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TRAFFIC IMPACT FEE ANALYSIS

CITY OF NOBLESVILLE

DECEMBER 2015

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CERTIFICATION

I certify that this **TRAFFIC IMPACT FEE ANALYSIS** has been prepared by me and under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

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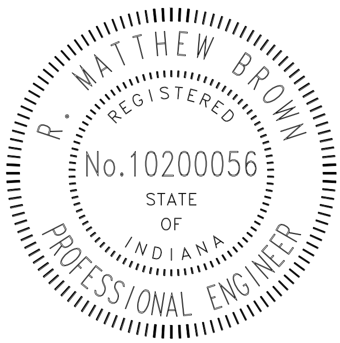

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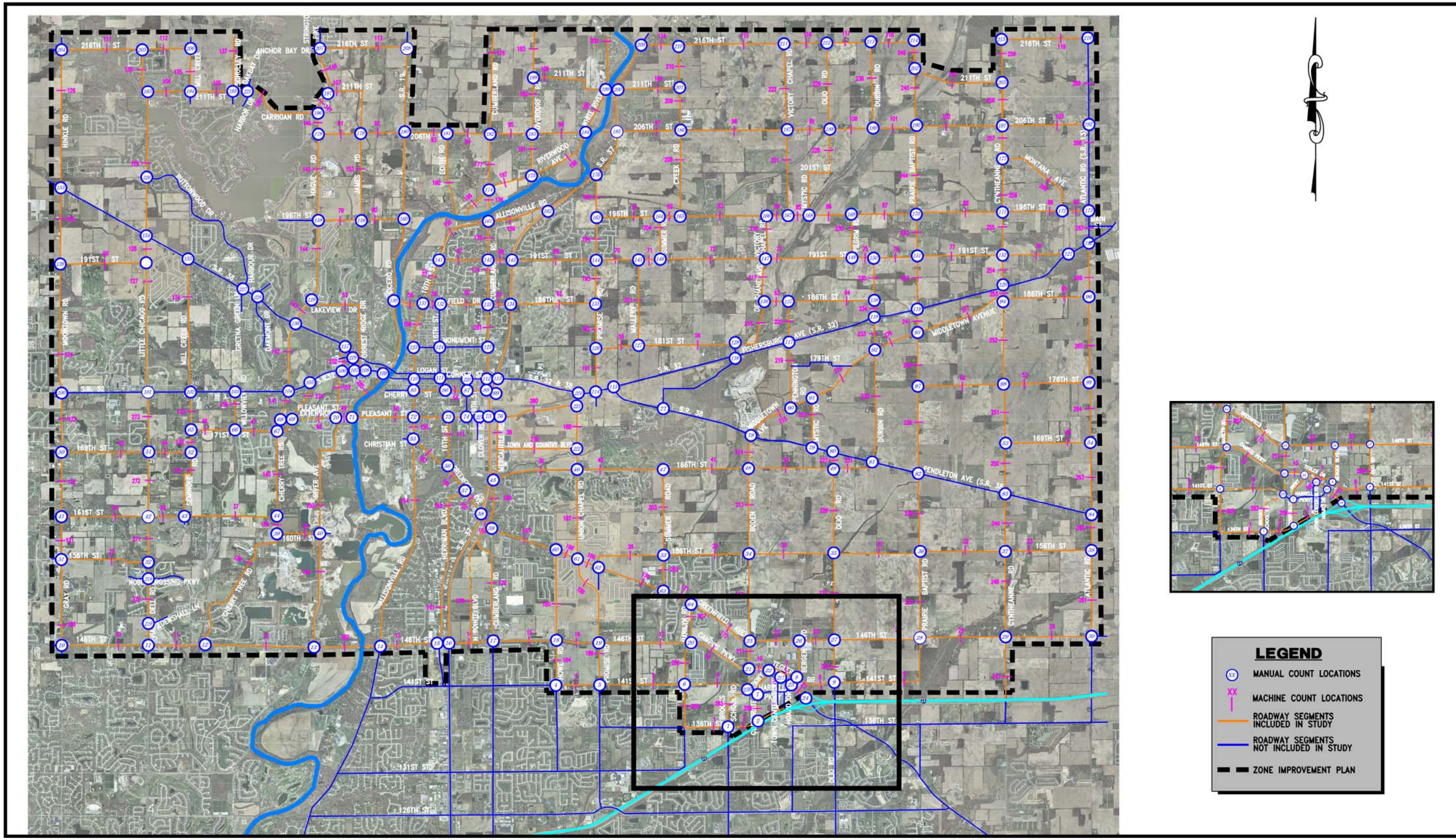

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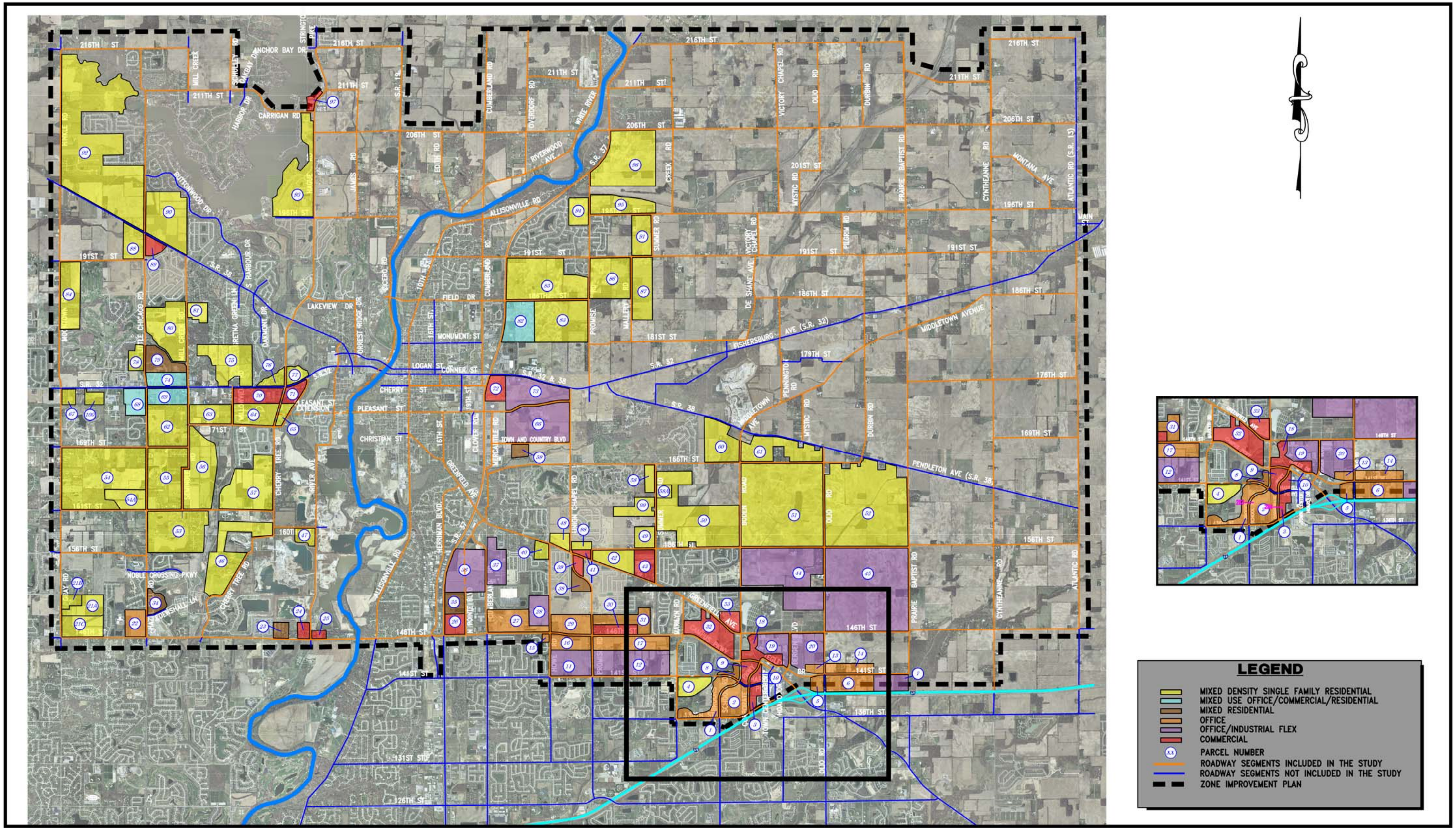
TRAFFIC IMPACT FEE ANALYSIS
NOBLESVILLE, INDIANA

FIGURE 1

STUDY AREA ROADWAY NETWORK



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TRAFFIC IMPACT FEE ANALYSIS
NOBLESVILLE, INDIANA

FIGURE 2
VACANT LAND PARCELS

INTRODUCTION

The City of Noblesville has undertaken a project to determine the adequacy for the amount of Traffic Impact Fees that can be assessed against future developments that will be constructed within the city limits. This analysis will project and evaluate the future impact of these developments on the roadway system. From the analysis, recommendations for the intersections and roadway segments within the study area will be made to accommodate the existing and future traffic volumes. Impact fees will then be determined based on the incremental improvements from existing recommendations to future recommendations.

PURPOSE

The purpose of this project is as follows:

Existing Conditions – Review the major street network as it presently exists within the study area. If necessary, intersection and roadway improvements will be recommended based on the existing traffic volumes. Estimated construction costs will be determined for the corresponding intersection and roadway improvements.

Projected 10-Year Conditions – Estimate the trips that could be generated by the vacant parcels of land and partially vacant parcels of land that existed in 2014 within the study area. These trips will then be added to the existing traffic volumes to project the 10-year traffic volumes that will use the City's roadway system. Intersection and roadway improvements will then be recommended based on these future traffic volumes. Estimated construction costs will be determined for the corresponding intersection and roadway improvements.

Impact Fee – Calculate an impact fee based on the estimated construction costs for the incremental improvements from existing conditions to the projected 10-year conditions, the cost of performing the impact fee study, the credit of any year to date Impact Fee funds that have been collected and the projected 24-hour trips that will be generated by the vacant land parcels.

STUDY AREA

The study area for this analysis has been determined based on guidelines set by the City of Noblesville. The area is bounded by 216th Street to the north, Gray Road/Moontown Road/Hinkle Road to the west, Atlantic Road to the east and 136th Street and 146th Street to the south. **Figure 1**, which is titled "Study Area Roadway Network" and is located at the front of this report, shows the intersections and roadway segments that are included in the study area. **Figure 2** shows the location of the vacant land parcels in reference to the study area roadway network.

SCOPE OF WORK

The scope of work for this analysis is as follows:

<u>Existing Conditions</u>

1. Determine the existing traffic volumes at all intersections and on all roadway segments.
2. Perform manual turning movement traffic counts at the existing study area intersections.
3. Perform 48-hour machine traffic counts along the existing study area roadway segments.
4. Inventory all existing study area intersections to determine traffic control and intersection geometrics.
5. Inventory all existing roadway segments to determine number of lanes, lane widths, shoulder widths and speed limits.
6. Prepare a capacity analysis for each intersection and each roadway segment using existing geometrics, existing traffic controls and existing traffic volumes. The capacity analysis will provide levels of service for each of the intersections and roadway segments which can be compared to the acceptable level of service standards.
7. Make recommendations to improve the intersections and roadway segments that are below acceptable levels of service.
8. Estimate construction costs based on the corresponding intersection and roadway improvements needed to accommodate the existing traffic volumes.

Projected 10-Year Conditions

1. Identify all of the vacant and partially vacant parcels of land within the study area and confirm the potential land uses for those parcels.
2. Estimate the number of AM peak hour and PM peak hour trips that will be generated by the potential use of each of these parcels.
3. Assign and distribute the generated trips for the peak hour periods throughout the street system.
4. Determine the total peak hour generated trips from all of the vacant parcels at each intersection and along each roadway segment of the study area roadway network.
5. Add the generated trips to the existing traffic volumes to project the 10-year traffic volumes.
6. Prepare a capacity analysis for each intersection and each roadway segment using the projected 10-year traffic volumes and any intersection/roadway improvements needed for the existing traffic volumes. The capacity analysis will provide levels of service for the roadway segments and intersections which can be compared to the acceptable level of service standards.
7. Make recommendations to improve the intersections and roadway segments that are below acceptable levels of service.
8. Estimate construction costs based on the corresponding roadway and intersection improvements needed to accommodate the projected 10-year traffic volumes.

Impact Fee

1. Estimate the 24-hour trips that will be generated by the potential use of each vacant parcel.
2. Determine the construction costs of the roadway segments and intersections based on the incremental improvements from existing recommendations to future recommendations. Add the cost of performing the impact fee study to the construction cost minus any year to date Impact Fee funds that have been collected, to obtain the total impact fee cost.
3. Divide the total impact fee cost by the total 24-hour trips to calculate the impact fee per trip.

EXISTING TRAFFIC DATA

Peak hour turning movement traffic volume counts were conducted at all of the study intersections by A&F Engineering Co., LLC. The counts include an hourly total of all "through" traffic and all "turning" traffic at the intersection. The counts were made during the hours of 6:00 AM to 9:00 AM and 4:00 PM to 7:00 PM in 2012 and 2013. The “Intersection Traffic Movements” figures in the **Exhibits** summarize the existing traffic volumes for the peak hours obtained from the manual counts. The raw data sheets for the intersection traffic counts are included in **Appendix A**.

Directional, machine traffic volume counts were conducted on all major existing roadway segments in the study area by A&F Engineering Co., LLC and the City of Noblesville in 2012 and 2013. Traffic volume counts were conducted for a period of approximately forty-eight hours and were averaged and summarized on an hourly basis for a twenty-four hour period. The total traffic over the averaged twenty-four hour period is referred to as the "Average Daily Traffic" (ADT). The "Roadway Segment Summary" figures in the **Exhibits** summarize the existing traffic volumes for the peak hours and the ADT obtained from the machine traffic counts. The raw data sheets for the roadway segment traffic counts are included in **Appendix B.**

EXISTING INTERSECTION INVENTORY

Each existing intersection within the study area was identified by the following characteristics:

- Traffic Controls
- Intersection Geometrics

These data have been graphically represented on the "Existing Intersection Conditions" figures in the **Exhibits.**

EXISTING ROADWAY SEGMENT INVENTORY

Each street within the study area is identified by dividing the roadway into segments to be analyzed. In general, each segment was chosen based on a change in traffic conditions or roadway characteristics. The characteristics that were included in the roadway segment analyses are:

- Number of Lanes
- Segment Length
- Speed Limits
- Percent No-Passing
- Presence of Median or Passing Lanes
- Peak Hour Factor (PHF)
- Average Daily Traffic (ADT)
- % Heavy Vehicles
- Directional Split of Traffic

These data, along with the results from the roadway segment capacity analyses, are shown on the "Roadway Segment Summary" figures in the **Exhibits.**

VACANT LAND PARCELS – PROPOSED USES

The vacant parcels of land to be included in this analysis were identified by the City of Noblesville and are illustrated on **Figure 2.** The current Comprehensive Plan and the Future Land Use Map were used along with direction from the City of Noblesville Planning Department to develop land use and density determinations for each parcel of vacant land.

SITE GENERATED TRIPS

An estimate of traffic anticipated to be generated by each of the vacant parcels is a function of the size and character of the land use. *ITE Trip Generation Manual (9th)*[1] was used to calculate the total number of trips expected to be generated by each land use for the adjacent street during the AM peak hour, PM peak hour and twenty-four hour weekday period. This report is a compilation of trip data for various land uses as collected by transportation professionals throughout the United States in order to establish the average number of trips generated by those land uses. Based on the comprehensive plan as well as data taken from *ITE Trip Generation Manual (9th)*, the classifications and descriptions for each of the vacant parcel uses applicable to this study are as follows:

Single Family: Single-family land use is defined as all single-family detached homes on individual lots. A typical example of this land use is a suburban subdivision.

Multi-Family: Multi-family land use includes apartments, townhomes and residential condominiums. An apartment residence is defined as a dwelling unit that is located in the same building with three other land uses and includes general apartment, low-rise apartments, mid-rise apartments and high-rise apartments. Townhomes are defined as dwelling units with a minimum of two attached units per building structure and units are not stacked on top of one another. Townhomes can be either rented or owned. Condominiums are defined as dwelling units within the same building of at least one other dwelling unit and are owned rather than rented.

Retail: The retail land use within this analysis is defined as an integrated group of commercial establishments that are planned, developed, owned and managed as a shopping center. Also includes free standing commercial units/service institutions. A shopping center provides on-site parking facilities sufficient to serve its own parking demands.

[1] *Trip Generation Manual*, Institute of Transportation Engineers, Ninth Edition, 2012.

Office: The office land uses within this analysis include general office and medical office. General office land use houses multiple tenants and is a location where affairs of businesses commercial or industrial organizations, or professional persons or firms are conducted. Medical office land use is defined as a facility that provides diagnoses and outpatient care on a routine basis but is unable to provide prolonged in-house medical and surgical care.

Light Industrial: Light industrial facilities are free-standing facilities devoted to a single use. The facilities have an emphasis on activities other than manufacturing and typically have minimal office space. Typical light industrial activities include printing, material testing and assembly of data processing equipment.

Office/Flex: The office/flex land use within this analysis was analyzed as a business park. Business park land use consists of a group of flex-type one or two-story buildings served by a common roadway system. The tenant space is flexible and houses a variety of uses. The space may include offices, retail and wholesale stores, restaurants, recreational areas and warehousing, manufacturing or light industrial uses.

PASS-BY TRIPS

The vacant parcels that include retail uses will attract pass-by trips. Pass-by trips are trips already on the roadway system that are captured by a proposed development. *ITE Trip Generation Handbook* provides procedures and data that can be used to estimate the reduction in trips for the retail land uses. The reduction in trips is a function of the size of the retail development. A pass-by reduction was considered for each retail parcel on an individual basis using the pass-by trip data in the *ITE Trip Generation Manual (9th).*

INTERNAL TRIPS

In multi-land use developments, there will be trips to individual land uses that are generated from within the development. These internal trips will be second and third stops, which never use the public street system. Internal trips were considered negligible in order to obtain a worst case traffic scenario. For the vacant land parcels within the study area that included a significant amount of mixed-use developments, a 20% or 30% internal trip rate was applied based on the methods outlined in the *ITE Trip Generation Manual (9th).*

ASSIGNMENT & DISTRIBUTION OF GENERATED TRIPS

To determine the volumes of traffic that will be added to the impact study street system, the generated traffic must be assigned and distributed by direction to the public roadway at its intersection with the access points, and then to each of the intersections throughout the study area. For each of the vacant parcels within the study area, the assignment and distribution was based on the existing traffic patterns, the location of patrons in relation to the individual parcels and the proposed street system within the study area. The assignment and distribution of the generated traffic for each parcel was expedited by using the *PTV VISUM 14*[2], a state-of-the-art transportation planning software package that utilizes origin-destination pairs and allows for changes in the roadway system and driver behavior to be considered when future traffic flows are to be determined.

PROJECTED 10-YEAR TRAFFIC VOLUMES

The current Comprehensive Plan and the Future Land Use Map were used along with direction from the City of Noblesville Planning Department to develop land use and density determinations for each parcel of vacant land. The generated traffic volumes from each parcel were totaled for both the AM peak hour and the PM peak hour at each of the study intersections and roadway segments. These generated volumes were then added to the existing traffic volumes at each intersection and roadway segment to obtain the 10-year traffic volumes. The projected 10-year traffic volumes are summarized for the AM peak hour and PM peak hour for each intersection on the "Intersection Traffic Movements" figures in the **Exhibits** and for each roadway segment on the "Roadway Segment summary" figures in the **Exhibits**.

[2] *PTV VISUM 14*, PTV Group, 2014.

CAPACITY ANALYSIS

The "efficiency" of an intersection or roadway segment is based on its ability to accommodate the traffic volumes that approach the intersection or that travel along the roadway. It is defined by the Level-of-Service (LOS) of the intersection or roadway segment. The LOS is determined by a series of calculations commonly called a "capacity analysis". Input data into a capacity analysis include traffic volumes, intersection geometry, number and use of lanes and, in the case of signalized intersections, traffic signal timing. To determine the LOS at each of the study intersections, a capacity analysis has been made using the recognized computer program *Synchro*[3]. This program allows multiple intersections to be analyzed and optimized using the capacity calculation methods outlined within the *Highway Capacity Manual (HCM)*[4]. To determine the LOS at each of the roadway segments, a capacity analysis has been performed using the computer program *HIGHPLAN,* which uses the capacity calculation methods outlined within the *Highway Capacity Manual (HCM)* for two-lane and multi-lane roadway segments.

DESCRIPTION OF LEVELS OF SERVICE – INTERSECTIONS

The Level of Service (LOS) for an intersection is based on the typical delay (in seconds) that a vehicle would experience at the intersection. The following data obtained from the *Highway Capacity Manual (HCM)* describes delays related to the levels of service for signalized intersections:

Level of Service A - describes operations with a very low delay, less than or equal to 10.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.

Level of Service B - describes operations with delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression. More vehicles stop than LOS A, causing higher levels of average delay.

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[3] *Synchro 6.0*, Trafficware, 2003.

[4] *Highway Capacity Manual (HCM)* Transportation Research Board, National Research Council, Washington, DC, 2000.

Level of Service C - describes operation with delay in the range of 20.1 seconds to 35.0 seconds per vehicle. These higher delays may result from failed progression. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of Service D - describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combinations of unfavorable progression. Many vehicles stop, and the proportion of vehicles not stopping declines.

Level of Service E - describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression and long cycle lengths.

Level of Service F - describes operations with delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The following list, obtained from the *Highway Capacity Manual (HCM),* shows the delays related to the levels of service for unsignalized intersections:

Level of Service	Control Delay (seconds/vehicle) UNSIGNALIZED
A	Less than or equal to 10
B	Between 10.1 and 15
C	Between 15.1 and 25
D	Between 25.1 and 35
E	Between 35.1 and 50
F	greater than 50

DESCRIPTION OF LEVELS OF SERVICE – ROADWAYS

HIGHPLAN computer software was used to determine the Level of Service (LOS) for the two-lane roadway segments (one travel lane in each direction) and multilane roadway segments (more than one travel lane in each direction) in this study. In the *HIGHPLAN* software, the LOS for the two-lane roadway segments for developed areas is based on the percentage free flow speed (the percentage of speed traveled in relation to the posted speed limit) that can be obtained over the segment. As for multilane roadway segments, the LOS is based on the density (passenger cars per mile per lane) of the segment.

HIGHPLAN is FDOT's (Florida Department of Transportation) planning and preliminary engineering software for two-lane and multilane uninterrupted flow highways. *HIGHPLAN* utilizes the following roadway variables in the determination of the LOS for two-lane and multilane roadway segments:

- Number of Lanes
- Segment Length
- Speed Limit
- Percent No-Passing
- Presence of Median or Passing Lanes
- Peak Hour factor (PHF)
- Average Daily Traffic (ADT)
- % Heavy Vehicles
- Directional Split of traffic

The following tables show the criteria used by *HIGHPLAN* in determining the level of service for two-lane roadway segments and multilane roadway segments.

LOS Thresholds for Two-Lane Roadway Segments		
Level of Service	Percentage of Free Flow Speed (%)	Minimum Speed (mph)
A	≥ 92	45
B	83-91.9	35
C	75-82.9	35
D	67-74.9	35
E	≤ 67 or v/c ≥ 1.0	35
F	v/c ≥ 1.0	35

LOS Thresholds for Multilane Roadway Segments		
Level of Service	Density (pc/mi/ln)	Speed (mph)
A	≤ 11	ALL
B	11.1-18	ALL
C	18.1-26	ALL
D	26.1-35	ALL
E	35.1-45	45-60
F	> 45	45-60

ACCEPTABLE LEVEL OF SERVICE STANDARDS

The City of Noblesville has established a minimum acceptable level of service (LOS) standard that was used when performing the capacity analyses for the study intersections and roadway segments. Level of service "D" has been selected for this study as the minimum acceptable LOS for intersections and roadway segments. Improvements were recommended for both the existing traffic volumes and the projected 10-year traffic volumes so that each study intersection/segment will meet the minimum acceptable level of service.

RECOMMENDED IMPROVEMENT CRITERIA

Improvements were recommended for both the existing traffic volumes and the projected 10-year traffic volumes so that each study intersection/segment will meet the minimum acceptable levels of service. The recommended improvements of this report are subject only to include those regarding the capacity of each study intersection/segment. Impact Fees are calculated based on the improvements needed to enhance the capacity of each intersection/segment, and the recommendations found in this report are based on improving said capacity. Recommended improvements can include: the addition of travel lanes, intersection turn lanes, and changes in intersection control. Improvements required based on safety or other non-capacity related issues were not addressed in the recommendations of this report.

ESTIMATED CONSTRUCTION COSTS

Table 1 is a summary of the estimated construction costs that will be required to bring the intersections up to design standards to accommodate either the existing traffic volumes or the projected 10-year traffic volumes. The table shows the estimated construction costs associated with the improvements needed to mitigate the existing traffic volumes (Today's Cost), the estimated construction costs associated with planned/proposed improvements and the improvements needed to mitigate the projected 10-year traffic volumes based on existing conditions (10-Year Cost) and the difference between the estimated future cost and the estimated existing mitigated cost (Applicable Impact Fee Cost). All construction estimates are based on year 2015 costs.

Table 2 is a summary of the estimated construction costs that will be required to bring the roadways up to design level of service standards to accommodate either the existing traffic volumes or the projected 10-year traffic volumes. The table shows the estimated construction costs associated with the improvements needed to mitigate the existing traffic volumes (Today's Cost), the estimated construction costs associated with the improvements needed to mitigate the projected 10-year traffic volumes based on existing conditions (10-Year Cost) and the difference between the estimated future cost and the estimated existing mitigated cost (Applicable Impact Fee Cost). All construction estimates are based on year 2015 costs.

TABLE 1 – ESTIMATED INTERSECTION CONSTRUCTION COSTS

#	Intersection	Today's Cost	Ten-year Cost	Applicable Impact Fee Cost
5	141st Street & Promise Road	$0	$527,794	$527,794
11	146th Street & Hazel Dell Road	$0	$1,082,086	$1,082,086
13	146th Street & River Road	$121,000	$786,601	$665,601
14	146th Street & Allisonville Road	$0	$862,623	$862,623
15	146th Street & Herriman Blvd	$0	$175,315	$175,315
16	146th Street & SR 37	$0	$779,464	$779,464
17	146th Street & Cumberland Road	$0	$1,099,239	$1,099,239
21	146th Street/Campus Pkwy & Boden Road	$0	$2,939,382	$2,939,382
23	Campus Pkwy & Harrell Pkwy/Bergen Blvd	$0	$2,367,088	$2,367,088
25	146th Street/Greenfield Avenue & Boden Road	$0	$2,483,372	$2,483,372
26	146th Street & Bergen Pkwy	$0	$217,500	$217,500
27	146th Street & Olio Road	$0	$3,171,783	$3,171,783
31	156th Street & Gray Road	$0	$408,578	$408,578
33	156th & Summer Road	$0	$1,047,405	$1,047,405
34	156th Street & Boden Road	$0	$1,752,366	$1,752,366
40	160th Street & River Road	$0	$679,982	$679,982
41	161st Street & Gray Road	$0	$1,375,328	$1,375,328
42	161st Street & Hazel Dell Road	$0	$591,290	$591,290
47	166th Street & Summer Road	$0	$1,033,333	$1,033,333
48	166th Street & Boden Road	$0	$732,425	$732,425
55	10th Street/Allisonville Road & Christian Street/Greenfield Avenue	$0	$1,808,060	$1,808,060
57	Herriman Blvd & Greenfield Avenue	$0	$1,609,961	$1,609,961
58	SR 37 & Greenfield Avenue	$0	$442,600	$442,600
60	Greenfield Avenue & Howe Road	$0	$1,515,734	$1,515,734
61	Union Chapel Road & Greenfield Avenue	$0	$910,680	$910,680
62	Promise Road & Greenfield Avenue	$0	$217,500	$217,500
63	Summer Road & Greenfield Avenue	$0	$895,242	$895,242
64	Marilyn Road & Greenfield Avenue	$0	$2,612,286	$2,612,286
69	Cherry Tree Rd & Pleasant Street (Proposed)	$0	$614,702	$614,702
72	10th Street & Pleasant Street	$0	$2,084,480	$2,084,480
74	19th Street & Pleasant Street	$0	$653,125	$653,125
75	SR 37 & Pleasant Street	$0	$395,186	$395,186
76	Mercantile Rd & Pleasant Street	$0	$802,045	$802,045
85	10th Street & Cherry Street	$0	$693,334	$693,334
100	SR 32 & Moontown Road/Gray Road	$0	$133,217	$133,217
102	SR 32 & Mill Creek Road	$0	$1,287,731	$1,287,731
103	SR 32 & Willowview Road	$0	$113,217	$113,217

#	Intersection	Today's Cost	Ten-year Cost	Applicable Impact Fee Cost
105	SR 32 & Cherry Tree Road	$0	$113,217	$113,217
106	SR 32 & River Road	$0	$840,304	$840,304
110	Conner Street/SR 32/38 & 10th Street	$0	$155,758	$155,758
114	SR 32/38 & Promise Road	$0	$444,952	$444,952
130	Field Drive & Cicero Road	$0	$1,406,500	$1,406,500
133	Field Drive & Cumberland Road	$0	$245,568	$245,568
134	186th Street & SR 37	$217,500	$0	-$217,500
143	191st Street & SR 37	$0	$113,217	$113,217
144	191st Street & Promise Road	$0	$514,512	$514,512
155	SR 38 & Mill Creek Road	$0	$263,217	$263,217
157	SR 38 & River Road	$217,500	$0	-$217,500
160	196th Street & Cicero Road	$0	$263,217	$263,217
176	SR 37 & Promise Road	$0	$263,217	$263,217
178	206th Street & Hague Road	$0	$399,292	$399,292
193	211th Street & Little Chicago Road	$0	$119,956	$119,956
226	Little Chicago Road & Buttonwood Drive	$0	$61,696	$61,696
227	SR 38 & Gretna Green Lane/S Harbour Drive	$0	$764,204	$764,204
228	SR 38 & Whitcomb Place	$0	$719,230	$719,230
229	SR 38 & Logan St	$0	$922,990	$922,990
-	Logan Street Signal Improvements	$0	$240,000	$240,000
	TOTALS	**$556,000**	**$48,753,101**	**$48,197,101**

LOGAN STREET SIGNAL SYSTEM IMPROVEMENTS

It is anticipated that the following existing signalized intersections along Logan Street will be upgraded with new interconnect signal controllers, detection system, and pedestrian push buttons.

1. Logan Street & 6th Street
2. Logan Street & 7th Street
3. Logan Street & 8th Street

The 10-year cost for these improvements is estimated to be $240,000 ($80,000 per intersection) and has been included in the impact fee cost.

TABLE 2 – ESTIMATED ROADWAY CONSTRUCTION COSTS

#	Street	Location	Today's Cost	Ten-year Cost	Applicable Impact Fee Cost
6*	141st Street	Marilyn Rd - Brooks School Rd	$2,719,141	$2,719,141	$0
10	146th Street	Gray Rd - Hazel Dell Rd	$0	$2,770,620	$2,770,620
11	146th Street	Hazel Dell Rd - Cherry Tree Rd	$0	$1,683,323	$1,683,323
12	146th Street	Cherry Tree Rd – River Rd	$0	$3,426,081	$3,426,081
13	146th Street	Allisonville Rd - SR 37	$0	$2,186,341	$2,186,341
14	146th Street	SR 37 - Cumberland Rd	$0	$1,343,898	$1,343,898
15	146th Street	Cumberland Rd - Howe Rd	$0	$1,996,679	$1,996,679
16	146th Street	Howe Rd - Promise Rd	$0	$1,333,050	$1,333,050
17	146th Street	Promise Rd - Marilyn Rd	$0	$2,684,745	$2,684,745
18	Campus Pkwy	Marilyn Rd - Boden Rd	$0	$2,554,958	$2,554,958
21	Campus Pkwy	Bergen Blvd - I-69 SB Ramp	$0	$309,266	$309,266
22	146th Street	Boden Rd - Bergen Blvd	$0	$2,206,975	$2,206,975
23	146th Street	Bergen Blvd - Olio Rd	$0	$940,776	$940,776
48*	Pleasant Street	Hague Rd - River Rd	$4,280,555	$4,280,555	$0
49*	Pleasant Street	River Rd - 2nd Street	$2,619,445	$2,619,445	$0
50a	Pleasant Street	2nd Street - 8th Street	$0	$870,870	$870,870
50b	Pleasant Street	8th Street - 10th Street	$0	$332,980	$332,980
51a	Pleasant Street	10th Street - 19th Street	$0	$1,861,171	$1,861,171
51b	Pleasant Street	19th Street - SR 37	$0	$679,950	$679,950
58	Field Drive	SR 19 - Allisonville/10th St	$0	$753,280	$753,280
141*	Hague Road	171st Street - SR 32	$2,670,908	$2,670,908	$0
154a	10th Street	146th Street - Westminster Dr	$0	$2,273,585	$2,273,585
155	10th Street	Greenfield Ave - Pleasant Street	$0	$652,534	$652,534
163	Greenfield Ave	10th Street - 16th Street	$0	$1,289,964	$1,289,964
164	Greenfield Ave	16th Street - Herriman Blvd	$0	$798,826	$798,826
165	Greenfield Ave	Herriman Blvd - SR 37	$0	$895,601	$895,601
166	Greenfield Ave	SR 37 - Cumberland Rd	$0	$446,506	$446,506
167	Greenfield Ave	Cumberland Rd - Howe Rd	$0	$1,989,295	$1,989,295
168	Greenfield Ave	Howe Rd - Union Chapel Rd	$0	$571,910	$571,910
169	Greenfield Ave	Union Chapel Rd – Promise Rd	$0	$585,525	$585,525
170	Greenfield Ave	Promise Rd & Summer Rd	$0	$2,011,714	$2,011,714
171	Greenfield Ave	Summer Rd - Marilyn Rd	$0	$814,489	$814,489
172	Greenfield Ave	Marilyn Rd - Boden Rd	$0	$1,993,128	$1,993,128
179b	Cumberland Rd	SMC Blvd - Cumberland Pointe Blvd	$0	$1,442,075	$1,442,075
207	Marilyn Rd	146th Street - Greenfield Ave	$0	$1,129,661	$1,129,661
212b	Boden Rd	Beauty Berry Ln - 156th Street	$0	$1,640,415	$1,640,415
213	Boden Rd	156th Street - 166th Street	$0	$2,433,839	$2,433,839
224*	Olio Rd	141st Street - 146th Street	$2,357,609	$2,357,609	$0
225	Olio Rd	146th Street - 156th Street	$0	$2,355,804	$2,355,804

#	Street	Location	Today's Cost	Ten-year Cost	Applicable Impact Fee Cost
226	Olio Rd	156th Street - 166th Street	$0	$2,347,326	$2,347,326
227	Olio Rd	166th Street - SR 38	$0	$468,125	$468,125
282	146th Street	River Road - Allisonville	$0	$1,750,053	$1,750,053
283A*	Brooks School Rd	136th Street - Harrell Pkwy	$1,170,909	$1,170,909	$0
283B*	Brooks School Rd	Harrell Pkwy - Campus Pkwy	$1,129,091	$1,129,091	$0
284*	Corporate Pkwy	136th Street - Harrell Pkwy	$909,890	$909,890	$0
285*	Cicero Rd	Pleasant St -SR 32	$1,667,877	$1,667,877	$0
TOTALS			**$19,525,426**	**$75,350,763**	**$55,825,336**

*PROPOSED ROADWAY SEGMENTS

TOTAL COSTS

Table 3 summarizes the total "Today's Cost" and "10-Year Cost" for the study area intersections and roadways. In addition, the Total Applicable Impact Fee Cost is shown. This cost is the difference between the "10-Year Cost" for intersections and roadways and the intersection and roadway "Today's Cost".

TABLE 3 – TOTAL COSTS

	Today's Cost	10-Year Cost
Intersections (Table 1)	$556,000	$48,753,101
Roadways (Table 2)	$19,525,426	$75,350,763
Total Cost	$20,081,426	$124,103,864
Total Applicable Impact Fee Cost (10-Year Cost – Today's Cost)		**$104,022,438**

PARCEL 24-HOUR TRIPS

In order to determine an impact fee per trip, the total number of trips that will be generated during a 24-hour weekday period for each of the vacant parcels has been determined. **Table 4** identifies each of the vacant parcels, the assumed land use, parcel 10-year build-out size and the resulting number of calculated twenty-four hour weekday trips for each parcel of land analyzed in this study.

TABLE 4 – SUMMARY OF 24-HOUR TRIPS

Parcel #	Land Use	ITE Code	Parcel Size	24-Hour Trips
1	Office	710	57,960 SF	**867**
2	Office	710	71,060 SF	**1,013**
3	Retail	820	80,808 SF	**5,913**
4	Single-Family	210	151 DU	**1,534**
5	Office	710	37,080 SF	**618**
6	Office	710	35,765 SF	**601**
7	Business Park	770	30,426 SF	**379**
8	Office	710	12,820 SF	**276**
9	Retail	820	84,312 SF	**6,078**
10	Retail	820	45,288 SF	**4,058**
11	Business Park	770	169,596 SF	**2,110**
12	Business Park	770	310,716 SF	**3,865**
13	Office	710	14,170 SF	**297**
14	Office	710	41,260 SF	**670**
15	Office	710	5,090 SF	**56**
16	Office	710	156,870 SF	**1,848**
17	Office	710	144,075 SF	**1,733**
18	Retail	820	104,304 SF	**6,979**
19	Business Park	770	528,528 SF	**6,329**
20	Business Park	770	928,320 SF	**10,574**
21a	Single-Family	210	127 DU	**1,309**
21b	Single-Family	210	76 DU	**816**
21c	Single-Family	210	271 DU	**2,628**
22	Office	710	247,250 SF	**2,612**
23	Multi-Family	220	92 DU	**681**
24	Retail	820	63,720 SF	**5,067**
25	Retail	820	37,260 SF	**3,575**
26	Retail	820	153,426 SF	**8,970**
27	Office	710	666,260 SF	**5,548**
28	Business Park	770	455,532 SF	**5,553**
29	Office	710	203,580 SF	**2,253**
30	Retail	820	58,335 SF	**4,784**
31	Office	710	176,725 SF	**2,024**
32	Retail	820	317,160 SF	**14,380**
33	Retail	820	71,880 SF	**5,479**

Parcel #	Land Use	ITE Code	Parcel Size	24-Hour Trips
34	Multi-Family	220	220 DU	**1,457**
35	Multi-Family	220	352 DU	**2,257**
36	Business Park	770	170,580 SF	**2,122**
37	Business Park	770	387,558 SF	**4,821**
38	Multi-Family	220	368 DU	**2,354**
39	Retail	820	39,480 SF	**3,712**
40	Single-Family	210	15 DU	**183**
41	Retail	820	2,985 SF	**694**
42	Single-Family	210	112 DU	**1,166**
43	Retail	820	318,900 SF	**14,432**
44	Business Park	770	837,792 SF	**9,613**
45	Business Park	770	2,227,896 SF	**24,376**
46	Single-Family	210	189 DU	**1,886**
47	Single-Family	210	24 DU	**283**
48	Single-Family	210	16 DU	**195**
49	Single-Family	210	100 DU	**1,050**
50	Single-Family	210	744 DU	**6,655**
51	Single-Family	210	1,065 DU	**9,256**
53	Single-Family	210	151 DU	**1,534**
52	Single-Family	210	206 DU	**2,042**
54	Single-Family	210	1,123 DU	**9,719**
54a	Single-Family	210	144 DU	**1,469**
55	Single-Family	210	411 DU	**3,855**
56	Single-Family	210	468 DU	**4,344**
57	Single-Family	210	173 DU	**1,739**
58	Single-Family	210	80 DU	**855**
58a	Single-Family	210	70 DU	**756**
59	Townhouse	230	130 DU	**808**
60	Single-Family	210	99 DU	**1,041**
61	Single-Family	210	115 DU	**1,194**
62	Single-Family	210	130 DU	**1,337**
63	Single-Family	210	63 DU	**687**
64	Single-Family	210	87 DU	**924**
65	Single-Family	210	20 DU	**239**
66	Business Park	770	1,862,730 SF	**20,498**
67	Single-Family	210	7 DU	**91**
68a	Office	710	16,780 SF	**338**
68b	Retail	820	10,068 SF	**1,527**
68c	Single-Family	210	6 DU	**79**
69a	Office	710	19,290 SF	**376**
69b	Retail	820	11,574 SF	**1,671**
69c	Single-Family	210	7 DU	**91**
70	Retail	820	200,370 SF	**10,669**
71	Retail	820	89,550 SF	**6,321**

Parcel #	Land Use	ITE Code	Parcel Size	24-Hour Trips
72a	Retail	820	120,000 SF	**7,645**
72b	Automotive Sales	841	30,000 SF	**969**
72c	Drive-In Bank	912	3,000 SF	**444**
72d	High-Turnover Restaurant	932	12,000 SF	**1,526**
73	Business Park	770	1,155,960 SF	**12,992**
74a	Office	710	83,183 SF	**1,141**
74b	Retail	820	49,910 SF	**4,323**
74c	Single-Family	210	29 DU	**336**
75	Single-Family	210	393 DU	**3,699**
76	Single-Family	210	9 DU	**115**
77	Single-Family	210	9 DU	**115**
78	Single-Family	210	34 DU	**389**
79	Multi-Family	220	70 DU	**548**
80	Single-Family	210	234 DU	**2,296**
81	Single-Family	210	84 DU	**895**
82a	Office	710	72,053 SF	**1,023**
82b	Retail	820	43,232 SF	**3,937**
82c	Single-Family	210	25 DU	**293**
83	Single-Family	210	69 DU	**746**
84	Single-Family	210	42 DU	**473**
85	Single-Family	210	137 DU	**1,403**
86	Single-Family	210	52 DU	**575**
87	Single-Family	210	20 DU	**239**
88	Single-Family	210	60 DU	**656**
89	Retail	820	36,900 SF	**3,552**
90	Single-Family	210	497 DU	**4,591**
91	Single-Family	210	12 DU	**149**
92	Single-Family	210	272 DU	**2,637**
93	Single-Family	210	71 DU	**766**
94	Single-Family	210	34 DU	**389**
95	Single-Family	210	17 DU	**206**
96	Single-Family	210	188 DU	**1,877**
97	Retail	820	12,474 SF	**1,755**
98	Townhouse	230	28 DU	**21**
99	Single-Family	210	115 DU	**1,194**
100	Single-Family	210	41 DU	**462**
TOTAL				**346,570**

Notes:

- DU = Dwelling Unit, SF = Square Feet

IMPACT FEE

The method used for determining the impact fee is based on the sum of the impact fee construction costs for all study intersections and roadways added to the cost of performing the impact fee study minus any year to date Impact Fee funds that have been collected. This results in the "Total Impact Fee Cost". The total impact fee cost is then divided by the total number of 24-hour trips that will be generated by the vacant land parcels. **Table 5** shows the calculation for the impact fee.

TABLE 5 – CALCULATION OF IMPACT FEE

Total Applicable Impact Fee Cost	**$104,022,438**
Cost of Performing Impact Fee Study	$642,000
Total Impact Fee Cost	$104,644,438
YTD Impact Fee Receipts	-$11,563,045
Total Impact Fee Cost	**$93,101,393**
24-Hour Trips from vacant Land Parcels	346,570
Impact Fee per 24-Hour Generated Trip (Equals Total Impact Fee Cost divided by the 24-hour trips)	**$269**

ANNUAL IMPACT FEE EVALUATION

The estimated construction costs that have been used to determine the impact fees presented in this report are based on year 2015 construction costs. Therefore, it may be necessary to re-evaluate the impact fee on an annual basis to reflect the annual inflation of costs for intersection and road construction or any major changes in the proposed land uses.

EXAMPLES OF TYPICAL IMPACT FEES COLLECTED

For all land uses, the number of 24-hour trips generated by each new development for a typical weekday would need to be determined on a case by case basis using the methods and procedures outlined in the most recent editions of the *ITE Trip Generation Manual (9th)* and the *ITE Trip Generation Handbook*. The generated 24-hour trip number for the new development is then multiplied by the $269 fee per trip to determine the collected fee. **Table 6** shows the typical impact fees that would be collected for a variety of land uses. For each land use the table lists the ITE Code classification, a range of typical sizes, the 24-hour weekday trips generated by each size and the resulting impact fee to be collected. It should be noted that the land uses listed in the table are only a small sample of the different types of land uses classified by the *ITE Trip Generation (9th)* report.

TABLE 6 – EXAMPLES OF TYPICAL FEES COLLECTED PER OTHER LAND USES

Land Use	ITE Code	Size	24-Hour Trips	Impact Fee per 24-hour Trip	Impact Fee Collected
Single-Family	210	10 DU	126	$269	$33,894
		20 DU	239	$269	$64,291
		30 DU	347	$269	$93,343
Multi-Family Apartments	220	100 DU	730	$269	$196,370
		200 DU	1,336	$269	$359,384
		300 DU	1,942	$269	$522,398
Business Park	770	200,000 SF	2,488	$269	$669,272
		300,000 SF	3,732	$269	$1,003,908
		400,000 SF	4,976	$269	$1,338,544
General Office	710	50,000 SF	775	$269	$208,475
		100,000SF	1,313	$269	$353,197
		200,000 SF	2,223	$269	$597,987
General Retail	820	50,000 SF	2,856	$269	$768,264
		100,000SF	4,482	$269	$1,205,658
		200,000 SF	7,033	$269	$1,891,877

Notes

DU = Dwelling Unit, SF = Square Feet

*Retail land uses attract pass-by trips. Therefore, the trips shown above represent the total number of non pass-by 24-hour trips. The pass-by percentage of trips varies by the size of the retail development.

The generated 24-hour trips for a typical weekday were determined by using the methods and procedures outlined in the most recent editions of the *ITE Trip Generation Manual* (9th Edition) and the *ITE Trip Generation Handbook* (August 2014). The trip report is a compilation of trip data for various land uses as collected by transportation professionals throughout the United States in order to establish the average number of trips generated by those land uses. The handbook provides the procedures and data used to estimate the pass-by traffic reductions for the retail land use.

RATIONAL NEXUS THEORY

The City of Noblesville selected A&F Engineering to provide the engineering assessment required to develop an appropriate impact fee schedule based on the future roadway needs of the City. This impact fee will be used to upgrade and replace the existing intersections and roads and to provide Noblesville residents with safe and uninterrupted travel through the City.

In order to develop a meaningful impact fee study, the Rational Nexus Theory was implemented. This analysis determines the impact fee schedule that would be required to fund the future roadway needs of the City. The Rational Nexus Theory simply states that new developments cannot be held responsible for the existing inadequacy of the street system. Therefore, this study was developed in two separate parts. The first part determined the existing inadequacy of the intersections and roadways in the study area and assigned costs to bring those intersections/roadways up to acceptable standards to accommodate the existing traffic volumes. The second part of the analysis determined the traffic volumes that would be generated by the vacant parcels of land within the study area. The generated traffic volumes were assigned to the street system in the study area. The projected future traffic volumes were then used to test the street system to determine the improvements to the intersections and roadways that would be necessary to accommodate the added traffic volumes. Costs were then calculated that would be required to upgrade the street system from the existing conditions to the proposed design. Finally, the total existing mitigated cost was subtracted from the total future mitigated cost. This amount is the cost the development community will be required to fund to meet the future needs of the City. The resulting impact fee cost is $269 per trip during a twenty-four hour period.

In determining the results of this analysis, A&F Engineering has followed acceptable traffic and transportation engineering methodologies that are pertinent and has completed this study by following the Rational Nexus Theory to its complete understanding.

SUMMARY TABLES FOR INTERSECTIONS

A tabular summarization of the analysis considering each study intersection is shown in the following pages. The existing intersection conditions and existing level of service (LOS) results are shown in the top left-hand corner under the heading "Existing Conditions". The existing conditions include the existing traffic control and existing intersection geometrics. The existing intersection geometrics are illustrated as black arrows along each approach of the intersection. Each arrow represents one lane along the approach and the traffic movements that can be made from that lane. An in-depth illustration of the existing intersection conditions is also shown in the **Exhibits**. The existing LOS results are based on the existing traffic control, existing intersection geometrics and the existing AM peak hour and PM peak hour traffic volumes. The existing intersection traffic volumes for the peak hours can be found on the "Intersection Traffic Movements" figures in the **Exhibits**.

Level of service "D" has been selected for this study by the City of Noblesville as the minimum acceptable LOS for intersections. If necessary, mitigated conditions for the existing traffic volumes have been recommended for intersections that currently operate below the minimum acceptable LOS. These conditions and the resulting levels of service are shown at the top under the heading "Mitigated Conditions for Existing Traffic Volumes". Black arrows represent lanes that are present under the existing conditions, red arrows represent lanes that are in addition to the existing intersection geometrics, and green arrows represent lanes that are in addition to the existing geometrics but the costs associated with this lane have been included in segments mitigation costs. A description of the improvements needed to mitigate the existing traffic volumes is listed below along with the estimated construction cost for those improvements (Today's Cost).

The projected 10-year traffic volumes for the AM peak hour and PM peak hour have been determined for each intersection and can be found on the "Intersection Traffic Movements" figures in the **Exhibits**. The planned/proposed intersection improvements as determined by the City of Noblesville to be constructed over the next 10-years and the resulting levels of service are shown at the top under the heading "Planned Conditions for Proj. 10-Yr. Traffic Volumes". Again, black arrows represent lanes that are present under the existing conditions and blue arrows represent lanes that are part of planned improvements previously indicated by the City of

Noblesville. A description of the planned/proposed improvements as determined by the City of Noblesville based on the projected 10-year traffic volumes is listed below. The costs of these planned/proposed improvements have been divided between the City of Noblesville and Developers based on a proportion of the existing traffic volumes to the future traffic volumes. The estimated construction costs for these improvements are included in the 10-Year Cost.

If necessary, mitigated conditions have been recommended so that the intersection will operate at acceptable levels of service during the peak hours with the projected 10-year traffic volumes. These conditions are shown in the top right-hand corner under the heading "Mitigated Conditions for Proj. 10-Yr. Traffic Volumes". Again, black arrows represent lanes that are present under the existing conditions, red arrows represent lanes that are in addition to the existing intersection geometrics, and green arrows represent lanes that are in addition to the existing geometrics but the costs associated with the lane have been included in roadway segment mitigation costs. The LOS results for the projected 10-year traffic volumes are also shown in the top right-hand corner. A description of the improvements needed to mitigate the projected 10-year traffic volumes is listed below along with the estimated construction cost for those additional improvements (10-Year Cost).

The "Total Estimated Impact Fee Cost" for all improvements needed at the intersection is shown at the bottom. All recommended intersection improvements were made solely on meeting minimum acceptable level of service criteria. However, standard engineering design practices should be used to determine actual intersection improvements.

The following intersections listed below have been planned by the City of Noblesville:

- Int. 2: 136th Street & Corporate Parkway
- Int. 68: Hague Road & Pleasant Street
- Int. 69: Cherry Tree Road & Pleasant Street
- Int. 70: Pleasant Street & River Road
- Int. 71: Pleasant Street & Cicero Road
- Int. 230: Brooks School Road & 141st Street