Value Engineering Study Agenda

- Welcome and Introductions
- Ground Rules
- Objectives
- Value Engineering – What? Why? How?
- Understanding and applying the phases of VE
- Evaluations
- Adjourn

There will be breaks in the morning and afternoon as well as a break for lunch.

- **Introductions**
  - Name, job/area of expertise, years of experience

- **Ground Rules**

Allow everyone to participate

Take calls outside

Catch up on work during breaks

Don’t interrupt

No side conversations

Stay on task – use the parking lot

Be respectful

VE Study Objectives

- Apply VE analysis/process
- Learn
- Generate creativity
- Develop Recommendations
- Have Fun

What is Value Engineering?

VE is an organized application of common sense and technical knowledge directed at finding and developing alternative ideas that can add value to a project.

Through this collaboration, recommendations can be developed that:

1. Provide the needed functions
2. Improve the quality
3. Reduce the Project Delivery time
4. Seek Innovative Alternatives
5. Reduce Impacts
6. Reduce Risks
7. Improve Constructability
8. Address inefficiencies

Value Engineering Program

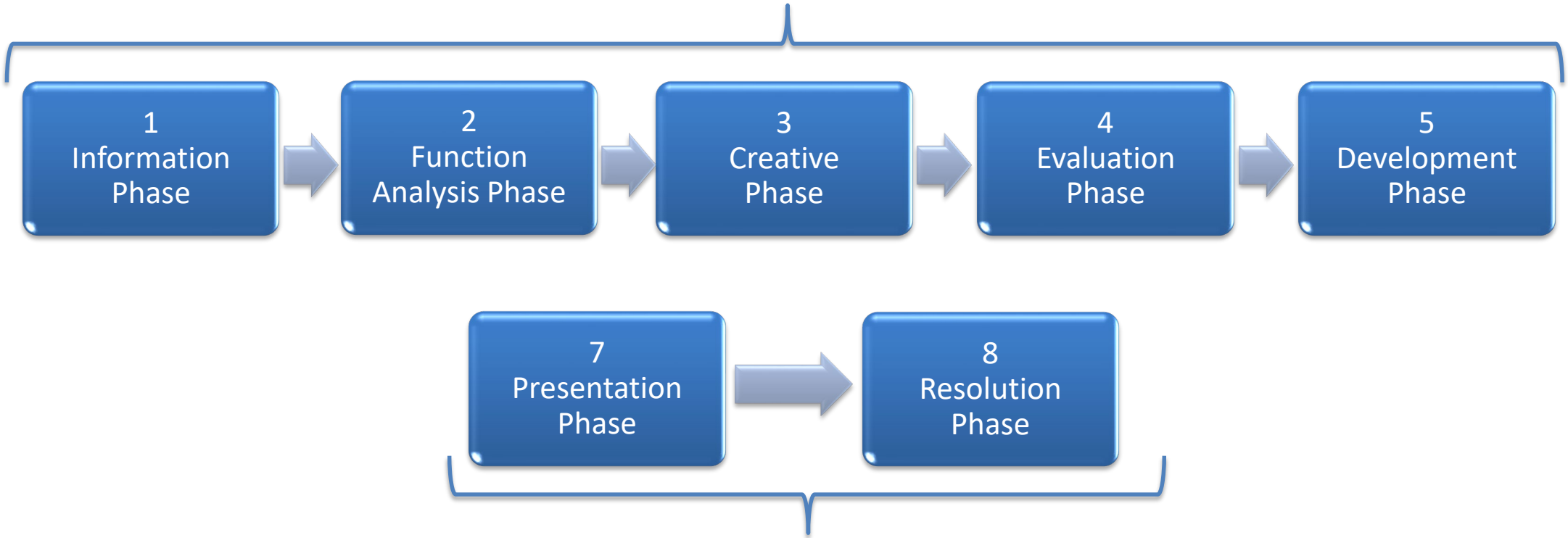
- Federal Program
- Required on all Design-Bid-Build projects…
  - located on the National Highway System or intersecting with the National Highway System,
  - With estimate **TOTAL** costs >$50M or > $40M for projects with a structure.
- Support project delivery by reviewing any project with escalating costs or unique circumstances that could benefit from VE Analysis

How is Value Engineering Applied?

- A VE Team participates in a Value Engineering Study
- VE Teams are compiled of experts, in various disciplines related to the project, but who are not directly involved in the planning or development of the project.
- VE Teams can include NCDOT Staff or Consultants or a combination of both.
- A trained facilitator leads the VE Team through the VE Process.

Value Engineering Study Process

The First 5 Phases are applied during the VE Study



The last 2 phases are at later dates.

Information Phase

The Project Manager/Design Team:

- Provide project background and specifics
- Answer questions
- Confirm project concept and scope
- Identify any constraints/commitments
- Identify and prioritizes issues

Notes from Information phase:

Function Analysis

What is a Function?

- Work that an item or procedure is intended to perform

To identify functions ask:

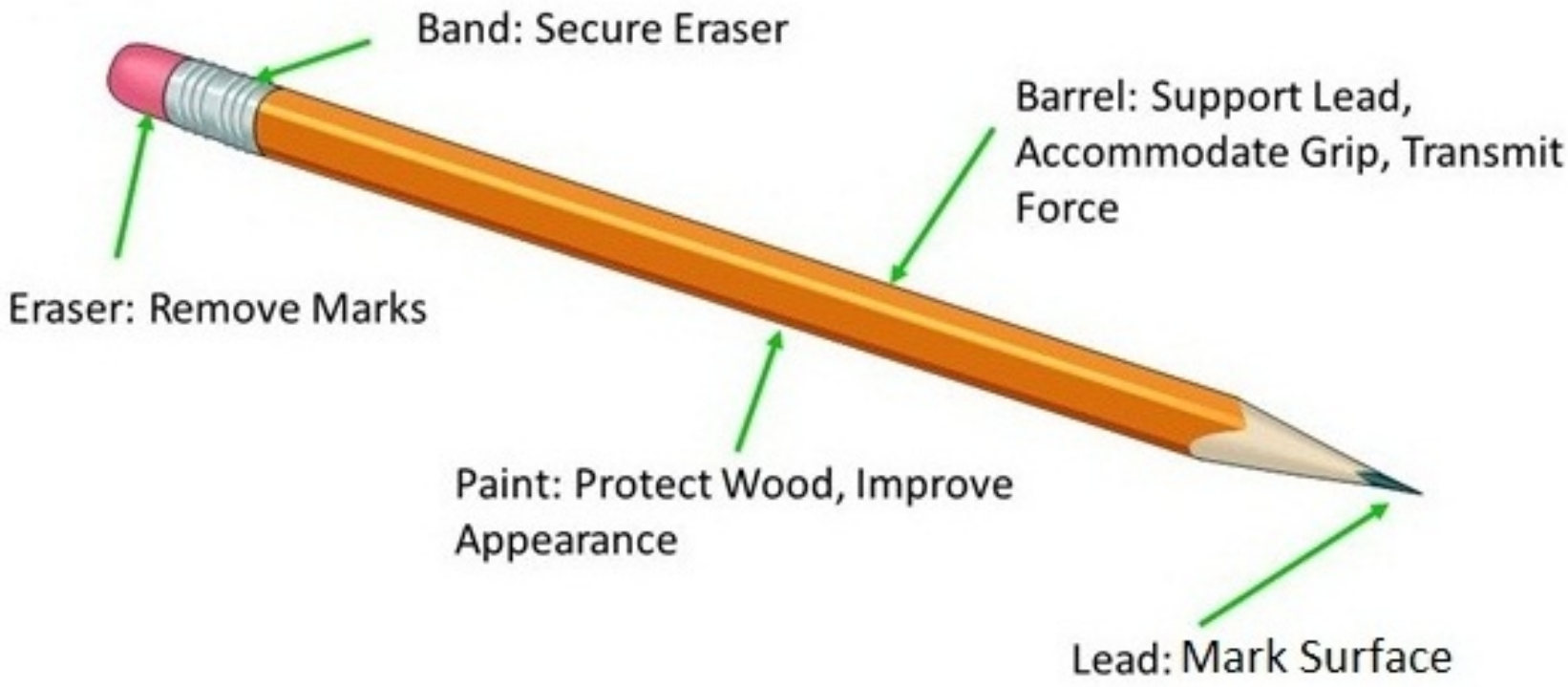
1- What is the item's purpose?

2- What does it do?

3- What must it do?

Function Analysis of a Pencil

Pencil: Mark Surface



Information Phase → **Function Analysis Phase** → Creative Phase → Evaluation Phase → Development Phase → Presentation Phase → Resolution Phase

Function Analysis Phase Example

VE-4 Function		
	F	
Project	Verb	Noun
R-2707C	Reduce	Traffic through Shelby
	Maintain	RR Connectivity
	Improve	Mobility
	Ensure	Environmental Integrity
	Minimize	Property Impacts
	Minimize	R/W Takings

Function Analysis Phase

- Classify each identified function
  - Higher Order- Objective of project
  - Basic- Cannot Change
  - Secondary- Supporting

Information Phase → Function Analysis Phase → Creative Phase → Evaluation Phase → Development Phase → Presentation Phase → Resolution Phase

Function Analysis Phase Example

VE-4 Function					
Project	Function				
	Verb	Noun	Higher Order	Basic	Secondary
R-2707C	Reduce	Traffic through Shelby		X	
	Maintain	RR Connectivity	X		
	Improve	Mobility		X	
	Ensure	Environmental Integrity		X	
	Minimize	Property Impacts			X
	Minimize	R/W Takings			X

Creative Phase

Identify creative ideas that will add value to the project– **Value Opportunities**

- What are alternative ways the functions of the project can be accomplished?
- Are there any constructability issues?
- Is this project a good candidate for an innovative idea?
- Can ROW, Environmental, Utility impacts be reduced?

Creative Phase Example

VE #	VE Opportunity / Description / Notes
1	Investigate realigning NC 180 to the east of Spake Concrete. Straighten NC 180 from Centerfield Dr. to the existing NC 150 intersection and make the NC 150/ NC 180 an at grade intersection instead of an interchange. Provide a connection from this new intersection to the Bypass.
2	Investigate realigning NC 180 to the north of the bypass interchange.
3	Investigate ways to balance earthwork to reduce unclassified excavation cost.
4	Change proposed grade elevation to hit the minimum required clearance (~17' or 18') at all structures.
6	Investigate -Y4rev- typical to see if new pavement is needed. Consider widening/wedging to eliminate the need for detouring traffic.
7	Consider stream realignment and culvert realignment around 553+50.

Evaluation Phase

- Clarify and categorize each idea to develop a shared understanding
- Consider how ideas affect project cost and performance parameters
- List the disadvantages and advantages of the idea
- Rate and select ideas for further development.
  - **-1**: When the disadvantages outweigh the advantages
  - **1**: When the idea is worth developing

Evaluation Phase Example

VE #	VE Opportunity / Description / Notes	Advantages	Disadvantages	Rating
1	Investigate realigning NC 180 to the east of Spake Concrete. Straighten NC 180 from Centerfield Dr. to the existing NC 150 intersection and make the NC 150/ NC 180 an at grade intersection instead of an interchange. Provide a connection from this new intersection to the Bypass.	Potentially eliminates the roundabouts	Bridges would have to be lengthened and potentially be steel girders, or there would need to be a place to put the center bents. Potential business relocations and R/W access issues.	-1
2	Investigate realigning NC 180 to the north of the bypass interchange.	Allows for shortened / lowered bypass structures over the railroad. Potentially simpler and cheaper traffic control. Allows contractor to use existing NC 180 to transfer earth material from one side of the project to the other.	Long realignment. Possible additional traffic, possible increased environmental impacts. Potential increased impacts to Spake Concrete.	1
3	Investigate ways to balance earthwork to reduce unclassified excavation cost.	minimize footprint, less environmental and human impacts, substantially lowers cost	less consistent / slightly steeper grade, slight increases in drainage structure (box culvert and cross drains) costs	1
4	Change proposed grade elevation to hit the minimum required clearance (~17' or 18') at all structures.	Shorten bridge length and potentially allow concrete girders, minimize footprint, lowers cost	Could possibly affect earthwork	1
6	Investigate -Y4rev- typical to see if new pavement is needed. Consider	Can maintain traffic onsite	Additional construction time	1
7	Consider stream realignment and culvert realignment around 553+50.	eliminate pipe, possible mitigation credit, possible reduction in culvert length	Slight increase in box culvert size, possible increase in stream impact	1

Development Phase

- Value Opportunities that received a “1” during Evaluation phase are now Recommendations that need development.

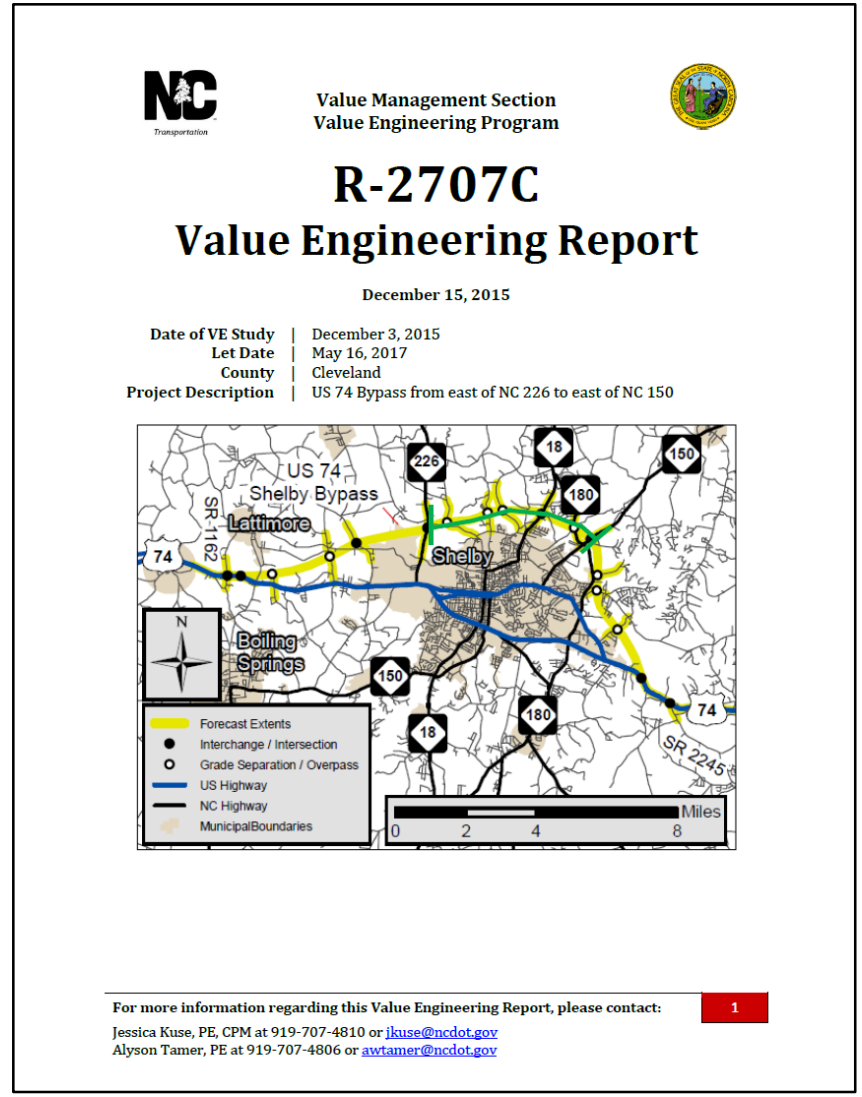
- Development is additional information provided that:
  1- Indicates how the recommendation is a better choice for the project than current design
  2- Includes a sketch, picture, or visualization for clarification purposes (if needed).
  3- Provides a cost estimate of any monetary changes

Questions to Ask During Development Phase

- How will the recommendation work?
- Can the design engineers clearly understand the concept of the recommendation?
- Are there existing projects that have this same scenario?
- How can potential issues be overcome?
- Why is the innovation better?
- Will it meet the requirements?
- What will be the total cost?
- What are the life cycle costs?
- What documents contain the item/idea being altered?

Presentation Phase (handled by VMO)

- VE Study information is compiled into a VE Report
- Report is distributed to Project Manager and the VE Team (or Oral Presentation is given)
- Recommendations with development information is given to the project design engineers for evaluation



Value Management Section
Value Engineering Program

R-2707C
Value Engineering Report

December 15, 2015

Date of VE Study	|	December 3, 2015
Let Date	|	May 16, 2017
County	|	Cleveland
Project Description	|	US 74 Bypass from east of NC 226 to east of NC 150

For more information regarding this Value Engineering Report, please contact:

Jessica Kuse, PE, CPM at 919-707-4810 or jkuse@ncdot.gov
Alyson Tamer, PE at 919-707-4806 or awtamer@ncdot.gov

Information Phase → Function Analysis Phase → Creative Phase → Evaluation Phase → Development Phase → Presentation Phase → Resolution Phase

The Time between Presentation and Resolution

- The project design engineers review the recommendations and provide comments to the project manager.
- The project manager reviews the documentation and comments then makes the final decision to either:
  - Accept the recommendation,
  - Accept the recommendation with some modifications, or
  - Reject the recommendation.
- Justification is provided as to why a decision to reject or modify is made.

Resolution Phase

This phase occurs at Final Design stage.

- Project Manager
  - Provides document(s) relevant to accepted recommendation
  - Signs off on Implementation Section of form

- Value Management Office
  - Verifies that accepted recommendations have been implemented into final plan document

Your Input and Expertise is Appreciated…

Please let us know of any projects that;

- have estimates over $20 Million.
- have the potential to be advanced
- are nearing 25% plans