Assessing Development Impacts from Transportation Infrastructure Alternatives that vary from Local Land Use Plans: A look at the ICC Alternatives Assessment Methodology

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I. INTRODUCTION

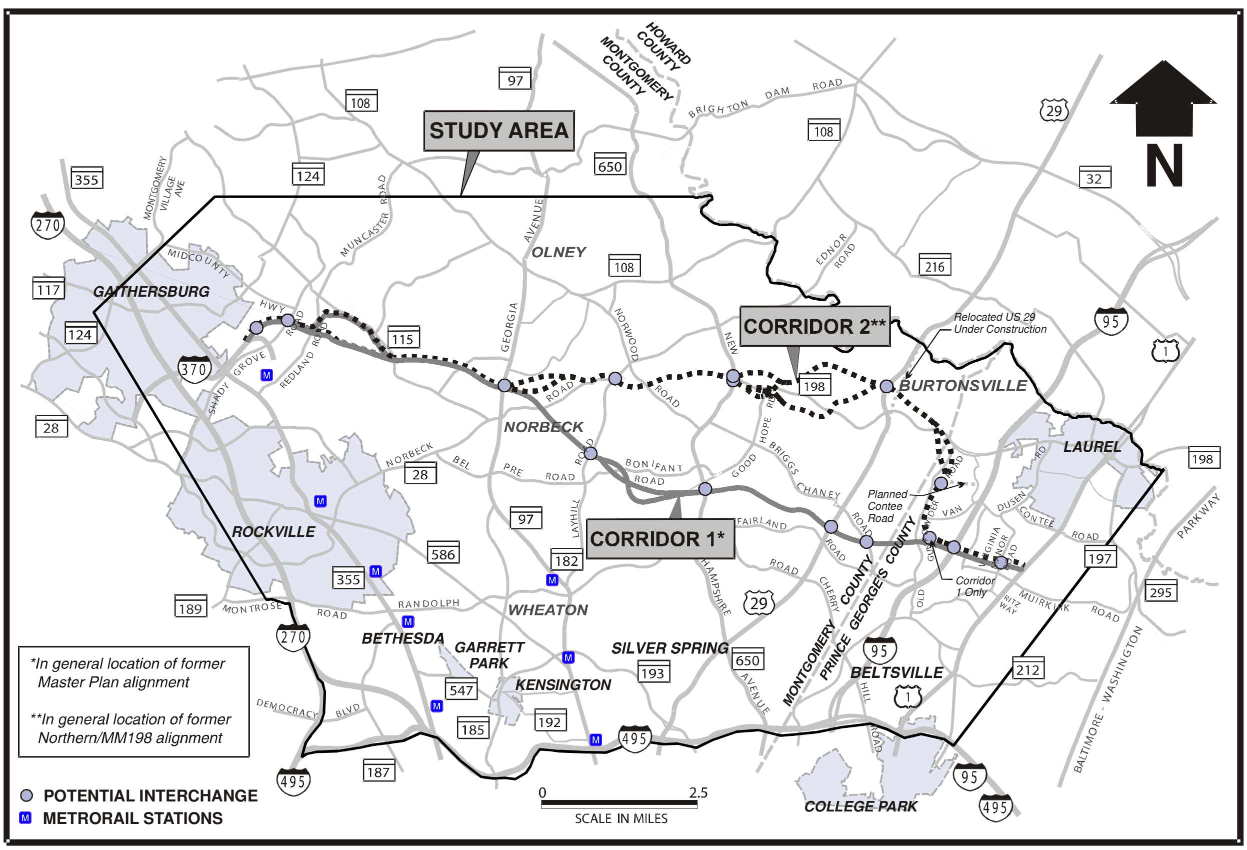
The purpose of this paper is to discuss the following:

- The process of performing an Indirect and Cumulative Effects (ICE) Analysis
- Factors that make this particular ICE Analysis unique
- The role that a Geographic Information System (GIS) played
- The different effects that could occur based on the proposed alternatives

This ICE Analysis was performed for the Intercounty Connector Project, located in portions of Montgomery and Prince George's County, just outside of Washington DC. The proposed six-lane roadway would span approximately 20 miles from I-270 to I-95. Two build alternatives (Corridor 1 and Corridor 2) where evaluated as part of this analysis along with the No-Action alternative. Corridor 1 or the southern alternative extends approximately 18 miles from I-370/I-270 near the Shady Grove Metrorail Station to I-95 and US 1 south of Laurel. Approximately 16 of the 18 miles are located in Montgomery County and approximately 2 miles are in Prince George's County (***Figure 1***). Corridor 1 is consistent with local master plans.

Corridor 2 or the northern alternative extends approximately 20 miles from I-370/I-270 near the Shady Grove Metrorail Station to I-95/US 1 south of Laurel. Approximately 16 of the 20 miles are located in Montgomery County and approximately 4 miles are in Prince George's County (***Figure 1***). Corridor 2 is not consistent with local master plans.

Figure 1
Location of Build Alternatives



II. ICE ANALYSIS OVERVIEW

A. NEPA Compliance

In addition to the consideration of a project's "direct" impacts, the Council on Environmental Quality (CEQ) regulations also require that the indirect and cumulative effects of a project be examined (40 CFR § 1508.25 (c)). Indirect (secondary) effects are defined as, "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 pattern 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)). Cumulative effects are defined as, "Impact on the environment which results from the incremental impact of 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 other actions" (40 CFR § 1508.7).

B. Indirect Effects

As previously mentioned, indirect effects include indirect impacts that are caused by the action (i.e., construction of an ICC build alternative), 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 pattern of land use, population density or growth rate. The time frame used for the assessment of reasonably foreseeable indirect impacts was 2030, which is the design year for the project. This was also the time frame for which an Expert Land Use Panel (ELUP) projected household and employment allocations for each of the project alternatives.

The indirect impacts analysis involved assessing impacts associated with growth-inducing effects of the ICC project. As such, land use scenarios for each of the ICC ARDS (Corridor 1 and Corridor 2), including the No-Action, were generated based on the ELUP's 2030 household and employment estimates. Land use maps were generated for each of the ICC ARDS, highlighting areas that could potentially accommodate the ELUP allocations. The future 2030 land use maps were then overlaid with environmental resources to assess resource impacts associated with indirect induced growth that might result from construction of the ICC.

The ELUP estimates suggest that indirect growth is likely for both Corridors 1 and 2. As a result of the projected induced growth, associated indirect environmental impacts would also be likely for both Corridors 1 and 2. Based on the ELUP's estimates, the extent of indirect induced growth would be similar between the two ICC build corridors, with slightly greater induced growth and associated indirect impacts expected under a Corridor 2 scenario.

Indirect impacts were assessed quantitatively whenever possible; however, many resources were assessed qualitatively. Quantitative impacts were calculated for certain resources (e.g., wetlands, floodplains, farmlands, streams and forests) when GIS data was readily available. It was not practical to conduct quantitative analysis for all resources; therefore, indirect impacts were assessed qualitatively for resources such as residential/business communities, parklands, and cultural resources.

C. Cumulative Effects

Cumulative environmental effects relate to the incremental impact of the ICC project in the context of other past, present and reasonably foreseeable future actions whether they are public or private actions. Therefore, cumulative effects take into account all past impacts that have occurred within the ICC ICE Analysis boundary, impacts associated with the ICC project itself, impacts associated with present/near future pipeline projects, and impacts associated with anticipated future 2030 projects. Indirect impacts are considered a component of cumulative effects. As such, cumulative effects under the Corridor 1 or Corridor 2 scenarios include the summation of all past, present and anticipated future impacts within the ICC ICE Analysis boundary, including impacts associated with indirect induced growth.

D. ICE Analysis Scoping

ICE Analysis scoping was conducted in accordance with the SHA's June 2000 *ICE Analysis Guidelines for Environmental Impact Statements and Environmental Assessments* (SHA, 2000). Scoping activities include the following and define the parameters for conducting the resource analysis:

- Defining resources to be analyzed in the ICE Analysis
- Establishing the ICE Analysis geographical boundary
- Establishing the ICE Analysis past and future time frames

1. Resources

The following resources were assessed in the indirect and cumulative effects analysis:

- Residential/Business Communities
- Farmlands
- Parks/Recreational Facilities
- Forests/Terrestrial Habitat
- Low-Income/Minority Populations
- Rare, Threatened, and Endangered Species (RTE)
- Floodplains
- Surface Water/Aquatic Habitat
- Wetlands
- Cultural Resources

The first step in identifying resources to be considered in the analysis is to consider all resources that are directly impacted by the project ARDS. Once the ICE Analysis is underway it is important to reassess additional resources to determine if there are any impacted by indirect development.

2. Geographical Boundaries

Geographic limits were first identified in which the ICE Analysis would be conducted. The ICE Analysis boundary covers sufficient area to allow for flexibility in the development of alternatives and encompasses all areas that may be directly affected. Indirect and cumulative effects could be further removed from the project alternatives than direct impacts; therefore, it was assumed that the geographic limits for the analysis of indirect and cumulative effects reach beyond the defined project study area.

Multiple resource boundaries were reviewed to determine appropriate ICE Analysis sub-boundaries using the environmental resources that may be directly affected by the project. Established sub-boundaries were overlaid onto one composite map to determine the outermost boundary extent ***(Figure 2)***. The outermost extent of all sub-boundaries comprises the overall ICE Analysis boundary. The sub-boundaries considered in establishing the ICE Analysis boundary are listed below.

- Alternatives/Study Area Boundary
- Area of Traffic Influence
- Natural Resources (e.g., Watersheds)
- Public Sewer and Water Service Areas
- Census Tracts
- Expert Land Use Panel Boundary

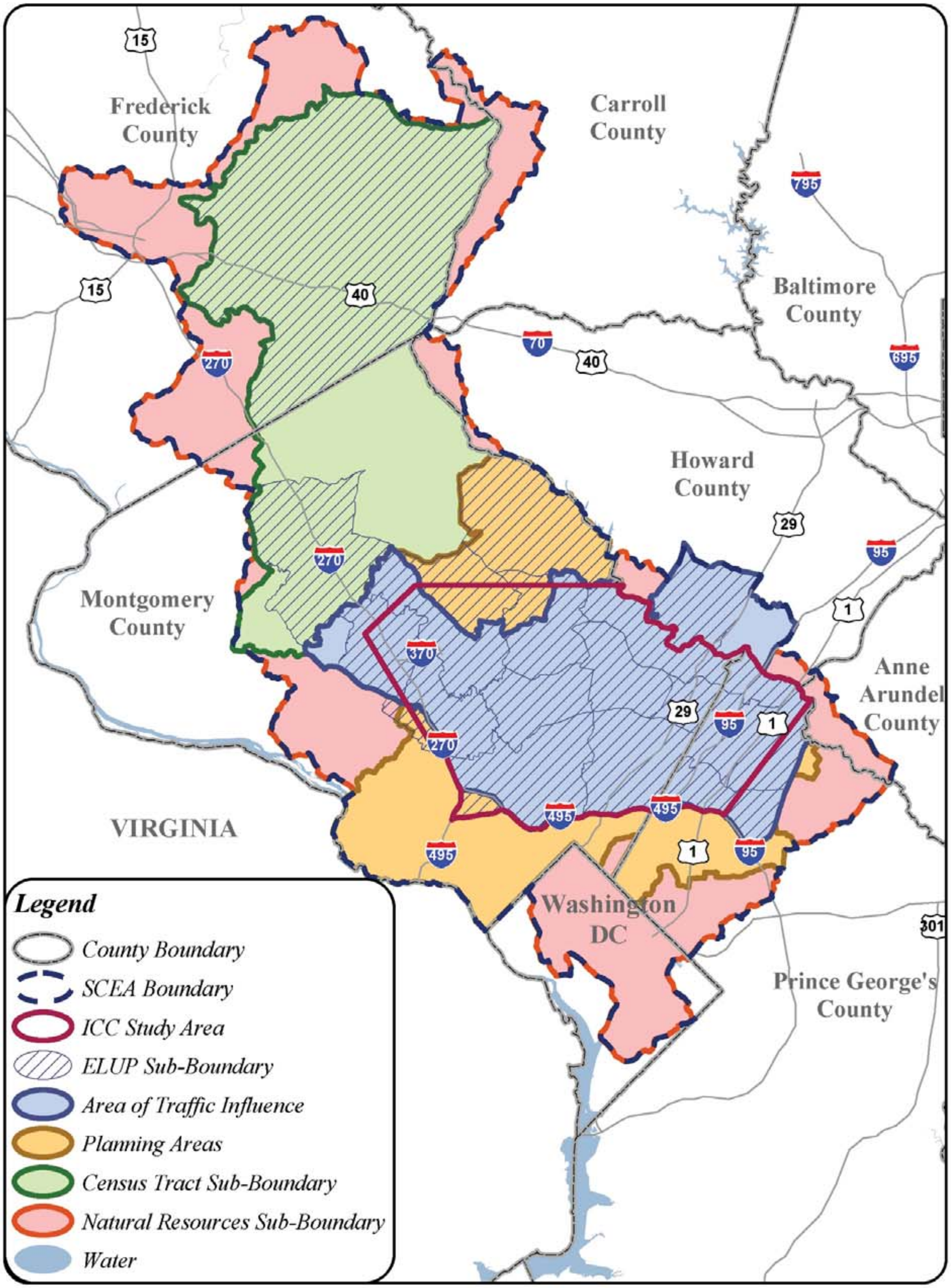
3. Time Frames

The ICE Analysis must consider past, present and reasonably foreseeable future actions. The past time frame of 1964 was chosen based on two significant events that occurred within the ICE Analysis boundary; the opening of the Capital Beltway (I-495) as well as the adoption by Maryland –National Capital Park and Planning Commission (M-NCPPC) of *On Wedges and Corridors: A General Plan for the Maryland-Washington Regional District* (M-NCPPC, 1964). The opening of the Capital Beltway and later Metrorail (the first Maryland station opened in 1978 in Silver Spring) were important factors influencing development patterns in both Montgomery and Prince George's Counties. Coupled with the local planning philosophy of wedges, corridors and centers, the stage was set for channeling and managing of the development that would occur as a result of the substantial population growth since World War II.

It was determined that five years from present (2010) would adequately assess the present/near future time frame. Commencement of construction of an ICC would be within the 2010 time frame.

The future time frame 2030 was chosen primarily based on the project's design year, 2030, and is derived from future land use assumptions. In addition, population projections are available through 2030, allowing a more accurate depiction of the future population within the ICE Analysis boundary.

Figure 2
ICE Boundary



III. ICE ANALYSIS

A. Preparation of Land Use Scenarios

The ICE Analysis involves the assessment of resource impacts from the past time frame to the present/near future time frame and ultimately, into the future 2030 time frame. In order to conduct this assessment an overlay analysis was performed using ArcGIS for the past, present/near future and future land use and resource maps. This analysis was used to determine what actions have taken place in the past timeframe and what resources have been affected, additionally it can determine what resources could potentially be affected in the future timeframe.

1. Past Land Use Scenario

The Past Land Use Scenario was derived from Maryland Department of Planning's (MDP) digital 1973 statewide land use/land cover data. It was previously mentioned that the past timeframe for this analysis was 1964. The 1973 digital data was the most readily available digital data, so in order to supplement the time gap historic aerials were analyzed to assess back to 1964. Please see ***Figure 3*** for the Past Land Use Scenario

2. Present/Near Future Land Use Scenario

The present/near future land use scenario was derived from M-NCPPC's digital 2000 land use land cover data and MDP 2000 land use land cover data for the remaining areas. Additionally transportation and development projects slated to occur by the year 2010 were superimposed on the land use data. The land use was then converted to reflect the appropriate land use specific to each project. These development and transportation projects were identified through Master Plans, coordination with each county and through the Constrained Long Range Plan (CLRP). Please see ***Figure 4*** for the Present/Near Future land use scenario

3. Future Land Use Scenario

The future land use scenario was derived from the adjusted present/near future land use scenario overlaid with planned development and transportation projects slated to occur between the year 2010 and 2030. The land use was then converted to reflect the appropriate land use specific to each project. These development and transportation projects were identified through Master Plans, coordination with each county and through the CLRP. Additionally, areas of indirect development were identified based on estimates provided by an Expert Land Use panel. These were also overlaid on the future land use scenario. Please see ***Figure 5*** for the Future Land Use Scenario.

Figure 3: Past Land Use Scenario

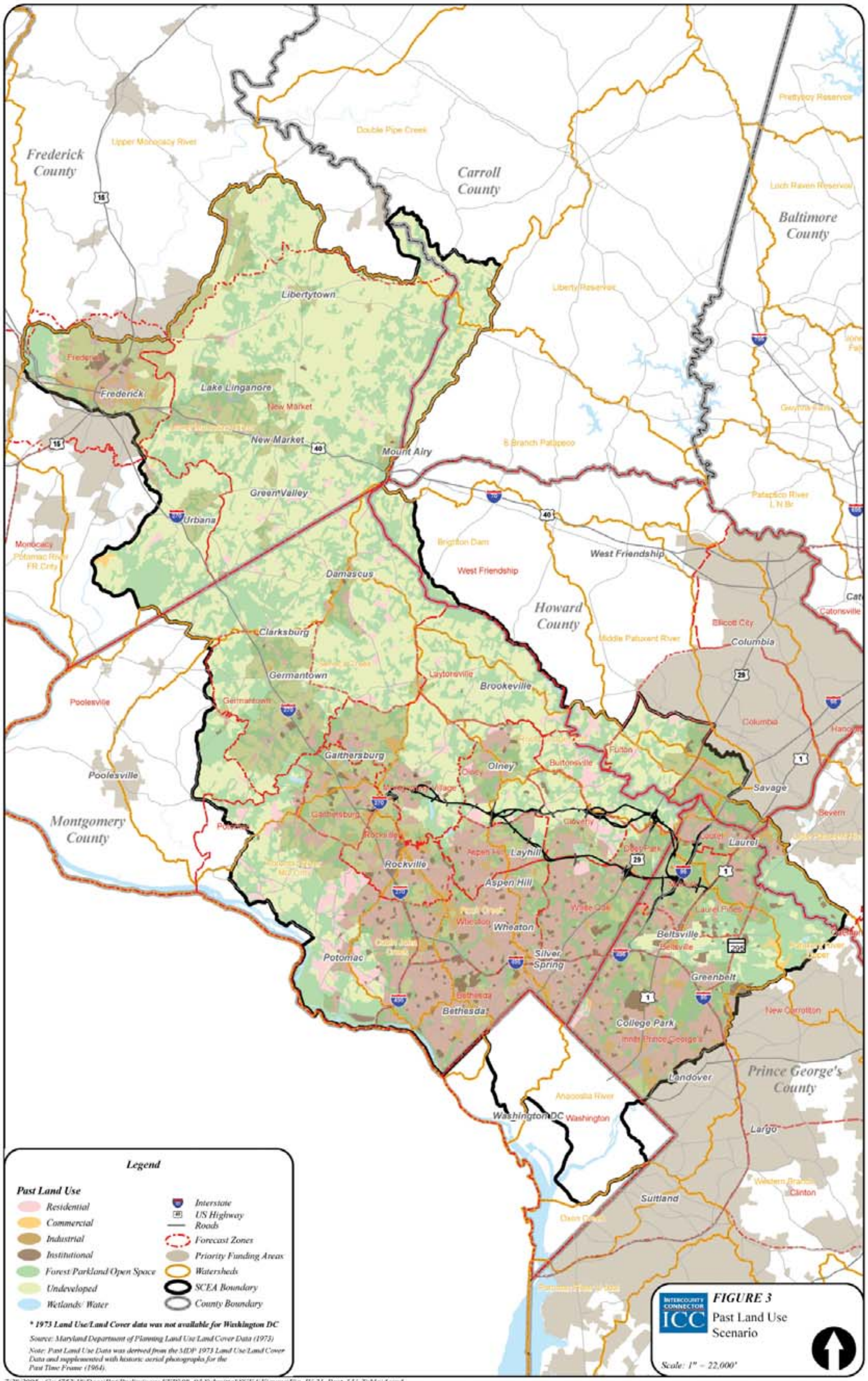


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Figure 4: Present Land Use Scenario

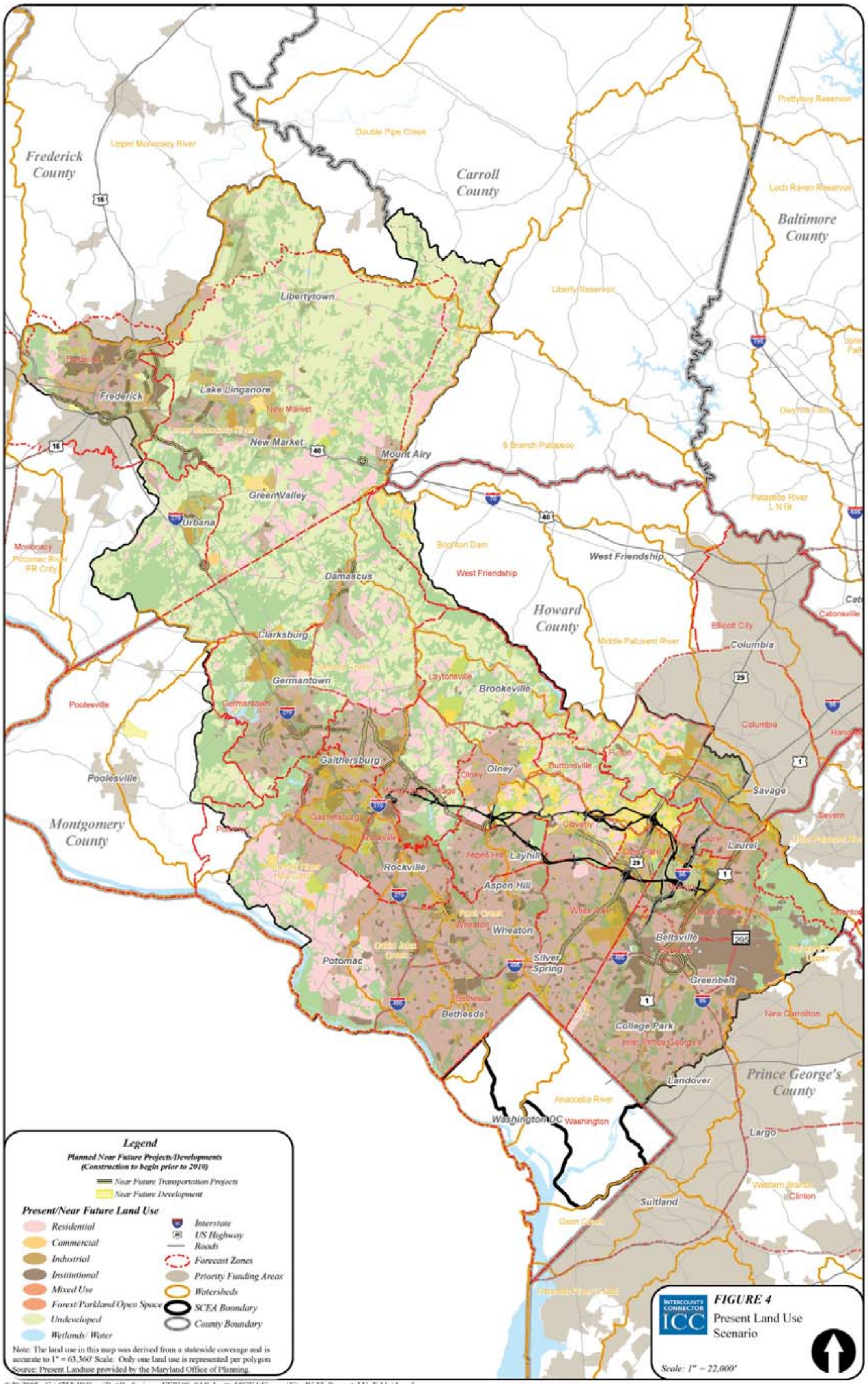

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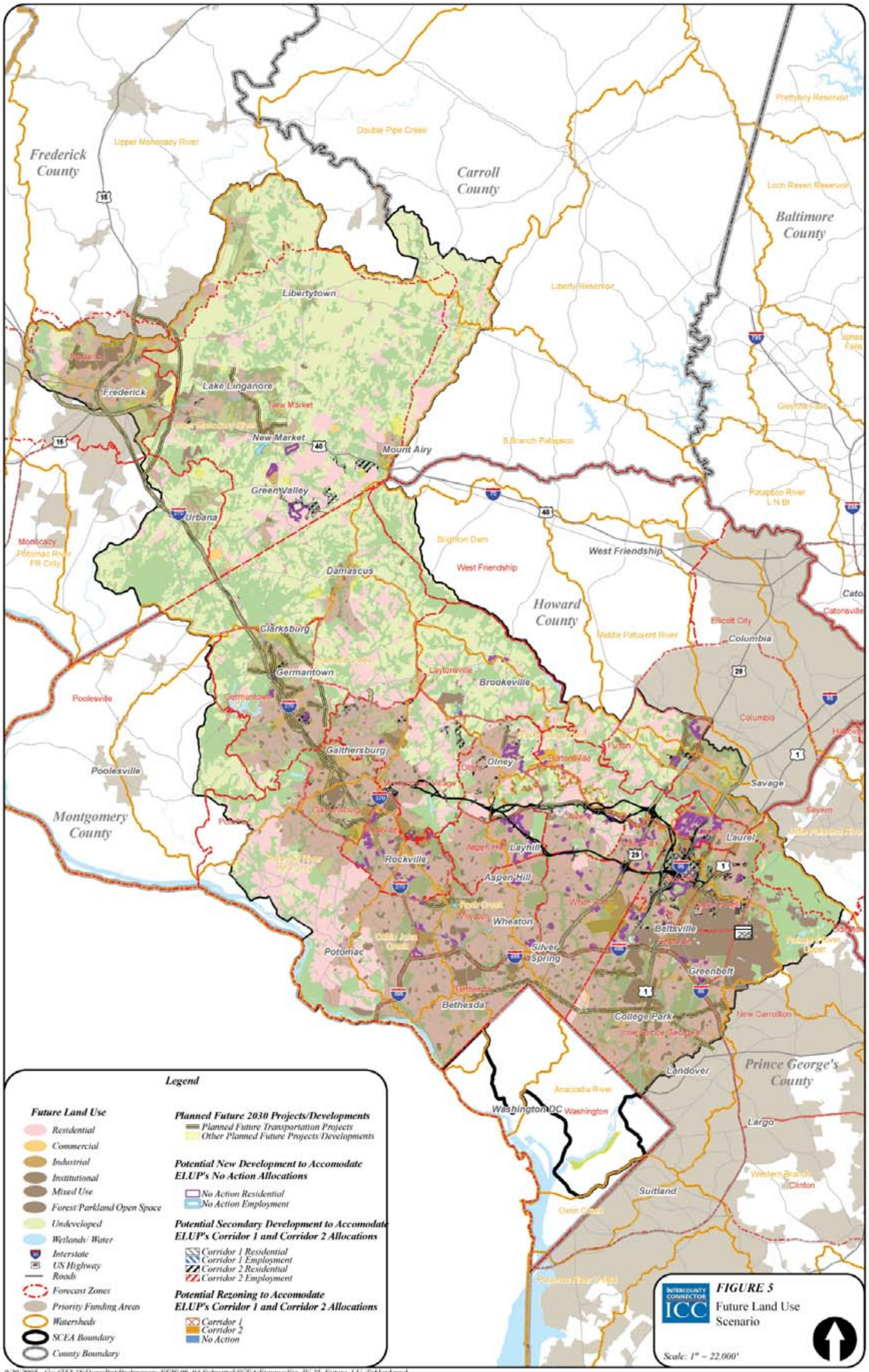
Figure 5: Future Land Use Scenario



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B. Integration of an Expert Land Use Panel (ELUP)

An Expert Land Use Panel was established as an advisory group for the ICC project to estimate differences in the amount and location of future households and jobs (indirect development) for each alternative, including the No-Action Alternative. The ELUP process is included as part of SHA's *ICE Analysis Guidelines* (SHA, 2000) for select projects. Due to the complexity of the project, an advisory panel was selected to identify future land use scenarios since there were differing viewpoints among local jurisdictions, agencies and special interest groups. The results of the panel's estimates were used in developing the future land use maps which were discussed above and assessing resource impacts based on indirect development.

The ELUP used a well-developed research technique known as the Delphi process to estimate future land use impacts associated with each of the ICC alternatives. This process is a highly structured technique in which participants provide their individual assessment of likely future events. The use of expert panels and the Delphi process are widely recognized methods for analyzing transportation and land use alternatives (NCHRP, 2002; NCHRP, 1998).

This process was administered through each panelist completing iterative rounds of questions, and having a moderator tally and summarize the results of each round to provide overall results. Panelists were asked to allocate estimates of households and employment within 34 forecast zones surrounding the ICC study area and for three different scenarios: No-Action, Corridor 1 and Corridor 2. Each panel member was provided with Metropolitan Washington Council of Government's/Baltimore Metropolitan Council (MWCOG/BMC) Round 6.3 2030 household and employment forecasts. Additionally, the panel was provided information regarding the details of the ARDS. Descriptions of each corridor along with specific interchange locations and the fact that the roadway would be a six-lane, multi-modal, controlled access facility were all presented to the panel.

1. Identification of Development Areas

Once the panel's estimates were complete they were then used in identifying areas of indirect development. Household and employment allocations were compared between the Metropolitan Planning Organization MPO forecasts and ELUP's estimates. In some areas, the differences between the MPO projections and greater ELUP estimates suggested that additional development would be likely beyond what is currently planned for by the counties. Through the use of GIS, using land use and zoning classifications we were able to identify areas where development could likely occur. We determined the number of households that could be accommodated on a parcel of land based on the number of dwelling units allowed by the zoning code. Floor area ratios were used when identifying the number of jobs that could be accommodated. There was a three tier process used in identifying areas of indirect development.

Tier 1 - Currently adequately-zoned, undeveloped areas were identified first to absorb the allocations. The number of households or jobs that could potentially be accommodated within an area was based on dwelling units or Floor Area Ratios (depending on zoning).

Tier 2 – If there were insufficient currently zoned lands to support the allocations, then areas that may experience rezoning pressures on currently undeveloped land were identified to absorb the allocations. (Lower density zoning areas were targeted as having the potential for rezoning to accommodate all the allocations.)

Tier 3 - If it was determined that there was insufficient undeveloped land area to absorb allocations then we assumed that redevelopment would be likely to accommodate the allocations. No specific redevelopment areas were identified.

In order to adequately manage the large amounts of GIS data used for this analysis the creation of a database was necessary. Types of data that were analyzed include spatial (land use, zoning, resource layers and property data) and tabular datasets (Master Plans data/ local, county and state datasets). In many cases it was necessary to join tabular datasets with the spatial ones in order to prepare more complete data layers. The use of ModelBuilder, an extension in ArcGIS, allowed us to perform iterative analyses in a fast paced manner.

Once identifying potential development areas was complete the acreages for each Alternative were identified and tallied. The ELUP estimated that the No-Action alternative could anticipate about 2,512 acres of additional development. The No-Action alternative was prepared by the ELUP as a baseline for which to compare both Build Alternatives indicating that the ELUP anticipates additional development even without an ICC alternative.

Corridor 1 could anticipate about 4,945 acres of indirect development in addition to the No-Action scenario. Based on ELUP's allocations, approximately 1,144 acres of undeveloped land could potentially be rezoned in order to accommodate the additional ELUP allocations for Corridor 1. In Corridor 1, 72 percent of the potential development areas would fall within PFAs.

Corridor 2 could anticipate approximately 5,546 acres of indirect development in addition to the No-Action scenario. Based on ELUP's allocations, approximately 1,578 acres of undeveloped land could potentially be rezoned in order to accommodate the additional ELUP allocations for Corridor 2. Approximately 64 percent of the potential development areas for Corridor 2 would fall within PFAs.

2. Other Considerations

Montgomery and Prince George's Counties and the State of Maryland have in place, well-known and rigorous land use plans, policies and laws, with the express purpose of channeling growth and public facilities into appropriate locations at an appropriate pace. The counties' general and master plans since the 1960's have provided the planning basis for their zoning, growth management, and land use restrictions, and ensure a balance between land use and transportation. In addition, beginning in the 1990's, the State enacted several laws, called the Smart Growth Initiatives, designed to direct State funding for major projects toward areas of existing and planned growth. Maryland law applies an unusually high burden for individual rezoning of land that do not agree with local plans and zoning. The impact of these zoning and land use laws on indirect and/or cumulative effects is inherently uncertain and depends, in large part, on judgments concerning future political decisions. Indeed, participants in this ICE Analysis process, including ELUP advisory group members and county planning officials, reached somewhat differing conclusions regarding how these laws may or may not influence future growth. Even so, these subjective factors play an important role in the development of this ICE Analysis and the consideration of the resource impact estimates and should be noted.

IV. CONCLUSIONS

In general, resources within the ICE boundary have experienced negative cumulative effects during the ICE time frame primarily due to the pressures caused by the large population growth that the area has experienced. It is expected that these trends will continue with additional growth in the present/near future and future time frames, although not always at the same rate due to current laws and regulations that could reduce the rate and extent to which resources are affected. The resources that have been analyzed as part of the ICC SCEA include residential/business communities, parkland and recreational facilities, cultural resources, minority and low income communities, floodplains, surface water/aquatic habitat, wetlands, farmland, forests/terrestrial habitat, groundwater, rare, threatened and endangered species, impervious area, and reservoirs.

The Expert Land Use Panel (ELUP) expects additional development to occur for each of the ICC alternatives within the ICE boundary. Resource impacts would occur in those areas of anticipated development.

According to MDP's *White Paper on Intercounty Connector Alternative Selection and Compliance with the Maryland Planning Act and Smart Growth Regulations* ***(ICC FEIS, Appendix I)***, Corridor 2 has not been planned for the type of land use change that will occur at proposed interchange sites, while Corridor 1 has such planning and zoning controls in place. This is particularly important for the three interchanges associated with Corridor 2 that are located outside of PFAs, because "direct development impacts from the ICC will be experienced most acutely at and near the proposed interchange locations". MDP has stated that proposed Corridor 2 interchange sites are currently poorly prepared to prevent development that is inconsistent with nearby Main Street oriented businesses, and that the breach of local comprehensive plan authority could result in "significant sprawl oriented development at and near Corridor 2 interchanges", which should be avoided.

Based on this information, the indirect and cumulative effects analysis indicates that Corridor 1 would perform better than Corridor 2 in terms of impacts and potential development locations.

References

CEQ, Considering Cumulative Effects Under the National Environmental Policy Act, January 1997.

Maryland State Highway Administrations (SHA). *ICE Analysis Guidelines for Environmental Impact Statements and Environmental Assessments,* June 2000.

National Cooperative Highway Research Program. *The Use of Expert Panels in Analyzing Transportation and Land Use Alternatives,* April 2002

National Cooperative Highway Research Program. *Land Use Impacts of Transportation: A Guidebook*, October 1998