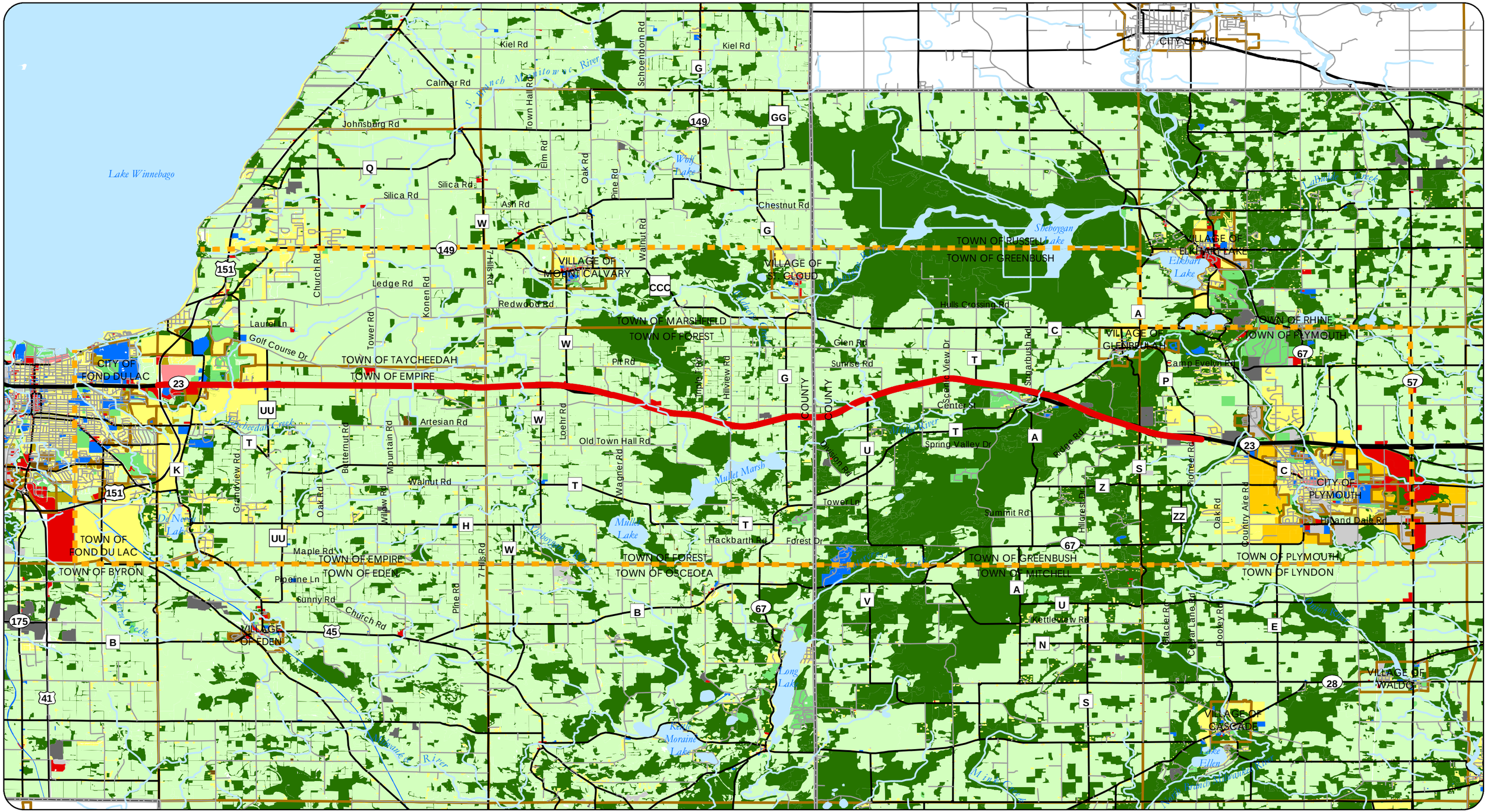

WIS 23
Supplemental EIS

Map 9b: Future Land Use - Cities and Villages

Sources: Fond du Lac County, Sheboygan County, WIDNR, ECWRPC, US Census Bureau, Martensen and Eisele, Strand Associates, Vandewalle & Associates

0 0.5 1 2 Miles

4/1/2013

- WIS 23 Build Alternative
- WIS ICE 23 Study Area
- Major Road
- Local Road
- Surface Water
- County Boundary
- Municipal or Town Boundary

Future Land Use Categories

- Single and Two Family Residential
- Multi-Family Residential
- Mobile Homes
- Planned Neighborhood
- Mixed Use
- Commercial
- Industrial
- Extraction
- Institutional / Community Facility
- Agriculture / Vacant
- Public Open Space
- Woodlands/Environmental Corridor
- Right-of-Way

CHAPTER 3: INDIRECT EFFECTS ANALYSIS

The Council on Environmental Quality (CEQ) defines indirect effects as project impacts that 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 or other effects related to 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.

This indirect and effects analysis considers the two proposed alternatives—the No Build Alternative and the Build Alternative (4-lane expansion), which includes the corridor preservation alternative. Both alternatives and their potential indirect impacts are described in the following sections.

The study team collected and compiled an inventory of local and regional trend data, including: population and housing trends and projections; demographics, including environmental justice populations; income, labor force, industries, and commuting patterns; agricultural resources; natural resources; land use and development patterns; archaeological and historical resources; and local, county, regional, and state plans and regulations. These notable features were selected based on guidance from the WisDOT's Guidance for Conducting an Indirect Effects Analysis as well as a determination by the study team that they were relevant to the analysis. This information has been compiled and is included in Chapter 2. Information from the inventory was considered in the preparation of this indirect effects analysis.

Counties and municipalities in the ICE study area have a long history of planning, zoning, and land division control. The study team and expert panel concur that locally adopted land use plans will be implemented because they are required to be adhered to based on Wis. Statutes 66.1001. These plans are in large part based on the assumption that historic, long-term population and employment growth trends, and resulting development markets, will continue in the future. These assumptions are corroborated by official population and household projections made by the Wisconsin Department of Administration (WisDOA) as directed by state statutes and produced and generally every 5 years. The WisDOA's approach for long range population and household projections, based on cohort survival and in and out migration patterns, has proven its merit and accuracy for many years. Therefore, it forms the basis for virtually all Wisconsin comprehensive plans adopted throughout the state for close to 3,000 counties and municipalities.

Expert panel members further confirmed that under the No Build Alternative, they expect development to occur per adopted comprehensive plans in terms of the amount, pace, location, type, and density of development. Expert panel members also indicated that similar impacts would occur under the Build Alternative, but would be slightly modified by changes in access, improved safety, and increased capacity as described in this chapter. The ICE study team corroborated the questionnaire completed by expert panel members at the expert panel meeting where maps indicating the location of impacts were also confirmed by the panel.

In addition to the very detailed knowledge of the expert panel, for this indirect and cumulative effects analysis, the study team read municipal plans, county plans, and local ordinances controlling development types, densities, and locations and reviewed WisDOA projections and actual US Census counts from 2010. The authors of this report have a combined 37 years of experience in local planning and development regulation, and knowledge of Wisconsin population and development trends and projections.

Throughout the course of this analysis, the ICE study team did not encounter issues or new information that would signal the need to vary from the long-term data, trends, or patterns identified by state, county, and local experts and as compiled, synthesized, and reported in this document. The ICE study team acknowledges that certain short-term trends, including population growth, building permits, economic conditions, and travel, do fluctuate in relation to national and global economies and markets, such as the recession of 2008. However, the ICE study team, as well as state and local experts, concur that over time such fluctuations have historically returned to long-term patterns, and are expected to do so in the future. This analysis forms the

basis of the ICE study team's conclusions behind the description of indirect and cumulative impacts throughout this report.

The theoretical foundation of many of the conclusions drawn in this impacts analysis is the Gravity Model of Social Interaction developed by William J. Reilly in 1931 from Reilly's Law of Retail Gravitation to calculate the breaking point between two places where customers will be drawn to one or another of two competing commercial centers. For decades, social scientists have been using Reilly's Law of Retail Gravitation (a modified version of Isaac Newton's Law of Gravitation) to predict movement of people, information, and commodities between cities and even continents. The 'Gravity Model", as social scientists refer to the modified law of gravitation, takes into account the population size of two places and their distance. Since larger places attract people, ideas, and commodities more than smaller places and places closer together have a greater attraction, the gravity model incorporates these two features.

The Gravity Model

$$\frac{\text{population}_1 \times \text{population}_2}{\text{distance}^2}$$

The relative strength of a bond between two places is determined by multiplying the population of city A by the population of city B and then dividing the product by the distance between the two cities squared. Some prefer to use the functional distance between cities instead of the actual distance. The functional distance can be the driving distance or can even be drive time between cities. Thus, the improvements under the Build Alternative, which increase capacity and thereby reduce driving time, will lead to greater interaction (more traffic) between places along the corridor and perhaps more dispersed development. The opinions of the expert panel and ICE study team are consistent with this broadly accepted theory.

Indirect Effects of No Build Alternative

The No Build Alternative would maintain the existing roadway in its current location and configuration. No improvements would be provided other than routine maintenance. The No Build Alternative serves as a baseline for comparison to the Build Alternative.

The following is a detailed analysis of the indirect effects of the No Build Alternative on traffic patterns, development, and resources.

Traffic Pattern

Figure 18 indicates that traffic volumes are projected to gradually increase on the WIS 23 corridor over the next 20+ years, which will increase congestion and travel time while decreasing system safety, particularly during times of peak travel. The WIS 23 intersection at County G was specifically identified by panelists as an area of significant safety concern and that the number of traffic accidents at this intersection is expected to increase under the No Build Alternative. In addition, expert panelists identified, and the ICE study team agrees, the use of farm vehicles on the highway as an existing safety concern that will not be addressed and will continue under the No Build Alternative.

Figure 18: Existing and Forecasted Average Daily Traffic

Location WIS 23 Between:	Vehicles per Day (2012)	2035 Projections (No Build)
US 151/County K	10,800	15,700
County K/Whispering Spring Dr	9,500	11,000
Tower Rd/Poplar Rd	7,500	9,100
Hinn Rd/Loehr Rd	7,700	8,900
Triple T Rd/Hillview Rd	7,100	7,900
Division Rd/County U	6,400	7,200
Plank Rd/Sugarbush Rd	7,600	7,800
County S/County P	7,400	8,200
County P/Branch Rd	9,800	11,000

Source: WisDOT, Strand Associates.

The ICE study team believes that under the No Build Alternative, congestion may result in a portion of highway users altering their travel patterns, diverting some local highway traffic to local roads, particularly during peak travel periods. Such a shift would impact local roads in terms of increased traffic volumes, decreased safety, and higher maintenance costs.

Environmental Justice Populations

Environmental justice populations are described in Chapter 2 and depicted on Maps 2 – 5. Minority and low income populations are located at the ends of the ICE study are in the cities of Plymouth and Fond du Lac. Several census tracks in the ICE study area also have a greater proportion of elderly individuals (i.e. age 65+) when compared to county averages.

The study team determined that minority and low income populations will not be disproportionately adversely impacted by the No Build Alternative because generally employment and social services are available in Fond du Lac and Plymouth where such population concentrations occur and therefore travel on WIS 23 is generally not required. Conversely, elderly populations will be more adversely affected by increased congestion and decreased safety because they are concentrated in the central portion of the ICE study area and need to travel to the urban areas at the ends of the ICE study area for services.

General Development Pattern

Expert panelists and the ICE study team agreed that under the No Build Alternative, future land development within the WIS 23 study area will most likely occur in the locations planned for in adopted comprehensive plans (see Maps 9a and 9b). Panelists further indicated that the amount of land identified in comprehensive plans is adequate to accommodate future development, particularly in light of the current economic climate, which has substantially slowed land development in recent years.

Adopted comprehensive plans indicate that future development will primarily occur in undeveloped lands at the periphery of cities and villages. While the majority of outlying town lands are planned to remain as agriculture, open space, or natural areas, the following areas are planned for future development in the vicinity of WIS 23:

- Residential and mixed use development at the south end of the town of Taycheedah, east of County UU.
- Highway commercial development at the intersection of County UU and WIS 23 in the town of Empire.
- Unspecified future development in the town of Forest on the north side of WIS 23, west of Triple T Road.
- Residential and commercial development in Greenbush at the intersection of County A and WIS 23, east of the Wade House historic site.
- Two areas of rural residential development in the town of Greenbush south of WIS 23 on either side of the Kettle Moraine State Forest.
- Commercial development along the WIS 23 frontage in the town of Plymouth, west of WIS 57 and east of the city of Plymouth.

Areas where panelists identified potential development that may occur under the No Build Alternative beyond that designated in adopted comprehensive plans are depicted on Map 10.

As is required under state statutes, local zoning supports development and preservation as indicated in adopted comprehensive plans. While certain areas have been planned and zoned for development in the study area, access to urban services and the real estate market will ultimately drive the pace, location, and intensity of future development.

Residential Development

Expert panelists and the ICE study team generally agreed that the location of future residential development will generally occur in locations planned by study area communities. As indicated in adopted comprehensive plans (see Maps 9a and 9b), new residential development in the study area is planned primarily in city and village growth areas, such as the east side of the city of Fond du Lac, the east and west sides of the city of Plymouth, and the north side of the village of Glenbeulah. Small areas of residential development are planned in the town of Greenbush and Empire, but otherwise very little new rural development is planned in study area towns, which is supported by farmland preservation zoning limiting lot sizes to between 10 to 35 acres.

Expert panelists identified areas where residential development may occur under the No Build Alternative on Map 10. These areas include lands in the town of Taycheedah to the east and northeast of Fond du Lac, along county highways on all sides of Mt. Cavalry, surrounding Wolf Lake in Marshfield, on the north and south side of St. Cloud, on the north side of Glenbeulah, east of the city of Plymouth near County S and County Z, and scattered residential development throughout the study area.

Expert panelists indicated, and the ICE study team agrees, that scattered, non-farm residential construction has occurred over the past couple of decades, which has reduced the amount of woodlands, natural areas, and farmland in the study area. Panelists suggested that low land prices and inadequate land use controls may have encouraged this trend. Recently adopted farmland preservation plans and zoning regulations, in combination with the slow economy, will likely continue to reduce this trend. However, areas not protected by conservation or farmland preservation zoning may be at risk for long range future residential development if and when economic conditions improve.

Commercial Development

Expert panelists and the ICE study team generally agreed that the location of future commercial development will generally occur in locations planned by study area communities. As depicted on Map 9b, the city of Plymouth plans for substantial commercial growth outside of the study area on its east side to the south of WIS 23 and adjacent to WIS 57. The city of Fond du Lac plans for future mixed-use development at the northeast quadrant of the WIS 23/US 151 interchange. As shown on Map 9a, the town of Forest anticipates a small area of commercial at the juncture of County G/County T, and the town of Plymouth anticipates commercial development along WIS 23 corridor to the northeast of the city of Plymouth.

Expert panelists and the ICE study team agreed that the timing of future commercial development will likely be tied to a broader economic recovery. Expert panelists and the ICE study team further agreed that increased traffic congestion and growing safety issues along the WIS 23 corridor may have a detrimental impact on future economic growth under the No Build Alternative, including the timing of future commercial development.

Some panelists identified a few areas of potential future small scale highway-oriented commercial development that are *not* planned by local communities (these are depicted on Map 10). These are located primarily at county highway intersections with WIS 23, as well as a large area of possible future commercial development on the southeast side of Fond du Lac where future residential development is now planned by the city.

Industrial Development

Very little industrial development is planned to occur in the study area. The city of Plymouth has identified industrial growth areas on the south side of the city in the study area and additional areas outside the study area (see Map 9b). Expert panelists and the ICE study team generally agreed that industrial development will likely occur in these locations under the No Build Alternative; however, as with commercial development, the timing of future industrial development will likely be tied to a broader economic recovery.

Expert panelists and the ICE study team further agreed that increased traffic congestion and growing safety issues along the WIS 23 corridor may have a detrimental impact on future industrial development under the No Build Alternative.

Institutional Development

Expert panelists indicated that Agnesian HealthCare recently announced that it will be opening a new hospital at the WIS 23/WIS 49 intersection in Ripon, approximately 25 miles west of the study area. This facility will provide healthcare services to a portion of the population in the study area. In addition the ICE study team notes that additional new small scale institutional development to serve local needs under the No Build Alternative is anticipated to occur as needed based on the pace of new residential development.

Redevelopment

As indicated previously, the present economic climate has substantially slowed land development and redevelopment in recent years. The ICE study team believes limited redevelopment is expected to occur in the study area under the No Build Alternative; however the timing of such redevelopment will likely be tied to a broader economic recovery.

Farmland

The majority of study area towns plan for the continuation of farming in existing agricultural areas. Farmland preservation plans prepared by Fond du Lac and Sheboygan counties aid in the preservation of productive farmland and protect farm operations from conflict with incompatible uses. However, the degree to which these plans are followed will vary depending on evolving growth policies and other land use regulations. The rate at which farmland is converted to non-agricultural uses will largely be a factor of economic conditions and each community's desire to preserve agriculture.

Expert panelists and the ICE study team generally agreed that only minimal farmland would likely be lost in the near term under the No Build Alternative beyond that associated with planned development in city and village growth areas. However, panelists indicated that in the longer term, agricultural land in the towns adjacent to urban areas (i.e. Taycheedah, Plymouth, and Empire) may experience development pressure, particularly as the economy rebounds. Both near term and longer term impacts to farmland are expected to occur in locations consistent with those identified for development in local comprehensive plans.

In terms of property-specific impacts, it is the ICE study team's observation that because the decision to sell farmland for scattered rural residential development is often more related to personal circumstances and

require only on-site well and septic systems, the precise timing and location of such development are very difficult to predict.

Wetlands

Wetland areas of regional significance are located in the study area. These include the Sheboygan River Marsh area, which has been identified by WDNR as a Land Legacy Place, Sheboygan Marsh County Park and State Wildlife Area, Kiel Marsh State Wildlife Area, Mullet Creek Wildlife Area, Mullet Lake State Natural Area, and Calvary Marsh. As indicated in the Land Legacy Report, protecting the open space around and between wetlands would buffer them from conflicting land uses and would link them together in an ecologically valuable corridor. Efforts in this general regard have been undertaken in Sheboygan County. Specifically, land conservancies have acquired 1,100 acres, which are protected by conservation easements. WDNR and land conservancies will likely continue to work to protect natural areas through land acquisition and conservation easements.

Expert panelists indicated, and the ICE study team agrees, that the amount of wetland areas lost to future development would be minimal under the No Build Alternative due to the minimal amount of new development. In terms of wetland quality, panelists suggested, and the ICE study team agrees, that the quality of wetlands in or adjacent to planned development areas may be minimally impacted by stormwater runoff from impervious surfaces associated with new development. Panelists noted that such impacts will likely accelerate over the long-term and as the economy rebounds, particularly surrounding the city of Plymouth. In addition, wetlands are strongly protected under federal and state law. Ultimately, the level of impact will vary based on development type, local regulations, mitigation activities, and future conservation efforts.

Surface and Ground Water

As indicated earlier in this report, the study area is located almost entirely within the Sheboygan River basin, which has been identified by the EPA as a Great Lakes Area of Concern (AOC). AOCs are geographic areas that are severely degraded, often due to water contamination from chemicals such as PCB´s and heavy metals or excessive nutrient contributions. The main land uses and practices within the Sheboygan River basin that have contributed to adverse environmental conditions include agricultural and urban runoff, municipal and industrial discharges, wetland removal, and shoreline modification. In addition, as stated in the Niagara Escarpment Inventory of Findings Report, the Escarpment area is sensitive to groundwater contamination.

Panelists indicated that under the No Build Alternative, impacts to surface water levels and groundwater recharge areas are not anticipated beyond that associated with planned development in city and village growth areas and current trends in rural residential land development. Panelists did note, however, that stormwater runoff associated with new development, combined with higher traffic volumes and substantially more pollutants along the WIS 23 corridor, could result in increases in water pollutants. The level of impact will vary based on development type, local regulations, and mitigation activities. Overall, panelists concur and the ICE study team agrees that these impacts to surface water and groundwater are anticipated to be minimal under the No Build Alternative.

Air Quality

Motor vehicles contribute several pollutants listed in the National Ambient Air Quality Standards. These include:

- Nitrogen oxides that react with ammonia, moisture, and other compounds to form nitric acid vapor and related particles. These compounds can affect lung tissue.
- Volatile Organic Compounds (VOC) combine with oxides of nitrogen, react and create ozone. While beneficial in the upper atmosphere, ozone irritates the respiratory system at ground level. According to a 2005 EPA report, about 26 percent of VOCs come from on-road motor vehicles.
- Carbon Monoxide reduces the blood's ability to deliver oxygen to the body. Motor vehicle travel is the major contributor of Carbon monoxide in the United States.

- Particulate Matter (PM_{10} and $PM_{2.5}$) produces ill health effect including asthma, lung cancers, and cardiovascular issues. According to a 2006 FHWA publication, motor vehicle travel contributed about 1 percent of PM_{10} and 2 percent of all $PM_{2.5}$ came from the exhaust of motor vehicles.

Other pollutants are also discussed in Section 4.6 of the LS SDEIS. With the No-Build Alternative, average daily traffic volumes on WIS 23 will increase from 8 to 23 percent by the year 2035. Corresponding to the increased WIS 23 traffic volumes will be increased side road volumes that both feed WIS 23 and lead to destinations from WIS 23. Motor vehicle technology is improving which has been leading to a reduction in motor vehicle exhaust pollution. Even with emission decreases resulting from technology, increases in travel volumes will provide the opportunity for increased motor vehicle emissions and the resulting health consequences.

Expert panelists indicated, and the ICE study team agrees, that air quality would be impacted by increased emissions associated with congestion and with higher traffic volumes on the WIS 23 corridor under the No Build Alternative. Such emissions could further impact Sheboygan County's nonattainment status.

Woodlands and Ecologic Resources

The majority of woodlands in the study area are located within the Kettle Moraine State Forest–Northern Unit. The forest has been identified as an area of scenic and scientific value and is protected as a unit of the Ice Age National Scientific Reserve. Numerous areas with geographic features of scientific value are located within the study area but are not yet within or protected as part of the Ice Age National Scientific Reserve, including the interlobate moraine. These areas contain woodlands, wetlands, streams, grasslands, kettles, kames, and lakes.

A portion of the Niagara Escarpment is also located in the study area. Because of the distinctive geology of this natural feature, a number of unique plant and animal species rely on the integrity of the escarpment. As indicated in the Niagara Escarpment Inventory of Findings report, the escarpment's ecosystems have been threatened by development, not only in Wisconsin, but also in the upper peninsula of Michigan, New York, and Canada. The escarpment ridge is located just east of the city of Fond du Lac in an area that has been planned for long-term development (see Map 7a); therefore, a high degree of development pressure in the long-term may impact woodlands and ecological resources in the vicinity of the Niagara Escarpment.

Expert panel members and the ICE study team generally agreed that there will be minimal impact to woodlands under the No Build Alternative due to new development. Such development, particularly rural residential, could occur in woodlands or alter woodland and wildlife habitat areas. The ICE study team suggests the impact will mainly be due to additional rural residential development in areas planned and zoned for such. Impacts include habitat fragmentation and reduction of the natural aesthetic caused by residences and woodland clearing on the face or top of the Escarpment.

However, panel members noted that it is a goal of WDNR and Niagara Escarpment Network to acquire and preserve additional lands of scientific value. Expert panel members and the ICE study team generally agreed there may be negligible impacts woodlands that are within the planned expansion areas of the Kettle Moraine State Forest and the Niagara Escarpment under the No Build Alternative if these acquisition and preservation efforts are successful.

Glacial Features

There are numerous glacial features throughout the study area. One panel member noted that these features are not currently protected through local regulation. Expert panel members and the ICE study team generally agreed there will likely be minimal impacts to glacial features under the No Build Alternative because there will be a limited amount of new development in areas where glacial features are present.

Endangered Species

Approximately ¼ of the township and range sections in the study area have been identified as having occurrences of endangered species (see Map 7b). The majority are located in the towns of Forest and

Greenbush. According to WDNR surveys, four threatened species may occur within the study area. These include the Slippershell Mussel, Ellipse Mussel, Butler's garter snake, and the Blanding's turtle.

Expert panelists indicated, and the ICE study team agrees, that the No Build Alternative is not expected to substantially impact these populations of endangered species due to absence of land-disturbing development activity indirectly related to the No Build Alternative.

Historic Resources

The No-Build Alternative is not expected to affect St. Mary's Springs Academy or the Sippel archeological site. Access to St. Mary's Springs Academy could become more problematic. Existing access to the Old Wade House site via WIS 23 currently poses traffic safety issues. Further, a new visitor center was constructed in 2012 and was designed to directly interface with an expansion of WIS 23 to 4 lanes. It is anticipated, and panelists agreed, that the Wade House historic site would be negatively impacted by growing traffic congestion and safety issues under the No-Build Alternative due to difficulty accessing the site. Impacts to historic resources are address more fully in the section 4.4 of the EIS.

Archaeological Resources

Known archaeological resources are protected from disturbance by state and federal regulations. Expert panel members did not identify archaeological resources and suggested that impacts to such resources would likely be minimal, if any, under the No Build Alternative. Undocumented archaeological resources are always at risk of being disturbed by development activity, however, the historically low development trends in the ICE study area are expected to continue under the No Build Alternative, likely having a low impact on these resources.

Trails

As described earlier in this report, the Old Plank Road Trail is a 17-mile multi-use trail that parallels WIS 23 from Sheboygan to Greenbush, linking with the Ice Age Trail in the Kettle Moraine State Forest – Northern Unit. Other trails in the study area include Ice Age Trail, the State Equestrian Trail, and a snowmobile trail—each of which directly cross WIS 23 between Plank Road and County S.

Expert panelists and the ICE study team agreed that impacts associated with the No-Build Alternative include continuation of the existing at-grade Ice Age Trail/State Equestrian Trail crossing on WIS 23, where high speed traffic is present, which many indicated they had experienced personally. Also, the proposed extension of the Old Plank Road Trail west to Fond du Lac would either be delayed, or would not occur, which panelists representing local governments indicated was something their constituents desired.

Community Character

Expert panelists and the ICE study team generally agreed that the No Build Alternative is not expected to significantly alter the existing character of study area communities, as development trends are likely to generally continue. These trends are likely to continue if ICE study area communities follow their adopted long range comprehensive plans which account for and are designed to accommodate modest continued growth trends. Small-scale highway-oriented commercial development may have a slight impact on rural character, as local zoning ordinances do not contain provisions that protect community character.

Indirect Effects of Build Alternative

The Build Alternative would expand the WIS 23 corridor from Plymouth to Fond du Lac to a 4-lane divided highway on the existing alignment. This alternative includes the following improvements:

- A roundabout at the intersection of WIS 23 and Wisconsin American Parkway.
- Interchanges and local roads near Fond du Lac, including County K, County UU, and County G.
- Extension of the Old Plank Road Trail, a multiuse trail that runs parallel to and south of WIS 23, from west of Greenbush to Fond du Lac.

- Access changes such as "right-in/right-out" and "left-in" at many local roads.
- Local road connections and extensions.
- Park and rides at County UU and County G.

In addition, the Build Alternative preserves right-of-way for long range future improvements including new interchanges with WIS 23 at County W and County A and new grade separations with WIS 23 at Tower Road, 7 Hill Road, Scenic View Drive, and Sugarbush Road.

The following is a detailed analysis of the indirect effects of the Build Alternative on traffic patterns, development, and resources.

Traffic Pattern

Expansion of WIS 23 to 4 travel lanes from Fond du Lac to Plymouth would increase overall system capacity, improve safety, and reduce regional travel time. Figure 19 indicates that traffic volumes on the WIS 23 corridor are projected to increase at a higher rate under the Build Alternative compared to the No Build Alternative.

Despite increases in traffic volume, the ICE study team anticipates that system improvements will decrease accident rates, reduce travel time, and improve travel predictability which may result in positive economic impacts—reduced travel time may promote residential growth in the study area, and access and visibility to a 4-lane highway may encourage some businesses to locate along or in the vicinity of the WIS 23 corridor. However, it should be noted that this is not an entirely new highway, which would have substantially more dramatic impacts on attracting development.

Expert panelists noted that the addition of the proposed WIS 23/County G interchange, in combination with safety improvements in this area, will result in fewer and less severe accidents and thus will ultimately result in fewer accident-related healthcare costs. On the other hand, expert panelists suggested that proposed J-turns at certain intersections may result in unsafe driving conditions for semis during inclement weather.

Figure 19: Existing and Forecasted Average Daily Traffic

Location WIS 23 Between:	Vehicles per Day (2012)	2035 Projections (No Build)	2035 Projections (Build Alternative)
US 151/County K	10,800	15,700	17,600
County K/Whispering Spring Dr	9,500	11,000	13,400
Tower Rd/Poplar Rd	7,500	9,100	11,200
Hinn Rd/Loehr Rd	7,700	8,900	10,800
Triple T Rd/Hillview Rd	7,100	7,900	9,500
Division Rd/County U	6,400	7,200	8,800
Plank Rd/Sugarbush Rd	7,600	7,800	9,300
County S/County P	7,400	8,200	9,600
County P/Branch Rd	9,800	11,000	12,700

Source: WisDOT and Strand Associates.

Environmental Justice Populations

Environmental justice populations are described in Chapter 2 and depicted on Maps 2 – 5. Minority and low income populations are located at the ends of the ICE study are in the cities of Plymouth and Fond du Lac. Several census tracks throughout the ICE study area also have a greater proportion of elderly individuals (i.e. age 65+) when compared to county averages.

The ICE study team determined that environmental justice populations will not be disproportionately adversely impacted by the Build Alternative. The most substantial changes to access in the Build Alternative occur in the town of Greenbush near the villages of Glenbeulah and Elkhart Lake. However, there are no concentrations of environmental justice populations in this area. A variety of less substantial access restrictions are proposed along other points in the corridor which may make access somewhat less convenient and trips slightly longer for the concentrations of elderly population in the central part of the ICE study area in the towns of Marshfield and Forest and the villages of Mount Calvary and St. Cloud. However, such access restrictions are likely to be offset by reduced highway congestion and safer conditions under the Built Alternative.

General Development Pattern

As with the No Build Alternative, expert panelists and the ICE study team agreed that future land development within the study area will generally follow adopted comprehensive plans (see Maps 9a and 9b). In the written questionnaire, there was some disagreement among panelists about the location, pace, and intensity of development that may occur under the Build Alternative as depicted on Maps 15 and 16. However, after discussing these impacts at the panel workshop meeting, expert panelists generally concurred with one another. Specifically, they identified development impacts that may occur within the jurisdiction they represent and deferred to other panelists for impacts in their communities.

It is the opinion of the expert panel and the ICE study team that the general locations of development at the western and eastern ends of the corridor will not be impacted under the Build Alternative because development in the cities of Fond du Lac and Plymouth respond to the provision of urban utilities and services. However, the pace of future development in these cities may be slightly accelerated as a result of reduced access along WIS 23 between the two cities pushing development to the ends of the corridor, where the preservation of access, reduced congestion, and improved ease of travel will attract development. The location, amount, and pace of future development in the rural central portion of the corridor (in the towns of Taycheedah, Forest, Greenbush, and Plymouth) may be further altered. Specifically, development will likely concentrate at future interchanges including County UU, County W (north), and County G, and be reduced where new access restrictions occur including Tower Road and 7 Hills Road. In the vicinity of Greenbush hamlet, interchange improvements at County T will likely be offset by access reductions at Sugarbush Road.

The ICE study teams believes that the pace and amount of growth related to the indirect effects of the Build Alternative will likely only be slightly higher than those associated with the No Build Alternative due to a combination of factors: regional growth trends have been and likely to continue to be modest, the Build Alternative is not a new highway facility but rather a modification of a long-existing highway, and the Build Alternative generally reduces the number of access points which has the strong tendency to focus additional development near remaining access points.

Residential Development

Expert panelists and the ICE study team generally agreed that residential development impacts will vary in the study area. For example, residential development may concentrate at higher densities in more urbanized areas and in other areas with highway access. Slightly shortened travel time for commuters and traveler comforter related to capacity and safety improvements may lead to slight increase in the amount of residential development in rural areas compared to the No Build Alternative. Smaller communities within the study area may experience modest increases in the pace and amount of residential growth as a result of improved access to major employment centers beyond the study area. Areas identified by panelists for possible residential development beyond areas identified in comprehensive plans are shown on Maps 15 through 17.

Other impacts associated with the Build Alternative include the direct access of rural residential lots to WIS 23 and response times of emergency vehicles. Expert panelists noted that a number of residential driveways presently have direct access to WIS 23. The Build Alternative will require alternate access and the potential relocation of driveway access to rural roads and county highways. Panelists also indicated that response times for emergency vehicles may be affected under the Build Alternative, particularly in the town of Greenbush. Higher response times could slightly reduce the amount of residential development in the study area. The WisDOT project manager indicated that access for emergency services would be coordinated in the design phase if the Build Alternative is implemented.

Commercial Development

Expert panel members and the ICE study team generally agreed that commercial development will continue to be focused in planned commercial areas under the Build Alternative, but unplanned highway-oriented commercial development may also occur at proposed interchange locations as a result of increased capacity and a focusing of access as proposed interchanges, combined with a general reduction of access in between interchanges. However, panelists noted and the ICE study team agrees that large increases in commercial development in rural areas, as well as large scale projects, are unlikely to occur until utilities and urban services are available in those areas. The ICE study teams notes that there are no plans for such provision of services at the time of writing.

In addition to the location of future commercial development, panelists indicated the Build Alternative may have the impacts in the study area listed below. This may be due to slight increases in traffic volume and commercial development under the Build Alternative.

- Higher-value commercial development may result.
- New economic development initiatives, such as marketing campaigns, creation of tax incremental financing districts, and new business parks and shopping centers may emerge.
- Employment related development may be channeled closer to WIS 23 and at higher concentrations.
- Communities with easier access to WIS 23 may experience greater economic growth than communities not directly on the corridor.
- Businesses may be encouraged to locate in the vicinity of WIS 23 corridor to take advantage of enhanced access and visibility.
- Connection of Sheboygan and Fond du Lac via a 4-lane highway may cause new economic development opportunities to emerge throughout the study area.

Industrial Development

Industrial development is primarily planned in the city of Plymouth on the south, southeast, and northwest sides of the city. Expansion to existing quarrying operations may also occur in the town of Plymouth as suggested by the town's comprehensive plan.

Expert panelists and the ICE study team generally agreed that the location of future industrial development will generally occur as planned under the Build Alternative, but at a somewhat accelerated pace and potentially at a somewhat greater intensity (e.g. more impervious surfaces) as a result of increased capacity and a focusing of access as proposed interchanges, combined with a general reduction of access in between interchanges. Panelists indicated that future industrial development may also be focused at interchange locations to take advantage of increased visibility. Panelists also suggested that new economic development initiatives may emerge, such as marketing campaigns, new tax incremental financing districts, and new industrial parks—such as in the city of Plymouth where industrial development is planned to occur.

Institutional Development

As suggested in the No Build Alternative, additional new locally serving institutional development in the study area is anticipated to occur as needed based on the pace of new residential development. However, compared to the No Build Alternative, institutional development may potentially occur at a somewhat faster rate under the Build Alternative when the economy recovers due to slight increases in the amount and pace of new residential development. Panelists also indicated that the intensity (e.g. more impervious surfaces) of new institutional development will likely be somewhat greater under the Build Alternative as a result of increased capacity and a focusing of access as proposed interchanges, combined with a general reduction of access in between interchanges.

Redevelopment

As indicated previously, the present economic climate has substantially slowed land development and redevelopment in recent years. Expert panelists and the ICE study team generally agree that limited redevelopment is expected to occur in the study area under the Build Alternative in the current economic climate; however, when the economy rebounds, redevelopment may occur at a slightly faster pace and at a slightly greater intensity/density under the Build Alternative as a result of increased capacity, reduced travel time, and reduced congestion. Redevelopment will most likely occur in urbanized areas, such as the cities of Fond du Lac and Plymouth.

Farmland

The majority of towns in the study area plan for the continuation of farming, except in small areas planned for development. County farmland preservation plans in combination with exclusive agricultural zoning further protect land that is planned to remain in agricultural uses and enables continuation of farming.

Expert panelists and the ICE study team agreed that the Build Alternative will likely slightly accelerate the pace the conversion of farmland compared to the No Build Alternative in areas planned for future development. The panel concurred that two counteracting trends would influence development at interchange locations. First, the development values of the land will likely increase providing an incentive for landowners to sell to developers. Second, town representatives and the WisDATCP representative on the panel also noted that agricultural commodity prices are very high which is providing an incentive to continue to farm. Areas of farmland not planned for development around interchange locations will likely experience development pressure and may result in the additional loss of farmland at these locations. As mentioned earlier, land development has been slow in recent years due to the slow economy; therefore, the degree to which land development is accelerated as a result of the highway expansion may be negligible until the economy makes a full recovery.

It was the ICE study team's opinion that because the decision to sell farmland for scattered rural residential development is often more related to personal circumstances and require only on-site well and septic systems, the timing and location of such development are very difficult to predict.

In addition, expert panelists noted a concern that closure of existing access to farm fields may result in the fragmentation of existing farms on opposite sides of the highway corridor. Fragmentation could lead to greater distances traveled by farm vehicles and may result in less productive and economically viable farm operations. However, the WisDOT project manager indicated that farm field access will be maintained and unrestricted direct median crossovers will be included as part of the Build Alternative design which will be available for use by farm machinery, police and maintenance vehicles, and others.

Wetlands

As noted under the No Build Alternative, several wetland areas of regional significance are located in the study area, the protection of which is a priority for WDNR and local land conservancies. Expert panelists indicated, and the ICE study team agrees, that the amount of wetland areas lost to future development would be slightly increased under the Build Alternative compared to the No Build Alternative due to slight increases in the amount of new development. Wetlands are protected from development by state and federal

regulations; therefore the ICE study team believes that substantial loss of wetlands is not anticipated under the Build Alternative. Where wetland areas are proposed to be filled for development, mitigation and/or replacement is required.

Panelists also noted that impacts resulting from increased pace and amount of development will likely accelerate over the long-term as the economy rebounds, particularly surrounding the city of Plymouth where substantial areas are proposed for development near wetland areas. Panelists also suggested that the quality of wetlands in or adjacent to planned development areas may be minimally impacted by stormwater runoff from impervious surfaces associated with new development. In addition, wetlands are strongly protected under federal and state law. Ultimately, the level of impact will vary based on development type, local regulations, mitigation activities, and future conservation efforts.

Surface and Ground Water

As indicated under the No Build Alternative, the study area is located almost entirely within the Sheboygan River Basin, which has been identified by the EPA as a Great Lakes Area of Concern (AOC). System improvements under the Build Alternative will increase the impervious surface area in the study area and the number of vehicles using the corridor. These factors may contribute to increases in the peak rate and volume of stormwater runoff and pollutants, including chloride, salt, and other deicing chemicals. In addition, as stated in the Niagara Escarpment Inventory of Findings Report, the Escarpment area is sensitive to groundwater contamination.

Expert panelists indicated, and the ICE study team agrees, that increased stormwater runoff and land development under the Build Alternative may reduce the area available for groundwater recharge which may alter surface water levels and further reduce water quality through increased sedimentation and increased temperature, particularly after periods of heavy rain and/or snow melt However, panelists indicated, and the ICE study team agrees, the degree of these impacts would likely be slightly higher compared to the No Build Alternative.

One member of the expert panel indicated that the marshes in the study area receive much of the runoff in this corridor. There will be an increased impact to the marshes in the study area under the Build Alternative due to increased impervious surface area and new development.

Air Quality

As mentioned under the No Build alternative, motor vehicles contribute several pollutants listed in the National Ambient Air Quality Standards that affect human health. These pollutants include nitrogen oxides, volatile organic compounds which lead to ozone, carbon monoxide, and minor amounts of particulate matter. Other pollutants are also discussed in Section 4.6 of the LS SDEIS.

With the Build Alternative, 2035 average daily traffic volumes on WIS 23 would be 10 to 25 percent greater than the traffic volumes associated with the No Build Alternative. Corresponding to the higher WIS 23 traffic volumes would be higher side road traffic volumes. Increases in traffic volumes over what would normally occur with the No Build alternative will provide the opportunity for increased motor vehicle emissions and the resulting health consequences. Expert panelists had varying opinions on air quality impacts for the study area under the Build Alternative. Panelists indicated that increased traffic volume might decrease air quality due to increased traffic capacity and volumes, while others suggested that system improvements permitting free flow travel conditions would improve air quality due to less stop and go driving, while others suggested air quality impacts would be negligible.

Woodland and Ecologic Resources

The majority of large tracts of woodlands in the study area are located in the Kettle Moraine State Forest – Northern Unit. As described earlier, the Forest is protected as a unit of the Ice Age National Scientific Reserve. Numerous other areas containing geographic features of scientific value, including the interlobate moraine, are located within the study area but are not yet within or protected by an Ice Age National Scientific Reserve.

As described earlier, the Niagara Escarpment is located in the study area. Hydrologic disruption and outright destruction of some of Escarpment features due to road construction is identified as a current threat in the Niagara Escarpment Inventory of Findings report. The report also indicates that residential development is one of the most pressing threats to the Niagara Escarpment as past residential development and associated infrastructure has also fragmented sensitive habitats and may destroy rare plant and animal species.

Expert panel members and the ICE study team generally agreed that there will be slightly increased impacts to woodlands under the Build Alternative compared to the No Build Alternative as a result of slightly increased pace and amount of development. Such development, particularly rural residential, could occur in woodlands or alter woodland and wildlife habitat areas. Panelists also indicated that invasive species, such as phragmites, spread rapidly along highway corridors, which is another possible impact of the Build Alternative. Expert panelists indicated that the Build Alternative could further impact the Escarpment, unique glacial features, and other resources areas of ecological significance. The ICE study team suggests the impact will mainly be due to additional rural residential development in areas planned and zoned for such. Impacts include habitat fragmentation and related impacts on threatened and endangered species, and reduction of the natural aesthetic caused by residences and woodland clearing on the face or top of the Escarpment.

However, panel members noted that it is a goal of WDNR and Niagara Escarpment Network to acquire and preserve additional lands of scientific value. Expert panel members and the ICE study team generally agreed there may be minimal impacts to woodlands that are within the planned expansion areas of the Kettle Moraine State Forest and the Niagara Escarpment under the Build Alternative if these acquisition and preservation efforts are successful.

Glacial Features

There are numerous glacial features throughout the study area. One panel member noted that these features are not currently protected through local regulation. Expert panel members and the ICE study team generally agreed there will likely be slightly increased impacts to glacial features under the Build Alternative due to lack of protection (e.g., overlay zoning) and slightly increased amounts of new development compared to the No Build Alternative. These impacts would be reduced if the WDNR implements its plans to acquire 7,000 acres of new land around the Kettle Moraine State Forest.

Threatened and Endangered Species

Approximately ¼ of the township and range sections in the study area have been identified as having occurrences of endangered species (see Map 7b). The majority are located in the towns of Forest and Greenbush. According to WDNR surveys, four threatened species may occur within the study area. These include the Slippershell Mussel, Ellipse Mussel, Butler's garter snake), and the Blanding's turtle. Panelists indicated, and the ICE study team agrees, that reduction and degradation of habitat as a result of slightly increased pace and amount of development under the Build Alternative could further threaten or potentially cause the displacement or loss of these threatened species.

Historic Resources

As indicated previously, the Wade House is a noteworthy historic site in the study area located on the WIS 23 corridor. Expert panelists indicated, and the ICE study team agrees, that the Wade House would be positively impacted by the Build Alternative as the planned visitor center and carriage house museum are designed to interface with an expansion to WIS 23 and associated improvements which will assure safe access to the site. Further, panelists indicated that the site would benefit from improved visibility and access for both cars and bicycles. Impacts to historic resources are address more fully in the section 4.4 of the EIS.

Archaeological Resources

As indicated under the No Build Alternative, archaeological resources are protected from disturbance by state and federal regulations. Expert panel members did not identify any specific archaeological resources that may be impacted under the Build Alternative; however, potential loss of undiscovered archaeological sites was noted as a potential impact of the Build Alternative. The ICE study team suggests new development

indirectly related to the Build Alternative would require ground-disturbing activities. These activities could adversely impact unknown archeological sites, and since archeological reconnaissance is not required for private development, these sites would not be avoided. Since the amount of new development under the Build Alternative is likely to be slightly greater compared to the No Build, the likelihood of adversely impacting unknown archeological sites would be slightly higher.

Trails

The Ice Age Trail and a horse and a snowmobile trail currently cross WIS 23 between Plank Road and County S. As part of the expansion project, an underpass will be constructed to provide a safer crossing across WIS 23 and to ensure these important recreational corridors are not interrupted. The WisDOT project manager noted that proposed park and rides in the Build Alternative could also include trailheads.

Expert panelists indicated, and the ICE study team agrees, that the extension of the Old Plank Road Trail from Plymouth to Fond du Lac will be a very positive impact of the Build Alternative. As proposed under the Build Alternative, the Old Plank Road Trail will connect with the 7-mile Prairie Trail in Fond du Lac, which is part of a larger system of trails to link the Peebles Trail and the Wild Goose Trail in Dodge County. Panelists also indicated the Build Alternative will result in safer and more efficient access to trails which will provide economic benefits for communities with trail access. While the trail network is anticipated to be improved in the study area, expert panel members, and the ICE study team, do not anticipate new land development associated with the expanded trail network.

The Niagara Escarpment Network is in the process of developing a Niagara Escarpment Greenway Plan, which will include a future north-south hiking trail along the escarpment that will cross the WIS 23 corridor. Extension of the Old Plank Road Trail under the Build Alternative would connect with this and other future trails, improving the regional trail network.

Community Character

Expert panelists and the ICE study team generally agreed that the Build Alternative is not expected to significantly alter the existing character of study area communities, as development trends are likely to be only slightly increased compared to the No Build Alternative. These trends are likely to continue if ICE study area communities follow their adopted long range comprehensive plans which account for and are designed to accommodate modest continued growth trends. However, some panelists indicated the rural character of the towns may be affected by accelerated growth of nearby cities and villages. Others suggested that easier access provided by WIS 23 may increase demand for "country-living" under the Build Alternative, and the increased development could negatively affect rural character in such areas. Finally, near future rural interchanges small-scale highway-oriented commercial development may also have a slight impact on rural character, as local zoning ordinances do not contain provisions that protect community character.

Panelists and the ICE study team generally agreed that community character will ultimately be dependent upon local government regulation and the quality of development and siting decision. Panelists also indicated that the Build Alternative will not increase the number of billboards in the study area due to lack of demand for off-site advertising. The ICE study team notes that adopting regulations that prevent billboards would be a more certain way of avoiding this adverse impact on community character.

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CHAPTER 4: CUMULATIVE EFFECTS ANALYSIS

The Council on Environmental Quality (CEQ) defines a cumulative impact as "the impact on the environment that 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Scoping for the Cumulative Effects Analysis

See Chapter 2: Inventory of the Study Area for significant issues associated with the proposed action.

The ICE study area for this cumulative effects analysis encompasses the same area used for the indirect effects analysis (see Map 1). Land use planners on the study team interacted with staff planners from Fond du Lac County, Sheboygan County, and East Central Wisconsin Planning Commission to determine the likely range of influence from the WIS 23 corridor. Beyond the study area, the influence of WIS 23 diminishes as other arterial corridors provide access to adjacent lands.

The timeframe for this cumulative effects analysis is 20 years which corresponds with the planning horizon of the majority of local comprehensive plans; however, it can be assumed that the effects identified in this analysis would continue to be valid after 20 years if local policies and regulations remain the same.

Past, Present, and Future Actions and Influences

Major roadway projects that have recently occurred in the study area include the US 151 Fond du Lac bypass on the south side of the city (constructed in 2005-2008) and the expansion of WIS 23 to 4-lanes from US 151 easterly to County K in Fond du Lac County and the expansion of WIS 23 to 4-lanes from Plymouth to Sheboygan in Sheboygan. At the time of writing, the following WisDOT studies were being conducted in the vicinity of the project study area:

- The WIS 23 Corridor Preservation Study. This study is considering alternatives to convert a 10 mile section of the WIS 23 corridor between County P and WIS 32 to a freeway in order to provide greater safety and mobility. This study will determine where land acquisitions for frontage roads, overpasses, and interchanges may be necessary for such freeway conversion. No construction is planned as a part of this study. Implementation of the improvements will occur as determined by future operational needs.
- The US 151 Fond du Lac Bypass Corridor Preservation Study. This study is addressing future, long-term transportation needs of two segments of the US 151 Fond du Lac bypass between WIS 175 and County WH. The first segment is a 5.2 mile 4-lane divided expressway between WIS 175 and WIS 23. The preservation study will map the right-of-way needs for the location of future overpasses and interchanges. WisDOT's long-term vision of this segment is an ultimate freeway with increased mobility and traveler safety. The second segment is a 2.9 mile 2-lane highway between WIS 23 and County WH. Right-of-way was previously acquired along this segment to accommodate a future four-lane segment. The preservation study for this segment includes a long-term safety and operations evaluation. It is likely three projects will be implemented from this study before the year 2020. These projects include the County V interchange with US 151, the County T overpass over US 151, and improvements to the DuCharme Parkway/US 151 intersection.
- US 41 Conversion Study. In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) identified US 41 from Milwaukee to Green Bay as a high priority corridor based on its importance for providing regional, national and international freight and vehicle movements. The Act also identified this section of US 41 as a future interstate highway. WisDOT, in consultation with (FHWA, is studying potential impacts of converting US 41 from a

non-interstate freeway on the National Highway System to an Interstate Highway between the Zoo Interchange on Interstate 94 (I-94/I-894) in Milwaukee and the US 41/I-43 interchange in Green Bay. The 132-mile corridor extends through portions of Milwaukee, Waukesha, Washington, Dodge, Fond du Lac, Winnebago, Outagamie, and Brown counties. A portion of the corridor is aligned with US 45 from the Zoo Interchange to the US 45/41 split in Washington County. New I-41 signage would extend from I-43 in Green Bay to the Zoo Interchange, then would be concurrent with I-894 around the southwest side of Milwaukee, and then would be concurrent with I-94 south to just beyond the Illinois State line at the interchange of I-94 and US 41.

The past, present, and future actions and plans of other agencies are described in greater detail in Chapter 2: Inventory of the Study Area. In addition, the activities of other entities have affected the study area. For example, local land use policies and decisions have led to the conversion of farmland and woodlands for scattered residential and nonresidential development over the past decades. To counter this trend, local regulations have changed over the past 10 years, including farmland preservation planning, zoning, and the acquisition of conservation easements have protected natural areas from future development. Other past activities, such as agricultural practices, urbanization, and stream channelization, have impacted the quality of waterways in the study area. However, modern agricultural practices, wetland mitigation banking and environmental cleanup of impaired waters, such as the Sheboygan River, have helped to improve conditions in the study area.

As indicated in Chapter 3, agencies have planned for future land conservation through acquisition in the study area and beyond, in particular expansion of the Kettle Moraine State Forest. At the same time, expert panelists suggested that commodity prices are currently high and are expected to continue to increase, which raises the value of agricultural land. This, in turn, may affect agencies' ability to acquire additional land for conservation purposes. This increase in commodity prices may also drive some farmers to convert wooded areas to tillable land causing additional impacts on natural resources through runoff and habitat loss. These trends are not influenced by the WIS 23 project.

The pace and amount of residential and non-residential development that may occur as a result of the No-Build and Build Alternatives is tied to market demand resulting from a combination of demographic factors and economic conditions. The country is emerging from an economic recession, which has slowed market demand in recent years. This is illustrated by residential building permit issued in Fond du Lac and Sheboygan Counties (see Figure 20). The number of residential building permits in Sheboygan and Fond du Lac Counties is considerably lower in 2011 than in 2006.

Figure 20: Annual New Privately Owned Residential Building Permits, Estimates with Imputation

	2006	2007	2008	2009	2010	2011
Sheboygan County	318	237	135	89	67	56
Fond du Lac County	334	255	172	128	125	101

Source: US Census

While it is difficult to project the number of future residential building permits based on recent trends and obvious effects of the recession and uncertainty regarding the timing of the economic recovery, the Wisconsin Department of Administration does provide long-term household projections for all municipalities and counties in the state. Figure 21 shows total household projections (existing plus new households) for study area communities and counties. As indicated below, the study area is expected to see increases in the number of households, primarily in the city of Fond du Lac. The villages of Mt. Calvary, St. Cloud, and Glenbeulah and the towns of Marshfield and Forest are projected to only see modest increases in the number of households by 2030.

Figure 21: Household Projections (2010-2030)

	2010	2015	2020	2025	2030	# Change 2015-2030	% Change 2015-2030
Town of Fond du Lac	1,014	1,055	1,092	1,122	1,144	130	12.8%
Town of Empire	1,045	1,100	1,153	1,198	1,236	191	18.3%
Town of Taycheedah	1,539	1,634	1,724	1,803	1,872	333	21.6%
Town of Forest	432	445	458	467	473	41	9.5%
Town of Marshfield	397	405	410	413	413	16	4.0%
Village of Mt. Calvary	225	242	259	274	288	63	28.0%
Village of St. Cloud	199	204	207	210	211	12	6.0%
City of Fond du Lac	18,398	19,332	20,199	20,946	21,569	3,171	17.2%
Fond du Lac County Portion of Study Area	23,249	24,417	25,502	26,433	27,206	3,957	17.0%
Town of Greenbush	576	616	654	691	727	151	26.2%
Town of Plymouth	1,208	1,263	1,316	1,368	1,413	205	17.0%
Village of Glenbeulah	179	188	198	207	214	35	19.6%
City of Plymouth	3,744	4,008	4,270	4,527	4,767	1,023	27.3%
Sheboygan County Portion of Study Area	5,707	6,075	6,438	6,793	7,121	1,414	24.8%
Study Area Total	**28,956**	**30,492**	**31,940**	**33,226**	**34,327**	**5,371**	**18.5%**
Fond du Lac County	41,036	42,933	44,692	46,164	47,362	6,326	15.4%
Sheboygan County	47,310	49,304	51,241	53,092	54,718	7,408	15.7%

Source: Wisconsin Department of Administration, 2015-2030 Housing Projects, 2008.

Based on its demographic, land use, and economic development expertise, and as confirmed by the ICE expert panel, the study teams believes that the market demand for new development is likely to return to pre-recession trends as the economy rebounds.

The activities of other entities have affected the ICE study area. Local land use policies and decisions have led to the conversion of farmland and woodlands for scattered residential and nonresidential development over the past decades. Figure 21 compares farm data from the 2007 and 2002 Census of Agriculture.

Figure 21: Agriculture Trends

	2002 Fond du Lac County	2007 Fond du Lac County	2002 Sheboygan County	2007 Sheboygan County
Number of Farms	1634	1643	1116	1059
Land in Farms (acres)	344,286	335,745	195,248	191,719
Average Farm Size (acres)	211	204	175	181
Total Cropland (acres)	292,255	279,922	166,592	157,607

Source: Census of Agriculture

Incremental development in the ICE study area has also impacted natural resources, particularly the Niagara Escarpment, which is located in the ICE study area (the escarpment brow extends north-south along the eastern periphery of the city of Fond du Lac), and the Kettle Moraine State Forest, which intersects with WIS 23 in the town of Greenbush.

In 2008 the Blue Sky Green Field Wind Energy Center was constructed in Fond du Lac County, Wisconsin. The 10,600-acre wind farm is located in the towns of Calumet and Marshfield in northeast Fond du Lac County and is the largest operating wind farm in Wisconsin.

The Affected Environment

The study team collected and compiled an inventory of local and regional trend data, including: population and housing trends and projections; demographics including environmental justice populations; income, labor force, industries, and commuting patterns; agricultural resources; natural resources; land use and development patterns; archaeological and historical resources; and local, county, regional, and state plans and regulations. See Chapter 2: Inventory of the Study Area and Section 3 of the LS SDEIS for a characterization of resources in the ICE study area.

Stresses Affecting Resources, Ecosystems, and Human Communities

The anticipated levels of stress under both alternatives are virtually identical to each other and to what has historically occurred.

- Agricultural land: Market forces affect how much land is in agriculture and which crops are grown, which is function of population growth, local plans, and zoning controls. Once converted to development, agricultural land will likely never return to agricultural use. The result is a consistent long-term trend in the reduction of agricultural lands. However, unlike rapidly urbanizing areas of Wisconsin (e.g., Green Bay/Fox Valley, Dane County, and the Milwaukee metro areas), the ICE study area remains healthy in terms of agricultural infrastructure and support services.
- Wetlands: The majority of historic and ongoing wetland loses in the ICE study area have resulted mostly from farming and conversion of small wetlands which are not protected under local, state, or federal regulations. Wetland ecosystems are very sensitive to change from disruption of native ground cover as a result of farming or development activity. Ongoing significant adverse impacts result from chemical application from farming or lawn care and increased impervious surfaces within their watershed.

- Water quality: Water quality is sensitive to change from disturbing the native ground cover as a result of farming or development activity and resulting increases in sedimentation. Ongoing significant adverse impacts also result from chemical application from farming or lawn care and increased impervious surfaces within their watershed.
- Upland habitat: Market forces affect how much land is in development and where it is located, which is function of population growth, local plans, and zoning controls. Local plans and zoning rarely protect these areas. However, the ICE study area, substantial upland areas are located in the Kettle Moraine State Forest, which enjoy permanent protection. Once converted to development, upland habitat will likely never return to undeveloped natural area.
- Threatened and endangered species: The three freshwater mussels that may be potentially directly affected by the Preferred Alternative are likely the most susceptible rare species on the project corridor. Their response to change is poor as related to draining, encroachment of habitat, loss of water quality buffers, and water pollution. Fifty-four percent of all mussels in Wisconsin are listed as rare species. Siltation from all mechanisms, including agriculture and roadway runoff, causes loss of aquatic bed habitat for these species. Water chemistry through increased fertilizer and agrichemical use, stormwater runoff, and residential development has also affected these species.

  Threatened reptilian species such as the Blanding's turtle and the Butler's garter snake are documented to have stable populations and found to be present in greater extent and density than previously thought throughout the ICE study area. Many impacts to these species result from concentrating beneficial habitats and loss of riparian buffers along streams. Natural succession from the exclusion of fire and reduced forestry management is reducing suitable, open upland habitat needed for many additional species. Increased runoff results in wetland sedimentation that often alters and degrades native plant communities, favoring monotypic stands of nuisance or exotic species not beneficial to these species. Roads have also fragmented habitats and resulted in altered hydrology and mortality for some species.

  Migratory-rare woodland-nesting birds and red-shouldered hawk populations in this part of Wisconsin are generally considered stable based on the woodland habitat in and near the Kettle Moraine Forest. Destruction of wintering and breeding habitat through deforestation and rural home development continue to present a large threat. Other limiting factors include forest fragmentation, contaminants, loss of key tree species to diseases, cowbird parasitism, and human disturbance. Invasive shrubs and herbaceous plants could be affecting the long-term ability of forests to regenerate into conditions suitable for some of these species and is precluding regeneration of large, mature trees in various woodland communities.

  Rare plants are the final listed species of concern. The yellow gentian is a candidate for delisting. It has proven to be capable of tolerating change and disturbance and has expanded its presence in suitable habitat types. The snow trillium is a more sensitive listed species in the project. Being a near-climax species, it has low tolerance for change and stress. Wetland clearing and grading of mature, wooded riparian habitat may have a further effect on this species. Continued suburban development, riparian clearing and filling, increased flooding, rural habitat loss and fragmentation from woodland home sites, invasive shrubs and herbaceous plants, and loss or harvest of large, mature trees in oak woodlands diminish the habitat for snow trillium.
- Historic and archeological resources: No information is readily available regarding the response to change and capacity to withstand stress for these resources.
- Air quality: Information regarding the response to change and capacity to withstand stress for air quality is addressed in section 4 of the EIS.
- Trails: The two trails in the ICE study area vary in their purpose and character. The Ice Age Trail is intended to provide access to the kettle moraine formations in a manner that highlights glacial landforms. To best meet this objective the natural landscape should be as free from development as possible. Therefore, increasing development diminishes the experience of the resource. The Old Plank Trail is intended to provide a recreational experience along the route historically linking Sheboygan to Fond du Lac. For this reason the trail corridor is very close to WIS 23 and adjacent

developed areas. Future development will likely occur near the WIS 23 corridor, however, the study team notes that such development is not inconsistent with the recreation purpose and character of this trail.

- Environmental justice populations: Environmental justice populations have a lower ability to respond to change and capacity to withstand stress related to age, income, education, general health, and access to health care.

Figure 22 summarizes stresses and factors that are affecting resources.

Figure 22: Stresses Affecting Resources

Resource	Stresses and Factors Affecting Resource
Agricultural Land	Development and urbanization High commodity prices
Wetlands	Urban and agricultural runoff Point source discharges Runoff from roads
Water Quality	Urban and agricultural runoff Stream channelization and erosion Point source discharges Runoff from roads
Upland Habitat:	Development and urbanization High commodity prices encourages land clearing for agriculture
Northern Unit of Kettle Moraine State Forest	High land prices decrease ability to acquire remaining tracts of land. Built environment, including road and agricultural runoff, diminish resources within State Forest.
Niagara Escarpment	Development and urbanization Wind turbines increase fragmentation of natural resources
Threatened and Endangered Species	Diminished water quality in streams and wetlands. Reduction in upland habitat caused by urbanization and agriculture
Historic and Archeological Resources	Property modifications and changes in the surrounding area can diminish historic value. Construction activities can disturb unrecorded archeological sites.
Trails	Funding constraints may prevent trail extensions and enhancements
Environmental Justice Populations	Gentrification can increase housing costs. Economic conditions affect employment opportunities.

Population growth, future development, sewer service extensions, transportation and other infrastructure improvements, and agricultural practices could continue to impact wetlands, water quality, upland habitats, and wildlife in the ICE study area. Agricultural land may also be lost because of increasing urbanization in the ICE study area, but rising commodity prices may stem this trend.

The baseline conditions for the purposes of this cumulative effects analysis are predicted based on information provided by local land use plans, county, regional, and state plans, United State Geological Survey data, WDNR data, WDOA population plans and reports and generally described in this cumulative effects analysis.

Determining the Environmental Consequences

Cause and Effect Relationships

The WIS 23 Build Alternatives will directly affect land uses and resources. Land that will be purchased for right of way will decrease the amount of cropland, upland habitat, and housing. The WIS 23 Build Alternatives will also indirectly affect land uses and resources by promoting more efficient and safe travel between the Fond du Lac metropolitan area and the Sheboygan metropolitan area. As described in the indirect effect analysis, this project has the potential to accelerate the timing of future development in the ICE study area. Where access has been restricted and focused by the construction of new interchanges, the project will also likely focus the location of development.

Additional development in the ICE study area may lead to a loss in agricultural land and will further encroach on and fragment natural habitats such as wetlands and woodlands. Habitat loss may also threaten rare sensitive species. Development will also generate additional stormwater runoff, which will impact water quality in the region and the previously identified rare species.

It should be noted, however, that modest historic employment, population, and general development trends are expected to continue consistent with adopted comprehensive plans and WisDOA population projections. Expert panelists and the ICE study team concur that the ICE study area and the surrounding area has historically been and is expected to remain an area of modest growth, in contrast to the northern portion of Calumet County or the West Bend area.

Cumulative Impacts of the No Build Alternative

The No Build Alternative would maintain the existing roadway in its current location and configuration. No improvements would be provided other than routine maintenance.

These notable features were selected based on guidance from the WisDOT's Guidance for Conducting an Indirect Effects Analysis as well as a determination by the study team that they were relevant to the analysis. This information has been compiled and is included in Chapter 2. Information from the inventory was considered in the preparation of this cumulative effects analysis.

This section describes the estimated magnitude of the cumulative effects of the No Build Alternative based on input from the expert panel and the study team's expertise.

Traffic Patterns

Traffic volumes will continue to increase over time as forecasted and as a result of long-term regional population growth. There will be cumulative impacts on traffic patterns under the No Build Alternative because of diminishing system safety associated with long-term increased traffic volume and limited capacity. The ICE study team notes that the proposed US 151 Fond du Lac Bypass project, which would decrease travel times around the south and east sides of Fond du Lac and ties into WIS 23 at the west end of the corridor, and the conversion of US 41 to an interstate, may lead to increased regional traffic on WIS 23 due to reduced travel times.

Environmental Justice Populations

There are no direct impacts to environmental justice populations under the No Build Alternative. In terms of indirect impacts, the study team determined that concentrations of minority and low-income populations will not be disproportionately adversely impacted by the No Build Alternative because generally employment and social services are available in Fond du Lac and Plymouth where such population concentrations occur and therefore travel on WIS 23 is generally not required. Conversely, concentrations of elderly populations will be

more adversely affected where they are concentrated in the central portion of the ICE study area and need to travel to the urban areas at the ends of the ICE study area for services.

In terms of cumulative impacts, in the long-term, the percentage of elderly populations is projected to increase in the coming decades based on data from the Wisconsin Department of Administration Demographic Services. The lack of improvements under the No Build Alternative will not address safety problems currently found in the corridor. This safety issue may disproportionately impact elderly residents and drivers who are more at risk where safety problems exist. As a result, these safely problems under the No Build Alternative are likely to slightly adversely impact a larger percentage of the population within the ICE study area as well as a larger percentage of drivers traveling on WIS 23 in the future.

Other cumulative effects of the No Build Alternative will be minimal and may include:

- *Need for additional public and non-motorized vehicle transportation.* The availability of public and non-motorized vehicle transportation options (i.e. sidewalks, bike lanes, paths, and trails) varies throughout the study area, with metro areas having a greater abundance of such options. As new development occurs, additional transportation options may be needed to provide multiple transportation options beyond the single occupancy vehicle. Transportation options will be helpful for all individuals in the ICE study area to reach new employment destinations.
- *Need for safe, affordable housing in vicinity of employment destinations.* The need for new, safe, affordable housing will likely continue. In Fond du Lac and Plymouth, higher density housing is planned near locations planned for employment. Future development of these areas may fill the need to provide affordable housing in the ICE study area.

General Development Pattern

The ICE study area has experienced modest change in land use patterns in the past two decades. The majority of the ICE study area is rural and much of it remains in agricultural use. Over the years, some unsewered residential development has occurred in most of the towns in the study area. Most concentrated development has occurred within and around cities and villages located in the study area—primarily in the cities of Fond du Lac and Plymouth, and to a much lesser extent the village of Mount Calvary, Glenbeulah, and St. Cloud. Some industrial development has occurred in the cities of Fond du Lac and Plymouth and some highway-oriented commercial development is very sparsely scattered along the WIS 23 corridor.

As indicated in Chapters 2 and 3, under the No Build Alternative, future land development within the ICE study area will most likely occur in the locations planned for in adopted comprehensive plans. The ICE study ream believes cumulative effects to development under the No Build Alternative will be minimal based on no changes to WIS 23, the continuation of steady long-term trends for modest development, lack of major regional transportation improvements and other large scale development projects, and the continued long-term economic viability of agricultural activities which reduces the likelihood of land conversion for other development.

Farmland

Population growth and past development decisions have led the incremental loss of farmland in the ICE study area. As indicated in Chapter 3, the incremental loss of farmland in the ICE study area over the long-term is a possible indirect effect under the No Build Alternative. As expressed by the expert panelists and indicated in local land use plans, this trend will continue. As the economy makes a recovery, other factors that will lead to a loss of farmland include modest exurban residential development and the aging agricultural workforce. According to the US Agricultural Census, Fond du Lac and Sheboygan counties lost 8,985 acres of farmland between 2002 and 2007. The amount of agricultural land required for the WIS 23 Preferred Build Alternative represents 2.5 percent of this 5-year loss.

However, local land use plans and zoning and farmland preservation policies indicate a strong desire by most communities in the study area to preserve agricultural lands by directing development to areas adjacent to

cities and villages where it can be served by sewer and water and generally be developed at higher densities, thereby reducing the acreage needed to accommodate development. The cumulative effect on farmland under the No Build Alternative will be minimal based on modest long-term development trends and the continued long-term economic viability of agricultural activities, which reduces the likelihood of land conversion for other development.

Wetlands

Wetlands are scattered throughout the area with large concentrations primarily located in the towns of Forest, Marshfield, and Greenbush, which are mostly permanently protected through public ownership. The incremental filling of wetlands elsewhere has occurred over time as a result of development. The conversion of wetlands to agricultural uses has also occurred over time. However, a comparison of pre-European settlement and current land cover data indicates that approximately 98 percent of historic wetlands remain in the study area due to public acquisition of large wetlands in the Sheboygan Marsh and the Mullet Marsh areas. As indicated in Chapter 3, there will likely be minimal indirect impacts to wetlands in the study area under the No Build Alternative. The cumulative effects on wetlands under the No Build Alternative will be minimal since there are no direct impacts, and because many of the larger concentrations of remaining study area wetlands are located on state-managed lands or are otherwise subject to state and federal wetland regulations and are therefore protected from development and actively managed. Impacts would consist mainly of continued wetland quality effects created by salt and debris from the existing roadway and future development activity.

Surface Water and Groundwater

The quality of surface water and groundwater in the study area has been impacted over the years by urban and agricultural land use practices and pollutants associated with chemical storage, road salt, accidental spills, leaking underground storage tanks, leaking underground pipes and sewers, animal feed lots, fertilizers, septic tanks, sewage lagoons, sumps and dry wells, and improperly abandoned wells.

As noted in Chapter 3, overall, indirect impacts to surface water and groundwater are anticipated to be minimal under the No Build Alternative. However, other future transportation projects in the region and increases in development may affect water quality and will likely contribute to incremental increases in the amount of urban runoff that enters and is distributed throughout the basin due to increased impervious surfaces. Alternatively, future public acquisition or private preservation of natural areas in the study area may help improve water quality by keeping lands undeveloped.

The cumulative effect on surface water and groundwater under the No Build Alternative will be minimal based on modest development trends, current economic conditions, and potential preservation and mitigation activities.

Air Quality

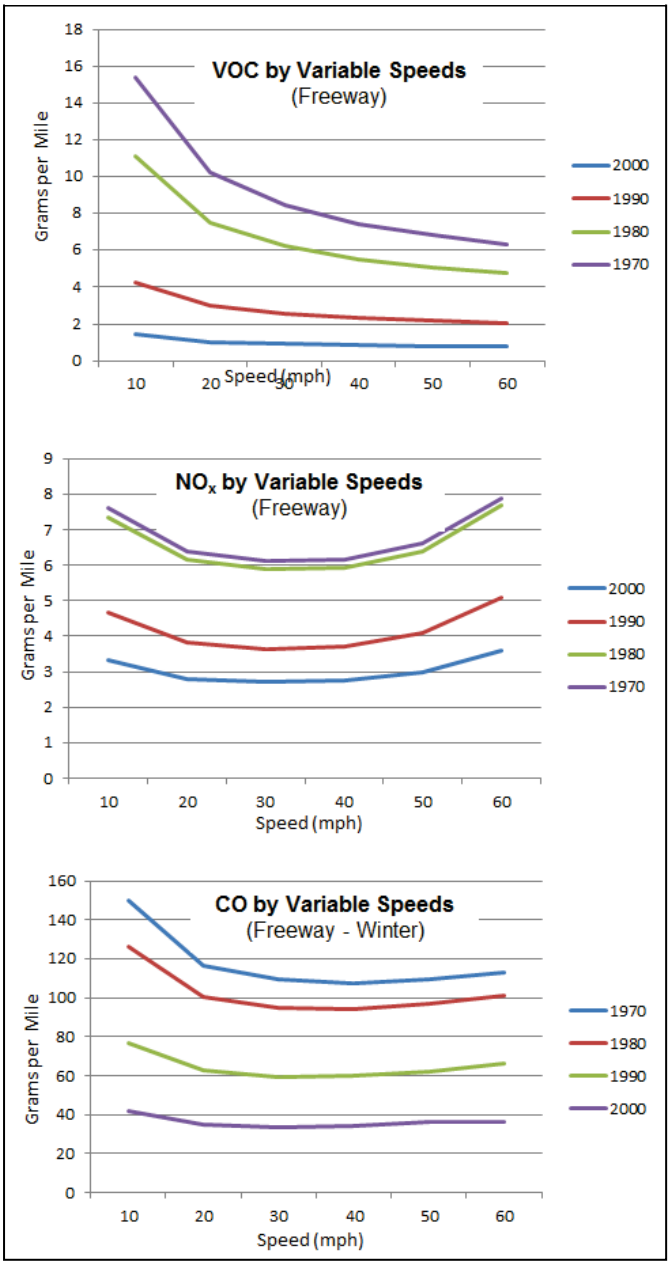
As indicated in Chapter 3, reduction in air quality is a potential indirect impact under the No Build Alternative as a result of increased traffic volume and congestion on the WIS 23 corridor. As described in Chapter 2, Sheboygan County is an EPA designated nonattainment area for the 8-hour NAAQS for ozone. However, according to the 8-Hour Ozone Redesignation Request and Maintenance Plan report, WDNR has actively been monitoring and implementing programs designed to control emissions of volatile organic compounds (VOCs) and ozone (NOx) which have contributed to significant air quality improvements. WDNR commits to continue monitoring ozone levels in Sheboygan County indefinitely and has requested attainment status by EPA. WDNR actions as well as the actions of other agencies and entities contribute to air quality impacts, including transportation projects.

The 8 to 23 percent WIS 23 traffic volume increase that is forecast to occur between 2012 and 2035 with the No Build Alternative has the potential to increase vehicle emissions. That combined with increases in vehicle

miles traveled throughout Fond du Lac and Sheboygan Counties may lead to increases in exhaust pollutants that could be partially offset by technology advances.

As mentioned previously, NOx and VOC emissions are a precursor to the formation of ozone, and Sheboygan County is not in attainment for the 8-hour standard for ground-level ozone (Fond du Lac County is in attainment.) The impact-causing effects of the Build Alternative on these emissions is complicated. Figure 23 shows emission graphs for VOCs and NOx emissions versus speed. Emission rates vary based on the speed a vehicle is traveling. US EPA's model for highway vehicle emissions - MOBILE 6.2[3] - shows how speed affects emissions rates. VOC and CO emissions rates typically drop as speed increases. NOx emission rates increase at higher speeds. Emissions rates at all speeds have been falling over time as newer, more controlled vehicles enter the fleet.[4]

Figure 23: Emission vs. Speed



The No-Build Alternative will have lower traffic volumes and lower travel speeds. Generally this means that traffic from the No-Build Alternative could produce higher VOC emissions and lower NOx emissions per each vehicle traveling on the roadway. The 8 to 23 percent WIS 23 traffic volume increase that is forecast to occur between 2012 and 2035 with the No-Build Alternative will increase the number of vehicles on the roadway, potentially increasing vehicle emissions. That combined with increases in vehicle miles traveled throughout Fond du Lac and Sheboygan counties may lead to increases in exhaust pollutants that could be partially offset by technology advances. The projected 2020 daily summer traffic on the Sheboygan County portion of WIS 23 represents about 2.39 percent of the total vehicle miles traveled (VMT) in Sheboygan County for a summer day.[5]

Woodlands and Ecologic Resources

A comparison of pre-European settlement and current land cover data indicates that approximately 55 percent of historic forested

[3] US EPA has a new air quality model called MOVES, however air quality modeling for Sheboygan County was performed using the previous model Mobile 6.2)

[4] http://www.fhwa.dot.gov/environment/air_quality/publications/fact_book/page15alt2.cfm June 2013

[5] Based on the Table C-5 in Appendix C, the conformity analysis for the Sheboygan MPO TIP for the 2013 to 2016 Calendar Years.

Only Sheboygan County is referenced because it is not in attainment. Fond du Lac County is in attainment.

lands remain in the study area—a significant portion of this is the Kettle Moraine State Forest. As described in Chapter 2, WDNR plans to acquire approximately 7,000 acres of new land, conduct restoration activities, and improve management practices to protect wildlife and enhance recreation. In addition, WDNR recently partnered with the Hardwood Forestry Fund, a 501(c)(3) foundation that establishes sustainable forests for future generations. The foundation received a grant in 2011 from the American Forest's Global ReLeaf program to plant 20,800 trees on 20 acres of the Kettle Moraine State Forest – Northern Unit near Plymouth. The planting efforts will aid in reduction of the forest fragmentation, allowing for more contiguous native hardwood forests. Additional benefits include production of woody biomass, carbon sequestration, the improvement of habitat for forest interior wildlife species, and the increased opportunity for forest-based recreational opportunities.

As indicated in Chapter 3, there will likely be modest indirect impacts to woodlands under the No Build Alternative. Cumulative impacts will be minimal under the No Build Alternative because long-term development in the region as a result of modest population growth will lead to minimal conversion of woodlands over time. However, the decisions and actions of state agencies and other environmental organizations, such as those described above, may contribute to reducing negative impacts to woodlands over the next 20 years and likely beyond through purchase and permanent protection of lands with woodlands as called for in plans for the Escarpment and Kettle Moraine.

The Niagara Escarpment Report documents the biodiversity associated with the escarpment and lists recommended strategies to ensure long-term integrity of this natural feature. However, many areas of the escarpment continue to see steady population growth and increases in development pressure, including most recently by the development of wind farms along the ridge. In 2011, the Bay-Lake Regional Planning Commission prepared a Niagara Escarpment Overlay Zoning Guide to help Wisconsin communities delineate, develop, implement, and enforce overlay zoning to protect the escarpment.

As indicated in Chapters 2 and 3 there will likely be minimal indirect impacts to the escarpment resulting from the No Build Alternative. Cumulative impacts to the Escarpment and ecological resources will be minimal under the No Build Alternative because modest long-term development in the region as a result of modest population growth will lead to residential development which may disrupt Escarpment features. However, activities of local communities along the escarpment and state agencies could result in positive cumulative impacts. For example, efforts to purchase conservation easements and implement overlay zoning could permanently protect the Escarpment thereby avoiding impacts.

Glacial Features

There are numerous glacial features throughout the study area. One panel member noted that these features are not currently protected through local regulation. As indicated in Chapter 3, there will likely be minimal indirect impacts to glacial features resulting from the No Build Alternative due to lack of protection (e.g., overlay zoning) and modest amounts of new development. These impacts would be reduced if the WDNR implements its plans to acquire 7,000 of new land around the Kettle Moraine State Forest. Cumulative effects to glacial features under the No Build Alternative will be minimal based on no changes to WIS 23, lack of other major regional transportation improvements, and the continuation of steady long-term trends for modest development which is the main threat to disruption of glacial features.

Threatened and Endangered Species

As described in Chapter 2, the following threatened species exist in the study area: Slippershell Mussel, Ellipse Mussel, Butler's garter snake, and the Blanding's turtle. It is difficult to estimate the pre-settlement populations of threatened and endangered species except by gauging changes in their habitat. The current amount of Wisconsin waters acreages and stream threads is comparable to the amount that existing in pre-settlement conditions; however, the water quality has diminished, which has likely resulted in decreased mussel populations. The current forested acres in the state and the study area has also declined since pre-settlement conditions, which may contribute to fragmentation and reduced quality of wildlife habitat,

including that of the garter snake and turtles. Similarly, wooded species and the introduction of exotic/invasive species into open canopy wetlands and grasslands has decreased suitable habitat for wildlife.

As indicated in Chapter 3, there will likely be minimal indirect impacts to threatened and endangered species under the No Build Alternative. Similarly, there may be minimal cumulative impacts under the No Build Alternative given the modest regional population growth and related development pressure on habitat areas (e.g. woodland and wetlands), lack of other major regional transportation improvements, and no direct impacts associated with highway construction.

Historic and Archaeological Resources

The most noteworthy historic site in the study area is the Wade House. As described in Chapter 3, existing safety issues and traffic congestion will continue under the No Build Alternative. There may be cumulative impacts on the Wade House historic site including a minor reduction in the number of visitors. There will be limited cumulative impacts on other historic resources under the No Build Alternative since there are no directed and minimal indirect impacts.

Archaeological resources are protected from disturbance by state and federal regulations; therefore indirect and cumulative impacts associated with the No Build Alternative are anticipated to be negligible, if any.

Trails

State, county, and local governments and other organizations in the study area continually plan for the acquisition and development of new trails, as described in Chapter 2. As described in Chapter 3, the potential indirect impacts to trails include delay of extension of the Old Plank Road Trail west to Fond du Lac and delay of construction of underpass for safe passage across WIS 23 for the Ice Age Trail and snowmobiles. In terms of cumulative impacts, as traffic congestion and trail usership increases over time, the presence of unsolved safety concerns and gap in the Old Plank Road trail network resulting from the No Build Alternative will become more problematic.

Community Character

The existing character in the study area is both urban and rural, depending on the location along the corridor. Farmland and unique natural features, such as the Niagara Escarpment, Kettle Moraine State Forest, and the many glacial features in the study area help to define rural areas. As indicated in Chapter 3, the No Build Alternative is expected to have minimal indirect impacts in the study area.

There will be modest cumulative impacts on community character under the No Build Alternative because the development activities that cause impacts will be modest and related to local government planning and zoning decisions and general economic conditions. In general, as small town and rural areas experience development, their community character is threatened by both the amount and ubiquitous suburban nature of new development. Area communities currently do not strongly address community character in their adopted plans or in their development regulations. Rural communities that have these regulations in place generally have protected small town and rural character more successfully.

Cumulative Impacts of the Build Alternative

The Build Alternative would expand the WIS 23 corridor from Plymouth to Fond du Lac to a 4-lane divided highway on the existing alignment. The following is a detailed analysis of the cumulative impacts of the Build Alternative compared to the baseline conditions described under the No Build Alternative on traffic patterns, development, and resources.

These notable features were selected based on guidance from the WisDOT's Guidance for Conducting an Indirect Effects Analysis as well as a determination by the study team that they were relevant to the analysis. This information has been compiled and is included in Chapter 2. Information from the inventory was considered in the preparation of this cumulative effects analysis.

This section describes the estimated magnitude of the cumulative effects of the Build Alternative based on input from the expert panel and the study team's expertise.

Environmental Justice Populations

There are no direct impacts to environmental justice populations under the Build Alternative. Indirect impacts under the Build Alternative may include access restrictions that are proposed along points in the corridor, which may make access somewhat less convenient and trips slightly longer for the concentrations of elderly population in the central part of the ICE study area in the towns of Marshfield and Forest and the villages of Mount Calvary and St. Cloud. However, such access restrictions are likely to be offset by reduced highway congestion and safer conditions under the Built Alternative.

In terms of cumulative impacts, in the long-term, the percentage of elderly populations is projected to increase in the coming decades based on data from the Wisconsin Department of Administration Demographic Services. The improvements under the Build Alternative will address safety problems currently found in the corridor and thus correct a problem, which disproportionately impacts elderly residents and drivers who are more at risk where safety problems exist. Other cumulative effects of the Build Alternative will be modest and may include:

- *Need for additional public and non-motorized vehicle transportation.* The availability of public and non-motorized vehicle transportation options (i.e. sidewalks, bike lanes, paths, and trails) varies throughout the study area, with metro areas having a greater abundance of such options. As new development occurs, additional transportation options may be needed to provide multiple transportation options beyond the single occupancy vehicle. Transportation options will be helpful for all individuals in the ICE study area to reach new employment destinations.
- *Need for safe, affordable housing in vicinity of employment destinations.* Similarly, as modest new employment related growth occurs as a result of the Build Alternative, the need for new, safe, affordable housing will likely occur. In Fond du Lac and Plymouth, higher density housing is planned near locations planned for employment. Future development of these areas may fill the need to provide affordable housing in the ICE study area.

Traffic Patterns

Expansion of WIS 23 to 4-travel lanes from Fond du Lac to Plymouth would increase overall system capacity, improve safety, and reduce regional travel time. Travel forecasts indicate that a 4-lane expansion would increase daily traffic by 15 to 24 percent, depending on the segment over the No Build Alternative. It is anticipated that these system improvements will decrease accident rates and simplify commutes which may result in positive economic impacts—simpler commutes may promote residential growth in the study area and access and visibility to a 4-lane highway may encourage businesses to locate along or in the vicinity of the WIS 23 corridor. In addition, the Build Alternative will facilitate easier east-west movement across the east-central portion of the state. The ICE study team notes that the proposed US 151 Fond du Lac Bypass project, which would decrease travel times around the south and east sides of Fond du Lac and ties into WIS 23 at the west end of the corridor, and the potential future conversion of US 41 to an interstate, may lead to increased regional traffic on WIS 23 due to reduced travel times. There will be positive impacts on traffic patterns under the Build Alternative due to more efficient and safe travel between the Fond du Lac metropolitan area and the Sheboygan metropolitan area.

General Development Pattern

Future land development in the study area will generally follow adopted comprehensive plans. As described in Chapter 3, the Build Alternative has the potential to concentrate development at access points and accelerate the pace of future development in the study area. In general, the expert panel and the ICE study team agreed that the main indirect effect of the Build Alternative is creation of a modest demand for more development, primarily located at the ends of the study area.

The panelists generally agreed that long-term economic conditions and local government planning and zoning policies, combined with the access control elements of the Build Alternative, would strongly influence the *location* of development. However, the panelists also agreed that long-term economic conditions and local policies are more influential on the *amount and type* of development than the improvements associated with the Build Alternative. While certain areas have been planned and zoned for development in the study area, access to urban services, local government planning and zoning decisions, and general economic conditions will ultimately drive the pace, location, and intensity of future development.

In terms of cumulative impacts, there may be slightly increased amount and pace of development under the Build Alternative based on development trends and economic conditions.

The ICE study ream believes there will generally be slightly increased cumulative effects to development under the Build Alternative compared to the No Build Alternative. These effects will be based on improved transportation connections between Fond du Lac and Sheboygan moderated by the continuation of steady long-term trends for modest development, lack of numerous major regional transportation improvements and large scale development projects, and the continued long-term economic viability of agricultural activities which reduces the likelihood of land conversion for other development. However, a particular location-specific impact can be identified. Specifically, the US 151 Fond du Lac Bypass project in combination with improvements proposed to WIS 23 under the Build Alternative will likely result in additional and faster commercial development around the US 151/WIS 23 interchange and surrounding areas. Such additional commercial development will likely result in additional employment and associated residential development. This residential development is likely to be a combination of both nearby urban housing and more scattered rural residential housing. In all instances, such induced development will likely be consistent with adopted comprehensive plans. The ICE study team believes that the Build Alternative will not induce significant regional because the proposed improvements are part of a long-established highway rather than a new corridor. Within the region similar impacts have been observed along US 151, US 41, and I-43.

Farmland

Population growth and past development decisions have led the incremental loss of farmland in the study area. The construction of the Build Alternative would directly require 227 acres of farmland. According to the US Agricultural Census, Fond du Lac and Sheboygan counties lot 8,985 acres of farmland between 2002 and 2007. The amount of agricultural land required for the WIS 23 Preferred Build Alternative represents 2.5 percent of this total. Also, as indicated in Chapter 3, expert panelists agreed that the Build Alternative will likely slightly accelerate the conversion of farmland in areas planned for future development, and an overall increase in urbanization may increase development pressure in rural areas.

As mentioned earlier, land development has been slow in recent years due to the slow economy; therefore, the degree to which land development is accelerated as a result of the highway expansion may be negligible until the economy makes a full recovery. In terms of cumulative impacts, when the economy makes a recovery, other factors that will contribute to slightly increased levels of farmland conversion include regional exurban residential development, commodity prices, and the aging agricultural workforce. Local government planning and zoning decisions and general economic conditions will influence the impacts.

Wetland

Wetlands are scattered throughout the area with large concentrations primarily located in the towns of Forest, Marshfield, and Greenbush, which are mostly permanently protected through public ownership.

The construction of the Build Alternative will directly require 48.1 acres of wetlands. According to WDNR records using aerial photography, there are about 109,600 acres of wetlands in Fond du Lac and Sheboygan Counties. Wetlands filled by the Build Alternative will be mitigated at a wetland mitigation bank site near the corridor. Also, as indicated in Chapter 3, panelists indicated that additional impervious surfaces associated with the roadway expansion and new development will increase stormwater runoff and reduce the quality and ecological integrity of wetland areas, including wetlands of regional significance.

In terms of cumulative impacts to wetlands, incremental filling of wetlands in the region has occurred over time as a result of development. The conversion of wetlands to agricultural uses has also occurred over time. However, a comparison of pre-European settlement and current land cover data indicates that approximately 98 percent of historic wetlands remain in the study area. The cumulative effects on wetlands under the Build Alternative will be slightly increased compared to the No Build Alternative based on slightly increased regional development pressure and other regional transportation projects. Impacts would consist mainly of continued water quality effects created by salt and debris from the existing roadway and slightly increased impervious surfaces.

Surface Water and Groundwater

The construction of the Build Alternative will add more than 90 acres of impervious surface. Also, as noted in Chapter 3, expert panelists and the ICE study team indicated that increased stormwater runoff and land development under the Build Alternative may impact soils for groundwater recharge and may alter surface water levels, particularly after periods of heavy rain and/or snow melt. However, panelists indicated the degree of these impacts to be minimal; this may be because the Build Alternative would be constructed on-alignment rather than establishing a new route. Over time, the increased traffic and development under the Build Alternative will likely contribute to incremental increases in the amount of urban runoff that enters and is distributed throughout the Sheboygan River basin. As indicated in Chapter 2, Lake Winnebago and De Neveu Creek are designated as Section 303(d) water resources; they may be at a higher risk for impacts.

One member of the expert panel indicated that the marshes in the study area receive much of the runoff in this corridor. There will be an increased impact to the marshes in the study area under the Build Alternative due to increased impervious surface area and new development. The WisDOT project manager indicated that best management practices will be employed during construction of the highway to minimize erosion and runoff.

The quality of surface water and groundwater in the study area has been impacted over the years by urban and agricultural land use practices and pollutants associated with chemical storage, road salt, accidental spills, leaking underground storage tanks, leaking underground pipes and sewers, animal feed lots, fertilizers, septic tanks, sewage lagoons, sumps and dry wells, and improperly abandoned wells.

There may be slightly increased cumulative impacts on surface water and groundwater under the Build Alternative compared to the No Build Alternative due to increased impervious surface from this and other regional transportation projects, slightly increased regional development pressure, and other impacts described above.

Air Quality

As indicated in Chapter 3, reduction in air quality is a potential indirect impact under the No Build Alternative as a result of increased traffic volume and congestion on the WIS 23 corridor. As described in Chapter 2, Sheboygan County is an EPA designated nonattainment area for the 8-hour NAAQS for ozone. However, according to the 8-Hour Ozone Redesignation Request and Maintenance Plan report, WDNR has actively been monitoring and implementing programs designed to control emissions of volatile organic compounds (VOCs) and ozone (NOx) which have contributed to significant air quality improvements. WDNR commits to continue monitoring ozone levels in Sheboygan County indefinitely and has requested attainment status by EPA. WDNR actions as well as the actions of other agencies and entities contribute to air quality impacts, including transportation projects.

The Build Alternative will lead to 2035 daily traffic volumes that are 10 to 25 percent higher than what would normally occur with the No Build alternative. The emissions associated with these higher traffic volumes, combined with other human activities such as manufacturing, off road vehicles, and other sources could lead to continued high ozone levels in Sheboygan County.

As mentioned previously, NOx and VOC emissions are a precursor to the formation of ozone, and Sheboygan County is not in attainment for the 8-hour standard for ground-level ozone (Fond du Lac County

is in attainment.) The impact-causing effects of the Build Alternative on these emissions is complicated. Figure 22 shows emission graphs for VOCs and NOx emissions versus speed. Emission rates vary based on the speed a vehicle is traveling. US EPA's model for highway vehicle emissions - MOBILE 6.2[6] - shows how speed affects emissions rates. VOC and CO emissions rates typically drop as speed increases. NOx emission rates increase at higher speeds. Emissions rates at all speeds have been falling over time as newer, more controlled vehicles enter the fleet.[7]

The Preferred Build Alternative will have higher traffic volumes and higher travel speeds. Generally this means that traffic from the Preferred Build Alternative could produce marginally lower VOC emissions and higher NOx emissions. Additionally, the projected 2035 daily traffic volumes are 10 to 25 percent higher than what would normally occur with the No-Build alternative. The projected 2020 daily summer traffic on the Sheboygan County portion of WIS 23 represents about 2.52 percent of the total vehicle miles traveled in Sheboygan County for a summer day. With the Preferred Build Alternative, WIS 23 has 0.13 percent more VMT contribution to the total county VMT. The emissions associated with these higher traffic volumes combined with other human activities such as manufacturing, off-road vehicles, and other sources emit VOCs and NOx that contribute to ground-level ozone levels in Sheboygan County.

As mentioned, Sheboygan County is not in attainment for the 8-hour standard for ground-level ozone as part of the NAAQS. Federal law requires that states prepare implementation plans for air quality (SIP) to identify how the NAAQS in the nonattainment area will ultimately be met. In Wisconsin, this is the responsibility of the WDNR. The attainment demonstration included in the SIP takes into account many emission source sectors. The Sheboygan Area Metropolitan Planning Agency becomes involved in the mobile source sector where the SIP provides emissions budgets for target future years. Transportation planning models produce estimates of mobile source emissions. Federal law requires that in nonattainment areas the planning agencies demonstrate that the mobile source emissions resulting from the modeling for transportation system activity in those target years "conform" to the budgets included in Wisconsin's SIP. The Sheboygan Area Metropolitan Planning Organization prepares a conformity analysis for ozone for its long range transportation plan as well as its transportation improvement program. The most recent conformity analysis is contained in Appendix C of the Sheboygan MPO TIP for Calendar Years 2013 to 2016. The expansion of WIS 23 to 4 lanes is part of the assumptions of the conformity analysis and is discussed on pages C-5 and C-19. As for VOC emissions, the conformity plan states the following:

> *Table C.6 presents the attendant volatile organic compound emissions. The forecasts are presented for the years 2015, 2020, 2030 and 2035 for all of Sheboygan County. In addition, Table C.6 presents the 2012 and 2020 motor vehicle emissions budgets for volatile organic compounds incorporated in the "8-Hour Ozone Redesignation Request and Maintenance Plan for the Sheboygan County Subpart-2 Moderate Nonattainment Area." The transportation system volatile organic compound emissions under the transportation system plan and transportation improvement program, when analyzed for all of Sheboygan County, are less than the motor vehicle emissions budgets for volatile organic compounds included in the "8-Hour Ozone Redesignation Request and Maintenance Plan for the Sheboygan County Subpart-2 Moderate Nonattainment Area," thus meeting this criterion for consistency.*

[6] US EPA has a new air quality model called MOVES, however air quality modeling for Sheboygan County was performed using the previous model Mobile 6.2)

[7] http://www.fhwa.dot.gov/environment/air_quality/publications/fact_book/page15alt2.cfm June 2013