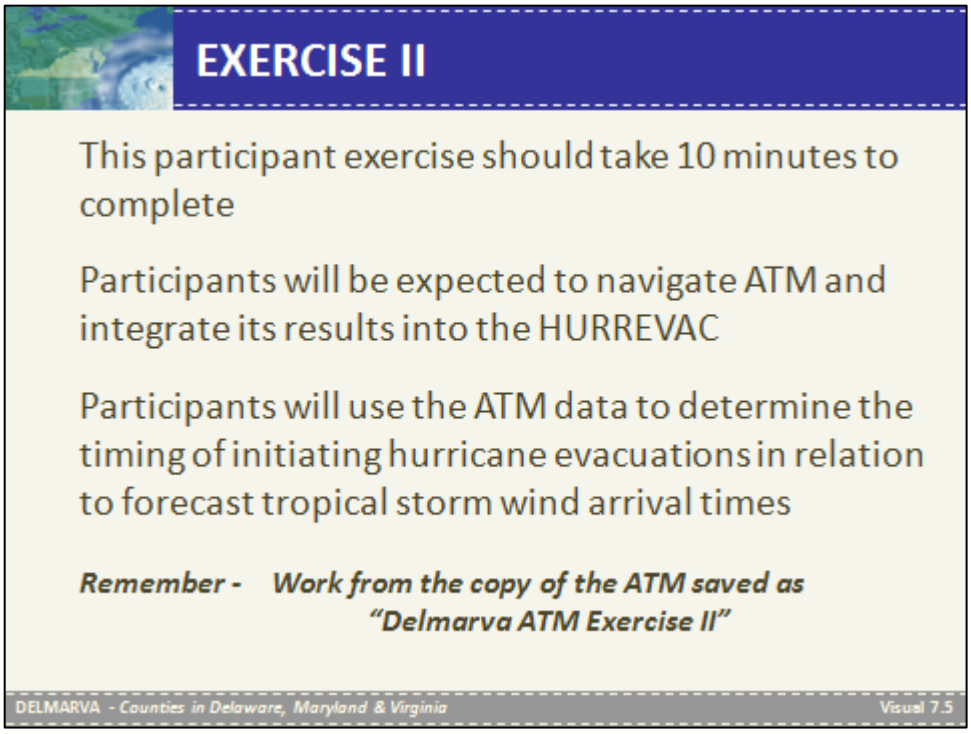
- The evacuation clearance time for Sussex County Out Region scenario was used.
- The clearance time used to calculate the radius of the Decision Arc is 43 hours.
- The forecast forward speed of the hurricane used to determine the Decision Arc is 8 knots.

Point out that HURREVAC uses the highest hourly forward speed from the initial position to the closest point of approach to the community in computing the Decision Arc radius. So if the hurricane is forecast to speed up before landfall, the higher number will be used to determine the Decision Arc radius.

Also point out that as the storm moves in relation to the community, HURREVAC will automatically shift the reference point to a different location in the community to ensure it uses the CPA point as the center of the Decision Arc circle.

Topic: EXERCISE II

Visual 7.5



Instructors Notes

The instructor will inform the participants that this exercise is an opportunity for them to fully demonstrate their skill in using HURREVAC, as well as to develop evacuation decision times based on the clearance times provided by the ATM.

This is an exercise, not a demonstration and the full 10 minutes will be required to complete the essential elements. Participants will be expected to navigate HURREVAC to answer the proposed questions on their own.

The instructors will monitor the participant progress and will provide direct instruction to individual participants if they encounter difficulties navigating the ATM or working through specific elements of the exercise.

Remind participants that they should have opened HURREVAC and loaded Hurricane Ferdinand from the Archives folder as the active storm.

The instructor will read the following scenario to the participants.

Part 1: **This part of the exercise will test your ability to use HURREVAC to determine when your community must begin an evacuation in order to ensure all vehicles have cleared the most critical bottleneck before the forecast arrival of tropical storm force winds.**

Inject: It is September 20 at 5 PM and an advisory has just been issued. Hurricane Ferdinand is approaching the shores of the Mid-Atlantic States as a category 3 hurricane. The forecast has the hurricane intensifying to a category 4 at the 55 hour forecast location along the predicted track with sustained winds increasing from 120 to 145 MPH.

You are an emergency manager with the Maryland Emergency Management Agency. Most of the Delmarva Peninsula is in the average forecast error cone and you know some of your communities are getting close to having to make their decisions to initiate evacuations for their out of region scenarios.

In order to assist the communities along the coast with their evacuation decisions you have been asked to determine what time evacuations need to be started for all communities in the average forecast error cone.

Answer the following questions by navigating through the HURREVAC program and interpreting the results for the 5 AM, September 21st advisory.

Question 1.1:

Which of your counties on the Delmarva Peninsula will need to start their evacuation first, based on the default forecast intensity selected by HURREVAC for the DTP assumption, and at what time?

*Answer 1.1: Refer to the **all locations** table from the **Evacuation Timing** selection in the **Reports Menu,** to find Worcester County for an out of Region scenario must evacuate first.*

Question 1.2:

Based on the DTP clearance time table how much time does the ATM indicate will be needed to safely evacuate all the community's vulnerable residents for that scenario, and at what date and time should the evacuation begin for that community?

Answer 1.2: In the same table, Worcester County's ATM clearance time for an out of region cat 4 evacuation is 50 hours which means the evacuation should be started no later than 11 PM, September 20, 2010, or in about 6 hours.

Question 1.3:

What is the next Maryland county on the Delmarva Peninsula needing to make its decision to evacuate, based on the ATM clearance times in HURREVAC, and at what time should they begin?

Answer 1.3: In the same table, Somerset and Wicomico Counties appear as the next communities needing to decide whether to evacuate and their decision time is 1 AM on September 21st.

Part 2: **This part of the exercise will test your ability to modify the clearance time data in HURREVAC in accordance with new data from the ATM and then interpret the results.**

Inject: After providing the, you were informed that some construction issues on US 50 westbound will have a negative impact on the critical link for Somerset County, and hence its clearance times. After running the ATM you discover that an additional 5 hours above the regular Cat 4 out of region clearance time will be needed to conduct the evacuation.

Question 2.1

Given the additional time needed to conduct the evacuation for Somerset County, at what time should the evacuation start?

*Answer 2.1: Using the **Utilities/Set Evac Options** menu, add four hours to the default scenario clearance time using the **Safety Buffer,** then refer to the **Evacuation Timing/all locations** table from the **Reports Menu** to find they must evacuate starting at 8 PM.*

Question 2.2

How many hours from the current advisory issuance period does Cape May County have to complete setting up and make the decision to evacuate?

*Answer 2.2: Using the **Evacuation Timing/single location** table from the **Reports Menu** you can graphically see that only three hours remain before the evacuation must start.*

Part 3: **This part of the exercise will test your ability to use the HURREVAC Timeline function to determine evacuation start times from new clearance time data developed by the ATM, rather than pre-loaded clearance times.**

Inject: As the emergency management director of Sussex County, Delaware, you are looking at the 5 AM Hurricane Ferdinand advisory issued on September 22nd. Using the ATM, you are assessing the impacts to your clearance time based on a more realistic behavioral scenario, rather than the one in the model which assumes that 100 percent of all permanent residents will evacuate their homes in the surge evacuation zones. Your low ball estimate for a low tourist season scenario results in a savings of 5 hours of clearance time.

Answer the following questions by navigating through and interpreting the data in HURREVAC using the DTP evacuation timing decision support tables.

Question 3

At what time should the evacuation begin for Baltimore County based on the current advisory and new evacuation scenario of 7 hours and is this a good time to initiate an evacuation?

*Answer 3: Using the **Evacuation Timing/single location** table from the **Reports Menu** and the **Timeline** function, Baltimore Co. should begin their evacuation no later than 2 AM on September 23rd, which is a very poor time to begin evacuating. If the evacuation started at this time, most vulnerable residents and visitors would be asleep and news and notification of the evacuation order would be too late to make the evening or nightly news. Recommend that the clearance time be initiated in the early evening hours so that a portion of the evacuation can take place during daylight hours.*

Part 4: **This part of the exercise will test your ability to conduct the same clearance time analysis for another advisory and using other evacuation scenarios.**

Inject: At 5 PM on September 22nd the National Hurricane Center has just issued another advisory which includes further adjustments to the forecast track. While serving in the Maryland State EOC you receive a call from the Harford County emergency management director seeking advice on when they should consider starting their evacuations. The director also informs you that they are considering evacuating to a category three because the storm would probably degrade as it traverses the Delmarva Peninsula.

Answer the following questions by navigating through and interpreting the data in HURREVAC using the DTP evacuation timing decision support tables.

Question 4.1

At what time should the evacuation begin for Harford County based on the current advisory and a cat 3, medium response, medium tourist occupancy scenario and how many hours in the future should the evacuation begin?

*Answer 4.1: Using the **Evacuation Timing/single location** table from the **Reports Menu**, Harford Co. should begin their evacuation no later than 5 AM the next morning, on September 23rd, or in 12 hours.*

Question 4.2

Would this be a good time to start an evacuation?

What would be your recommendation to the Hudson County EM director relative to when the community might consider issuing an evacuation order?

Answer 4.2: It is an advantageous time to begin an evacuation in that it gives local officials the opportunity to notify and mobilize vulnerable populations to start evacuating before people have begun their normal workday routine. Nonetheless, it would be very beneficial to forewarn potential evacuees as soon as possible and prepare them for the possibility an evacuation first thing in the morning.

Part 5: **This part of the exercise will test your ability to use the CPA approach in HURREVAC to determine the forecast arrival time of tropical storm force winds for evacuation decision making.**

Inject: It is 11 PM on September 22nd and the outer bands of Ferdinand are just off the coast of Chincoteague, VA. The NHC is confident at this point that the storm will make landfall in the vicinity of Delaware Bay and will re-curve toward the northeast before it reaches the Chesapeake Bay. At that time the director of Charles County emergency management office calls to discuss his primary concerns regarding the protective actions for the mobile home population in his community and the fact that the participation rate in the category 1 evacuation areas could be very low.

He asks for your advice on when he should begin to conduct his evacuation in his county given the variables input into the ATM relative to the situation. Their new clearance time is only 4 hours, significantly less than their posted clearance times. He wants to know if he has enough time to conduct the evacuation between the 5 AM advisory the next morning and the forecast arrival of tropical storm force winds.

Answer the following questions by working with and interpreting the data in HURREVAC.

Question 5

With a newly computed 4 hour clearance time from the ATM, when should they begin their limited evacuation based on the forecast track of the storm?

*Answer 5: Using the **Storm Map** in HURREVAC, advance the storm along the forecast track until the tropical storm wind ellipse touches the nearest edge of Charles County at 9 AM on September 23, 2010; when the storm is backed up 4 hours from that point the resulting time will be 5 AM or in 6 hours.*

Part 6: **This part of the exercise will test your ability to use the Decision Arc method in determining when to begin an evacuation based on a CPA assumption and clearance time data from the ATM.**

Inject: It is still just after the 11 PM on September 22nd and you have just hung up the phone with Charles County. Baltimore City, given the NHC confidence in the recurve track forecast, has decided to conduct a limited evacuation involving just the cat 2 evacuation zones and mobile homes. The Baltimore City emergency management director is seeking advice on when he can start a limited evacuation of the cat 2 zones.

This situation when plugged into the ATM revealed that the clearance time will be 8 hours or synonymous with a cat 2 scenario, medium tourist occupancy and public response.

Answer the following questions by working with and interpreting the data in HURREVAC.

Question 6

With newly computed data from the ATM which matches the clearance time for a category 2 scenario with medium tourist occupancy, as well as medium public response rates when should they begin their evacuation based on the forecast track of the storm?

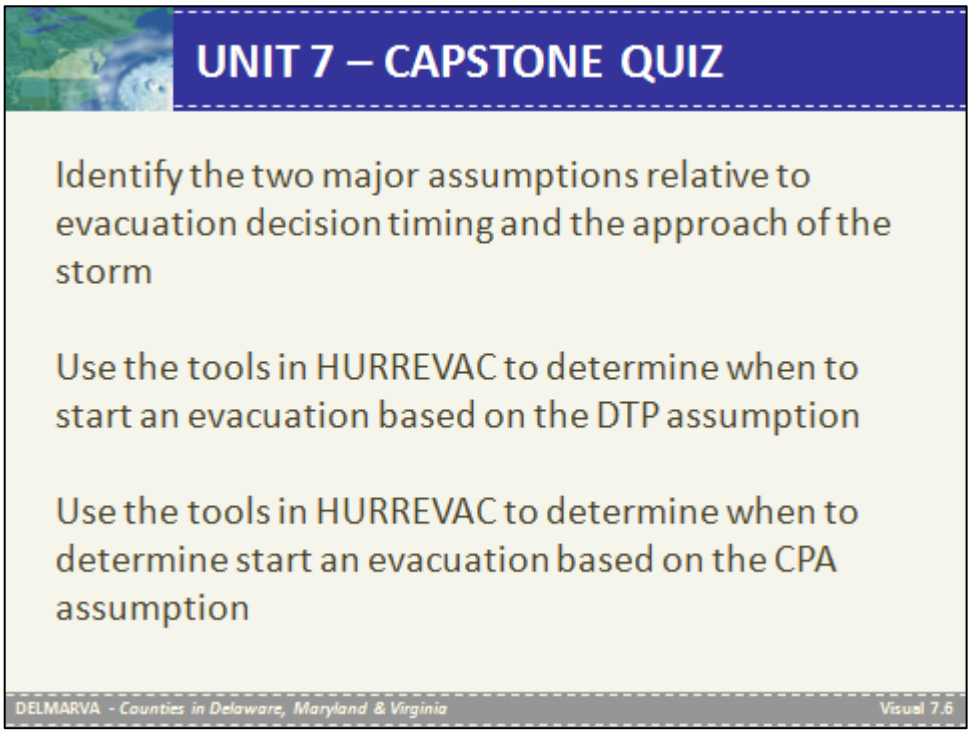
*Answer 6: Using the **Decision Arc** function in HURREVAC, advance the storm along the forecast track until the tropical storm wind ellipse touches the nearest edge of the City of Baltimore's Decision Arc. For the 11 PM Advisory for September 22nd, the tropical storm wind ellipse and the decision arc touch at about 3 AM the next morning, September 23rd.*

EXERCISE CONCLUSION

The instructors will go over the answers to the questions posed by the exercise and answer any additional questions the participants may have.

Topic: Unit Capstone Quiz

Visual 7.6



Instructors Notes

Ask participants if they can now:

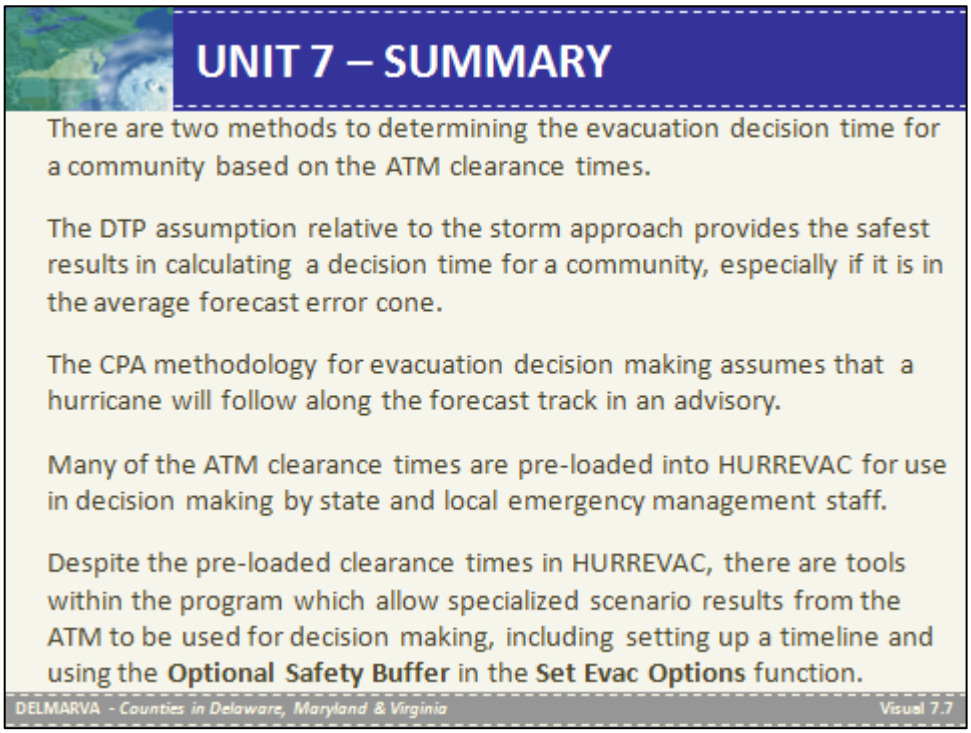
Identify the two major assumptions relative to evacuation decision timing and the approach of the storm.

Use the tools in HURREVAC to determine when to start an evacuation based on the DTP assumption.

Use the tools in HURREVAC to determine when to start an evacuation based on the CPA assumption.

Topic: Summary

Visual 7.7



Instructors Notes

Summarize this unit by reminding the group that:

- There are two methods to determining the evacuation decision time for a community based on the ATM clearance times.
- The DTP assumption relative to the storm approach provides the safest results in calculating a decision time for a community, especially if it is in the average forecast error cone.
- The CPA methodology for evacuation decision making assumes that a hurricane will follow along the forecast track in an advisory.
- Many of the ATM clearance times are pre-loaded into HURREVAC for use in decision making by state and local emergency management staff.
- Despite the pre-loaded clearance times in HURREVAC, there are tools within the program which allow specialized scenario results from the ATM to be used for decision making, including setting up a timeline and using the **Optional Safety Buffer** in the **Set Evac Options** function.

Unit 8: Course Summary

Objectives

- Review Course materials
- Ensure that participants have a basic understanding of the use of the Delmarva ATM
- Ensure that participants understand how ATM results may be used in HURREVAC
- Provide opportunities for participant feedback

Scope

- Review of Unit Summaries
- Participant Observations
- Course Evaluation Procedures
- Closing Elements

Methodology

The instructors will start of f the unit by stating the overall course objectives listed above. It is important to remind the participants that they are now trained in the use of the ATM, how its results integrate into HURREVAC. Inform them that they should now have sufficient training to train other users on the basic features of the ATM.

The instructor will move into the presentation by going through a review slide for each unit in the course. At the end of each unit topic, the instructors will ask the participants if they have any questions.

After covering the unit review, the instructors will open up the presentation to participant feedback including general observations and questions. After the participants have been given an opportunity to provide input, the instructors will move onto covering the formal course evaluation procedures

Once the course evaluation procedures have been presented, the instructors will go over some final review points and housekeeping issues before closing out the course.

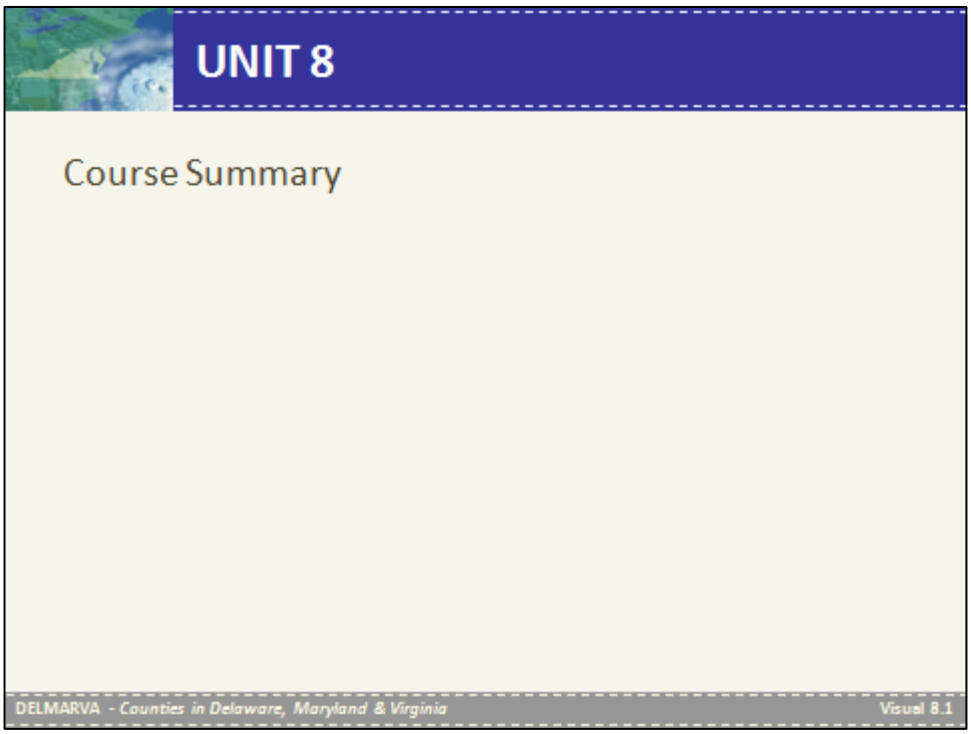
Time Plan

A suggested time plan for this unit is shown below. More or less time may be required, based on the experience level of the group.

Topic	Time
Review of Unit Summaries	10 minutes
Participant Observations	10 minutes
Course Evaluation Procedures	5 minutes
Closing Elements	5 minutes
Total Time	**30 minutes**

Topic: Review of Unit Summary

Visual 8.1



Instructors Notes

The instructors will inform the participants that in this final unit they will have the opportunity to review summary information presented in the main units of the transportation tools workshop.

The instructors will read through the following list of units that will be recapped:

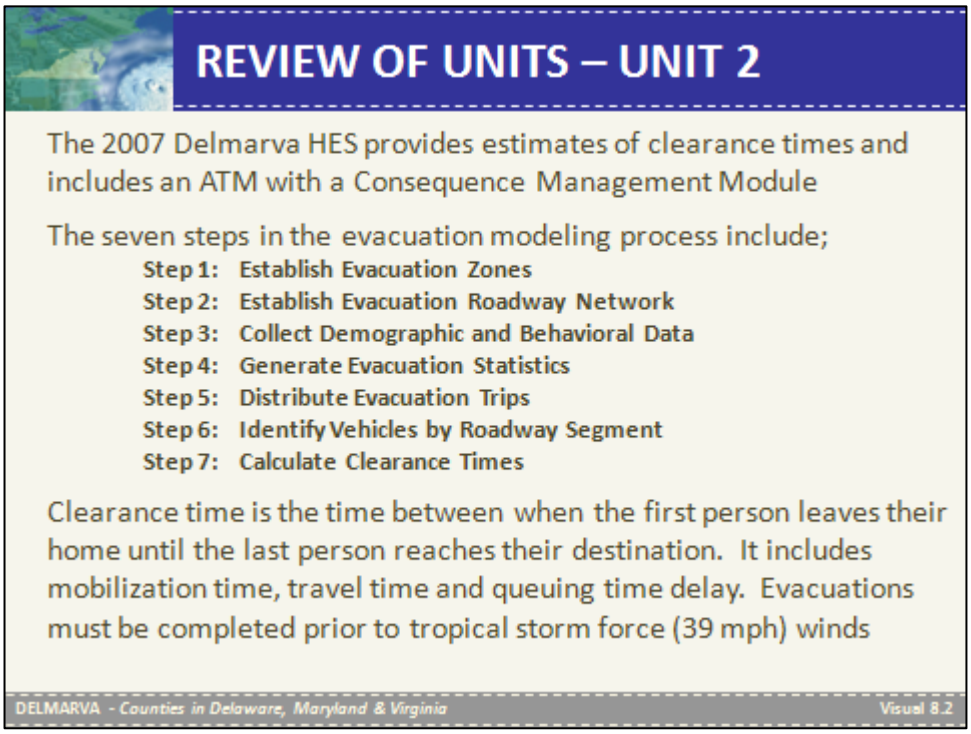
- Unit 2: Hurricane Evacuation Study Process
- Unit 3: Basic Features of the Delmarva ATM
- Unit 4: Data Entry Modules
- Unit 5: Data Results Modules
- Unit 6: Consequence Management Module
- Unit 7: HURREVAC Integration

The instructors will let the participants know they will have the opportunity to ask questions after each unit summary, as well as at the close of the presentation.

The instructors will let also the participants know they will have the opportunity to discuss the HES Tools as well as the course. Inform them that they will be asked to participate in a formal evaluation.

Topic: Review of Units – Unit 2

Visual 8.2



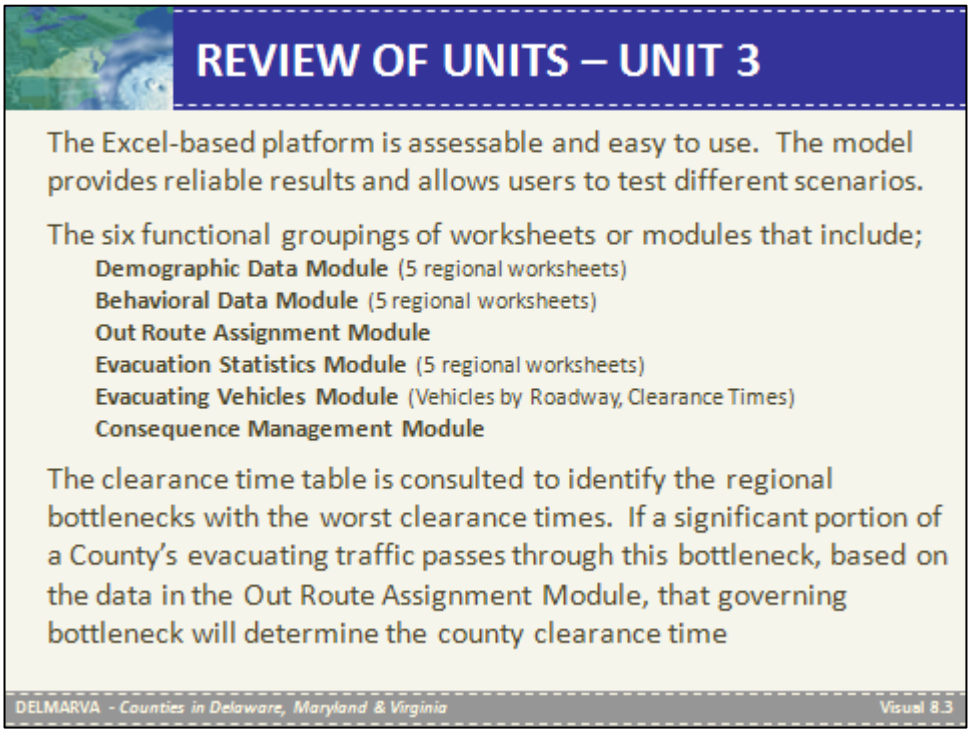
Instructors Notes

Review the following main points:

- The 2007 Delmarva HES provides estimates of clearance times and includes an ATM with a Consequence Management Module.
- The seven steps in the evacuation modeling process include; Step 1: Establish Evacuation Zones, Step 2: Establish Evacuation Roadway Network, Step 3: Collect Demographic and Behavioral Data, Step 4: Generate Evacuation Statistics, Step 5: Distribute Evacuation Trips, Step 6: Identify Vehicles by Roadway Segment, and Step 7: Calculate Clearance Times.
- Clearance time is the time between when the first person leaves their home until the last person reaches their destination. It includes mobilization time, travel time and queuing time delay. Clearance times are based upon all evacuation movements completing prior to the onset of tropical storm force (39 mph) winds.

Topic: Review of Units – Unit 3

Visual 8.3



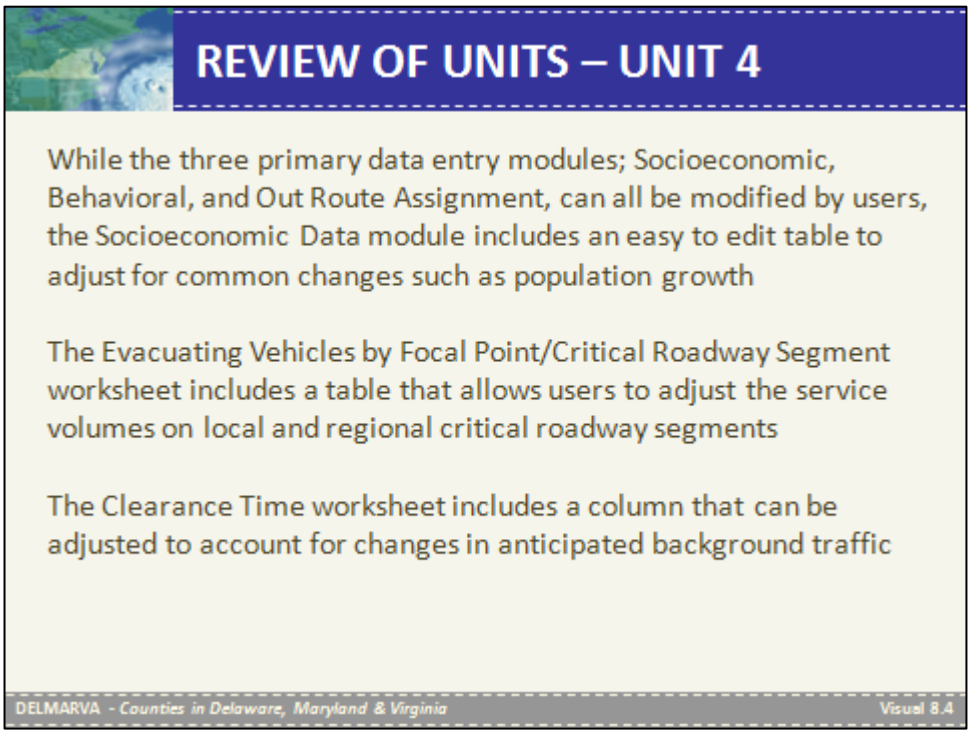
Instructors Notes

Review the following main points:

- The Microsoft Excel platform is accessible (everyone has a copy), provides reliable results, is easy to update, and allows testing of new scenarios "on the fly" with negligible processing time.
- The six functional modules or groupings of worksheets in the ATM include modules addressing socioeconomic data, behavioral data, out route assignment, evacuation statistics, evacuating vehicles and consequence management.
- The clearance time table is consulted to identify the regional bottlenecks with the worst clearance times. If a significant portion of a County's evacuating traffic passes through this bottleneck, based on the data in the Out Route Assignment Module, that governing bottleneck will determine the county clearance time.

Topic: Review of Units – Unit 4

Visual 8.4



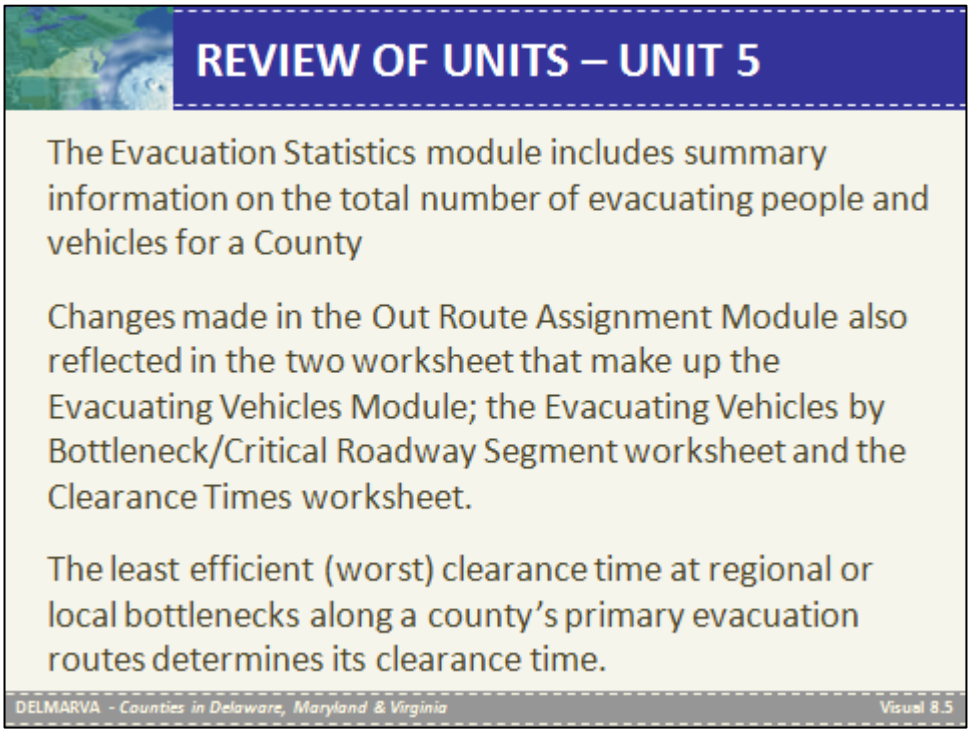
Instructors Notes

Review the following main points:

- While the three primary data entry modules; Socioeconomic, Behavioral, and Out Route Assignment, can all be modified by users, the Socioeconomic Data module includes an easy to edit table to adjust for common changes such as population growth.
- The Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet includes a table that allows users to adjust the service volumes on local and regional critical roadway segments.
- The Clearance Time worksheet includes a column that can be adjusted to account for changes in anticipated background traffic.

Topic: Review of Units – Unit 5

Visual 8.5



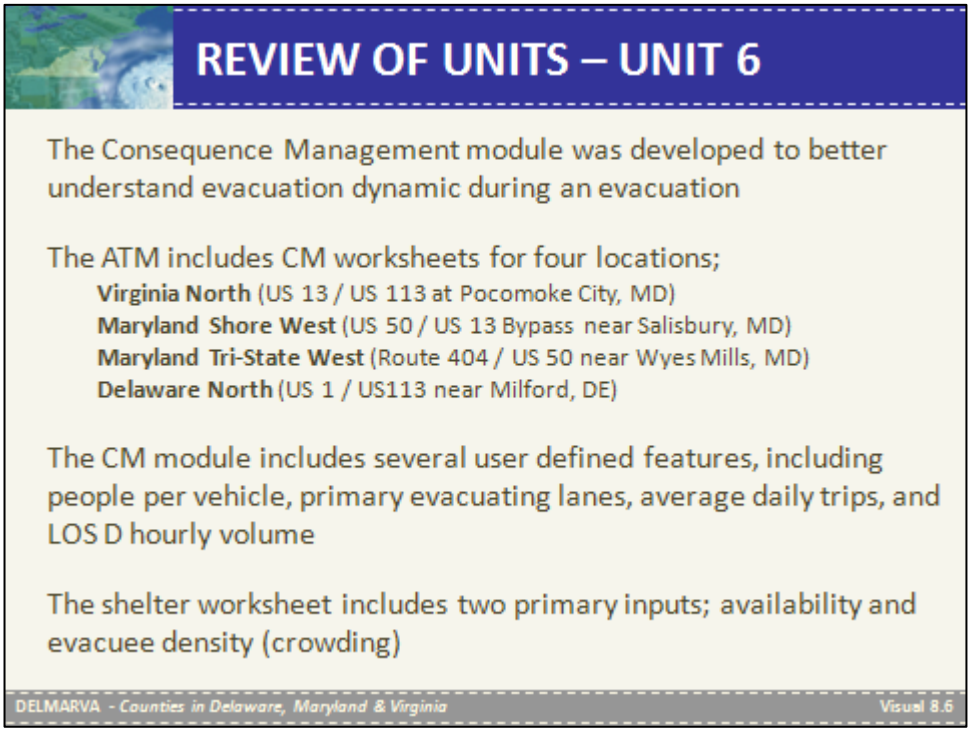
Instructors Notes

Review the following main points:

- The Evacuation Statistics module includes summary information on the total number of evacuating people and vehicles for a County.
- Changes made in the Out Route Assignment Module also reflected in the two worksheet that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet and the Clearance Times worksheet.
- The least efficient (worst) clearance time at regional or local bottlenecks along a county's primary evacuation routes determines its clearance time.

Topic: Review of Units – Unit 6

Visual 8.6



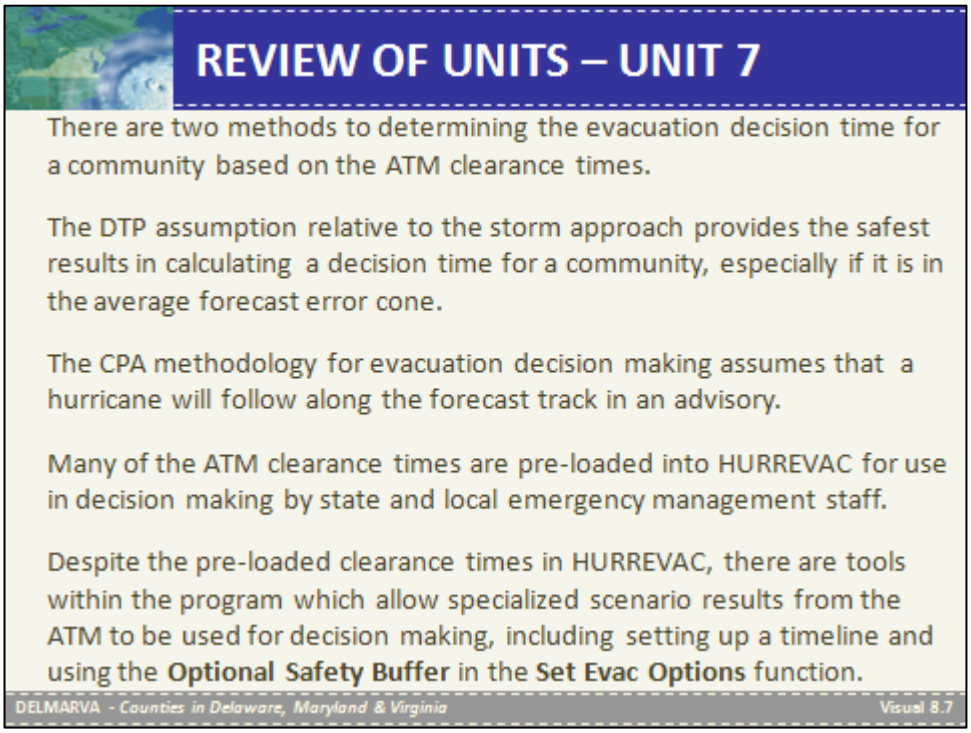
Instructors Notes

Review the following main points:

- The Consequence Management module was developed to better understand evacuation dynamic during an evacuation.
- The ATM includes CM worksheets for four locations:
  - Virginia North (US 13 / US 113 at Pocomoke City, MD),
  - Maryland Shore West (US 50 / US 13 Bypass near Salisbury, MD),
  - Maryland Tri-State West (Route 404 / US 50 near Wyes Mills, MD), and
  - Delaware North (US 1 / US113 near Milford, DE).
- The CM module includes several user defined features, including people per vehicle, primary evacuating lanes, average daily trips, and LOS D hourly volume.
- The shelter worksheet includes two primary inputs; availability and evacuee density (crowding).

Topic: Review of Units – Unit 7

Visual 8.7



Instructors Notes

Review the following main points:

- There are two methods to determining the evacuation decision time for a community based on the ATM clearance times.
- The DTP assumption relative to the storm approach provides the safest results in calculating a decision time for a community, especially if it is in the average forecast error cone.
- The CPA methodology for evacuation decision making assumes that a hurricane will follow along the forecast track in an advisory.
- Many of the ATM clearance times are pre-loaded into HURREVAC for use in decision making by state and local emergency management staff.
- Despite the pre-loaded clearance times in HURREVAC, there are tools within the program which allow specialized scenario results from the ATM to be used for decision making, including setting up a timeline and using the **Optional Safety Buffer** in the **Set Evac Options** function.

Topic: Participant Observations

Visual 8.8

Instructors Notes

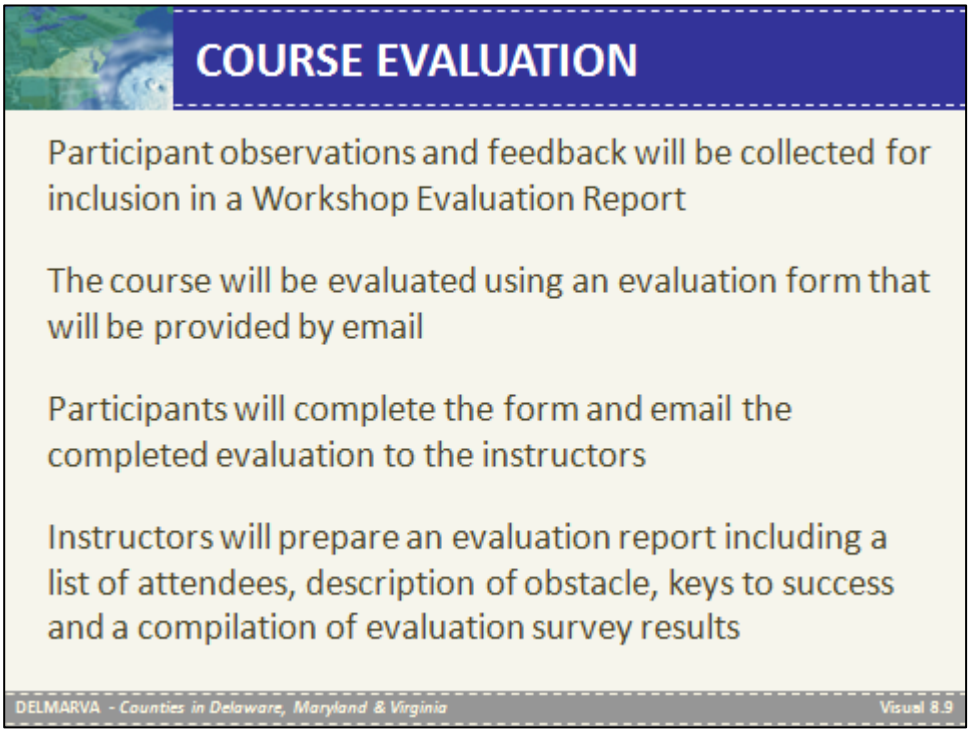
Let the participants know that they will be completing a formal survey of the course in a few minutes. Inform them that they are being provided with an opportunity now to provide immediate feedback and to ask any remaining questions that they may have.

Instructors should guide the participants through the following questions:

- Did the course meet your objectives?
- Was the course structure well?
- Do you feel prepared to use the ATM?
- Do you understand how the results of the ATM integrate into HURREVAC?
- Can you train others in the use of the ATM?

Topic: Course Evaluation Procedures

Visual 8.9



Instructors Notes

The instructors will let the participants know that in order for their needs to continue to be met and for the ATM products and training to improve, it is essential that they take part in the course evaluation.

The instructors will let the participants know that their informal, verbal observations and feedback will be collected for inclusion in a Workshop Evaluation Report.

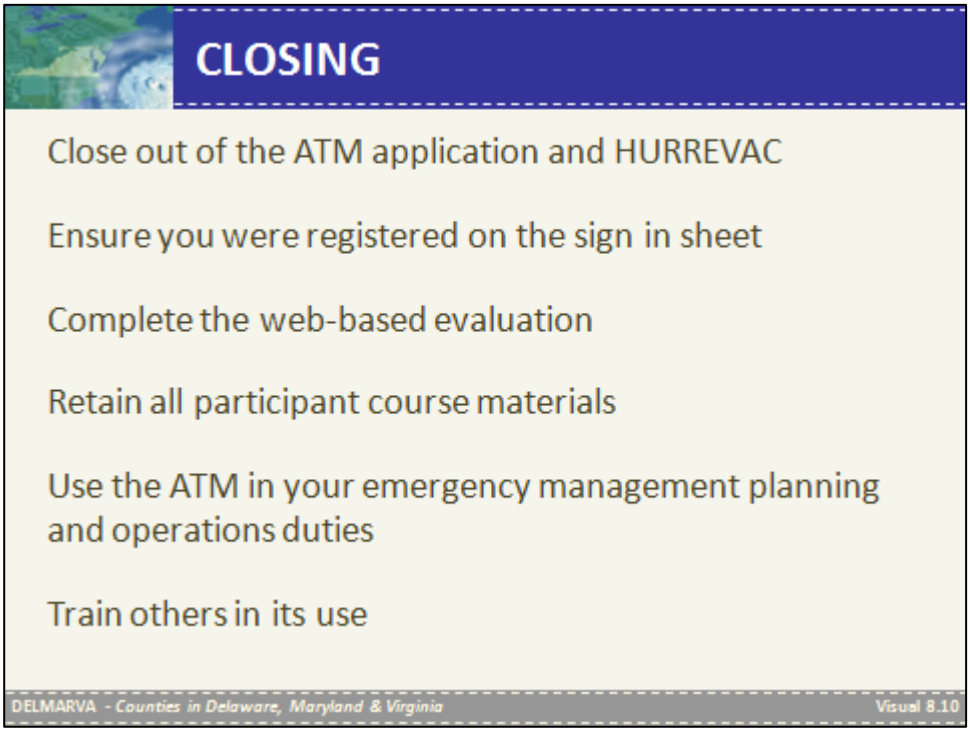
The instructors will tell the participants that the course will be evaluated using a form-based evaluation tool that they will be provided by email to return as soon as possible.

The instructors will let the participants know that they will be preparing an evaluation report, which will include a list of attendees, description of obstacle, keys to success and a compilation of evaluation survey results.

If the training room is web enabled, the participants will be directed to go online and complete the course evaluation survey.

Topic: Closing Elements

Visual 8.10



Instructors Notes

The instructors will go over the following housekeeping issues with the participants, reminding them to:

- Close out of the ATM application and HURREVAC,
- Ensure you were registered on the sign in sheet,
- Complete the web-based evaluation if not already done, and
- Retain all participant course materials.

The instructors will urge the participants to:

- Use the ATM in your emergency management planning and operations duties, and
- Train others in its use.

The instructors will close by thanking the participants, the State, and the National Hurricane Program partners.