

Chapter 4: Affected Environment and Environmental Consequences

This chapter combines the Affected Environment and Environmental Consequences from the DEIS published in June of 2003. Furthermore, the content of this chapter focuses on changes since the DEIS, including an analysis of alterations of environmental conditions and new construction, a re-evaluation of impacts associated with Alternative F4 (single preferred identified following the DEIS), and an evaluation of impacts associated with the Major Moves Alternative. Impacts associated with the No-Action Alternative have not changed significantly from the DEIS; therefore, a full re-evaluation for this alternative was not included in this chapter. See Chapter 3 for a discussion of the No-Action Alternative.

Table 4.0-1 provides a full list of impacts of the single preferred alternative from the DEIS (Alternative F4) and the Major Moves Alternative. Both the original impacts from the DEIS and the re-evaluated impacts for Alternative F4 are included.

4.1 Traffic and Transportation

This section examines the traffic impacts of the Alternative F4 and the Major Moves Alternative.

Since the DEIS was signed on June 3, 2003, several changes have been made to the alternatives considered. These changes are detailed in Chapter 3.

4.1.1 No-Action Alternative

The No-Action Alternative assumes that all of the projects in the current Indianapolis Metropolitan Planning Organization (MPO) Year 2030 Regional Transportation Plan would be implemented with the exception of the New US 31 Hamilton County Project. Detailed analysis of the no action alternative was included in the DEIS.

4.1.2 Modified F4 Alternative (post DEIS) and the Major Moves Alternative

Traffic Modeling and Capacity Analysis

A traffic capacity analysis for the morning and evening peak hours was completed for each mainline segment of the proposed freeway for the F4 Alternative that was modified after publication of the DEIS, as well as the Major Moves Alternative. A project specific travel demand model was developed using CUBE Voyager travel demand modeling software, with the Indianapolis MPO travel demand model used as calibration. The model was used to forecast traffic volumes along the proposed freeway facility for both the modified F4 alternative and the major moves alternative. The Modified F4 Traffic Volume Projections are included in the "Traffic Forecast Report, 2015 and 2035 Forecasts" in Appendix B1.

The results of the analysis of the projected volumes and roadway geometry are reported as Level of Service. Levels of Service along the proposed freeway for the Modified F4 Alternative and the Major Moves Alternative range from LOS A to C, with lower, but still acceptable, service levels south of 136th Street. Results of this analysis can be found in Table 4.1-1. These results meet INDOT's standards for an urban freeway design class. The multiple interchange alternatives at 146th Street also result in acceptable service levels along the proposed freeway, as the total mainline volume between 146th and 151st Streets for those alternatives is virtually identical even though the access locations vary.

Table 4.0-1 Potential Impacts of Alternatives

Category	Unit	Alternatives				
		F4 (original)*	F4 (current)	Major Moves		
Land Use	Agricultural	acres	102.3	72.0	81.0	
	Commercial	acres	86.9	78.0	94.3	
	Industrial	acres	18.1	13.6	15.6	
	Institutional	acres	21.7	22.5	27.4	
	Mixed Urban	acres	0.3	43.2	45.7	
	Residential	acres	26.8	17.08	34.8	
	Forestland	acres	30.7	29.8	30.9	
	Herbaceous	acres	2.7	6.6	7.3	
	Scrub-Shrub	acres	10.3	16.9	17.3	
	TOTAL	acres	299.7	299.7	354.3	
Relocations	Single Residence	number	52	52	55	
	Multiple Residence	number	1	1	1	
		TOTAL	number	53	53	56
	Commercial	number	27	28	28	
	Office	number	13	14	17	
	Public Facilities	number	0	0	0	
	Industrial	number	5	5	5	
		TOTAL	number	45	47	50
	Churches	number	2	2	1	
School Properties		number	2	2	2	
		acres	2.1	3.17	7.29	
Cemeteries		number	0	0	0	
Section 4(f) Properties		number	0	1 (net benefit)	1 (net benefit)	
		acres	0	0.0	0.0	
Emergency Facilities		number	0	0	0	
Hazardous Materials Sites		number	13	30	34	
Noise Receptors		number	74	74	28**	
Major Utilities		number	14	14	14	
	Geodetic Monuments	number	5	5	5	
		TOTAL	number	19	19	19
Wellhead Protection Zones		number	4	4	4	
Wetlands	Forested	acres	0.06	0.48	2.00	
	Scrub Shrub	acres	0.05	0.41	0.47	
	Emergent	acres	0.60	4.65	4.30	
		TOTAL	acres	0.71	5.54	6.77
Open Water	(ponds, lakes)	acres	3	4.54	3.55	
Streams/Ditches		crossings	11	28	31	
		linear feet	3,165	7,882	8,313	
Floodplains	Floodways	number	7	4	4	
		acres	103	17.76	23.28	
	100-yr Floodplains	number	14	14	16	
		acres	35	35.12	45.33	
Soils	Prime farmland	acres	95	62.3	68.61	
Archaeological	sites	number	7	7	10	
		acres	1.1	1.1	4.3	
	High probability	acres	42	42	54	
Historic	Section 106	number	2	1	1	
Planned Future Development		acres	13	12	12	
Costs	Construction	\$ million	316	316	353	
	Right-of-way	\$ million	118	118	130	
		TOTAL	\$ million	434	434	483

* Impacts as provided in the DEIS (June 2003)

** Using TNM

**Table 4.1-1
Modified F4 Alternative and Major Moves Alternative
Projected Design Year (2035) Mainline Capacity Analysis***

	Northbound					Southbound				
	Lanes	AM Peak Hour Volume	LOS	PM Peak Hour Volume	LOS	Lanes	AM Peak Hour Volume	LOS	PM Peak Hour Volume	LOS
96 th Street to I-465	4	3640	C	3900	C	4	5220	D	2240	B
I-465 to 106 th Street	3	3300	C	2960	C	3	4190	C	3040	B
106 th Street to 116 th Street	3	3590	C	3240	C	3	4705	D	3230	C
116 th Street to 131 st Street	3	1830	B	2920	C	3	3820	C	1480	B
131 st Street to 136 th Street	3	1830	B	2920	C	3	3820	D	1980	B
146 th Street Interchange – Split Diamond Interchange Alternative (Major Moves Alt.)										
136 th Street to Keystone	3	1780	B	3620	C	3	4410	C	1920	B
Keystone to 146 th Street	3	1130	A	2420	B	3	2140	C	750	A
146 th Street to 151 st Street	3	1130	A	2420	B	3	2780	C	1380	B
151 st Street to 161 st Street	3	1530	A	3520	C	3	2670	C	2270	B
161 st Street to SR 32	3	1350	A	2130	B	3	2670	C	1670	B
SR 32 to 191 st Street	2	930	B	1400	B	2	1790	D	1180	B
191 st Street to SR 38	2	930	B	1590	C	2	1600	C	1050	B

Note: Results of freeway mainline capacity analysis based on Highway Capacity Software.

*At two locations (I-465 to 106th Street and 146th Street to 151 Street), a collector-distributor is present. Volumes on the collector-distributor are not included in the mainline volumes.

The intersections created from the ramp junctions and cross streets would be designed to meet the INDOT standard of LOS D or better for an urban arterial, subject to the design-year traffic demand. A capacity analysis was completed at these signalized intersections for the morning and evening peak hours. For the Modified F4 Alternative, some LOS fall below acceptable levels. Results of the analysis can be found in (Table 4.1-2A). Throughout the corridor for the Major Moves Alternative, levels of service range from A to D at all signalized intersections (Table 4.1-2B).

A majority of the off- and on-ramps along the proposed freeway facility would be one-lane, except for the I-465/US 31 interchange ramps and the ramps to/from US 31 south of 106th Street.

**Table 4.1-2A
Modified F4 Alternative
Projected Design Year (2035) Ramp Intersection Capacity Analysis**

Location	AM Peak		PM Peak	
	South Bound Ramp	North Bound Ramp	South Bound Ramp	North Bound Ramp
96 Street (stand alone intersection)	F	-	E	-
I-465 Westbound to US 31 Southbound	C	-	B	-
106 th Street	C	D	B	B
116 th Street	C	D	C	B
131 st Street	B	B	B	B
136 th Street	F	B	C	F
146 th Street (split diamond interchange)	D	C	C	C
151 st Street (split diamond interchange)	B	B	C	C
161 st Street	F*	B	F*	F
SR 32	C	C	C	C
191 st Street	F*	C*	C*	D*
SR 38	B	B	A	B

Note: Results of ramp terminal intersection capacity analysis based on Synchro and HCS

E, F = Substandard level of service

* intersection analyzed as unsignalized- if intersection is signalized (although signal currently not warranted based on volume), LOS is acceptable

**Table 4.1-2B
Major Moves Alternative
Projected Design Year (2035) Ramp Intersection Capacity Analysis**

Location	AM Peak		PM Peak	
	South Bound Ramp	North Bound Ramp	South Bound Ramp	North Bound Ramp
96 Street (stand alone intersection)*	C	-	C	-
96 Street “Michigan Left” (stand alone intersection)	B	-	B	-
I-465 Westbound to US 31 Southbound	C	-	A	-
106 th Street	C	C	B	C
116 th Street (single-point interchange)	C	-	C	-
Old Meridian Slip Ramp (not signalized)	B	-	C	-
131 st Street	A	A	A	A
136 th Street	B	B	B	C
146 th Street (split diamond interchange)	A	B	A	C
151 st Street (split diamond interchange)	B	C	B	B
161 st Street (round-about)***	A	A	A	A
SR 32	B	B	C	C
191 st Street	A**	C****	A**	D****
SR 38	B	B	A	B

Note: Results of ramp terminal intersection capacity analysis based on Synchro.

E = Substandard level of service

* In order for the 96th Street intersection to operate acceptably, a supplemental “Michigan Left” intersection would need to be installed just west of the 96th Street/US 31 intersection to accommodate south bound and east bound left turns. The “Michigan Left” intersection would be a signalized intersection.

** Intersection analyzed as signalized. Signal will be installed per signal warrant criteria based on post-construction year traffic counts.

*** Round-abouts were analyzed using RODEL and SIDRA.

**** Intersection analyzed as unsignalized.

Corridor-wide Traffic Simulation/Analysis

Proposed modifications to the entire corridor were modeled using Paramics, a microscopic simulation model designed to simulate traffic flow on freeways and surface streets, including roundabouts. It provides a representation of individual vehicles and their interaction with their physical environment and other vehicles. The main benefit of this model compared to other capacity analysis methods is that it analyzes the freeway and surface street system as a whole, rather than isolating each segment. This is especially important where a traffic backup at one location, such as a heavily congested intersection, can spill over and cause traffic congestion on other freeway or street segments.

Paramics was used to identify potential operations deficiencies on a project wide level. Synchro and the Highway Capacity software (HCS) were used to analyze individual ramp junction, cross street corridors, and ramp intersections. RODREL and SIDRA were used to analyze individual roundabout level of service. A complete analysis of the entire corridor has been completed for the Modified F4 Alternative and for the Major Moves Alignment. These reports are attached as Appendix B2 and Appendix B3. The Modified F4 Alternative analysis is titled the “Capacity Analysis Report, Years 2015 and 2035,” and the Major Moves analysis is titled the “Major Moves Alternative Capacity Analysis Report, 2035”.

4.1.3 Summary of Major Moves Alternative

The proposed freeway and ramp terminals for the Major Moves Alternative are projected to operate within INDOT standards. A capacity analysis was completed for each of the freeway mainline segments for the morning and evening peak hours. Levels of service along the proposed freeway range from LOS A to C with higher congestion occurring south of 136th Street.

4.2 Pedestrian/Bicycle Access

Changes to this section since the publication of the DEIS:

- Design modifications associated to include 111th Street overpass and 169th Street underpass.
- Consideration of planned recreational trails in Washington Township including the proposed Monon Trail and Midland Trace routes.
- Consideration of new statewide and regional bicycle and pedestrian plans.

The existing US 31 intersections currently have no pedestrian traffic signal indicators or connecting sidewalks. As a result, US 31 currently does not provide for pedestrian and bicycle cross movement, nor would the No-Action Alternative.

Planned Bicycle and Pedestrian Facilities

In 2006 INDOT and IDNR co-published Indiana’s first state trails, greenways and bikeways plan. This plan focused on the development of a system that would place every Hoosier within 15 minutes of a trail by 2016. This was further interpreted to be a trail within 7.5 miles of every resident. A statewide trails vision map was created based on public input and extensive inventory of facilities, opportunities and constraints. The US 31 Corridor is identified on the map as a Priority Visionary Trail in southern Hamilton County and a Potential Visionary Trail in the northern half of the county.

The Indianapolis MPO has prepared several plans and studies on multi-modal transportation. These plans include recommendations for bicycle and pedestrian systems and facilities in Hamilton County, including the US 31 Corridor. IMPO's Bike Route System Plan and Multi-Modal and Public Space Design Guidelines (2007) and a Regional Pedestrian Plan (2006) include recommendations for various local streets crossing the US 31 corridor. Identified pedestrian corridor crossings include 116th Street, 146th Street, and SR 32. Multi-use paths are recommended within the right-of-way at 96th Street, 116th Street, and 146th Street. The Regional Pedestrian Plan calls for railings, barriers and clear pedestrian ways on both sides of bridges in all multi-modal corridors. Sidewalks are not to be used within the county outside the limits of local jurisdictions

The Hamilton County Alternative Transportation Plan (1995) and updated Thoroughfare Plan (2007) call for all US 31 crossings to be shared roadway paths at least 10 feet wide on both sides of the roadway with the exception of 146th Street which is planned as a separated, parallel multi-use path of the same width.

The City of Westfield requires developers to install sidewalks or multi-use paths in all new residential and commercial development. Both types of development are currently planned in and along the US 31 corridor. Westfield also identified four pedestrian corridors in the Westfield Thoroughfare Plan (2007), one of which is located adjacent to Union Street and west of US 31 north of 146th Street to approximately 156th Street. The Westfield Thoroughfare Plan (2007) identifies the planned Monon–Midland Trace Loop as a major trail system to be constructed as a 12-foot wide multi-use path. The Monon Trail is planned to extend north of 146th Street along the abandoned rail line to SR 38. The Midland Trace is an east-west trail following an abandoned rail line that parallels SR 32 just south of Park Street. Crossings of the US 31 corridor by the Monon-Midland system are proposed at 169th Street and 181st Street.

The City of Carmel adopted an Alternative Transportation Plan in 2003. This plan identifies the type and location of sidewalks, shared use paths, and trails proposed in and along the US 31. It identifies a range of crossing types based on anticipated levels of use. The Alternative Transportation Plan provides specific guidance on bicycle and pedestrian facility requirements at all US 31 crossings. The City of Carmel adopted a plan for a network of bike trails (April, 2008) as part of the city's Alternative Transportation Plan. Two of the five proposed bike loops would cross US 31 at 126 Street and 146th Street and at the existing Monon Crossing (136th Street).

Table 4.2-1 provides a compilation of all proposed pedestrian and bicycle facility crossings of US 31 as identified in the current plans of the Indianapolis MPO, Hamilton County, the City of Westfield and the City of Carmel. During final design, there will be further consultation with the Pedestrian/Trails Work Group in finalizing location and type of pedestrian/bicycle accommodation.

A great deal of planning for multi-modal transportation and bicycle and pedestrian facilities has been completed during the past 5 years in Hamilton County. These plans have been developed to provide guidance for an emerging multi-modal network that is sometimes, but not always associated with roadway construction and reconstruction. Construction within the US 31 Corridor should not introduce barriers to the planned multi-modal network.

Table 4.2-1: Planned Pedestrian and Bicycle Facilities in or Adjacent to the US 31 Corridor.

CATP = City of Carmel Alternative Transportation Plan, 2003
CBRP = City of Carmel Bicycle Route Plan, 2003
WTP = City of Westfield Thoroughfare Plan, 2007
HATP = Hamilton County updated Alternative Transportation Plan, 2007

103rd Street :

Land Use: residential
 CATP: Overpass incorporating separated grade ped. crossing

106th Street - Underpass Interchange:

Land Use: commercial
 CBRP: Sidewalk/path constructed
 CATP: Interchange incorporating separated grade ped. crossing
 HATP: Shared roadway paths; Two 10' paths and/or 5' paths

111th Street - Overpass:

Land Use: commercial
 CATP: Overpass incorporating separated grade ped. crossing

116th Street - Underpass Interchange:

Land Use: commercial office and hospital
 CATP: Interchange incorporating separated grade ped. crossing

College Avenue :

Land Use: commercial office and hospital
 CATP: Separated grade ped. crossing

126th Street - Underpass:

Land Use: mixed commercial hotels, retail and office
 CBRP: Recommended on-street route
 CATP: Overpass incorporating separated grade ped. crossing
 HATP: Shared roadway paths; Two 10' paths and/or 5' paths

131st Street - Overpass Interchange:

Land Use: mixed commercial hotels and office
 CATP: Interchange incorporating separated grade ped. crossing

136th Street - Underpass Interchange:

Land Use: commercial
 CATP: Overpass incorporating separated grade ped. crossing
 HATP: Shared roadway paths; Two 10' paths and/or 5' paths

MONON Trail:

Land Use: residential
 CBRP: Greenways Trail Constructed
 CATP: Separated grade ped. crossing
 HATP: Separated paths

Rangeline Road - Underpass:

Land Use: multi-family residential and commercial
 CBRP: Sidewalk/path to be constructed
 CATP: Overpass incorporating separated grade ped. crossing

146th Street - Overpass:

Land Use: commercial
 CATP: Interchange incorporating separated grade ped. crossing
 WTP: Interchange; Bike/ped. accommodation within road ROW
 HATP: Shared roadway paths; Two 10' paths and/or 5' paths

E. Greyhound Pass:

Land Use: commercial
 WTP: Interchange

151st Street - Overpass Interchange:

Land Use: commercial
 WTP: Interchange; Bike/ped. accommodation within road ROW;
 Pedestrian corridor to South Union St/WesternWay/156th St.

South Union Street/Western Way:

Land Use: commercial
 WTP: Overpass

Cool Creek Trail:

Land Use: residential
 WTP: Bike/ped. accommodation within offstreet ROW

161st Street - Overpass Interchange:

Land Use: residential
 WTP: Interchange; Bike/ped. accommodation within road ROW
 HATP: Shared roadway paths; Two 10' paths and/or 5' paths

169th Street - Underpass:

Land Use: commercial
 WTP: Overpass; Westfield Monon-Midland Trail Loop (regional trail

Midland Trace Trail:

Land Use: commercial
 HATP: Separated paths

SR 32 - Overpass Interchange:

Land Use: commercial and school
 WTP: Interchange; Bike/ped. accommodation within road ROW
 HATP: Two 10' paths and/or 5' paths

181st Street - Overpass:

Land Use: school
 WTP: Overpass; Westfield Monon-Midland Trail Loop (regional trail)
 HATP: Two 10' paths and/or 5' paths

191st Street - Overpass Interchange:

Land Use: limited commercial
 WTP: Interchange; Bike/ped. accommodation within road ROW
 HATP: Two 10' paths and/or 5' paths

196th Street:

Land Use: residential
 WTP: Overpass; Bike/ped. accommodation within road ROW
 HATP: Two 10' paths and/or 5' paths

206th Street:

Land Use: agriculture/residential
 WTP: Overpass (new road); Bike/ped. accommodation within road ROW
 HATP: Two 10' paths and/or 5' paths

SR 38 - Underpass Interchange:

Land Use: open space
 WTP: Interchange; Bike/ped. accommodation within road ROW
 HATP: Two 10' paths and/or 5' paths

Table 4.2-2 details the locations of all proposed interchanges and over/underpasses for the New US 31 Hamilton County Project. Pedestrian and/or bicycle accommodations would be provided at these interchanges and over/underpasses via sidewalks, shared-use paths, or other means for future pedestrian capabilities. In addition, because these interchanges and over/underpasses are grade separated, the potential conflicts between cross movements and US 31 mainline through traffic would be eliminated.

**Table 4.2-2
Interchange and Over/Underpass Locations for
Major Moves Alternative**

Location	Access
I-465 / 106 th Street	interchange
111 th Street	overpass
116 th Street	interchange
126 th Street	overpass
131 st Street	interchange
136 th Street	interchange
Monon Trail	underpass
Rangeline Road	underpass
146 th Street	split interchange
151 st Street	split interchange
161 st Street	interchange
169 th Street	underpass
SR 32	interchange
181 st Street	overpass
191 st Street	interchange
SR 38	interchange

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will provide an interchange or an over/underpass at every signalized intersection along the existing US 31 except at 103rd Street and Greyhound Pass (Table 4.2-1). In addition, it will also provide an overpass at 111th Street and an underpass at 169th Street. Pedestrian and/or bicycle accommodations would be provided at these interchanges and over/underpasses. The Major Moves Alternative will not require permanent use from the existing Monon Greenway (Appendix A, Sheet 5), the shared-use path and sidewalk system along 146th Street (Appendix A, Sheet 6), or the South Union Trail (Appendix A, Sheet 7); therefore, pedestrian and bicycle access along these trails would be maintained. However, temporary closure of these trails/path could be required during construction activities.

4.3 Social/Economic Impacts

Changes to this section since the publication of the DEIS:

- Displacements associated with the Major Moves Alternative in the southwest quadrant of 191st Street & US 31, southwest quadrant of 111th Street and US 31, between 146th Street and 151st Street, and in the southwest quadrant of 161st Street and US 31.

- Addition of detailed assessment of potential impacts specific to Major Moves Alternative including land use and tax revenues.

4.3.1 Relocations

There are a number of businesses and residential properties that would be displaced by both the F4 Alternative and the Major Moves Alternatives. The No-Action Alternative would incur no relocations. The Major Moves Alternatives incurs additional displacements due to the refinement of interchange designs associated with additional traffic volumes.

Residential Displacements

Displaced Housing Units are illustrated in Appendix A. A housing unit was considered displaced if it was located within the project right-of-way or if reasonable access could not be maintained. The number of displaced housing units for each alternative is included in Table 4.3-1. Mitigation for residential displacements is discussed in Section 5.1.

**Table 4.3-1
Displaced Housing Units[†]**

Price Range (\$K)	No-Action Alternative	F4 Alternative	Major Moves Alternative
0 – 50	0	14	13
50 – 100	0	4	4
100 – 150	0	26	24
150 – 200	0	8	14
200 – 250	0	1	1
> 250	0	0	0
Total	0	53	56

The “No-Action” Alternative will not displace any individuals.

[†] Valuation of displaced housing units is an estimation based on local housing sales.

Commercial Displacements

A majority of the existing US 31 corridor is developed with a variety of commercial enterprises. The areas of highest commercial density are from 146th Street north to 151st Street and at the intersection of SR 32. Commercial properties include retail, restaurant, service, industrial, and production agriculture. The number of displaced commercial units for each alternative is included in Table 4.3-2.

**Table 4.3-2
Displaced Commercial Units**

Type	No-Action Alternative	F4 Alternative	Major Moves Alternative
Retail	0	28	28
Industrial	0	5	5
Office	0	14	17
Total	0	47	50

Displaced Commercial Units are illustrated in Appendix A. A commercial unit was considered displaced if it was located within the project right-of-way or if reasonable access could not be maintained. Mitigation for commercial displacements is discussed in Section 4.1.

Summary of Impacts: Single Preferred Alternative

The Major Moves Alternative will displace 52 single residence dwellings, 1 multi-residence dwelling (4 units), 28 retail buildings, 6 industrial facilities, and 15 office buildings.

4.3.2 Economic

The potential loss of tax revenues for Carmel/Clay Township and Westfield/Washington Township resulting from project related displacements represent a small percentage of the Townships’ total tax base (Table 4.3-3). The No-Action Alternative would not impact tax revenue.

**Table 4.3-3
Tax Revenue Loss of Residential and Commercial Displacement**

Location	Total Tax Revenue [†]	Alternative	Displaced Properties	Percent of Tax Base
Carmel/Clay Township ¹	\$173,687,000	Major Moves Alternative	\$ 96,746.63	0.10%
Westfield/ Washington Township ²	\$55,765,000	Major Moves Alternative	\$ 447,563.27	1.5%

[†] - Project receivables (2007 billing for 2006 end-of-year)

1 Includes City of Carmel, Clay Township, Carmel Clay School and Carmel Clay Library

2 Includes City of Westfield, Washington Township, Westfield Washington School and Westfield Library

Economic impacts may be experienced by commercial facilities due to changes in access from US 31. Loss of direct access to/from the highway may have adverse impacts on businesses that are dependent on US 31 traffic. The access loss associated with Alternatives F4 and the Major Moves Alternative at Greyhound Pass and 151st Street could adversely impact the Westfield retail district. The hotels located on 103rd Street could be impacted by lack of direct access (both build alternatives). Similarly, if no interchange is provided at 126th Street, the retail center along the east side of US 31 could be impacted. However, an upgraded facility would have the capability to support the larger projected traffic volume in the communities; therefore, businesses along the corridor would have exposure to a larger number of people. This creates a potential for an increase in commercial activity along the corridor.

The Major Moves Alternative was developed, in part, based on comments on the DEIS from local businesses and the City of Westfield concerning potential economic impacts due to loss/alteration of access to the commercial district between 146th Street and 151st Street. The Major Moves Alternative addresses this concern by providing direct access for both 146th Street and 151st Street via the proposed split diamond interchange and indirect access for Greyhound Pass via the proposed C-D system (Appendix A, Sheet 6).

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will result in a loss of tax base of approximately 0.10% in Carmel/Clay Township and 1.5% in Westfield/Washington Township.

4.3.3 Land Use/Zoning

The No-Action Alternative would have no impacts on current, future or proposed land use in the area. The F4 and Major Moves Alternatives would directly impact land use adjacent to the existing US 31 corridor. The majority of this impact would take place in the current right-of-way. The F4 and Major Moves Alternatives would incur very similar impacts to land types in the corridor. In addition, both built alternatives would limit access to adjacent parcels. This limited access would need to be taken into consideration during design of future development plans.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will directly impact land use adjacent to, and within the existing right-of-way of, the US 31 corridor. This alternative will impact approximately 81 acres of agricultural land, 94.3 acres of commercial property, 15.6 acres of industrial property, 27.4 acres of institutional property, 45.7 acres of mixed urban uses, 34.8 acres of residential property, 30.9 acres of forest land, 7.3 acres of herbaceous rangeland, and 17.3 acres of shrub/brush rangeland.

4.3.4 Neighborhoods/Community Cohesion

Due to current zoning and land use planning, only a few residential communities are located adjacent to the existing US 31 corridor. As well, neither the F4 or Major Moves Alternatives would bisect or isolate any communities located along the existing alignment. The No-Action Alternatives would incur no impacts to neighborhoods, residential communities, and/ or community cohesion.

Alternative F4 and Major Moves Alternative have not changed the neighborhood/community cohesion impacts discussion for the following neighborhoods, as described in the DEIS.

- Parks at Springmill (Appendix A, Sheet 4)
- North Meridian Heights (Appendix A, Sheet 4)
- North Glenn Village (Appendix A, Sheet 9)
- Justin Morgan Lane and Ethan Allen Drive (Appendix A, Sheets 10 and 11)

Alternatives F4 and Major Moves Alternative South of 156th Street

- *Meridian Suburban* (Appendix A, Sheet 2): This neighborhood would have one displacement and 11 impacted noise receivers. The neighborhood would experience no loss of access and no impacts to community cohesion.
- *Thistlewood, consisting of Village of Mount Carmel Subdivision* (Appendix A, Sheet 5): This neighborhood would have no displaced residences, no loss of access, and no impacts to community cohesion.
- *Hunters Knoll, consisting of Village of Mount Carmel and Hunters Knoll Subdivisions* (Appendix A, Sheet 5): This neighborhood would have three displaced residences located on 136th Street adjacent to the neighborhood. The neighborhood would experience no loss of access and no impacts to community cohesion.
- *Hays Addition* (Appendix A, Sheet 5): This neighborhood would have no displaced residences within the community. The neighborhood would experience no loss of access and no impacts to community cohesions. The views to the road from the residences may be altered due to the increased elevation of US 31.

- *Autumn Lakes* (Appendix A, Sheet 5): This neighborhood would have no displaced residences, no loss of access, and no impacts to community cohesion. The views to the road from the residences may be altered due to the decreased elevation of US 31.
- *Circle Drive, consisting of Walters Rolling Acres Subdivision* (Appendix A, Sheet 6): Circle Drive would no longer be directly accessible via US 31; however, there are two alternate access routes proposed for this neighborhood. Connecting Circle Drive with the proposed extension of Rangeline Road would provide the alternate access (Appendix A, Sheets 6). This neighborhood would incur one displaced residence with the Alternative F4 or the Major Moves Alternative, which provides access via the proposed extension of Rangeline Road. There is no anticipated significant change in community structure or cohesion, as the community would maintain its current setting.
- *Walter's Plaza* (Appendix A, Sheet 6): This neighborhood would no longer have direct access to US 31. This neighborhood would incur no displaced residences or impacts to community cohesion with the Alternative F4 or Major Moves Alternative, which maintains access via Rangeline Road/Clay Terrace Boulevard.

Alternatives F4 and Major Moves Alternative North of 156th Street

- *Buena Vista Drive, consisting of Buena Vista and Jack Lane Subdivisions* (Appendix A, Sheet 7): There would be four displaced residences within this community, all located along the US 31 corridor and associated with the proposed right-of-way; however, there is no anticipated significant change in community structure or cohesion. Buena Vista Drive would no longer have direct access to US 31; rather, proposed access would connect Buena Vista Drive with Farr Hills Drive that connects with 161st Street.
- *Farr Hills Drive* (Appendix A, Sheet 7): There would be three displaced residences within this community and four additional displaced residences located along 161st Street in close proximity to the community; however, there is no anticipated significant change in community structure or cohesion. Access to Farr Hills Drive would be altered to allow for the proposed interchange at 161st Street. Proposed access would occur west of the existing access on 161st Street.
- *Woodside Estates* (Appendix A, Sheet 8): This neighborhood would have one displaced residence within the community. The neighborhood would experience no loss of access, and no impacts to community cohesions.
- *Westfield neighborhood, consisting of Abel Doan and Roberts Addition to Westfield Subdivisions* (Appendix A, Sheets 8 and 9): seven residences within this area would be displaced and access would not be lost or altered considerably. Several commercial amenities would be displaced in close proximity to this neighborhood that could impact existing community cohesion. However, public schools, Asa Bales Park, the public library, and downtown Westfield are still easily accessible to this neighborhood, promoting community cohesion.

Summary of Impacts: Major Moves Alternative

Alternative F4 and Major Moves Alternative will require a change in access to Meridian Suburban, Circle Drive, Walter's Plaza, Buena Vista, Farr Hills, North Glenn Village, and Justin Morgan Lane/Ethan Allan Drive neighborhoods. In addition, the following neighborhoods will have residential displacements: Meridian Suburban (1), Hunters Knoll (3), Hays Addition (1),

Walter's Plaza (1), Buena Vista Drive (4), Farr Hills Drive (3), Woodside Estates (1), Westfield Neighborhood (7), and North Glenn Village (13). However, no change is anticipated in the overall community structure or cohesion of these neighborhoods.

4.3.5 Environmental Justice

Using the same methodology as the DEIS, current census data was evaluated. Both the F4 and Major Moves Alternatives would incur no impacts to minority or low-income populations, as there is no minority or low-income neighborhoods or communities within the project area. Information regarding minority and low income populations is available in the DEIS.

4.4 Community Facilities and Services

Changes to this section since the publication of the DEIS:

- Consideration of planned recreational trails in Washington Township including the proposed Monon Trail and Midland Trace.
- Potential impacts to national geodetic monuments assessed.
- Consideration of new or expanded facilities along the corridor.
- Addition of detailed assessment of potential impacts specific to the Major Moves Alternative.

4.4.1 Schools

The No-Action Alternative would result in no impacts to any schools within the project area.

Neither the F4 nor Major Moves Alternative would result in direct impacts to any of the schools in the Carmel/Clay School District; however, there would be indirect impacts associated with current bus routes. Buses for the Carmel/Clay Schools gain access to and/or crossover US 31 most heavily at 116th Street, 126th Street, 131st Street, and 136th Street. Access/crossover would no longer be available at 103rd Street or Old Meridian Street. Few buses are utilizing these intersections. Routes for these buses would be able to utilize interchanges/overpasses at 106th Street, 116th Street, 126th Street, or 131st Street. Bus traffic requiring access to US 31 at Rangeline Road would need to be rerouted to 146th Street. Alternative F4 and the Major Moves Alternative would result in a loss of direct access to US 31 from 126th Street. Bus traffic would need to be rerouted to the 131st Street Interchange. The Major Moves Alternative would also include a 111th Street overpass (Appendix A, Sheet 2) providing additional east-west access across the mainline.

Alternative F4 and the Major Moves Alternative would impact approximately 0.9 acre of a vacant grass lot adjacent to the football field at the Westfield High School, northeast of the intersection of US 31 and SR 32 (Appendices A, Sheet 9). Both alternatives would also impact approximately 1.2 acres of school property along 181st Street due to the construction of the 181st Street overpass. The Westfield/Washington Township School District has affirmed that the aforementioned impacted areas, though part of the public school property, are currently unused and are not utilized for recreation (see Chapter 5: Section 4(f) Resources).

Access would also be impacted to the Westfield Washington Township Schools (e.g. loss of direct access to US 31 from 181st Street). These schools include Washington Elementary, Westfield Intermediate School, and Westfield High School. The impacts are the result of the

proposed interchange at US 31 and SR 32 as well as an overpass at 181st Street. The Westfield/Washington Township buses rely most heavily on the SR 32/US 31 intersection. Access at this location would be maintained. For Alternative F4 and the Major Moves Alternative, access would no longer be available at Greyhound Pass, Westfield Boulevard, 156th Street, Buena Vista, 169th Street, Park Street, David Brown Drive, North Glenn Drive, Blackburn Avenue, Union Street, 196th Street, 202nd Street, and 203rd Street. A crossover would be provided at 181st Street; however, there would be no access to/from US 31. Interchanges would be available within one-half mile of each of these restricted access points.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will impact approximately 2.1 acres of vacant school property associated with the Westfield/Washington Township School District campus (Appendix A, Sheet 9). These impacted areas, though part of the public school property, are currently unused.

4.4.2 Churches

The No-Action Alternative would incur no impacts to churches. With all of the build alternatives, the Seventh-Day Adventist Church would need to be relocated (Appendix A, Sheet 7). It is possible the I-465 Interchange design of the Major Moves Alternative will avoid the Pilgrim Lutheran Church and its parsonage (Appendix A, Sheet 1). The St. Christopher's Episcopal Church on 131st Street moved into a new structure east of the former location since the publication of the DEIS. The previous structure is now vacant and is planned for demolition. St. Christopher's would experience no impact as a result of the project.

Summary of Impacts: Single Preferred Alternative

The Major Moves Alternative will displace the Seventh-Day Adventist Church (Appendix A, Sheet 7). It is possible that the Pilgrim Lutheran Church (Appendix A, Sheet 1) would be displaced as well.

4.4.3 Cemeteries

In accordance with Indiana State Law (IC 23-14-44-1 through 3), there are no direct impacts to any of the existing cemeteries with any of the alternatives. Since the publication of the DEIS, the Carmel Cemetery has expanded along the US 31 corridor (Appendix A, Sheet 5). The Major Moves Alternative will avoid impacting the recent expansion area.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will have no direct impacts to any of the existing cemeteries within the project area. If any construction activity is needed within 100 feet of a cemetery, a cemetery development plan will be required.

4.4.4 Libraries

There are no direct impacts to any of the libraries with any of the alternatives.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will have no direct impacts to any libraries within the project area.

4.4.5 Fire Stations, Police Stations, and EMS

The No-Action Alternative would result in no impacts to Fire Stations, Police Stations or EMS facilities within the project area.

Neither the F4 nor the Major Moves Alternative would result in direct impacts to any Fire Stations, Police Stations or EMS facilities. However, with both alternatives, some roads would no longer access US 31 while others would have interchanges or overpasses. Therefore, with these alternatives, there would be the potential for a change in emergency response times. Some response times would be increased, while others would be reduced.

The build alternatives are anticipated to improve the level of safety for motorists traveling through the US 31 corridor by eliminating signalized traffic control and by better satisfying driver expectation. These improved conditions would likely reduce the volume of emergency response calls directly related to the US 31 corridor. Once the newly constructed US 31 is opened, the reduced traffic congestion would likely improve access and emergency response time.

For Alternative F4, the response time of the Westfield-Washington Township Fire Station #82, located on 151st Street, east of US 31 (Appendix A, Sheets 6 and 7), would have the greatest potential to be directly impacted. These impacts are outlined in the DEIS.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will incur no direct impacts to any Fire Stations, Police Stations or EMS facilities within the project area. This alternative was developed, in part, in response to comments received on the DEIS from the City of Westfield and the general public concerning access from the Westfield-Washington Township Fire Station #82. The Major Moves Alternative would provide direct access to the US 31 facility from 151st Street; thereby, potentially reducing response times to incidents on and along US 31.

4.4.6 Hospitals

The No-Action Alternative would incur no impacts to hospitals. St. Vincent Hospital would have some impacts with both the F4 and Major Moves Alternatives related to a proposed interchange at 136th Street (Appendices A, Sheet 5). The impact would result in a relocation of the hospital's detention pond due to the relocation of 136th Street and the exit ramp from northbound US 31. The hospital entrance would be maintained. The access to and from US 31 from St. Vincent Hospital would be improved with the proposed interchange configuration.

Both the F4 and Major Moves Alternatives would also result in some impacts to the Heart Center of Indiana property. The proposed interchange located at 106th Street would require additional right-of-way to be purchased for ramp systems along the eastern property line of the building which fronts the right-of-way of existing US 31 (Appendices A, Sheet 2). The proposed interchange at 116th Street would require right-of-way from Clarion North Hospital in the northwest corner of 116th Street and US 31. The interchange would impact only the right-in entrance from westbound 116th Street.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will incur no significant impacts to hospitals in the project area.

4.4.7 Public Parks and Recreation Areas

The No-Action Alternative would incur no impacts to public parks or recreational areas. Neither the F4 or the Major Moves Alternatives would require the permanent or temporary use of any property identified as a Section 4(f) resource pursuant to 23 CFR 771.135 (a), Section 4(f) of the US Department of Transportation Act of 1966 (49 USC 303) and Section 138 of the Federal-Aid

Highway Act of 1968 (i.e., public park, recreation area, wildlife or waterfowl refuge or sites eligible for or included in the National Register of Historic Places).

The US 31 project will remove the existing access to MacGregor Park. The FHWA has already approved a Section 4(f) *de minimis* for the SR-38 project which includes a new access to MacGregor Park. This new access will be constructed prior to removal of the existing access to MacGregor Park.

Neither the F4 or the Major Moves Alternatives would require permanent use from the existing Monon Greenway (Appendices A, Sheets 5) or the South Union Trail (Appendix A, Sheet 7); therefore, recreation use of these trails would be maintained. Temporary closure of these trails would be required during construction activities. A detailed discussion of Section 4(f) issues concerning these trails was included in Chapter 6: Section 4(f) Resources of the DEIS.

Both the F4 and the Major Moves Alternatives would accommodate the proposed extension of the Monon Trail (Appendix A, Sheets 7, 8, 9, and 10) and the proposed Midland Trace (Appendix A, Sheet 8) in the City of Westfield and Washington Township during final design. These accommodations would be provided in cooperation with local trail planning efforts.

Neither the F4 or the Major Moves Alternatives would require the permanent or temporary use from, or convert the use of, any property identified as a Section 6(f) property pursuant to Section 6(f)(3) of the Land and Water Conservation Fund (LWCF) Act of 1965 (16 USC 460); therefore, no Section 6(f) resources would be impacted.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will not require the permanent or temporary use of any property identified as either a Section 4(f) or Section 6(f) resource. The Major Moves Alternative will accommodate the proposed extension of the Monon Trail (Appendix A, Sheets 7, 8, 9, and 10) and the proposed Midland Trace (Appendix A, Sheet 8) in the City of Westfield and Washington Township during final design.

4.4.8 Major Utilities/Geodetic Control Monuments

The No-Action Alternative would incur no impacts to major utilities. Both the F4 Alternative and the Major Moves Alternatives would require the relocation of both public and private above and belowground utilities. The impacts associated with both alternatives are the same.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will cross 14 major utilities and require the relocation of both public and private above and belowground utilities. As well, the high pressure natural gas metering station north of 156th Street will require relocation (Appendix A, Sheets 7 and 14; Appendix A, Sheet 7). The Major Moves Alternative will also impact five geodetic control monuments (S79, 201, U42, H32, and G32) that will require relocation.

4.5 Farmland

Changes to this section since the publication of the DEIS:

- Addition of detailed assessment of potential impacts specific to the major Moves Alternative due to changes in land use in the corridor.

As is required by the Farmland Protection Policy Act, a Form AD-1006 was completed for the DEIS alternatives. The DEIS assessment of F4 Alternative indicated an impact of 102.3 acres of agricultural land and 95 acres of land underlain by prime farmland soils. The re-evaluation of the F4 Alternative based on updated land use data revealed an impact of 72 acres of agricultural land and 62.3 acres of land underlain by prime farmland soils. No agricultural parcels would have been bisected by the F4 Alternative. The original DEIS alternatives received a total point value of less than 160 points. The new Major Moves Alternative will incur even fewer impacts to prime farmland than the original alternatives. The reduction in impacts associated with the Major Moves alternative is due to the overall loss of prime farmland in the project area from development unrelated to this project in the past five years.

Summary of Impacts: Major Moves Alternative

The Major Moves Alternative will impact 81 acres of agricultural land and 89.1 acres of land underlain by prime farmland soils. No agricultural parcels will be bisected by the Major Moves Alternative. The Indiana NRCS was consulted via telephone on January 6th, 2005 concerning the 2004 proposed modifications of the F4 Alternative in reference to changes in the Farmland Impact Rating process for corridor projects. They concurred that impacts to farmland associated with modifications were not significant and, therefore, did not warrant a re-evaluation. As well, NRCS staff noted at that time, since the AD-1006 Forms were completed for the DEIS, the new NRCS-CPA-106 Forms (Farmland Impact Rating for Corridor Projects) would not be required for a modified alternative. If so instructed by NRCS, an updated NRCS-CPA-106 Form will be filed with NRCS as matter of record keeping; however, it is unlikely that the Major Moves Alternative would receive further consideration for farmland protection.

4.6 Historic and Archaeological Resources

At the time of the DEIS, field reconnaissance (report submitted 2002) identified one historic district (Westfield Historic District) and two individual properties (the T. J. Lindley Farm and the Hunt House) that the Indiana SHPO and FHWA agreed are eligible for inclusion in the NRHP.

Identification of archaeological sites was performed through analysis of available documentation, coordination with DHPA, and field survey (reports submitted 2003 and 2005). No archaeological sites listed in or eligible for inclusion in the NRHP were identified in the project area.

Analysis of effects to the two individual historic properties and the historic district determined that the Hunt House and the Lindley Farm would be adversely affected by the project and that the project would not affect the Westfield Historic District. The adverse effects would include the loss of the historic entrances to the Hunt House and Lindley Farm, visual effects, and auditory effects. A Section 106 Memorandum of Agreement (MOA) was executed by FHWA (including INDOT) in 2004 to provide measures to mitigate the adverse effects on the Hunt House and Lindley Farm. Stipulations of the MOA included preparation of a NRHP nomination for each property, avoidance of disturbance to existing woody vegetation or mitigation for removed vegetation, and creation of alternative access to the parent parcel of both properties.

Since the DEIS, Indiana SHPO has reevaluated the eligibility of the Hunt House and has determined that the Hunt House is no longer eligible for listing on the NRHP, as such is no longer subject to Section 106 requirements. FHWA, the Indiana SHPO, and INDOT are preparing an amended MOA removing the Hunt House from the mitigation stipulations, which is pending signatures and public comment. A copy of the amended MOA will be included in the Final

Environmental Impact Statement. The effects to the Lindley Farm have not changed and the amended MOA retains the stipulations mitigating the impacts to the property.

4.6.1 Section 4(f) Resource Evaluation of Lindley Farm

Removal of the existing access to the Lindley Farm is a Section 4(f) use. New safer access to the parcel will be provided from SR 38 (see Appendix A, Sheets 12 and 13) to the existing property line. Furthermore, the property owner will be compensated so they can connect their existing driveway to the new frontage road to the north of their property. A retaining wall will be constructed along the west side of the southbound ramp from SR 38 to US 31, thereby avoiding direct impacts to the historic property. A “net benefit” is achieved when the transportation use, the measures to minimize harm and the mitigation incorporated into the project results in an overall enhancement of the Section 4(f) property when compared to both the future No-Action or avoidance alternatives and the present condition of the Section 4(f) property. The new access to the property from SR 38 will be much safer than the existing access directly onto US 31, and therefore will result in a net benefit to the historic property. See Chapter 5 for the complete section 4(f) resource evaluation.

4.7 Air Quality

Changes to this section since the publication of the DEIS:

- New NAAQS Standards.
- Design modifications of Major Moves Alternative.
- Impact calculations have been assessed to evaluate the effects of design changes as well as changes in available evaluation techniques and regulatory requirements.

The No-Action Alternative could potentially result in a decrease in air quality due to a projected increase in traffic congestion.

4.7.1 Conformity

In June 2004, the US EPA designated 9 counties in the Indianapolis metropolitan area as nonattainment for the 8-hour ozone standard, which includes Hamilton County. The US EPA has also designated Hamilton County as nonattainment for particulate matter less than 2.5 microns in diameter (PM_{2.5}). Because of these designations, conformity determinations must be made on all planned transportation projects to ensure consistency with State Implementation Plan (SIP) documents designed to bring nonattainment areas into attainment with National Ambient Air Quality Standards (NAAQS).

Under Federal regulations (40 CFR 93), each individual highway project must be evaluated for conformity with the SIP unless it is exempt under 40 CFR 93.126 or 93.128. If the project is listed in the current transportation plan (TP) and transportation improvement programs (TIP) have been evaluated for conformity, then additional regional analysis is not required. This project does not qualify for exemption under 40 CFR 93.126 or 93.128, but it is listed as MPO#105 in the Indianapolis 2030 Regional Transportation Plan (IMPO 2005) and the 2007-2010 Regional Transportation Improvement Program (IMPO 2007).

The TP and TIP were evaluated for conformity to the Indiana SIP for ozone in the Air Quality Conformity Analysis, 2007 Amendments to the Indianapolis 2030 Regional

Transportation Plan (City of Indianapolis 2007), and conformity requirements were found to have been satisfied. The TP and TIP were also analyzed using the interim PM_{2.5} 2002 baseline test, and conformity requirements were found to have been satisfied. Therefore, this project meets the regional conformity requirements of 40 CFR 93.

4.7.2 Carbon Monoxide Microscale Analysis

A CO microscale dispersion analysis was conducted for the DEIS for “worst case” receptors for the years 2000 (existing), 2010 (first year of operation), and 2035 (design year). A “worst case” receptor is typically defined as a location nearest the roadway segment with the highest traffic volumes and lowest average speeds on the project route and nearest to a high volume crossroad where an individual is likely to be found for the time extent in the NAAQS. For this project edge of right-of-way receptors were identified at the US 31 proposed interchanges located at 116th and 146th Streets.

The results of the microscale CO analysis (Table 4.7-1) indicated that this project would not result in violations of either the one-hour (35.0 parts per million - ppm) or eight-hour (9.0 ppm) NAAQS for CO. All of the predicted 1-hour CO concentrations were well below the NAAQS of 35.0 ppm. The highest predicted 8-hour concentration was 5.4 ppm at the 146th Street interchange, below the NAAQS of 9.0 ppm. It is unlikely that this concentration level would ever be experienced by anyone since extremely conservative assumptions were built into the modeling for this project. The most conservative assumption is the location of receptors along the edge of the right-of-way. This means that a person would have to be located on the right-of-way for 8 hours to experience the calculated maximum concentration.

**Table 4.7-1
Predicted Carbon Monoxide Concentrations (in parts per million)**

Location	2000 Existing		2010 First Year of Operation		2035 No Action		2035 Build	
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour
116 th & US 31	6.4	3.9	7.7	4.8	5.9	3.5	7.6	4.7
146 th & US 31	3.6	1.9	8.5	5.4	3.6	1.9	8.6	5.4

Note: 1-hour background = 3 ppm; 8-hour background = 1.5 ppm

This CO analysis was done using mobile source emissions factors issued by the USEPA known as MOBILE5B. The MOBILE emission factor model has since been updated to versions 6.0, 6.1, and to the current version, MOBILE6.2. MOBILE6.0 incorporated many changes to the MOBILE5B model, including significant changes to CO emission factors. CO emission factors built into MOBILE6.0 were generally higher than those used in MOBILE5 for vehicle model years prior to about 2007. Thereafter, the MOBILE6.0 factors were lower than in MOBILE5 (Beardsley, 2001). Over a 10-year period, the differences in emission factors ranged from about 50 percent higher in MOBILE6.0 for 1997 vehicles to approximately equal in the two versions by 2007. Versions 6.1 and 6.2 primarily added additional capabilities unrelated to CO, but version 6.2 further revised CO emission factors downward to account for various regulatory requirements after 2001 (Oje & Page, 2004).

The amount of difference in total CO emissions and concentrations depends on the mix of model years in the vehicle fleet being modeled as well as the emission factors predicted by the MOBILE

emission factor model. If the CO analysis for this project were redone using MOBILE6.2 with the same traffic volumes, it is expected that emissions in 2010 would be higher by less than 10 percent (assuming the average age of the fleet is about 5 years). If the analysis was done for 2015, the current estimate for opening year, CO emission rates are expected to be about the same using either model. In the design year, 2035, MOBILE6 emissions estimates would be lower than the MOBILE5 estimates by more than 20 percent.

The CAL3QHC model, Version 2.0 (USEPA, 1992), was the intersection model used for this analysis. This model has not changed since the original analysis was done.

Traffic volume estimates for 2015 and 2035 would be higher than were modeled in 2010 and 2025. An annual growth rate of 1.5 percent per year was used in estimating future traffic volumes for this study. Thus, traffic volumes are expected to be about 7.5 percent higher in 2015 than in 2010, and about 15 percent higher in 2035 than in 2025.

Although precise adjustments to the results shown in Table 4.7-1 cannot be made without redoing the analysis, it is possible to draw some conclusions about the magnitude and direction of changes that might result by combining the effects of the emission factor changes in MOBILE6 and the traffic volumes in different years discussed above. Opening year CO concentrations would probably be 5 to 10 percent higher for 2015 than those modeled previously for 2010, primarily due to the increased traffic volumes. CO concentrations in 2035 would be about the same to 5 percent lower than was modeled in 2025. It should be noted that these percentage variations apply to the modeled concentrations, not the background levels included in Table 4.7-1, which it is reasonable to assume would remain about the same. For example, the maximum eight-hour concentration of 5.4 ppm in the opening year at the 146th Street intersection might be expected to be about 0.4 ppm higher if the modeling were redone (10 percent of the tabulated value with background removed). This would yield a maximum concentration of 5.8 ppm, or about 65 percent of the NAAQS level of 9 ppm.

Thus, redoing the microscale CO analysis is considered unnecessary, this project is not expected to result in violations of either the one-hour or eight-hour NAAQS for CO.

4.7.3 PM_{2.5} Hot-Spot Analysis

For PM_{2.5}, US EPA and FHWA guidance (USEPA & FHWA 2006) requires consideration of localized effects in addition to the regional effects discussed in Section 4.7.1. For projects determined to be of air quality significance, a microscale or “hot spot” analysis is required. Since PM_{2.5} emissions are primarily associated with diesel exhaust, the determination of air quality significance is based primarily on maximum diesel truck traffic volumes.

For this project, the intersection with the highest truck volumes is the I-465/US 31 interchange. This interchange was included in a PM_{2.5} evaluation for the entire I-465 Northeast Corridor (Stafford 2008). In that evaluation, truck traffic at the I-465/US 31 interchange was shown to be about 3 percent higher in 2010 if the project is built than if it is not built. In subsequent years, building the project would actually result in decreased truck traffic. None of the interchanges evaluated in the study were found to be of air quality significance based on the expected increases in truck traffic. Furthermore, truck volumes were found to be similar to or lower than in other projects that had been evaluated and determined to conform to the PM_{2.5} NAAQS.

The Interagency Consultation Group met on May 19, 2008 and evaluated the I-465 Northeast Corridor PM_{2.5} qualitative hot-spot analysis and concluded that the New US 31 Hamilton County project is not a project of air quality concern, and as such, conformed to the PM_{2.5} NAAQS.

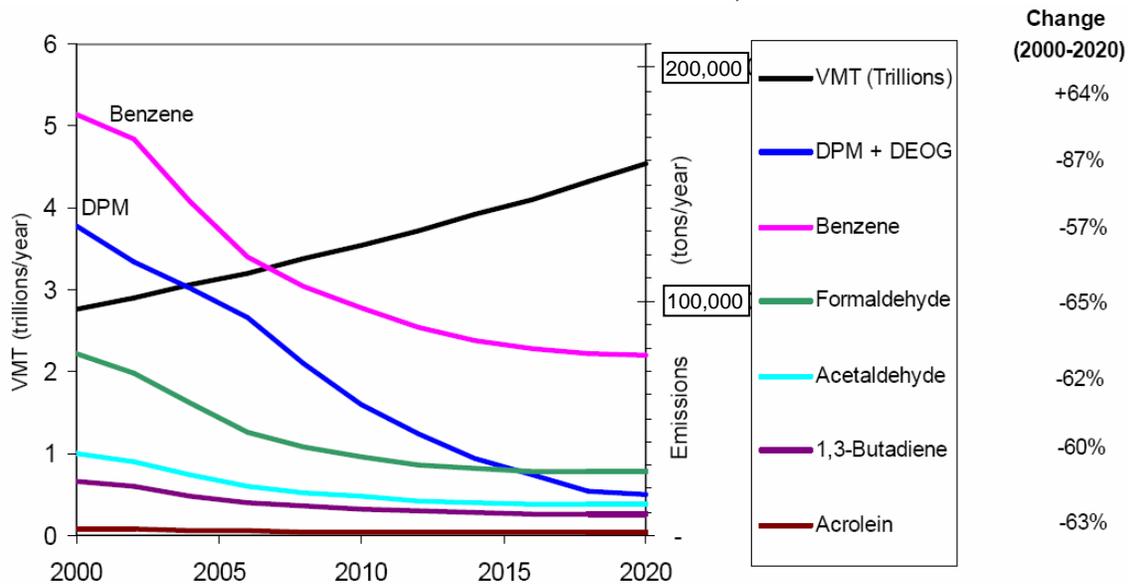
4.7.4 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Figure 4.7-1.

Figure 4.7-1 U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 2000-2020



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon,

organic carbon and SO₄ from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns. (Source: *Interim Guidance on Air Toxic Analysis in NEPA Documents*, FHWA, June 2006)

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

Information that is Unavailable or Incomplete

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

- **Emissions:** The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model—emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE 6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE 6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

- **Dispersion:** The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS.

The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion

models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

- **Exposure Levels and Health Effects:** Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis prevent making meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupported assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- Benzene is characterized as a known human carcinogen.
- The potential carcinogenicity of acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- Formaldehyde is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- 1,3-butadiene is characterized as carcinogenic to humans by inhalation.

- Acetaldehyde is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes—particularly respiratory problems. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based upon Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

In this document, FHWA has provided a qualitative analysis of MSAT emissions relative to the various alternatives, and has acknowledged that the project alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

Mobile Source Air Toxics Qualitative Assessment

Technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future

MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For each alternative evaluated as part of this EIS, the amount of MSATs emitted would be proportional to the amount of vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for both the F4 and Major Moves Alternatives is slightly higher than that for the No-Action Alternative because of the added capacity. This increase in VMT could lead to higher MSAT emissions for the F4 Alternative and the Major Moves Alternative. However, the elimination of stop lights along the corridor would, to a certain degree, offset the increase in VMT. The emissions increase would also be offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOBILE6 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

In addition, because the estimated VMT under each of the build alternatives are identical, there would be no appreciable difference in overall MSAT emissions among the two alternatives. Also, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent from 2000 to 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Because of the specific characteristics of the project alternatives, under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced at areas where new interchanges are proposed. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

Construction activity may generate a temporary increase in MSAT emissions. Project-level assessments that render a decision to pursue construction emission mitigation will benefit from a number of technologies and operational practices that should help lower short-term MSATs. In addition, the SAFETEA-LU has emphasized a host of diesel retrofit technologies in the law's CMAQ provisions - technologies that are designed to lessen a number of MSATs.¹

Summary of Impacts: Major Moves Alternative:

In sum, for the Major Moves Alternative in the design year it is expected there would be higher MSAT emissions in the study area, relative to the No-Action Alternative, due to increased VMT. There could be slightly elevated but unquantifiable changes in MSATs to residents and others in a few localized areas where VMT increases, which may be important particularly to any members of sensitive populations. However, on a regional basis, EPA's vehicle and fuel regulations,

¹ SAFETEA-LU, Public Law 109-59, August 10, 2005

coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

4.8 Noise

Changes to this section since the publication of the DEIS:

- Two noise receptors were removed: one because it will be displaced (DEIS - RN337) and the other because it was demolished (DEIS – RS505).
- Addition of detailed assessment of potential impacts specific to the Major Moves Alternative using the Traffic Noise Model (TNM) version 2.5, which is the model currently recommended by FHWA and INDOT.

As discussed in Section 4.8.1 of the DEIS, noise impacts for this project were evaluated in accordance with the FHWA Noise Assessment Guidelines and INDOT Guidelines. However, these guidelines changed since the DEIS was prepared. Specifically, the noise model used in previous modeling, STAMINA 2.0, has been replaced by TNM 2.5. For consistency, the existing case and the No-Action Alternative were re-modeled using TNM as part of the assessment of the Major Moves Alternative.

Noise modeling results are shown in Table 4.8-1. As discussed above, the noise levels tabulated for the Existing, No-Action, and Major Moves Alternatives were obtained using TNM 2.5. The Alternative F4 (DEIS) results were obtained using the STAMINA 2.0 model. There are many technical differences between the two models that can cause results to differ. Source terms used for vehicle noise emissions are more refined in TNM, and TNM more accurately accounts for factors such as ground type, terrain, signals at intersections, and many others. STAMINA was generally considered to overpredict noise levels by about 3 dB compared to measured values, depending on the road configuration and traffic mix. TNM 1.0 was found to match measured noise values much more closely in most cases (See Appendix G of Menge et al. 1998²). In addition, several improvements were made to TNM between versions 1.0 and the current 2.5 that reduced TNM noise predictions further. For example, comparisons have shown that TNM 2.5 predicts lower noise levels than TNM 2.1 by up to 4.5 dB, depending on ground type and distance from road to receptor (Bowlby 2004³). Because of these differences in the models, existing results shown in Table 4.8-1 may be different than those shown in the DEIS for the same receptors.

Compared to existing conditions, projected noise levels would approach or exceed the noise abatement criteria at 4 additional receptors (51 receptors in all) under the No-Action Alternative. Projected noise levels at the receptors analyzed range from 54 decibels (dBA) to 72 dBA. No receptors are projected to experience a noise increase of greater than 2 dBA over existing (Table 4.8-1).

Compared to existing conditions as reported in the DEIS, project noise levels would approach or exceed the noise abatement criteria at 23 additional receptors (73 receptors in all) under the F4 Alternative. Projected noise levels at the receptors analyzed range from 59 dBA to 74 dBA.

² Menge, C., C. Rossano, G. Anderson, & C. Bajdek (1998). *FHWA Traffic Noise Model, Version 1.0 Technical Manual*, Prepared by U.S. DOT, Report numbers FHWA-PD-96-010 and DOT-VNTSC-FHWA-98-2, February.

³ Bowlby & Associates (2004). *FHWA Traffic Noise Model Short Course Workbook*, Rev. 6-04.