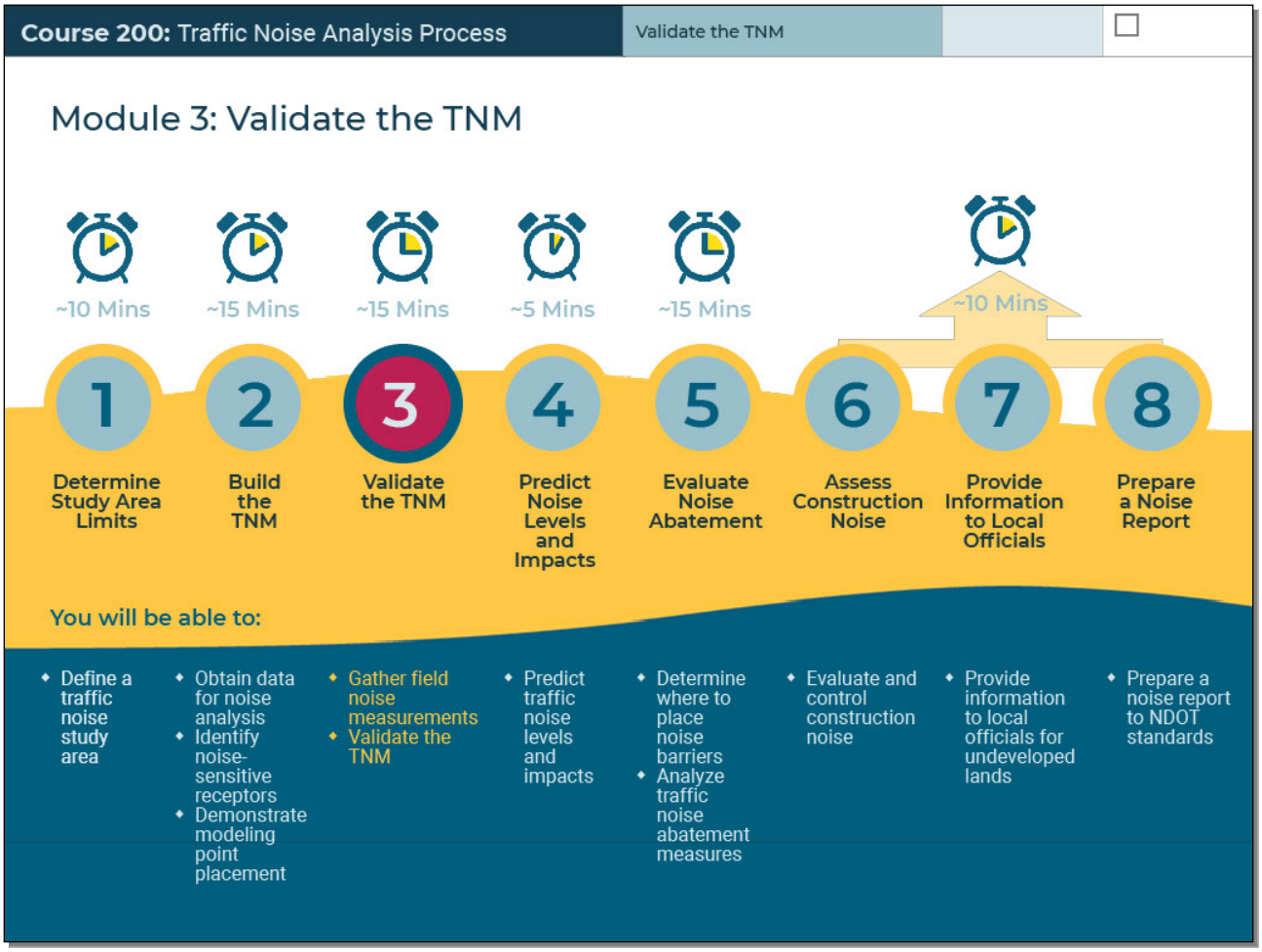
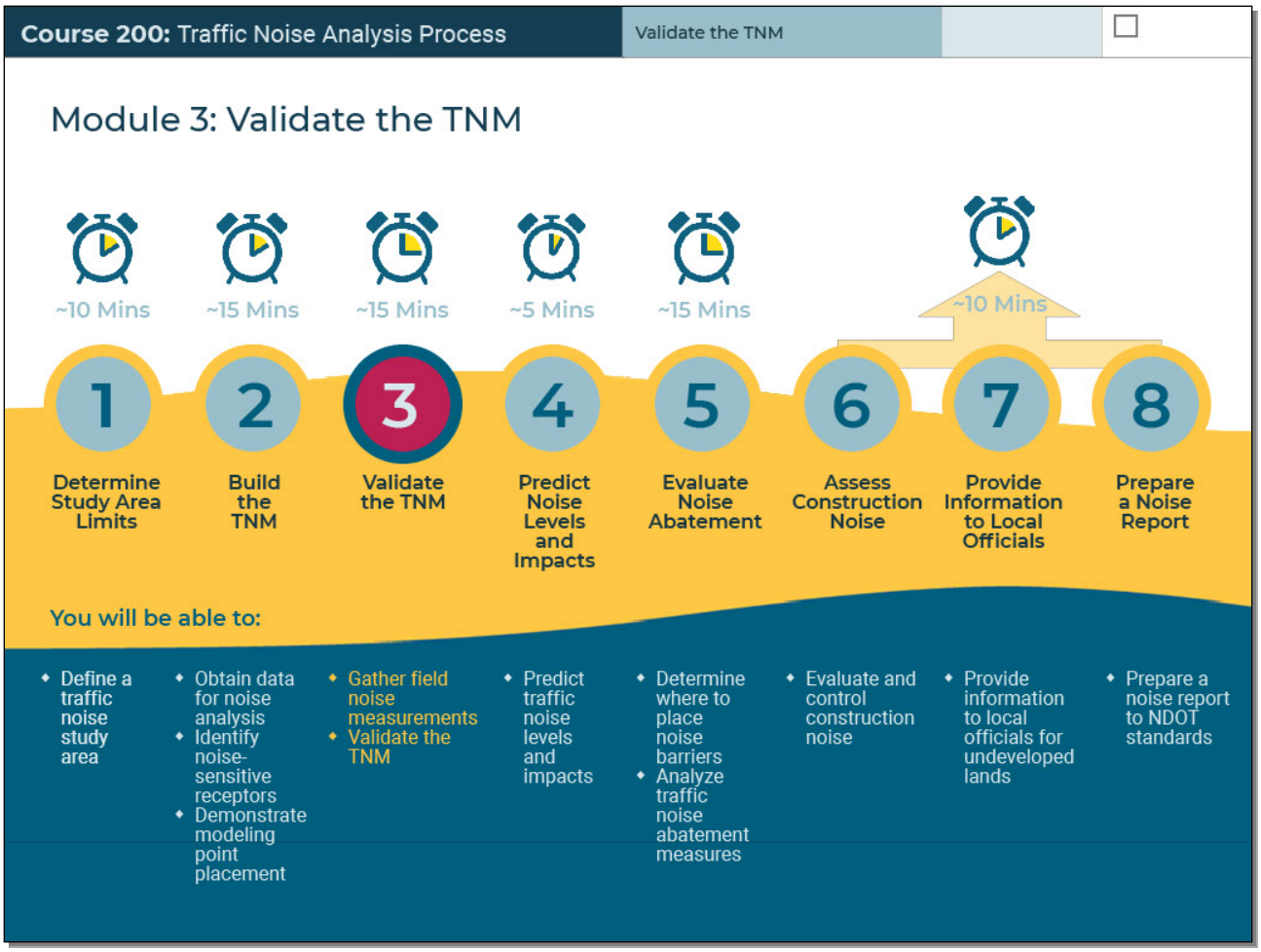
Slide 1 - Slide 1



Slide 1 - Slide 1



Audio Script and Notes to Reviewers

Welcome to Module Three, Validate the T-N-M. After completing this module, you will be able to gather field measurements and validate the T-N-M.

Text Captions

Validate the TNM

Module 2: Build the TNM

You will be able to:

Validate the TNM

- Gather field noise measurements
- Validate the TNM

Determine Study Area Limits

- Define a traffic noise study area

Build the TNM

- Obtain data for noise analysis
- Identify noise- sensitive receptors
- Demonstrate modeling point placement

Predict Noise Levels and Impacts

- Predict traffic noise levels and impacts

Evaluate Noise Abatement

- Determine where to place noise barriers
- Analyze traffic noise abatement measures

Assess Construction Noise

- Evaluate and control construction noise

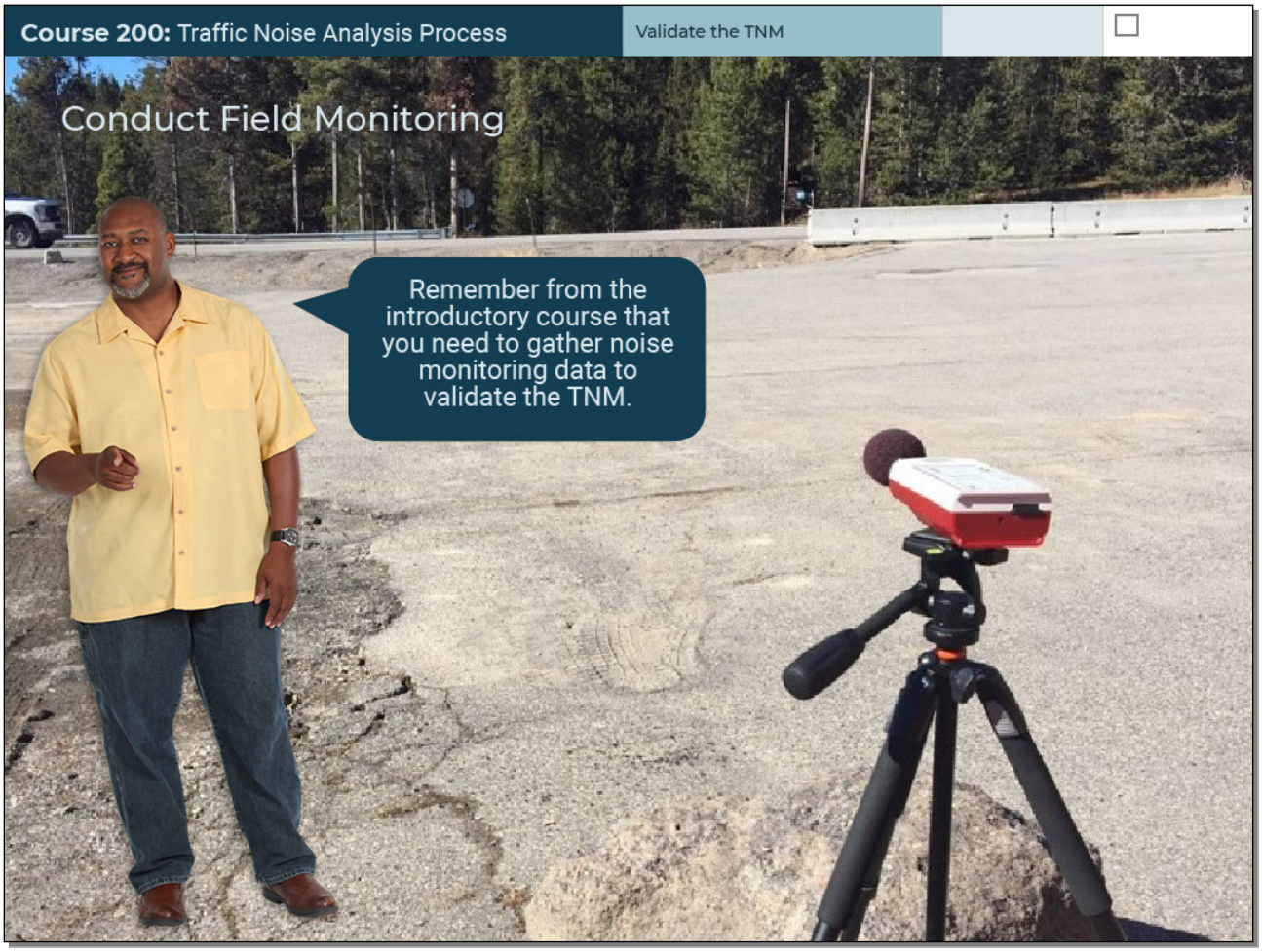
Provide Information to Local Officials

- Provide information to local officials for undeveloped lands

Prepare a Noise Report

- Prepare a noise report to NDOT standards

Slide 2 - Slide 2



Audio Script and Notes to Reviewers
Remember from the introductory course that you need to gather noise monitoring data to validate the T-N-M.

Text Captions
Conduct Field Monitoring
Remember from the introductory course that you need to gather noise monitoring data to validate the TNM.

Slide 3 - Slide 3

Audio Script and Notes to Reviewers
In addition to validation purposes, we also take field measurements to determine existing noise levels for projects on a new alignment.

Text Captions
Conduct Field Monitoring
We also take field measurements to determine existing noise levels for projects on a new alignment.

Slide 4 - Slide 4

Audio Script and Notes to Reviewers
Take measurements at locations representative of receptors in the project area, such as residences, schools, churches, libraries, etcetera. However, not all locations included in the T-N-M need to be field monitored. Focus on locations that best represent the study area.

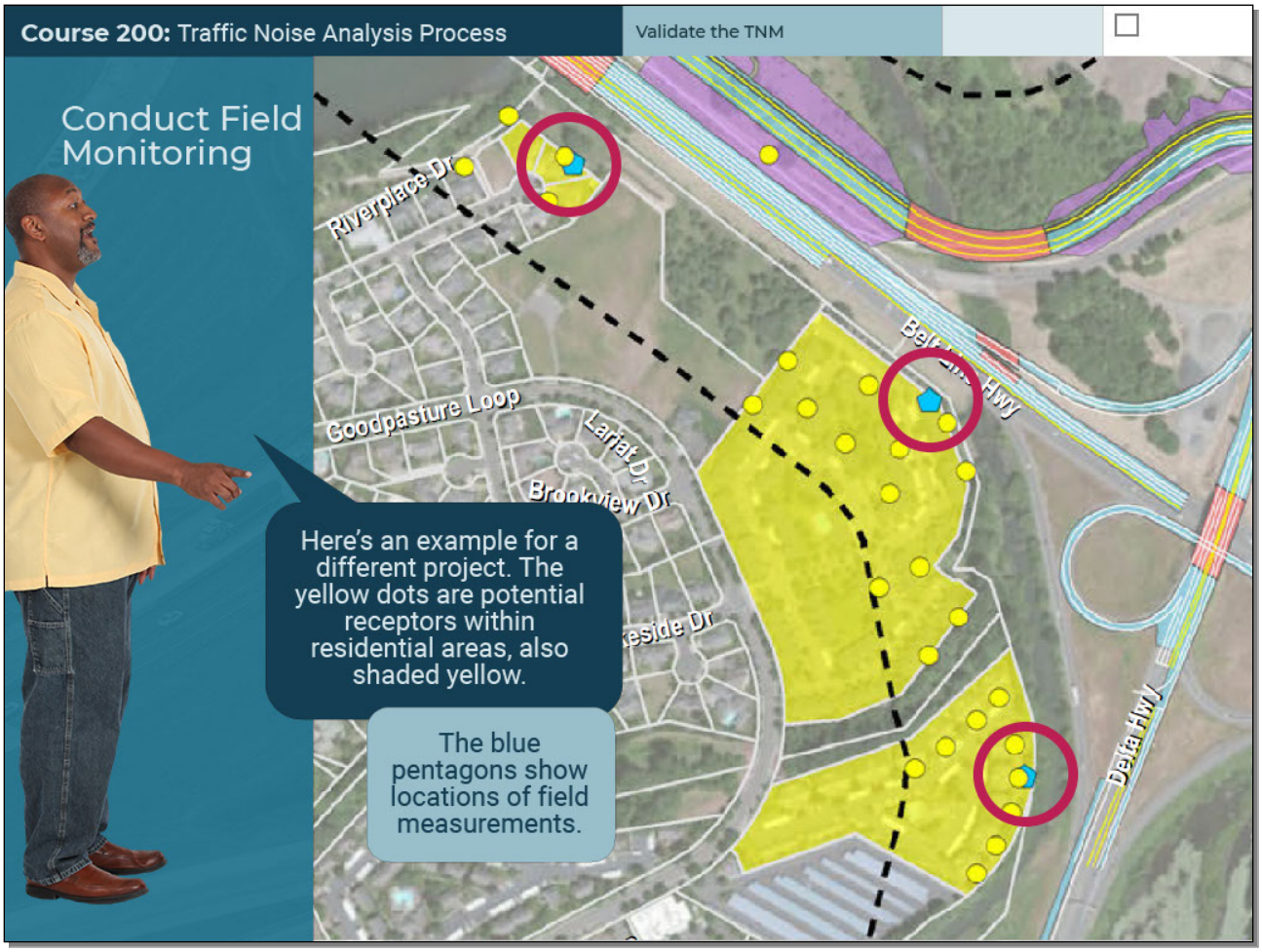
Text Captions
Conduct Field Monitoring
Take measurements at locations representative of receptors in the project area.
However, not all locations included in the TNM need to be field monitored. Focus on locations that best represent the study area.

Slide 5 - Slide 5

Audio Script and Notes to Reviewers
For example, we generally select locations where there are significant changes in traffic and topography. For lengthy corridors, use locations that are spread out enough to adequately cover the study area.

Text Captions
Conduct Field Monitoring
For example, we generally select locations where there are significant changes in traffic and topography.
For lengthy corridors, use locations that are spread out enough to adequately cover the study area.

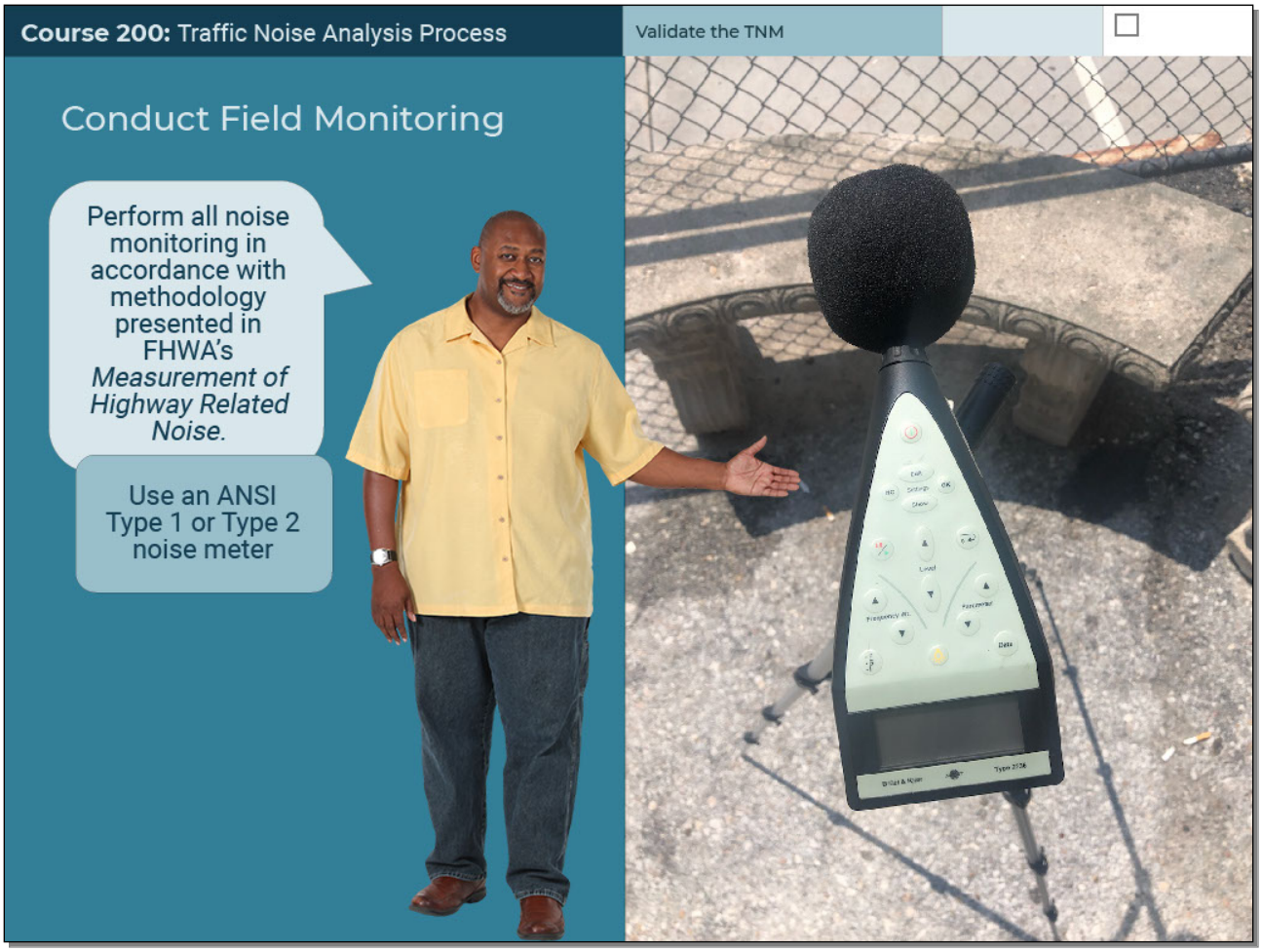
Slide 6 - Slide 6



Audio Script and Notes to Reviewers
Here's an example for a different project. The yellow dots are potential receptors within residential areas, also shaded yellow. The blue pentagons show locations of field measurements.

Text Captions
Conduct Field Monitoring
Here's an example for a different project. The yellow dots are potential receptors within residential areas, also shaded yellow.
The blue pentagons show locations of field measurements.

Slide 7 - Slide 7



Audio Script and Notes to Reviewers
Perform all noise monitoring in accordance with methodology presented in F-H-W-A's "Measurement of Highway Related Noise." Use an Ansee Type One or Type Two noise meter.

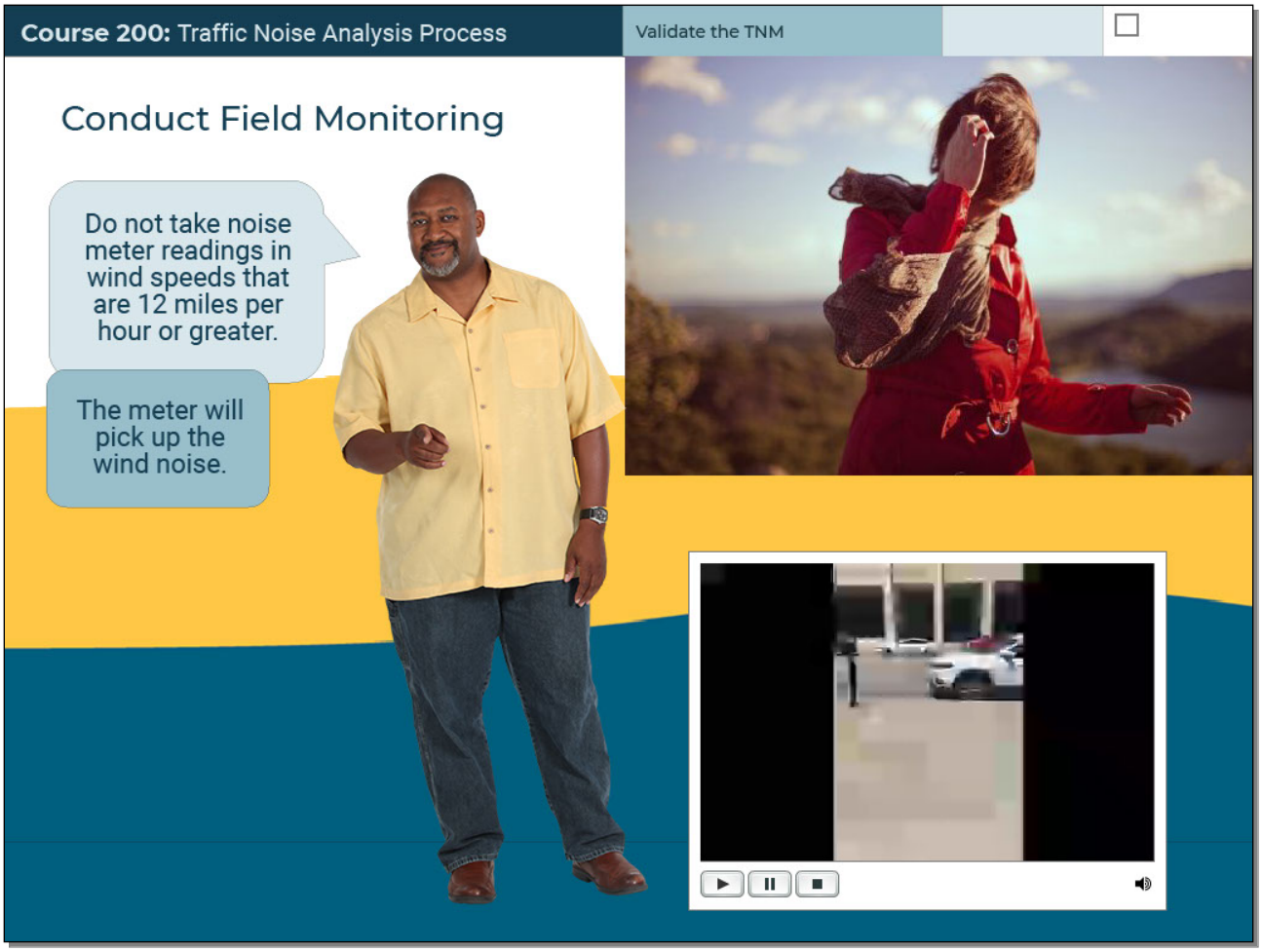
Text Captions
Conduct Field Monitoring
Perform all noise monitoring in accordance with methodology presented in FHWA's *Measurement of Highway Related Noise.*
Use an ANSI Type 1 or Type 2 noise meter

Slide 8 - Slide 8

Audio Script and Notes to Reviewers
Take field measurements at exterior areas of frequent human use, or at the right-of-way line if there is no outdoor use.

Text Captions
Conduct Field Monitoring
Take field measurements at exterior areas of frequent human use or at the right-of-way line if there is no outdoor use.

Slide 9 - Slide 9



Audio Script and Notes to Reviewers
Do not take noise meter readings in wind speeds that are twelve miles per hour or greater. The meter will pick up the wind noise.
Reviewer: This slide includes a video of windy conditions.

Text Captions
Conduct Field Monitoring
Do not take noise meter readings in wind speeds that are 12 miles per hour or greater.
The meter will pick up the wind noise.

Slide 10 - Slide 10

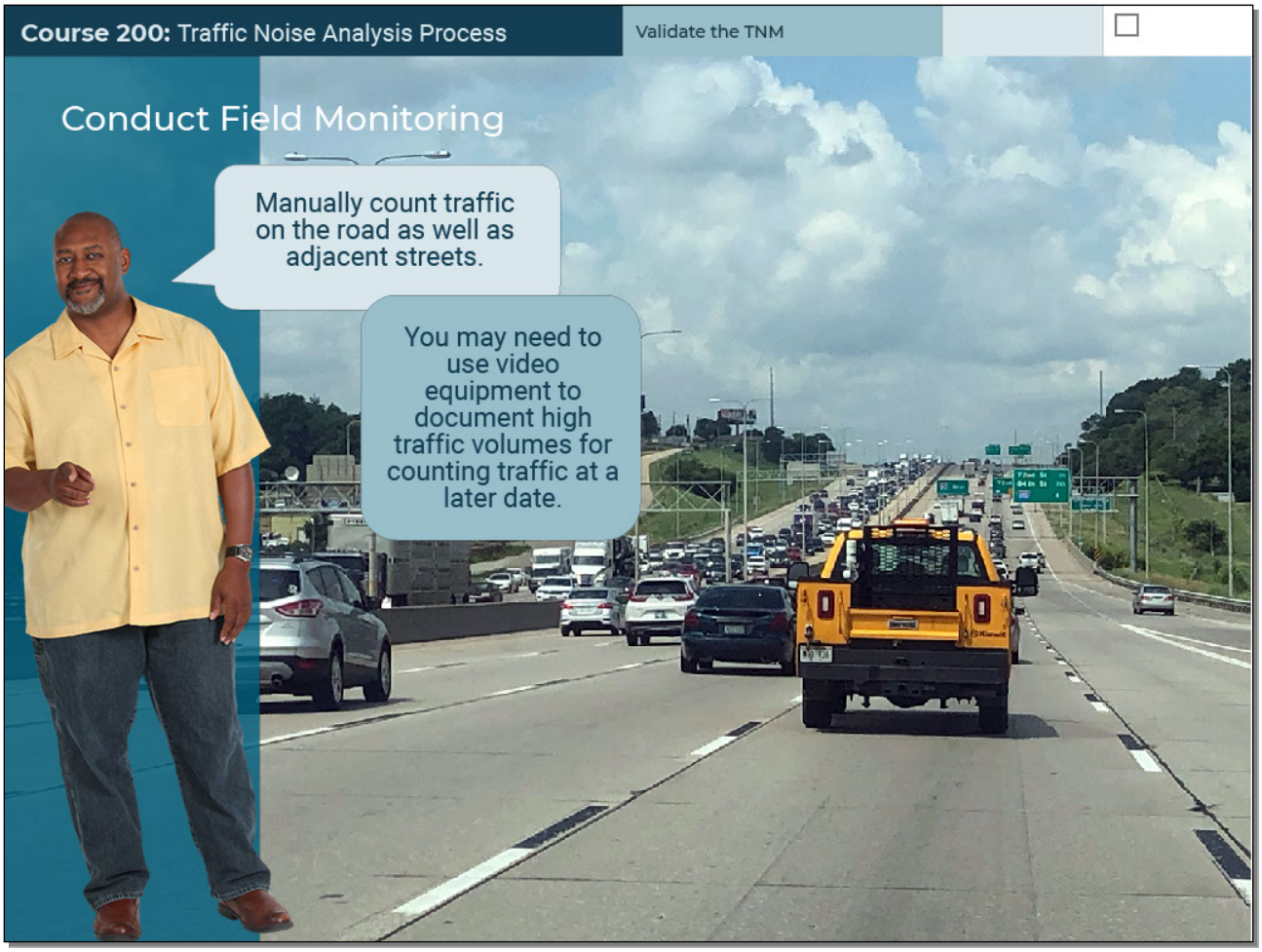
Audio Script and Notes to Reviewers

This location is a Category "C" receptor. I took three fifteen-minute measurements at each location, which is usually sufficient. Although three measurements are recommended, in some instances, two readings may be sufficient if terrain is relatively flat and noise levels are consistent. Long-term, twenty-four-hour modeling is typically not necessary and requires coordination with N-dot P-Q-S to develop a monitoring plan.

Text Captions

Conduct Field Monitoring
This location is a Category C receptor.
I took three 15-minute measurements at each location, which is usually sufficient.
Two readings may be sufficient if terrain is relatively flat and noise levels are consistent.
Long-term, 24-hour modeling is typically not necessary and requires coordination with NDOT PQS to develop a monitoring plan.

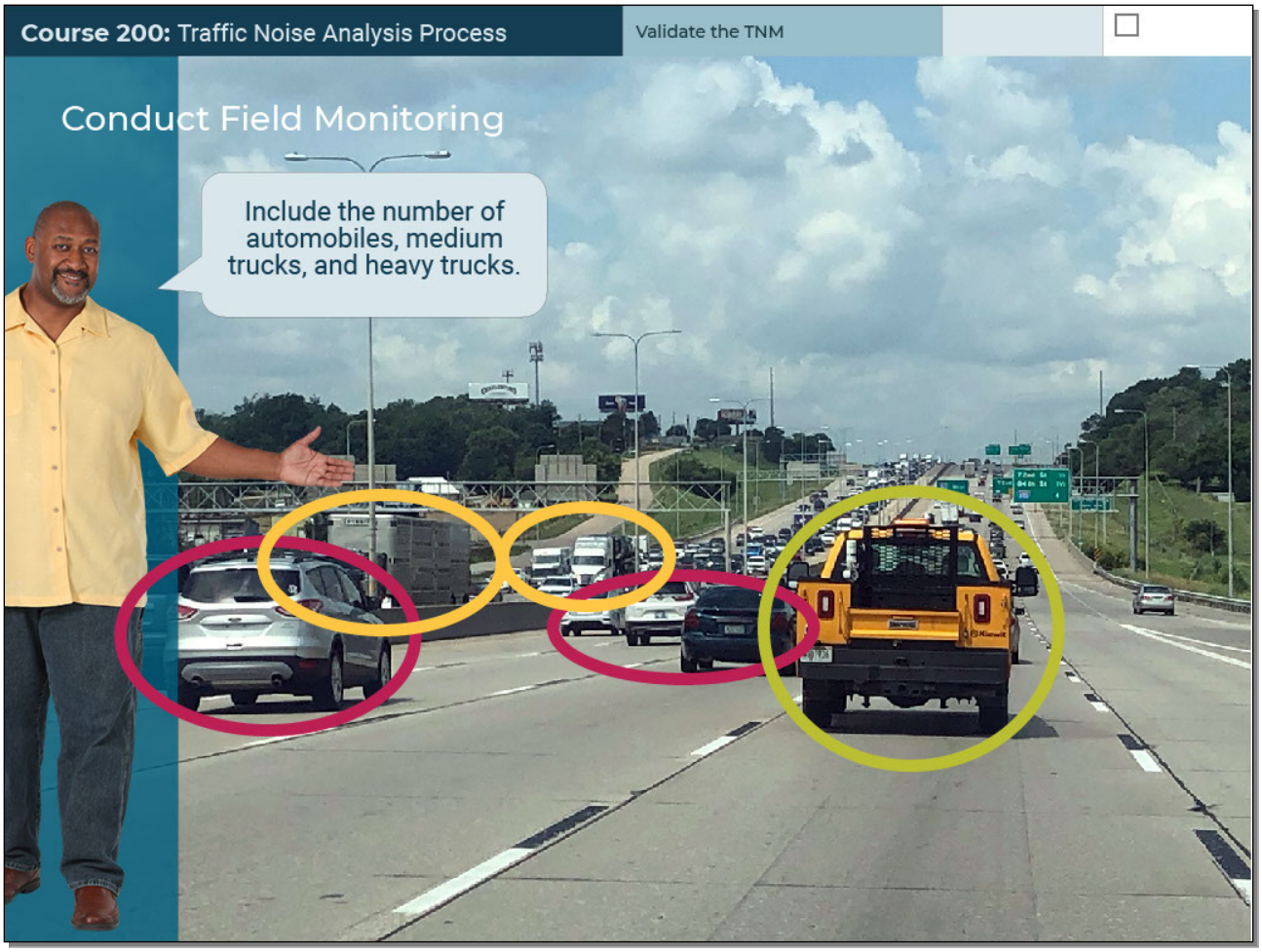
Slide 11 - Slide 11



Audio Script and Notes to Reviewers
Manually count traffic on the road as well as adjacent streets. You may need to use video equipment to document high traffic volumes for counting traffic at a later date.
Note: Possibly add video here.

Text Captions
Conduct Field Monitoring
Manually count traffic on the road as well as adjacent streets.
You may need to use video equipment to document high traffic volumes for counting traffic at a later date.

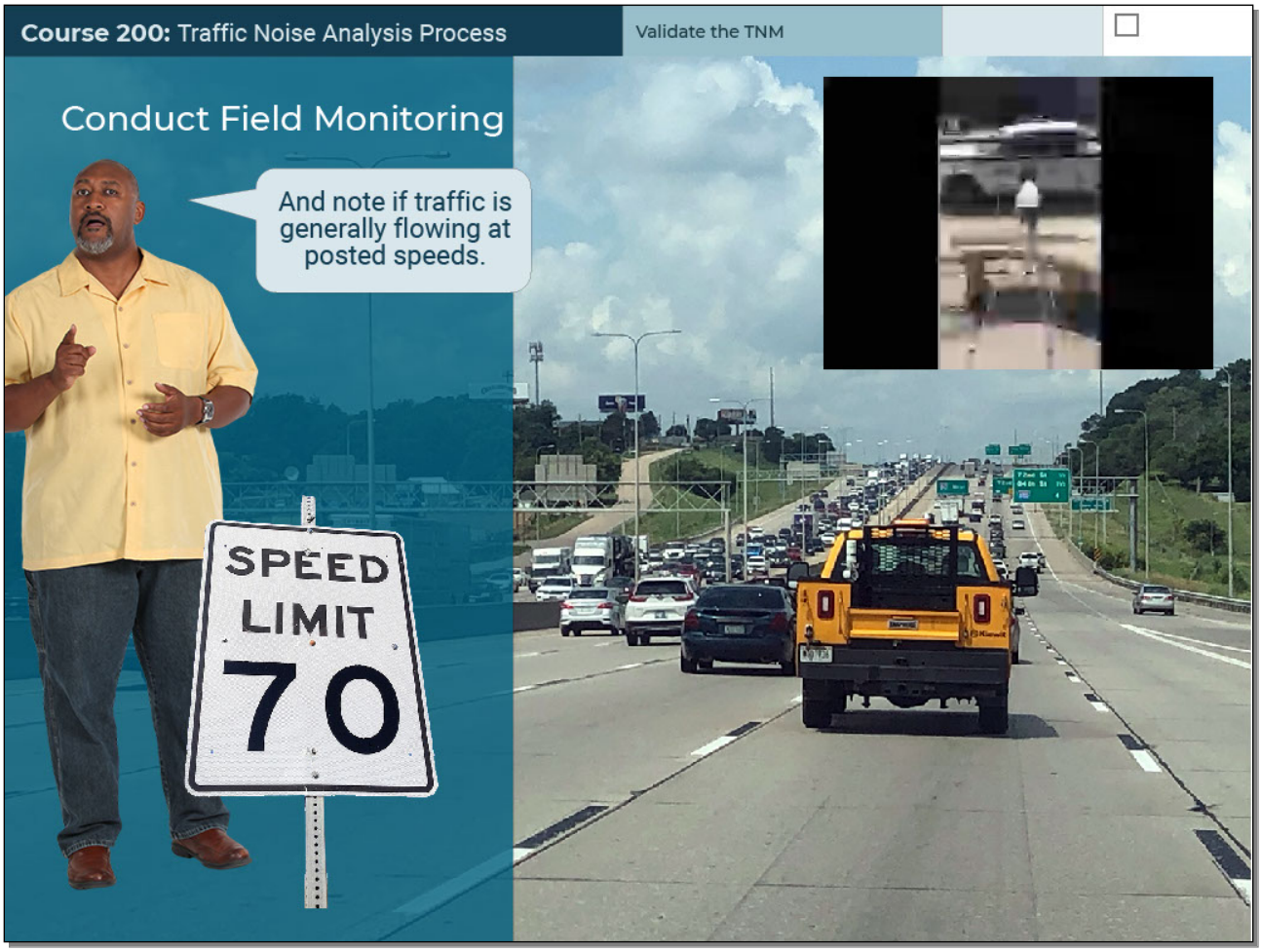
Slide 12 - Slide 12



Audio Script and Notes to Reviewers
Include the number of automobiles, medium trucks, and heavy trucks. Also count motorcycles and buses to validate the model.

Text Captions
Conduct Field Monitoring
Include the number of automobiles, medium trucks, and heavy trucks.

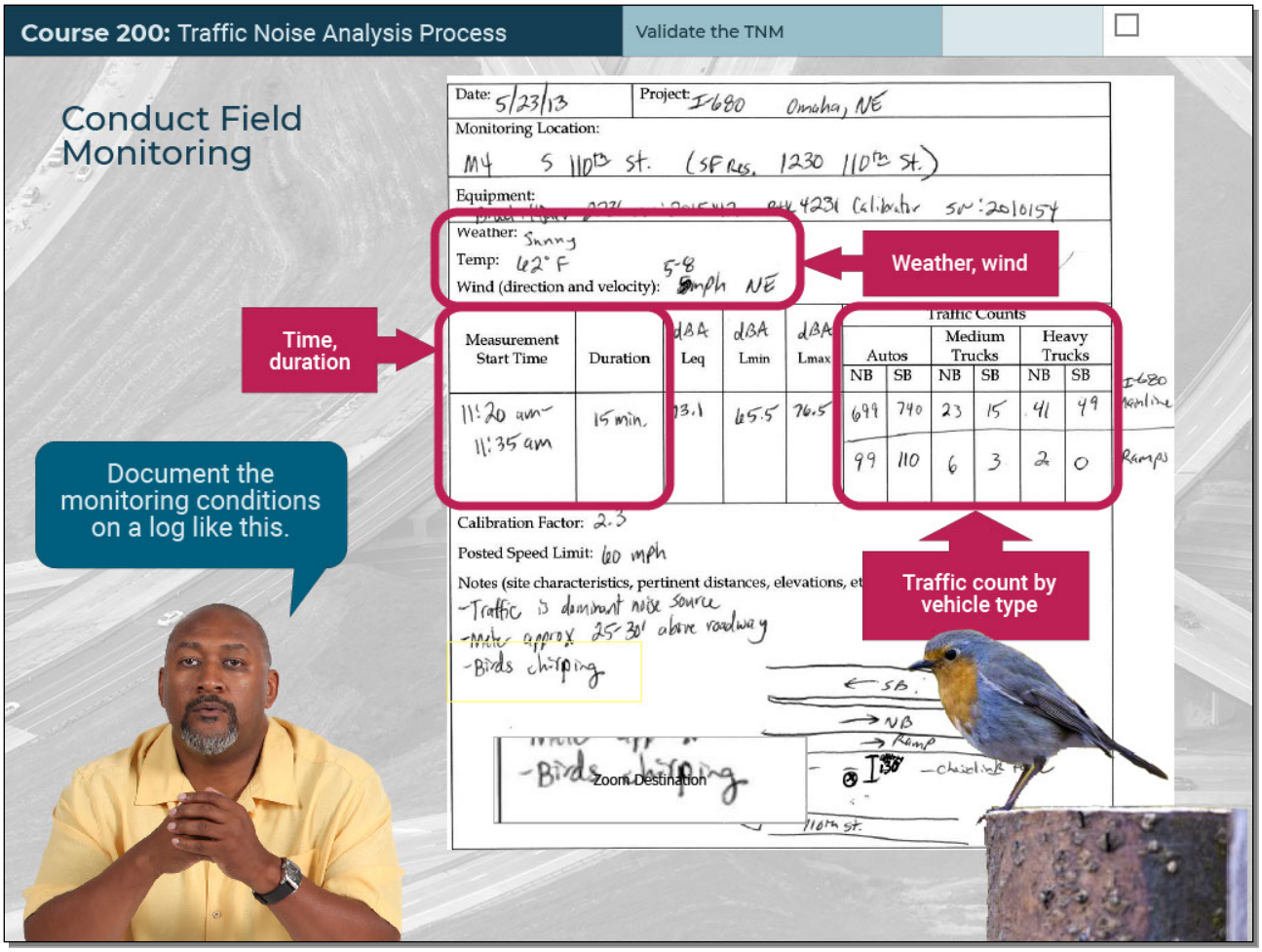
Slide 13 - Slide 13



Audio Script and Notes to Reviewers
And note if traffic is generally flowing at posted speeds.

Text Captions
Conduct Field Monitoring
And note if traffic is generally flowing at posted speeds.

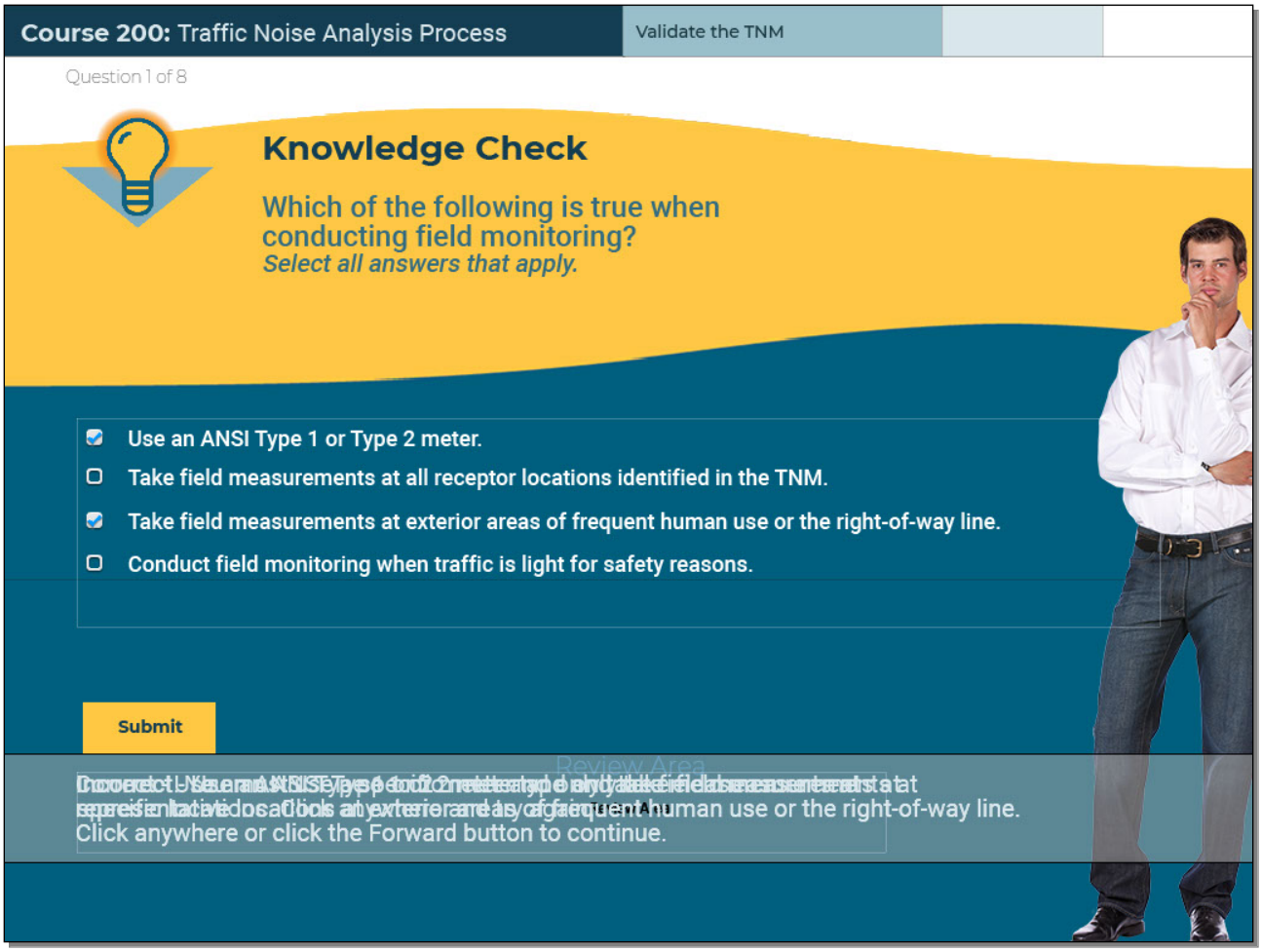
Slide 14 - Slide 14



Audio Script and Notes to Reviewers
Document the monitoring conditions on a log like this. Include notes about weather and wind, the time and duration of each recording, and the traffic count by vehicle type. Also make note of anything else that could affect the noise data you're gathering, such as birds chirping. If an unusually loud event occurs, such as emergency vehicles passing by, jets flying overhead, or dogs barking, you may need to re-take the measurements.

Text Captions
Conduct Field Monitoring
Document the monitoring conditions on a log like this.
Weather, wind
Time, duration
Traffic count by vehicle type

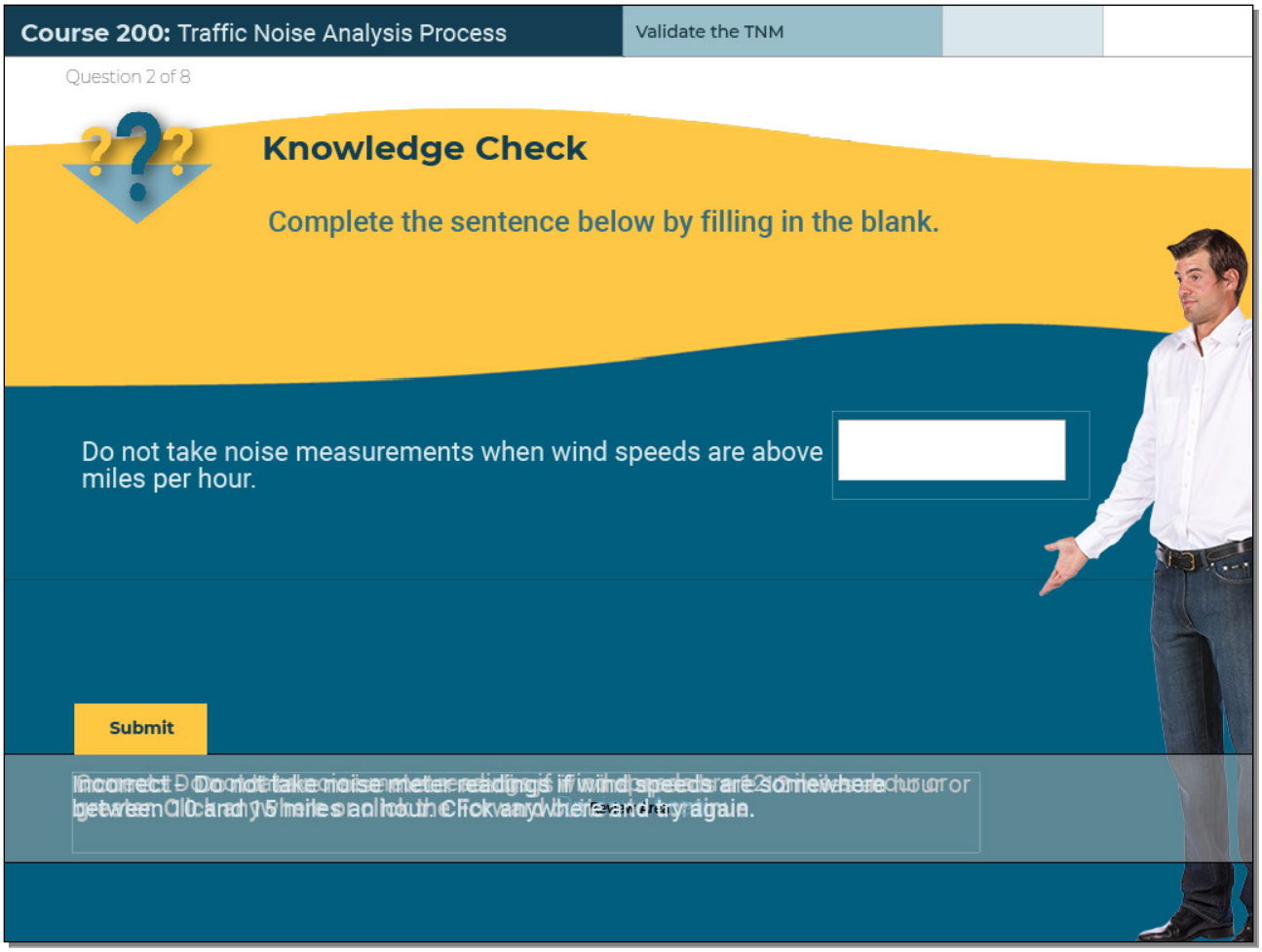
Slide 15 - Slide 15



Audio Script and Notes to Reviewers
Which of the following is true when conducting field monitoring?

Text Captions
Knowledge Check
Which of the following is true when conducting field monitoring?
Select all answers that apply.
Correct feedback: Correct - Use an ANSI Type 1 or 2 meter and only take field measurements at representative locations at exterior areas of frequent human use or the right-of-way line. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect. You must use a specific meter type and take measurements at specific locations. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Use an ANSI Type 1 or 2 meter and only take field measurements at representative locations at exterior areas of frequent human use or the right-of-way line. Click anywhere or click the Forward button to continue.

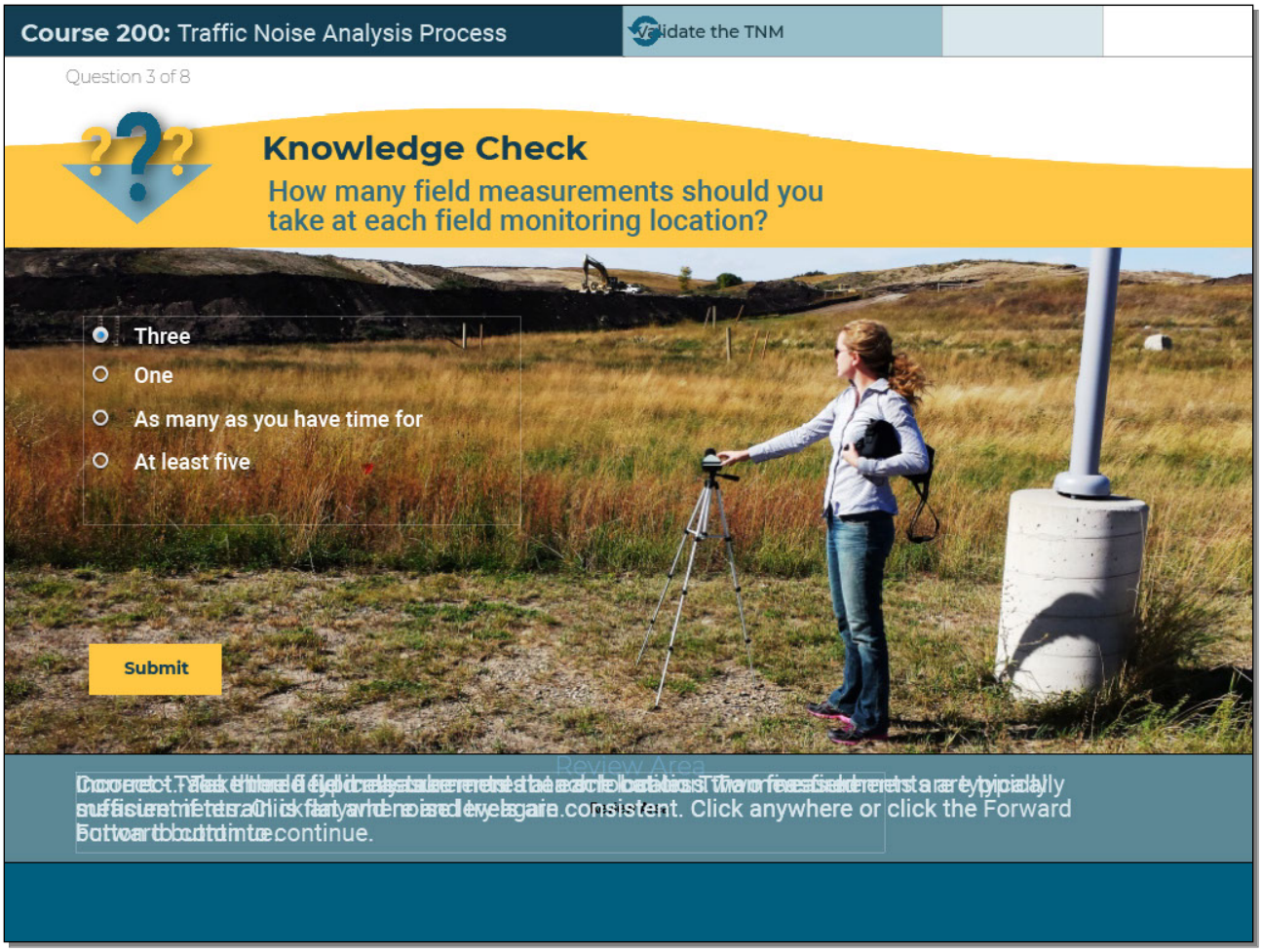
Slide 16 - Slide 16



Audio Script and Notes to Reviewers
Complete the sentence below by filling in the blank.

Text Captions
Knowledge Check
Complete the sentence below by filling in the blank.
Do not take noise measurements when wind speeds are above ____ miles per hour.
Correct feedback: Correct - Do not take noise meter readings if wind speeds are 12 miles an hour or greater. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect - Do not take noise meter readings if wind speeds are somewhere between 10 and 15 miles an hour. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Do not take noise meter readings if wind speeds are 12 miles an hour or greater. Click anywhere or click the Forward button to continue.

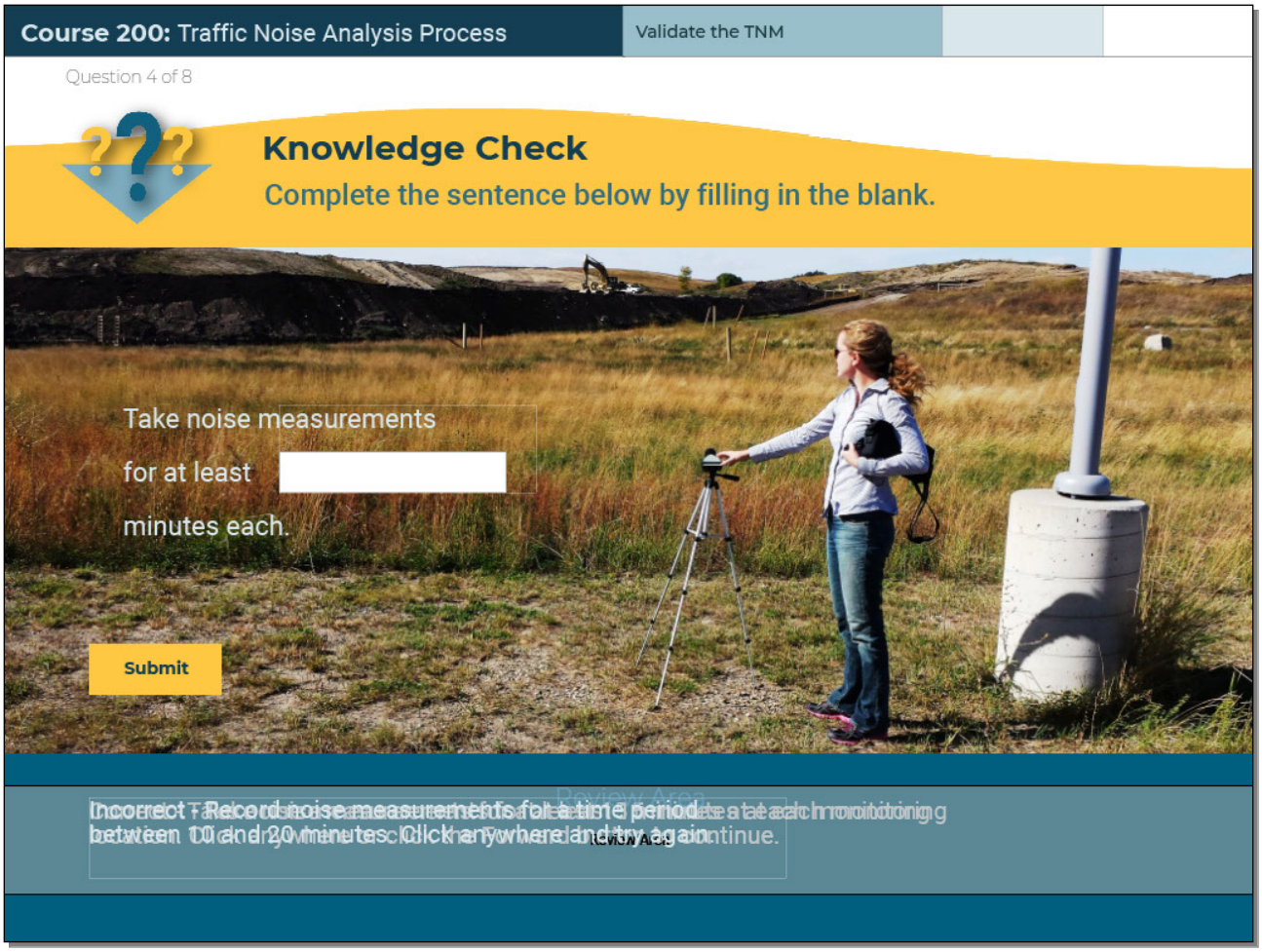
Slide 17 - Slide 17



Audio Script and Notes to Reviewers
How many field measurements should you take at each field monitoring location?

Text Captions
Knowledge Check
How many field measurements should you take at each field monitoring location?
Correct feedback: Correct - Take three field measurements at each location. Two measurements are typically sufficient if terrain is flat and noise levels are consistent. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect. You should typically take more than one but less than five field measurements. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Take three field measurements at each location. Two measurements are typically sufficient if terrain is flat and noise levels are consistent. Click anywhere or click the Forward button to continue.

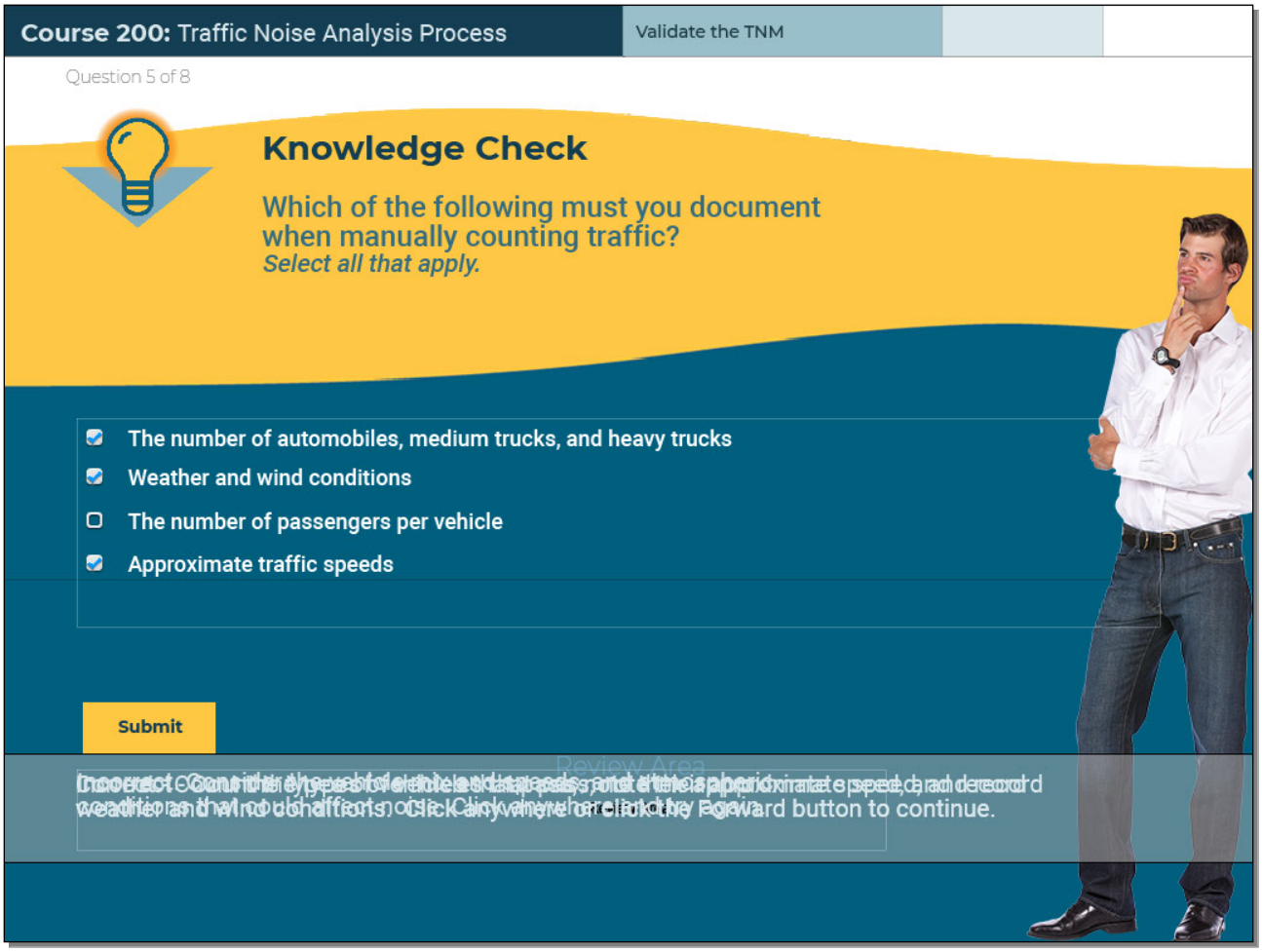
Slide 18 - Slide 18



Audio Script and Notes to Reviewers
Complete the sentence below by filling in the blank.

Text Captions
Knowledge Check
Complete the sentence below by filling in the blank.
Take noise measurements for at least _____ minutes each.
Correct feedback: Correct - Take noise measurements for at least 15 minutes at each monitoring location. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect - Record noise measurements for a time period between 10 and 20 minutes. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Take noise measurements for at least 15 minutes at each monitoring location. Click anywhere or click the Forward button to continue.

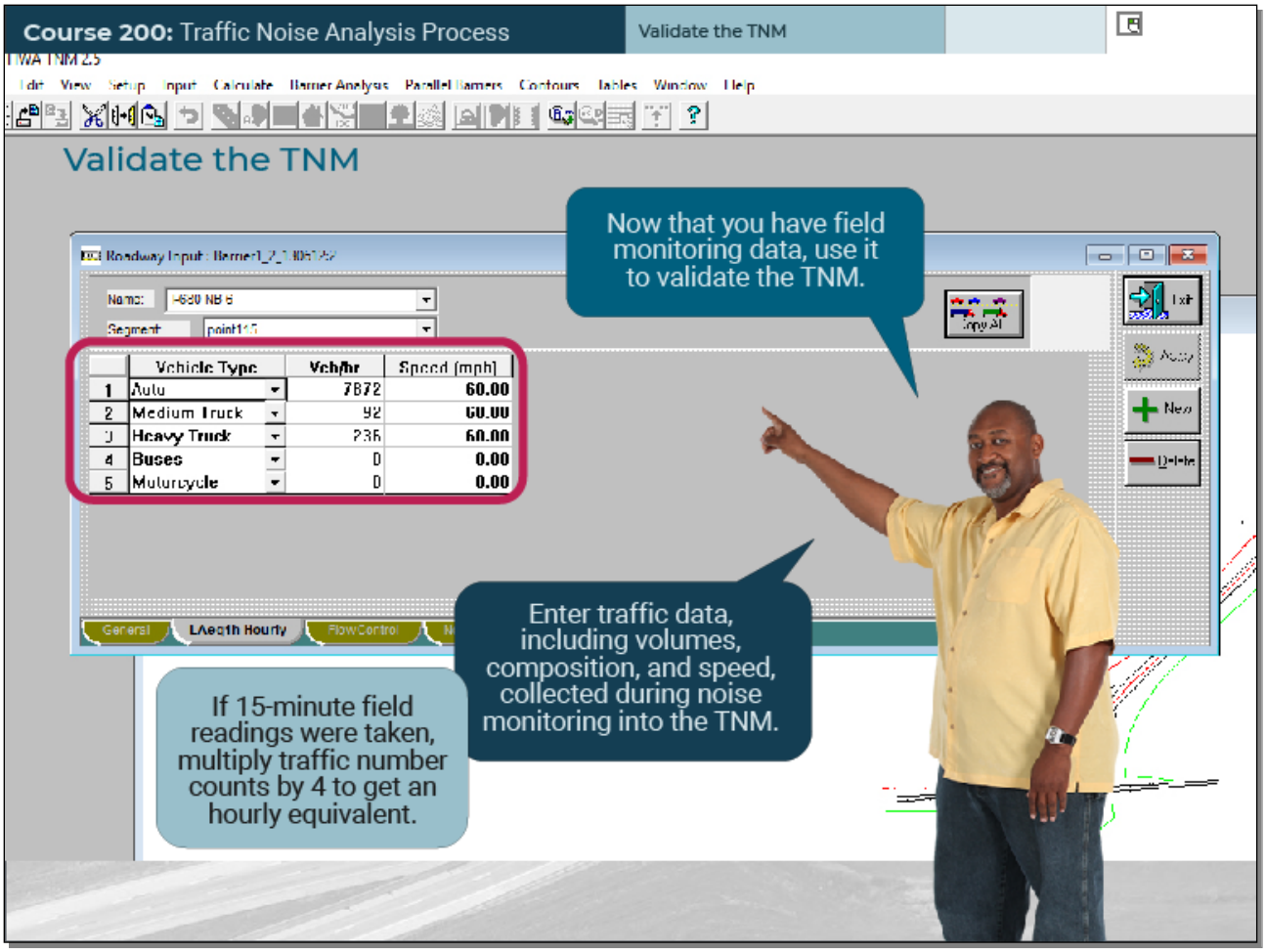
Slide 19 - Slide 19



Audio Script and Notes to Reviewers
Which of the following must you document when manually counting traffic?

Text Captions
Knowledge Check
Which of the following must you document when manually counting traffic?
Select all that apply.
Correct feedback: Correct - Count the types of vehicles that pass, note their approximate speed, and record weather and wind conditions. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect. Consider the vehicle mix and speeds, and atmospheric conditions that could affect noise. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Count the types of vehicles that pass, note their approximate speed, and record weather and wind conditions. Click anywhere or click the Forward button to continue.

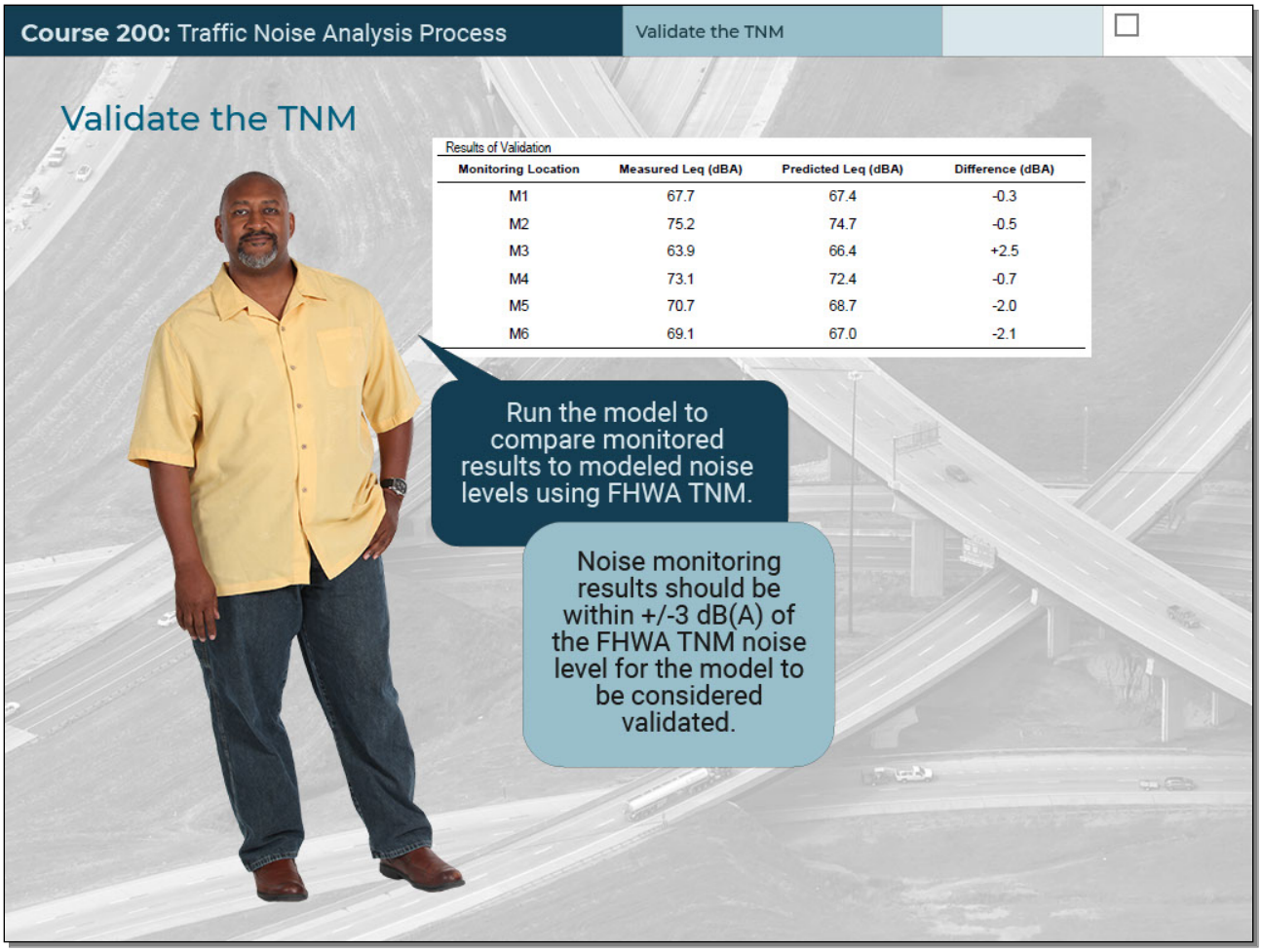
Slide 20 - Slide 20



Audio Script and Notes to Reviewers
Now that you have field monitoring data, use it to validate the T-N-M. Enter traffic data, including volumes, composition, and speed, collected during noise monitoring into the T-N-M. If fifteen-minute field readings were taken, multiply traffic number counts by four to get an hourly equivalent.

Text Captions
Course 200: Traffic Noise Analysis Process
Validate the TNM
Enter traffic data, including volumes, composition, and speed, collected during noise monitoring into the TNM.
Validate the TNM
Now that you have field monitoring data, use it to validate the TNM.
If 15-minute field readings were taken, multiply traffic number counts by 4 to get an hourly equivalent.

Slide 21 - Slide 21



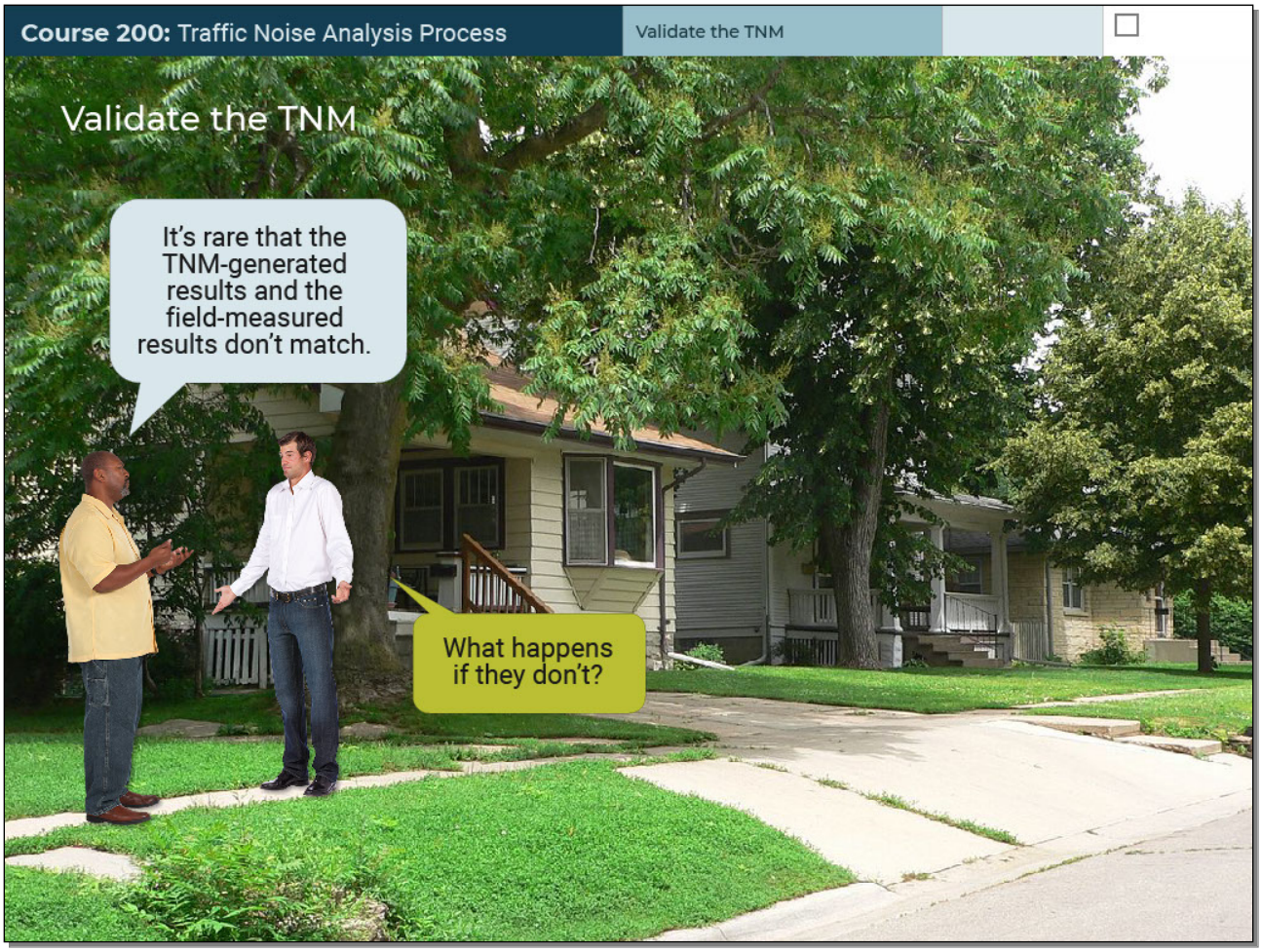
Audio Script and Notes to Reviewers

Run the model to compare monitored results to modeled noise levels using F-H-W-A T-N-M. Noise monitoring results should be within plus-or-minus three D-B-A of the F-H-W-A T-N-M noise level for the model to be considered validated.

Text Captions

Validate the TNM
Run the model to compare monitored results to modeled noise levels using FHWA TNM.
Noise monitoring results should be within +/-3 dB(A) of the FHWA TNM noise level for the model to be considered validated.

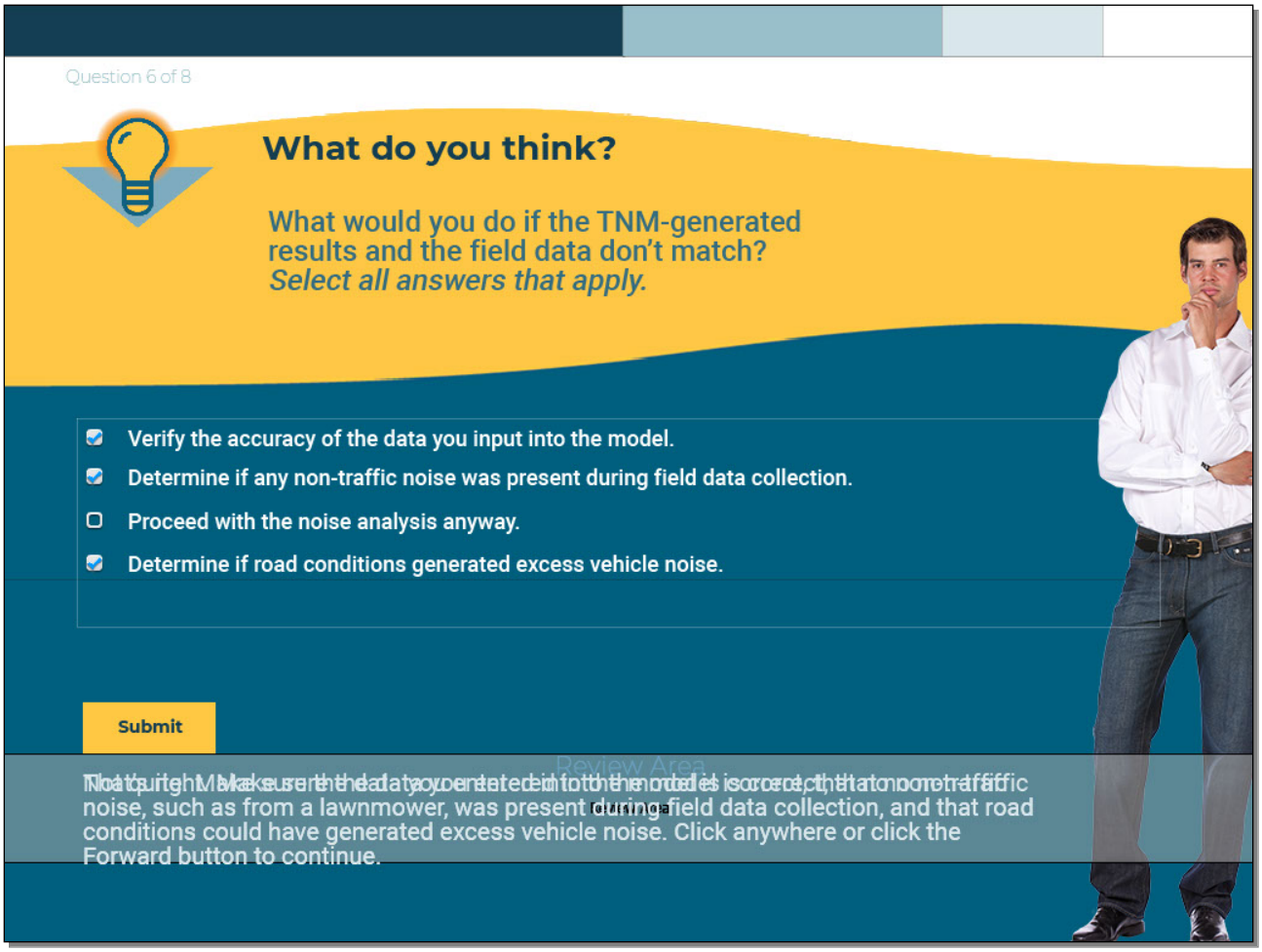
Slide 22 - Slide 22



Audio Script and Notes to Reviewers
It's rare that the T-N-M-generated results and the field-measured results don't match.
What happens if they don't?

Text Captions
Validate the TNM
It's rare that the TNM-generated results and the field-measured results don't match.
What happens if they don't?

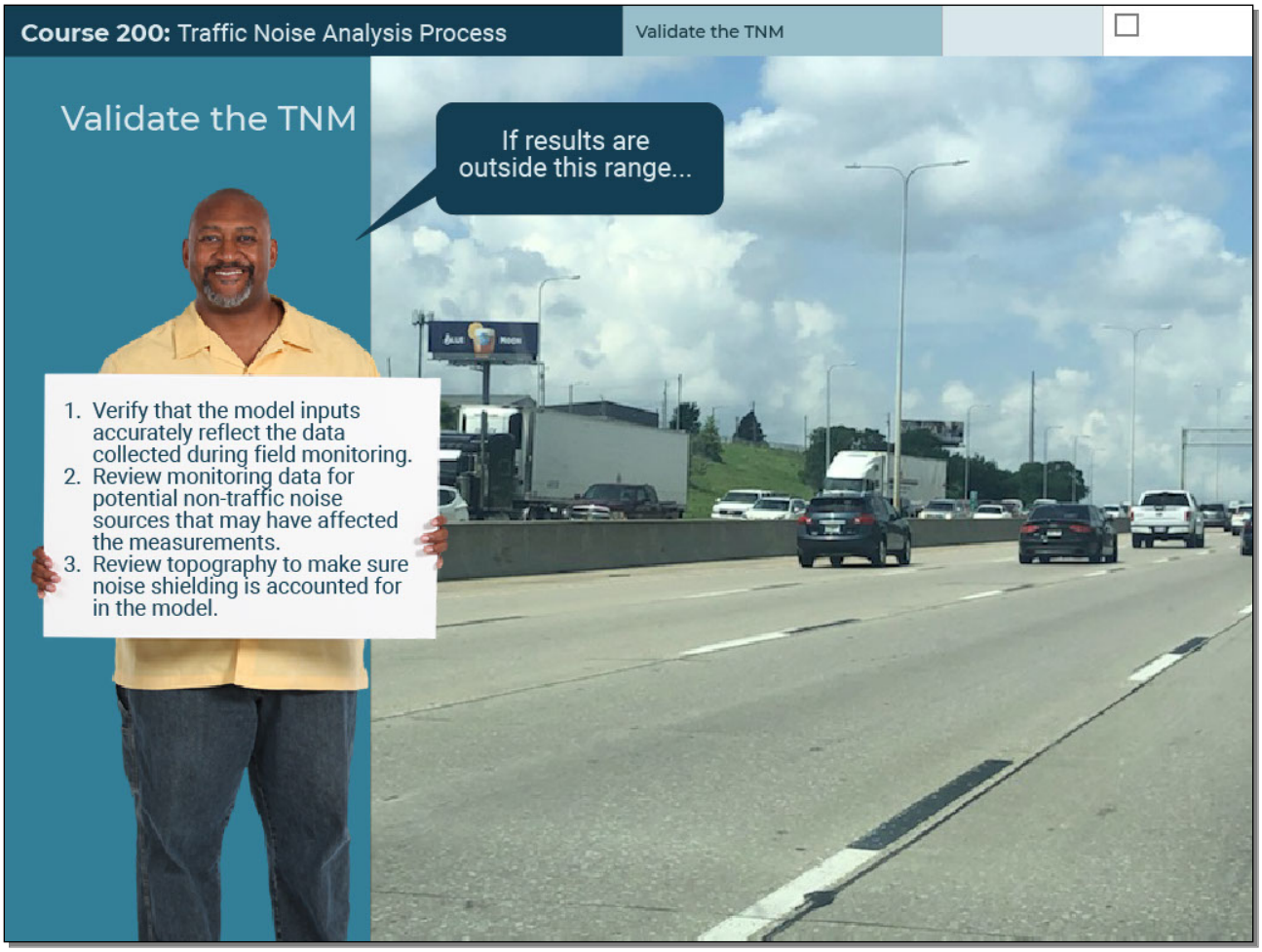
Slide 23 - Slide 23



Audio Script and Notes to Reviewers
What would you do if the T-N-M-generated results and the field data don't match?

Text Captions
What do you think?
What would you do if the TNM-generated results and the field data don't match?
Select all answers that apply.
That's right. Make sure the data you entered into the model is correct, that no non-traffic noise, such as from a lawnmower, was present during field data collection, and that road conditions could have generated excess vehicle noise. Click anywhere or click the Forward button to continue.
Not quite. Make sure the data you entered into the model is correct, that no non-traffic noise, such as from a lawnmower, was present during field data collection, and that road conditions could have generated excess vehicle noise. Click anywhere or click the Forward button to continue.

Slide 24 - Slide 24



Audio Script and Notes to Reviewers

If results are outside this range, verify that the model inputs accurately reflect the data collected during field monitoring. For example, refer to field photos. Review monitoring data for potential non-traffic noise sources that may have affected the measurements. And Review topography to make sure noise shielding is accounted for in the model.

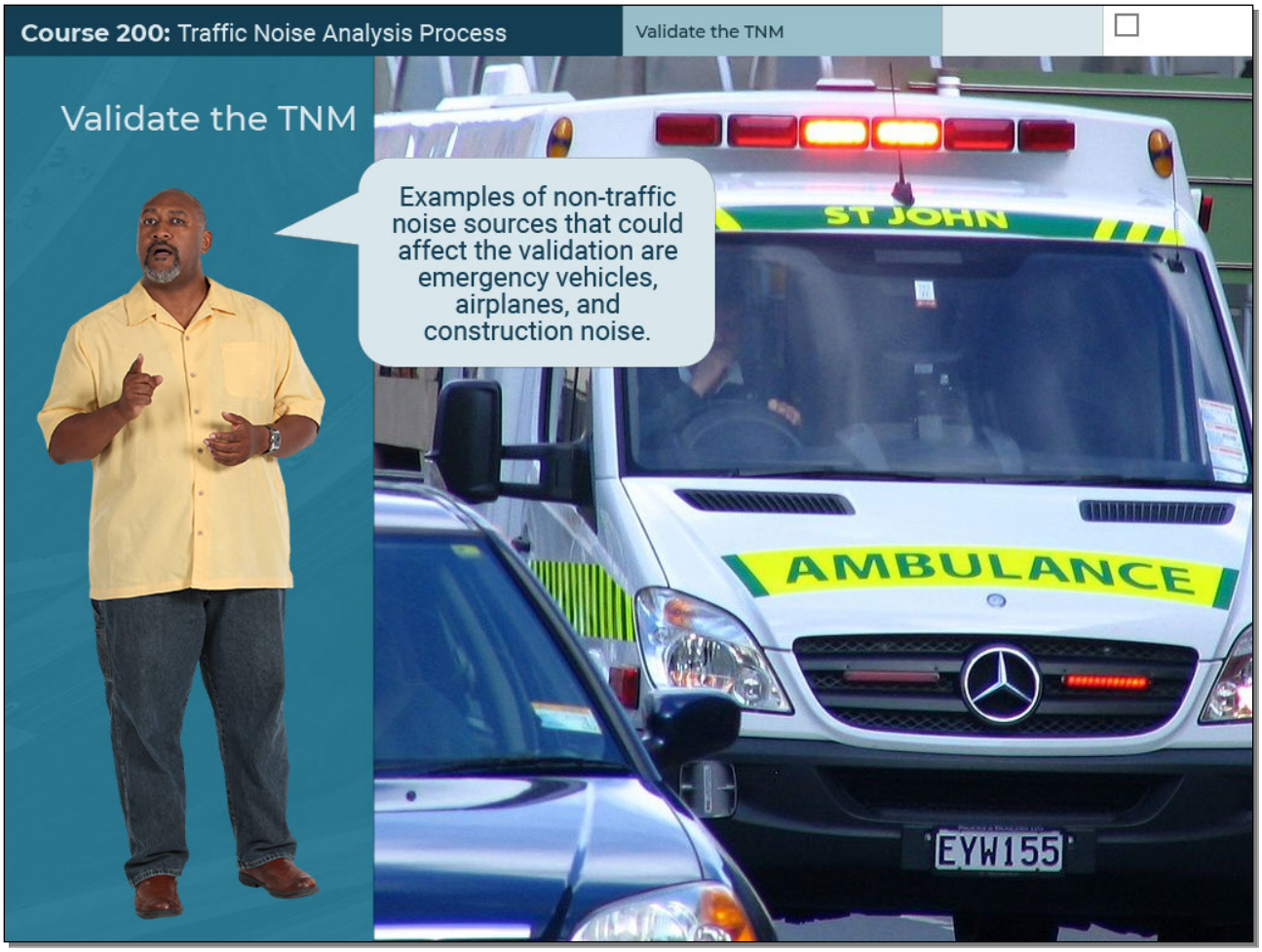
Text Captions

Validate the TNM

If results are outside this range...

1. Verify that the model inputs accurately reflect the data collected during field monitoring.
2. Review monitoring data for potential non-traffic noise sources that may have affected the measurements.
3. Review topography to make sure noise shielding is accounted for in the model.

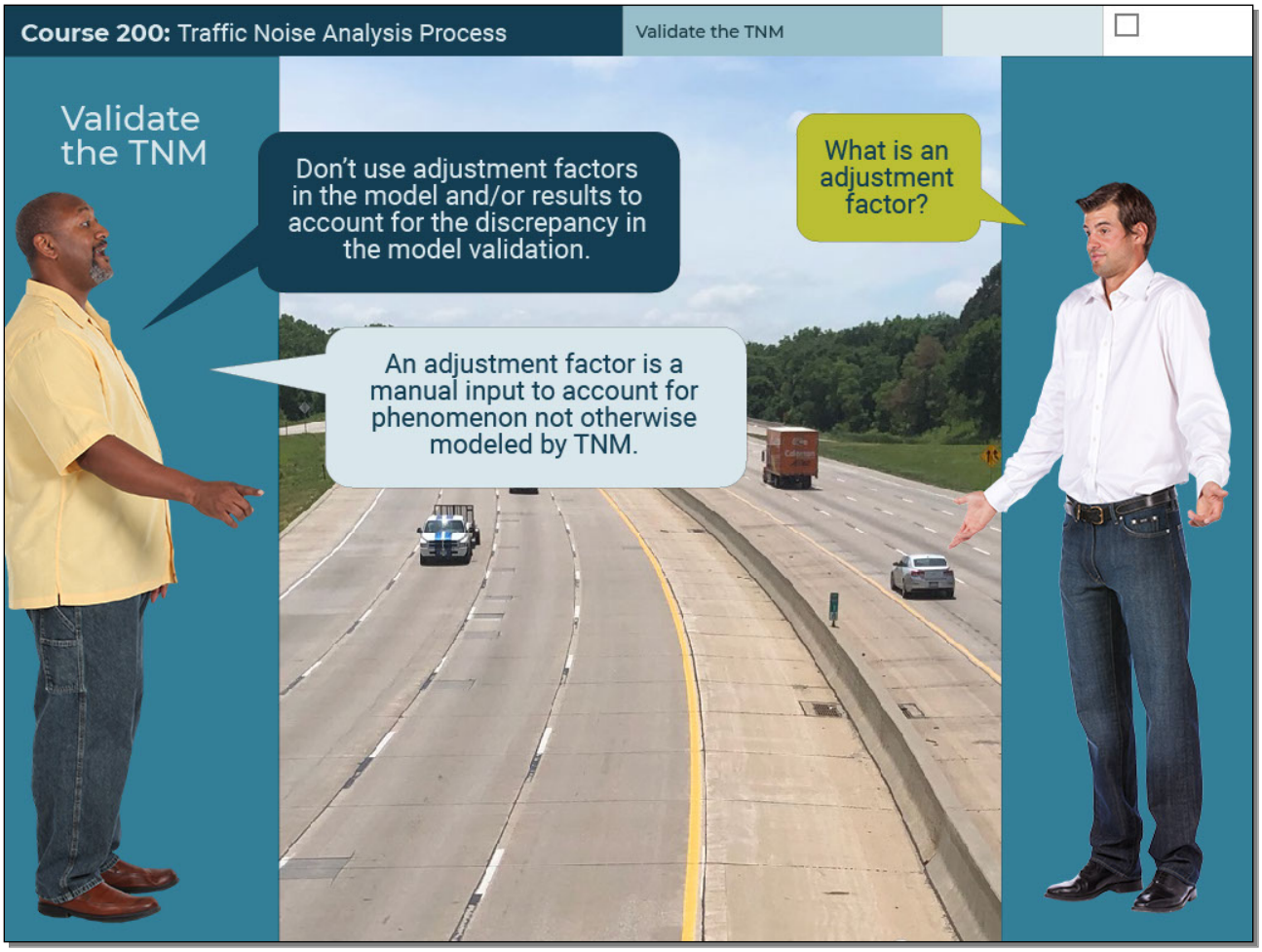
Slide 25 - Slide 25



Audio Script and Notes to Reviewers
Examples of non-traffic noise sources that could affect the validation are emergency vehicles, airplanes, and construction noise.

Text Captions
Validate the TNM
Examples of non-traffic noise sources that could affect the validation are emergency vehicles, airplanes, and construction noise.

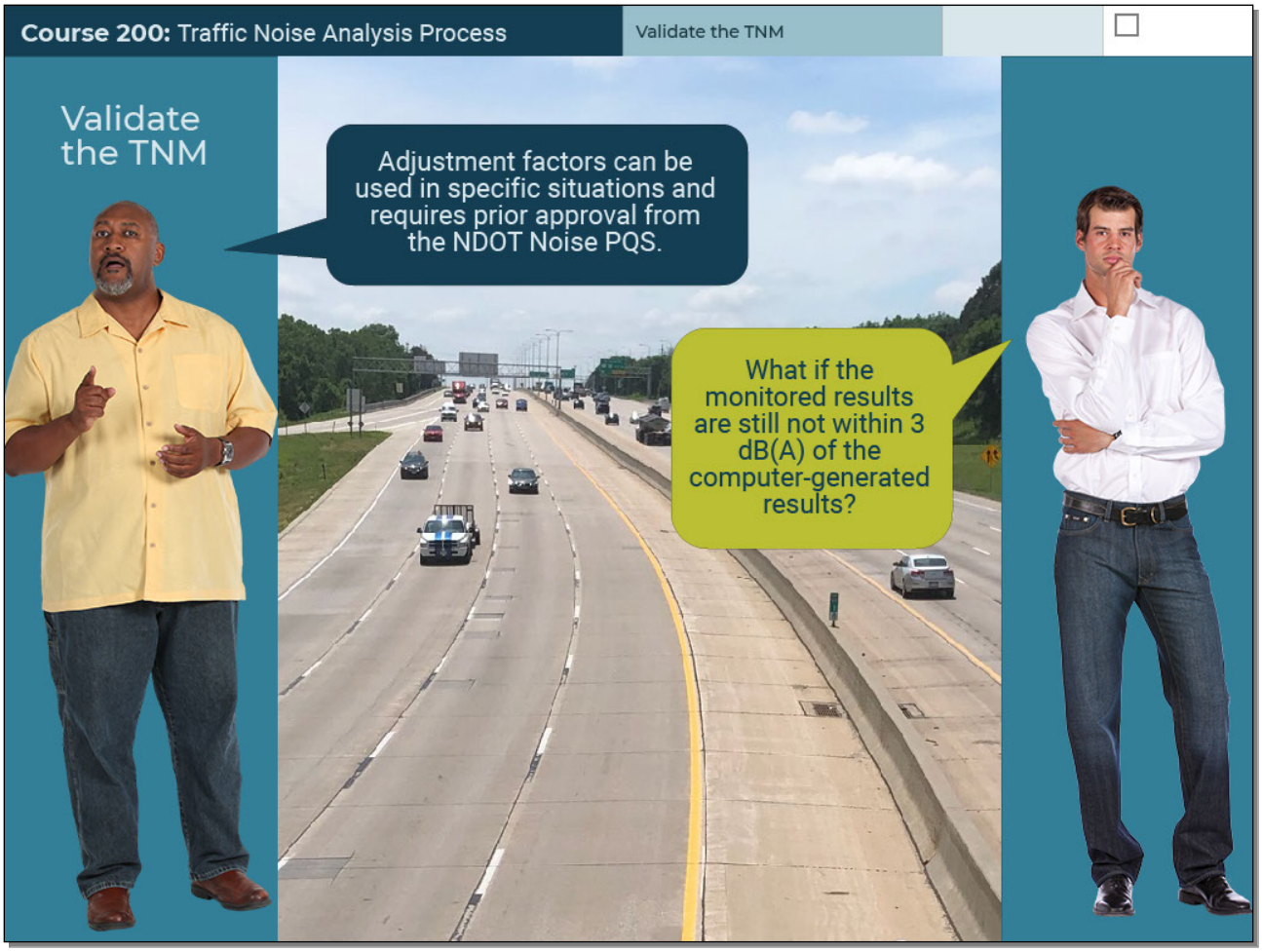
Slide 26 - Slide 26



Audio Script and Notes to Reviewers
Don't use adjustment factors in the model and-or results to account for the discrepancy in the model validation.
What is an adjustment factor?
An adjustment factor is a manual input to account for phenomenon not otherwise modeled by T-N-M, for example, atmospheric conditions.

Text Captions
Validate the TNM
Don't use adjustment factors in the model and/or results to account for the discrepancy in the model validation.
What is an adjustment factor?
An adjustment factor is a manual input to account for phenomenon not otherwise modeled by TNM.

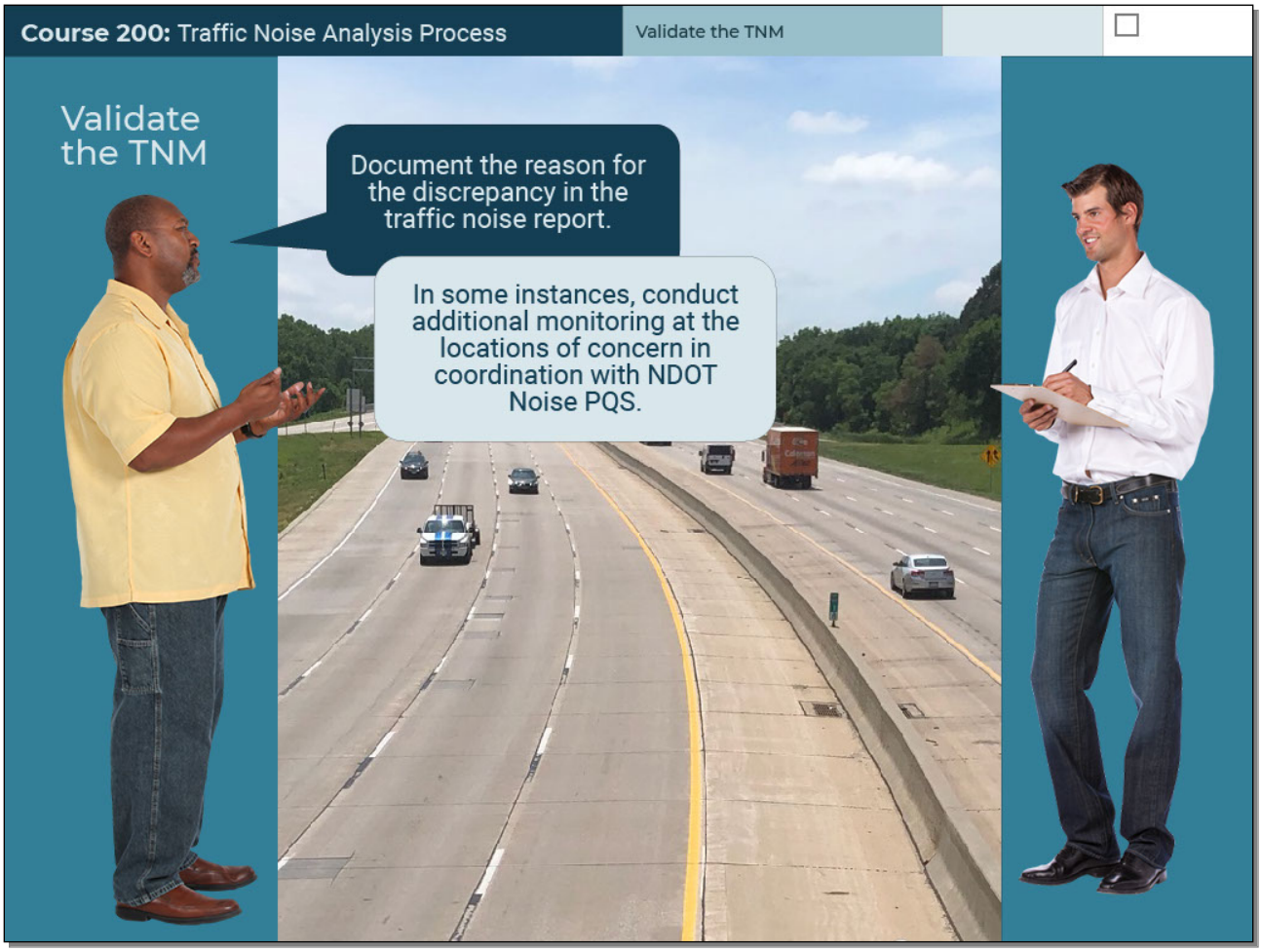
Slide 27 - Slide 27



Audio Script and Notes to Reviewers
Adjustment factors can be used in specific situations, for example, deteriorated pavement conditions causing higher than normal noise. Using an adjustment factor requires prior approval from the N-dot Noise P-Q-S.
What if the monitored results are still not within 3 dB(A) of the computer-generated results?

Text Captions
Validate the TNM
Adjustment factors can be used in specific situations and requires prior approval from the NDOT Noise PQS.
What if the monitored results are still not within 3 dB(A) of the computer-generated results?

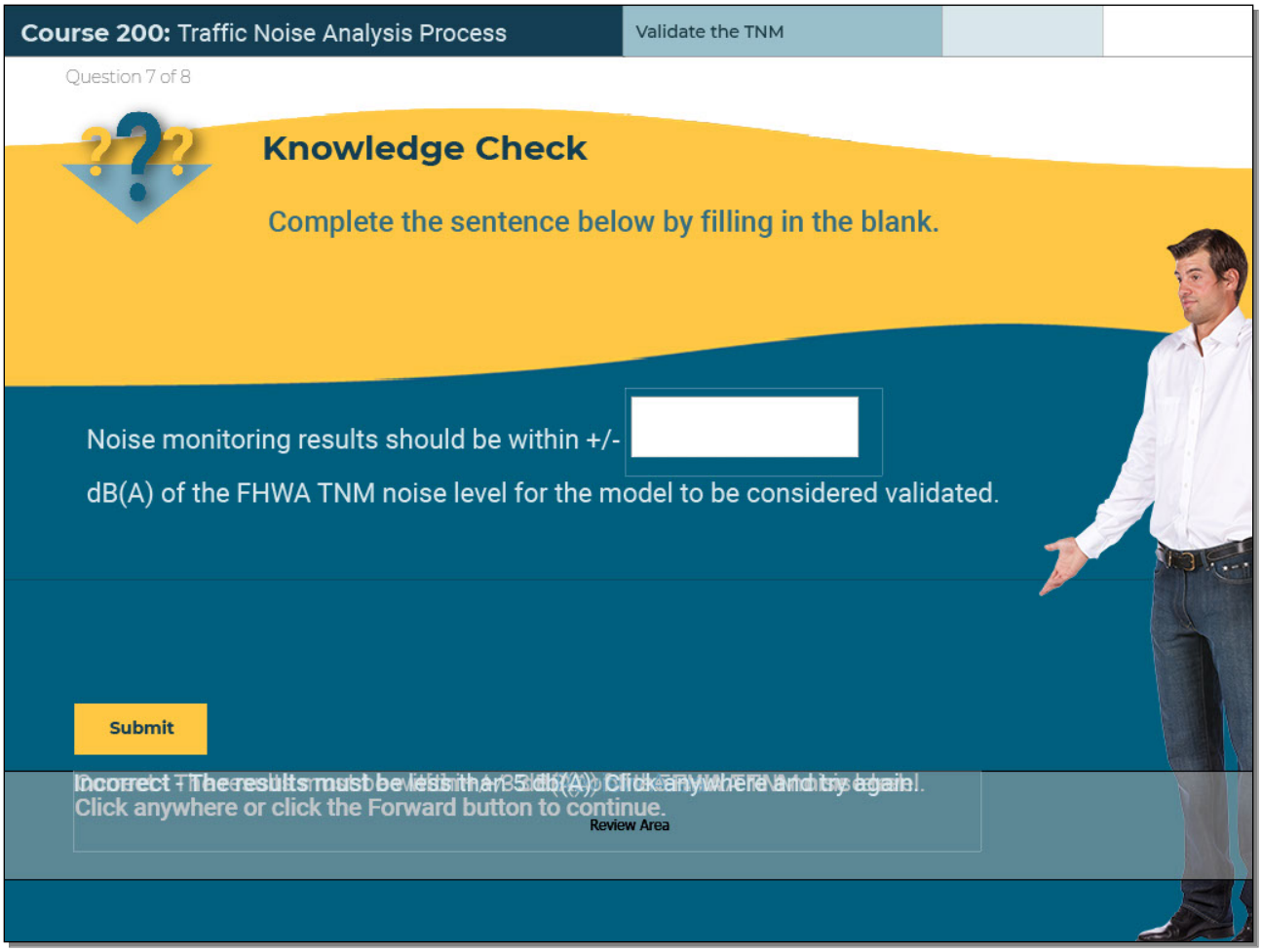
Slide 28 - Slide 28



Audio Script and Notes to Reviewers
Document the reason for the discrepancy in the traffic noise report. In some instances, conduct additional monitoring at the locations of concern in coordination with N-dot Noise P-Q-S.

Text Captions
Validate the TNM
Document the reason for the discrepancy in the traffic noise report.
In some instances, conduct additional monitoring at the locations of concern in coordination with NDOT Noise PQS.

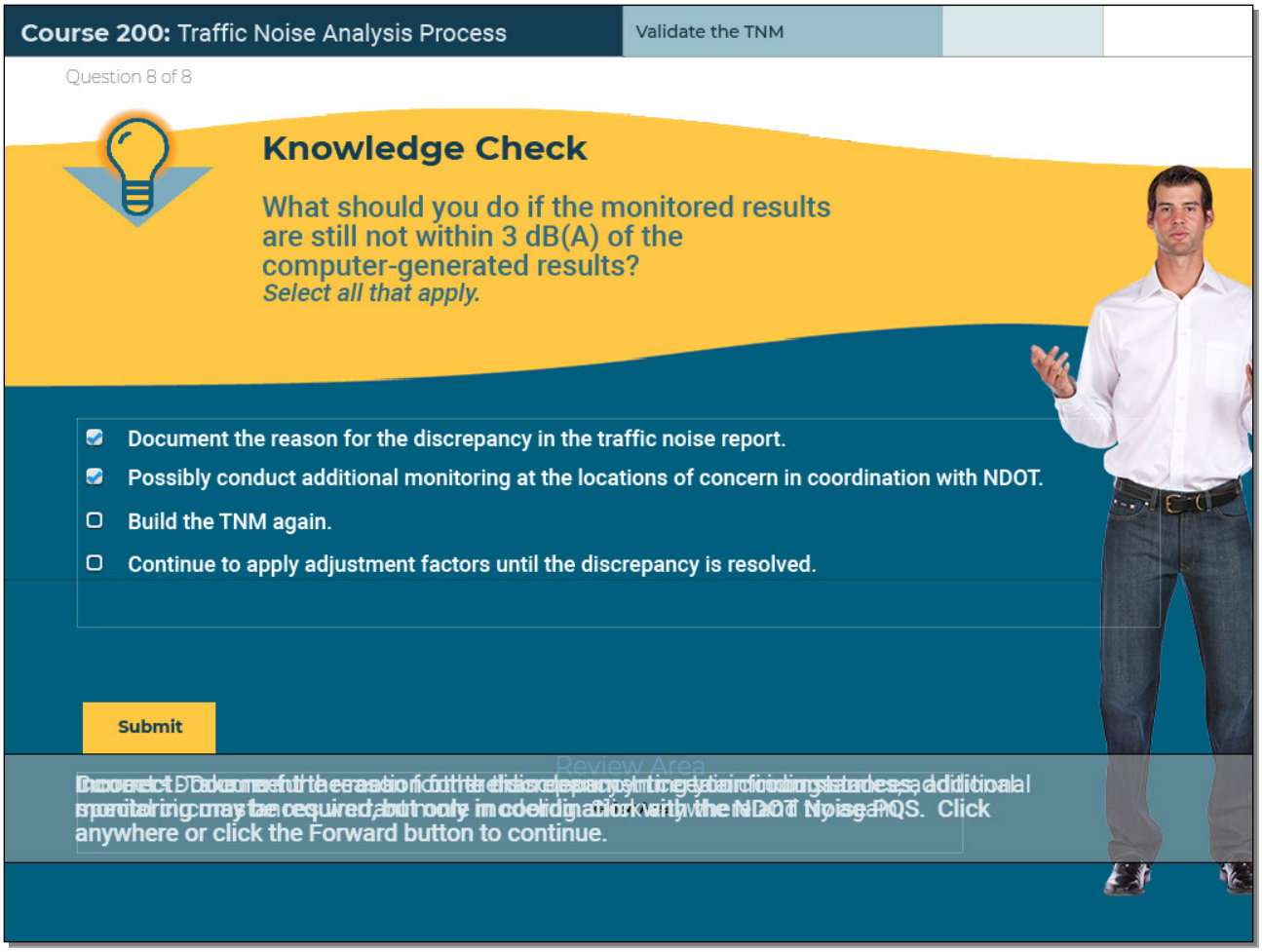
Slide 29 - Slide 29



Audio Script and Notes to Reviewers
Complete the sentence below by filling in the blank.

Text Captions
Knowledge Check
Complete the sentence below by filling in the blank.
Noise monitoring results should be within +/-_____ dB(A) of the FHWA TNM noise level for the model to be considered validated.
Correct feedback: Correct - The results must be within +/- 3 dB(A) of the FHWA TNM noise level. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect - The results must be less than 5 db(A). Click anywhere and try again.
2nd incorrect feedback: Incorrect - The results must be within +/- 3 dB(A) of the FHWA TNM noise level. Click anywhere or click the Forward button to continue.

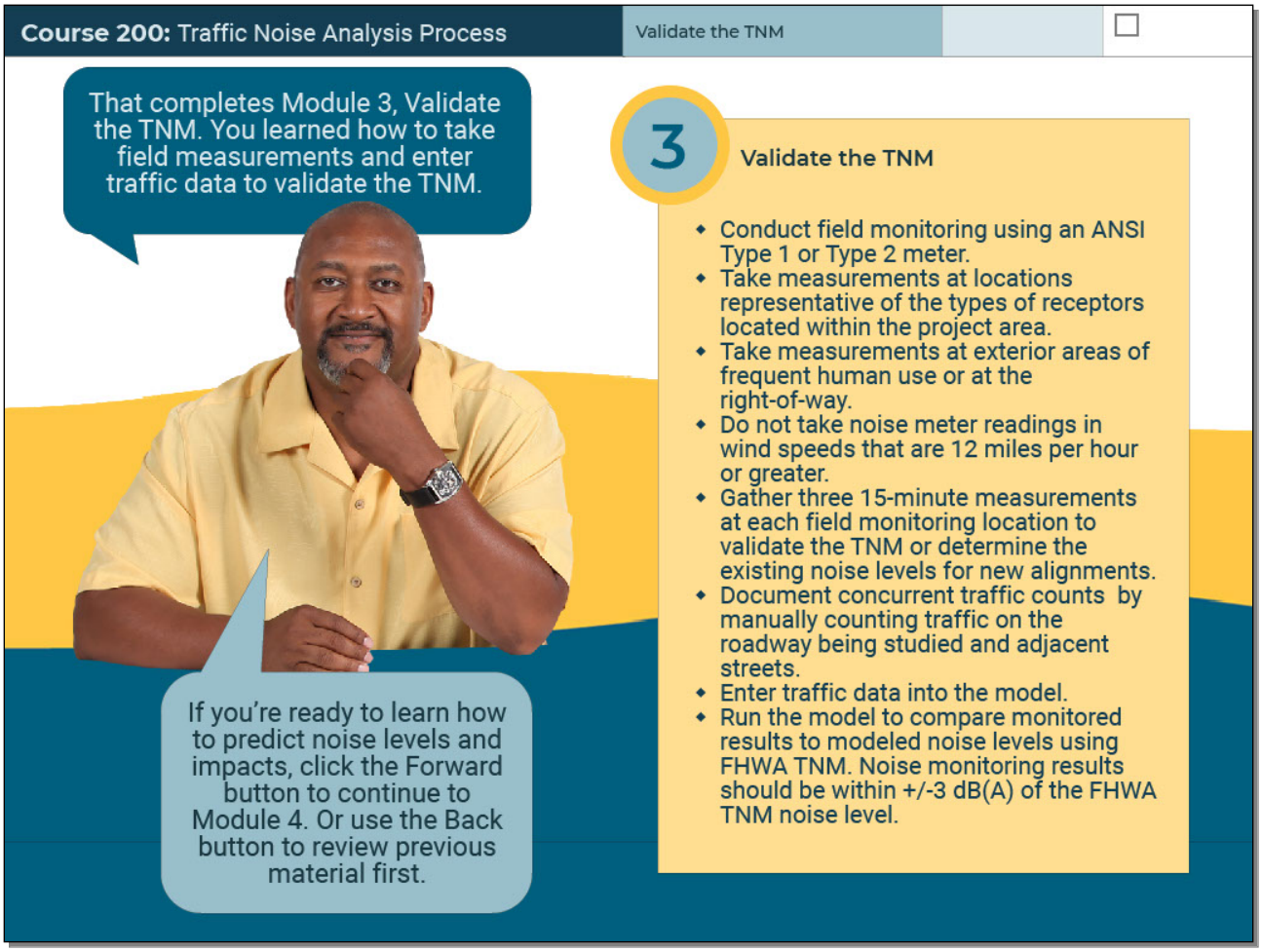
Slide 30 - Slide 30



Audio Script and Notes to Reviewers
What should you do if the monitored results are still not within three D-B-A of the computer-generated results?

Text Captions
What should you do if the monitored results are still not within 3 dB(A) of the computer-generated results?
Select all that apply.
Knowledge Check
Correct feedback: Correct - Document the reason for the discrepancy. In certain circumstances, additional monitoring may be required, but only in coordination with the NDOT Noise PQS. Click anywhere or click the Forward button to continue.
1st incorrect feedback: Incorrect. Take no further action other than documenting your findings unless special circumstances warrant more modeling. Click anywhere and try again.
2nd incorrect feedback: Incorrect - Document the reason for the discrepancy. In certain circumstances, additional monitoring may be required, but only in coordination with the NDOT Noise PQS. Click anywhere or click the Forward button to continue.

Slide 31 - Slide 31



Audio Script and Notes to Reviewers

That completes Module Three, Validate the T-N-M. In this module, you learned how to gather field noise measurements and enter traffic data to validate the T-N-M. Here's a quick summary. If you're ready to learn how to predict noise levels and impacts, click the Forward button to continue to Module Four. Or use the Back button to review previous material first.

Text Captions

That completes Module 3, Validate the TNM. You learned how to take field measurements and enter traffic data to validate the TNM.

Validate the TNM

- Conduct field monitoring using an ANSI Type 1 or Type 2 meter.
- Take measurements at locations representative of the types of receptors located within the project area.
- Take measurements at exterior areas of frequent human use or at the right-of-way.
- Do not take noise meter readings in wind speeds that are 12 miles per hour or greater.
- Gather three 15-minute measurements at each field monitoring location to validate the TNM or determine the existing noise levels for new alignments.
- Document concurrent traffic counts by manually counting traffic on the roadway being studied and adjacent streets.
- Enter traffic data into the model.
- Run the model to compare monitored results to modeled noise levels using FHWA TNM. Noise monitoring results should be within +/-3 dB(A) of the FHWA TNM noise level.

If you're ready to learn how to predict noise levels and impacts, click the Forward button to continue to Module 4. Or use the Back button to review previous material first.