

Maryland State Highway Administration



DRAFT Indirect and Cumulative Effects Analysis Manual



Revised 05.2007

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Introduction

GOALS OF THIS MANUAL

Provide SHA employees, federal and state resource agencies, local governments and consultants:

- **Consistent procedures in conducting an indirect and cumulative effects analysis.**
- **A clear definition of direct impacts, indirect impacts and cumulative effects.**
- **A clear understanding of how ICE Analysis applies to project development.**
- **Knowledge to facilitate the review of ICE Analysis documentation.**

UNDERSTANDING THE FUNDAMENTALS OF ICE ANALYSIS

- **NEPA and CEQ regulations**
- **“Indirect” versus “Cumulative” effects**
- **SHA’s ICE Analysis Guidelines**
- **ICE Analysis and the SHA Project Planning Process**
- **Levels of Environmental Documentation**

NEPA AND CEQ REGULATIONS

Compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations require that the indirect and cumulative effects of a project be examined along with direct impacts (40 CFR 1508.25 (c)).

What are Indirect and Cumulative Effects?

Indirect	vs.	Cumulative
<p>CFR Definition: Effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the patterns of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8 (b))</p>		<p>CFR Definition: The impact on the environment which results from the action when added to other, past, present and reasonably foreseeable future actions regardless of what agency (federal, or non-federal) or person undertakes such actions (40 CFR 1508.7)</p>
<p>Common Definition: Development or land use change that will occur as a result of the proposed transportation improvement and related effects</p>		<p>Common Definition: Total impacts that occur from all responsible parties, including direct and indirect impacts</p>
<p>Examples:</p> <ul style="list-style-type: none"> •Commercial and residential development following construction of a highway or new access points on highway •When local governments or developers identify planned development that will not proceed without a specific project or transportation alternative •Zoning/land use change as a result of each project alternative retained for detailed study •Rate of development changes because of shorter commute times 		<p>Examples:</p> <ul style="list-style-type: none"> •Increase stormwater peak flows and polluting loadings from commercial and residential development •Incremental loss of wetlands under the Nationwide Permit Program •Decrease in active farmlands due to development pressures

UNDERSTANDING THE SHA ICE ANALYSIS GUIDELINES

The Guidelines provide general procedures and a consistent framework for preparing an indirect and cumulative effects analysis, including:

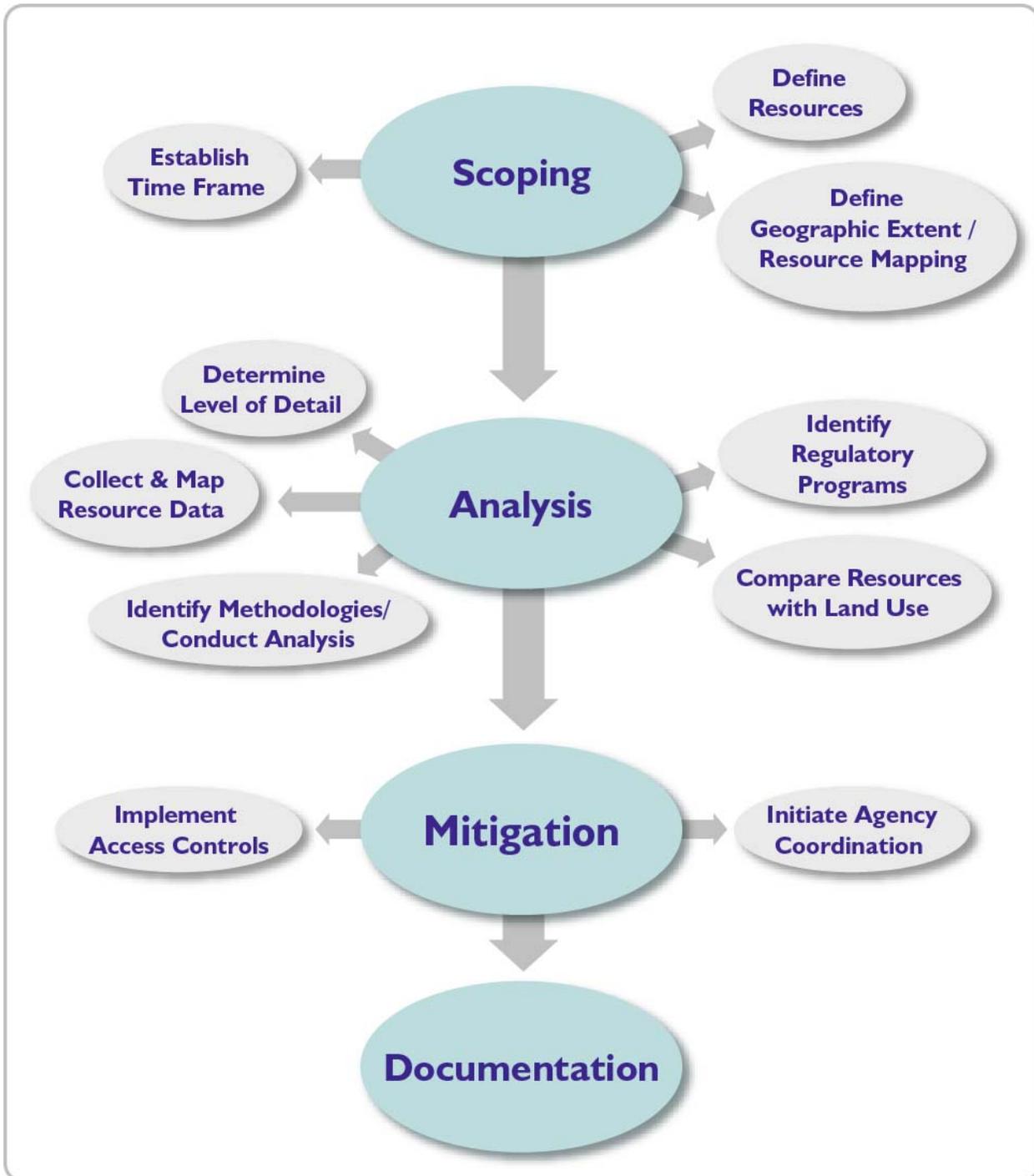
- Introduction
- Scoping/Initial ICE Analysis activities
- Analysis
- Mitigation

KEY POINTS TO REMEMBER

Each ICE Analysis is unique based upon its “Project Purpose and Need” and its “Alternatives Retained for Detailed Study.” Do not apply a “cookie cutter” approach!

The ICE Analysis guidelines provide a framework in which to conduct your analysis. Technical components including key resources, and data availability will vary between projects, thus making each approach unique.

The SHA ICE Analysis Process



Note: SHA Process identified in above flowchart will be discussed in detail throughout manual

Introduction

The SHA Project Planning / ICE Analysis Process

SHA PROJECT PLANNING STAGES

STAGE I

STAGE II

STAGE III

SHA PROJECT PLANNING ACTIVITIES

Interagency Field Review	Alternatives Retained for Detailed Study (IRM)	SHA Selected Alternative (IRM) & Conceptual Mitigation	Selection of Alternative
Purpose & Need (IRM)	Alternates Public Workshop	Draft Environmental Document Location / Design Hearing	Final Environmental Document

ICE ANALYSIS ACTIVITIES

Scoping

Indirect and Cumulative Effects Analysis

Final Documentation/ Mitigation

AGENCY COORDINATION

AGENCY COORDINATION IS CONDUCTED THROUGHOUT THE SHA PLANNING PROCESS

Introduction

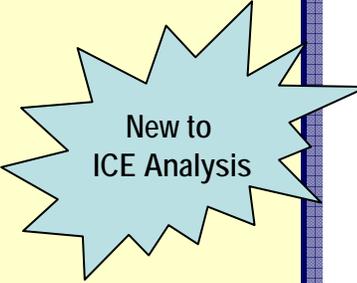
LEVELS OF ENVIRONMENTAL DOCUMENTATION

SHA's ICE Analysis Guidelines apply to:

- Environmental Impact Statements (EIS), including Supplemental Environmental Impact Statements (SEIS's)
- Environmental Assessments (EA's)

SHA has also developed specific ICE Analysis guidelines for **Categorical Exclusions (January 2002, revised April 2007)**

- Some level of ICE Analysis may be required for Categorical Exclusions depending on the scope of the project. Although a similar methodology based on this training can be utilized to conduct ICE Analysis for projects qualifying as Categorical Exclusions, consultation of the specific guidance is recommended.

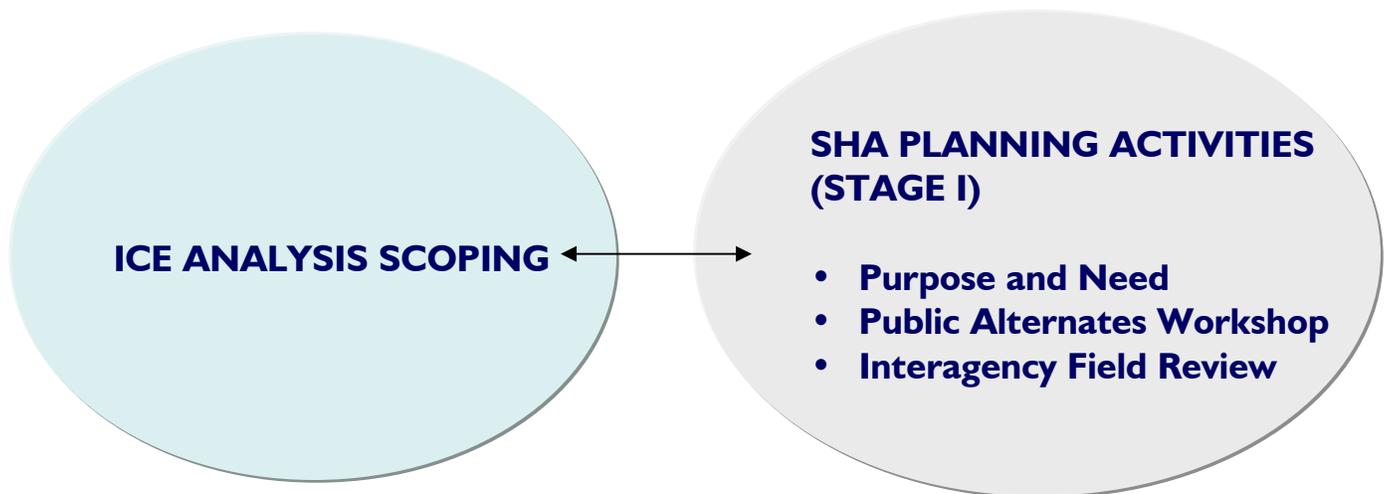


New to
ICE Analysis

ICE Analysis Scoping



Where are we in the SHA Project Planning Process?



Scoping

Step

Action

1

Determine whether an Ice Analysis is necessary

Do project alternatives result in direct or indirect impacts on a resource? The goal of the ICE Analysis is to determine if the direct impacts of the project on a resource, when added to potential indirect impacts plus all other past/present/future impacts by others, is enough to significantly impair that resource.

2

Coordinate with local planners, developers, resource agencies

- **A successful ICE Analysis will seek guidance and comment from resource agencies early in the scoping process. Coordination with developers will identify future development projects in the ICE Analysis area.**

3

Begin initial scoping activities

The Main Components of ICE Analysis Scoping are:

- **Define Resources (Step 3a)**
- **Establish ICE Analysis Boundary (Step 3b)**
- **Establish Time Frame (Step 3c)**

Scoping Define ICE Analysis Resources

Step

Action

3a

Identify ICE Analysis Resources



Identify Resources that may be directly impacted by project alternatives. *(More resources may be identified based on potential indirect impacts or if new alternatives with other/new impacts are considered.)*

Typical ICE Analysis Resources

- Wetlands
- Surface/Groundwater
- Parks
- Wildlife/Sensitive Species
- Farmlands
- Cultural Resources
- Communities

Resources Not Considered

- Air Quality
- Noise Quality
- Land Use

Consideration/Selection of Resources are based upon a variety of factors, including:

- Data Availability
- Relevancy to Project
- Recommendations from Resource Agencies

Scoping Define ICE Analysis Boundary

Step

Action

3b Identify ICE Analysis Boundary

The ICE Analysis Boundary is a synthesis of many factors into a **single** ICE Analysis Boundary.

Potential Sub-Boundaries	
Sub-Boundary	Example
Resource Boundaries	Parks, Forests, Historic Districts, Sensitive Species Areas, Chesapeake Bay Critical Area Boundaries, watersheds, sub-watersheds
Extent of Preliminary Alternatives	Project Study Area
Census Tracts	U.S. Census Bureau Census Tract Boundaries
Area of Traffic Influence	Traffic Analysis Zones (TAZs)
State and Local Planning Areas	Montgomery and Prince George's County Planning Areas
Sewer and Water Service Locations	Projects within close proximity to urban and rural areas of Baltimore and Harford County.
Other Project-Specific Sub-Boundaries	Coastal Zone Management Areas

ICE Analysis Manual

Scoping Define ICE Analysis Boundary

Step

Action

3b

Identify ICE Analysis Boundary

Consideration/Selection of Sub-Boundaries are based upon a variety of factors, including:

- Data Availability
- Relevancy to Project
- Recommendations from Resource Agencies



Complete Sub-Boundary Checklist

Identifying Factors	Yes	No	Rationale
Resource Boundaries			
Watersheds	<input type="checkbox"/>	<input type="checkbox"/>	
Sub-Watersheds	<input type="checkbox"/>	<input type="checkbox"/>	
Chesapeake Bay Critical Area	<input type="checkbox"/>	<input type="checkbox"/>	
Sensitive Species Protection Areas	<input type="checkbox"/>	<input type="checkbox"/>	
Forested Tracks	<input type="checkbox"/>	<input type="checkbox"/>	
Farmland/Agricultural Areas	<input type="checkbox"/>	<input type="checkbox"/>	
Historic Districts/Cultural Resources	<input type="checkbox"/>	<input type="checkbox"/>	
Communities/Neighborhoods	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
Census Tracts			
Census Tracts	<input type="checkbox"/>	<input type="checkbox"/>	
Extent of Preliminary/Conceptual Alternatives			
Project Study Area or "Project Area"	<input type="checkbox"/>	<input type="checkbox"/>	
Area of Traffic Influence			
Traffic Analysis Zones (TAZ)	<input type="checkbox"/>	<input type="checkbox"/>	
Other Measures of Traffic Influence	<input type="checkbox"/>	<input type="checkbox"/>	
Sewer and Water Service			
Existing Sewer and Water Service Boundaries	<input type="checkbox"/>	<input type="checkbox"/>	
Planned Sewer and Water Service Boundaries	<input type="checkbox"/>	<input type="checkbox"/>	
Planning Areas			
Priority Funding Areas (PFAs)	<input type="checkbox"/>	<input type="checkbox"/>	
Local Planning Area Boundaries	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
Other			
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

Scoping Define ICE Analysis Boundary

Step

Action

3b

Identify ICE Analysis Boundary



Complete Supporting Documentation For ICE Analysis Boundary

- Document graphically and in narrative the rationale for considering certain factors in how the overall ICE Analysis boundary is a synthesis of all considered.
- Clearly record comments and recommendations received from resource agencies to use in developing ICE Analysis boundary.
- Include Sub-Boundary Checklist and / or process of determination in Project Files / Administrative Record

Scoping Determine ICE Analysis Time Frames

Step

Action

3c

Determine ICE Analysis Time frame



Determine Past Time Frame

Factors to Consider

- Major Events within the ICE Analysis Boundary
- Dates of Major Road Construction/Expansion
- Private and Public Actions affecting population growth
- Land Use Changes
- Agency Input
- Availability of Data

NOTE:

All Information should be reviewed **collectively** to determine the past time frame

Potential Past Time Frame "Triggers"

Event	Significance
New Roadway Construction (i.e., I-270, I-295, I-95, etc.)	Roadway construction resulted in changes in employment, population, and consequently on environmental resources
Opening of a Military Base, Airport, or other large government installment	Resulted in changes in employment, population, etc.
Lifting/Enactment of Building Moratoriums	Resulted in changes in land use, employment, population, etc.
Establishment of Comprehensive Zoning	Affected the growth patterns of a given area

ICE Analysis Manual

Scoping Determine ICE Analysis Time Frames

Step

Action

3c

Determine ICE Analysis Time Frame



Complete Past Time Frame Checklist

Identifying Factors	Yes	No	Description
Considerations			
Major Events in the Historic Context of the Area:	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Dates of Major Road Construction in SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Changes in Land Use within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Population Changes within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Employment Changes within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Other Considerations			
Received agency input on Past Time Frame?	<input type="checkbox"/>	<input type="checkbox"/>	
Is all of the above information readily available?	<input type="checkbox"/>	<input type="checkbox"/>	

Scoping Determine ICE Analysis Time Frames

Step

Action

3c

Determine ICE Analysis Time Frame



Complete Supporting Documentation For Past Time Frame

- Document in narrative the rationale for considering certain factors in how the past Time Frame is a synthesis of all factors considered.
- Clearly record comments and recommendations received from resource agencies to use in developing past time frame.
- Include Past Time Frame Checklist and/or process of determination in Project Files/Administrative Record

Scoping Determine ICE Analysis Time Frames

Step

Action

3c

Determine ICE Analysis Time Frame



Determine Future Time Frame

The Project's Design Year should be used for the Future Time Frame, as design year traffic is normally based on the land use agency's future land use assumptions.

Scoping

Have you Considered the Following Regarding the ICE Analysis Scoping?

- Incorporated the ICE Analysis into the project planning process during preliminary alternatives development?
- Identified all environmental resources and ICE Analysis issues in the project area?
- Identified resources that are directly impacted by each proposed project alternative?
- Identified all potential sub-boundaries and synthesized information into one, overall ICE Analysis Boundary?
- Determined the Past and Future Time Frames?
- Documented rationales for selecting all of the above?
- Coordinated with resource agencies?

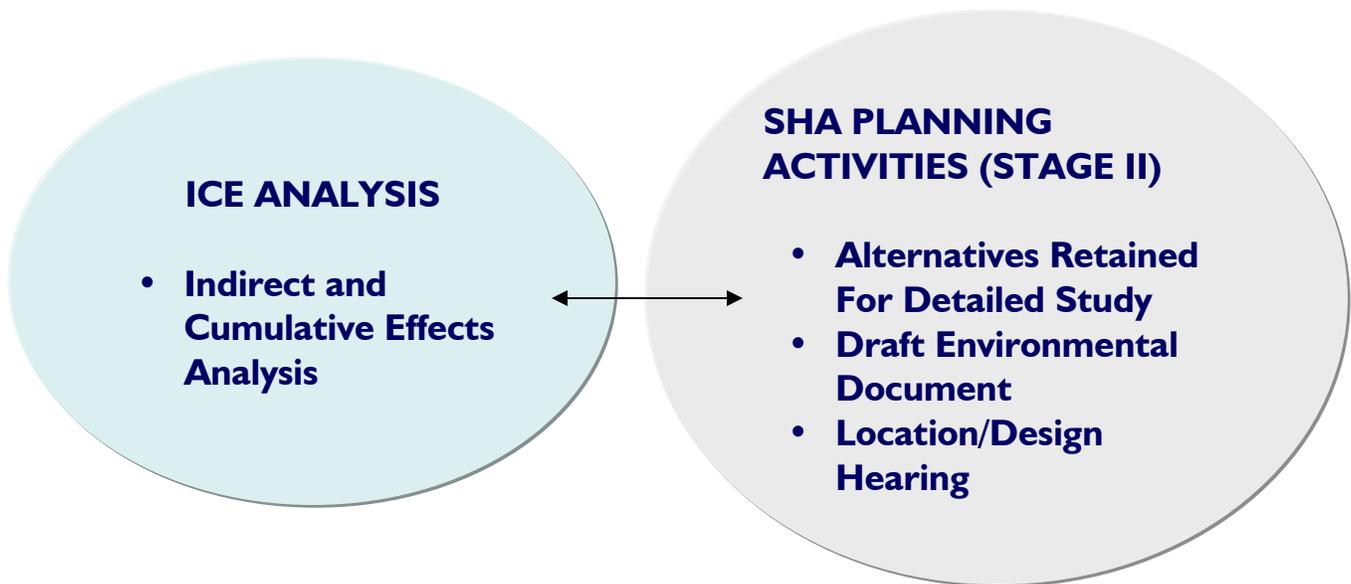
STOP!

ICE Analysis



Analysis

Where are we in the SHA Project Planning Process?



Analysis: Determine Level of Detail

Step

Action

1

Determine Level of Detail

The level of detail of the ICE Analysis should be tailored to the project type.

Factors to Consider

- Availability of Data
- Presence of Direct or Indirect Impacts
- Resources within the ICE Analysis Boundary
- Agency Input

NOTE:

Do not develop predictive models to fill in data gaps. Instead, use existing, readily available data.



Complete Supporting Documentation For Level of Detail

Document the rationale for level of analysis conducted.

Analysis: Data Collection

Step

Action

2

Collect and Map Appropriate Data

It is necessary to collect and map all resource data prior to performing any of the analytical methodologies necessary to assess indirect and cumulative impacts. Some of this data may have been collected in the initial ICE Analysis scoping process. The data available will often determine which analysis methodology will be implemented.

Analysis: Regulatory Programs

Step

Action

3

Identify Regulatory Programs

Certain regulatory programs (i.e., wetlands and public parklands) essentially provide a degree of protection from direct impacts to applicable resources due to the fact that they have “teeth” and contain mitigation requirements. This is especially important when conducting trends analysis (discussed later). Predicting a future condition based on past trend should factor in how recent laws and regulations will alter the trend of impacts to a particular resource. **These programs should be considered in the analysis portion of the ICE Analysis.**

Analysis: Regulatory Programs

Step

Action

3

Identify Regulatory Programs

Directly Impacted Resource	Applicable Laws/Regulations
Forests	<ul style="list-style-type: none"> · Forest and Renewable Resources Planning Act (1974) · National Forest Management Act
Wetlands/ Waters of the United States	<ul style="list-style-type: none"> · Clean Water Act (1972) · North American Wetland Conservation Act · Executive Order 11990 of the Federal Register (Protection of Wetlands) · Maryland Tidal Wetlands Act · Maryland Nontidal Wetlands Protection Act · MDE Section 401 Water Quality Certification · Nontidal Wetlands and Waterways Permit
Floodplains	<ul style="list-style-type: none"> · Flood Disaster Protection Act (1973) · Executive Order 11988 of the Federal Register (Floodplain Management)
Rare, Threatened, or Endangered Species	<ul style="list-style-type: none"> · Section 7 of the Endangered Species Act (1973) · Maryland Endangered Species Act (1973) · Maryland Nongame and Endangered Species Conservation Act (1975)
Historic Resources	<ul style="list-style-type: none"> · National Historic Preservation Act (1966) · Section 4(f) of the United States Department of Transportation Act (1966) · Maryland Historical Trust Act of 1985, as amended in Article 5A-325 and 5A-326 of the Annotated Code of Maryland
Public Parkland/ Recreational/Community Facilities and Wildlife Refuges	<ul style="list-style-type: none"> · Federal Land Policy and Management Act (1976) · Section 4(f) of the United States Department of Transportation Act (1966) · Section 6(f)

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use

Mapping environmental resources and land use within the ICE Analysis boundary provides a base from which many of the analytical methodologies can be performed. Land use mapping should be prepared for past, present and future time frames. **This step must be conducted prior to performing analysis.**

How is Land Use Information Important to the ICE Analysis?

Past Land Use (partially determined by your past time frame) provides a baseline from which trends can be developed.

Present Land Use (partially determined by year conducting study) provides an intermediate year from which trends can be determined as well as a year to conduct an overlay analysis.

Future Land Use (partially determined by design-build year of the project) provides a build-out analysis year to conduct overlay analysis.

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use



Develop/Map Past Land Use

Data sources that can be used to develop a past land use scenario include, but are not limited to:

- Past Aerial Photography
- Past land use components of county master plans
- Past regional transportation plans
- Past Maryland Department of Planning land use maps
- Past development tracked through SHA's Regional Intermodal Planning Division.

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use



Develop Present Land Use

Data sources that can be used to develop a present land use scenario include, but are not limited to:

- Existing Aerial Photography
- Current county master plans
- Current regional transportation plans
- Maryland Department of Planning land use maps
- Development tracked through SHA's Regional Intermodal Planning Division.
- Other Planned Development Projects (within 1-5 years beyond present year) as identified through local officials, planners, etc.

Note:

The appropriate development size(s) (i.e., residential subdivisions) to be analyzed must be determined on project-by-project basis. It is not necessary to scour the entire ICE Analysis study area for proposed development such as individual residential lots less than one acre. However; it is important to document the rationale for the level of detail used in identifying development projects.

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use



Develop Future Land Use

Future land use scenarios are developed **for each alternative including the no-build**. Future land use is primarily based on the following data sources:

- **Travel Forecasts** – Review and map future land use with assumptions based on travel forecasts.
- **Local/Regional Planning Resources** – Meet with local planners and utilize planning resources such as the Regional & Intermodal Division's (RIPD) major development matrix, the Metropolitan Planning Organization's (MPO) Constrained Long Range Plan (CLRP) and local master plans to develop future land use scenarios.

Note:

In situations where two or more different land use scenarios are predicted for a project alternative:

- Determine the scenario that will most likely reflect future land use. (Hint: consider age and source of plans as a major factor).
- Meet with the jurisdiction/agency to resolve discrepancies.
- Try to come to an agreement; if you can't, determine how to proceed on a project by project basis.

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use



Identify Indirect and Cumulative Impacts for Future Land Use Scenarios

It is important to identify types of impacts that cause land use change within the ICE Analysis Boundary. Remember: **Indirect Development** will cause land use change due to the Project Alternative while indirect impacts could be non-development but related. **Cumulative Impacts** will result in land use change regardless of Project Alternative.

Land use changes caused
by indirect impacts

Cumulative land use
changes resulting from
non-project related impacts

**TOTAL LAND USE CHANGE IN
ICE ANALYSIS BOUNDARY**

Analysis: Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use



Coordinate with Local Officials regarding Indirect Development

Coordination with local governments and/or developers indicate planned development **that will not** proceed without approval of a specific transportation alternative.

Identify any local zoning implications and identify changes in land use or level of development that **may occur as the result of** each project alternative.

Meetings with the local planners may be the most important coordination in developing the future land use scenario, especially with respect to indirect development. It is important to present alternatives mapping when identifying potential indirect impacts with local planners. This will help illustrate differences in land use changes that may result from two or more alternatives.

Analysis: :Resource and Land Use Mapping

Step

Action

4

Map Environmental Resources and Land Use

The Role of the Expert Land Use Panel

In special cases, Expert Land Use Panels can be convened to identify future land use scenarios, if a project is especially complex or if local jurisdictions, agencies or special interest groups disagree that a particular land use will or will not occur. The Expert Land Use Panels are not required when developing land use for an ICE Analysis, but are considered on a project by project basis.

The Delphi Method For Expert Land Use Panels

Activity	Round 1	Round 2	Round 3
Type of data and information	-Broad trends, events developments	-Agreed developments from Round 1 -Newly suggested items	-Narrowing of items from previous rounds -Detailed analysis of selected trends, events, and developments
Inquiry	-When might these take place?	-When might these occur? -Under what conditions? -Justification of extreme views	-Reasons for consensus or non-consensus -Reasons for time estimates -Likelihood and severity of consequences
Analysis	-Collation of statements -Configurations of first agreements -Analysis of commentary	-Summary of selections -Estimation of median -Any additional considerations	-Tabulation of major consequences -Range of agreement -List of selected threatening and desirable items
Suggestions	-What other developments can be suggested? -What is the level of the participant's expertise?	-What major technological and societal consequences may result?	-What can be done to alleviate or mitigate effects? -Reestimates for time horizon or other comments

Analysis: Methodologies

Step

Action

5

Identify Methodologies and Conduct Analysis



Determine Best Methodologies For ICE Analysis

There are four basic ICE Analysis Methodologies:

- **Trends Analysis** - Trend analysis is based on the idea that what development that has happened in the past gives the investigator an idea of what will happen in the future.
- **Overlay Analysis** - Overlay analysis allows impacted resources, such as wetlands, to become the spatial area(s) which will be analyzed on another map. This analysis is often conducted in a digital environment, such as Geographic Information Systems (GIS).
- **Matrices** - Matrices alone cannot quantify effects, but they are a useful means of presenting and manipulating quantitative results of trends analysis or overlay process. Matrices can be used to show/illustrate trends of impacts to resources. For example, wetland impacts can be shown for pre- and post-regulation time frames to highlight the effects of regulatory programs.
- **Interviews** - Expert interviews are most useful where "hard" data is not readily available and may potentially be the most accurate and efficient method for assessing impacts to certain resources.

Analysis: Methodologies

Step

Action

5

Identify Methodologies and Conduct Analysis

Select Appropriate Methodology Based On:

- ✓ Availability of data (use existing, readily available data)
- ✓ Appropriateness of the data to the ICE Analysis study area. Document what scale or geographical unit is available for each data source (i.e., state level, county level, census tract level, etc.)
- ✓ Ease of manipulating mapped data (overlays)
- ✓ Past or future impacts (overlays often cannot be used to assess past impacts because mapping of past resources may not be available)
- ✓ Impact of regulatory programs (especially regarding future impacts)

Analysis: Conduct Analysis

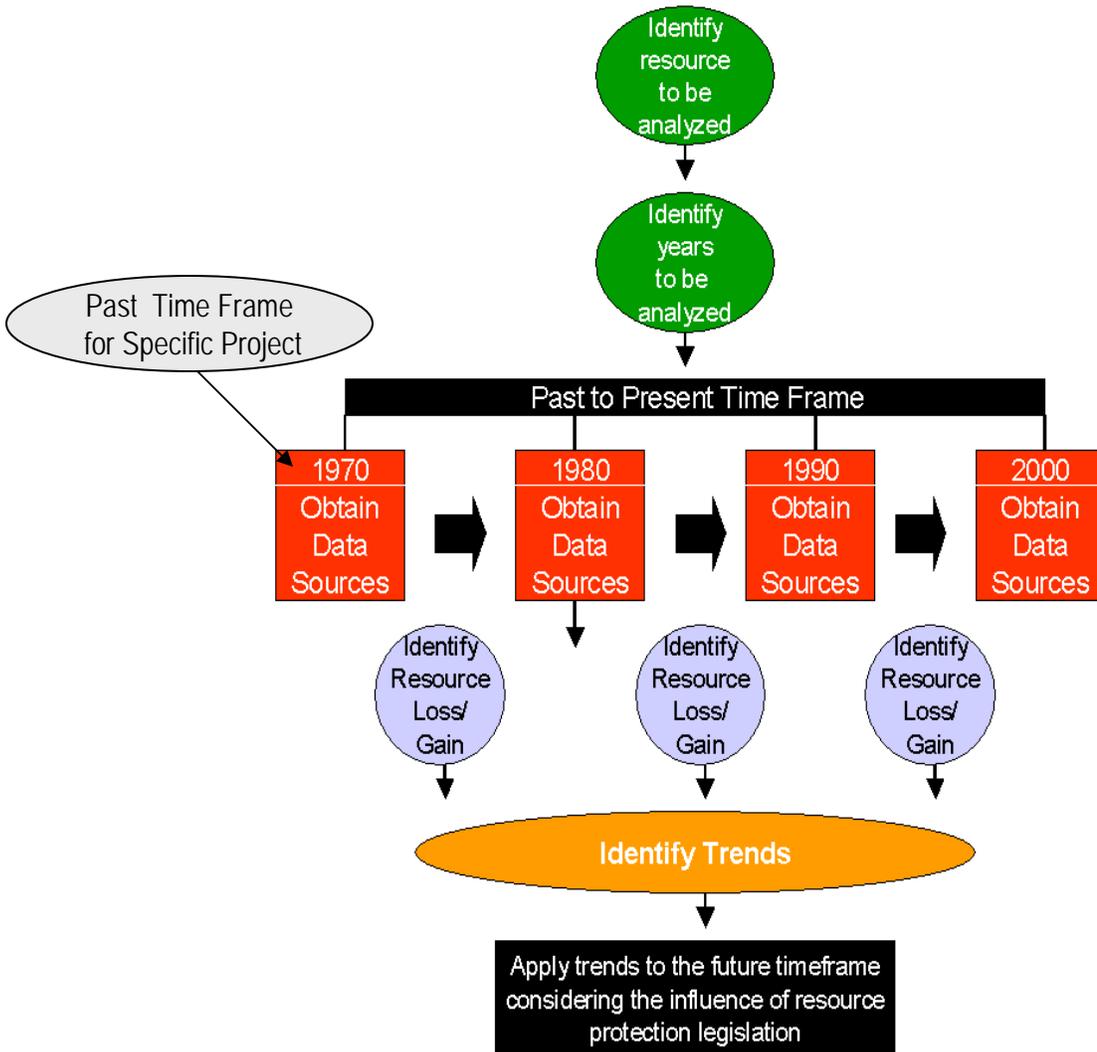
Step

Action

5

Identify Methodologies and Conduct Analysis

How to Conduct a Trends Analysis



Analysis: Conduct Analysis

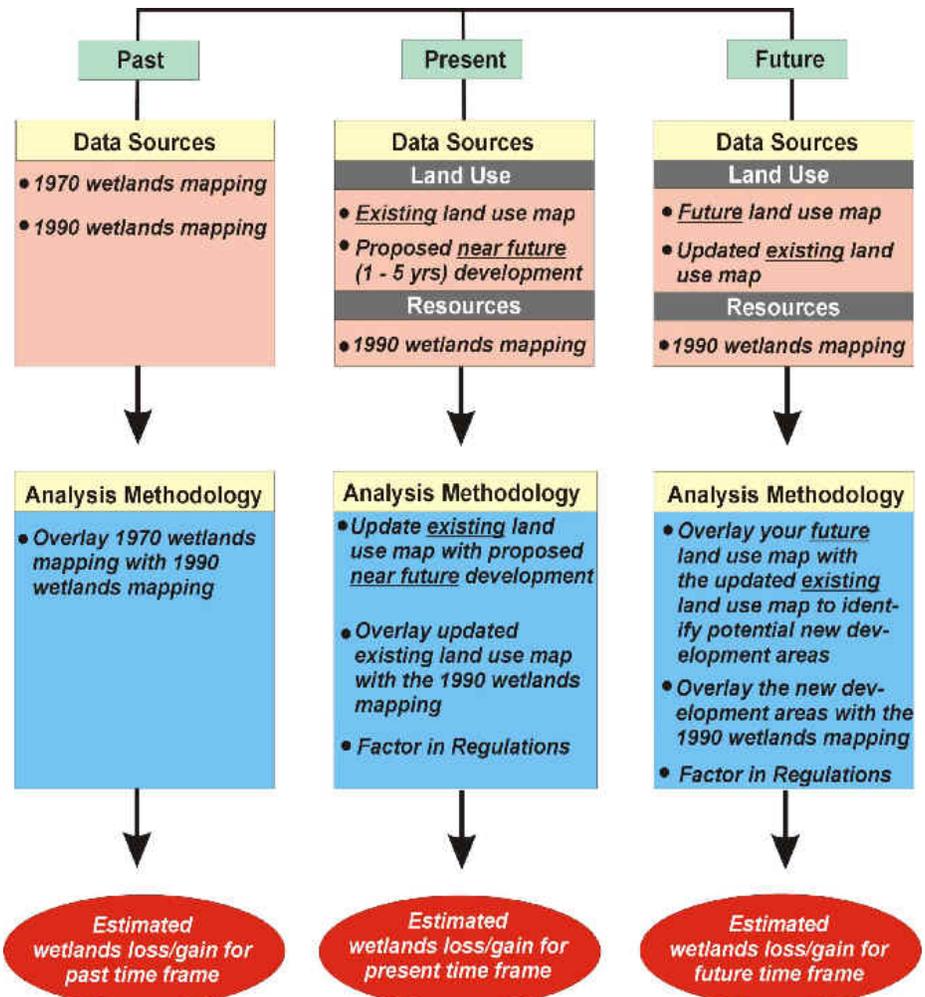
Step

Action

5

Identify Methodologies and Conduct Analysis

How to Conduct an Overlay Analysis



ICE Analysis Manual

Analysis: Conduct Analysis

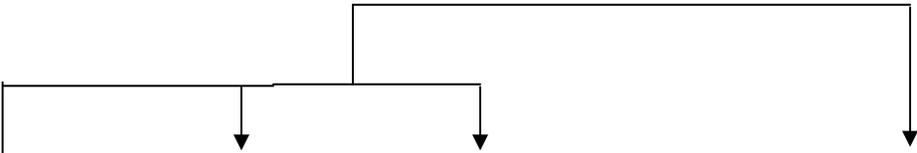
Step

Action

5

Identify Methodologies and Conduct Analysis

How to Conduct a Matrices Analysis



Direct Effects From Impact Causing Activities	Indirect Effects (List All)	Potential Cumulative Impacts (List All)	Cumulative Impacts From Direct Effects (List All)	
			Yes (Employ Other Analysis Techniques)	No (Assessment Complete)
<i>Socio-Economic</i>				
<i>Natural Environmental</i>				
<i>Other</i>				

Analysis: Conduct Analysis

Step

Action

5

Identify Methodologies and Conduct Analysis

How to Conduct Interviews

Who	Regarding	Why
Experts	ICE Geographical Boundary	Expert interviews, expert land use panel techniques, task forces, or other public involvement efforts can be used to define a ICE Geographical Boundary, or appropriate/refine a boundary created with any of the techniques described in the ICE guidelines. The general approach is to query experts or stakeholders about the geographic extent of potential effects.
Resource Agencies		
Other		
Experts	ICE Analysis Resources	Because of the age or incompleteness of statistics and local plans it may be necessary to conduct interviews with local government and planning officials to ascertain or confirm information on social and physical conditions.
Resource Agencies		
Other		
Experts	Land Use	Detailed interviews (or conference calling) with experts may be a workable substitute for the Expert Land Use Panel when panelists would be unable to participate in an iterative process.
Local Officials/Planners	Indirect Impacts	Interview local officials and private developers to determine development that <i>may</i> occur and development that <i>cannot</i> occur without the proposed project.
Developers		
Resource Agencies	Mitigation	The issue of responsibility for mitigation often relies on detailed interviews for additional information and confirmation of strategies identified in the ICE Analysis.

ICE Analysis Manual

Analysis: Conduct Analysis

Step

Action

5

Identify Methodologies and Conduct Analysis



Complete Analysis Methodology Checklist

Analysis Methodology	Yes	No	Rationale
Resource			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
<hr/>			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
<hr/>			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
<hr/>			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
<hr/>			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
<hr/>			
Other Considerations			
Received agency input?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Is all of the above information readily available?	<input type="checkbox"/>	<input type="checkbox"/>	_____

Analysis: Conduct Analysis

Step

Action

5

Identify Methodologies and Conduct Analysis



Document Methodologies and Rationales

- Document the rationale for level of analysis conducted for each resource
- Include Sub-Boundary Checklist and/or process of determination in Project Files/Administrative Record

Analysis: Conclusions

Step

Action

6

Reach ICE Analysis Conclusion

It is important to document all indirect and cumulative effects. Concluding that there are indirect and cumulative effects is part of the overall ICE Analysis process, therefore it is important to document when they occur. Keep the purpose of identifying and documenting, even if qualitatively, any of these effects at the forefront of the ICE Analysis process.

Analysis

Step

Action

6

Reach ICE Analysis Conclusion

Have you Considered the Following Regarding the ICE Analysis Conclusions?

- Relied on experience of project team members to reach ICE Analysis conclusions?
- Document when there is not sufficient data to analyze effects on a particular resource?
- Have not presented arbitrary data?
- Used tables (Matrices), where appropriate, to interpret data?
- Reviewed existing and proposed regulations and their affect on past, present, and future impacts to resources?
- Reviewed local, county and state planning initiatives?
- Reviewed local, in place or proposed, preservation programs?
- Identified all future public/private development proposals and associated land use changes?

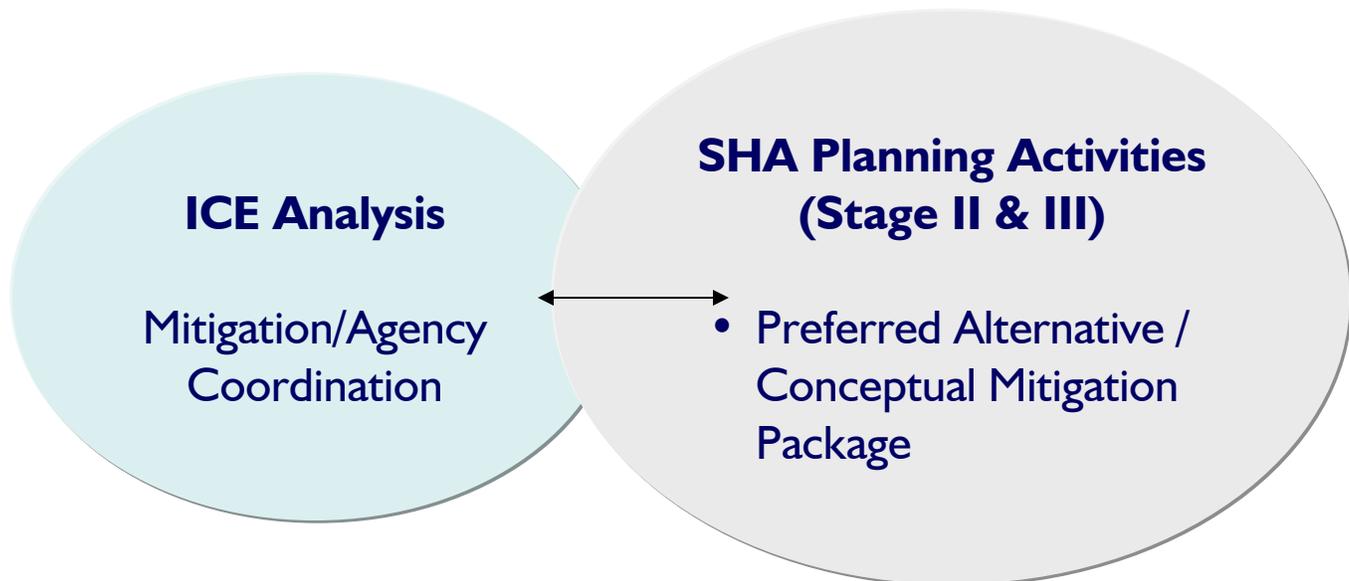
STOP!

Mitigation



Mitigation

Where are we in the **SHA Project Planning Process?**



Mitigation

Step

Action

1

Potential SHA ICE Analysis Mitigation



Recommend Mitigation Strategies

SHA will recommend mitigation for direct impacts. If potential Indirect and cumulative impacts are identified, then possible mitigation strategies to be considered by the party(ies) responsible for these impacts (or others) are noted.

Mitigation

Step

Action

2

Potential SHA ICE Analysis Mitigation



Coordinate with Local Resource Agencies

Identification/development of potential mitigation measures for significant indirect/cumulative effects may result from consultation with appropriate resource agencies and local governments. If mitigation is warranted, the measures listed below are examples of resource measures that may be considered:

- Work with local/county government or resource agencies to develop/implement resource preservation plans
- Implement access controls that may minimize resource impacts.

Mitigation

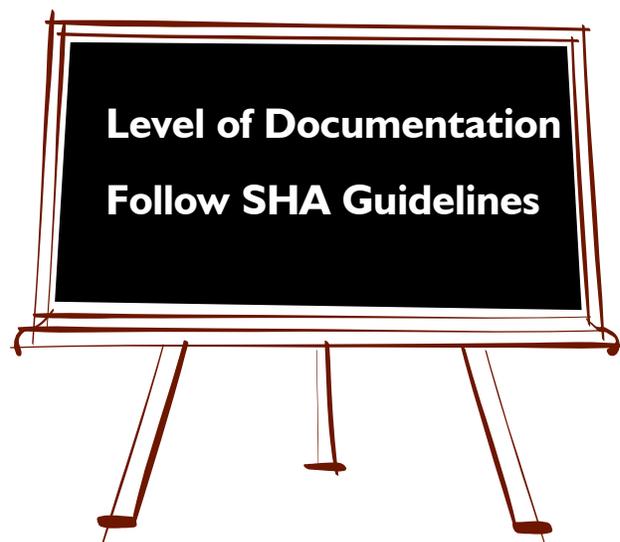
Potential SHA ICE Analysis Mitigation

Have you Considered the Following Regarding the Potential ICE Analysis Mitigation?

- Reviewed existing and proposed regulations and their affect on mitigation efforts?
- Reviewed local, county and state planning initiatives?
- Reviewed local, in place or proposed, preservation programs?
- Coordinated with local/government resource agencies regarding mitigation potential?
- Included findings, formal coordination and/or correspondence regarding mitigation in the ICE Analysis and Project Files/ Administrative Record?

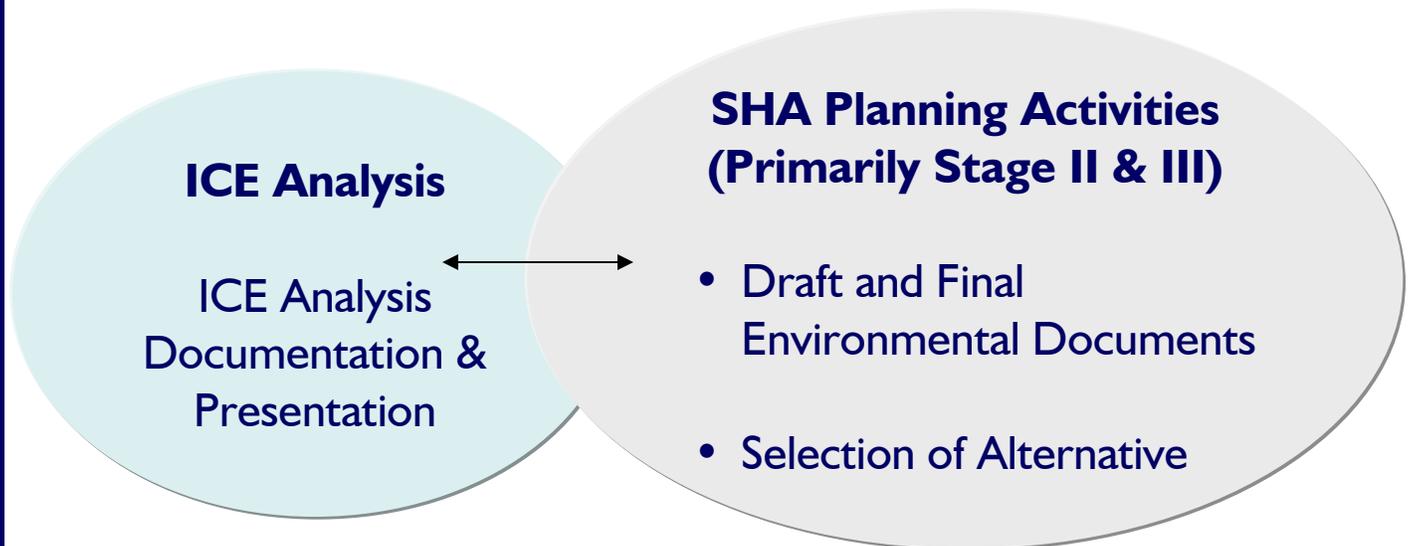
STOP!

Documentation



Documentation

Where are we in the SHA Project Planning Process?



Documentation

Present ICE Analysis in Environmental Document

What information should be included in the Introduction to the ICE Analysis?

- ✓ Citation to NEPA and CEQ regulations
- ✓ Statement of Compliance to NEPA and CEQ regulations
- ✓ Definition of Indirect and Cumulative Effects, as cited in the CFR
- ✓ Brief outline of the ICE Analysis document

Note:

Larger projects may also include an “overview” of the analysis following the introduction. An overview section summarizes the approach, findings, and other pertinent information to the analysis.

Documentation

Step

Action

1

Present ICE Analysis in Environmental Document



Describe Scoping Activities

Resources

- Describe the rationale for selecting resources considered in the ICE Analysis
- Provide background information pertinent to the resource (general description of resources within the ICE Analysis study area and their significance and use)
- Use maps and overlays to present this information clearly in the environmental documentation.

Geographical Boundaries

- Describe the factors and rationale that serve as the basis for establishing the geographical boundary.
- Use boundary maps to present this information clearly in the environmental documentation.

Time Frame

- Describe the factors and rationale leading to the selection of the ICE Analysis time frame.
- Include timeline of major developments within ICE Analysis Boundary to present this information clearly in the environmental documentation.

Documentation

Step

Action

2

Present ICE Analysis in Environmental Document



Describe ICE Analysis

- Describe the data sources used in developing the past, present, and future land use scenarios (cite data sources).
- Include meeting summaries with local/county planning agencies, MPO's etc.
- Describe the ICE Analysis methodologies (e.g. trends, overlays, matrices and interviews and combinations of these methods), including analysis methodology checklist.
- Describe effects for each resource considered in the ICE Analysis

Documentation

Step

Action

Present ICE Analysis in Environmental Document

3

Describe ICE Analysis Conclusions

- Describe how the ICE Analysis conclusions were reached.
- Cite applicable regulatory programs and their relationship to the ICE Analysis conclusions.

4

Describe ICE Analysis Mitigation

- Document any proposed mitigation efforts applicable to a resource, such as access controls and agreements with resource agencies.

5

Describe Any Additional Support Information

Include additional support information such as:

- Narrative regarding data availability
- Checklists
- Supporting data/documentation (appendices)

Documentation

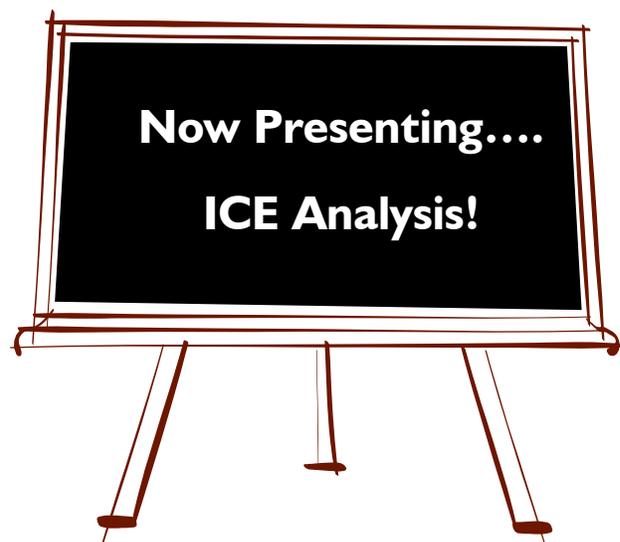
Present ICE Analysis in Environmental Document

Have you Considered the Following Regarding the ICE Analysis Documentation?

- Incorporated ICE Analysis into Project Environmental Document (in Environmental Consequences section)?
- Thoroughly described coordination with local, county and state planning officials?
- Used maps, tables and graphics judiciously in the ICE Analysis write-up to help facilitate agency review?
- Ensured all major topics (i.e., scoping, analysis, etc.) are documented according to SHA's guidelines?
- Completed ICE Analysis Checklists and included in appendix?

STOP!

Presenting the ICE Analysis



Presenting the ICE Analysis

The ICE Analysis Presentation (Other Information)

Remember the following when presenting your ICE Analysis:

Document resource impacts for each build alternative

- If indirect effects are relevant to the project, then separate indirect and cumulative effects discussions should also appear for each resource within the “Effects” subsection of the ICE Analysis narrative.
- Exclude data not used in explaining the indirect and/or cumulative effects to a resource.

Addressing the Analysis of Many Alternatives

In many cases, your effects analysis may be the same for multiple alternatives because they may be similar in alignment, typical section and access controls. In these cases it is only necessary to present your effects analyses once.

ICE Analysis Mapping

At a minimum mapping should be provided for:

- ICE Analysis Geographical Boundary (including support maps such as area of traffic influence, watershed/subwatershed boundaries and census tracts).
- Land use for past, present and future time frames.
- Location of existing resources within the ICE Analysis geographical boundary.

Presenting the ICE Analysis

The ICE Analysis Presentation (Other Information)

Typical ICE Analysis Outline:

A. Indirect and Cumulative Effects Analysis

TABLE OF CONTENTS

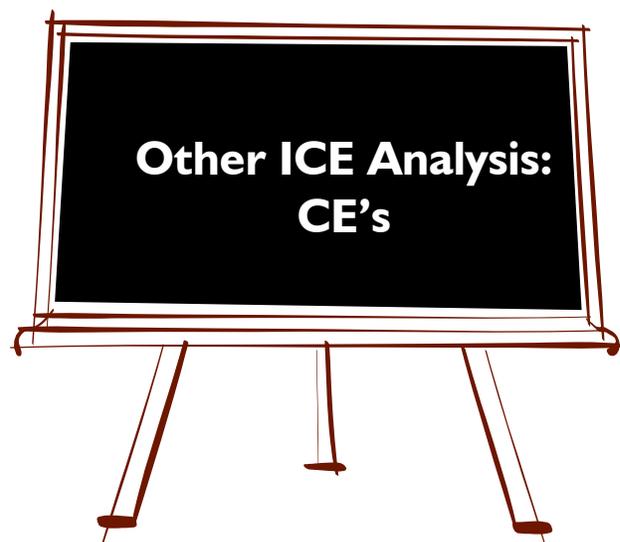
INTRODUCTION

1. **Overview** (for large, complex ICE Analysis/projects)
2. **Expert Land Use Panel** (if applicable)
3. **ICE Analysis Scoping**
 - a. ICE Analysis Resources
 - b. Geographical Boundaries
 - c. Time Frames (Past, Present, Future)
4. **Analysis Methodology**
5. **Land Use and Development**
 - a. Past Land Use
 - b. Present/Near Future Land Use
 - c. Future Land Use
6. **Summary of Indirect and Cumulative Effects**
 - a. Past Impacts
 - b. Present/Near Future Impacts
 - c. Future Impacts
7. **Detailed Indirect and Cumulative Effects Per Resource**
8. **ICE Analysis Mitigation**

Sample Outline:
Presentation of each
ICE Analysis is
Project Specific

APPENDICES

ICE Analysis for Categorical Exclusions



ICE Analysis Manual

ICE Analysis for CE's

Step

Action

1

Determine whether an ICE Analysis is necessary

Some level of ICE analysis may be required for a Categorical Exclusion (CE). Projects not requiring ICE documentation include:

- Programmatic CE
- Replacement of Non-Historic Bridges
- Enhancement Projects

YES = Continue with Analysis, Step 2.

NO = Continue with Step 1a. An ICE Analysis is not necessary for this project. Document scoping efforts in Project Files.

1a

Addressing CE Projects Not Requiring an ICE Analysis.

For CE letters prepared for Enhancement and Streetscape projects and non-historic bridges, include a statement in the letter indicating that an ICE analysis is not required due to the scope of the project.

2

Addressing CE Projects Requiring an ICE Analysis

For those projects that meet the criteria for classification as a CE, the following questions should be considered:

- What is the purpose and need for the project? Is the primary need for the project economic development, or is it related in any way to planned development in the vicinity of the project?
- Does the project propose new/improved access which could allow potential development to occur?
- If increasing roadway capacity is a primary purpose of the project, is the current capacity limiting development?
- Would the project enhance the development potential of adjacent properties.

NO TO ALL = Continue to Step 2a

YES TO ANY OR ALL = Continue to Step 2b

ICE Analysis for CE's

Step

Action

2a

If Answered No to All Questions in #2:

An ICE Analysis is not required; however, the rationale for why one is not required should be discussed in the CE Classification Request letter (or in the L/A request if separate classification request is not prepared).

2b

If Answered Yes to Any or All Questions in #2:

An ICE analysis discussion must be included in the CE Classification letter requesting Location Approval (L/A) from FHWA. Continue with the following steps on conducting an ICE Analysis for Categorical Exclusions.

ICE Analysis for CE's

Step

Action

3

The boundary, time frame, and resources to be evaluated in the ICE analysis should be established consistent with the SHA guidelines in the same manner as they would if the analysis were prepared for either an EA or an EIS.

4

Develop mapping that illustrates existing and proposed land use/development in the project area.

5

Based on the information gathered during the ICE Analysis, the following questions should be addressed and answered for the ICE analysis:

- Is the development potential of the area already built-out?
- Is the other development in the area that will occur regardless of the project?
- Is there proposed development that cannot occur unless the proposed transportation improvements are built?

NOTE:

The boundary should be appropriate to the scope of the project. It should generally be confined to the project study area, and any properties directly impacted, parcels adjacent to the study area or properties otherwise affected by the project.

ICE Analysis for CE's

Step

Action

6

If the answer to the last question is “Yes” in Step 5, it is essential to assess land use changes that will occur as a result of the project and how environmental resources on or adjacent to the affected parcel will be impacted. Finally, discuss whether the direct impacts to specific resources are of a magnitude that is significant.

7

Documentation: The ICE analysis discussion is to be included in the CE Classification letter requesting Location Approval (L/A) from FHWA.

NOTE:

For information regarding CE's and Re-evaluations and Supplemental Environmental Impact Statements, please refer to the ICE Analysis Guidelines.

Other Information

Available Resources Regarding ICE Analysis

- **CEQ Regulations 1508.7 and 1508.8**
- **FHWA Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process**
- **FHWA Environment Guidebook, Considering Cumulative Effects Under NEPA, Council on Environmental Quality Memorandum (October 1997)**
- **Consideration Of Cumulative Impacts In EPA Review of NEPA Documents, U.S. Environmental Protection Agency, Office of Federal Activities (2252A); EPA 315-R-99-002, May 1999**
- **FHWA Website – <http://www.fhwa.dot.gov/>**
- **Guidance for Estimating the Indirect Effects of Proposed Transportation Projects. NCHRP Report 403, Transportation Research Board, National Research Council. Prepared by the Louis Berger Group, 1998**
- **Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects. NCHRP Report 466, Transportation Research Board, National Research Council. Prepared by the Louis Berger Group, 2002**
- **FHWA Position Paper (April 1992) Indirect and Cumulative Impact Assessment in the Highway Project Development Process**
- **Re: NEPA Community of Practice website (<http://www.fhwa.dot.gov>)**

ICE Analysis Checklists

- **Sub-Boundary Checklist**
- **Past Time Frame Checklist**
- **Methodology Checklist**

ICE Analysis Manual



Identifying Factors	Yes	No	Rationale
Resource Boundaries			
Watersheds	<input type="checkbox"/>	<input type="checkbox"/>	
Sub-Watersheds	<input type="checkbox"/>	<input type="checkbox"/>	
Chesapeake Bay Critical Area	<input type="checkbox"/>	<input type="checkbox"/>	
Sensitive Species Protection Areas	<input type="checkbox"/>	<input type="checkbox"/>	
Forested Tracts	<input type="checkbox"/>	<input type="checkbox"/>	
Farmland/Agricultural Areas	<input type="checkbox"/>	<input type="checkbox"/>	
Historic Districts/Cultural Resources	<input type="checkbox"/>	<input type="checkbox"/>	
Communities/Neighborhoods	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
Census Tracts			
Census Tracts	<input type="checkbox"/>	<input type="checkbox"/>	
Extent of Preliminary/Conceptual Alternatives			
Project Study Area or "Project Area"	<input type="checkbox"/>	<input type="checkbox"/>	
Area of Traffic Influence			
Traffic Analysis Zones (TAZ)	<input type="checkbox"/>	<input type="checkbox"/>	
Other Measures of Traffic Influence	<input type="checkbox"/>	<input type="checkbox"/>	
Sewer and Water Service			
Existing Sewer and Water Service	<input type="checkbox"/>	<input type="checkbox"/>	
Planned Sewer and Water Service	<input type="checkbox"/>	<input type="checkbox"/>	
Planning Areas			
Priority Funding Areas (PFAs)	<input type="checkbox"/>	<input type="checkbox"/>	
Local Planning Area Boundaries	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
Other			
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

ICE Analysis Manual



Identifying Factors	Yes	No	Description
Considerations			
Major Events in the Historic Context of the Area:	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Dates of Major Road Construction in SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Changes in Land Use within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Population Changes within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Employment Changes within SCEA Boundary	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
Other Considerations			
Received agency input on Past Time Frame?	<input type="checkbox"/>	<input type="checkbox"/>	
Is all of the above information readily available?	<input type="checkbox"/>	<input type="checkbox"/>	

ICE Analysis Manual



Analysis Methodology	Yes	No	Rationale
Resource			
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
Trend	<input type="checkbox"/>	<input type="checkbox"/>	_____
Overlay	<input type="checkbox"/>	<input type="checkbox"/>	_____
Matrices	<input type="checkbox"/>	<input type="checkbox"/>	_____
Interview	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other Considerations			
Received agency input?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Is all of the above information readily available?	<input type="checkbox"/>	<input type="checkbox"/>	_____

VALUABLE LAND USE DATA SOURCES

Valuable Past Land Use Data Sources

<i>Key Data Source</i>	<i>Description</i>	<i>SHA Availability</i>
Aerial Photography	Digital Orthophotography from DNR, USGS or county government, Spot satellite imagery and SHA Project Planning archived aerial photography	✓
State Roads Commission	Annual Highway Improvement Records	✓
EPA Region III/DOT	Past NEPA documents disclose the impacts of past projects	
SHA's Regional Intermodal Planning Division (RIPD)	Past Master Plans and Major Development Matrices	✓
Maryland Office of Planning Land Use Maps	MOP mapping provides Anderson Classification land use mapping for past years.	✓
ACOE Permit Files	Provides way of tracking development through Army Corps of Engineers permit files	
MDE Permit Files	Provides way of tracking development through Maryland Department of Environment permit files	
Metropolitan Planning Organizations	Used to identify land use trends through past Long Range Plans (LRP) and Transportation Improvement Plans (TIP)	✓

Please note that this list of valuable data sources is not all inclusive, it should be used as a guide.

VALUABLE LAND USE DATA SOURCES

Valuable Present Land Use Data Sources

Key Data Source	Description	SHA Availability
Local Planners	Local/Private development proposed for the "near future" (Within 1 - 5 years)	
Regional Intermodal Planning Division (RIPD)	Major Development Projects	✓
SHA Access Permits	Additional screening for local development	✓
SHA Projects having received location approval	Provides insight to land use that will potentially change due to a future SHA project.	✓
ACOE Permit Files	Provides way of tracking development through Army Corps of Engineers permit files	
MDE Permit Files	Provides way of tracking development through Maryland Department of Environment permit files	
EPA Region III	NEPA documents for all federally funded projects, including non-highway	
Aerial Photography	Digital Orthophotography from DNR, USGS or county government, Spot and other current satellite imagery that is readily available	✓
Maryland Office of Planning land use/cover maps	Digital or paper county-wide land use/cover maps published by the Maryland Office of Planning	✓
Travel Forecasting	Used to determine what impacts existing travel patterns and volumes have on land use.	✓

Please note that this list of valuable data sources is not all inclusive, it should be used as a guide.

VALUABLE LAND USE DATA SOURCES

Valuable Future Land Use Data Sources

Key Data Source	Description	SHA Availability
Metropolitan Planning Organizations (MPO's)	Constrained Long Range Plan (CLRP)	✓
Regional Intermodal Planning Division (RIPD)	Major Development Matrix and local Master Plans	✓
Travel Forecastng	Used to determine what impacts existing travel patterns and volumes have on land use and also source of land use data since there are specific land use assumptions used to develop no-build, ADTs.	✓
Local Planners	Local/Private proposed development	
Local Master Plans	Provide insight to areas designated for growth and also general trends for population and employment growth	
SHA Access Permits	Additional screening for local development	✓
SHA Projects having received location approval	Provides insight to land use that will potentially change do to a future SHA project.	✓
Federal Register	Announces EIS, NOI's and public hearings for 404 permits	
EPA		
Maryland Office of Planning	Land Use Forecast Maps	
Chesapeake Bay Foundation	Provide data on proposed major works /development projects	
Sierra Club	Provide data on proposed major projects/development works	

Please note that this list of valuable data sources is not all inclusive, it should be used as a guide.