08-28.09

Report of

Project I.D. 1123-09-02

Interchange Study

For

CTH A at USH 41

Outagamie County, Wisconsin

September, 2004
OMNNI Project No. E1582A02

ENGINEERING • ARCHITECTURE • ENVIRONMENTAL

OMNNI ASSOCIATES

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INTRODUCTION

The purpose of this study is to investigate the interchange options at the CTH A and USH 41 interchange in the Town of Grand Chute, Outagamie County. The study will look at the feasibility, costs, and impacts of a grade separation (no interchange), partial interchange and full interchange. The partial interchange option would consist of constructing a southbound on-ramp and a northbound off-ramp on the west side of CTH A.

USH 41 in Outagamie County was constructed at its present location in 1960. At that time, right-of-way was purchased for a full diamond interchange at CTH A (Lynndale Avenue) and USH 41 intersection. However, at the time a two-lane structure on CTH A over USH 41 was built with no interchange.

The current freeway standards require 16.5 ft. of clearance above the freeway pavement. Since the clearance under the 1960 vintage bridges is only 15+/- ft., the existing bridges are being raised or replaced. The structure on CTH A at USH 41 is scheduled for reconstruction in year 2005.

There are positive impacts for building an interchange at CTH A for the general traveling public and for the local street system. There are also some negative impacts primarily to the USH 41 traffic. The alternatives have different impacts on the adjacent interchanges. There is strong local support for a partial interchange at CTH A and USH 41.

WisDOT has conducted traffic studies and projected traffic volumes for the three basic alternate designs. OMNNI Associates was retained to study the alternates and prepare this report.

EXISTING CONDITIONS

USH 41, STH 47 & CTH A. At the project location, CTH A is a rural two-lane minor arterial that runs north south. USH 41 is a four-lane freeway with a 60-foot median and is classified as a principal arterial. Even though USH 41 is generally a north-south route, it runs in an east west direction at CTH A. Just west of CTH A, USH 41 curves to the south and then parallels CTH A one mile to the west. Exhibits 1 and 2 show the general area of this study

There is an interchange on USH 41 with STH 15/CTH OO that is located one and one half miles southwesterly from CTH A. South of this interchange, USH 41 is a six-lane facility.

There is a full diamond interchange at the USH 41 intersection with STH 47 that is about one and one half miles east of CTH A. At USH 41, STH 47 runs in a true north-south direction. About six miles north of USH 41, STH 47 bears to the northwest and intersects with CTH A at about eight miles north of USH 41. This "T" intersection handles all of the traffic on STH 47 but only the northbound traffic from CTH A. The southbound traffic on CTH A has a separate roadway and avoids the "T" intersection. From the "T" intersection both routes head north concurrently for a short distance until CTH A turns west toward Shiocton. STH 47 continues north toward Black Creek. Exhibit 3 shows the roadway configuration at the merger point.

From the merger point of CTH A and STH 47, traffic destined for southbound USH 41 has two choices, either to take STH 47 to its interchange with USH 41 or take CTH A across USH 41 to CTH OO, turn right and enter USH 41 at the interchange one mile to the west of CTH A. The STH 47 route is 2.1 miles longer.

Local Road System. The local road system in this area of Grand Chute has many challenges. The location of USH 41, Canadian National Railroad, Gordon Bubolz Nature Preserve and other environmental sensitive areas impact the connectivity of the local road system. Exhibit 4 shows the roadway layouts, jurisdictions and classifications. Exhibit 5 shows the Community Facilities and Park and Recreations Facilities.

To the west of the CTH A/USH 41 intersection there is not another north-south route that crosses USH 41. Capitol Drive, an east-west minor collector, goes over USH 41 in the middle of the curve, which transitions USH 41 from an east west direction to a north south direction. There are no roads northwest of USH 41 that currently connect between Capitol Drive and CTH A. Rifle Range Road is a dead end roadway that intersects with Capitol Drive and goes northeasterly for approximately one half mile before it dead ends. It functions as a local road for the residents' along the north side of USH 41. The Town of Grand Chute plans to extend Rifle Range Road to the northeast and connect it to Grand Chute Blvd, which is a local street that intersects CTH A approximately 1600 feet north of USH 41. The location of a large tract of environmentally sensitive land and the Gordon Bubolz Nature Preserve have prevented other local roads to be connected to the west resulting in a gap in the local road system.

To the east of CTH A/USH 41 intersection, Gillette Street has an underpass of USH 41 approximately halfway between CTH A and STH 47. However there are no east west roadway connections for the first one and one quarter miles north of USH 41 due to the Canadian National Railroad which runs parallel to CTH A about one half mile to the east. CTH JJ, which is a major arterial, is the first east west connection across the railroad north of USH 41. CTH JJ from the east forms a "T" intersection with CTH A. The two roadways run concurrent to the north for about one mile where CTH JJ turns to the west forming another "T" intersection with CTH A. Both "T" intersections have stop control on CTH JJ.

The local road system south and east of USH 41 is more connected than the area north of USH 41. However USH 41 and Canadian National Railroad are barriers. Capitol Drive is an east west minor collector that is approximately a quarter of a mile south of USH 41 at CTH A. Capitol Drive provides access to numerous subdivisions in this area. CTH OO is an east west arterial located approximately one half mile south of Capitol Drive. It has an interchange with USH 41 approximately 1.5 miles southwesterly from the CTH A/USH 41 intersection. Bluemound Drive is a north south minor collector located one

EXHIBIT 3

STH 47 and CTH A

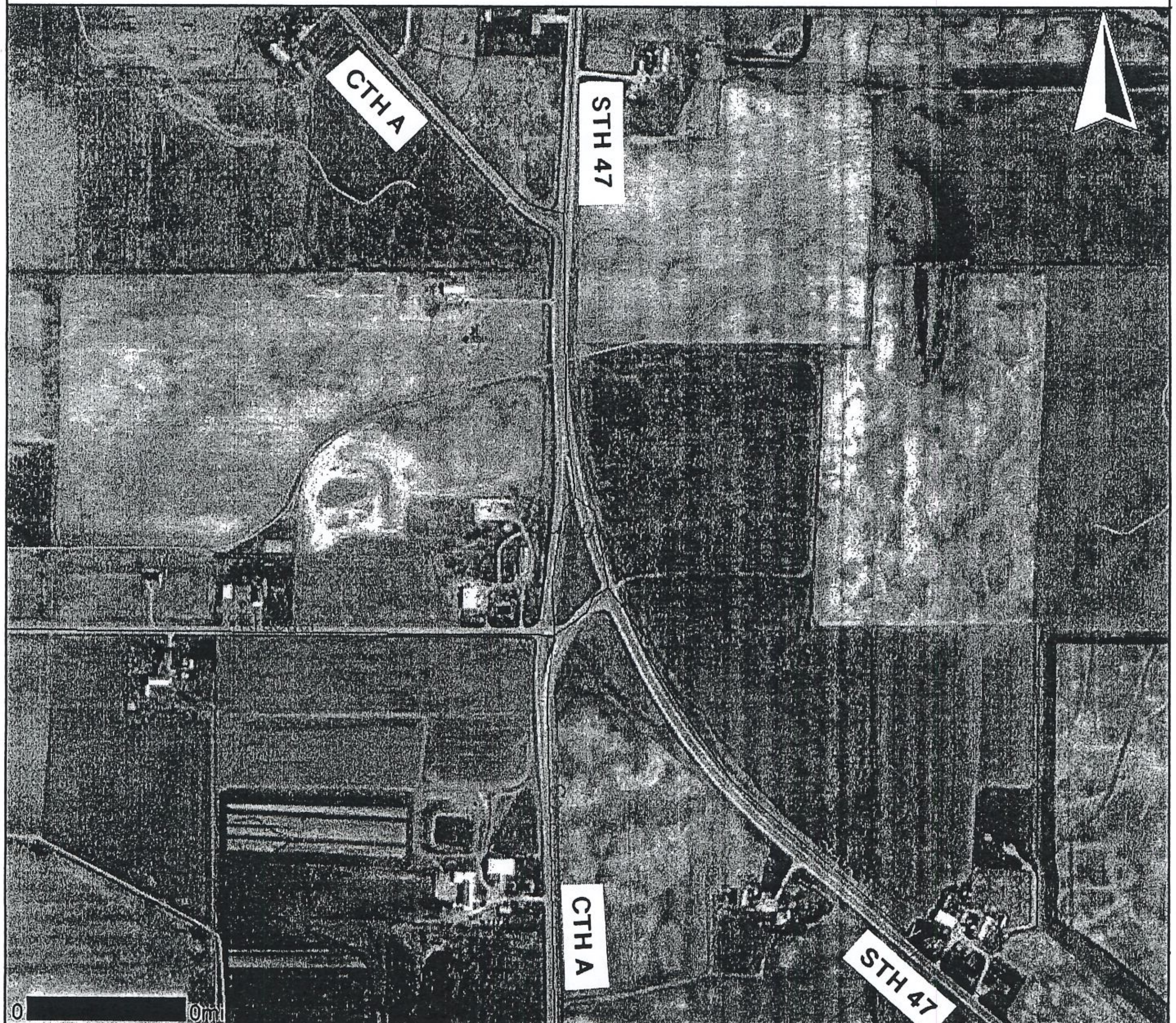
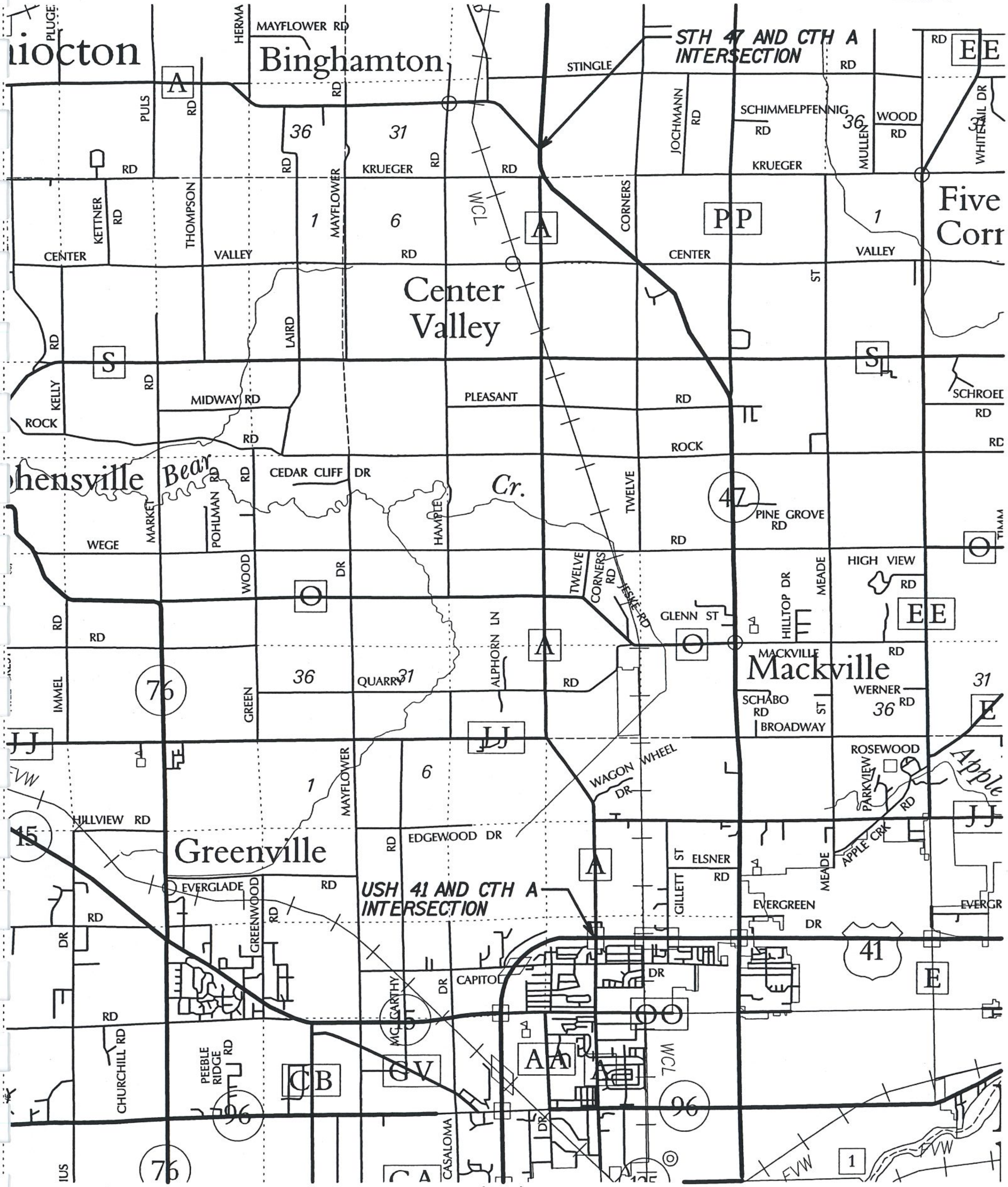


EXHIBIT 1



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ONE SYSTEMS DRIVE
APPLETON, WI 54914
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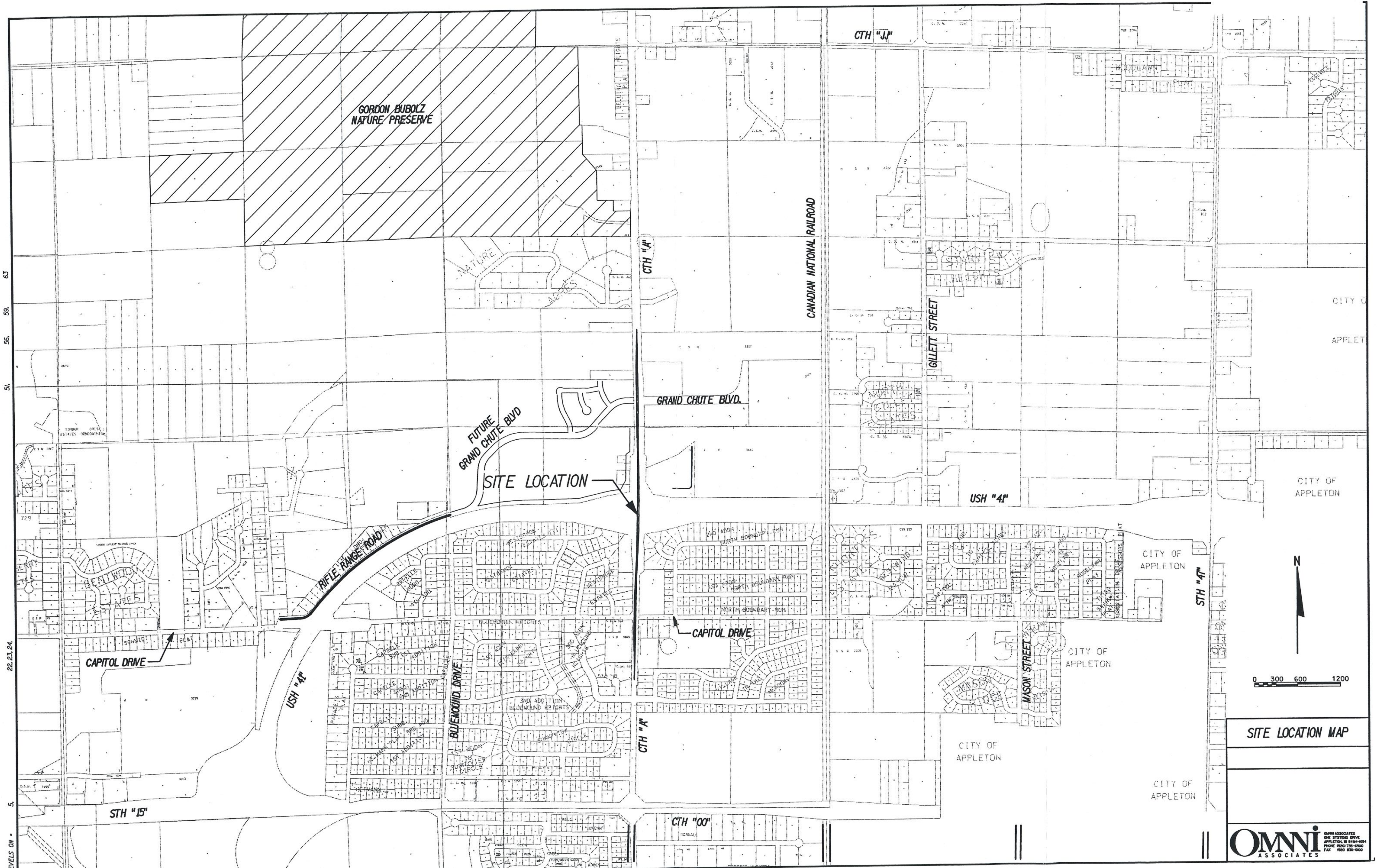
FAX (920) 830-6100

EXHIBIT 2



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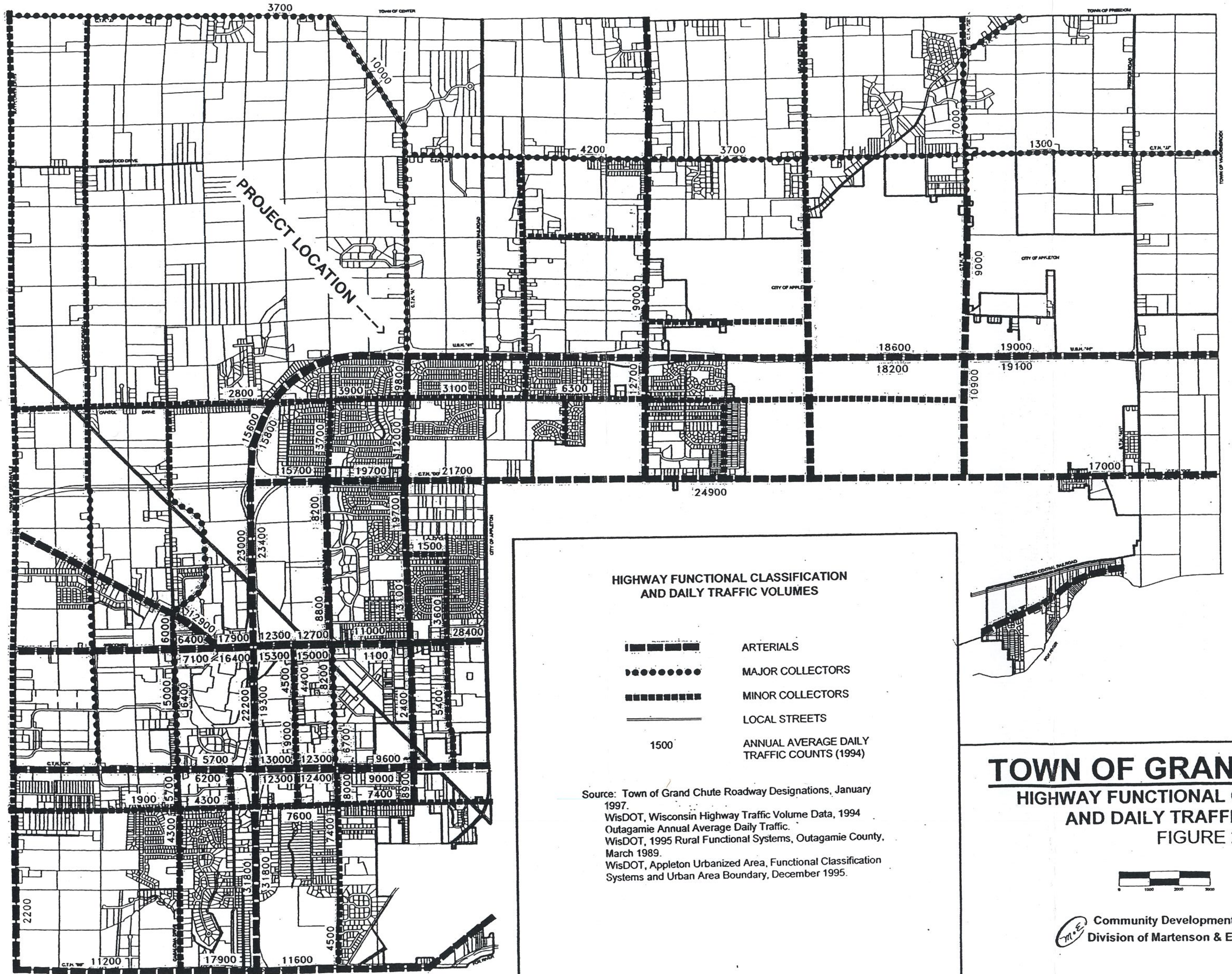


HIGHWAY FUNCTIONAL CLASSIFICATION AND DAILY TRAFFIC VOLUMES

	ARTERIALS
	MAJOR COLLECTORS
	MINOR COLLECTORS
	LOCAL STREETS
1500	ANNUAL AVERAGE DAILY TRAFFIC COUNTS (1994)

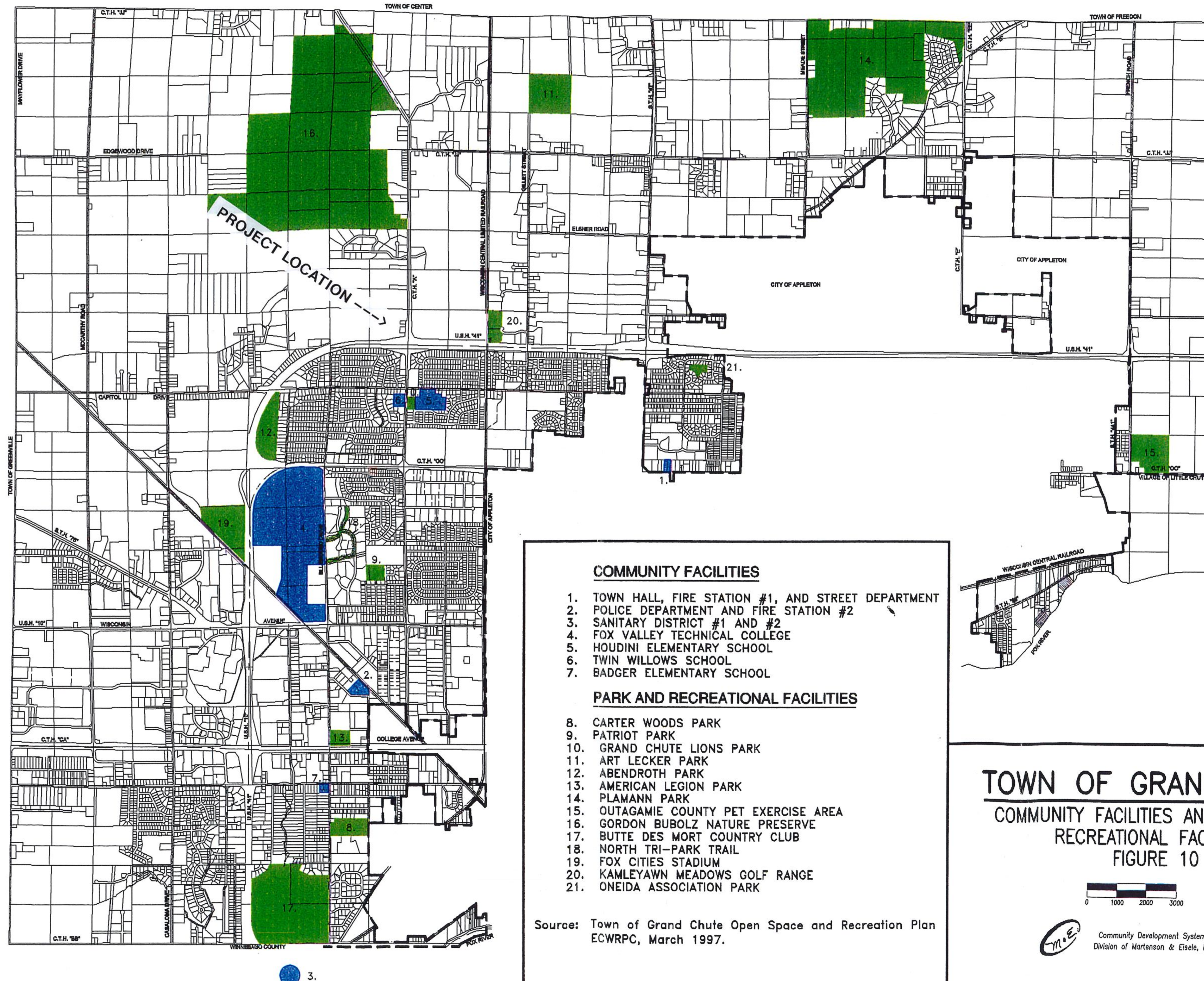
Source: Town of Grand Chute Roadway Designations, January 1997.
WisDOT, Wisconsin Highway Traffic Volume Data, 1994 Outagamie Annual Average Daily Traffic.
WisDOT, 1995 Rural Functional Systems, Outagamie County, March 1989.
WisDOT, Appleton Urbanized Area, Functional Classification Systems and Urban Area Boundary, December 1995.

TOWN OF GRAND CHUTE

HIGHWAY FUNCTIONAL CLASSIFICATION AND DAILY TRAFFIC VOLUME

FIGURE 2

Community Development Systems
Division of Martenson & Eisele, Inc.



COMMUNITY FACILITIES

1. TOWN HALL, FIRE STATION #1, AND STREET DEPARTMENT
2. POLICE DEPARTMENT AND FIRE STATION #2
3. SANITARY DISTRICT #1 AND #2
4. FOX VALLEY TECHNICAL COLLEGE
5. HOUDINI ELEMENTARY SCHOOL
6. TWIN WILLOWS SCHOOL
7. BADGER ELEMENTARY SCHOOL

PARK AND RECREATIONAL FACILITIES

8. CARTER WOODS PARK
9. PATRIOT PARK
10. GRAND CHUTE LIONS PARK
11. ART LECKER PARK
12. ABENDROTH PARK
13. AMERICAN LEGION PARK
14. PLAMANN PARK
15. OUTAGAMIE COUNTY PET EXERCISE AREA
16. GORDON BUBOLZ NATURE PRESERVE
17. BUTTE DES MORT COUNTRY CLUB
18. NORTH TRI-PARK TRAIL
19. FOX CITIES STADIUM
20. KAMLEYAWN MEADOWS GOLF RANGE
21. ONEIDA ASSOCIATION PARK

Source: Town of Grand Chute Open Space and Recreation Plan ECWRPC, March 1997.

TOWN OF GRAND CHUTE

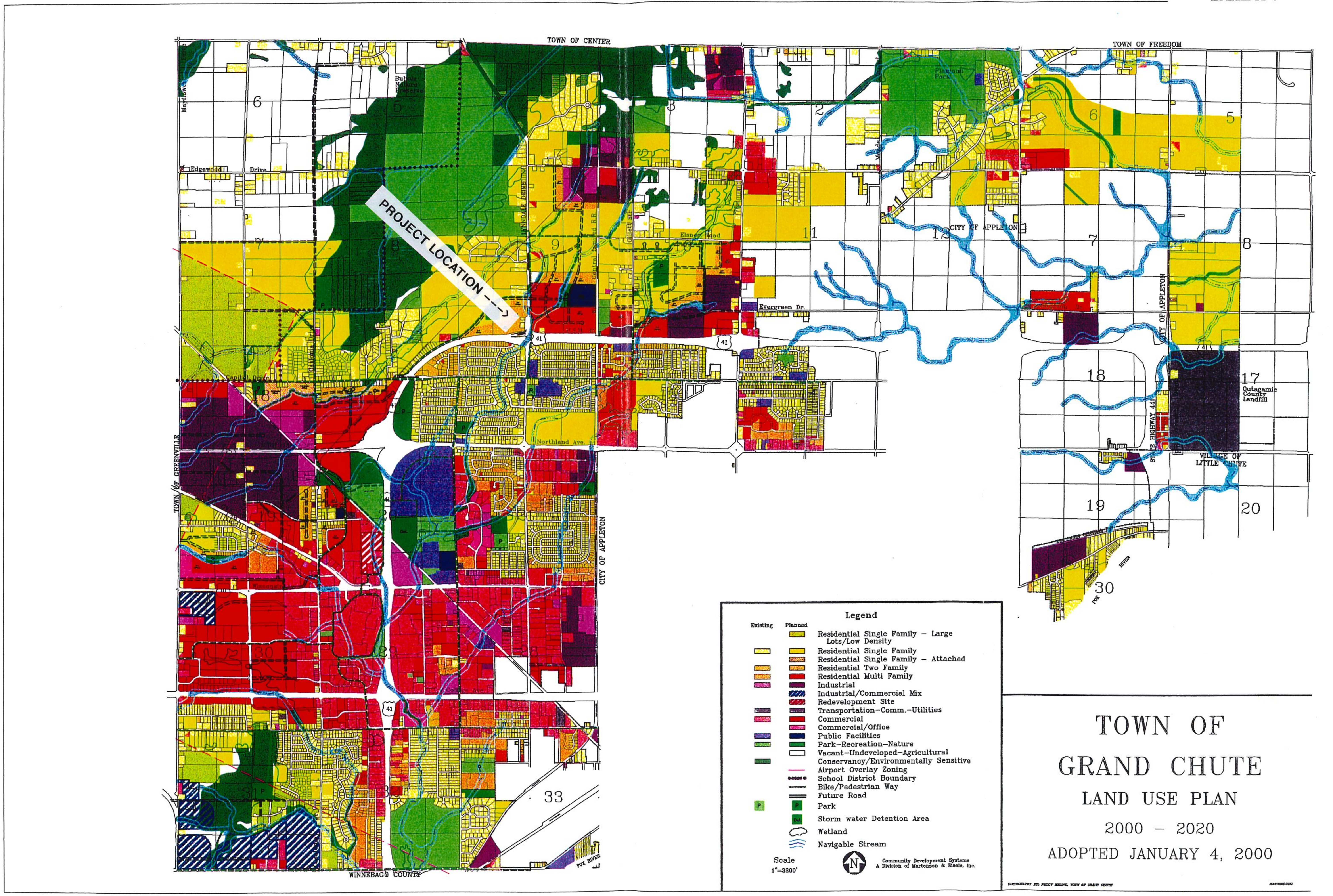
COMMUNITY FACILITIES AND PARKS AND RECREATIONAL FACILITIES

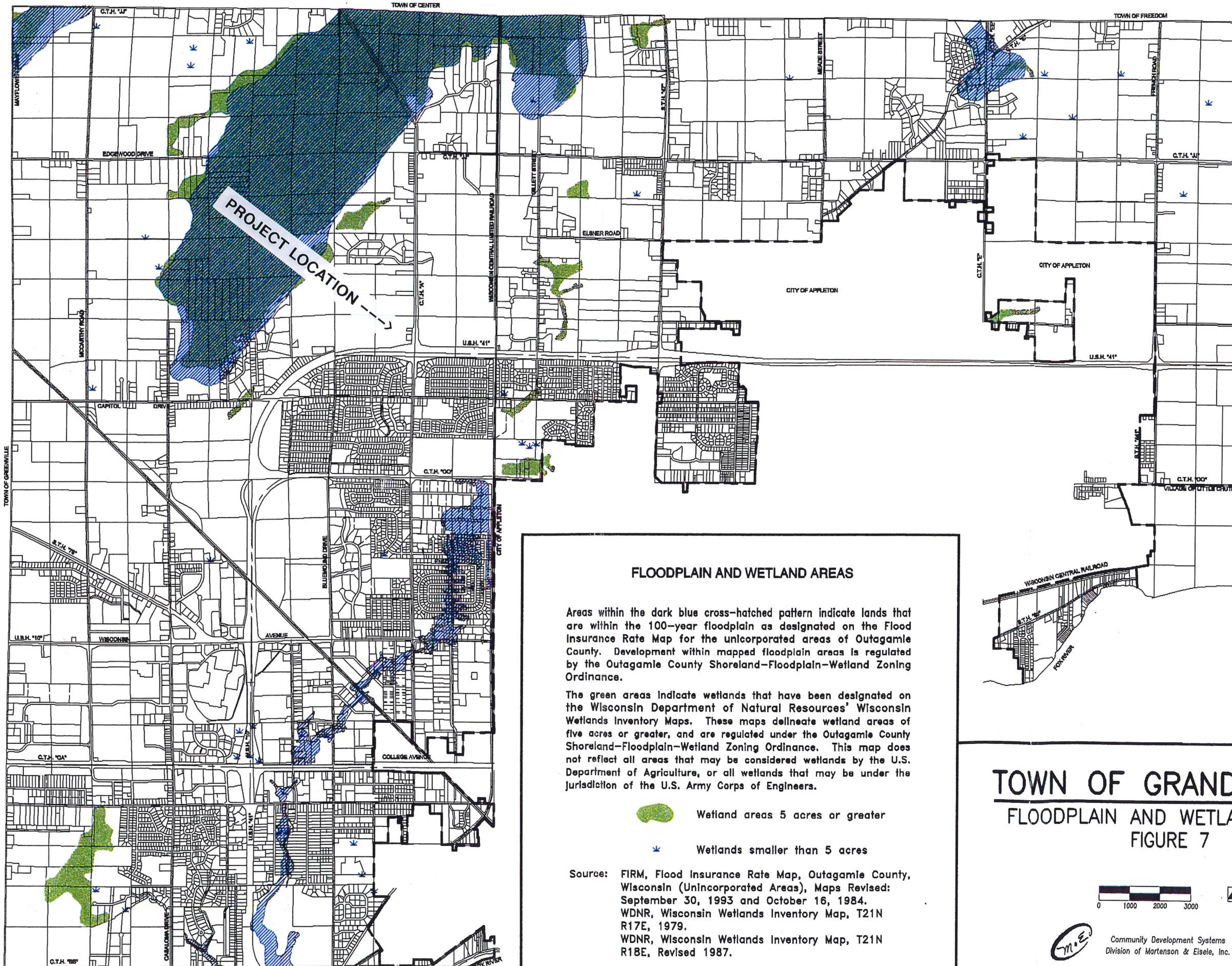
FIGURE 10

0 1000 2000 3000

Community Development Systems
Division of Martenson & Eisele, Inc.

EXHIBIT 6


TOWN OF CENTER
TOWN OF FREEDOM
PROJECT LOCATION
Evergreen Dr.
Northland Ave
CITY OF APPLETON
TOWN OF GREENVILLE
Outagamie County Landfill
VILLAGE OF LITTLE CHUTE
STATE HIGHWAY 441
FOX RIVER
WINNEBAGO COUNTY
Legend
Existing
Planned
Residential Single Family – Large Lots/Low Density
Residential Single Family
Residential Single Family – Attached
Residential Two Family
Residential Multi Family
Industrial
Industrial/Commercial Mix
Redevelopment Site
Transportation–Comm.–Utilities
Commercial
Commercial/Office
Public Facilities
Park–Recreation–Nature
Vacant–Undeveloped–Agricultural
Conservancy/Environmentally Sensitive
Airport Overlay Zoning
School District Boundary
Bike/Pedestrian Way
Future Road
Park
Storm water Detention Area
Wetland
Navigable Stream
Scale
1"=3200'
Community Development Systems
A Division of Martenson & Eisele, Inc.
TOWN OF
GRAND CHUTE
LAND USE PLAN
2000 – 2020
ADOPTED JANUARY 4, 2000



FLOODPLAIN AND WETLAND AREAS

Areas within the dark blue cross-hatched pattern indicate lands that are within the 100-year floodplain as designated on the Flood Insurance Rate Map for the unincorporated areas of Outagamie County. Development within mapped floodplain areas is regulated by the Outagamie County Shoreland-Floodplain-Wetland Zoning Ordinance.

The green areas indicate wetlands that have been designated on the Wisconsin Department of Natural Resources' Wisconsin Wetlands Inventory Maps. These maps delineate wetland areas of five acres or greater, and are regulated under the Outagamie County Shoreland-Floodplain-Wetland Zoning Ordinance. This map does not reflect all areas that may be considered wetlands by the U.S. Department of Agriculture, or all wetlands that may be under the jurisdiction of the U.S. Army Corps of Engineers.

Wetland areas 5 acres or greater

Wetlands smaller than 5 acres

Source: FIRM, Flood Insurance Rate Map, Outagamie County, Wisconsin (Unincorporated Areas), Maps Revised: September 30, 1993 and October 16, 1984.
WDNR, Wisconsin Wetlands Inventory Map, T21N R17E, 1979.
WDNR, Wisconsin Wetlands Inventory Map, T21N R18E, Revised 1987.

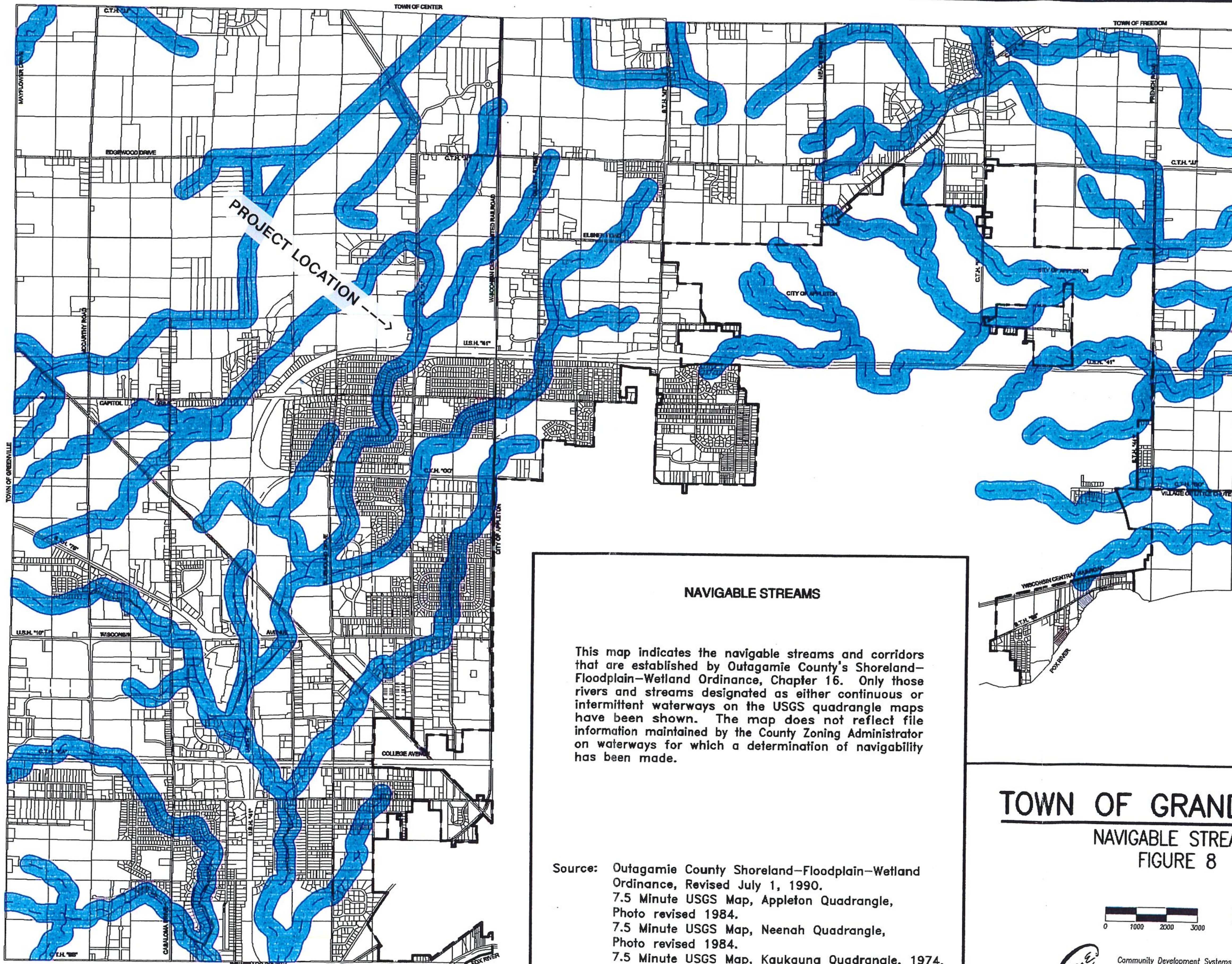
TOWN OF GRAND CHUTE

FLOODPLAIN AND WETLAND AREAS

FIGURE 7

0 1000 2000 3000

Community Development Systems
Division of Mortenson & Eisele, Inc.



NAVIGABLE STREAMS

This map indicates the navigable streams and corridors that are established by Outagamie County's Shoreland–Floodplain–Wetland Ordinance, Chapter 16. Only those rivers and streams designated as either continuous or intermittent waterways on the USGS quadrangle maps have been shown. The map does not reflect file information maintained by the County Zoning Administrator on waterways for which a determination of navigability has been made.

Source: Outagamie County Shoreland–Floodplain–Wetland Ordinance, Revised July 1, 1990.
7.5 Minute USGS Map, Appleton Quadrangle, Photo revised 1984.
7.5 Minute USGS Map, Neenah Quadrangle, Photo revised 1984.
7.5 Minute USGS Map, Kaukauna Quadrangle, 1974.

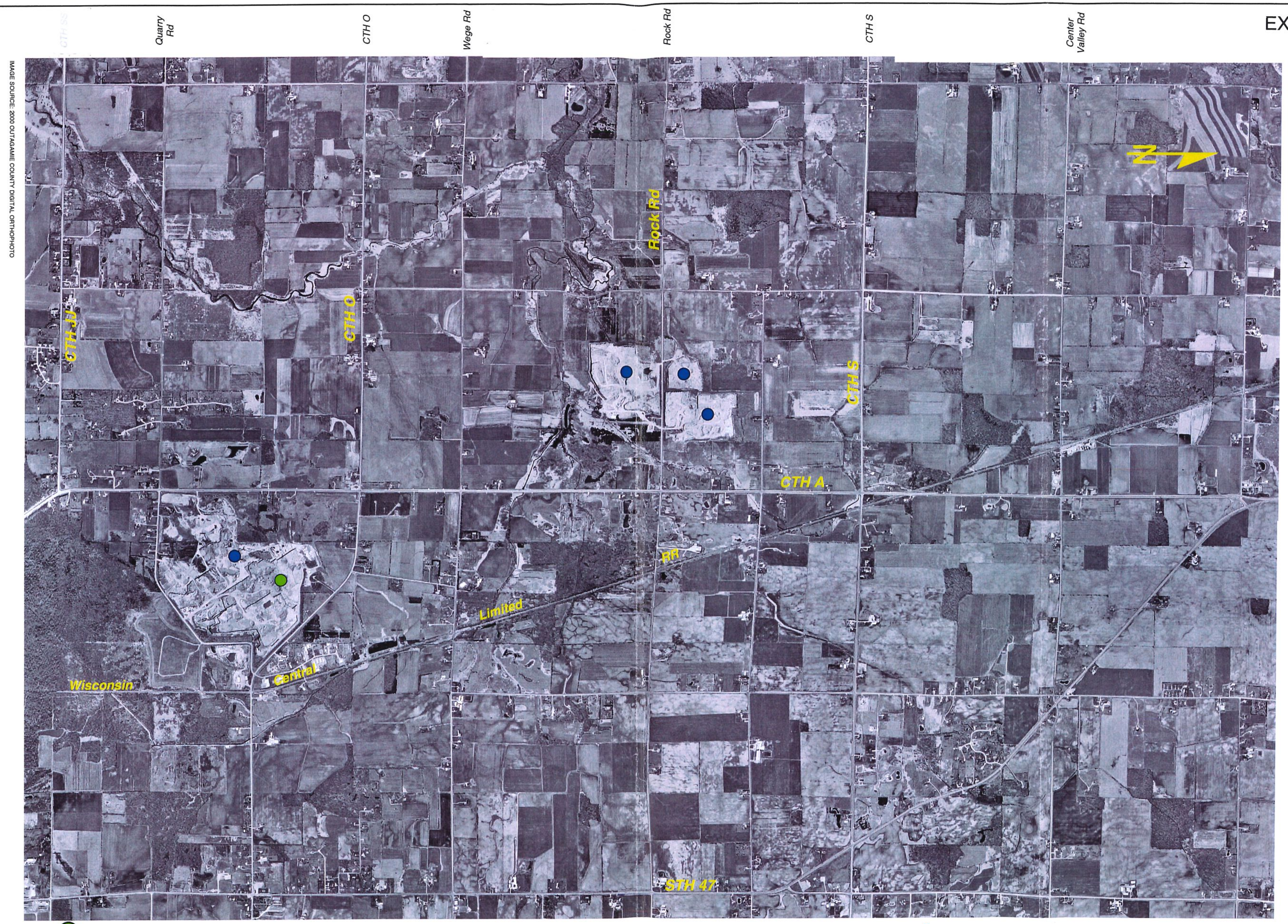
TOWN OF GRAND CHUTE

NAVIGABLE STREAMS
FIGURE 8

0 1000 2000 3000

Community Development Systems
Division of Mortenson & Eisele, Inc.

EXHIBIT 9



ASPHALT PLANT

QUARRY

Scale: 1 inch equals 2,500 feet

half mile west of CTH A and terminates with a cul-de-sac just south of USH 41. Gillette Street is a north south minor collector located three quarters of a mile east of CTH A and has an underpass with USH 41. Gillette Street forms a "T" intersection with Capitol Drive. Due to development it does not proceed south to CTH OO. Mason Street is another north south minor collector located a quarter of a mile east of Gillette Street. Due to development Mason Street forms a "T" intersection with Capitol Drive and does not extend any further north. STH 47 is a north south arterial that is located 1.5 miles east of CTH A. It has a full diamond interchange with USH 41. The area bordered by the STH 47, CTH OO and USH 41 is mostly residential with commercial development along CTH OO and STH 47.

Land Use. The Town of Grand Chute has adopted a comprehensive plan. Exhibit 6 shows the land use plan.

The area along CTH A south of USH 41 is mostly residential. Except for one large parcel in the northeast quadrant of CTH A & CTH OO, the area is fully developed. Lions Park is a small neighborhood park that is contiguous with Houdini Elementary School. Lions Park abuts a portion of CTH A and the school is just east of CTH A on Capitol Drive. There is also a daycare/preschool, formerly known as Twin Willow School, located in the southwest quadrant of the Capitol Drive/CTH A intersection. Exhibit 5 shows the location of the community facilities.

The development for the first mile and one half to the north of USH 41 is limited by large environmentally sensitive wetlands and flood plains. This area also contains the Gordon Bubolz Nature Preserve. The wetlands and flood plain locations are shown on Exhibit 7. The location of Mud Creek and some of its tributaries also impact the area as shown in Exhibit 8. Mud Creek parallels the east side of CTH A from Grand Chute Boulevard south. About 600 feet north of USH 41, Mud Creek pulls away from the east side of CTH A but swings back toward CTH A and USH 41 where it enters the existing twin cell box culvert under USH 41. The box culvert angles under USH 41 and outlets on the west side of CTH A. Mud Creek drains away from the intersection of CTH A and USH 41 in a southwesterly direction.

The area north of USH 41 is mostly agricultural or vacant with some residential. There has been some recent development in this area which includes a multi family development and the Grand Chute Town Hall to the east of CTH A and a large church and subdivision to the west of CTH A. The developments have access to CTH A via Grand Chute Boulevard.

The area further north along CTH A is mostly undeveloped or agricultural. However there are a several heavy truck generators in this area. These include at least 4 quarries and a large asphalt plant as shown on Exhibit 9. Badger Highways Co., Carew Concrete & Supply Co., Michels Materials, Murphy Concrete and Construction, and smaller contractors haul materials out of these quarries. Large quantities of sand are hauled into the asphalt plants. The majority of these trucks are using CTH A to CTH OO to access USH 41.

EXISTING TRAFFIC

USH 41. Based on the 2000 counts the Average Daily Traffic (ADT) on the portion of USH 41 between STH 15/CTH OO and STH 47 is 55,400 vehicles of which 27,800 vehicles are southbound and 27,600 vehicles are northbound. Based on a peak hour factor of 11.1 and a directional split of 55/45, USH 41 functions at a level of service D during the peak hour. Exhibit 10 shows the 2000 annual ADT. The capacity analysis for the existing traffic can be found in Appendix D.

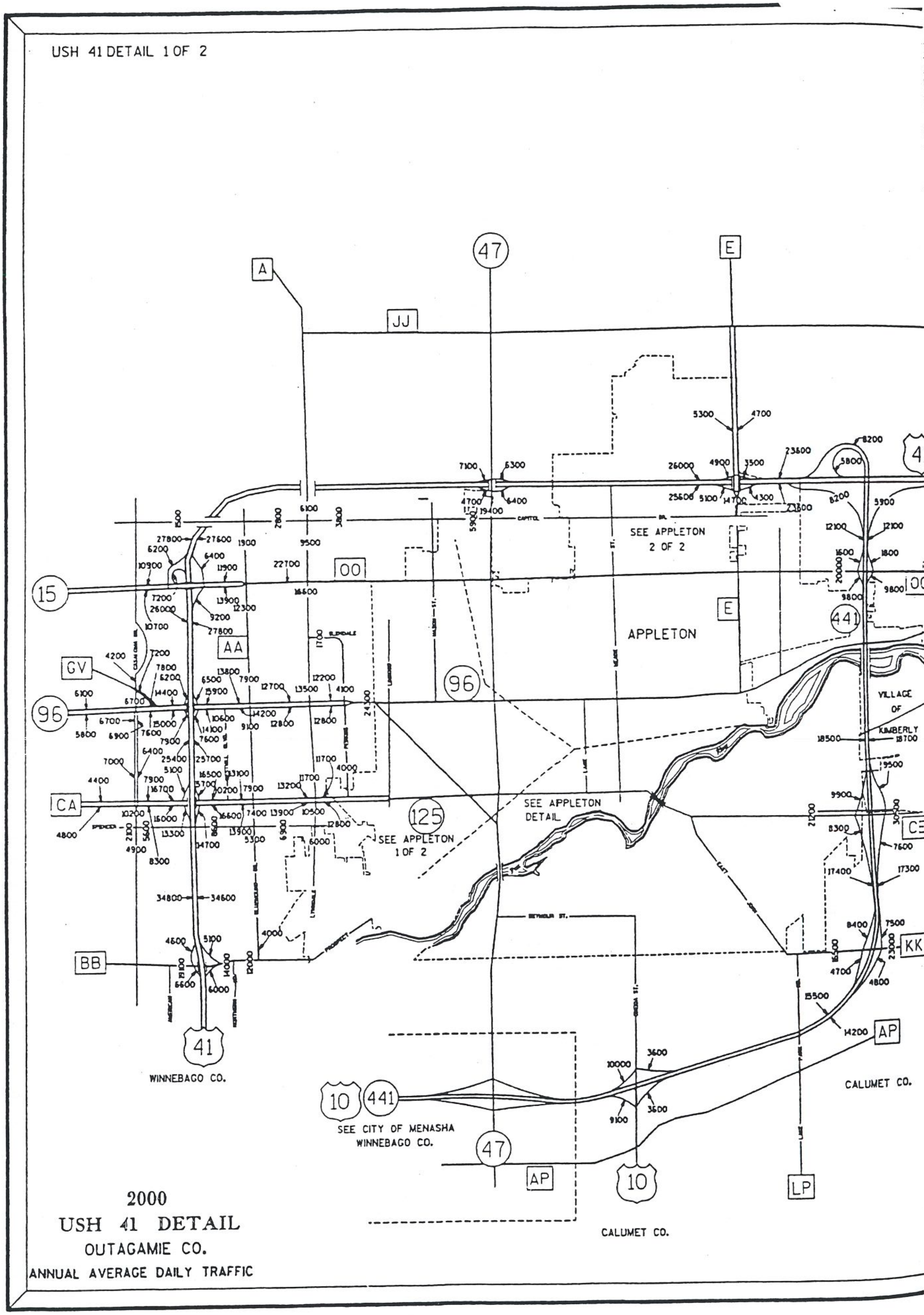
CTH A. Based on the 2000 counts the ADT on CTH A at the overpass of USH 41 is 6,100 vehicles. This number increases to 9,500 south of Capitol Drive. The CTH A and Capitol Drive intersection was signalized in 1992.

STH 47. Based on the 2000 counts the ADT on STH 47 just south of the USH 41 interchange is 19,400 vehicles. North of the interchange the ADT is 16,900 vehicles. STH 47 was reconstructed to 4 lanes from USH 41 north to CTH JJ in 2003. The STH 47 Bridge over USH 41 does not meet the current freeway standards clearance requirement of 16.5 feet. The STH 47/USH 41 interchange is being considered for upgrades.

STH 47/ CTH A Intersection. At the "T" intersection of STH 47/ CTH A the 2000 ADT for the STH 47 leg has 6,900 vehicles. The CTH A leg has a projected volume of 5,600 vehicles and the joint leg of STH 47/CTH A has a projected volume of 15,700 vehicles. The Outagamie County Highway Department has indicated that the intersection is already experiencing traffic congestions on weekends. STH 47 and CTH A are popular routes used by weekend recreational traffic. Four-hour traffic counts were taken on May 5, 2000, the Friday before the opening of fishing season, between 3:00 and 7:00 pm. These volumes are shown in Appendix B. Although these volumes would normally not be used to evaluate an intersection, these volumes represent the weekend recreational traffic and are over 70% higher than the weekday peak volumes. The WisDOT is in the process of studying the alternatives for the intersection under a separate project.

Origin-Destination Study. WisDOT conducted an extensive origin-destination (OD) study around the Appleton urbanized area in 1993 as one of the initial steps in developing a transportation plan for the area. The OD study can be found in Appendix C. Thirty-two interview stations recorded the vehicle travel patterns over a six-week period.

The study found that 83 percent of the vehicle travel patterns were local trips and 17 percent were through trips. A local trip is one in which either the origin and/or destination are within the study area. A through trip is a trip whose origin and destination are located outside of the study area. USH 41 accounted for 15,484 of the 27,900 (55%) through trips that were recorded. This is followed by USH 45 south, which has been renamed as STH 76, with 2,028 (7.3%) through trips, USH 45 north, which has been renamed as STH 15, with 1,559 (5.6%) through trips and CTH A north with 1,355 (4.9%) through trips. No other station recorded more than 1,000 through trips.



2000
USH 41 DETAIL
OUTAGAMIE CO.
ANNUAL AVERAGE DAILY TRAFFIC

Slightly more than two thirds of all vehicles recorded in the survey were automobiles. The remaining one third was split between light trucks at 22.6% and heavy trucks at 10%. For the truck traffic, 66 percent were local trips and 34 percent were through trips. The largest concentrations of heavy trucks were on CTH A north (16.2%), STH 55 south (14.7%), STH 47 (14.3%), USH 41 north (14.1%) and USH 45 south (13.5%).

Two interview stations are of particular interest to this interchange study. Station # 73 which is located on CTH A, 1.2 miles north of Broadway Drive (CTH JJ) and Station #74 which is located on STH 47, 0.8 miles north of Broadway Drive. The interview station on CTH A provides information regarding travel patterns for vehicles on CTH A. The interview station on STH 47 can be used for comparisons purposes of vehicle travel patterns. These stations are shown on Exhibit 11 and Figure 1 of the OD Study, which can be found in Appendix C.

The total number of trips for the two locations is similar with 7,560 trips on CTH A and 7,237 trips on STH 47. However, the amount of thru traffic on CTH A, 1,355 trips (18%), was more than double that on STH 47, 586 (8%) trips.

The 7,560 total trips recorded on CTH A were made up of 1,224 heavy truck trips and 6,336 passenger and lightweight truck trips. There were 6205 local trips, which were made up of 843 heavy trucks and 5362 passenger and lightweight truck trips. There were 1355 through trips, which were made up of 381 heavy trucks and 974 passenger and lightweight vehicles.

The vast majority (289) of the through trucks were headed towards or coming from USH 41 at Neenah. 62 trucks were headed toward or coming from CTH A South (Winnebago County). 10 trucks were headed toward or coming from points west of USH 41. 10 trucks were headed toward or coming from points north west of USH 41 and 10 trucks were headed toward or coming from USH 41 north by the weigh station. 361of the 381 through heavy trucks traveled on CTH A south of USH 41 through the residential area to intersect CTH OO and access USH 41. This represents 95% (361/381) of the through truck traffic on CTH A and 30% (361/1,224) of all the trucks on CTH A.

Similarly 928 through passenger cars including lightweight trucks were headed toward or coming from USH 41at Neenah, CTH A South (Winnebago County) or west of USH 41. The 928 vehicles represent 95% (928/974) of the through passenger vehicles and 15% (928/6,336) of the total passenger vehicles on CTH A.

The 7,237 total trips recorded on STH 47 were made up of 1,034 heavy truck trips and 6,203 passenger and lightweight truck trips. There were 6,651 local trips, which were made up of 891 heavy trucks and 5,760 passenger and lightweight truck trips. There were 586 through trips, which were made up of 143 heavy trucks and 443 passenger and lightweight vehicles.

EXHIBIT 11

FIGURE 1

The data indicates that much of the through traffic uses CTH A instead of STH 47 to access USH 41. This is particularly true of truck traffic.

NO INTERCHANGE ALTERNATIVE

This option would not change current traffic patterns. Exhibits 12 and 13 show the projected traffic for the no interchange alternate. The capacity analysis for the existing traffic can be found in Appendix E.

Impacts to CTH A. The projected year 2020 traffic on CTH A is 17,000 vehicles north of Capitol Drive and 21,000 vehicles south of Capitol Drive. This traffic volume would warrant CTH A to be reconstructed to 4 lanes. The first three miles of CTH A north of USH 41 have been graded to accommodate a rural four lane section but only the center two lanes consisting of the existing roadway were resurfaced.

Exhibit 14 shows the traffic projections for CTH A, STH 47 and CTH JJ north of USH 41. The "T" intersection with CTH JJ to the east is stop control on CTH JJ and functions at a LOS C with year 2000 traffic. The intersection will function at a level of service F by the year 2020. Intersection improvements would need to be evaluated. These might include a roundabout, signalization, and/or additional lanes. With four lanes on CTH A and no separate left turn lane, a signalized intersection would function at a level of service "B" in the year 2020.

The six-mile segment of CTH A just south of CTH A/STH 47 intersection was reconstructed in 1996. The typical section consists of two twelve-foot driving lanes and ten-foot shoulders. No additional work is needed on this section for the no interchange alternate.

Impacts to USH 41. Since this alternative does not change traffic patterns, vehicles needing access to USH 41 are using the interchanges at STH 15/CTH OO or STH 47. The capacity of USH 41 can be used as a comparison for the other alternatives.

Traffic analysis indicates that the capacity of the existing four-lane facility on USH 41 is 66,000 vehicles per day. Using the year 2000 counts and year 2020 projections, this capacity will be reached in year 2019 for the segment of USH 41 from STH 15/CTH OO to STH 47.

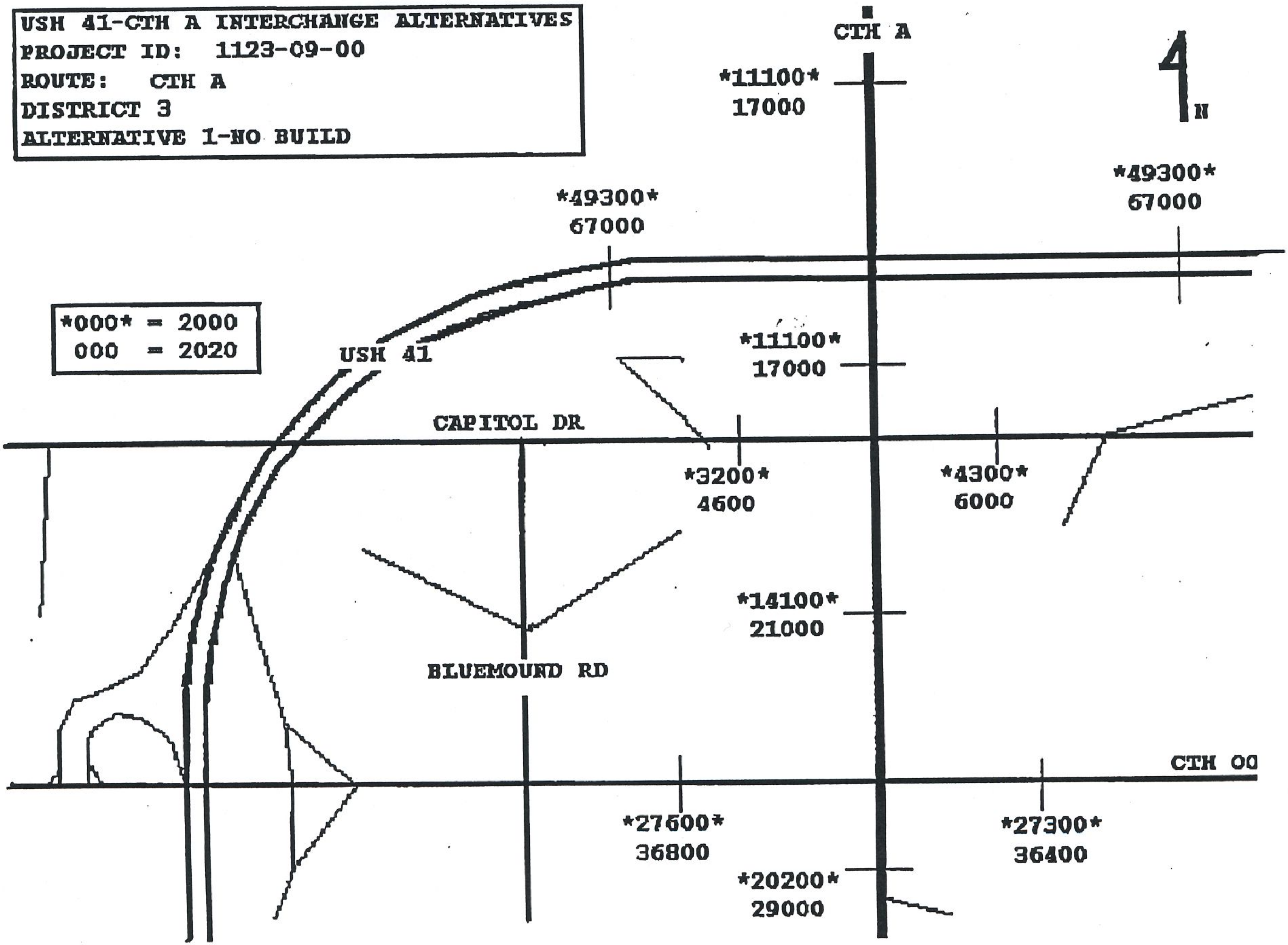
Based on the 2000 counts the segment of USH 41 between STH 15/CTH OO and STH 47 functions at a LOS D. In the year 2020 this segment of USH 41 will function at a LOS of F if no changes are made to USH 41. If this segment is upgraded to 6 lanes it will function at LOS C in the year 2020. Exhibit 15 shows the traffic volumes and level of service along USH 41 for both year 2000 and year 2020.

Note that the existing year 2000 volume (7100 ADT) for the southbound on ramp to USH 41 at the STH 47 interchange is greater than the 2020 projected volume (7000 ADT). The projected volumes were completed before the 2000 counts were available and are

EXHIBIT 12

USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
DISTRICT 3
ALTERNATIVE 1-NO BUILD

000 = 2000
000 = 2020



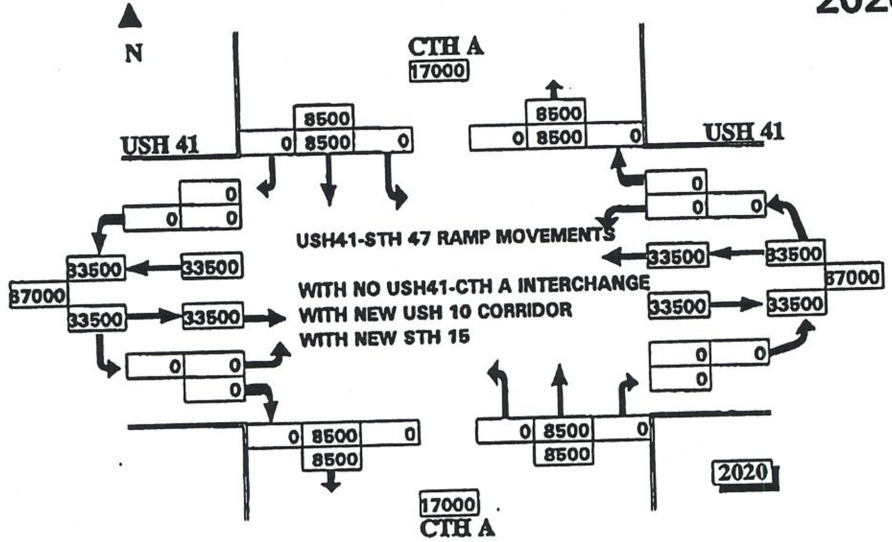
File Ref: U:\LOTUS\41AA120.WK1

PROJECT ID: 1123-09-00
2020 USH 41- CTH A Interchange Alternatives
ALTERNATIVE 1: NO BUILD
2020 RAMP MOVEMENTS

INTERCHANGE FORECAST

ALTERNATIVE 1: NO BUILD USH 41-CTH A INTERCHANGE

2020 AADT



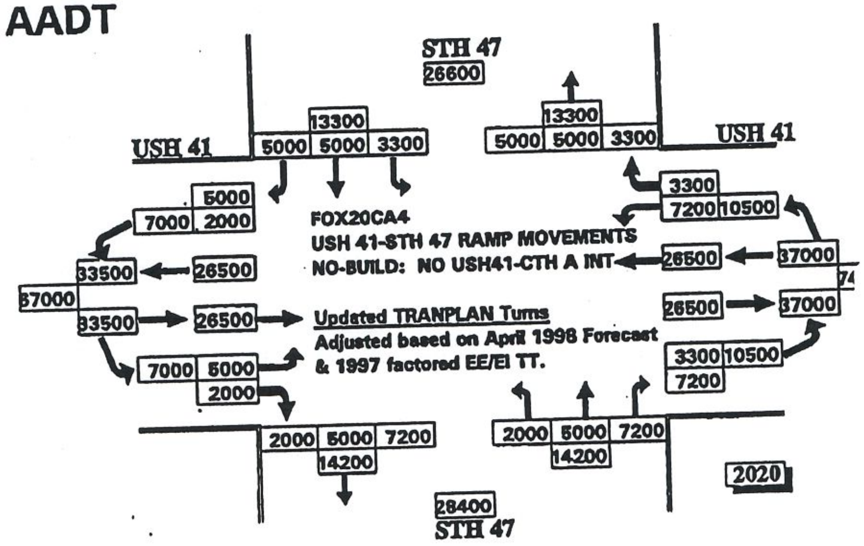
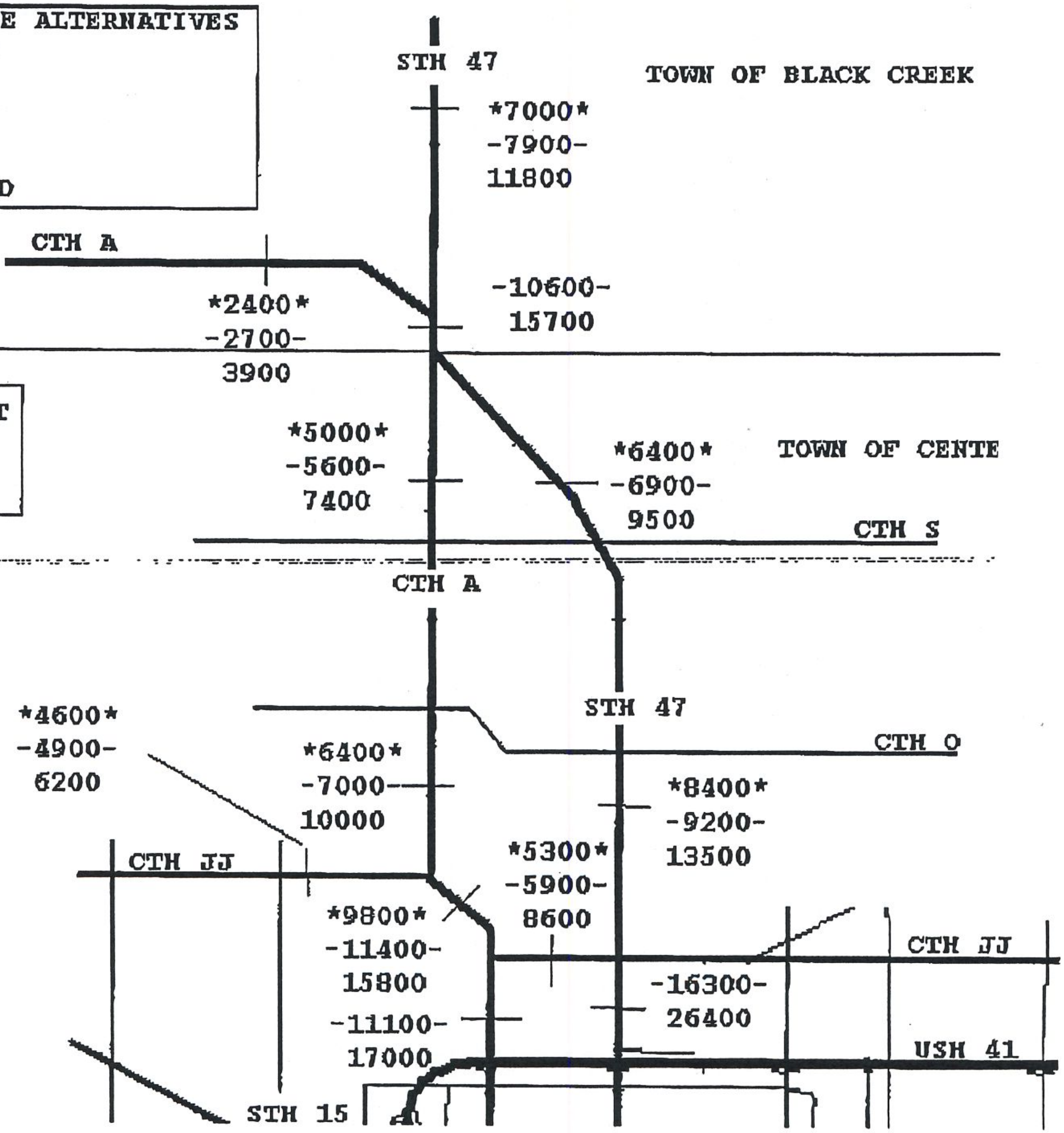
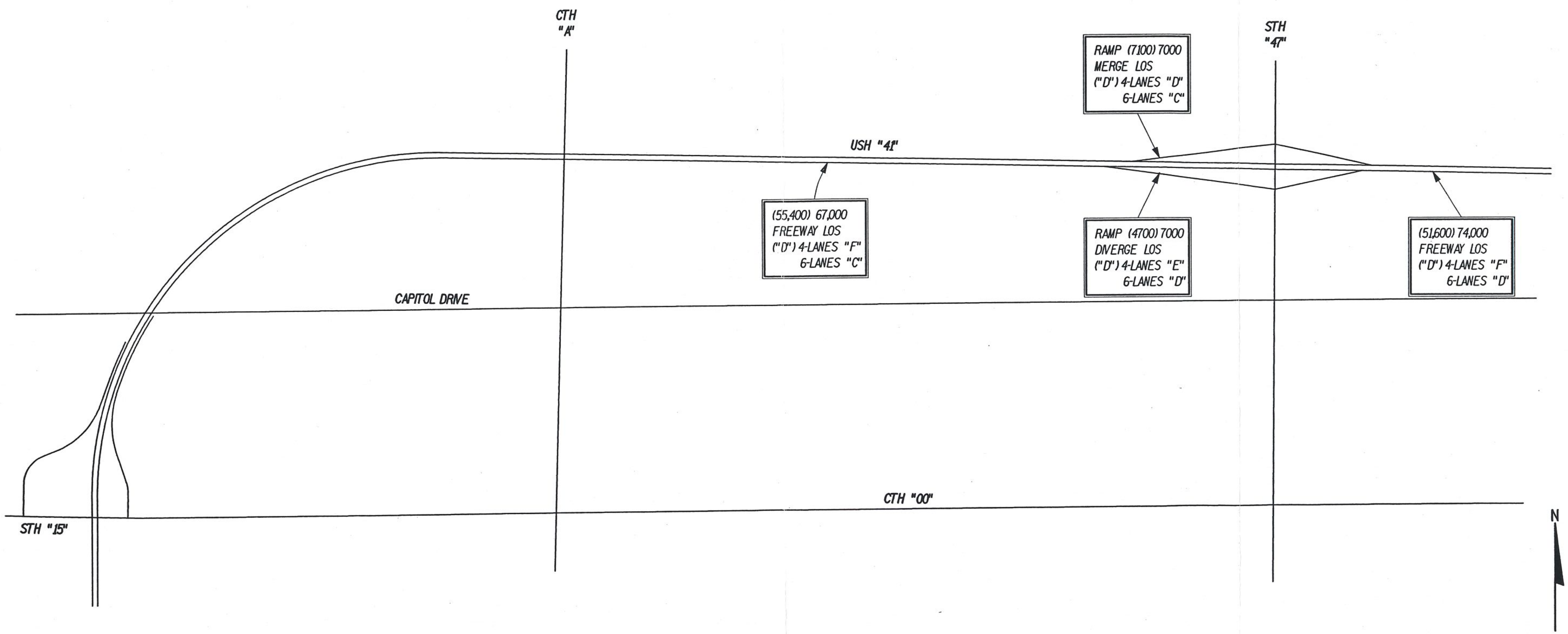


EXHIBIT 14

USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
COUNTY: OUTAGAMIE
DISTRICT: 3
ALTERNATIVE 1: NO BUILD

000 = 1997 COUNT
-000- = 2000
000 = 2020





LEGEND:

LOS = LEVEL OF SERVICE

(000) = YEAR 2000 AVERAGE DAILY TRAFFIC

000 = YEAR 2020 AVERAGE DAILY TRAFFIC

("X") = YEAR 2000 LOS

"X" = YEAR 2020 LOS

CAPACITY ANALYSIS

ALTERNATE: NO INTERCHANGE

OMNI ASSOCIATES

FILE NAME : F:\Transportation\E1582A02\Reports\Interchange Report\no PLOT DATE : 07/12/2004 01:33:09 PM PLOT BY : knuthc consistent with the traffic model for the area. It is assumed that some unknown factor may have attributed to the 2000 volume being higher. This is based on the significant increase for this ramp from the 1997 count (4700 ADT) to the 2000 count (7100 ADT). Traffic volumes on the other ramps at the STH 47/USH 41 interchange did not change as significantly. The northbound off ramp remained the same at 4700 ADT while the northbound on ramp and southbound off ramp volumes decreased from 1997 to 2000. The northbound on ramp decreased from 7200 ADT to 6400 ADT and the southbound off ramp decreased from 6900 ADT to 6300 ADT.

Since the no interchange alternative does not change traffic patterns, the capacity of the STH 47 interchange with USH 41 can be used as a comparison for the other alternatives. Based on the 2000 counts both the southbound on-ramp and the northbound off-ramp functions at LOS D.

Based on the projected traffic for year 2020, the southbound on-ramp would function at a level of service D while the northbound off-ramp would function at a level of service E if no changes were made to USH 41. If USH 41 were upgraded to a six-lane facility by the year 2020, the southbound on-ramp would function at a level of service C and the northbound off-ramp would function at a level of service D.

Impacts to STH 47. With the no interchange option, the projected 2020 traffic on STH 47 would be 26,600 vehicles north of USH 41 and 28,400 vehicles south of USH 41. These volumes would put STH 47 in Urban Design Class 4, which calls for a 4-lane facility according to the Wisconsin Department of Transportation Facilities Development Manual (FDM). STH 47 was upgraded to 4 lanes from USH 41 north to CTH JJ in 2003.

Impacts to STH 47/CTH A Intersection. Currently all legs of the "T" intersection have one lane in each direction with a stop condition for northbound CTH A traffic. Southbound STH 47/CTH A to southbound CTH A traffic does not go through the intersection. Based on the turn movement traffic counts taken on Thursday March 3, 2000, the STH 47 legs of the intersection functions at LOS A while the northbound CTH A leg functions at LOS C. If the configuration of the intersection remains the same in 2020, the STH 47 leg would still have a LOS A while the CTH A leg would drop to a LOS F. The 2020 traffic projections are shown in Exhibit 14. The traffic turn movement counts are shown in Appendix B.

STH 47 and CTH A are popular routes used by weekend recreational traffic. The intersection experiences congestion not indicated by the week day counts or the traffic projections Based on counts taken on Friday May 5, 2000 between 3:00 and 7:00, the intersection receives over 70% higher volumes than the weekday peak volume. These counts are shown in Appendix B and should be taken into consideration when this intersection is analyzed. Options may include roundabout, interchange and signalization. WisDOT is analyzing this intersection under a separate project.

Impacts to the Community. Under this alternative the through traffic that was identified in the OD study would still be using CTH A and CTH OO to access USH 41.

This traffic volume is of particular concern to the local government because it is through traffic that passes through the residential area that includes Twin Willows School, which now operates as a daycare, Lions Park and Houdini Elementary School. According to the OD study this traffic contains the highest concentration of heavy trucks (16.2%) in the Appleton area. The projected 2020 traffic volume on CTH A south of USH 41 is 4000 higher for the no interchange option than the partial interchange option.

The south side of USH 41 on both sides of CTH A is a fully developed residential area. Noise predictions were made at five house locations utilizing the FHWA Traffic Noise Model. Both the year 2000 and year 2020 noise impacts are severe, with year 2000 noise levels ranging from 70.1dB to 70.9dB. The year 2020 noise levels are about 1.5 dB higher than the year 2000 levels. The severe noise impacts would have to be addressed when lanes are added to USH 41 but would not be required under the no interchange alternative.

Under this alternative there would be some impact to Mud Creek. The existing box culvert would need to be extended to accommodate a wider roadway on CTH A. North of USH 41 widening of CTH A would impact either Mud Creek on the eastside of CTH A or wetlands on west side of CTH A.

Road User Costs. Road user costs are based on the fact that with no interchange at CTH A, through traffic from the north needs to travel extra distance to reach USH 41 and travel southbound.

In the year 2020, the ADT from the north to the west (south via USH 41) at STH 47 interchange is 5,000 vehicles for the no interchange alternate and 2,400 vehicles for the partial interchange alternative (See Exhibits 13 and 17). This means that 2,600 vehicles would avoid the indirection of STH 47 and used the southbound on-ramp at CTH A. This also applies from the south to north movement. The road user costs associated with the indirection is $7,000,000 over a 20-year period. Based on the state wide average crash rate, the reduction in overall length of travel could potentially eliminate 50 accidents and the associated costs over the same 20 years.

Exhibits 13 and 17 also show that the southbound ADT on CTH A in year 2020 south of USH 41 is 8,500 vehicles for the no interchange alternate and 5,500 vehicles for the partial interchange alternate. This means that a total of 3,000 vehicles are avoiding the inconvenience and indirection of getting to southbound USH 41 via CTH A and CTH OO. This also applies to the northbound movement. The reduction in traffic from the north to the west at STH 47 plus the reduction in traffic from the north to the south at CTH A (namely 5600 vehicles) should equal the movement from the north to the west for the interchange alternates at CTH A. This movement, as shown on exhibits 17 and 21, is 5,500 vehicles, which is close to the 5,600 vehicles used in computing the road user costs. The road user costs of this indirection and inconvenience are $2,500,000 over a 20-year period. The statewide average crash rate is less for an urban interstate facility than non-interstate facilities. Based on the reduction in the average crash rate and less miles traveled, 20 accidents and the associated costs could potentially be eliminated.

The total cost of not providing the west ramps at CTH A is $9,500,000 in road user costs. The parameters and assumptions used to compute the road user costs are contained in Appendix H.

Construction Costs. The recently completed Meade Street over USH 41 project is very similar to the no interchange alternate. Meade Street was widened to four lanes and the profile was raised to allow for appropriate clearance above USH 41. Adjusting the Meade Street project costs for inflation and box culvert extension at CTH A, the rough construction cost estimate of the no interchange alternate is $1,500,000.

PARTIAL INTERCHANGE ALTERNATIVE

This alternative would involve the addition of southbound on-ramp and northbound off-ramp at USH 41 and CTH A. The half diamond interchange would be constructed on the west side of CTH A. This would change the existing traffic patterns by allowing the through traffic that was destined for USH 41 a direct route via CTH A. Both the indirection of the USH 41/STH 47 interchange and the CTH OO to CTH A route thru the residential area would be eliminated. The capacity analysis for the existing traffic can be found in Appendix F.

Impacts to CTH A. Building the partial interchange at the CTH A and USH 41 intersection would increase the traffic on CTH A north of USH 41 and reduce the traffic on CTH A south of USH 41. Exhibits 16, 17 and 18 show the projected traffic volumes and movements for the partial interchange alternate. This alternative would eliminate much of the truck traffic from CTH A south of USH 41 that originates from the quarries located along CTH A north of USH 41. The origin destination study indicated that 25% of all heavy trucks on CTH A have an origin and destination beyond the Appleton Urbanized area west or south on USH 41.

Under this alternate, the capacity of two lanes on CTH A south of USH 41 would be reached in the year 2021. This would be approximately 20 years later then the no interchange alternate, which is already approaching the capacity of two lanes.

The added traffic on CTH A north of USH 41 would warrant a stronger pavement structure on the existing two lanes. The six-mile segment of CTH A north of USH 41 from Quarry Road to STH 47 was reconstructed in 1996. Since traffic under this alternate would increase 18 to 20 percent, an overlay would be warranted by the year 2020.

The intersection of CTH A with CTH JJ to the east would be over capacity as soon as the partial interchange opened. Due to the increase in traffic and the increase in left turns from CTH JJ to southbound CTH A the intersection would need to be reconstructed to a roundabout or signalized. A signalized intersection with the exiting geometrics would function at a LOS F in the year 2020. With four lanes on CTH A and no separate left turn lane, a signalized intersection would function at a LOS “C” in the year 2020.

EXHIBIT 16

USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
DISTRICT 3
ALTERNATIVE 3-1/2 SOUTH INTERCHANGE

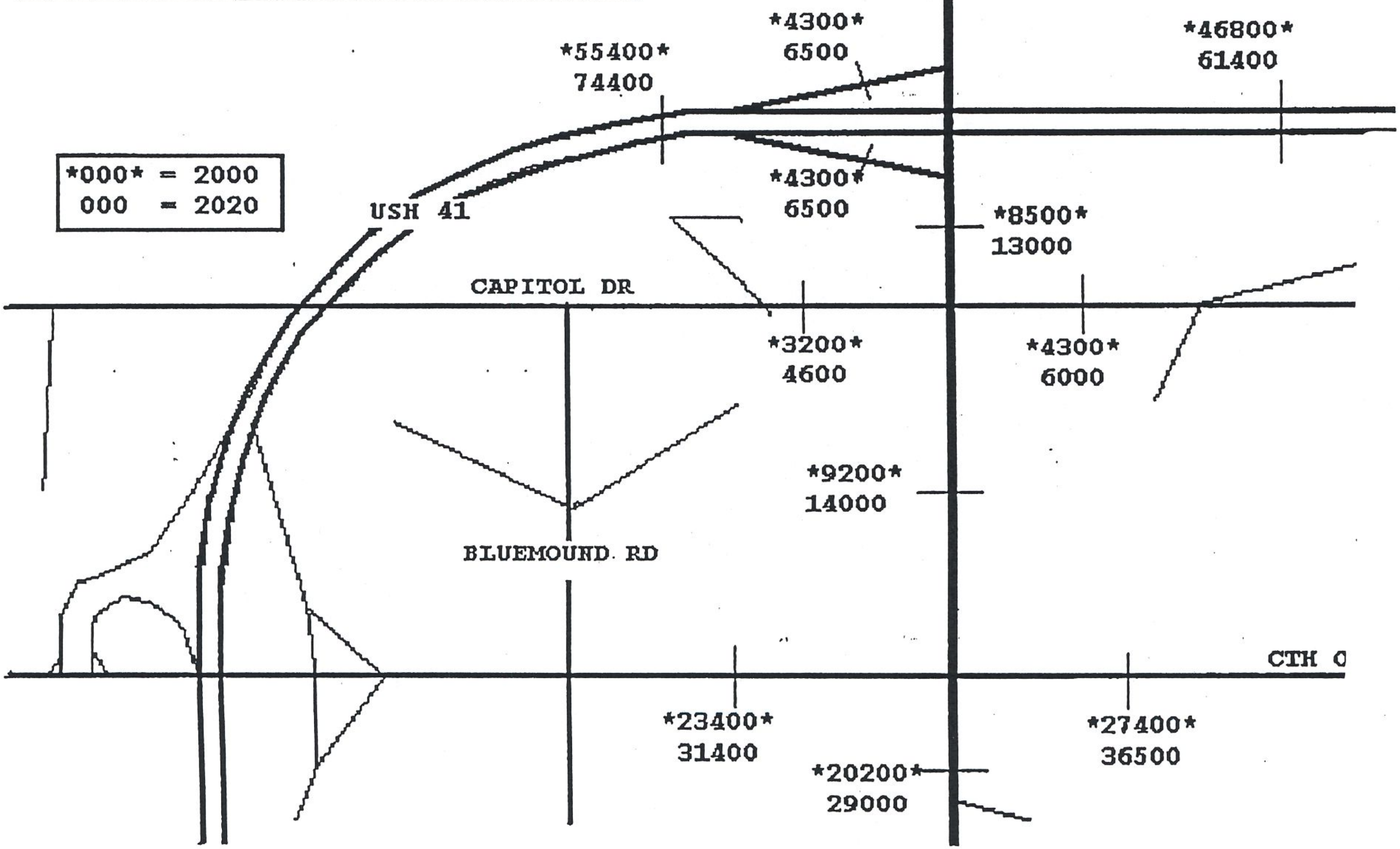


EXHIBIT 17

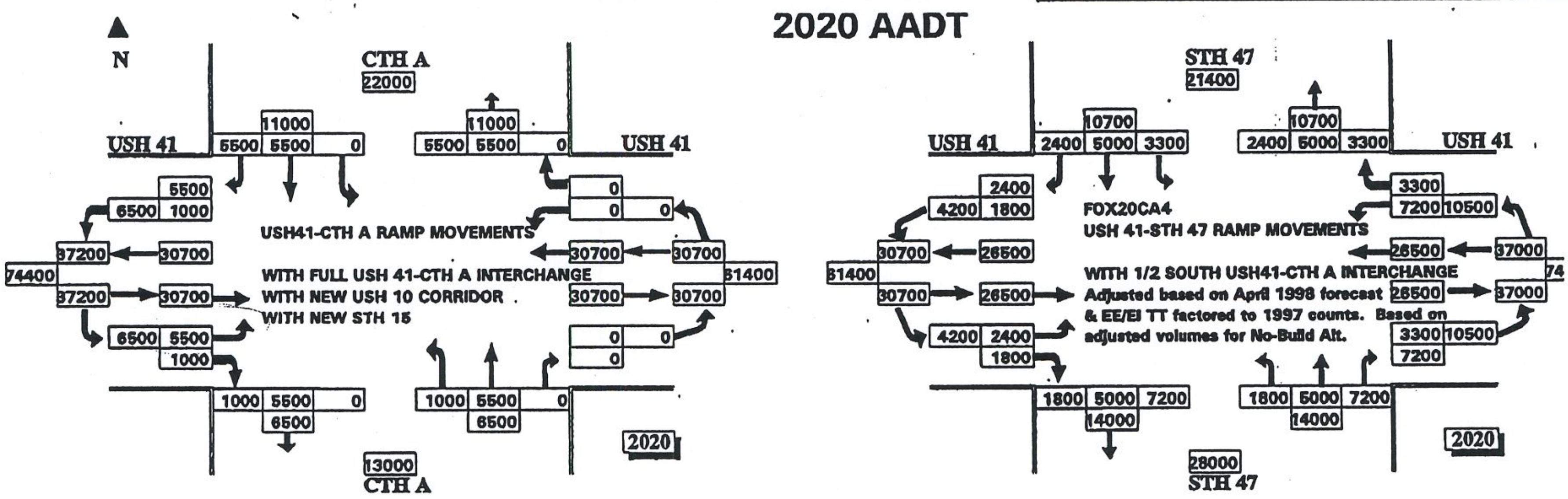
File Ref: U:\LOTUS\141AA320.WK1

PROJECT ID: 1123-03-00
2020 USH 41- CTH A Interchange Alternatives
ALTERNATIVE 3: 1/2 SOUTH INTERCHANGE
2020 RAMP MOVEMENTS

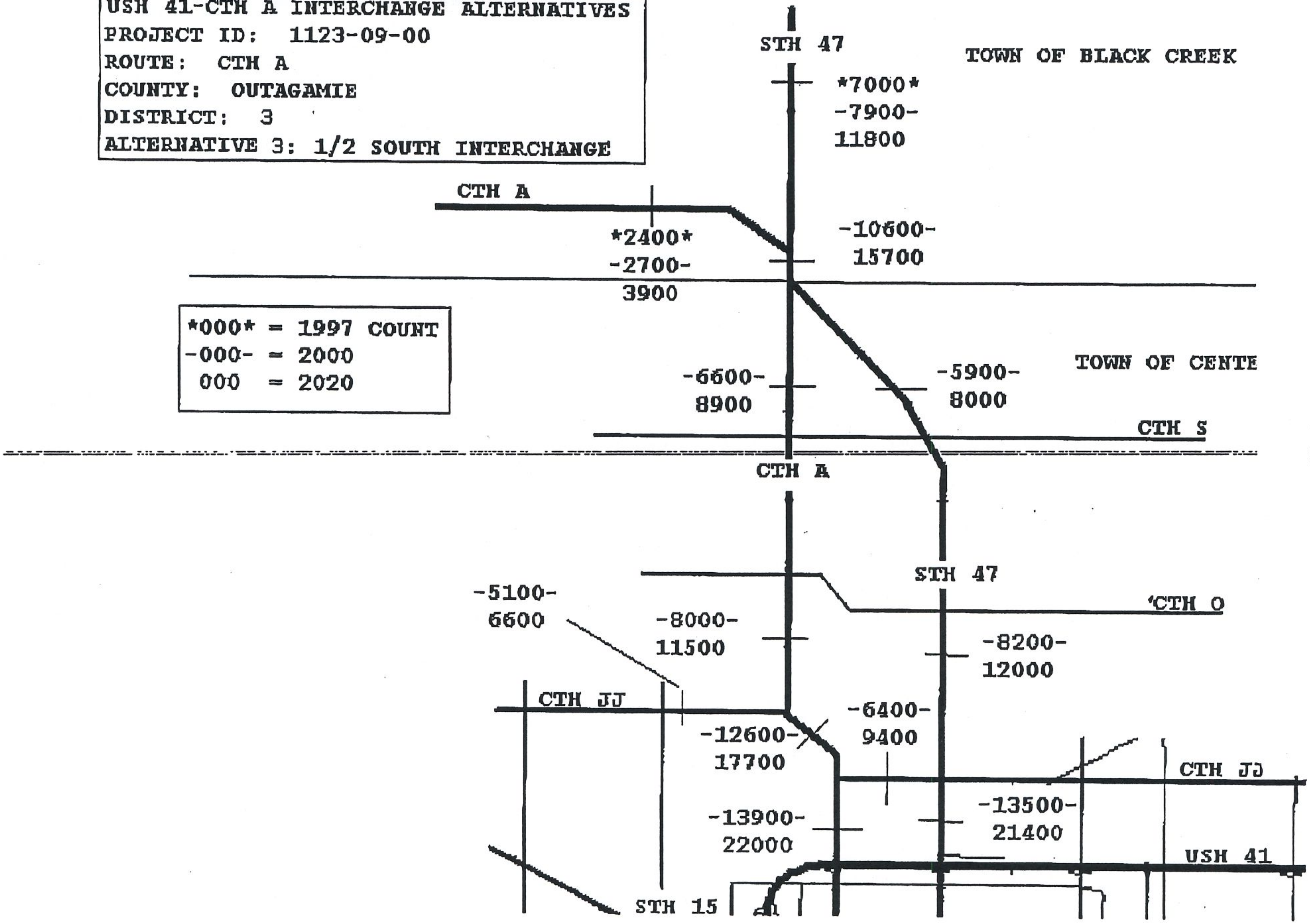
INTERCHANGE FORECAST

ALTERNATIVE 3: WITH 1/2 SOUTH USH 41- CTH A INTERCHANGE

2020 AADT



USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
COUNTY: OUTAGAMIE
DISTRICT: 3
ALTERNATIVE 3: 1/2 SOUTH INTERCHANGE



Impacts to USH 41. Under the partial interchange alternate, the year 2020 traffic on USH 41 west of CTH A would increase from 67,000 vehicles to 74,400 vehicles per day. The USH 41 traffic east of CTH A, however, would drop from 67,000 vehicles to 61,400 vehicles. This means that a six-lane facility west of CTH A would be warranted in year 2011 or eight years earlier when compared to the no interchange alternate. East of CTH A six lanes would be warranted in year 2026 or seven years later than for the no interchange alternate.

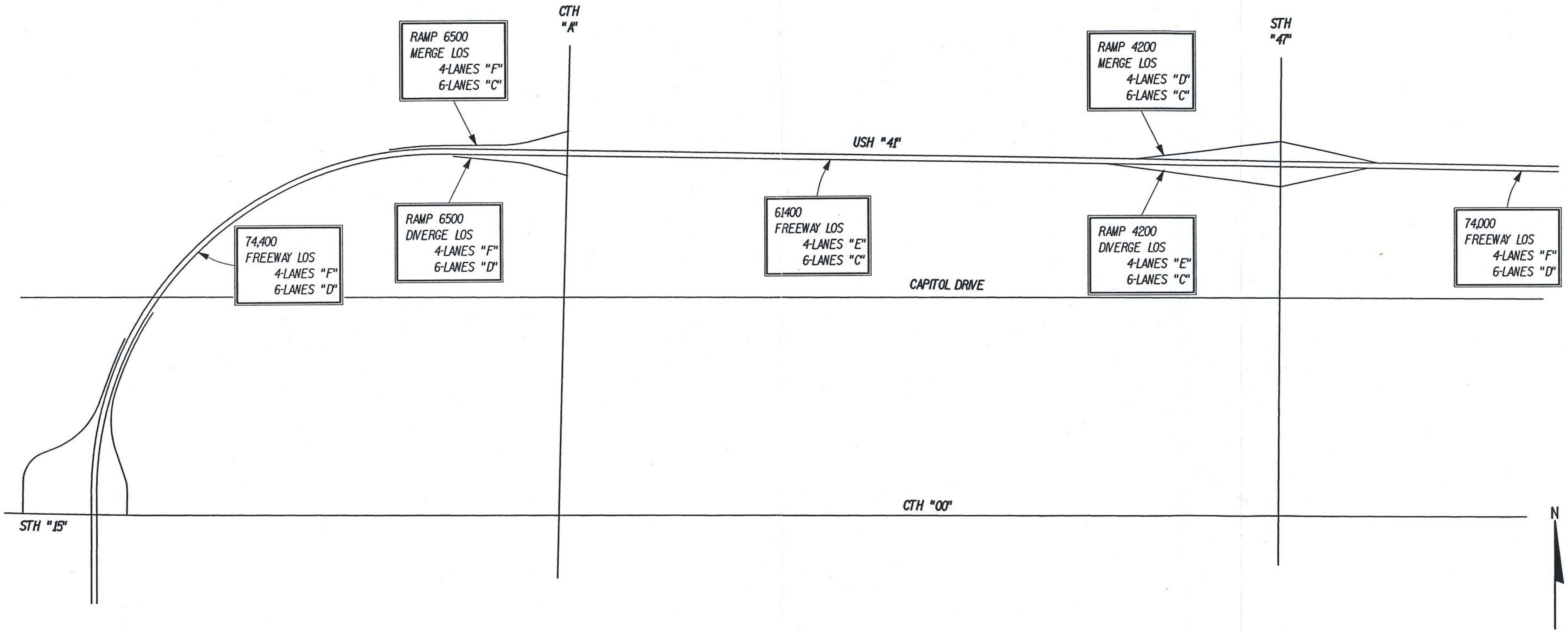
With a partial interchange at CTH A, the freeway segment on USH 41 between STH 15/CTH OO and CTH A would function at a level of service of F in the year 2020. If USH 41 were upgraded to 6 lanes, the segment would function at a level of service D. For the no interchange option the level of service was F and C respectively.
With a partial interchange at CTH A and 4 lanes on USH 41, the freeway segment between CTH A and STH 47 would function at a level of service of E in the year 2020. If USH 41 were upgraded to 6 lanes, the freeway segment would function at a level of service of C. For the no interchange option the level of service was F and C respectively.

The ramp terminals onto USH 41 at CTH A would have an adverse impact on USH 41 traffic. However, converting USH 41 to a six-lane facility at the time of ramp construction would reduce this adverse impact. Exhibit 19 shows the traffic volumes and level of service for year 2020. The ramp junctions for both the southbound on-ramp and northbound off ramp at USH 41/CTH A interchange would be a level of service F. If USH 41 were upgraded to 6 lanes the junction at the southbound on-ramp would be a level of service C while the northbound off-ramp would be a level of service D.

The partial interchange has a positive impact on the USH 41 traffic at the ramp terminals for the USH 41 and STH 47 interchange. The ramp junction for the southbound on-ramp at USH 41/ STH 47 would be a level of service D in the year 2020 for a four-lane facility on USH 41. The level of service would be C for a six-lane facility. Although the level of services did not change from the no interchange alternative the numbers are slightly better for the partial interchange alternative. The ramp junction for the northbound off-ramp at USH 41/ STH 47 would be a level of service E in the year 2020 for a four-lane facility on USH 41. The level of service would be C for a six-lane facility. For the no interchange alternative the level of services are E and D respectively.

If USH 41 is not reconstructed to six-lanes at the time of the ramp construction the ramp lengths could be increased from the typical design lengths shown in the FDM. Increasing the on and off ramp tapers at CTH A and the northbound on-ramp and southbound off-ramp at STH 15/CTH OO would help improve the level of service at the ramp-freeway junction areas of influence until the volume of USH 41 through traffic has reached a level of service of F.

Because of the increased length of the ramps, the curved alignment of USH 41 and the uncertainty of the timing of the six lane upgrade, northbound and southbound auxiliary lanes from CTH A to STH 15/CTH OO will be required. Southbound and northbound



LEGEND:

LOS = LEVEL OF SERVICE

(000 = YEAR 2020 AVERAGE DAILY TRAFFIC

"X" = YEAR 2020 LOS

CAPACITY ANALYSIS

ALTERNATE: PARTIAL INTERCHANGE

OMNI ASSOCIATES

LEVELS ON = 51, 53, 56, 58,59, 63

FILE NAME : F:\Transportation\E1582A02\Reports\Interchange Report\part20xx.dgn PLOT DATE : 07/13/2004 01:46:41 PM PLOT BY : knuthc auxiliary lanes would have a negative impact on the Capitol Drive Bridge over USH 41. This bridge has substandard clearance over USH 41 and is being evaluated for future needs. Auxiliary lanes on USH 41 would cause the span of the bridge to be longer. There would also be a negative impact on Rifle Range Road from the southbound auxiliary lane. The frontage road would need to be shifted to the north. However there is adequate right of way to rebuild Rifle Range Road with a 15-foot terrace from the property line and a 32' face of curb to face of curb roadway width. The Town of Grand Chute will be extending Grand Chute Boulevard to the west to tie into this ultimate location and typical section of Rifle Range Road.

Ramp spacing adversely affects the level of service if the merge or diverge influence areas overlap. According to the Highway Capacity Manual, diamond interchanges would have to be spaced less than one mile apart for this to be a concern. CTH A is a mile and a half northeasterly from the CTH OO/ STH 15 interchange as well as a mile and a half west of the STH 47 interchange.

Anyone exiting northbound USH 41 at CTH A could be redirected to northbound USH 41 via signing south on CTH A, east on CTH OO, north on STH 47 to the USH 41 northbound on-ramp. There is no gas; food or lodging in this area so the through traffic wishing to reenter USH 41 should be minimum.

Impacts to STH 47. The partial interchange at CTH A would have a positive affect on STH 47. Based on traffic projection, the partial interchange option would reduce the traffic on STH 47 and on the USH 41/ STH 47 interchange. The 2020 traffic on STH 47 north of USH 41 would decrease from 26600 ADT with the no interchange alternative to 21400 ADT for the partial interchange alternative. With a 19% reduction in traffic the partial interchange alternative would have a positive affect on the design of the STH 47/USH 41 interchange when it is upgraded. The reduced traffic could potentially reduce the length of turn lanes needed as well as the pavement depth.

Impacts to STH 47/CTH A Intersection. Just south of the STH47/CTH A intersection the CTH A traffic increases by 1,500 vehicles per day and STH 47 traffic decreases by 1500 vehicles per day in the year 2020 when comparing the partial interchange to the no interchange alternate. However, the amount of traffic at the "T" intersection of STH 47 and CTH A would be reduced by one half of the 1500 vehicles because the southbound traffic on CTH A by passes the "T" intersection as shown in Exhibit 3. Based on continuing with the stop control on CTH A at STH 47 and the 2020 traffic projections, the level of service is A for STH 47 and F for CTH A. The critical movement affecting the operations of the intersection is the left turn movement from CTH A to northbound STH 47. Under the partial interchange alternative this movement is about 20 percent higher than the no interchange alternate.

The levels of services are based on weekday traffic counts/projections as shown in Exhibit 18. They do not take into account the large volumes of recreational/weekend traffic. These volumes are over 70% higher than the weekday traffic and should be taken into account when the intersection is analyzed. WisDOT is analyzing this intersection under a separate project.

Impacts to the Community. The partial interchange alternative would have a positive impact for the community and the traveling public. According to the OD study, CTH A had 1,355 through trips, which was the fourth highest percentage for the Appleton Area. USH 41, USH 45 north and USH 45 South were the only locations that had higher percentages of through traffic. With the partial interchange the through traffic would be able to access USH 41 without using CTH OO and CTH A south of USH 41.

The noise impact on the residences on the south side of USH 41 is already severe. The construction of the northbound off-ramp in the southwest quadrant of USH 41 and CTH A would move some of the noise closer to the residents. The severe noise impacts would have to be addressed when lanes are added to USH 41. The estimated cost of a noise wall along the northbound off-ramp is $500,000.00.

Under the partial interchange alternate traffic along the developed area on CTH A south of USH 41 would be reduced. The reduced traffic would improve the safety along CTH A and CTH OO, including the school zone area of Houdini School.

Under this alternative there would be some impacts to Mud Creek. The box culvert would need to be extended under the northbound-off ramp. North of USH 41 widening of CTH A would impact either Mud Creek on the eastside of CTH A or wetlands on west side of CTH A.

A small amount of right of way would be needed for the construction of the northbound off-ramp and southbound on-ramp.

Road User Costs. The partial interchange alternate eliminates the road user costs associated with the no interchange alternate because the indirection of using STH 47 to go west/south on USH 41 would be eliminated. Without the southbound on-ramp and northbound off-ramp at CTH A, motorists will travel on the average 5,500 extra miles per day over the next 20 years by traveling STH 47 to reach USH 41. The partial interchange would eliminate about $7,000,000 in user cost associated with the extra travel to STH 47 over the next 20 years. Based on state wide crash rates the interchange alternates would potentially eliminate about 50 accidents associated with the extra 40 million miles traveled over the next 20 years.

The partial interchange would also eliminate the indirection and inconvenience of the CTH A to CTH OO route south of USH 41. Over the next 20 years an average of about 5,000 vehicles per day will use CTH A and CTH OO to reach USH 41 and points south and west if there is no partial interchange at CTH A and USH 41. This is a slower and longer route through a fully developed urban area as compared to the USH 41 route that would be available if there was a southbound on-ramp and northbound off-ramp to USH 41 at CTH A. Access to USH 41 at CTH A would save about $2,500,000 in user costs over the next 20 years. The statewide average crash rate is less for an urban interstate facility than non-interstate facilities. Based on the reduce travel length and the reduction in the average crash rate, 120 traffic crashes over the 20 year period could potentially be eliminated.

The partial interchange alternative would save about $9,500,000 in road user costs and could potentially eliminate a total of 170 accidents over the next 20 years. The parameters and assumptions used to compute the road user costs are contained in Appendix H.

Construction Costs. Adjusting the actual costs of the completed USH 41 and Ballard Road interchange, the cost of the partial interchange alternate, including noise wall along the northbound off-ramp in the southwest quadrant would be about $2,500,000.00. This does not include the cost of auxiliary lanes or impacts from the auxiliary lanes such as reconstructing Rifle Range Road or the increased length of the Capitol Drive Bridge over USH 41.

FULL INTERCHANGE ALTERNATIVE

This alternative would involve adding a ramp in each of the quadrants for a complete diamond interchange. This would change the existing traffic patterns by allowing all movements between USH 41 and CTH A. The capacity analysis for the existing traffic can be found in Appendix G.

Impacts to CTH A. Building a full diamond interchange at CTH A would increase the traffic on CTH A north and south of USH 41 when compared to the no build or the partial interchange alternative. Exhibit 20, 21 and 22 show the current and projected traffic for this alternate.

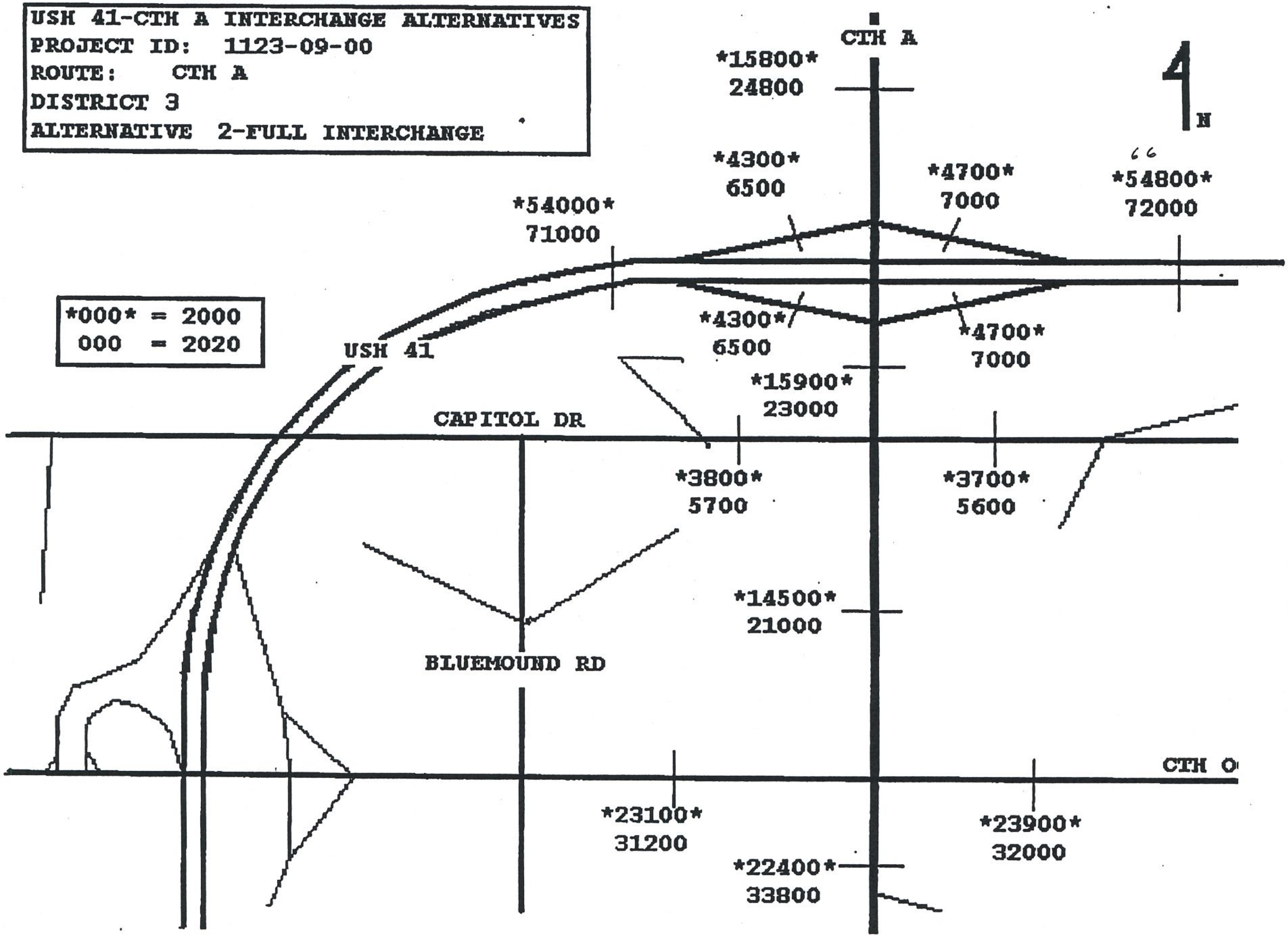
Based on projected traffic volumes CTH A would warrant 4 lanes. Under this alternate, the capacity of two lanes on CTH A south of USH 41 would be exceeded as soon as the interchange was opened.

Traffic on CTH A north of USH 41 would increase about 10 % when compared to the partial interchange alternate and about 46% when compared to the no interchange alternative. CTH A between USH 41 and CTH JJ would warrant 4 lanes. The added traffic on CTH A north of CTH JJ would warrant a stronger pavement structure on the existing two lanes. An overlay would be warranted by the year 2020.

This alternate reduces the traffic on CTH JJ to the east of CTH A by about one third. As with the partial interchange alternate, the stop sign controlled intersection of CTH A and CTH JJ to the east would be over capacity when the full interchange opens. It would need to be analyzed and reconstructed to a roundabout or signalized. A signalized intersection with the exiting geometrics would function at a LOS F in the year 2020. With four lanes on CTH A and no separate left turn lane, a signalized intersection would function at a LOS "C" in the year 2020.

USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
DISTRICT 3
ALTERNATIVE 2-FULL INTERCHANGE

000 = 2000
000 = 2020



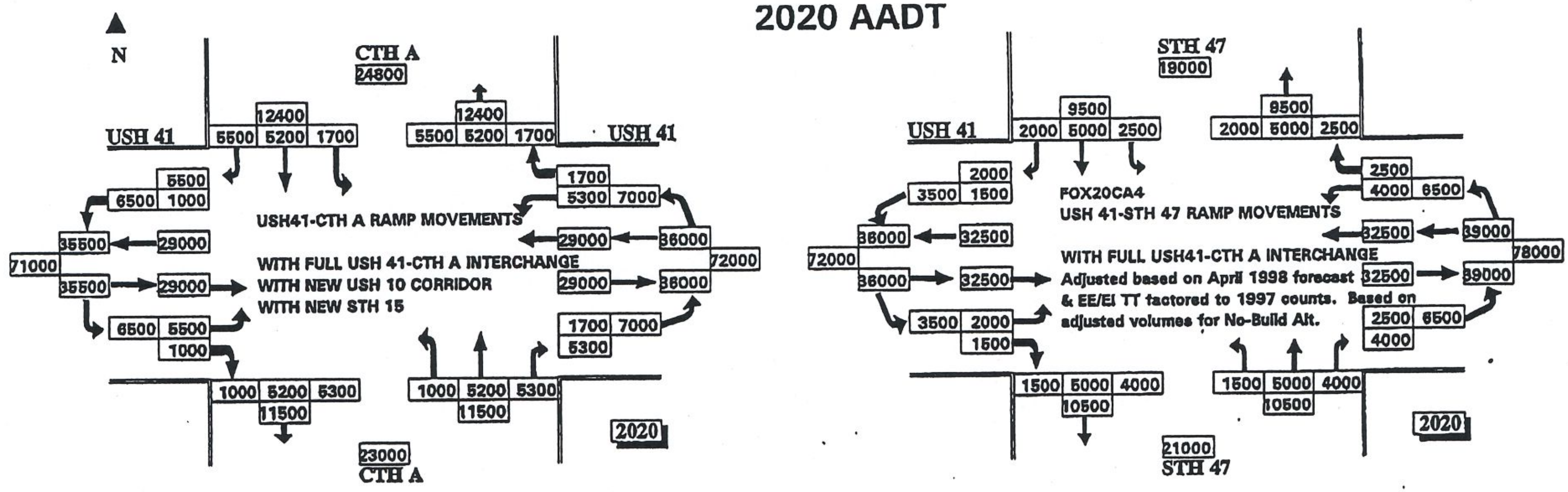
File Ref: U:\LOTUS\141AA220.WK1

PROJECT ID: 1123-09-00
2020 USH 41- CTH A Interchange Alternatives
ALTERNATIVE 2: FULL INTERCHANGE
2020 RAMP MOVEMENTS

INTERCHANGE FORECAST

ALTERNATIVE 2: WITH FULL USH 41-CTH A INTERCHANGE

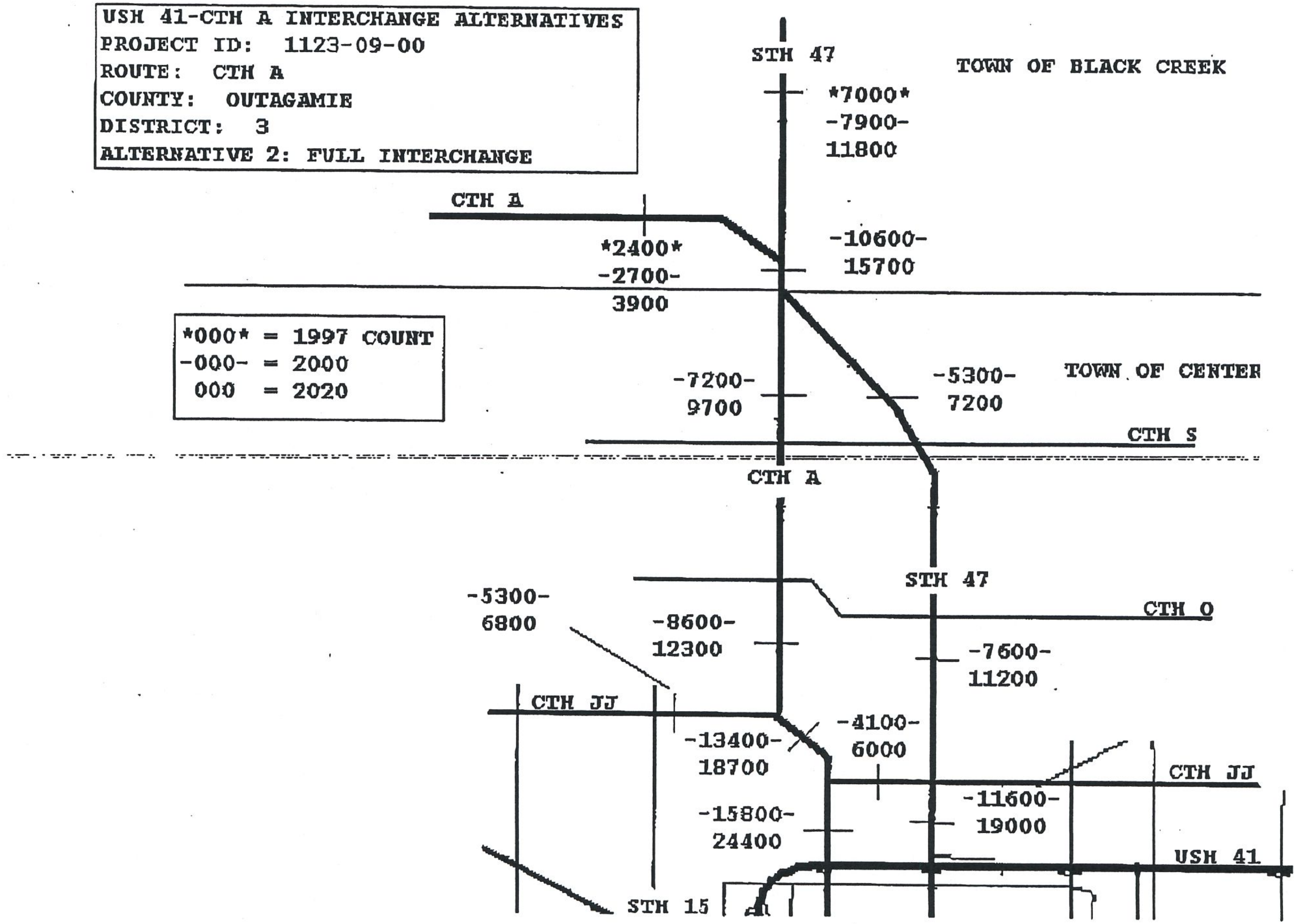
2020 AADT



WisDOT TF&A Section RAP Corrected 14-Oct-98

EXHIBIT 21

USH 41-CTH A INTERCHANGE ALTERNATIVES
PROJECT ID: 1123-09-00
ROUTE: CTH A
COUNTY: OUTAGAMIE
DISTRICT: 3
ALTERNATIVE 2: FULL INTERCHANGE



Impacts to USH 41. Under the full interchange alternate, the traffic on USH 41 would increase on both sides of CTH A as compared to the no build alternate. The traffic would warrant upgrading USH 41 to six lanes in the year 2014 west of CTH A and in the year 2013 east of CTH A. Exhibit 23 shows the traffic volumes and levels of service for this alternate.

With a full interchange at CTH A, the freeway segment on USH 41 between STH 15/CTH OO and CTH A would function at a level of service of F in the year 2020. If USH 41 were upgraded to 6 lanes, the segment would function at a level of service D. For the no interchange option the level of service was F and C respectively.

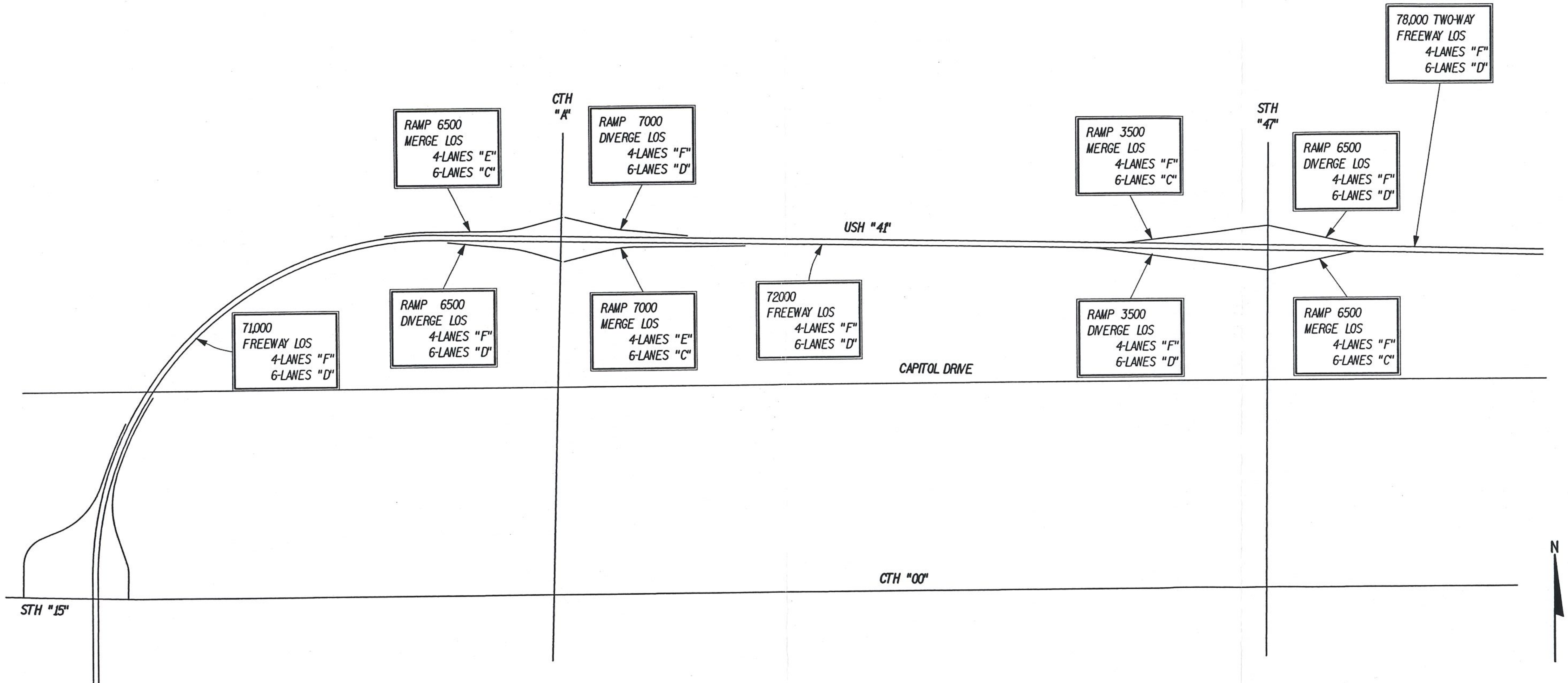
With a full interchange at CTH A and 4 lanes on USH 41, the freeway segment between CTH A and STH 47 would function at a level of service of F in the year 2020. If USH 41 were upgraded to 6 lanes, the freeway segment would function at a level of service of D. For the no interchange option the level of service was F and C respectively.

The full interchange alternate would increase the ADT on USH 41 east of STH 47 by 4,000 vehicles when compared to the no interchange alternative. There would also be a decrease in the ADT on CTH OO east of CTH A of 4400 vehicle. This change in traffic suggests that some vehicles are choosing to use USH 41 instead of CTH OO. The freeway segment east of STH 47 would function at a level of service of F in the year 2020. If USH 41 were upgraded to 6 lanes, the freeway segment would function at a level of service of D. For the no interchange option the level of service was F and D respectively.

The addition of the ramps would have an adverse impact on USH 41 traffic. However converting USH 41 to a six-lane facility at the time of the interchange construction would reduce this adverse impact. Exhibit 23 shows the traffic volumes and levels of service for the ramp junctions and freeway segments for this alternate.

If USH 41 is not reconstructed to six-lanes at the time of the ramp construction, the ramp lengths could be increases from the typical design lengths shown in the FDM. Increasing the on and off ramp tapers would help improve the level of service at the ramp-freeway junction areas of influence until the volume of USH 41 through traffic has reached a level of service of F. If longer ramp tapers and/or auxiliary lanes are added, the impacts for the area between CTH A and STH 15/ CTH OO would be the same as the partial interchange option.

Impacts to STH 47. The full interchange alternative would have a positive affect on STH 47. Based on traffic projections, the full interchange would reduce the traffic on STH 47 and at the USH 41/STH 47 interchange. The 2020 traffic on STH 47 north of USH 41 would decrease from 26600 ADT with the no interchange alternative to 19000 ADT for the full interchange alternative. STH 47 south of USH 41 would decrease from 28400 ADT to 21000 ADT. With an approximate 26% reduction in traffic, the full interchange alternative would have a positive affect on the design of the STH 47/USH 41



LEGEND:

LOS = LEVEL OF SERVICE

000 = YEAR 2020 AVERAGE DAILY TRAFFIC

"X" = YEAR 2020 LOS

CAPACITY ANALYSIS

ALTERNATE: FULL INTERCHANGE

OMNI ASSOCIATES

LEVELS ON = 50,51,52,53, 56, 58,59, 63

FILE NAME : F:\Transportation\E1582A02\Reports\Interchange Report\full20xx.dgn PLOT DATE : 07/13/2004 01:48:36 PM PLOT BY : knuthc interchange when it is upgraded. The reduced traffic could potentially reduce the length of turn lanes needed as well as the pavement depth

Impacts to STH 47/ CTH A Intersection. Just south of the STH47/CTH A intersection, the CTH A traffic would increase by 2,300 vehicles per day and STH 47 traffic would decrease by 2,300 vehicles per day in the year 2020 when comparing the full interchange to the no interchange alternate. However, the amount of traffic at the "T" intersection of STH 47 and CTH A would be reduced by one half of the 2,300 vehicles because the southbound traffic on CTH A by passes the "T" intersection as shown in Exhibit 3. Based on continuing with the stop control on CTH A at STH 47 and the 2020 traffic projections, the level of service is A for STH 47 and F for CTH A. The critical movement affecting the operations of the intersection is the left turn movement from CTH A to northbound STH 47. Under the full interchange alternative this movement is about 25 percent higher than the no interchange alternate.

The levels of services are based on weekday traffic counts/projections as shown in Exhibit 22. They do not take into account the large volumes of recreational/weekend traffic. These volumes are over 70% higher than the weekday traffic and should be taken into account when the intersection is analyzed. WisDOT is analyzing this intersection under a separate project.

Impacts to the Community. The full interchange alternative would have a negative impact on the community because this option would increase the traffic on CTH A between Capitol Drive and USH 41 when compared to the no interchange and partial interchange alternates. The traffic on Capitol Drive west of CTH A would also increase. The volume of traffic on CTH A between CTH OO and Capitol Drive would not be significantly different than that for the no interchange alternate. However the ADT is projected to be 7000 vehicles more than the partial interchange option. These increases would have an adverse effect on the primarily residential development in the area.

One positive impact for the community would be that the characteristics of traffic through the residential area would change because the through traffic consisting of a large percentage of heavy trucks would have access to USH 41 without using CTH OO and CTH A south of USH 41.

The noise impact on the residences on the south side of USH 41 is already severe. The construction of ramps at USH 41 and CTH A would move some of the noise closer to the residents. The severe noise impacts would have to be addressed when lanes are added to USH 41. The estimated cost of a noise wall along the northbound off-ramp and the northbound on-ramp is $1,000,000.

Under this alternative there would be impacts to Mud Creek. The box culvert would need to be extended to accommodate a wider roadway on CTH A, the southbound off-ramp and northbound off-ramp. The southbound off ramp would also impact wetlands. North of USH 41 widening of CTH A would impact either Mud Creek on the east side of CTH A or wetlands on west side of CTH A.

Some right-of-way in each of the quadrants may be required for the construction of the ramps.

Road User Costs. The full interchange alternate would have the same impact to road user costs as the partial interchange alternative. It would eliminate the road user costs associated with the no interchange alternate because the indirection of using STH 47 to go west/south on USH 41 would be eliminated as well as eliminating the indirection and inconvenience of the CTH A to CTH OO route. Without the ramps at CTH A, motorists will travel on the average 5,500 extra miles per day over the next 20 years to reach USH 41 via STH 47. The full interchange would eliminate about $7,000,000 in user cost associated with the extra travel to STH 47 over the next 20 years. Based on state wide crash rates the interchange alternates would potentially eliminate about 50 accidents associated with the extra 40 million miles traveled over the next 20 years.

The full interchange would also eliminate the indirection and inconvenience of the CTH A to CTH OO route south of USH 41. Over the next 20 years an average of about 5,000 vehicles per day will use CTH A and CTH OO to reach USH 41 and points south and west if there is no ramps at CTH A and USH 41. This is a slower and longer route through a fully developed urban area as compared to the USH 41 route that would be available if there was a southbound on-ramp and northbound off-ramp to USH 41 at CTH A. Access to USH 41 at CTH A would save about $2,500,000 in user costs over the next 20 years. The statewide crash rate is less for an urban interstate facility than non-interstate facilities. Based on the reduced travel length and the reduction in the average crash rate, 120 traffic crashes over the 20-year period could potentially be eliminated.

The total savings for the full interchange alternative would be about $9,500,000 in user costs and could potentially eliminate a total of 170 accidents over the next 20 years. The parameters and assumptions used to compute the road user costs are contained in Appendix H.

Construction Costs. By adjusting the actual costs of the completed USH 41 and Ballard Road interchange, the cost of a full diamond interchange with noise walls along the south side would be about $3,500,000. This does not include the cost of auxiliary lanes or impacts from the auxiliary lanes such as reconstructing Rifle Range Road or the increased length of the Capitol Drive Bridge over USH 41.

RECOMMENDATION

It is our recommendation that a partial interchange be planned for and built at the USH 41 and CTH A intersection. The OD Study showed that CTH A had 1,355 through trips, which was the fourth highest percentage for the Appleton Area. This was only surpassed by the percentages on USH 41, USH 45 north and USH 45 south. The OD study also showed that the largest concentration of heavy trucks in the Appleton Area was on CTH A north of USH 41. 1,224 of the 7,560 trips (16.2%) were with heavy trucks. The OD study also indicated that 25% of all heavy trucks on CTH A have an origin and destination beyond the Appleton area west or south on USH 41. The partial interchange alternative would allow the through traffic to access USH 41 at CTH A without using the local street system through the residential area to access USH 41 at CTH OO.

The partial interchange has some impacts to USH 41. Most of the impacts are a shift of the impact from the adjacent interchanges. Vehicles accessing USH 41 at the partial interchange would deduct from the number of vehicles accessing USH 41 at CTH OO/STH 15 and the STH 47 interchanges. Capacity concerns for the ramp junctions could be reduced by the construction of auxiliary lanes from CTH A to STH 15/CTH OO. The negative impacts of the interchange could be further reduce by building the partial interchange at the time that USH 41 is upgraded to 6 lanes.

Interchange Project Evaluation Guidelines. The partial interchange meets most of the Wisconsin Department of Transportation criteria for Interchange Project Evaluation Guidelines-Backbone Program Preliminary Draft-February 18, 2004. The first of the minimum criteria indicates that the interchange must be consistent with local land use and transportation plans and/or supported in writing by local officials. The existing East Central Wisconsin Regional Planning Commission's (ECWRPC) Long Range Transportation/Land Use Plan for the Fox Cities Urbanized Area does not include a partial interchange at CTH A and USH 41. However ECWRPC is in the process of updating the plan. ECWRPC supports a partial interchange at this location. See Appendix I. The Town of Grand Chute's Comprehensive Land Use Plan does include a partial interchange at CTH A. Outagamie County has approved a partial interchange at CTH A and USH 41 contingent upon the Wisconsin Department of Transportation addressing concerns at the intersection of CTH A and STH 47.

The second criterion is that the interchange must meet minimum spacing requirements of 2 miles for rural and 1 mile for urban. The partial interchange meets this requirement. The STH 15/CTH OO interchange to the southwest is located one and one half miles away. The STH 47 interchange to the east is also one and one half miles away from CTH A.

The third criterion is that the mainline LOS should be LOS C or better, or no worse than existing LOS. The existing LOS on USH 41between STH 15/CTH OO and STH 47 is D. In 2020 this USH 41 freeway segment will be at a LOS F for a 4-lane facility and C for a 6-lane facility. For the partial interchange option and 2020 traffic, the USH 41 segment between STH 15/CTH OO and CTH A would function at a LOS of F for a 4-lane facility and D for a 6-lane facility. The LOS for the USH 41 segment between CTH A and STH 47 would improve to E for the 4-lane facility and C for a 6-lane facility.

The ramp merge, ramp diverge and weaving movements should be LOS C or better. The CTH A southbound on-ramp, the STH 47 southbound on-ramp and the STH 47 northbound off-ramp meet this criteria with USH 41 as a 6 lane facility. The CTH A northbound off-ramp would meet this criterion if the taper length of the off ramp were lengthened to 500 feet. The LOS for the STH 47 northbound off-ramp improves under the partial interchange alternative for the 6-lane facility from D to C.

The next criterion indicates that the environmental issues need to be able to be addressed through the environmental process. This should not be a concern for the partial interchange alternative. The partial interchange option has a positive impact on the community and traveling public. Noise walls will mitigate the noise problems along USH 41. The impacts to Mud Creek and the associated wetlands will be mitigated adjacent to Mud Creek upstream on the Town of Grand Chute's property.

The next criterion deals with traffic volumes. The traffic on CTH A and USH 41 exceed the required traffic volumes for adding a new interchange to an existing freeway.

FHWA Interchange Criteria. The Wisconsin Department of Transportation is considering using the 8 FHWA Interchange Criteria for the backbone system as well as the interstate system. Each criterion is listed below followed by how the partial interchange alternative addresses that criterion.

1. **The existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design-year traffic demands while at the same time providing the access intended by the proposal.**

The existing interchange at STH 47 is reaching capacity. For year 2000 ADT the southbound on ramp and northbound off ramp function at a LOS D. The addition of the partial interchange at CTH A will improve the conditions at the STH 47 interchange and the STH 15/CTH OO interchange, as well as reduce the through traffic from the local road system.

The OD study indicates that CTH A had 1,355 through trips, which was the fourth highest percentage for the Appleton Area. It also showed that the majority of those through trips are heading or coming from the south. This through traffic is entering USH 41 at the CTH OO/STH 15 interchange, which requires this through traffic to cross over USH 41 and continue on CTH A through a developed area before having access to USH 41.

2. **All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.**

The partial interchange option is a reasonable design alternative. The no interchange option does not remove the through traffic from the local road system or improve the adjacent interchanges. The full interchange option provides for access to USH 41 for the though traffic. However it also has negative impacts to the community and additional negative environmental impacts. Because of the geometrics of USH 41 and the environmental constraints north of USH 41 there are no other reasonable design options.

3. **The proposed access point does not have a significant adverse impact on the safety and operation of the Interstate facility based on an analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas, include an analysis of sections of Interstate to and including at least the first adjacent existing or proposed interchange on either side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with new or revised access points.**

The partial interchange alternative does not have a significant impact to USH 41 if the interchange is constructed when USH 41 is upgraded to a 6-lane facility. The partial interchange option would have a small negative impact to the CTH A/USH 41 ramp junctions. However it would have a positive impact at the adjacent interchanges.

4. **The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" for special purpose access for transit vehicles, for HOV's, or into park and ride lots may be considered on a case-by-case basis. The proposed access will be designed to meet or exceed current standards for Federal-aid projects on the Interstate System.**

The partial interchange connects to a public road but does not provide for all traffic movements. The partial interchange addresses the need for through traffic heading south on CTH A and west to access USH 41 southbound. The through traffic that is heading south on CTH A and desires to head north or east on USH 41 is accommodated by the interchange at STH 47 and the local road system north of USH 41. Because of the geometry of USH 41 and the interchange at STH 47 there is not a need for a full interchange at CTH A. The full interchange increases traffic in the developed area south of USH 41. The full interchange has additional negative environmental impacts and does not have the support of Grand Chute and Outagamie County.

Northbound USH 41 through traffic could be redirected to northbound USH 41 via signing on CTH A, east on CTH OO, north on CTH 47 to the USH 41 northbound on-ramp.

5. **The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new or revised access must be consistent with the metropolitan and/or statewide transportation plan, as appropriate, the applicable provisions of 23 CFR part 450 and the transportation conformity requirements of 40 CFR parts 51 and 93.**

Applicable provisions of 23 CFR part 450 indicate that the plan must conform to the regional plan. The partial interchange is included in Grand Chute's Comprehensive Land Use Plan. The existing East Central Wisconsin Regional Planning Commission's Long Range Transportation/Land Use Plan for the Fox Cities Urbanized Area does not include a partial interchange at CTH A and USH 41. However East Central is in the process of updating the plan. East Central supports a partial interchange at CTH A and USH 41.

Outagamie County has approved a partial interchange at CTH A and USH 41 contingent upon the Wisconsin Department of Transportation addressing concerns at the intersection of CTH A and STH 47.

Transportation conformity requirements of 40 CFR parts 51 and 93 deal with non-attainment areas. This does not apply in the Town of Grand Chute.

6. In areas where the potential exists for future multiple interchange additions, all requests for new or revised access are supported by a comprehensive Interstate network study with recommendations that address all proposed and desired access within the context of a long term plan.

This criterion does not apply to this location due to the adjacent interchange spacing.

7. The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.

The request for the partial interchange is based on the OD study showing that CTH A carries a high percentage of through traffic and that through traffic has a large percentage of heavy trucks. This traffic is currently crossing over USH 41 and traveling through a developed area before entering USH 41 at the CTH OO/STH 15 interchange.

There is some planned development on CTH A north of USH 41 that is consistent with Grand Chute's Comprehensive Land Use Plan. The amount of development is limited because of the environmentally sensitive area north and west of USH 41 and CTH A. All development would be consistent with a partial interchange.

8. The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.

Grand Chute has already included the partial interchange in their Comprehensive Land Use Plan. ECWRPC supports the partial interchange alternative and is in the process of updating the Fox Cities Long Range Transportation/Land Use Plan. Outagamie County has approved a partial interchange at CTH A and USH 41 contingent upon the Wisconsin Department of Transportation addressing concerns at the intersection of CTH A and STH 47. An environmental assessment is in the process of being finalized on the partial interchange.

APPENDIX A

PROJECT ID: 1123-09-00
ROUTE: CTH A
LOCATION: USH 41-CTH A INT
2000, & 2020 AADT FORECAST

Truck Classification/Design Parameters for USH 41 Between STH 47 and the Proposed CTH A Interchanges

ALTERNATIVE 1: NO BUILD

Truck Classification / **Design Parameters**

Truck Type	%AADT	Factor	%AADT
2D	3.7	P(K1)	13.6
3AXSU+	1.7	K30	11.1
2S1+2S2	0.7	K50	10.8
3S2+	6.7	K100	10.2
DBL BTM	0.2	T(DHV)	10.5
TOTAL	13.0	T(PHV)	7.9
		D	55/45

ALTERNATIVE 2: FULL INTERCHANGE

Truck Classification / **Design Parameters**

Truck Type	%AADT	Factor	%AADT
2D	3.7	P(K1)	13.4
3AXSU+	1.7	K30	10.9
2S1+2S2	1.0	K50	10.6
3S2+	6.8	K100	10.0
DBL BTM	0.2	T(DHV)	10.7
TOTAL	13.4	T(PHV)	8.1
		D	55/45

ALTERNATIVE 3: ½ HALF SOUTH INTERCHANGE

Truck Classification / **Design Parameters**

Truck Type	%AADT	Factor	%AADT
2D	3.7	P(K1)	13.6
3AXSU+	1.7	K30	11.1
2S1+2S2	0.7	K50	10.8
3S2+	6.7	K100	10.2
DBL BTM	0.2	T(DHV)	10.5
TOTAL	13.0	T(PHV)	7.9
		D	55/45

The following major assumptions are reflected in the USH 41Truck Classification and Design Parameters for Project ID: 1123-09-00:

1. Truck classification data is based on Vehicle Classification data collected in 1996 on USH 41 North of USH 10/Wisconsin Av. (Site ID: 440165/WIM Site 14C06). With the changes in access to USH 41 under Alternatives 2 & 3, the truck classification data is adjusted based on the site North of USH 10. This reflects the basic assumption that under the existing no access conditions at USH 41-CTH A, significant numbers of trucks on CTH A North of CTH JJ are using a CTH A to CTH JJ to STH 47 route to access USH 41. Alternatives 2 & 3 provide different levels of access at USH 41-CTH A.
2. Design parameters are based on ATR STA. 5-0001, 1.5 Mi. N. of Outagamie-Brown Co. line as well as Factor Group 1- Urban Interstate values.

WisDOT Traffic Forecasts & Analysis Section
Robert Pike Feb 14, 1999

PROJECT ID: 11
ROUTE: CTH A
LOCATION: USl
2000, & 2020 AADT FORECAST

Truck Classification/Design Parameters

ALTERNATIVE 1: NO BUILD

Truck Classification

Truck Type	%AADT
2D	3.2
3AXSU+	3.5
2S1+2S2	1.9
3S2+	0.8
DBL BTM	0.2
TOTAL	9.6

Design Parameters

Factor	%AADT
P(K1)	13.1
K30	11.2
K50	11.0
K100	10.4
T(DHV)	7.7
T(PHV)	5.8
D	55/45

ALTERNATIVE 2: FULL INTERCHANGE

Truck Classification

Truck Type	%AADT
2D	3.2
3AXSU+	3.5
2S1+2S2	4.2
3S2+	1.4
DBL BTM	0.2
TOTAL	12.5

Design Parameters

Factor	%AADT
P(K1)	12.1
K30	10.7
K50	10.5
K100	10.0
T(DHV)	10.0
T(PHV)	7.5
D	55/45

ALTERNATIVE 3: ½ HALF SOUTH INTERCHANGE

Truck Classification

Truck Type	%AADT
2D	3.2
3AXSU+	3.5
2S1+2S2	3.1
3S2+	1.1
DBL BTM	0.2
TOTAL	11.1

Design Parameters

Factor	%AADT
P(K1)	12.4
K30	10.9
K50	10.6
K100	10.1
T(DHV)	8.9
T(PHV)	6.7
D	55/45

The following major assumptions are reflected in the Truck Classification and Design Parameters for Project ID: 1123-09-00:

1. Truck classification data is based on Vehicle Classification data collected in 1996 on CTH A North of Capitol Dr. (Site ID: 441216) and in 1993 on CTH A North of CTH JJ (Site ID: 440073). Alternative 1: No Build is based on the site North of Capitol Dr. With the changes in access to USH 41 under Alternatives 2 & 3, the truck classification data is adjusted based on the site North of CTH JJ. This reflects the basic assumption that under the existing no access conditions at USH 41-CTH A, significant numbers of trucks on CTH A North of CTH JJ are using a CTH A to CTH JJ to STH 47 route to access USH 41. Alternatives 2 & 3 provide different levels of access at USH 41-CTH A.
2. Design parameters are a composite of Factor Group 2, Urban Other and Factor Group 4, Rural Other values reflecting the existing rural character evolving to a more urban character over the forecast period.

WisDOT Traffic Forecasts & Analysis Section
Robert Pike Dec 16,1998

PROJECT ID: 62
ROUTE: STH 47
LOCATION: USI
2002, 2012 & 2022

Truck Classification/Design Parameters

Truck Classification

Truck Type	%AADT
2D	2.6
3AXSU+	1.9
2S1+2S2	1.3
3S2+	1.2
DBL BTM	0.2
TOTAL	7.2

Design Parameters

Factor	%AADT
P(K1)	11.9
K30	10.6
K50	10.4
K100	9.9
T(DHV)	5.8
T(PHV)	5.4
D	55/45

The following major assumptions are reflected in the 2002, 2012 & 2022 AADT Forecast for the USH 41-CTH OO segment of Project ID: 6240-05-00:

1. The forecast volumes are based on an analysis of historic traffic volumes and the 2020 travel demand model for the Fox Cities area. Year 2020 Socio-Economic forecasts developed by the ECWRPC for the Fox Cities Area Long Range Transportation Plan adopted in July, 1997 are incorporated into the travel model. This land use plan reflects major residential development along the STH 47 corridor between CTH JJ and Evergreen Drive North of the project area. Continued moderate expansion of residential development is identified for the Richmond Street corridor South of USH 41 and the Capitol Drive corridor East and West of STH 47/Richmond Street.
2. The estimated turning movements are based on a review of previous turning movement projections at the Richmond-Capitol intersection (1988) and the 1994 and 2020 turning movements generated in the Fox Cities travel model.
3. Truck classification data was obtained from site ID 441157 - STH 47/Richmond North of CTH OO/Northland Av..
4. Design parameters are based on the functional classification of this segment of STH 47 as an urban principal arterial in Factor Group 2.

WisDOT Traffic Forecasts & Analysis Section
Robert Pike April 28,1998

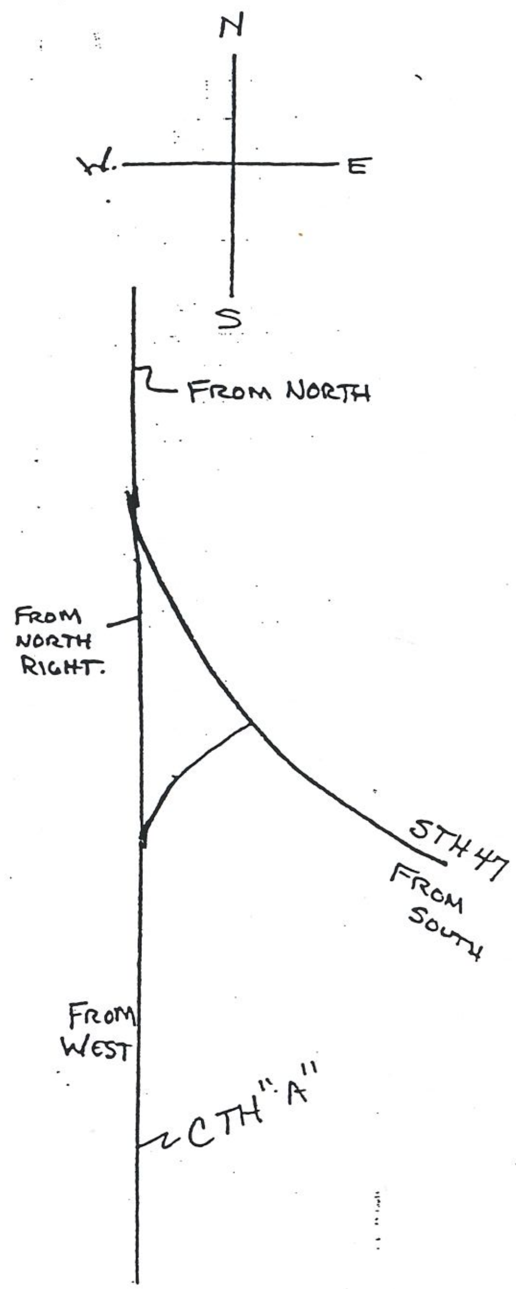
APPENDIX B

VEHICLE AND PEDESTRIAN
VOLUME SUMMARY

LOCATION	CTH "A" & STH 47	X	ALL VEHICLES
DAY & DATE	3-30-00		
WEATHER	BY Brian Jacobs		TRUCKS & BUSES ONLY

SHOW STREET NAMES — N / W / E / S

NAME OF STREETS	STH 47 FROM NORTH				STH 47 FROM SOUTH				FROM EAST				CTH "A" FROM WEST				TOTALS			PEDESTRIANS						
TIME	L	S/47	S/A	TOT	S/A	N/47	R	TOT	L	A	R	TOT	N/47	A	S/47	TOT	N/S 47	N/A	ALL	N	S	E	W-E	N-S	E-W	TOT
6:00 - 6:15 AM		55	63	118	0	26		26					7		0	7	144	7	151							
6:15 - 6:30		75	72	147	1	18		19					15		0	15	166	15	181							
6:30 - 6:45		66	68	134	0	17		17					15		0	15	151	15	166							
6:45 - 7:00		62	51	113	0	35		35					23		1	24	148	24	172							
7 :00 - 7:15		55	72	127	2	32		34					19		0	19	161	19	180							
7:15 - 7:30		64	57	121	0	34		34					27		0	27	155	27	182							
7:30 - 7:45		63	76	139	1	30		31					24		1	25	170	25	195							
7:45 - 8:00		53	47	100	3	33		36					23		1	24	136	24	160							
8:00 - 8:15		38	41	79	0	35		35					13		0	13	114	13	127							
8:15 - 8:30		38	39	77	1	18		19					20		1	21	96	21	117							
8:30 - 8:45		36	30	66	1	29		30					24		0	24	96	24	120							
8:45 - 9:00		30	37	67	0	25		25					19		2	21	92	21	113							
9:00 - 9:15		34	26	60	0	40		40					19		2	21	100	21	121							
9:15 - 9:30		40	21	61	0	26		26					28		0	28	87	28	115							
9:30 - 9:45		34	24	58	0	19		19					24		1	25	77	25	102							
9:45 - 10:00		33	22	55	0	38		38					26		1	27	93	27	120							
10:00 - 10:15		32	30	62	0	38		38					20		1	21	100	21	121							
10:15 - 10:30		21	19	40	2	32		34					26		0	26	74	26	100							
10:30 - 10:45		32	22	54	1	17		18					14		1	15	72	15	87							
10:45 - 11:00		34	25	59	0	32		32					16		0	16	91	16	107							
11:00 - 11:15		27	25	52	0	32		32					28		0	28	84	28	112							
11:15 - 11:30		35	25	60	0	23		23					20		0	20	83	20	103							
11:30 - 11:45		39	25	64	0	29		29					19		1	20	93	20	113							
11:45 - 12 Noon		17	25	42	0	36		36					28		0	28	78	28	106							
TOTAL	0	1013	942	1955	12	694		706	0		0	0	497		13	510	2661	510	3171							



VEHICLE AND PEDESTRIAN
VOLU‥‾ SUMMARY

LOCATION	CTH "A" & STH "47"	X	ALL VEHICLES
DAY & DATE	3-30-00		
WEATHER	BY Brian Jacobs		TRUCKS & BUSES ONLY

SHOW STREET NAMES

	N	
W		E
	S	

NAME OF STREETS	STH 47				STH 47								CTH "A"														
	FROM NORTH				FROM SOUTH				FROM EAST				FROM WEST				TOTALS			PEDESTRIANS						
TIME	L	S/47	S/A	TOT	S/A	N/47	R	TOT	L	A	R	TOT	N/47	A	S/47	TOT	N/S 47	N/A	ALL	N	S	E	W	N-S	E-W	TOT
12 Noon - 12:15		30	23	53	0	32		32					20		1	21	85	1	86							
12:15 - 12:30		29	28	57	0	22		22					35		0	35	79	0	79							
12:30 - 12:45		34	21	55	1	42		43					29		0	29	98	0	98							
12:45 - 1:00		28	30	58	0	41		41					25		0	25	99	0	99							
1:00 - 1:15		37	38	75	1	26		27					28		1	29	102	1	103							
1:15 - 1:30		28	38	66	2	28		30					29		0	29	96	0	96							
1:30 - 1:45		34	46	80	0	30		30					35		1	36	110	1	111							
1:45 - 2:00		27	22	49	3	40		43					29		0	29	92	0	92							
2:00 - 2:15		51	32	83	2	34		36					40		0	40	119	0	119							
2:15 - 2:30		26	34	60	0	33		33					56		0	56	93	0	93							
2:30 - 2:45		35	32	67	1	34		35					42		0	42	102	0	102							
2:45 - 3:00		30	22	52	1	40		41					62		2	64	93	2	95							
3:00 - 3:15		41	36	77	2	46		48					49		0	49	125	0	125							
3:15 - 3:30		36	23	59	2	59		61					63		0	63	120	0	120							
3:30 - 3:45		34	32	66	0	56		56					52		3	55	122	3	125							
3:45 - 4:00		40	22	62	3	77		80					60		0	60	142	0	142							
4:00 - 4:15		36	32	68	2	66		68					65		0	65	136	0	136							
4:15 - 4:30		36	31	67	3	63		66					63		0	63	133	0	133							
4:30 - 4:45		30	47	77	0	56		56					52		2	54	133	2	135							
4:45 - 5:00		29	25	54	4	65		69					67		4	71	123	4	127							
5:00 - 5:15		25	24	49	1	70		71					65		2	67	120	2	122							
5:15 - 5:30		42	26	68	1	60		61					71		0	71	129	0	129							
5:30 - 5:45		49	26	75	1	61		62					48		0	48	137	0	137							
5:45 - 6:00		40	22	62	1	56		57					58		3	61	119	3	122							
6:00 - 6:15		27	27	54	0	63		63					48		0	48	127	0	127							
6:15 - 6:30		20	20	40	0	63		63					48		2	50	103	2	105							
6:30 - 6:45		27	24	51	0	34		34					36		0	36	85	0	85							
6:45 - 7:00PM		19	31	50	0	40		40					31		0	31	90	0	90							
TOTAL	0	920	814	1734	31	1337	0	1368					1306		21	1327	3112	21	3133							
TOTAL	0	1933	1756	3689	43	2031		2074					1803		34	1837	5,773	531	6,304							X

TRAFA&472

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

LOCATION	CTH "A" & STH 47	X	ALL VEHICLES
DAY & DATE	5-5-00		
WEATHER	BY Brian Jacobs		TRUCKS & BUSES ONLY

CTH "A" & STH 47
SHOW STREET NAMES

N
W E
S

NAME OF STREETS	FROM NORTH				CTH "A" FROM SOUTH				47 FROM SOUTH				47 FROM NORTH				TOTALS			PEDESTRIANS						
TIME	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	N-S	E-W	ALL	N	S	E	W-E	N-S	E-W	TOT
3 PM - 3:15					82		0	82	3	78		81		41	40	81										
3:15 - 3:30					84		1	85	0	77		77		41	41	82										
3:30 - 3:45					87		2	89	4	122		126		46	38	84										
3:45 - 4 PM					71		0	71	1	100		101		46	30	76										
4PM - 4:15					98		0	98	0	131		131		53	30	83										
4:15 - 4:30					117		1	118	0	143		143		72	33	105										
4:30 - 4:45					122		2	124	3	150		153		48	38	86										
4:45 - 5 PM					99		0	99	0	124		124		53	33	86										
5 PM - 5:15					115		2	117	0	144		144		45	31	76										
5:15 - 5:30					99		0	99	3	110		113		31	33	64										
5:30 - 5:45					107		1	108	2	139		141		34	39	73										
5:45 - 6:00					87		2	89	2	145		147		44	36	80										
6:00 - 6:15					106		1	107	1	109		110		33	43	76										
6:15 - 6:30					93		1	94	4	100		104		47	36	83										
6:30 - 6:45					77		1	78	1	87		88		37	22	59										
6:45 - 7:00 PM					68		0	68	1	82		83		30	24	54										
TOTAL					1512		14	1526	25	1841		1866		701	547	1248										

TRAFCOU.WK1 PAGE 2 OF 2

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

LOCATION	CTH "JJ" & CTH "A"	X	ALL VEHICLES
DAY & DATE	3-23-00		
WEATHER	BY Brian Jacobs		TRUCKS & BUSES ONLY

SHOW STREET NAMES

N / W / E / S

NAME OF STREETS	FROM NORTH				FROM SOUTH				FROM EAST				FROM WEST				TOTALS			PEDESTRIANS						
TIME	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	N-S	E	ALL	N	S	E	W	N-S	E-W	TOT
12 Noon - 12:1	10	41		51		43	16	59	12		13	25					110	25	135							
12:15 - 12:30	10	38		48		38	17	55	6		15	21					103	21	124							
12:30 - 12:45	12	37		49		41	14	55	15		21	36					104	36	140							
12:45 - 1:00	16	40		56		35	7	42	9		12	21					98	21	119							
1:00 - 1:15	14	43		57		42	6	48	16		10	26					105	26	131							
1:15 - 1:30	21	39		60		50	10	60	10		23	33					120	33	153							
1:30 - 1:45	14	59		73		53	9	62	16		12	28					135	28	163							
1:45 - 2:00	13	46		59		37	15	52	12		14	26					111	26	137							
2:00 - 2:15	10	41		51		67	16	83	12		21	33					134	33	167							
2:15 - 2:30	13	44		57		79	19	98	7		14	21					155	21	176							
2:30 - 2:45	19	35		54		59	17	76	10		23	33					130	33	163							
2:45 - 3:00	23	37		60		92	14	106	5		20	25					166	25	191							
3:00 - 3:15	15	25		40		72	14	86	10		28	38					126	38	164							
3:15 - 3:30	12	51		63		77	19	96	10		34	44					159	44	203							
3:30 - 3:45	15	44		59		87	19	106	12		25	37					165	37	202							
3:45 - 4:00	22	48		70		81	23	104	9		31	40					174	40	214							
4:00 - 4:15	14	38		52		95	12	107	9		36	45					159	45	204							
4:15 - 4:30	18	45		63		93	13	106	9		35	44					169	44	213							
4:30 - 4:45	17	46		63		79	24	103	12		27	39					166	39	205							
4:45 - 5:00	24	49		73		93	27	120	14		22	36					193	36	229							
5:00 - 5:15	15	35		50		92	22	114	19		47	66					164	66	230							
5:15 - 5:30	22	43		65		84	12	96	8		24	32					161	32	193							
5:30 - 5:45	19	39		58		17	78	95	11		23	34					153	34	187							
5:45 - 6:00	25	52		77		13	73	86	10		25	35					163	35	198							
6:00 - 6:15	19	42		61		17	58	75	5		22	27					136	27	163							
6:15 - 6:30	8	30		38		11	43	54	9		30	39					92	39	131							
6:30 - 6:45	16	38		54		15	47	62	4		17	21					116	21	137							
6:45 - 7:00PM	14	29		43		7	43	50	6		9	15					93	15	108							
TOTAL	450	1154		1604		1569	687	2256	287		633	920					3860	920	4780							X
TOTAL	990	2540		3530		2266	876	3142	572		891	1463					6,672	1,463	8,135							

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VEHICLE AND PEDESTRIAN
VOLUM' MMARY

LOCATION	CTH JJ & CTH "A"	X	ALL VEHICLES
DAY & DATE	3-23-00		
WEATHER	BY Brian Jacobs		TRUCKS & BUSES ONLY

SHOW STREET NAMES

N / W E / S

NAME OF STREETS	FROM NORTH				FROM SOUTH				FROM EAST				FROM WEST				TOTALS			PEDESTRIANS						
TIME	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	L	A	R	TOT	N-S	E	ALL	N	S	E	W-E	N-S	E-W	TOT
6:00 - 6:15 AM	19	59		78	20	4		24	5		6	11					102	11	113							
6:15 - 6:30	24	78		102	20	6		26	7		9	16					128	16	144							
6:30 - 6:45	35	72		107	24	6		30	10		5	15					137	15	152							
6:45 - 7:00	36	77		113	17	11		28	14		13	27					141	27	168							
7:00 - 7:15	48	92		140	18	6		24	12		22	34					164	34	198							
7:15 - 7:30	38	81		119	24	13		37	19		14	33					156	33	189							
7:30 - 7:45	39	101		140	20	9		29	19		16	35					169	35	204							
7:45 - 8:00	74	91		165	30	7		37	23		21	44					202	44	246							
8:00 - 8:15	17	85		102	28	7		35	15		10	25					137	25	162							
8:15 - 8:30	26	67		93	29	12		41	14		7	21					134	21	155							
8:30 - 8:45	19	38		57	22	5		27	7		8	15					84	15	99							
8:45 - 9:00	11	63		74	44	5		49	16		8	24					123	24	147							
9:00 - 9:15	13	37		50	23	4		27	9		7	16					77	16	93							
9:15 - 9:30	7	40		47	22	6		28	8		13	21					75	21	96							
9:30 - 9:45	18	52		70	30	2		32	12		13	25					102	25	127							
9:45 - 10:00	18	36		54	26	8		34	6		11	17					88	17	105							
10:00 - 10:15	14	37		51	37	4		41	13		8	21					92	21	113							
10:15 - 10:30	7	29		36	34	9		43	13		12	25					79	25	104							
10:30 - 10:45	11	47		58	41	8		49	8		8	16					107	16	123							
10:45 - 11:00	25	47		72	40	13		53	11		4	15					125	15	140							
11:00 - 11:15	15	30		45	37	11		48	11		7	18					93	18	111							
11:15 - 11:30	10	54		64	25	12		37	10		17	27					101	27	128							
11:30 - 11:45	12	34		46	41	12		53	6		13	19					99	19	118							
11:45 - 12 Noo	4	39		43	45	9		54	17		6	23					97	23	120							
TOTAL	540	1386		1926	697	189		886	285		258	543					2812	543	3355							

ALTERNATE EVALUATION
Table 1

USH 41	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange
West of A	Average Daily Traffic 2020	67,000	74,400	71,000
	% Traffic Increase 2020	-	11	6
	LOS 2020 4-lane	F	F	F
	LOS 2020 6-lane	D	D	D
	Traffic Impacts	-	Negative	Negative
East of A	Average Daily Traffic 2020	67,000	61,400	72,000
	% Traffic Increase 2020	-	-8	7
	LOS 2020 4-Lane	F	E	F
	LOS 2020 6-lane	C	C	D
	Traffic Impacts	-	Positive	Negative
East of 47	Average Daily Traffic 2020	74,000	74,000	78,000
	% Traffic Increase 2020	-	0	5
	LOS 2020 4-Lane	F	F	F
	LOS 2020 6-lane	D	D	D
	Traffic Impacts	-	None	Negligible
STH 15- STH 47	**Noise Impacts	Severe	Severe	Severe
	***Impact on Safety	-	Negative	Negative

** Noise mitigation for the no interchange alternate would not have to be made at this time. It would take place at time of conversion to 6-lanes.

*** The addition of ramp terminals creates new points of friction for USH 41 traffic.

ALTERNATE EVALUATION
Table 2

CTH A	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange
South of CTH OO	Average Daily Traffic 2020	29,000	29,000	33,800
	% Traffic Increase 2020	-	0	17
	Traffic Impacts	-	None	Negative
CTH OO to Capitol	Average Daily Traffic 2020	21,0000	14,0000	21,000
	% Traffic Increase 2020	-	-33	0
	Traffic Impact	-	Very Positive	Negligible
Capitol to USH 41	Average Daily Traffic 2020	17,0000	13,0000	23,000
	% Traffic Increase 2020	-	-24	35
	Traffic Impact	-	Positive	Severe
USH 41 - JJ East	Average Daily Traffic 2020	17,000	22,000	24,800
	% Traffic Increase 2020	-	29	46
	Traffic Impacts	-	Negative	Severe
JJ East - JJ West	Average Daily Traffic 2020	15,800	17,700	18,700
	% Traffic Increase 2020	-	12	18
	Traffic Impacts	-	Negative	Negative
JJ West - CTH O	Average Daily Traffic 2020	10,000	11,500	12,300
	% Traffic Increase 2020	-	15	23
	Traffic Impacts	-	Negative	Negative
CTH O to STH 47	Average Daily Traffic 2020	7,400	8,900	9,700
	% Traffic Increase 2020	-	20	31
	Traffic Impacts	-	Negative	Negative
CTH OO – STH 47	* Road User Costs	2,500,000	0	0
	Pavement Structure Costs South of USH 41	-	-40,000	+60,000
	Pavement Structure Cost USH 41 to JJ West	-	+50,000	+90,000
	** Overlay Cost North 5 miles	-	+350,000	+350,000
	Construction Costs 41/A Intersection	1,500,000	2,500,000	3,500,000
	Accidents South of 41 20 years	-	-120	-120
	*** Safety Impact South of USH 41	-	Positive	Negative
	Safety Impacts North of USH 41	-	Negative	Negative

CTH A	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange

* Road user costs are due to indirection and lower speed using CTH A and CTH OO to go south and west as compared to using USH 41.

** Overlay cost to compensate for added traffic on new pavement. Actual overlay would take place when conditions warrant.

*** For the partial interchange alternate, safety not only improved by reduction of traffic, but also substantial reduction of trucks in a school zone.

ALTERNATE EVALUATION
Table 3

STH 47	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange
South of USH 41	Average Daily Traffic 2020	28,400	28,000	21,000
	% Traffic Increase 2020	-	-1	-26
	Traffic Impact	-	Negligible	Very Positive
USH 41 to CTH JJ	Average Daily Traffic 2020	26,400	21,400	19,000
	% Traffic Increase 2020	-	-19	-28
	Traffic Impact	-	Positive	Very Positive
CTH JJ to CTH O	Average Daily Traffic 2020	13,500	12,000	11,200
	% Traffic Increase 2020	-	-11	-17
	Traffic Impact	-	Positive	Positive
CTH O to CTH A	Average Daily Traffic 2020	9,500	8,000	7,200
	% Traffic Increase 2020	-	-16	-24
	Traffic Impact			
Capitol Dr to A	Traffic Impact	-	Positive	Positive
	*Road User Costs	7,000,000	0	0
	** Pavement Structure Costs	-	-180,000	-340,000
	Accidents (20 years)	-	-50	-50
	Safety Impact	-	Positive	Positive

* Road user costs are due to the 2-mile indirection of traffic from the north wishing to travel west on USH 41.

** Costs associated with the changes in design class are not included.

ALTERNATE EVALUATION
Table 4

Capitol Drive	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange
West of CTH A	Average Daily Traffic 2020	4600	4600	5700
	% Traffic Increase 2020	-	0	24
	Traffic Impact	-	None	Negative
East of CTH A	Average Daily Traffic 2020	6000	6000	5600
	% Traffic Increase 2020	-	0	-7
	Traffic Impact	-	None	Positive

ALTERNATE EVALUATION
Table 5

CTH OO	Impacts and Costs	No Interchange	Partial Interchange	Full Interchange
West of CTH A	Average Daily Traffic 2020	36,800	31,400	31,200
	% Traffic Increase 2020	-	-15	-15
	Traffic Impact	-	Positive	Positive
East of CTH A	Average Daily Traffic 2020	36,400	36,500	32,000
	% Traffic Increase 2020	-	1	-12
	Traffic Impact	-	Negligible	Positive

APPENDIX C

WISCONSIN DEPARTMENT OF TRANSPORTATION

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ROBERT A. PIKE
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1993 Origin-Des
for
Appleto
Transportation Study

WISCONSIN DEPARTMENT OF TRANSPORTATION

WISCONSIN DEPARTMENT OF TRANSPORTATION
DIVISION OF PLANNING AND BUDGET
JULY 1994

1993 ORIGIN-DESTINATION SURVEY
FOR THE
APPLETON AREA TRANSPORTATION STUDY

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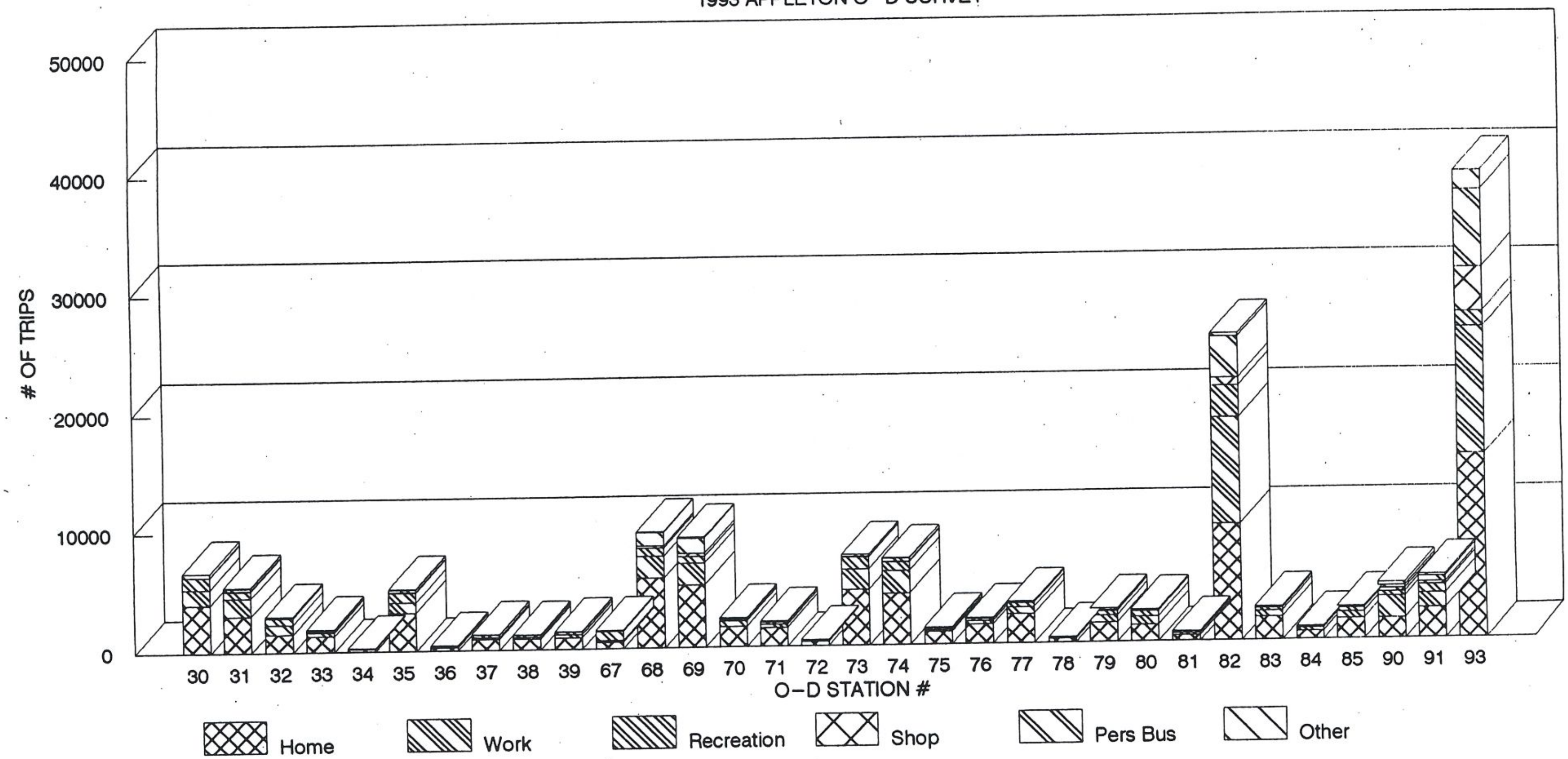
1993 APPLETON O–D SURVEY



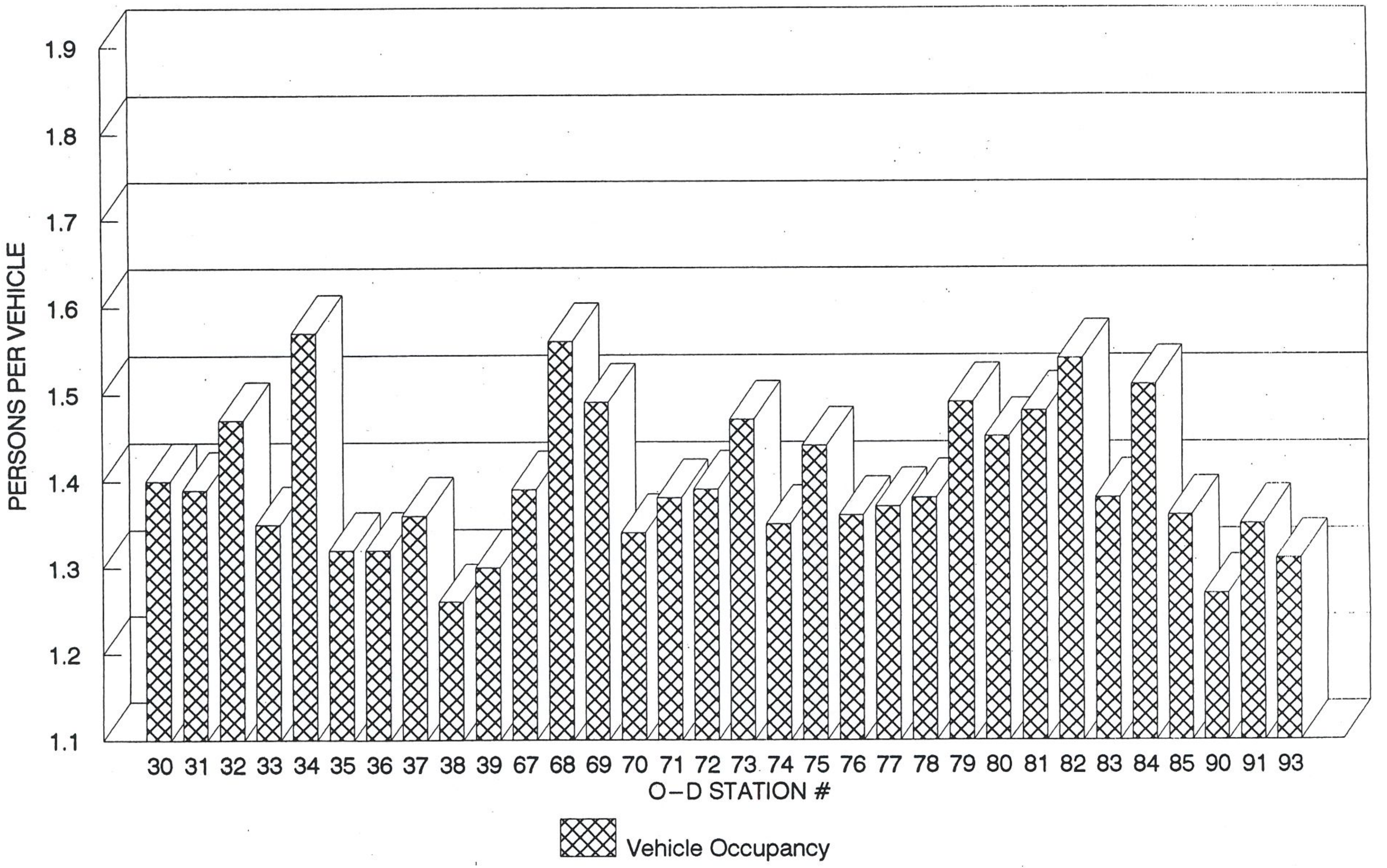
Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70
Locaion	STH 114	USH 10E	STH 55S	CTH KK	SHADY	STH 150	OAKRD	BREZWC	CTH G	CTH GG	CTH BB	USH 10V	USH 45I	CTH JJ
Home	4008	3024	1493	1298	190	3180	290	900	881	960	544	5835	5213	1685
Work	1343	1523	833	329	25	894	38	140	154	275	141	1831	1808	437
Recreaion	969	592	530	163	41	800	78	243	214	191	782	692	554	176
Shop	40	66	57	44	4	47	19	32	4	15	54	195	295	22
Personal Business	287	230	69	83	11	260	24	13	31	53	29	1130	1255	68
Other	33	44	15	6	0	16	3	5	0	9	0	58	101	27
Total	6680	5479	2997	1923	270	5196	452	1333	1284	1503	1551	9741	9227	2414
% Home	60.0%	55.2%	49.8%	67.5%	70.4%	61.2%	64.2%	67.5%	68.6%	63.9%	35.1%	59.9%	56.5%	69.8%
% Work	20.1%	27.8%	27.8%	17.1%	9.1%	17.2%	8.4%	10.5%	12.0%	18.3%	9.1%	18.8%	19.6%	18.1%
% Recreaion	14.5%	10.8%	17.7%	8.5%	15.1%	15.4%	17.2%	18.2%	16.7%	12.7%	50.4%	7.1%	6.0%	7.3%
% Shop	0.6%	1.2%	1.9%	2.3%	1.4%	0.9%	4.2%	2.4%	0.3%	1.0%	3.5%	2.0%	3.2%	0.9%
%Personal Busines	4.3%	4.2%	2.3%	4.3%	4.0%	5.0%	5.3%	1.0%	2.4%	3.5%	1.9%	11.6%	13.6%	2.8%
% Other	0.5%	0.8%	0.5%	0.3%	0.0%	0.3%	0.7%	0.4%	0.0%	0.6%	0.0%	0.6%	1.1%	1.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Station #	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Totals
Locaion	STH 76	MAYFLW	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41	STH 96	CTH Z	CTH CE	USH 45	CTH A S	USH 41S	
Home	1538	348	4634	4299	1048	1562	2414	302	1591	1352	446	9766	1888	702	1683	1692	2510	15494	40261
Work	279	77	1709	1853	104	284	565	82	593	687	183	9068	533	233	546	1836	1202	10657	15378
Recreaion	195	55	998	738	169	206	331	53	364	467	124	2609	233	129	297	363	722	1298	6236
Shop	27	0	68	58	7	6	48	6	102	63	6	672	64	26	54	233	206	3697	15464
Personal Business	61	32	151	268	83	92	90	15	102	71	42	3436	50	23	96	238	464	6607	2683
Other	0	0	0	22	0	0	0	6	6	0	0	284	8	0	0	298	169	1573	162790
Total	2101	512	7560	7237	1412	2151	3448	462	2757	2641	801	25835	2776	1113	2675	4660	5273	39326	162791
% Home	73.2%	68.0%	61.3%	59.4%	74.2%	72.6%	70.0%	65.3%	57.7%	51.2%	55.7%	37.8%	68.0%	63.1%	62.9%	36.3%	47.6%	39.4%	50.8%
% Work	13.3%	15.0%	22.6%	25.6%	7.4%	13.2%	16.4%	17.7%	21.5%	26.0%	22.8%	35.1%	19.2%	20.9%	20.4%	39.4%	22.8%	27.1%	24.7%
% Recreaion	9.3%	10.7%	13.2%	10.2%	12.0%	9.6%	9.6%	11.4%	13.2%	17.7%	15.5%	10.1%	8.4%	11.6%	11.1%	7.8%	13.7%	3.3%	9.5%
% Shop	1.3%	0.0%	0.9%	0.8%	0.5%	0.3%	1.4%	1.2%	3.7%	2.4%	0.8%	2.6%	2.3%	2.3%	2.0%	5.0%	3.9%	9.4%	3.8%
%Personal Busines	2.9%	6.3%	2.0%	3.7%	5.9%	4.3%	2.6%	3.2%	3.7%	2.7%	5.2%	13.3%	1.8%	2.1%	3.6%	5.1%	8.8%	16.8%	9.5%
% Other	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	1.2%	0.2%	0.0%	0.0%	1.1%	0.3%	0.0%	0.0%	6.4%	3.2%	4.0%	1.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Graph 3

VEHICLE OCCUPANCY BY O–D

1993 APPLETON O–D SURVEY



Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Average
Location	STH 114	USH 10E	STH 55S	CTH KK	SHADY	STH 150	OAKRD	BREZWO	CTH G	CTH GG	CTH BB	USH 10W	USH 45N	CTH JJ	STH 76	MAYFLW	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41N	STH 96	CTH Z	CTH CE	USH 45S	CTH A S	USH 41S	Pers/Veh
Persons/Vehicle	1.4	1.39	1.47	1.35	1.57	1.32	1.32	1.36	1.26	1.3	1.39	1.56	1.49	1.34	1.38	1.39	1.47	1.35	1.44	1.36	1.37	1.38	1.49	1.45	1.48	1.54	1.38	1.51	1.36	1.27	1.35	1.31	1.41

Graph 4

1993 ORIGIN-DESTINATION SURVEY
FOR THE
APPLETON AREA TRANSPORTATION STUDY

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KEY FINDINGS

1) An extensive origin-destination survey was conducted around the Appleton Urbanized Area during the latter half of May and all of June, 1993 to determine the vehicle travel patterns which currently exist.

2) Thirty-two interview stations recorded a factored total of 162,791 daily vehicle trips. The top three station locations and daily volumes are USH 41 south at 39,326; USH 41 north at 25,835; and USH 10W at 9,741. Station locations can be found on Figure 1 with detailed descriptions beginning on page 3.

3) The majority of trips surveyed were local trips (internal-external) with 82.9% (134,891 trips). Through trips accounted for the remaining 17.1% (27,900 trips). Graph #1 on the following page illustrates local and through trips by O-D station.

4) Of the 162,791 total trips recorded, 16,351 or 10% are considered medium and heavy duty trucks (page 67). The majority are local trips (65.9%) while the remaining 34.1% pass through the area.

5) Of the 27,900 through trips recorded, 15,484 or nearly 56% passed through the two USH 41 stations north and south of the Appleton urbanized area.

6) Winnebago County provided the greatest number of through trip ends or trips with either an origin or destination by county with 28.8%. Brown County followed with 19.2%.

7) The primary attraction zone was zone 206, a large tract of land representing the Fox River Mall along USH 41, with 6,233 or 4.6% of the total local trips. The entire study area was subdivided into 398 individual zones.

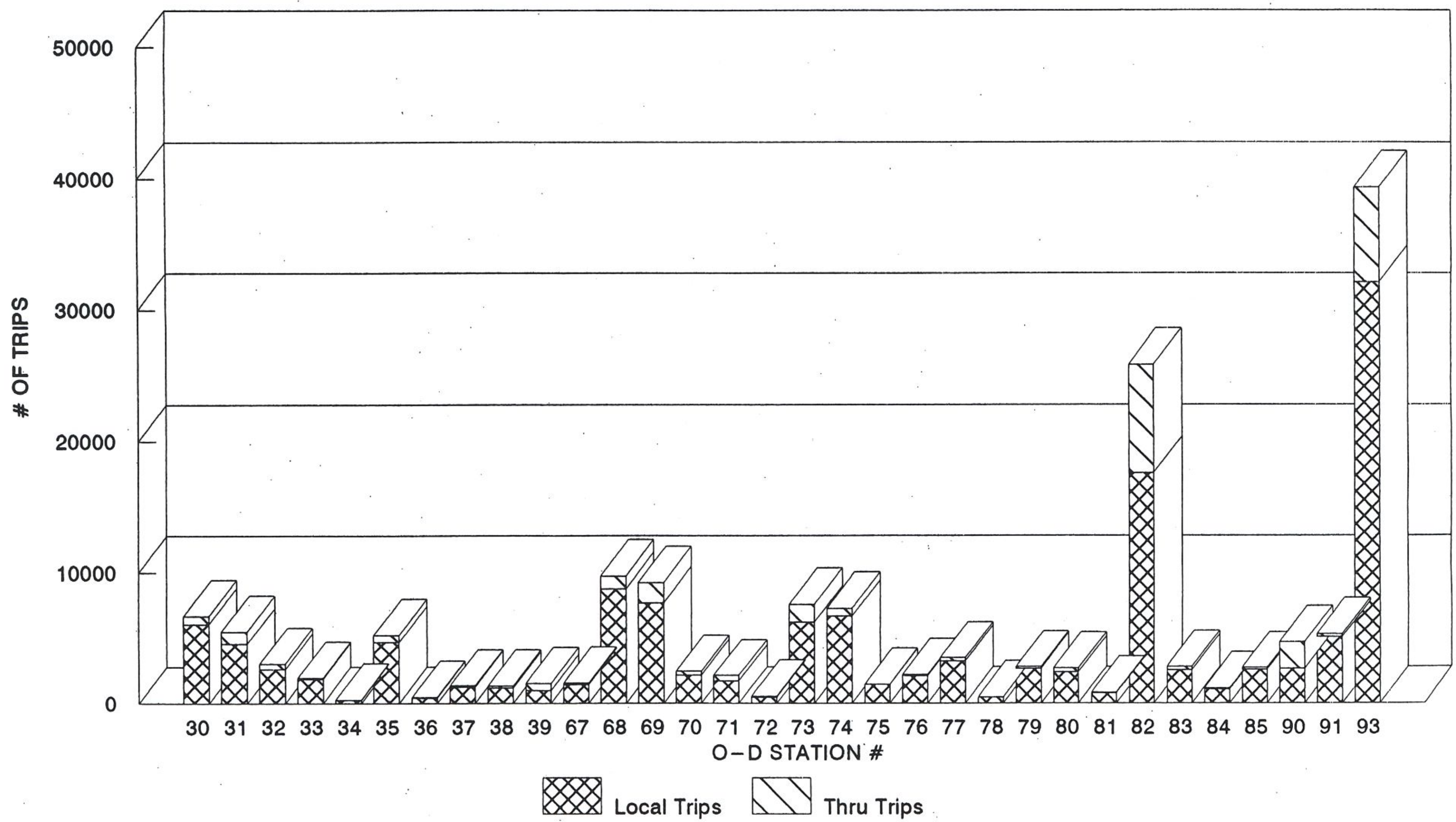
8) Autos accounted for 67.4% of the total trips while light trucks (pick-up, vans, etc.) accounted for 22.6%. The remaining 10% consisted of heavy trucks (delivery, semi-trailers, etc.). Graph #2 illustrates vehicle type by O-D station.

9) The largest destination trip purpose was the home trip with 50.8%. This was followed by the work trip with 24.7%. Time of the survey (10 AM - 6 PM) helps to explain the percentage split. Graph #3 illustrates trip purpose by O-D station.

10) Vehicle occupancy, the average number of people in each vehicle recorded throughout the entire survey, was tabulated at 1.41. Graph #4 illustrates vehicle occupancy by O-D station.

LOCAL & THRU TRIPS BY O-D STATION

1993 APPLETON O-D SURVEY



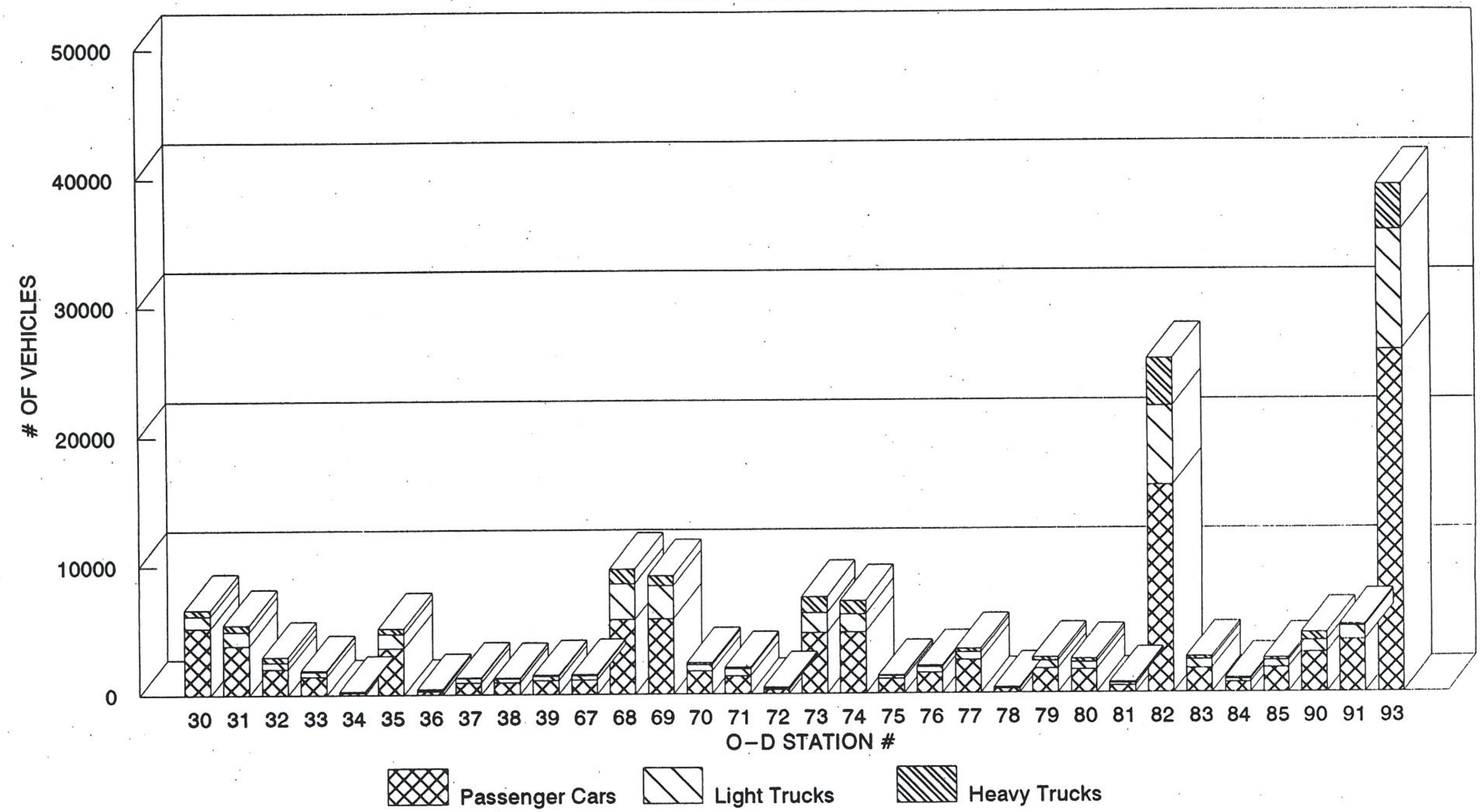
Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70	71	72
Location	STH 114	USH 10E	STH 55S	CTH KK	SHADY (	STH 150	OAKRD	BREZWO	CTH G	CTH GG	CTH BB	USH 10V	USH 45I	CTH JJ	STH 76	MAYFLW
Local Trips	6072	4527	2568	1860	248	4668	412	1238	1135	959	1424	8771	7668	2134	1680	464
Thru Trips	608	952	429	63	22	528	40	95	149	544	127	970	1559	280	421	48
Total Trips	6680	5479	2997	1923	270	5196	452	1333	1284	1503	1551	9741	9227	2414	2101	512
% Local Trips	90.9%	82.6%	85.7%	96.7%	91.9%	89.8%	91.2%	92.9%	88.4%	63.8%	91.8%	90.0%	83.1%	88.4%	80.0%	90.6%
% Thru Trips	9.1%	17.4%	14.3%	3.3%	8.1%	10.2%	8.8%	7.1%	11.6%	36.2%	8.2%	10.0%	16.9%	11.6%	20.0%	9.4%
Total Trips	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Station #	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Totals
Location	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41N	STH 96	CTH Z	CTH CE	USH 45S	CTH A S	USH 41S	
Local Trips	6205	6651	1398	2081	3201	446	2620	2331	747	17575	2494	1011	2528	2632	5043	32102	134891
Thru Trips	1355	586	14	70	247	16	137	310	54	8260	282	102	147	2028	230	7224	27900
Total Trips	7560	7237	1412	2151	3448	462	2757	2641	801	25835	2776	1113	2675	4660	5273	39326	162791
% Local Trips	82.1%	91.9%	99.0%	96.7%	92.8%	96.5%	95.0%	88.3%	93.3%	68.0%	89.8%	90.8%	94.5%	56.5%	95.6%	81.6%	82.9%
% Thru Trips	17.9%	8.1%	1.0%	3.3%	7.2%	3.5%	5.0%	11.7%	6.7%	32.0%	10.2%	9.2%	5.5%	43.5%	4.4%	18.4%	17.1%
Total Trips	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Graph 1

VEHICLE TYPE BY O–D STATION

1993 APPLETON O–D SURVEY

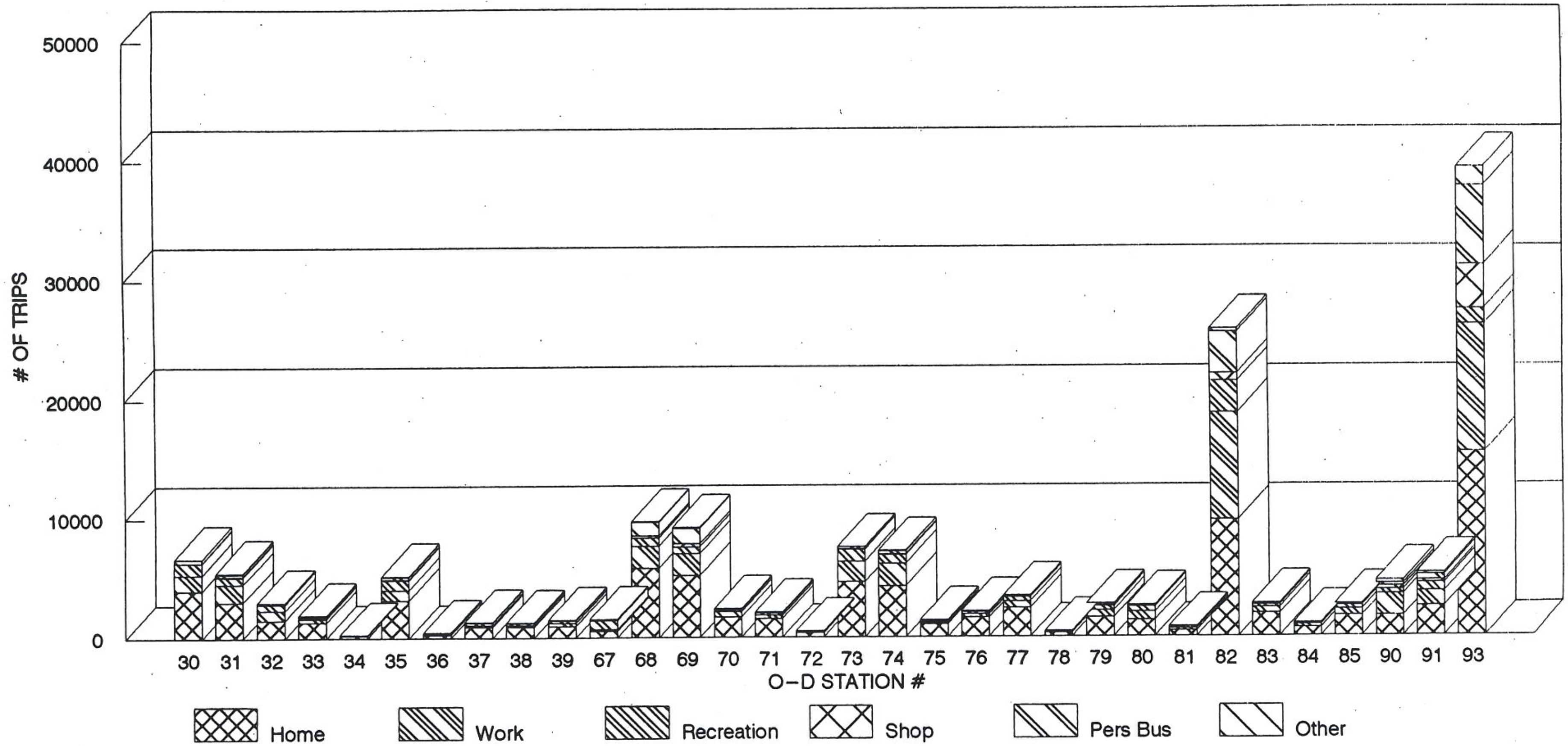


Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Totals
Location	STH 114	USH 10E	STH 55S	CTH KK	SHADY	STH 150	OAKRD	BREZWC	CTH G	CTH GG	CTH BB	USH 10W	USH 45	CTH JJ	STH 76	MAYFLW	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41	STH 96	CTH Z	CTH CE	USH 45S	CTH A S	USH 41S	
Cars	5230	3874	2032	1419	224	3648	311	922	946	1100	1117	5845	5859	1791	1380	327	4770	4798	1113	1609	2589	328	1861	1799	550	16095	1885	748	1915	3085	4039	26466	109677
Light Trucks	955	1085	524	415	32	1138	117	360	304	326	361	2786	2593	478	557	143	1565	1404	267	422	579	97	620	549	177	6097	666	262	567	946	1070	9320	36784
Heavy Trucks	494	521	441	88	14	410	24	51	33	77	73	1110	775	145	164	42	1225	1035	32	120	279	37	276	293	74	3643	225	104	193	629	163	3539	16329
Total Vehicles	6680	5479	2997	1923	270	5196	452	1333	1284	1503	1551	9741	9227	2414	2101	512	7560	7237	1412	2151	3448	462	2757	2641	801	25835	2776	1113	2675	4660	5273	39326	162791
% Cars	78.3%	70.7%	67.8%	73.8%	83.0%	70.2%	68.8%	69.2%	73.7%	73.2%	72.0%	60.0%	63.5%	74.2%	65.7%	63.9%	63.1%	66.3%	78.8%	74.8%	75.1%	71.0%	67.5%	68.1%	68.7%	62.3%	67.9%	67.2%	71.6%	66.2%	76.6%	67.3%	67.4%
% Light Trucks	14.3%	19.8%	17.5%	21.6%	11.8%	21.9%	25.9%	27.0%	23.7%	21.7%	23.3%	28.6%	28.1%	19.8%	26.5%	27.9%	20.7%	19.4%	18.9%	19.6%	16.8%	21.0%	22.5%	20.8%	22.1%	23.6%	24.0%	23.5%	21.2%	20.3%	20.3%	23.7%	22.6%
% Heavy Trucks	7.4%	9.5%	14.7%	4.6%	5.2%	7.9%	5.3%	3.8%	2.6%	5.1%	4.7%	11.4%	8.4%	6.0%	7.8%	8.2%	16.2%	14.3%	2.3%	5.6%	8.1%	8.0%	10.0%	11.1%	9.2%	14.1%	8.1%	9.3%	7.2%	13.5%	3.1%	9.0%	10.0%
Total Vehicles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Graph 2

TRIP PURPOSE BY O–D STATION

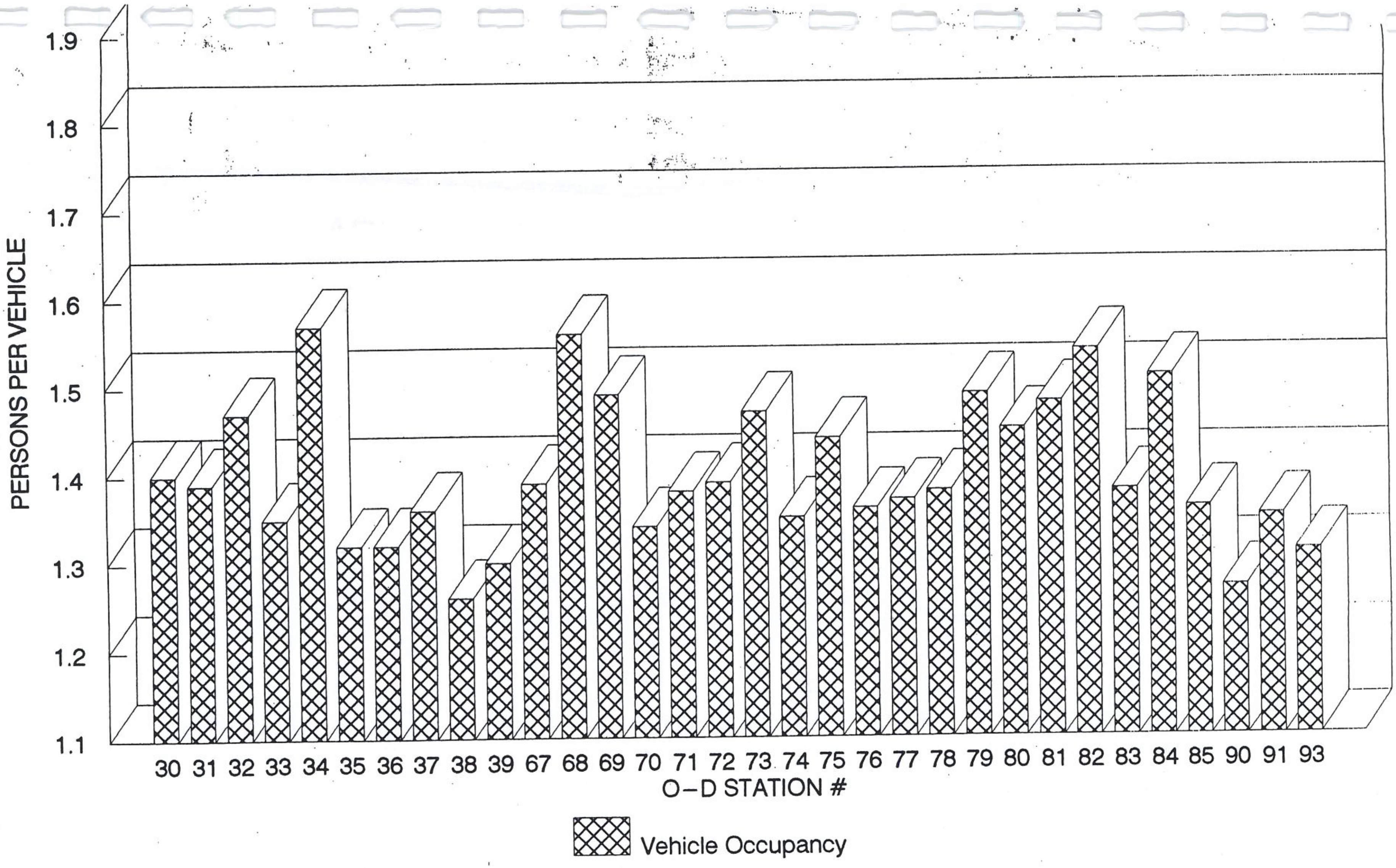
1993 APPLETON O–D SURVEY



Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70	71	72
Location	STH 114	USH 10E	STH 55S	CTH KK	SHADY	STH 150	OAKRD	BREZWO	CTH G	CTH GG	CTH BB	USH 10V	USH 45N	CTH JJ	STH 76	MAYFLW
Home	4008	3024	1493	1298	190	3180	290	900	881	960	544	5835	5213	1685	1536	348
Work	1343	1523	833	329	25	894	38	140	154	275	141	1831	1808	437	279	77
Recreation	969	592	530	163	41	800	78	243	214	191	782	692	554	176	195	55
Shop	40	66	57	44	4	47	19	32	4	15	54	195	295	22	27	0
Personal Business	287	230	69	83	11	260	24	13	31	53	29	1130	1255	68	61	32
Other	33	44	15	6	0	16	3	5	0	9	0	58	101	27	0	0
Total	6680	5479	2997	1923	270	5196	452	1333	1284	1503	1551	9741	9227	2414	2101	512
% Home	60.0%	55.2%	49.8%	67.5%	70.4%	61.2%	64.2%	67.5%	68.6%	63.9%	35.1%	59.9%	56.5%	69.8%	73.2%	68.0%
% Work	20.1%	27.8%	27.8%	17.1%	9.1%	17.2%	8.4%	10.5%	12.0%	18.3%	9.1%	18.8%	19.6%	18.1%	13.3%	15.0%
% Recreation	14.5%	10.8%	17.7%	8.5%	15.1%	15.4%	17.2%	18.2%	16.7%	12.7%	50.4%	7.1%	6.0%	7.3%	9.3%	10.7%
% Shop	0.6%	1.2%	1.9%	2.3%	1.4%	0.9%	4.2%	2.4%	0.3%	1.0%	3.5%	2.0%	3.2%	0.9%	1.3%	0.0%
%Personal Busines	4.3%	4.2%	2.3%	4.3%	4.0%	5.0%	5.3%	1.0%	2.4%	3.5%	1.9%	11.6%	13.6%	2.8%	2.9%	6.3%
% Other	0.5%	0.8%	0.5%	0.3%	0.0%	0.3%	0.7%	0.4%	0.0%	0.6%	0.0%	0.6%	1.1%	1.1%	0.0%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Station #	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Totals
Location	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41N	STH 96	CTH Z	CTH CE	USH 45S	CTH A S	USH 41S	
Home	4634	4299	1048	1562	2414	302	1591	1352	446	9766	1888	702	1683	1692	2510	15494	40261
Work	1709	1853	104	284	565	82	593	687	183	9068	533	233	546	1836	1202	10657	15378
Recreation	998	738	169	206	331	53	364	467	124	2609	233	129	297	363	722	1298	6236
Shop	68	58	7	6	48	6	102	63	6	672	64	26	54	233	206	3697	15464
Personal Business	151	268	83	92	90	15	102	71	42	3436	50	23	96	238	464	6607	2683
Other	0	22	0	0	0	6	6	0	0	284	8	0	0	298	169	1573	162790
Total	7560	7237	1412	2151	3448	462	2757	2641	801	25835	2776	1113	2675	4660	5273	39326	162791
% Home	61.3%	59.4%	74.2%	72.6%	70.0%	65.3%	57.7%	51.2%	55.7%	37.8%	68.0%	63.1%	62.9%	36.3%	47.6%	39.4%	50.8%
% Work	22.6%	25.6%	7.4%	13.2%	16.4%	17.7%	21.5%	26.0%	22.8%	35.1%	19.2%	20.9%	20.4%	39.4%	22.8%	27.1%	24.7%
% Recreation	13.2%	10.2%	12.0%	9.6%	9.6%	11.4%	13.2%	17.7%	15.5%	10.1%	8.4%	11.6%	11.1%	7.8%	13.7%	3.3%	9.5%
% Shop	0.9%	0.8%	0.5%	0.3%	1.4%	1.2%	3.7%	2.4%	0.8%	2.6%	2.3%	2.3%	2.0%	5.0%	3.9%	9.4%	3.8%
%Personal Busines	2.0%	3.7%	5.9%	4.3%	2.6%	3.2%	3.7%	2.7%	5.2%	13.3%	1.8%	2.1%	3.6%	5.1%	8.8%	16.8%	9.5%
% Other	0.0%	0.3%	0.0%	0.0%	0.0%	1.2%	0.2%	0.0%	0.0%	1.1%	0.3%	0.0%	0.0%	6.4%	3.2%	4.0%	1.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Graph 3



Station #	30	31	32	33	34	35	36	37	38	39	67	68	69	70	71	72
Location	STH 114	USH 10E	STH 55S	CTH KK	SHADY	STH 150	OAKRD	BREZWO	CTH G	CTH GG	CTH BB	USH 10V	USH 45	CTH JJ	STH 76	MAYFLW
Persons/Vehicle	1.4	1.39	1.47	1.35	1.57	1.32	1.32	1.36	1.26	1.3	1.39	1.56	1.49	1.34	1.38	1.39

Station #	73	74	75	76	77	78	79	80	81	82	83	84	85	90	91	93	Average
Location	CTH A N	STH 47	MEADE	CTH EE	CTH E	FRENCH	CTH N	STH 55N	CTH J	USH 41	STH 96	CTH Z	CTH CE	USH 45S	CTH A S	USH 41S	Pers/Veh
Persons/Vehicle	1.47	1.35	1.44	1.36	1.37	1.38	1.49	1.45	1.48	1.54	1.38	1.51	1.36	1.27	1.35	1.31	1.41

Graph 4

BACKGROUND AND STUDY OBJECTIVES

An extensive origin-destination survey was conducted on the highway routes leading from Appleton as one of the initial steps in developing a long-range transportation plan for the Appleton Urban Area. The report examines the influence of externally generated vehicle trips which either originated in Appleton or pass completely through the area. Follow-up analyses will address the travel patterns within the urban zonal network. Previous work in the Appleton Urban Area included the Fox Valley Transportation Study which was initiated in 1969 as well as the Appleton Area Highway Network Plan report in 1977 and an update to the Fox Cities Highway Network Plan which was completed in 1986. Most of the recommendations in the plan are traffic operations modifications to the existing system. With the information collected in this latest survey as well as additional traffic counts and the demographic information contained in the 1990 census, a more comprehensive data base for development of the long-range transportation plan will be provided.

For analysis purposes the survey consisted of thirty-two data collection stations or one at nearly every roadway leading from Appleton as shown in Figure 1. These stations are located on the external fringe or away from the urban center of the city to better assess the complete pattern of highway travel from an areawide perspective. The survey was conducted starting in mid-May and lasting through the month of June, 1993 with operation taking place between the hours of 10 AM and 6 PM to ensure that the largest number of interviews possible were recorded with the motoring public. After compilation and tabulation of thousands of survey records, the data was then processed and factored upward to reflect a 24-hour traffic period at each of the 21 interview sites.

Nearly all interviews were conducted through a uniform procedure which incorporates stopping motorists as they approach the interview station and asking predetermined questions about their trip. At locations where average daily traffic volumes exceed approximately 12,000 such as the two sites on USH 41, motorists are given a survey card to be filled out and mailed back to the department at a later date. This process assists in speeding up the traffic flow and reduces the possibility for long vehicle delays. Essential questions asked included origin of the trip being made, destination of the trip, the type of vehicle used and primary purpose of the trip as well as the number of occupants in each vehicle.

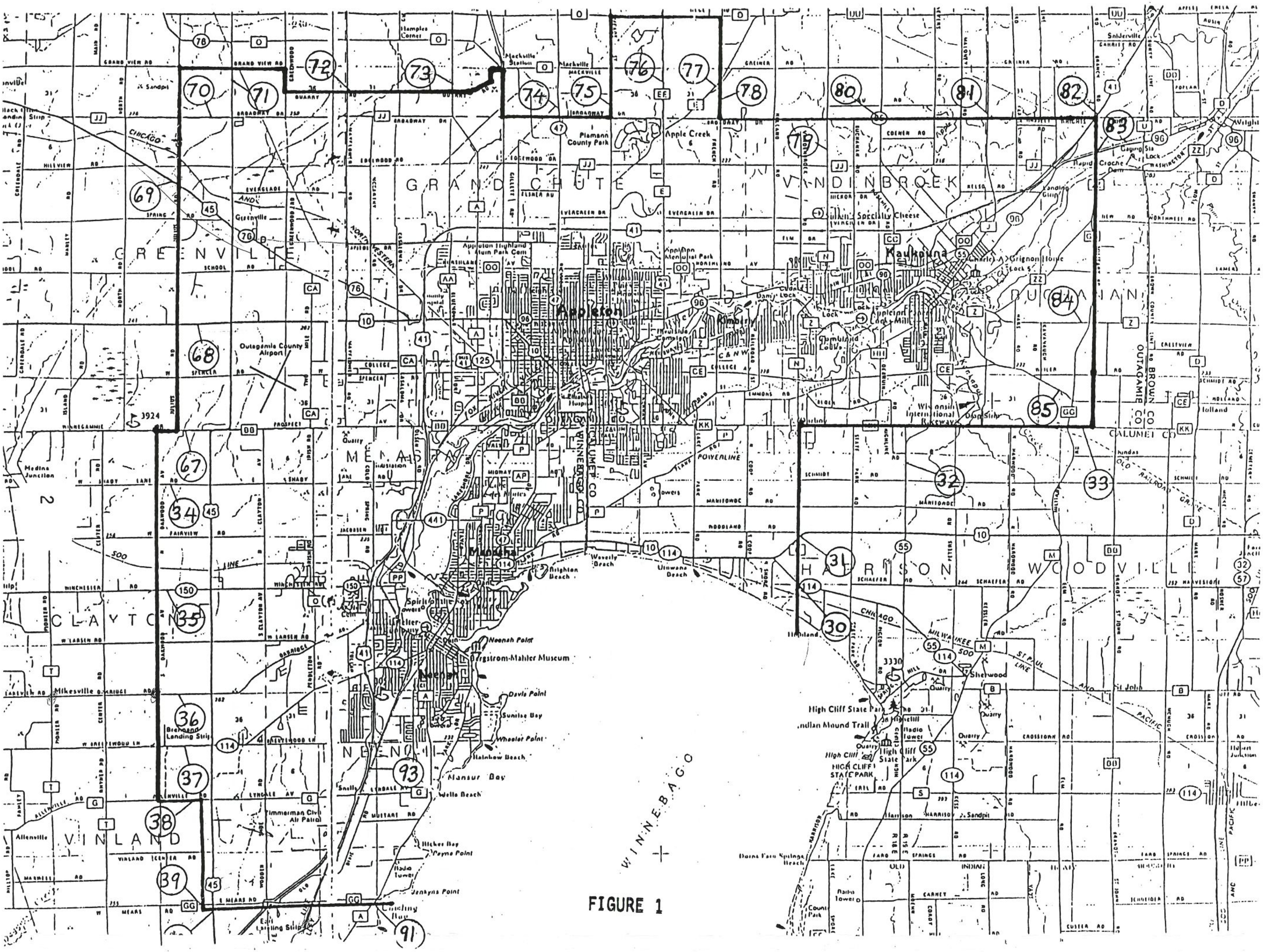

GRAND CHUTE
VANDINBROEK
GREENVILLE
BUCHANAN
MENASHA
HARRISON
WOODVILLE
CLAYTON
NEENAH
VINLAND
Appleton
Kaukauna
Kimberly
Menasha
Neenah
Sherwood
WINNEBAGO
BROWN CO
OUTAGAMIE CO
CALUMET CO
WINNEBAGO CO
Outagamie County Airport
High Cliff State Park
Bergstrom-Mahler Museum
Plamann County Park
Apple Creek
Wisconsin International Raceway

FIGURE 1

2

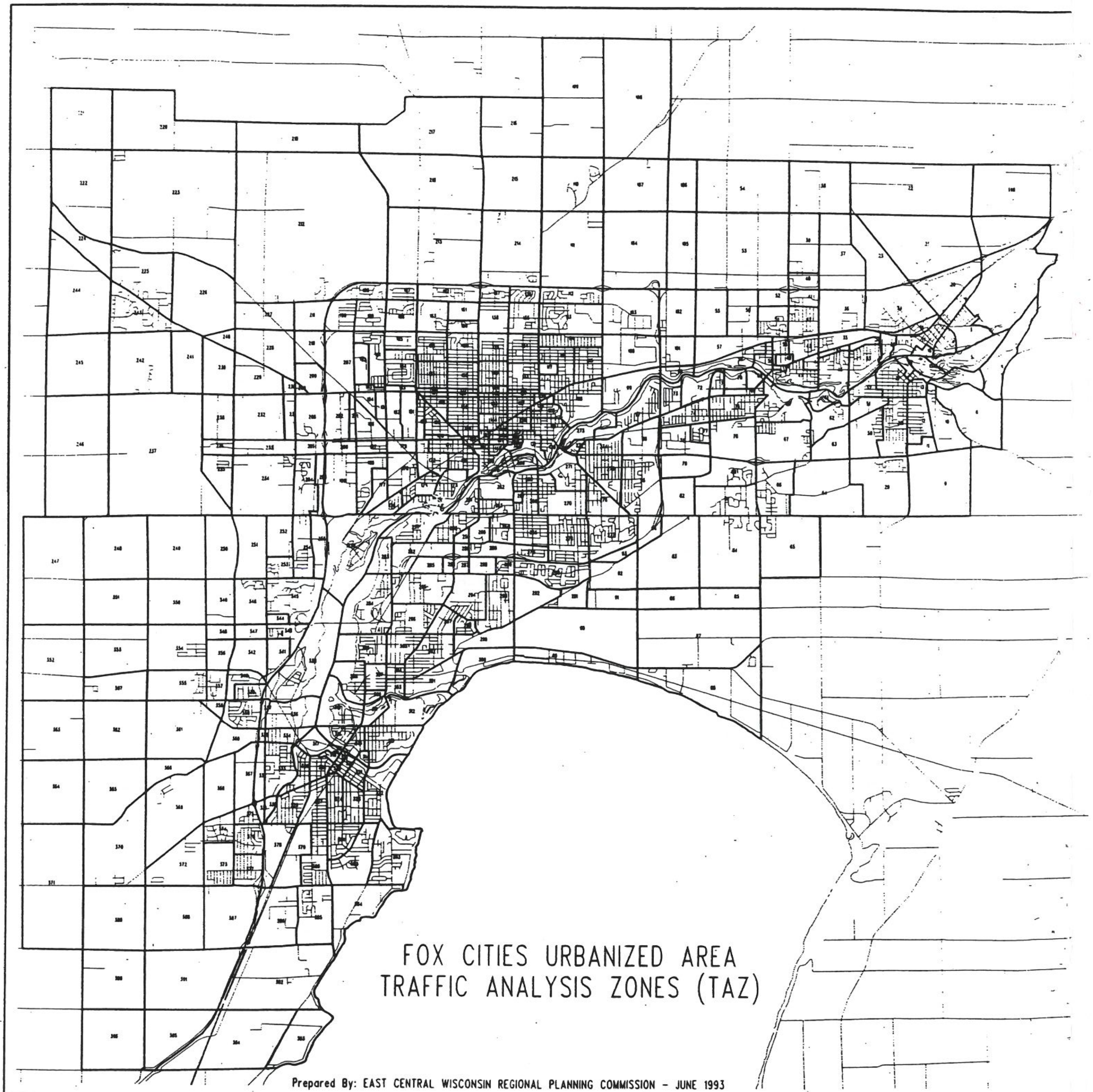
One of the origin-destination survey's primary purposes was to answer questions concerning how much traffic passes through the study area without stopping (known as through trips). Also much of the traffic either enters from the outside and ends its trip in the study area (known as external to internal trips) or exits the study area and ends its trip elsewhere (known as internal to external trips).

INTERNAL ZONAL STRUCTURE

On Figure 2 the internal traffic analysis zonal configuration for the Appleton Urban Area is shown. The area was divided into 398 separate geographic zones representing similar land use and/or commercial activity. The zones were referenced on the survey forms to determine where the motorist was traveling from and destined to.

An eight hour data collection sample of the origin-destination trips at each of the thirty-two survey stations provided the basis for the trip making behavior of all trips passing through each station. With the expansion of those trips to a 24-hour traffic count period, each interview station's daily number of trips was tabulated for analysis. External to internal and internal to external trips to and from the Appleton zonal network are considered local trips. The slash mark splits the total number of all vehicles from the number of larger or heavier type vehicles such as delivery trucks and semi-trailers with multiple axle configurations. Following are the 24-hour results for each interview station.

	Station Location	Total Trips All Veh/Hvy Trk	Trip% All Veh/Hvy Trk
#30	STH 114, 1.4 MI S of USH 10		
	Local Trips	6,072/379	91%/ 77%
	Through Trips	608/114	9%/ 23%
	TOTAL	6,680/493	100%/100%
#31	USH 10E, 1.0 MI E of CTH "N"		
	Local Trips	4,527/316	83%/ 61%
	Through Trips	952/205	17%/ 39%
	TOTAL	5,479/521	100%/100%
#32	STH 55S, 0.3 MI N of Schmidt Rd.		
	Local Trips	2,568/331	86%/ 75%
	Through Trips	429/110	14%/ 25%
	TOTAL	2,997/441	100%/100%


FOX CITIES URBANIZED AREA
TRAFFIC ANALYSIS ZONES (TAZ)
Prepared By: EAST CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION - JUNE 1993

	Station Location	Total Trips All Veh/Hvy Trk	Trip% All Veh/Hvy Trk
#33	CTH "KK", 0.1 MI E of CTH "GG"		
	Local Trips	1,860/82	97%/ 94%
	Through Trips	63/ 5	3%/ 6%
	TOTAL	1,923/87	100%/100%
#34	Shady Lane Rd., 0.1 MI W of USH 45		
	Local Trips	248/14	92%/100%
	Through Trips	22/ 0	8%/ 0%
	TOTAL	270/14	100%/100%
#35	STH 150, 2.0 MI W of USH 45		
	Local Trips	4,668/260	90%/ 63%
	Through Trips	528/153	10%/ 37%
	TOTAL	5,196/413	100%/100%
#36	Oakridge Rd., 0.8 MI W of USH 45		
	Local Trips	412/18	91%/ 72%
	Through Trips	40/ 7	9%/ 28%
	TOTAL	452/25	100%/100%
#37	W Breezewood Ln., 0.6 MI W of USH 45		
	Local Trips	1,238/43	93%/ 84%
	Through Trips	95/ 8	7%/ 16%
	TOTAL	1,333/51	100%/100%
#38	CTH "G", 0.2 MI E of CTH "T"		
	Local Trips	1,135/ 9	88%/ 27%
	Through Trips	149/24	12%/ 73%
	TOTAL	1,284/33	100%/100%
#39	CTH "GG", 0.4 MI W of USH 45		
	Local Trips	959/19	64%/ 25%
	Through Trips	544/58	36%/ 75%
	TOTAL	1,503/77	100%/100%
#67	CTH "BB", 0.8 MI W of USH 45		
	Local Trips	1,424/62	92%/ 86%
	Through Trips	127/10	8%/ 14%
	TOTAL	1,551/72	100%/100%

	Station Location	Total Trips All Veh/Hvy Trk	Trip% All Veh/Hvy Trk
#68	USH 10W, 2.0 MI W of USH 45		
	Local Trips	8,771/ 990	90%/ 89%
	Through Trips	970/ 122	10%/ 11%
	TOTAL	9,741/1,112	100%/100%
#69	USH 45N, 2.0 MI N of STH 76		
	Local Trips	7,668/409	83%/ 53%
	Through Trips	1,559/362	17%/ 47%
	TOTAL	9,227/771	100%/100%
#70	CTH "JJ", 1.0 MI W of STH 76		
	Local Trips	2,134/103	88%/ 72%
	Through Trips	280/ 41	12%/ 28%
	TOTAL	2,414/144	100%/100%
#71	STH 76, 0.9 MI N of CTH "JJ"		
	Local Trips	1,680/ 91	80%/ 55%
	Through Trips	421/ 74	20%/ 45%
	TOTAL	2,101/165	100%/100%
#72	Mayflower Rd., 0.3 MI N of CTH "JJ"		
	Local Trips	464/33	91%/ 79%
	Through Trips	48/ 9	9%/ 21%
	TOTAL	512/42	100%/100%
#73	CTH "A" N, 1.2 MI N of CTH "JJ"		
	Local Trips	6,205/ 843	82%/ 69%
	Through Trips	1,355/ 381	18%/ 31%
	TOTAL	7,560/1,224	100%/100%
#74	STH 47, 0.8 MI N of Broadway		
	Local Trips	6,651/ 891	92%/ 86%
	Through Trips	586/ 143	8%/ 14%
	TOTAL	7,237/1,034	100%/100%
#75	Meade St., 0.6 MI N of Broadway		
	Local Trips	1,398/33	99%/100%
	Through Trips	14/ 0	1%/ 0%
	TOTAL	1,412/33	100%/100%

	Station Location	Total Trips All Veh/Hvy Trk	Trip% All Veh/Hvy Trk
#76	CTH "EE", 1.0 MI N of CTH "E"		
	Local Trips	2,081/116	97%/ 97%
	Through Trips	70/ 4	3%/ 3%
	TOTAL	2,151/120	100%/100%
#77	CTH "E", 0.2 MI W of French Rd.		
	Local Trips	3,201/248	93%/ 89%
	Through Trips	247/ 32	7%/ 11%
	TOTAL	3,448/280	100%/100%
#78	French Rd., 0.3 MI N of Broadway		
	Local Trips	446/36	97%/100%
	Through Trips	16/ 0	3%/ 0%
	TOTAL	462/36	100%/100%
#79	CTH "N", 0.3 MI N of CTH "JJ"		
	Local Trips	2,620/225	95%/ 82%
	Through Trips	137/ 50	5%/ 18%
	TOTAL	2,757/275	100%/100%
#80	STH 55N, 0.6 MI N of Coenen Rd.		
	Local Trips	2,331/207	88%/ 71%
	Through Trips	310/ 85	12%/ 29%
	TOTAL	2,641/292	100%/100%
#81	CTH "J", 0.2 MI N of CTH "JJ"		
	Local Trips	747/56	93%/ 77%
	Through Trips	54/17	7%/ 23%
	TOTAL	801/73	100%/100%
#82	USH 41N, Weigh Station		
	Local Trips	17,575/1,923	68%/ 53%
	Through Trips	8,260/1,734	32%/ 47%
	TOTAL	25,835/3,657	100%/100%
#83	STH 96, 0.4 MI E of CTH "JJ"		
	Local Trips	2,494/129	90%/ 58%
	Through Trips	282/ 95	10%/ 42%
	TOTAL	2,776/224	100%/100%

	Station Location	Total Trips All Veh/Hvy Trk	Trip% All Veh/Hvy Trk
#84	CTH "Z", 0.4 MI E of CTH "GG"		
	Local Trips	1,011/ 76	91%/ 74%
	Through Trips	102/ 27	9%/ 26%
	TOTAL	1,113/103	100%/100%
#85	CTH "CE", 0.4 MI W of CTH "GG"		
	Local Trips	2,528/152	95%/ 80%
	Through Trips	147/ 39	5%/ 20%
	TOTAL	2,675/191	100%/100%
#90	USH 45S, 1.0 MI N of USH 41		
	Local Trips	2,632/188	56%/ 30%
	Through Trips	2,028/440	44%/ 70%
	TOTAL	4,660/628	100%/100%
#91	CTH "A"S, 0.6 MI N of CTH "GG"		
	Local Trips	5,043/162	96%/100%
	Through Trips	230/ 0	4%/ 0%
	TOTAL	5,273/162	100%/100%
#93	USH 41S, North of USH 45		
	Local Trips	32,102/2,325	82%/ 65%
	Through Trips	7,224/1,232	18%/ 35%
	TOTAL	39,326/3,557	100%/100%

More than four out of every five trips collected along the Appleton external survey locations has an origin or destination within the Appleton zonal network. Conversely less than one in five trips (17.1%) pass completely through the urban area. Not surprisingly, the majority of the through trips were recorded on USH 41 which is a four-lane limited access freeway running north and south through the region. Together USH 41 north (8,260) and USH 41 south (7,224) account for more than 55% of all the through trips collected throughout the survey. This is followed by USH 45 south with 2,028 trips (7.3%), USH 45 north with 1,559 trips (5.6%) and CTH "A" north with 1,355 trips (4.9%). No other interview station recorded more than 1,000 through trips. These five survey stations accounted for nearly three-quarters of all the trips passing through the Appleton urban area. Table A summarizes the trip types at all thirty-two interview stations including heavier trucks separated from all vehicles.

TABLE A

TRIP TYPE TOTAL

TRIP TYPE	ALL O-D STATIONS	PERCENT
Local Trips	134,891/10,769	82.9%/ 65.9%
Through Trips	27,900/ 5,582	17.1%/ 34.1%
TOTAL	162,791/16,351	100.0%/100.0%

Heavy trucks (delivery, semi-trailers, etc.) accounted for 10% of the total vehicle trips. When comparing only through trips the percentage increases to 20% while the local trip percentage separately decreases to 8%. Of all the heavy trucks collected in the external study area, slightly more than one out of three (34.1%) passes through or does not make a stop in the Appleton urban area.

THROUGH TRIP PATTERNS

The largest concentration of through trips were recorded at the stations on USH 41 and USH 45. For additional information the complete tabulation of through trips from each of the thirty-two O-D stations to all of the exit routes from the study area is included in Table B. These trips are listed for trucks as well as all vehicles and are useful in determining through trip traffic between any two stations. The left hand column represents the O-D station each trip passed through while the remaining columns list the possible through trip routes.

As can be seen from the table nearly 40% of the through trips pass through station #93 on USH 41 south. An additional 20% of the through trips pass through station #82 on USH 41 north. Together these two stations on USH 41 account for 60% of the trips passing through the Appleton urbanized area. USH 10 west and USH 45 south followed with 8% and 7%, respectively.

TABLE B

Tabulation of Through Trips -- All Vehicles/Heavy Trucks
(Recording station left hand column; through trip route remaining columns)

TP Ext. sta #	Station#	#30	#31	#32	#33	#34	#35	#36	#37
	#30 STH 114			4			18		9
	#31 USH 10E	6		4			9		23
	#32 STH 55S	4	15		27/12				
	#33 CTH "KK"		7	22/5					
	#34 Shady Ln								
	#35 STH 150	8	30	5		7			
	#36 Oakridge					5			
	#37 Breezewood		5			8/8			
	#38 CTH "G"		3				13/13		
	#39 CTH "GG"	4							
	#67 CTH "BB"	3					9/7		
	#68 USH 10W	18	222						
410 ✗	#69 USH 45N	7	32					10	
	#70 CTH "JJ"	4	23/6						
412	#71 STH 76	13/8	8/4				43/34		
	#72 Mayflower								
	#73 CTH "A" N								
	#74 STH 47	6	10/4	9			8		
	#75 Meade		6						
	#76 CTH "EE"		4/4						
	#77 CTH "E"						11		
	#78 French								
	#79 CTH "N"		6						
	#80 STH 55N	9/9	45/6	62/8					
	#81 CTH "J"						3		
	#82 USH 41N	12	56/34	32			36		
	#83 STH 96		13	10/6			6/6		
	#84 CTH "Z"			4					
	#85 CTH "CE"			58/5					
	#90 USH 45S						110/13	10	
	#91 CTH "A" S	14	35	12			6		
	#93 USH 41S		338/100	61			88		
	TOTAL	108/17	858/158	283/24	27/12	20/8	360/73	20/0	32/0

TABLE B (Cont'd)

Tabulation of Through Trips -- All Vehicles/Heavy Trucks
(Recording station left hand column; through trip route remaining columns)

409

Station#	#38	#39	#67	#68	#69	#70	#71	#73
#30 STH 114		4		185/43	71/12	7		
#31 USH 10E	5			278/77	82/30	4	21	5
#32 STH 55S					18			
#33 CTH "KK"		15						
#34 Shady Ln								
#35 STH 150				13	34/11		14	
#36 Oakridge				7/7	5			
#37 Breezewood								
#38 CTH "G"		4		14/11	9			
#39 CTH "GG"				3	3			
#67 CTH "BB"					11			
#68 USH 10W			8		121/68		8	
#69 USH 45N				128		9	10	
#70 CTH "JJ"				13	21/3		48/7	
#71 STH 76				22	115/9	38/4		
#72 Mayflower				4/4		13/5		6
#73 CTH "A" N				27/10	20/10	5		
#74 STH 47				17	27/4		4/4	
#75 Meade								
#76 CTH "EE"					13			
#77 CTH "E"					29	6	4	11
#78 French					4			
#79 CTH "N"				16	5			5
#80 STH 55N				6	8/4			
#81 CTH "J"				4/4				
#82 USH 41N		110		421/60	169/17			
#83 STH 96					13/4			
#84 CTH "Z"				21/18	6/6	5		
#85 CTH "CE"				15/7	5			
#90 USH 45S	14	512		124/35	1051/291		19	7
#91 CTH "A" S	29	61		7			5	12
#93 USH 41S	67	14		782/10	591/64	17	360/82	
TOTAL	115/0	720/0	8/0	2107/286	2431/529	104/9	493/93	46/0

TABLE B (Cont'd)

Tabulation of Through Trips -- All Vehicles/Heavy Trucks
(Recording station left hand column; through trip route remaining columns)

415

Station#	#74	#76	#77	#78	#79	#80	#82	#83
#30 STH 114	14/6						46/7	5
#31 USH 10E	15				62/15	5	43/4	
#32 STH 55S	7/3	3/3	23/19		15/4	11/4	269/52	10/3
#33 CTH "KK"			6					
#34 Shady Ln	2							
#35 STH 150	10/10		11/11				56/4	
#36 Oakridge								
#37 Breezewood							10	3
#38 CTH "G"							18	
#39 CTH "GG"	3						21	
#67 CTH "BB"							6	
#68 USH 10W	16					5	312/27	
#69 USH 45N	64		9				40	
#70 CTH "JJ"	87/8		5			4	27	
#71 STH 76							15/4	
#72 Mayflower								
#73 CTH "A" N				5			36/10	
#74 STH 47					434/120		38/8	8
#75 Meade							3	
#76 CTH "EE"							6	3
#77 CTH "E"							11	
#78 French			5					
#79 CTH "N"						11	21	6
#80 STH 55N								12/7
#81 CTH "J"							3	
#82 USH 41N	57/17		12					
#83 STH 96	4/4		7				25/4	
#84 CTH "Z"	14		10				8	
#85 CTH "CE"	25/19							
#90 USH 45S	14						153/57	
#91 CTH "A" S							36	
#93 USH 41S	168/72		29/12				4586/877	7
TOTAL	500/139	3/3	117/42	5/0	511/139	36/4	5789/1054	54/10

TABLE B (Cont'd)

Tabulation of Through Trips -- All Vehicles/Heavy Trucks
(Recording station left hand column; through trip route remaining columns)

401 400

Station#	#84	#85	#90	#91	#93	TOTAL
#30 STH 114			35/19		210/27	608/114
#31 USH 10E			32/4	20/5	339/70	952/205
#32 STH 55S		3	5		18/10	429/110
#33 CTH "KK"					13	63/5
#34 Shady Ln			7		12	22/0
#35 STH 150			125/33	11/11	204/72	528/153
#36 Oakridge			19		3	40/7
#37 Breezewood			33	3	33	95/8
#38 CTH "G"			47	5	36	149/24
#39 CTH "GG"			377/58	16	118	544/58
#67 CTH "BB"			54		44/3	127/10
#68 USH 10W			16		244/27	970/122
#69 USH 45N			138/61		1112/301	1559/362
#70 CTH "JJ"			9	36/14	4/4	280/41
#71 STH 76			101		68/9	421/74
#72 Mayflower			12		14	48/9
#73 CTH "A" N			46	111/62	1106/289	1355/381
#74 STH 47			27/4			586/143
#75 Meade					6	14/0
#76 CTH "EE"					45	70/4
#77 CTH "E"					176/32	247/32
#78 French					6	16/0
#79 CTH "N"			10/5		56/45	137/50
#80 STH 55N	15/10	18/4	6		128/36	310/85
#81 CTH "J"					44/14	54/17
#82 USH 41N			855/110	14	6487/1448	8260/1734
#83 STH 96			4		200/71	282/95
#84 CTH "Z"				12	22/3	102/27
#85 CTH "CE"	4/4		15/4		25	147/39
#90 USH 45S					13	2028/440
#91 CTH "A" S					13	230/0
#93 USH 41S	41		14		61/16	7224/1232
TOTAL	60/14	21/4	1987/298	228/92	10860/2477	27900/5582

Each origin or destination is known as a trip end. Figure 3 illustrates the through trip ends by origin and destination by county. Winnebago County constitutes 28.8% of the through trips at either the origin or destination end. This was followed by Brown County with 19.2%, Outagamie County with 9.6% and Waupaca County with 5.2%. Michigan was the largest of the out-of-state through trip contributors with 1.8% of the overall trips.

LOCAL TRIP ANALYSIS

The internal external trips by traffic analysis zone (TAZ) and by survey station are shown in Table C. The trip totals for each of the 398 zones range from 6,233 for Zone 206 and 3,496 for Zone 207 down to none for Zones 7, 76, 91, 286, 337, 344, 397 and 398. Zone 206 represents the Fox River Mall just west of USH 41, whereas Zone 207 is a large tract of land northeast of Zone 206 representing extensive commercial development. Third in the ranking is Zone 318 with 1,947 trips and a location in downtown Neenah. Zones without any trips are scattered throughout the study area. The zone with the largest number of heavy truck traffic is Zone 194 located along USH 10 between USH 41 and downtown Appleton with 283 trips. Locations for all 398 zones are represented on Figure 2. Station #93 on USH 41 from the south provided the largest number of internal trips with 32,102 while station #34 on Shady Lane had the least with 248. Station #82 on USH 41 from the north was runner-up with 17,575 trips.

FIGURE 3

THROUGH TRIP END TOTALS BY ORIGIN AND DESTINATION COUNTY FOR ALL STATIONS

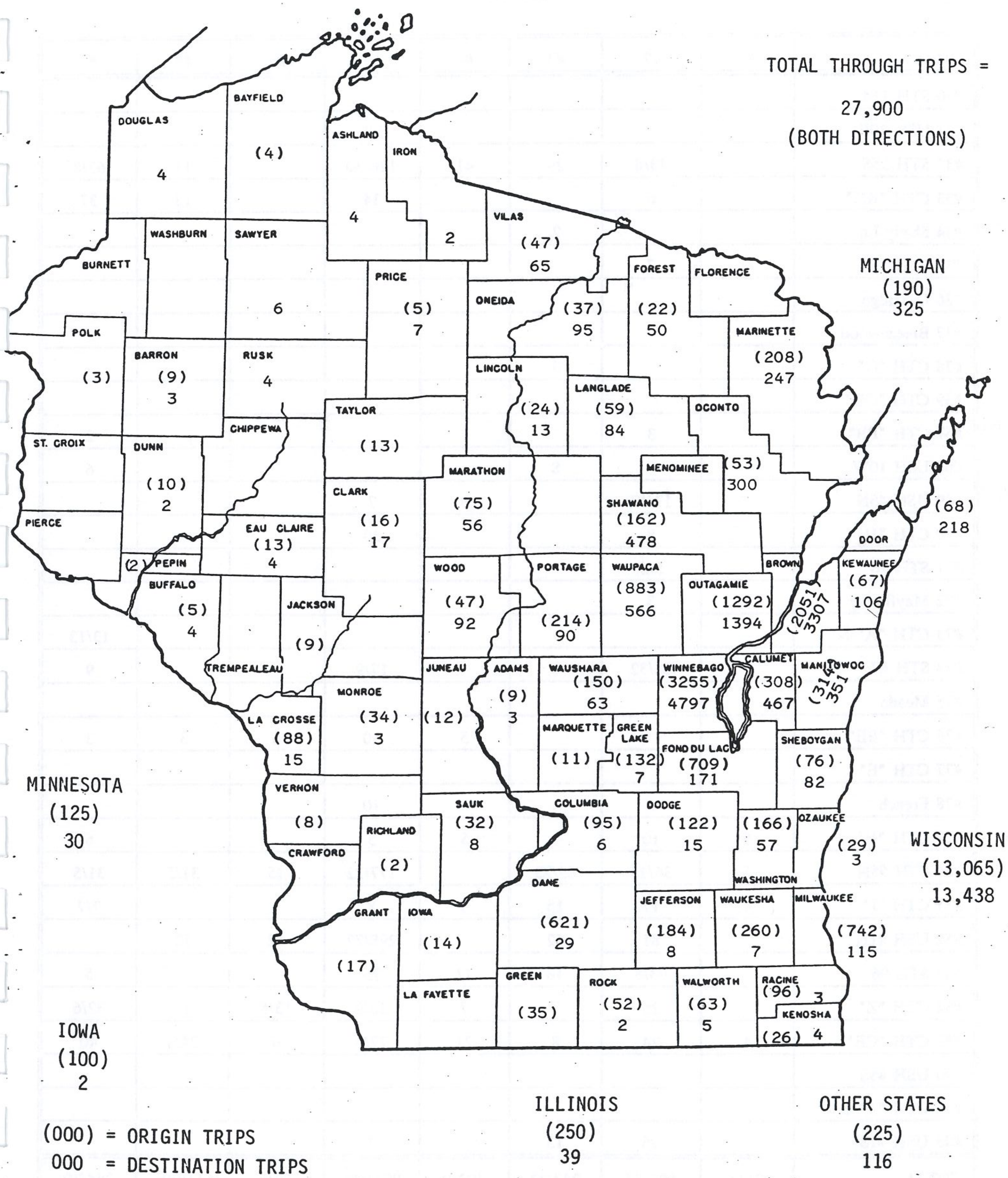


TABLE C

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE

Station#	#1	#2	#3	#4	#5	#6	#8	#9
#30 STH 114								
#31 USH 10E					5/5			
#32 STH 55S		43/8	29	41	128/30		11	63/8
#33 CTH "KK"		6			34		13	37
#34 Shady Ln			2					
#35 STH 150		7						
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"			3					
#39 CTH "GG"								
408 #67 CTH "BB"		3						2
#68 USH 10W			8					6
410 #69 USH 45N		17/17		8	7			
#70 CTH "JJ"		8			30			
#71 STH 76		5/5						
#72 Mayflower		3						
#73 CTH "A" N								13/13
#74 STH 47		88/32	8		17/9			9
#75 Meade	3							
#76 CTH "EE"				5	10	6	3	3
#77 CTH "E"								
#78 French					10			
#79 CTH "N"	5	10		5	5			6
#80 STH 55N	5	36/15	69/23		177/22	15	31/5	31/5
#81 CTH "J"	4	17	15	5	8			7/7
#82 USH 41N		81	62		298/77	12	12	
#83 STH 96		93/8	18	11	75			5
#84 CTH "Z"		25	7	7	36/9	13/5	23	32/6
#85 CTH "CE"	4	24	8	21	77/4	6	24/4	40
#90 USH 45S								
#91 CTH "A" S								
#93 USH 41S		36	13		7			
TOTAL	21/0	502/85	242/23	103/0	924/156	52/5	117/9	254/39

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks

ZONE #

Station#	#10	#11	#12	#13	#14	#15	#16	#17
#30 STH 114			14				4	5
#31 USH 10E			5					
#32 STH 55S	26/11	142/14	187/15	63	96/15	80/4	79/7	65/4
#33 CTH "KK"		40	43		24	6	7	25/5
#34 Shady Ln					5/5			
#35 STH 150					6			
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"							6	
#39 CTH "GG"								
#67 CTH "BB"						4		
#68 USH 10W			8	6				16
#69 USH 45N								10
#70 CTH "JJ"			5		4		8	5
#71 STH 76								
#72 Mayflower								
#73 CTH "A" N	20/20			6				
#74 STH 47		7				8	7/7	14
#75 Meade								
#76 CTH "EE"	5				5		3	
#77 CTH "E"								
#78 French					3/3			3
#79 CTH "N"	5				11		5	17
#80 STH 55N	38	33	90/4	21	53	46/6	70/5	71
#81 CTH "J"	11	20	9	18	29	24	11	35/10
#82 USH 41N	36/24	52/24	107	9	73/18	45	21	170/58
#83 STH 96		32/4	21/4	12	25	48	87/10	43
#84 CTH "Z"	13	55	28	34	32	23/6	28	36
#85 CTH "CE"	68	197	83/4	56/4	45	136	51/4	41
#90 USH 45S								
#91 CTH "A" S	7		13					
#93 USH 41S	7	41/35	46		7	6	73/73	17
TOTAL	236/55	619/77	649/27	225/4	418/41	426/16	460/106	573/77

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#18	#19	#20	#21	#22	#23	#24	#25
#30 STH 114				5			13	
#31 USH 10E							5	
#32 STH 55S	17	11	75/23	19/8	13	87/19	74/27	6
#33 CTH "KK"	22	6	30/11		7	15/9	13	
#34 Shady Ln					3			
#35 STH 150				5				
#36 Oakridge								
#37 Breezewood							3	
#38 CTH "G"					3		8	
#39 CTH "GG"			3					
#67 CTH "BB"	5		2	5				
#68 USH 10W							18	8
#69 USH 45N			14	8	10			
#70 CTH "JJ"	5		9			5	14	4
#71 STH 76	3						3	
#72 Mayflower								
#73 CTH "A" N				7			6	
#74 STH 47	9		7/7				14	
#75 Meade			4/4				6	
#76 CTH "EE"	8	5			3		3	
#77 CTH "E"			4	15/5			5	
#78 French			3				3	
#79 CTH "N"	11		32	11	6		5	6
#80 STH 55N	55/13		100	24	25	52/5	116/16	4
#81 CTH "J"	6		17	4	7		31/7	
#82 USH 41N	172/24	77	152/17	67		9	226	11
#83 STH 96	11	18	100/7	6/6	10	17	39	5
#84 CTH "Z"	15	4	40/9	12		9	36	3
#85 CTH "CE"	21/4		101/23	7		8	32	5
#90 USH 45S			12/5					
#91 CTH "A" S							5	
#93 USH 41S	14		60	32	14	26	29	
TOTAL	374/41	121/0	765/106	227/19	101/0	228/33	707/50	52/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#26	#27	#28	#29	#30	#31	#32	#33
#30 STH 114				13/8				
#31 USH 10E								
#32 STH 55S	47/10	84/8	135/11	91/3	35/7	8	40/3	34
#33 CTH "KK"	24	31	19	72/21	26	6	6	
#34 Shady Ln								
#35 STH 150		8		5				
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"							3	
#67 CTH "BB"		4				4/4	3	
#68 USH 10W		14	37	30/16		6	30/19	8
#69 USH 45N		8	10/10					
#70 CTH "JJ"	4		9			5		
#71 STH 76								
#72 Mayflower								
#73 CTH "A" N					10			
#74 STH 47								
#75 Meade								
#76 CTH "EE"		8	3					
#77 CTH "E"					4			
#78 French								
#79 CTH "N"	17		11	5		5		17
#80 STH 55N	113	46	91/8	19/4	10	8/4	27	28
#81 CTH "J"	23	11/4	14	8/3	4	3	6	3/3
#82 USH 41N	36	62	111	25	23	24	36	47
#83 STH 96	40	34	27	4	16		19	28
#84 CTH "Z"	22	24	14	16		8	11	4
#85 CTH "CE"	34	54/4	97	51	8		24	14
#90 USH 45S		4/4						
#91 CTH "A" S								
#93 USH 41S	76	7		13	23	8	19	
TOTAL	436/10	399/20	578/29	352/55	159/7	85/8	224/22	183/3

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#34	#35	#36	#37	#38	#39	#40	#41
#30 STH 114	5							5
#31 USH 10E		13/13	4				5	10/5
#32 STH 55S	8	28/8	26/6				5	7/4
#33 CTH "KK"		24	21				7	21
#34 Shady Ln								
#35 STH 150	6	7			6			
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								3
#39 CTH "GG"	3							
#67 CTH "BB"								
#68 USH 10W	8	6	6				8	
#69 USH 45N		8	18/18					9
#70 CTH "JJ"		9	17/3				4	
#71 STH 76	5							4/4
#72 Mayflower								
#73 CTH "A" N		6	5					
#74 STH 47			14/7			4/4		12/4
#75 Meade							4	
#76 CTH "EE"		3	3					9
#77 CTH "E"								
#78 French			3				3	
#79 CTH "N"		50/5	37		5		39/5	45
#80 STH 55N	19	59	72/8	9	16	5		4
#81 CTH "J"		10						14
#82 USH 41N	101	122/42	260/35	14			24/24	96/17
#83 STH 96	19	35	23				5	14/3
#84 CTH "Z"	16	13/5	13					4
#85 CTH "CE"	10	79	22					19
#90 USH 45S								
#91 CTH "A" S								
#93 USH 41S		73	17					14
TOTAL	200/0	545/73	561/77	23/0	27/0	9/4	104/29	290/37

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#42	#43	#44	#45	#46	#47	#48	#49
#30 STH 114	21/7	4	5		4	9	16	4
#31 USH 10E		5			5	5	5	10
#32 STH 55S	3	12		5	3	13		8
#33 CTH "KK"		15						
#34 Shady Ln								
#35 STH 150						33		
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"						3		
#39 CTH "GG"								
#67 CTH "BB"					3			
#68 USH 10W	5				29	15	8	8
#69 USH 45N	7						9	16
#70 CTH "JJ"	4							
#71 STH 76								
#72 Mayflower								
#73 CTH "A" N	6							
#74 STH 47	14							4/4
#75 Meade	4			4				
#76 CTH "EE"						3	8	
#77 CTH "E"								
#78 French				4				8
#79 CTH "N"	38	31	11	44	10	38	12	27
#80 STH 55N	12		15/4		27/4	21	5	4
#81 CTH "J"						8	5	3
#82 USH 41N	136/34	45		129/51	168/82	91	27	82
#83 STH 96	9	6	7	5	4	14	7	11
#84 CTH "Z"	3				13	10/5	4	
#85 CTH "CE"					5	5	12/12	18/12
#90 USH 45S								
#91 CTH "A" S						5		
#93 USH 41S	13	44			14	26	6	
TOTAL	275/41	162/0	38/4	191/51	285/86	299/5	124/12	203/16

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#50	#51	#52	#53	#54	#55	#56	#57
#30 STH 114	13/8	28				12/12	9	40
#31 USH 10E	5					15		14
#32 STH 55S		4		3		12/4	21	17/4
#33 CTH "KK"	7			6		79/28	12	6
#34 Shady Ln								
#35 STH 150		37						6
#36 Oakridge								
#37 Breezewood		18						
#38 CTH "G"								
#39 CTH "GG"								
#67 CTH "BB"							4	
#68 USH 10W	14	14		8			13	
#69 USH 45N			10/10			8		
#70 CTH "JJ"	5	4/4			5	4	15	8
#71 STH 76								4
#72 Mayflower								
#73 CTH "A" N		13				13/13		
#74 STH 47		19/4		16/16	4/4		8	36/30
#75 Meade								
#76 CTH "EE"						3	9/6	6
#77 CTH "E"								
#78 French					10		9/4	5
#79 CTH "N"	11	22	5	18	6		28	54
#80 STH 55N		9		5	4	7	17	23
#81 CTH "J"	5							16
#82 USH 41N	43	43				11	12	29
#83 STH 96	7	9		5			17	25
#84 CTH "Z"		9		3				
#85 CTH "CE"	5					16	20	11
#90 USH 45S								
#91 CTH "A" S								
#93 USH 41S	14	22					7	6
TOTAL	129/8	251/8	15/10	64/16	29/4	180/57	201/10	306/34

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#58	#59	#60	#61	#62	#63	#64	#65
#30 STH 114		4						8
#31 USH 10E		4	11				5	10
#32 STH 55S	8		4	5	15	5		
#33 CTH "KK"		6	11					
#34 Shady Ln								
#35 STH 150								
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"								
#67 CTH "BB"								
#68 USH 10W			6					
#69 USH 45N								
#70 CTH "JJ"								
#71 STH 76								
#72 Mayflower								
#73 CTH "A" N		5						5
#74 STH 47								4/4
#75 Meade								
#76 CTH "EE"	3	11						
#77 CTH "E"								
#78 French	6							
#79 CTH "N"	21				5			
#80 STH 55N	4							
#81 CTH "J"								
#82 USH 41N	58	34		31				
#83 STH 96	6	6	6					
#84 CTH "Z"					4			
#85 CTH "CE"					5		6	27/8
#90 USH 45S								
#91 CTH "A" S	8							
#93 USH 41S								
TOTAL	114/0	70/0	38/0	36/0	29/0	5/0	11/0	54/12

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#66	#67	#68	#69	#70	#71	#72	#73
#30 STH 114		28/12	73/4	5		13	53	5
#31 USH 10E	14/10	14/4	33/7	15	10		6	
#32 STH 55S	3	16/3	95/20	7	11/4		7/3	3
#33 CTH "KK"	6	7	31	6		6	38	
#34 Shady Ln								
#35 STH 150				6				
#36 Oakridge		9/9						
#37 Breezewood					3			
#38 CTH "G"								
#39 CTH "GG"			3					
#67 CTH "BB"		2				2		
#68 USH 10W		33/19	46	14			5	6
#69 USH 45N			10					
#70 CTH "JJ"			45				5	
#71 STH 76			3	5				
#72 Mayflower								
#73 CTH "A" N		7	11					
#74 STH 47	8		148/91	8		23/23		8
#75 Meade	3		19					
#76 CTH "EE"		6	28		6		3	7/7
#77 CTH "E"		7/7						
#78 French		19	3	3				9
#79 CTH "N"		32/5	124/5	173/53	6	33	15	5
#80 STH 55N		10	33/5		12		7	
#81 CTH "J"		9	16			4	3	
#82 USH 41N		24	431/75		63	24	12	
#83 STH 96		6	59	4	5	8	24	10
#84 CTH "Z"			44/22					
#85 CTH "CE"			41/19	6			59	6
#90 USH 45S								7
#91 CTH "A" S			7		5			
#93 USH 41S		22	74	32				
TOTAL	34/10	251/59	1377/248	284/53	121/4	113/23	237/3	66/7

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE

Station#	#74	#75	#77	#78	#79	#80	#81	#82
#30 STH 114	53	127	21/7	26/17			14	5
#31 USH 10E	15	107/4		30	10		10	
#32 STH 55S	10/4	26		7/4		8/8		
#33 CTH "KK"	12	12						
#34 Shady Ln								
#35 STH 150	8	5				5		
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"		3						
#39 CTH "GG"								
#67 CTH "BB"	3	3						
#68 USH 10W	14	32	8	6				
#69 USH 45N		43						
#70 CTH "JJ"		5		5				
#71 STH 76								
#72 Mayflower		3						
#73 CTH "A" N		6						
#74 STH 47	16	23/8	7					
#75 Meade		9						
#76 CTH "EE"	6	13		9				
#77 CTH "E"								
#78 French	4	6						
#79 CTH "N"	33	119/11		11			5	14/9
#80 STH 55N	11	16/5	4					
#81 CTH "J"						5		
#82 USH 41N		278/35	24					
#83 STH 96	11/4	42				4		
#84 CTH "Z"	9/6	7						
#85 CTH "CE"	10	18		8	5			
#90 USH 45S		7					6	
#91 CTH "A" S	5							
#93 USH 41S	88	150/19	28	13				26
TOTAL	308/14	1060/82	92/7	115/21	15/0	22/8	35/0	45/9

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#83	#84	#85	#86	#87	#88	#89	#90
#30 STH 114	13	4			30/4	16/7	18/12	4
#31 USH 10E		6			6		11	5
#32 STH 55S								
#33 CTH "KK"					8	14		
#34 Shady Ln								
#35 STH 150								
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"								
#67 CTH "BB"								
#68 USH 10W						12/12		
#69 USH 45N	9							
#70 CTH "JJ"								
#71 STH 76								
#72 Mayflower								
#73 CTH "A" N			5					
#74 STH 47								
#75 Meade								
#76 CTH "EE"								
#77 CTH "E"								5
#78 French								
#79 CTH "N"		5			5	5		
#80 STH 55N								
#81 CTH "J"					3			
#82 USH 41N				12				
#83 STH 96		3						
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S								
#91 CTH "A" S								
#93 USH 41S								
TOTAL	22/0	18/0	5/0	12/0	64/16	35/7	29/12	14/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#92	#93	#94	#95	#96	#97	#98	#99
#30 STH 114			11/7	32	12	23		4
#31 USH 10E	10		6	21		6	4	24
#32 STH 55S	3					3		
#33 CTH "KK"			5			14		
#34 Shady Ln								
#35 STH 150				7		14		
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"				3		3		
#67 CTH "BB"				8		5		
#68 USH 10W				15		16		18
#69 USH 45N				34		25		
#70 CTH "JJ"			4	9		14		4
#71 STH 76				4		4		
#72 Mayflower				3				
#73 CTH "A" N				18		22/5		20/10
#74 STH 47						16		18
#75 Meade				6		3	5	
#76 CTH "EE"				6		3		18
#77 CTH "E"	6	4		6	4			9
#78 French						4		
#79 CTH "N"				32/11		21/11		5
#80 STH 55N						5		
#81 CTH "J"			4				4	
#82 USH 41N				37	9	82	12	34/24
#83 STH 96			7	3		9		
#84 CTH "Z"				4	15			
#85 CTH "CE"				16	20	19		5
#90 USH 45S								
#91 CTH "A" S				5	6		6	
#93 USH 41S				41	14	60		66/11
TOTAL	19/0	4/0	37/7	310/11	80/0	371/16	31/0	225/45

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#100	#101	#102	#103	#104	#105	#106	#107
#30 STH 114	92	4		70	36	11		4
#31 USH 10E	44	11		41	6			
#32 STH 55S	4			4	3	4		
#33 CTH "KK"	22	6		24			6	
#34 Shady Ln					2			
#35 STH 150	5			5	6		5	
#36 Oakridge								
#37 Breezewood	3							
#38 CTH "G"								
#39 CTH "GG"	6			3				
#67 CTH "BB"			3	6	2			
#68 USH 10W	109			55	45		6	8
#69 USH 45N	7		8	40	37			
#70 CTH "JJ"	88/11	4	4	86	50		4/4	
#71 STH 76	4			10				
#72 Mayflower	6			2				
#73 CTH "A" N	16			35				
#74 STH 47	84/7	8		49	44/4			23/5
#75 Meade	12			3	15	4		65/4
#76 CTH "EE"	133/3			178/10	69		6	72/9
#77 CTH "E"	87/6	6	4	119/3	88	4	12/12	25
#78 French	27	10	19/11	11	29		15/3	14
#79 CTH "N"	23			22				
#80 STH 55N	9			9				
#81 CTH "J"					4			8
#82 USH 41N	290/24	23	12	384/51	118	26		
#83 STH 96	69/3	4	4	12	14			
#84 CTH "Z"	4			22			4	4
#85 CTH "CE"	23			6	20			
#90 USH 45S					7			
#91 CTH "A" S	5/5					6		
#93 USH 41S	137	14		271	177			
TOTAL	1309/59	90/0	54/11	1467/64	772/4	55/0	58/19	223/18

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#108	#109	#110	#111	#112	#113	#114	#115
#30 STH 114	5				31	19		
#31 USH 10E		4	6	6	9	16		9/4
#32 STH 55S			3		16	4	8/4	
#33 CTH "KK"							15	
#34 Shady Ln					2			
#35 STH 150			11					5
#36 Oakridge								
#37 Breezewood		3						
#38 CTH "G"			3					
#39 CTH "GG"					9		4	4
#67 CTH "BB"	3				15	7	3	7
#68 USH 10W	6		38/16		132/82	27	53	14
#69 USH 45N					8	27	25	7
#70 CTH "JJ"		14			51	36	13	22
#71 STH 76	4			5	3	3		8
#72 Mayflower								
#73 CTH "A" N	13/13		6		19	12	12	6
#74 STH 47			7		24	83/14	49	
#75 Meade		69	8	2	43	41/3	19	11
#76 CTH "EE"	5	14/11	46		85/16	15	30	27
#77 CTH "E"	4	10	20		113	31	19	17/3
#78 French		4			4		6	
#79 CTH "N"						13/7		6
#80 STH 55N					4	5	5	5
#81 CTH "J"	4						4	
#82 USH 41N	12		23	12	105	101	69	84
#83 STH 96					15	4	5	
#84 CTH "Z"								
#85 CTH "CE"					12	6		8
#90 USH 45S		24/16			5/5		5	
#91 CTH "A" S				7		8		6
#93 USH 41S	32	41			60	19	37	62
TOTAL	88/13	183/27	171/16	32/0	765/103	477/24	381/4	308/7

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#116	#117	#118	#119	#120	#121	#122	#123
#30 STH 114	32	54	36	31	9	9	18	22
#31 USH 10E	29/4	62	31	5	5	9	5	5
#32 STH 55S	4	8	5			4		
#33 CTH "KK"	14	5	6	13				
#34 Shady Ln		2						
#35 STH 150		5	6	33		5		7
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"		7						
#39 CTH "GG"	3	13	8	7				
#67 CTH "BB"	19	7			3			7
#68 USH 10W	69	103	53	19	60/52	35/27	49	35/27
#69 USH 45N	17	83	15	8	15/15	7		17
#70 CTH "JJ"	17/4	50	13	5			4	5
#71 STH 76	3	23	12	8	3			
#72 Mayflower	8		2					
#73 CTH "A" N	11	16	11		19	11	11	
#74 STH 47	50/8	120	29/4	4/4	35/20	14/4	39	15
#75 Meade	44	76	17		11	4	14	
#76 CTH "EE"	13	29	28	5	5	5	11	3
#77 CTH "E"	34	53	39/5	6	4	4	20	5
#78 French		7					13	
#79 CTH "N"		5	17			6		
#80 STH 55N		4	9		5		5	
#81 CTH "J"		3	3					
#82 USH 41N	32	157	184/48	14	12	23	41	21
#83 STH 96		28	9/3					
#84 CTH "Z"		4	4					
#85 CTH "CE"	5	25	6		19/11	6	4/4	6
#90 USH 45S				5				
#91 CTH "A" S								6
#93 USH 41S	128	304	223	50		13	7	93
TOTAL	532/16	1253/0	766/60	213/4	205/98	155/31	241/4	247/27

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE

Station#	#124	#125	#126	#127	#128	#129	#130	#131
#30 STH 114	21/12	38	13	17	8	38	33	5
#31 USH 10E	26	11	23	5	10	5	9/4	15
#32 STH 55S	4			5		8		
#33 CTH "KK"	11	6			6	5	10/5	6
#34 Shady Ln								
#35 STH 150			33		11		10	
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"			3					3
#67 CTH "BB"	5		3	2	4		7	
#68 USH 10W	37	32	39	29	13	17	57/19	27/27
#69 USH 45N	42/10	17	8	15	9	17	27	
#70 CTH "JJ"	5	10		4	5	15	22	
#71 STH 76			3	3	3			
#72 Mayflower	2							2
#73 CTH "A" N	11	23	17			7	10	5
#74 STH 47	18/4	26	23	38	7/7	37/13	24/7	30
#75 Meade	3		14	21	24/3	5	38	
#76 CTH "EE"			7	11	3		39/7	7
#77 CTH "E"	32	9	22	16	13	12/3	74/5	20
#78 French	9/3				4	7	18	6
#79 CTH "N"	11		5	5			17	
#80 STH 55N								
#81 CTH "J"				3			4	
#82 USH 41N	67	12		42	34	24	131/24	
#83 STH 96	7	5	8			6	34/6	
#84 CTH "Z"		3						
#85 CTH "CE"							19/14	
#90 USH 45S	6	13		5				7
#91 CTH "A" S	19			6			5	
#93 USH 41S	79	98	109	38	74	71	98/53	17
TOTAL	415/29	303/0	330/0	265/0	228/10	276/16	686/144	150/27

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#132	#133	#134	#135	#136	#137	#138	#139
#30 STH 114		9	22	9			9	12
#31 USH 10E	16		36/5	6			46	10
#32 STH 55S							12/4	
#33 CTH "KK"	6	6	7				7	
#34 Shady Ln								
#35 STH 150	5	6	8			6	25/5	
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"								
#39 CTH "GG"							4	3
#67 CTH "BB"			8	10	2	3		4
#68 USH 10W		19	44/20	34	33	6	39/12	45
#69 USH 45N	27	8	54	19			9	17
#70 CTH "JJ"			18	37	18	5	35	15
#71 STH 76		5			5	4	6	4
#72 Mayflower								
#73 CTH "A" N		5	34/5	15		24	32	33/10
#74 STH 47	7	21	38	60	19/4	82/15	110/21	69/4
#75 Meade	13	27/13	32	62/2	9		24	19
#76 CTH "EE"	6	11	35	33		3	6	10
#77 CTH "E"	4	12	38	43	6	18	45/9	8
#78 French			3					3
#79 CTH "N"	19	5		5			10	
#80 STH 55N								5
#81 CTH "J"	3	3/3		4				3
#82 USH 41N	51	27	62	51	14	80	65	46
#83 STH 96		8	18	7		7	13	12
#84 CTH "Z"	8	4		5				
#85 CTH "CE"	5							7
#90 USH 45S	7	15						
#91 CTH "A" S	7			7				6
#93 USH 41S	45	14	57	22		71	28	74
TOTAL	229/0	205/16	514/29	429/2	106/4	309/15	525/51	405/14

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#140	#141	#142	#143	#144	#145	#146	#147
#30 STH 114	9	9	9		20	37	18/6	87
#31 USH 10E		6		10	6	10	10	70
#32 STH 55S					16	3		7
#33 CTH "KK"				7		6	7	
#34 Shady Ln		2			5	2		
#35 STH 150	7	7	5			11		
#36 Oakridge		4						
#37 Breezewood						5	7/4	
#38 CTH "G"			3				6	4
#39 CTH "GG"	5							3
#67 CTH "BB"	5/3		5	3	3	2	5	14
#68 USH 10W	28	23	21		35	11	72	97/20
#69 USH 45N		17	10	16	17	46	101	109
#70 CTH "JJ"	28/7	4	4	9		18	9	17
#71 STH 76		3		6	3	3	7	7
#72 Mayflower					2		2	
#73 CTH "A" N	11	29	12	10	23	42	24	56/10
#74 STH 47	74/28	37/8	46/30	45/5	47	46	159/51	126/5
#75 Meade		2	12	3	2	2	3	17
#76 CTH "EE"				14	16	11	12	21
#77 CTH "E"	4	6	13	17	6	11	31	27
#78 French	3	3			10	3		
#79 CTH "N"			5		5	11	5	
#80 STH 55N	9			4/4	8/4	7		
#81 CTH "J"						10		4
#82 USH 41N	41/18	68	73	21		26	242/68	237/17
#83 STH 96		4		12		9	12	15
#84 CTH "Z"								9
#85 CTH "CE"		10	7		6	10		31
#90 USH 45S			13					15
#91 CTH "A" S		13		6	13	7	12	18
#93 USH 41S	49	28	56	27	173/35	89	271	308
TOTAL	273/56	275/8	294/30	210/9	416/39	438/0	1015/129	1299/52

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#148	#149	#150	#151	#152	#153	#154	#155
#30 STH 114	12	26	14	5	13	9	14	18
#31 USH 10E	9	15	10		5		5	11
#32 STH 55S								
#33 CTH "KK"		12		6	14			7
#34 Shady Ln								
#35 STH 150		42						
#36 Oakridge					3			
#37 Breezewood		7/4				3		
#38 CTH "G"		3	4					
#39 CTH "GG"		3	3	7				
#67 CTH "BB"	9	9	8		3			5
#68 USH 10W		51	25		14	27	19	27
#69 USH 45N	26	87		31/15	22	43		16
#70 CTH "JJ"		13	5			10	4	4
#71 STH 76		7			3		3	8
#72 Mayflower								
#73 CTH "A" N	6	39	10	5	17	15		22
#74 STH 47	39	57		8	43/4	30/16	19/4	49
#75 Meade	3	16	5		8		6	4
#76 CTH "EE"	3	10	6					3
#77 CTH "E"	20/5	46	9	4	9/5	4	18	10
#78 French		4	9				3	
#79 CTH "N"		5	12		5			
#80 STH 55N		5	5		4	10/4		
#81 CTH "J"		3				4		4
#82 USH 41N		55	58	19	27	11	14	71/24
#83 STH 96		16		4		7		7
#84 CTH "Z"		4						
#85 CTH "CE"	8			7				14/14
#90 USH 45S			5	6				7
#91 CTH "A" S	7	7						
#93 USH 41S	13	178	82	7	25	13	35	18
TOTAL	155/5	720/4	270/0	109/15	215/9	186/20	140/4	305/38

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#156	#157	#158	#159	#160	#161	#162	#163
#30 STH 114		5	13	10	48	5	8	
#31 USH 10E	5	5	10	35	43		5	5/5
#32 STH 55S					11			
#33 CTH "KK"		5	6	12	12			6
#34 Shady Ln								
#35 STH 150					5			
#36 Oakridge							3	
#37 Breezewood			6/4		9			
#38 CTH "G"					9			
#39 CTH "GG"					7			3
#67 CTH "BB"			4	2	15		3	
#68 USH 10W	8	29	47	41	73		13	
#69 USH 45N	24	9	8	8	66	9		
#70 CTH "JJ"	13		9	34	145	5	12/3	
#71 STH 76		5	3	7	30/4		4	
#72 Mayflower					3			
#73 CTH "A" N	7	58/24	11	41	128		7	25/13
#74 STH 47	15	38	58	81	317/17	36	55/9	23
#75 Meade	6	11	3/3	9	24			
#76 CTH "EE"	5	11/6	3	8	55	6	9/4	
#77 CTH "E"	12		18	23/6	81/13		12	
#78 French					3			
#79 CTH "N"		5	6	15	49			5
#80 STH 55N		5		4	4			
#81 CTH "J"	4				21		4	
#82 USH 41N	21	37	37	35	242		45	
#83 STH 96	10/10			5	22			
#84 CTH "Z"								
#85 CTH "CE"					8			
#90 USH 45S				15				
#91 CTH "A" S			4/4	8	6			
#93 USH 41S	22	32/8	55	110	147/9		24	27/12
TOTAL	152/10	255/38	301/11	503/6	1583/43	61/0	204/16	94/30

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#164	#165	#166	#167	#168	#169	#170	#171
#30 STH 114	14	4	21	4	7		14	18
#31 USH 10E		10/5	5	15	4/4	10	15	16
#32 STH 55S			5				4	
#33 CTH "KK"								
#34 Shady Ln								
#35 STH 150		8	5					5
#36 Oakridge								
#37 Breezewood			3	3				3
#38 CTH "G"								
#39 CTH "GG"		3					5	
#67 CTH "BB"	3	7	3		3	5	7	2
#68 USH 10W	35	51	40	27		13	32	19
#69 USH 45N	10	61	19	31	15	22	14	16
#70 CTH "JJ"	12	3/3		16/16	4	4/4	5	8
#71 STH 76	4		5	4		4	3	
#72 Mayflower			5	3		6		
#73 CTH "A" N	29	33	24	60		52/22	21	33
#74 STH 47	18	44	8	17	8	12/4		24
#75 Meade		5	3		4	5	3	4
#76 CTH "EE"	5	6/6	3		3	8		29/7
#77 CTH "E"	16	10/6		14	10	20	4	4
#78 French								3
#79 CTH "N"	6	5	5	5	5			
#80 STH 55N	4		4					
#81 CTH "J"			3					
#82 USH 41N	119	105	24	66/18		47	43	24
#83 STH 96	10	5	4	4				9
#84 CTH "Z"			3					
#85 CTH "CE"					5		7	
#90 USH 45S				13			8	6
#91 CTH "A" S							6	7
#93 USH 41S	89	56/12		72	77	64	166/44	58
TOTAL	379/0	416/32	192/0	354/34	145/4	272/30	357/44	288/7

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#172	#173	#174	#175	#176	#177	#178	#179
#30 STH 114	54	8/4	16	19		4	47/6	27
#31 USH 10E	28/4	5	5	5/5	5		58/17	5/5
#32 STH 55S	4						4/4	
#33 CTH "KK"	24						14	
#34 Shady Ln								
#35 STH 150	85				5			6
#36 Oakridge	3							
#37 Breezewood				4		3		
#38 CTH "G"	6						5	
#39 CTH "GG"	6							
#67 CTH "BB"	40	9		10	2	7	7	6
#68 USH 10W	198/22	5	26/11	43	8	8	118/31	49
#69 USH 45N	131	26	8	48	17	24	54	186/32
#70 CTH "JJ"	8				9	5	8	8
#71 STH 76	13			3			15	16
#72 Mayflower	9		2	3	2		2	7
#73 CTH "A" N	195/40		5	16	7	25/13	90/10	83/13
#74 STH 47	73/4			25		9	41	22
#75 Meade	2			9		7	18	
#76 CTH "EE"	16				8		14	3
#77 CTH "E"	79	13	10	4		9	10	10
#78 French								
#79 CTH "N"	45			9/9				5
#80 STH 55N	4							9
#81 CTH "J"	10/3			4			4	
#82 USH 41N	126/34	28		122/27	36/24		217	49
#83 STH 96	13					16/16	7	11
#84 CTH "Z"	4							
#85 CTH "CE"	14/4	8	5		6		6	12
#90 USH 45S	14	6	6					15
#91 CTH "A" S	8			6			5	
#93 USH 41S	308/96	39	7	39		178/95	115	129/56
TOTAL	1520/207	147/4	90/11	369/41	105/24	295/124	859/68	658/106

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#180	#181	#182	#183	#184	#185	#186	#187
#30 STH 114	14	38	97/12	14	4	5		11
#31 USH 10E	20	6	34	9	20	16	6	
#32 STH 55S			3/3		5	4		
#33 CTH "KK"			7					
#34 Shady Ln								
#35 STH 150	8		28	6	7	6		
#36 Oakridge								
#37 Breezewood					3	4		
#38 CTH "G"			3		3			3
#39 CTH "GG"		5	6					
#67 CTH "BB"	3	4	10		5	5		2
#68 USH 10W	57/39	65/12	97/20		27	21	11	19
#69 USH 45N	32	65	110	8	15	39/15	16	9
#70 CTH "JJ"	9	4	10		9	13	8	5
#71 STH 76		4	13	4		3		6
#72 Mayflower	5							
#73 CTH "A" N	48/30	129/5	115	20	29	48		16
#74 STH 47	31	102/37	99/9	31/16	8	31/7		9
#75 Meade			20	6			4	
#76 CTH "EE"	10/4	3	9	3/3	8		3	5
#77 CTH "E"		26/6	58	11		13		17/11
#78 French			3	15		3/3		
#79 CTH "N"	9/9	10	5	5	6	5/5		
#80 STH 55N		10	5	9/9	5			
#81 CTH "J"				4				
#82 USH 41N	59/27	136	112/24	12	73	57		14
#83 STH 96	8	7	5			12		3
#84 CTH "Z"	3					3	9	
#85 CTH "CE"		11	35				6	
#90 USH 45S						13		
#91 CTH "A" S		12/4	13		6	5		
#93 USH 41S	85	261/22	285	12/12	23	183		42
TOTAL	401/109	898/86	1182/68	169/40	256/0	489/30	63/0	161/11

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#188	#189	#190	#191	#192	#193	#194	#195
#30 STH 114		9	4	5			80	29
#31 USH 10E			4	5	14/5	10	82/10	11
#32 STH 55S	4						19	
#33 CTH "KK"						7	24	
#34 Shady Ln								
#35 STH 150				8	6		22	6
#36 Oakridge								
#37 Breezewood							8	
#38 CTH "G"			3				3	6
#39 CTH "GG"				4		14	3	3
#67 CTH "BB"		5		5	3		23	
#68 USH 10W	8	8	18	21	6	15	271/58	88
#69 USH 45N	7			8	25	18	264/31	54
#70 CTH "JJ"	4	4	17	5	9		22	13
#71 STH 76					3	6	64/5	19
#72 Mayflower	5					2	21	
#73 CTH "A" N	22	33/10	11/5	47	22	40	401/10	46
#74 STH 47	9	7		15			54/8	9
#75 Meade			3	9			26	
#76 CTH "EE"				3			23	15
#77 CTH "E"	5	4	15	4			79/15	6/6
#78 French								
#79 CTH "N"			6	10/5			18	5
#80 STH 55N						9	5	
#81 CTH "J"				4	3	3/3		
#82 USH 41N		62	21	36	36	12	91/42	116
#83 STH 96	7	4	11/4				26/13	12
#84 CTH "Z"							4	
#85 CTH "CE"							16	6
#90 USH 45S				8			15	8
#91 CTH "A" S		11						
#93 USH 41S	15	33	22		49	31/12	175/91	128/39
TOTAL	86/0	180/10	135/9	197/5	176/5	167/15	1839/283	580/45

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#196	#197	#198	#199	#200	#201	#202	#203
#30 STH 114	82/12	30	24	47	12	47	87	36
#31 USH 10E	41/5	15	5	43/9	19	10	26/8	15
#32 STH 55S	5	3					9	
#33 CTH "KK"		6	6		7	7	6	14
#34 Shady Ln							8	
#35 STH 150	8	6	12	11	33		45/4	7
#36 Oakridge				2			12	
#37 Breezewood					3			4
#38 CTH "G"		11						
#39 CTH "GG"	3	3		7			13	3
#67 CTH "BB"	5/3	15	13	7	4	4	19	9
#68 USH 10W	80	89	48	48/16	80	26	191	69
#69 USH 45N	113	68	40/18	33	56	92/17	233	86
#70 CTH "JJ"	3/3		10		4	11/6	8	
#71 STH 76	10		3	12	12	16	54	3
#72 Mayflower	11				3	2	39	
#73 CTH "A" N	173/29	28	22	46	17	40	153/20	30/13
#74 STH 47	30	22	15	62/14	32	39	77/11	29
#75 Meade				5	2	14		4
#76 CTH "EE"	9	3	3	8	3	12	17	8
#77 CTH "E"	4	20/5	5	19	25	12	66	21
#78 French		9					7	
#79 CTH "N"	32		6	5			6	
#80 STH 55N	4	5	6					
#81 CTH "J"			4					
#82 USH 41N	129/35	108	88	39	173	119/24	122	130
#83 STH 96	18	17	4	13	4	7	33/6	11
#84 CTH "Z"	4			4		4		
#85 CTH "CE"	14	8		5/5			15	
#90 USH 45S		12		28/9			25	7
#91 CTH "A" S					7		8	
#93 USH 41S	125/12	78/12	73	182/10	198	99	345	200
TOTAL	903/99	556/17	387/18	626/63	694/0	561/47	1624/43	686/19

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#204	#205	#206	#207	#208	#209	#210	#211
#30 STH 114	16	41	196/8	206	8		5	
#31 USH 10E	20	21	261/8	90			5	
#32 STH 55S			19		3			4
#33 CTH "KK"			43	20		5		
#34 Shady Ln			7					
#35 STH 150	20		63/4	59		19		
#36 Oakridge								
#37 Breezewood			33	5		5		
#38 CTH "G"	4		68	16				
#39 CTH "GG"			56	17			3	
#67 CTH "BB"	25	4	30	13	4	2	3	
#68 USH 10W	58	65	813	170/11	14	14	8	8
#69 USH 45N	41	81	586	253/30		17	16	8
#70 CTH "JJ"	5	4	57	59			5	
#71 STH 76		6	135/16	14	7	6	3	
#72 Mayflower			60	5				
#73 CTH "A" N	30	25	390/48	195	23	38/20		
#74 STH 47	21	26	78	150/14		54		
#75 Meade	5		13					
#76 CTH "EE"		3	62	22	5			
#77 CTH "E"	11	9	100	43	5	18	5	
#78 French								
#79 CTH "N"	10	5	81	26	6		5	
#80 STH 55N			8/4	5				
#81 CTH "J"			10					
#82 USH 41N	56	83	1144/42	244/97	28	37		25
#83 STH 96	17	6/6	132/6	10		9		
#84 CTH "Z"			7	3		4		
#85 CTH "CE"		9	30	6				
#90 USH 45S	27/4	9/4	34	39	7			5
#91 CTH "A" S	7		28	41	6			
#93 USH 41S	65	187/104	1689	1785	23	52		7
TOTAL	438/4	584/114	6233/136	3496/152	139/0	280/20	58/0	57/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#212	#213	#214	#215	#216	#217	#218	#219
#30 STH 114	13			4				
#31 USH 10E	13/5		5	5			6	
#32 STH 55S								
#33 CTH "KK"						8		
#34 Shady Ln								
#35 STH 150			6				5	
#36 Oakridge								
#37 Breezewood								12
#38 CTH "G"			6					
#39 CTH "GG"					4			
#67 CTH "BB"	14		4		19/7		6	3
#68 USH 10W	25		38		6			
#69 USH 45N	40/14		9		8		8	
#70 CTH "JJ"	38	11/7	4		4		8	5
#71 STH 76	19							
#72 Mayflower	37/33		3					
#73 CTH "A" N	31	43/32	15/10	7			15/10	7
#74 STH 47	25	8	44/9	14	7/7	14	26	
#75 Meade	5		5		17	4		
#76 CTH "EE"	18/6		5		3		12	
#77 CTH "E"	17	12/6	14/6	6	11	10		
#78 French			4	3				
#79 CTH "N"	5	13/13	15/11					
#80 STH 55N	9		4					
#81 CTH "J"	3	4	6					
#82 USH 41N	12	14	26	11				21
#83 STH 96	4			4				
#84 CTH "Z"			6					
#85 CTH "CE"	5							
#90 USH 45S	7							
#91 CTH "A" S				6				12
#93 USH 41S	160		21		29		59/46	52/46
TOTAL	500/58	105/58	240/36	60/0	108/14	36/0	145/56	112/46

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#220	#221	#222	#223	#224	#225	#226	#227
#30 STH 114			4	4		24	18	
#31 USH 10E								
#32 STH 55S								
#33 CTH "KK"								
#34 Shady Ln							2	
#35 STH 150				6		19		
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"						4		
#39 CTH "GG"				4		3		
#67 CTH "BB"		5	4/2	4/2	2	7	6	
#68 USH 10W	13				37/16	35	22	19
#69 USH 45N	8	16	27	8	44	133	89	8
#70 CTH "JJ"	9	13	18	7/3	5	41	9	
#71 STH 76		4	97/7	130	9	10/7	9/4	
#72 Mayflower		10		2		26	6	
#73 CTH "A" N	6		18		20/20	16	5	6
#74 STH 47		4/4				23	6	
#75 Meade				9			5	
#76 CTH "EE"		6						
#77 CTH "E"				3/3		4	7/7	5
#78 French				3/3			4	
#79 CTH "N"							5	
#80 STH 55N				7/7				
#81 CTH "J"								
#82 USH 41N		12		18/18		23	36	
#83 STH 96				3			3	
#84 CTH "Z"				4	3/3			
#85 CTH "CE"						5		
#90 USH 45S	5	25/5	5	28/4	9/4	30	45/4	
#91 CTH "A" S								
#93 USH 41S	25	29		24	6	24		
TOTAL	66/0	124/9	173/9	264/40	135/43	427/7	277/15	38/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#228	#229	#230	#231	#232	#233	#234	#235
#30 STH 114		9		48		7	13	4
#31 USH 10E		4/4		14			5	10
#32 STH 55S				3				
#33 CTH "KK"				15				
#34 Shady Ln				5		2		
#35 STH 150				23		11		
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"		3		17				
#39 CTH "GG"				3	3			
#67 CTH "BB"		4		4		2	2	
#68 USH 10W		14		264	13	20	15	
#69 USH 45N	31	15	15	146			32	16
#70 CTH "JJ"	4		5	23				4
#71 STH 76	14	11		44				3
#72 Mayflower	10			8			3	
#73 CTH "A" N			12	57		6	5	
#74 STH 47				23		8		4/4
#75 Meade				9	3			
#76 CTH "EE"				3				
#77 CTH "E"				13		8/8		5/5
#78 French								
#79 CTH "N"		5		40		5		
#80 STH 55N							9	
#81 CTH "J"								
#82 USH 41N	58/34	12		14	23			9
#83 STH 96	3			17				
#84 CTH "Z"								
#85 CTH "CE"				6		4		6
#90 USH 45S				26			7	
#91 CTH "A" S								
#93 USH 41S			25	223/10	21	14		37
TOTAL	120/34	77/4	57/0	1048/10	63/0	85/8	91/0	98/9

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#236	#237	#238	#239	#240	#241	#242	#243
#30 STH 114	18	21			4			
#31 USH 10E	5	24/5					5	
#32 STH 55S		4						
#33 CTH "KK"			7					
#34 Shady Ln								
#35 STH 150		28/5				7		
#36 Oakridge		3						
#37 Breezewood		6						
#38 CTH "G"	5		3					
#39 CTH "GG"		5						
#67 CTH "BB"	7	9/2						
#68 USH 10W	33	96	14			25	27	33
#69 USH 45N	18	67	8	8		27	17	102
#70 CTH "JJ"	5	4		4				3/3
#71 STH 76	3	12	4			6		12
#72 Mayflower		15		3				
#73 CTH "A" N	5	28					6	11/5
#74 STH 47	7	23	5/5		7		9	
#75 Meade		3					3	3
#76 CTH "EE"		3						
#77 CTH "E"		28/3	8			10/6		
#78 French								
#79 CTH "N"		15			5		5	
#80 STH 55N								5
#81 CTH "J"				4				4
#82 USH 41N	27	59			11			36
#83 STH 96	4	19	5					
#84 CTH "Z"	4		4			4		
#85 CTH "CE"								
#90 USH 45S	5	118/4	15			7		
#91 CTH "A" S								
#93 USH 41S		330	25	23		29	8	
TOTAL	146/0	920/19	98/5	42/0	27/0	115/6	80/0	209/8

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#244	#245	#246	#247	#248	#249	#250	#251
#30 STH 114				4				
#31 USH 10E	6							9/5
#32 STH 55S								
#33 CTH "KK"								
#34 Shady Ln				2/2				
#35 STH 150								
#36 Oakridge								
#37 Breezewood				5				
#38 CTH "G"					14/9			
#39 CTH "GG"		5						3
#67 CTH "BB"	2		2	4	3/3	16		2
#68 USH 10W	6	8	29	8			25/12	
#69 USH 45N	8	17				8		
#70 CTH "JJ"								
#71 STH 76		6	5		3			
#72 Mayflower								
#73 CTH "A" N		12			27/27	6		6
#74 STH 47					16			9
#75 Meade				4				
#76 CTH "EE"								
#77 CTH "E"					5		6	
#78 French								
#79 CTH "N"								
#80 STH 55N		5						
#81 CTH "J"								
#82 USH 41N	9							12
#83 STH 96	4							
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S			6			6		
#91 CTH "A" S						6		
#93 USH 41S		21			18			
TOTAL	35/0	74/0	42/0	27/2	86/39	42/0	31/12	41/5

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#252	#253	#254	#255	#256	#257	#258	#259
#30 STH 114	9	13/4	20	44/4	9/4	23	85/12	15
#31 USH 10E		14	4	36	5	15/5	38	6
#32 STH 55S				4	3		4	
#33 CTH "KK"			12	12	5		19	
#34 Shady Ln			10	9	3	2		
#35 STH 150	5	17	21/4	48	6	16	23	6
#36 Oakridge				3				
#37 Breezewood			3		5		7	
#38 CTH "G"		3	3	5		3	3	
#39 CTH "GG"			3	10	5		5	
#67 CTH "BB"	4	2	16	31/7	10	6	2	4
#68 USH 10W	23/12		27	90	24	21	45	27
#69 USH 45N	14	7	14	45			38	8
#70 CTH "JJ"		4				4	9	9
#71 STH 76	6	3		41	3		12	3
#72 Mayflower	4	2	2	7				
#73 CTH "A" N	18/5	6	16	161/10	5	6	18	13
#74 STH 47		8	8	59	22/8		53	9
#75 Meade					10		10	
#76 CTH "EE"			3	10/4			3	
#77 CTH "E"	6		13	43	11	6	30	
#78 French								
#79 CTH "N"		5	10	16	11		21/9	
#80 STH 55N							6	
#81 CTH "J"					3			
#82 USH 41N			36	143	12	37	109	14
#83 STH 96		6		13			11	3
#84 CTH "Z"				16				
#85 CTH "CE"			4	15			5	
#90 USH 45S	7		13	29		7		
#91 CTH "A" S				14	7	7	7	
#93 USH 41S				280/16	60	67	236	17/11
TOTAL	97/17	90/4	238/4	1184/41	219/12	220/5	799/21	134/11

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#260	#261	#262	#263	#264	#265	#266	#267
#30 STH 114	5	17	19/4	18	45/6	37	13	193/4
#31 USH 10E	4/4		41/10	5	29/5	10	10	116/4
#32 STH 55S						3	3	4
#33 CTH "KK"	6	6	33/4	6	6	27		45
#34 Shady Ln								2
#35 STH 150			46/4	7	17/11			7
#36 Oakridge						4		
#37 Breezewood			53					4
#38 CTH "G"			8	3	3			9
#39 CTH "GG"		3			9			11
#67 CTH "BB"	2/2	2	2	4	13	2/2	2	4
#68 USH 10W	22		25		40/12	52	13	130/20
#69 USH 45N	41		31	15	41	24	10	100
#70 CTH "JJ"		4	19/8	9		4	5	30
#71 STH 76	3	3	9			3		4
#72 Mayflower			3		4	3		5
#73 CTH "A" N	17	20/20	17/10	20/10	18	16		87
#74 STH 47	14	9	98/52	30/8	46/5	47	25	139
#75 Meade	5		3	5	11	8		24
#76 CTH "EE"		6		11	3	3	3	36
#77 CTH "E"			6	6				43
#78 French				3				
#79 CTH "N"			11		16			22
#80 STH 55N						5		10
#81 CTH "J"						3		3
#82 USH 41N	14	21		53	45	72		176
#83 STH 96			5			7		26
#84 CTH "Z"			7			4	4	
#85 CTH "CE"	6		6					27
#90 USH 45S	5		15		12	11		7
#91 CTH "A" S	7		7	8	17	6		8
#93 USH 41S	14	22		77	107	32	29	184
TOTAL	165/6	113/20	464/92	280/18	482/39	383/2	119/0	1456/28

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#268	#269	#270	#271	#272	#273	#274	#275
#30 STH 114	38	13		16	26	12	9	46
#31 USH 10E	31		14	5	6		10	15
#32 STH 55S		5	3	7			8	
#33 CTH "KK"	18	10	11	6			8	7
#34 Shady Ln								
#35 STH 150	6		5			6		10
#36 Oakridge								
#37 Breezewood			4					
#38 CTH "G"								4
#39 CTH "GG"								
#67 CTH "BB"	2			2	3			8
#68 USH 10W	15	11	11	21	25	35/27	27	8
#69 USH 45N	39	16	42	16	15		24	36/17
#70 CTH "JJ"	9	13		4	5			
#71 STH 76	3		8				3	8
#72 Mayflower								
#73 CTH "A" N	10	6	12	11	5			10
#74 STH 47	16	13	22	23		7	30	13
#75 Meade			2	5			7	2
#76 CTH "EE"	8	15	3	3			3	
#77 CTH "E"	9/6	11	12	15			4	10
#78 French				4				
#79 CTH "N"	5		5	5			5	5
#80 STH 55N							5	
#81 CTH "J"				3				
#82 USH 41N	77/24	112	47	55	33	12	28	36
#83 STH 96		4				4	4	7
#84 CTH "Z"	3	4						
#85 CTH "CE"	4		8	6			23	14
#90 USH 45S		6	8	7				
#91 CTH "A" S		8	13	7			7	12
#93 USH 41S	56	83	127	57	56	6	47	36
TOTAL	349/30	330/0	357/0	278/0	174/0	82/27	252/0	287/17

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE

Station#	#276	#277	#278	#279	#280	#281	#282	#283
#30 STH 114	22	79/6	26	5			24/12	4
#31 USH 10E	9	38/8	41	5	15		15	
#32 STH 55S		3						
#33 CTH "KK"	11	51	23	6				
#34 Shady Ln					2			
#35 STH 150			5/5		8		6	6
#36 Oakridge								
#37 Breezewood								
#38 CTH "G"			9					
#39 CTH "GG"	3							
#67 CTH "BB"	3	8	17		2		5	3
#68 USH 10W	8	39	42		6	6	8	
#69 USH 45N		49/15	17	10	7	10	18/18	
#70 CTH "JJ"			5	3/3				
#71 STH 76			8/4		4	5	3	
#72 Mayflower								
#73 CTH "A" N	17	28/10	11	13/13		5	18	
#74 STH 47		15	30	16	16		4/4	
#75 Meade		5			3	3	3	
#76 CTH "EE"			17				6	
#77 CTH "E"							4	6
#78 French								
#79 CTH "N"	11	10	5		5	5/5	5	5
#80 STH 55N			7					
#81 CTH "J"								
#82 USH 41N	66	105/24	59	12				
#83 STH 96			4					
#84 CTH "Z"								
#85 CTH "CE"			8					
#90 USH 45S							8	
#91 CTH "A" S	19	5					7	
#93 USH 41S	109/7	98	202		31/31		38	14
TOTAL	278/7	533/63	536/9	70/16	99/31	34/5	172/34	38/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#284	#285	#287	#288	#289	#290	#291	#292
#30 STH 114	4		64/24		9	35	6/6	
#31 USH 10E	9		29		20	10	6	
#32 STH 55S			7					
#33 CTH "KK"	5	5	19		6	5	14	
#34 Shady Ln								
#35 STH 150			17		12	10		
#36 Oakridge						8		
#37 Breezewood				5				
#38 CTH "G"						3		
#39 CTH "GG"								
#67 CTH "BB"	4		3			17		
#68 USH 10W			45		6	13	5	
#69 USH 45N	17		58	8		8	18	
#70 CTH "JJ"	4		36		4	4		
#71 STH 76			19					
#72 Mayflower			2			3		
#73 CTH "A" N	34/24		111			24	5	6
#74 STH 47			252		6	8		
#75 Meade	3		19		3	3/3	4	
#76 CTH "EE"	5		34			5		
#77 CTH "E"		5	68		6			
#78 French			8/4					
#79 CTH "N"			16/5		5	12		
#80 STH 55N	5		5					
#81 CTH "J"	4		11					
#82 USH 41N	12		35		24	35/24		12
#83 STH 96			18			3		
#84 CTH "Z"								
#85 CTH "CE"						4		
#90 USH 45S						6		
#91 CTH "A" S	13				6		6	12
#93 USH 41S			29			10	49/7	
TOTAL	119/24	10/0	905/33	13/0	107/0	226/27	113/13	30/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#293	#294	#295	#296	#297	#298	#299	#300
#30 STH 114	13	13	53	14	24	9	9	26
#31 USH 10E	22	25	23/4	24	10/5		5	61
#32 STH 55S				3	3			
#33 CTH "KK"	7							
#34 Shady Ln			8					
#35 STH 150	19	51	17	15	9/4		8	
#36 Oakridge				2				
#37 Breezewood	3	9	3		3	3		
#38 CTH "G"	3	5	8		8			
#39 CTH "GG"	11	12	3	3	7	4		
#67 CTH "BB"	11	9	7	4	10	2	7	4
#68 USH 10W	34	28	25	5	16	16	8	
#69 USH 45N	19	49	87/14		33			17
#70 CTH "JJ"		5						
#71 STH 76	3	3	3	6	5			
#72 Mayflower		5			6			
#73 CTH "A" N	16	27	17		156/127			
#74 STH 47	24/7	22	8	6	18/4	8		8
#75 Meade		4	5		3			
#76 CTH "EE"	6		8	3			3	
#77 CTH "E"	7		11					
#78 French								6
#79 CTH "N"		12		5	17			
#80 STH 55N	9/5	10/5	9		4			
#81 CTH "J"		7/3	6				10	
#82 USH 41N	22	110	23	25	49	26		17/17
#83 STH 96	13	5	8					
#84 CTH "Z"								
#85 CTH "CE"	5							
#90 USH 45S					7			
#91 CTH "A" S	19	6	24	14	14	6	6	6
#93 USH 41S	168	256	262/55	100	153/16	12/12	37	39
TOTAL	434/12	673/8	618/73	229/0	555/156	86/12	93/0	184/17

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks

ZONE #

Station#	#301	#302	#303	#304	#305	#306	#307	#308
#30 STH 114	10	60	52/8		35	22	21	23
#31 USH 10E	20	49	34	11	30	10	69/9	45/5
#32 STH 55S							8	
#33 CTH "KK"								
#34 Shady Ln							3	
#35 STH 150	5	68	18	6	10/4	28/4	23/11	15
#36 Oakridge					5			
#37 Breezewood	3		3				5	3
#38 CTH "G"			3			5	3	5
#39 CTH "GG"		6			3		9	6
#67 CTH "BB"	5	9	8	3	4	6		4
#68 USH 10W		51	8		21		25/20	
#69 USH 45N	16	17			7	22		15
#70 CTH "JJ"						5		
#71 STH 76		5	4			8		
#72 Mayflower			6	3				2
#73 CTH "A" N	17	17			28/10		7	11
#74 STH 47					25		24	14
#75 Meade					6			
#76 CTH "EE"					3			
#77 CTH "E"	6				6		6	10
#78 French								
#79 CTH "N"	5						5	6
#80 STH 55N	5							4
#81 CTH "J"						4		4
#82 USH 41N	14	47			31	59/27	46/18	72
#83 STH 96	7		4			5		
#84 CTH "Z"	5	7						
#85 CTH "CE"								
#90 USH 45S	4/4	7					6	
#91 CTH "A" S	30/4	24	21	22	25	6	8	27
#93 USH 41S	165	98	56	13	290/28	183	84	49
TOTAL	317/8	465/0	217/8	58/0	529/42	363/31	352/58	315/5

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#309	#310	#311	#312	#313	#314	#315	#316
#30 STH 114	101/86	17	43	9	49	58	5	31
#31 USH 10E	54/5	58	30		52	45/4	15	21
#32 STH 55S	3							4
#33 CTH "KK"					6		7	
#34 Shady Ln	12	2			2	2		2
#35 STH 150	70/17	61	31		102	124	29/4	31/4
#36 Oakridge			17		25	3	4	10
#37 Breezewood	5	3	11	7/4	38	19	4	28
#38 CTH "G"	9	9	24	3	28	39	3	17
#39 CTH "GG"	9	3	14	3	22	32	7	6
#67 CTH "BB"	14	9	2		2	2	2	4
#68 USH 10W	21	23	30	35	8	52/12	14	8
#69 USH 45N	14/14	15	8		26	32	24/14	17
#70 CTH "JJ"					3/3	4		
#71 STH 76	3	3	3		10	9	3	7
#72 Mayflower	3						3	
#73 CTH "A" N	7	23	5	6	16	10	16	20
#74 STH 47	33/8	6	7		32	16	17	
#75 Meade							5	4
#76 CTH "EE"					3	3		
#77 CTH "E"			5	4		14		11
#78 French								
#79 CTH "N"		5	11					11/5
#80 STH 55N		4				6/6		6
#81 CTH "J"					4		4/4	
#82 USH 41N	12	34/34	49/24	12	61	86	26	34/18
#83 STH 96	3							7
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S			4/4		39		4/4	12
#91 CTH "A" S	59/10	38	65	62	257/4	165	144	97/45
#93 USH 41S	154/22	204	164	61	407	475	139	76
TOTAL	586/162	517/34	523/28	202/4	1192/7	1196/22	475/26	464/72

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#317	#318	#319	#320	#321	#322	#323	#324
#30 STH 114	23	82	22/6		5	26		5
#31 USH 10E	24	100/18	24	10		20	14	5
#32 STH 55S		4						
#33 CTH "KK"								
#34 Shady Ln	2	2	6					
#35 STH 150	88	118	33/12	18	15	6	53/4	25
#36 Oakridge		13	6			6		2
#37 Breezewood	3	23	14	12	8	20	3	4
#38 CTH "G"	26	66	3	10	3	5	8	4
#39 CTH "GG"	12	36/6	9/6		3		3	9
#67 CTH "BB"	47/8	16/2	5				4	2
#68 USH 10W	8	32	11/11					5
#69 USH 45N	34	50	17		16	15	7	16
#70 CTH "JJ"	4							
#71 STH 76		13		8				
#72 Mayflower	3							3
#73 CTH "A" N	12	40	6	13		10		10
#74 STH 47	25	35		16/7		15	7/7	
#75 Meade			3				3	
#76 CTH "EE"	3	10				3		
#77 CTH "E"		11		4		6/6	5	6
#78 French								
#79 CTH "N"		6				5		11
#80 STH 55N								
#81 CTH "J"		11						
#82 USH 41N	12	91/42	63		12			35
#83 STH 96		24					10/10	
#84 CTH "Z"						7		
#85 CTH "CE"		4						
#90 USH 45S	7	224/10	24/17		20	49		7
#91 CTH "A" S	55/21	280/5	82	66	68	104/9	59	105/9
#93 USH 41S	344/85	656/130	242	62	45	169	208	91
TOTAL	730/114	1947/213	570/52	219/7	195/0	466/15	384/21	345/9

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#325	#326	#327	#328	#329	#330	#331	#332
#30 STH 114		26	4	7		28	9	66
#31 USH 10E		24	30	21	20	21		20
#32 STH 55S								8
#33 CTH "KK"			7					
#34 Shady Ln						4	2	8
#35 STH 150		71	28/4	105	14	120	15	47
#36 Oakridge				5	2	16		18
#37 Breezewood		6	23	6	5	23	5	44
#38 CTH "G"	7	3	5	16	4	16		11
#39 CTH "GG"		3	22	15	7	26		20
#67 CTH "BB"		4	2	9	5	4		4
#68 USH 10W	8	6	44	6		8		17
#69 USH 45N		26	15	7		14		16
#70 CTH "JJ"								5
#71 STH 76		9	6	9		4		
#72 Mayflower				2				3
#73 CTH "A" N		23/5	22/10	10		5		6
#74 STH 47	8	18			9	9		8
#75 Meade								
#76 CTH "EE"		3				3		7
#77 CTH "E"		11/7		5/5		11	3/3	
#78 French				4				
#79 CTH "N"						18		11/6
#80 STH 55N								
#81 CTH "J"			10/3			4		8
#82 USH 41N		77/24	62/27	12	47	23	18/18	36
#83 STH 96				3				5
#84 CTH "Z"			3			12		
#85 CTH "CE"				6				
#90 USH 45S	6	22	12/5	27	13	14	7	32
#91 CTH "A" S	19	94	79	19	32	88	15	76
#93 USH 41S	23	189	119/12	180	22	182/20	63	347
TOTAL	71/0	615/36	493/61	474/5	180/0	653/20	137/21	823/6

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#333	#334	#335	#336	#338	#339	#340	#341
#30 STH 114	40	42			48		6/6	5
#31 USH 10E	10	20	6	6	27/8		13/4	5
#32 STH 55S					4/4			
#33 CTH "KK"	6	7			5			
#34 Shady Ln	2/2				2			2
#35 STH 150	43/24	74/4	12	22	137/9	5	27	21
#36 Oakridge	14	10	3	11	16/8			
#37 Breezewood	19	14/4	4		7			5
#38 CTH "G"	5	12			17			7
#39 CTH "GG"	18	15			6			3
#67 CTH "BB"	15	15/9	4	2	40			2
#68 USH 10W	6	27			68/30			11
#69 USH 45N	9	61			33	9	8	15
#70 CTH "JJ"	5							
#71 STH 76	9	13			24			4
#72 Mayflower								
#73 CTH "A" N	22	25	5		60/10		6	
#74 STH 47	7	8	30/30		17/9		9	
#75 Meade		3						
#76 CTH "EE"					3			
#77 CTH "E"	4	4			8		25/11	
#78 French					3/3			
#79 CTH "N"		5			31/20			5
#80 STH 55N								4
#81 CTH "J"					4			
#82 USH 41N	36/17	78			106/18		36/24	46
#83 STH 96	5	5			11			
#84 CTH "Z"		3						
#85 CTH "CE"		6			5			
#90 USH 45S	18	29			7		6	
#91 CTH "A" S	40	71			42	11		15
#93 USH 41S	210	286/30	30/16	56/16	462/136		11/11	184/90
TOTAL	543/43	833/47	94/46	97/16	1193/255	25/0	147/56	334/90

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#342	#343	#345	#346	#347	#348	#349	#350
#30 STH 114		32	13	5			5	
#31 USH 10E		21	6					
#32 STH 55S								
#33 CTH "KK"		6						
#34 Shady Ln		5	15			2	2	4
#35 STH 150	33	139	16/4				15	5
#36 Oakridge								
#37 Breezewood		12	3					
#38 CTH "G"		14	9					
#39 CTH "GG"		6						
#67 CTH "BB"		9	6	9		2		2
#68 USH 10W		99/68	101/38					
#69 USH 45N	9	8	68/14	7				
#70 CTH "JJ"								
#71 STH 76		4	12					
#72 Mayflower			2					
#73 CTH "A" N				12				
#74 STH 47		17						
#75 Meade			2					
#76 CTH "EE"		8	19					
#77 CTH "E"		4	5/5					
#78 French								
#79 CTH "N"			5					
#80 STH 55N		4	5					
#81 CTH "J"								
#82 USH 41N		25	49		14			
#83 STH 96			5					
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S		5	19	14			5/5	
#91 CTH "A" S		7	23				6	
#93 USH 41S	26	172/19	86	31				14
TOTAL	68/0	597/87	469/61	77/0	14/0	4/0	33/5	25/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#351	#352	#353	#354	#355	#356	#357	#358
#30 STH 114					9		7	7
#31 USH 10E		6			4		5	5
#32 STH 55S								
#33 CTH "KK"								
#34 Shady Ln		2		2	2	3		
#35 STH 150			6	13	38	5	18/6	16/5
#36 Oakridge					12			
#37 Breezewood				4			3	
#38 CTH "G"								
#39 CTH "GG"								
#67 CTH "BB"			2	2	8			
#68 USH 10W					5		5	19/19
#69 USH 45N				19			15	
#70 CTH "JJ"								
#71 STH 76					3	4		
#72 Mayflower								
#73 CTH "A" N				5	5		6	
#74 STH 47							9	
#75 Meade								
#76 CTH "EE"								7/7
#77 CTH "E"								
#78 French								
#79 CTH "N"								5
#80 STH 55N								
#81 CTH "J"								
#82 USH 41N					24			27/27
#83 STH 96								
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S	6	6		7	20		7	
#91 CTH "A" S				8				
#93 USH 41S	41			14	13	13	104	
TOTAL	47/0	14/0	8/0	74/0	143/0	25/0	179/6	86/58

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#359	#360	#361	#362	#363	#364	#365	#366
#30 STH 114	4		51	22	7			
#31 USH 10E			64/14	10				5
#32 STH 55S								
#33 CTH "KK"			6	7				
#34 Shady Ln	3		16	4	5			
#35 STH 150	19	7	158/29	157	39		40	5
#36 Oakridge					3	4		
#37 Breezewood	3		21					4
#38 CTH "G"		3	23	16	11	3		
#39 CTH "GG"			20	3	7			
#67 CTH "BB"	5		11/3	8		2/2		2
#68 USH 10W	8		58	27				
#69 USH 45N			73	22	8			
#70 CTH "JJ"								
#71 STH 76			40	3	3			
#72 Mayflower			2	3				
#73 CTH "A" N	7		33	5				
#74 STH 47			16					
#75 Meade								
#76 CTH "EE"	3		14					
#77 CTH "E"			34	4	4		6/6	
#78 French								
#79 CTH "N"			28					
#80 STH 55N								
#81 CTH "J"	4					4		
#82 USH 41N	35		199/24	14				
#83 STH 96			7					
#84 CTH "Z"								
#85 CTH "CE"			5					
#90 USH 45S			198	56	48	5	7	
#91 CTH "A" S	13	7	49	5	6			
#93 USH 41S	100		628/173	83				
TOTAL	204/0	17/0	1754/243	449/0	141/0	18/2	53/6	16/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#367	#368	#369	#370	#371	#372	#373	#374
#30 STH 114				19/19	11			15
#31 USH 10E	5	4		6		5	5	9
#32 STH 55S								4/4
#33 CTH "KK"								
#34 Shady Ln			5				8	
#35 STH 150	17/17	12/12		5		41/21	56	24
#36 Oakridge		4		2	11	3	3	5
#37 Breezewood	8	7	3	14	72/8	4	34/4	23
#38 CTH "G"	10		13	6	3	3	13	9
#39 CTH "GG"		6/6		4		3	9	11
#67 CTH "BB"				4		4		2
#68 USH 10W				76/68	22			8
#69 USH 45N				8				25/15
#70 CTH "JJ"			4	10/6				
#71 STH 76	5/5			4	3	37/29		
#72 Mayflower								5
#73 CTH "A" N				6		6		13/13
#74 STH 47	9		14					
#75 Meade	6							
#76 CTH "EE"								
#77 CTH "E"		6/6						
#78 French								
#79 CTH "N"				5				
#80 STH 55N								
#81 CTH "J"				4/4				
#82 USH 41N					24	12		46
#83 STH 96				3		5		
#84 CTH "Z"								
#85 CTH "CE"								
#90 USH 45S	33	4/4	28	41	110	74		51
#91 CTH "A" S	19		13			13	33	40
#93 USH 41S	65	6	113	97/12	307/63	104	303/51	205
TOTAL	177/22	49/28	193/0	314/109	563/71	314/50	464/55	495/32

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#375	#376	#377	#378	#379	#380	#381	#382
#30 STH 114		13/4	4	26	5	12/12	9	5
#31 USH 10E			20/5	17	36/4	51/5	15	15
#32 STH 55S								
#33 CTH "KK"								
#34 Shady Ln			2		5	9/5	2	2
#35 STH 150	5	5	64	40	169/5	102	46/4	18
#36 Oakridge	6	2	14	5	2	55	11	
#37 Breezewood	4/4	12	52	49	53	48	50	14
#38 CTH "G"	6	3	30	16	76	14	9	23
#39 CTH "GG"	3	20	15	6	10	14	18	6
#67 CTH "BB"	16	9	11	3	22	8	6	
#68 USH 10W		19		13	31/11	19/11	6	15
#69 USH 45N	8		34		30	36	9	15
#70 CTH "JJ"			4					
#71 STH 76	8	8	25	10	19		7	
#72 Mayflower					9	3		
#73 CTH "A" N	6		24	5	67	11	7	
#74 STH 47		22/7			27	15		11/4
#75 Meade				4	2	5		3
#76 CTH "EE"	3			5		6		
#77 CTH "E"		5		4	27	12/3		9
#78 French								
#79 CTH "N"								11
#80 STH 55N		5						
#81 CTH "J"								
#82 USH 41N	23	38	65	51	37	57/24	36/24	16
#83 STH 96			11		4		4	
#84 CTH "Z"								
#85 CTH "CE"					4	6	6	
#90 USH 45S	13	5	26		20/5		10/5	19
#91 CTH "A" S	23	25	102/4	47	196/4	201/4	221	176/16
#93 USH 41S	44	207	576/29	161	937/112	328	410/51	220
TOTAL	168/4	398/11	1079/38	462/0	1788/141	1012/64	882/84	578/20

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#383	#384	#385	#386	#387	#388	#389	#390
#30 STH 114	10	5	18	23	45/9			4
#31 USH 10E	6		16	19/4	22/12	6		
#32 STH 55S							4/4	
#33 CTH "KK"							7	
#34 Shady Ln				4				
#35 STH 150	7	8	32/4	17	24	5		
#36 Oakridge	18			2	2			
#37 Breezewood			16	29	29/9		16	
#38 CTH "G"	3	5	18	15	15		3	
#39 CTH "GG"	6	3	6	9	16	10	7	
#67 CTH "BB"	2		2	6	6	2		
#68 USH 10W			8	46/19	8			
#69 USH 45N			34/17	15	48/17			
#70 CTH "JJ"								
#71 STH 76			7	12	20		4	
#72 Mayflower			2					
#73 CTH "A" N	6		10	6	16		10/10	
#74 STH 47	7				18			
#75 Meade					4			
#76 CTH "EE"	3		3	3				
#77 CTH "E"			6	8/3	33/3			
#78 French								
#79 CTH "N"	5		5			5		
#80 STH 55N	11			4				
#81 CTH "J"								
#82 USH 41N	25		73	54	75		12	
#83 STH 96	9		7	7				
#84 CTH "Z"				4				
#85 CTH "CE"			6					
#90 USH 45S			5	42/16	45/18	5	6	6
#91 CTH "A" S	114	21	113/5	90/3	94			
#93 USH 41S	136		346/8	214/52	645	97	41	27
TOTAL	368/0	42/0	733/34	629/97	1165/68	130/0	110/14	37/0

TABLE C (Cont'd)

Tabulation of Interview Station & Internal Zone Trips - All Vehicles/Heavy Trucks
ZONE #

Station#	#391	#392	#393	#394	#395	#396	TOTAL
#30 STH 114		7					6,072/379
#31 USH 10E	5	4/4	6		5		4,527/316
#32 STH 55S							2,568/331
#33 CTH "KK"							1,860/82
#34 Shady Ln							248/14
#35 STH 150		17		41		6	4,668/260
#36 Oakridge							412/18
#37 Breezewood							1,238/43
#38 CTH "G"		23	11	11	8	3	1,135/9
#39 CTH "GG"	3	12	4	3			959/19
#67 CTH "BB"		5					1,424/62
#68 USH 10W	5	5					8,771/990
#69 USH 45N	7			7			7,668/409
#70 CTH "JJ"							2,134/103
#71 STH 76		4					1,680/91
#72 Mayflower							464/33
#73 CTH "A" N					7		6,205/843
#74 STH 47	8/8	8					6,651/891
#75 Meade							1,398/33
#76 CTH "EE"							2,081/116
#77 CTH "E"							3,201/248
#78 French							446/36
#79 CTH "N"		5					2,620/225
#80 STH 55N							2,331/207
#81 CTH "J"							747/56
#82 USH 41N		70/61	40	11			17,575/1,923
#83 STH 96							2,494/129
#84 CTH "Z"							1,011/76
#85 CTH "CE"							2,528/152
#90 USH 45S	14/4	31/21		10		32	2,632/188
#91 CTH "A" S	6	54/5	66	18			5,043/162
#93 USH 41S		83/29		108	28	68	32,102/2,325
TOTAL	48/12	328/120	127/0	209/0	48/0	109/0	134,891/10,769

VEHICLE TYPE

Following are the vehicle type percentage breakdowns at each of the thirty-two external origin-destination station locations. Light trucks include pick-ups, vans and mini-vans while heavy trucks include any vehicles larger such as 2 D's, 3 AX and 3 S-2's. The classification identification chart in Figure 4 gives an indication of the types of vehicles considered to be heavy trucks as presented in Table D.

Slightly more than two-thirds of all the vehicles recorded in the Appleton urban area transportation survey were automobiles. The remaining one-third was split between light trucks (pick-ups, vans, etc.) at 22.6% and heavy trucks (delivery, semi-trailers, etc.) at 10%. The largest concentration of heavy trucks was on CTH "A" North (16.2%), STH 55 South (14.7%), STH 47 (14.3%), USH 41 North (14.1%) and USH 45 South (13.5%). The largest total truck volumes were found on USH 41 North with (3,657), USH 41 South (3,557), CTH "A" North (1,224), USH 10 West (1,112) and STH 47 (1,034). All of the other stations recorded less than 1,000 heavy trucks. As expected, the heavy truck volumes were found on the major north-south and east routes to the Appleton area with the exception of CTH "A" which runs northward into Outagamie County.

TABLE D
Vehicle Type

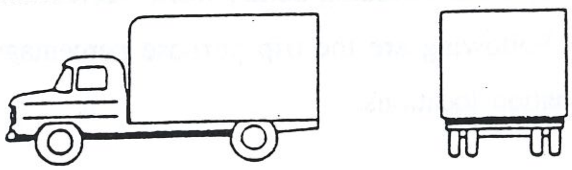
STATION#	Passenger Cars	Light Trucks	Heavy Trucks
#30 STH 114	78.3%	14.3%	7.4%
#31 USH 10E	70.7%	19.8%	9.5%
#32 STH 55S	67.8%	17.5%	14.7%
#33 CTH "KK"	73.8%	21.6%	4.6%
#34 SHADY LN	83.0%	11.8%	5.2%
#35 STH 150	70.2%	21.9%	7.9%
#36 OAKRIDGE	68.8%	25.9%	5.3%
#37 BREEZEWOOD	69.2%	27.0%	3.8%
#38 CTH "G"	73.7%	23.7%	2.6%
#39 CTH "GG"	73.2%	21.7%	5.1%
#67 CTH "BB"	72.0%	23.3%	4.7%
#68 USH 10W	60.0%	28.6%	11.4%
#69 USH 45N	63.5%	28.1%	8.4%
#70 CTH "JJ"	74.2%	19.8%	6.0%
#71 STH 76	65.7%	26.5%	7.8%
#72 MAYFLOWER	63.9%	27.9%	8.2%
#73 CTH "A" N	63.1%	20.7%	16.2%
#74 STH 47	66.3%	19.4%	14.3%
#75 MEADE	78.8%	18.9%	2.3%
#76 CTH "EE"	74.8%	19.6%	5.6%
#77 CTH "E"	75.1%	16.8%	8.1%
#78 FRENCH	71.0%	21.0%	8.0%
#79 CTH "N"	67.5%	22.5%	10.0%
#80 STH 55N	68.1%	20.8%	11.1%
#81 CTH "J"	68.7%	22.1%	9.2%
#82 USH 41N	62.3%	23.6%	14.1%
#83 STH 96	67.9%	24.0%	8.1%
#84 CTH "Z"	67.2%	23.5%	9.3%
#85 CTH "CE"	71.6%	21.2%	7.2%
#90 USH 45S	66.2%	20.3%	13.5%
#91 CTH "A" S	76.6%	20.3%	3.1%
#93 USH 41S	67.3%	23.7%	9.0%
OVERALL AVERAGE	67.4%	22.6%	10.0%

CLASSIFICATION IDENTIFICATION CHART
TRUCKS AND TRUCK COMBINATIONS

FIGURE 4

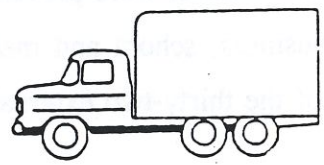
HEAVY SINGLE UNIT TRUCKS

2-AXLES, 6-TIRES



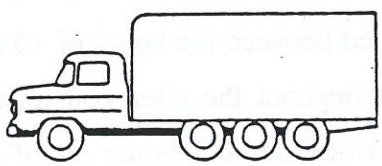
2D

THREE AXLES



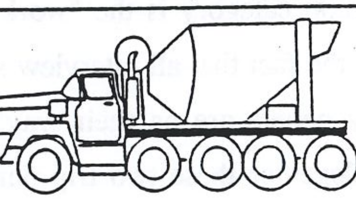
3A

FOUR AXLES



4A

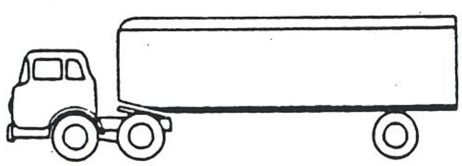
FIVE AXLES



5A

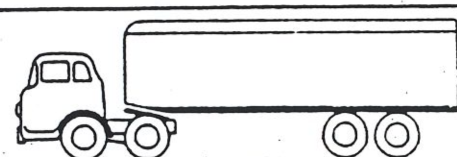
TRACTOR-SEMI TRAILER

THREE AXLES

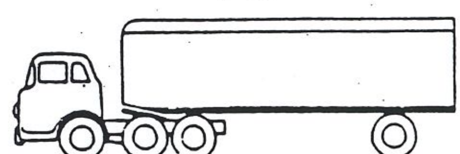


2—S1

FOUR AXLES

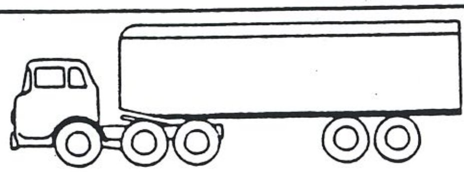


2—S2

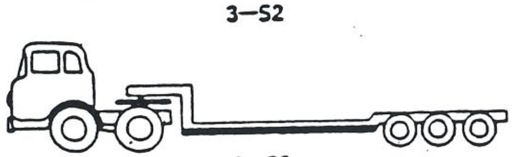


3—S1

FIVE AXLES

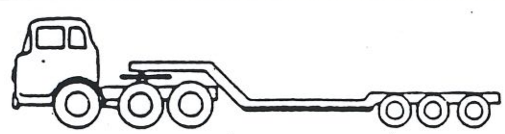


3—S2

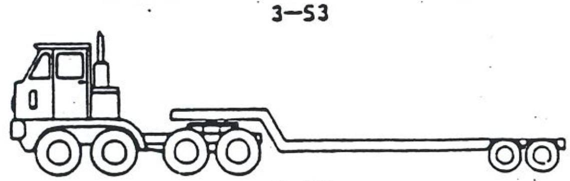


2—S3

SIX AXLES



3—S3



4—S2

DOUBLE BOTTOM

TRIP PURPOSE

Along with information such as the origin of the trip, destination of the trip and the type of vehicle used in making the trip, each interview station also collected data pertinent as to why the trip was made. Seven different reasons to travel were provided on the survey form including home, work, recreation, shopping, personal business, school and medical-dental. Following are the trip purpose percentage breakdowns at each of the thirty-two external origin-destination locations.

The most common trip purpose is the "home" trip with slightly over 50% of all trips being made. The second most common category is the "work" trip with one-quarter of all trips. The reason for this percentage split is the fact that all interview stations were conducted between the hours of 10 AM and 6 PM when many people are on their way home from work throughout the afternoon traffic peak volume period. Together these two trip purpose categories accounted for three-quarters of all trips being made. Both the recreational and personal business trip had 9.5% of the total trips.

TABLE E
Trip Purpose

Station#	Home	Work	Recreation	Shopping	Personal Business	School	Medical Dental
#30 STH 114	60.0%	20.1%	14.5%	0.6%	4.3%	0.2%	0.3%
#31 USH 10E	55.2%	27.8%	10.8%	1.2%	4.2%	0.2%	0.6%
#32 STH 55S	49.8%	27.8%	17.7%	1.9%	2.3%	-	0.5%
#33 CTH "KK"	67.5%	17.1%	8.5%	2.3%	4.3%	-	0.3%
#34 Shady Ln	70.4%	9.1%	15.1%	1.4%	4.0%	-	-
#35 STH 150	61.2%	17.2%	15.4%	0.9%	5.0%	0.2%	0.1%
#36 Oakridge	64.2%	8.4%	17.2%	4.2%	5.3%	0.7%	-
#37 Breezewood	67.5%	10.5%	18.2%	2.4%	1.0%	-	0.4%
#38 CTH "G"	68.6%	12.0%	16.7%	0.3%	2.4%	-	-
#39 CTH "GG"	63.9%	18.3%	12.7%	1.0%	3.5%	-	0.6%
#67 CTH "BB"	35.1%	9.1%	50.4%	3.5%	1.9%	-	-
#68 USH 10W	59.9%	18.8%	7.1%	2.0%	11.6%	0.6%	-
#69 USH 45N	56.5%	19.6%	6.0%	3.2%	13.6%	1.1%	-
#70 CTH "JJ"	69.8%	18.1%	7.3%	0.9%	2.8%	0.2%	0.9%
#71 STH 76	73.2%	13.3%	9.3%	1.3%	2.9%	-	-
#72 Mayflower	68.0%	15.0%	10.7%	-	6.3%	-	-
#73 CTH "A" N	61.3%	22.6%	13.2%	0.9%	2.0%	-	-
#74 STH 47	59.4%	25.6%	10.2%	0.8%	3.7%	0.2%	0.1%
#75 Meade	74.2%	7.4%	12.0%	0.5%	5.9%	-	-
#76 CTH "EE"	72.6%	13.2%	9.6%	0.3%	4.3%	-	-
#77 CTH "E"	70.0%	16.4%	9.6%	1.4%	2.6%	-	-
#78 French	65.3%	17.7%	11.4%	1.2%	3.2%	1.2%	-
#79 CTH "N"	57.7%	21.5%	13.2%	3.7%	3.7%	-	0.2%
#80 STH 55N	51.2%	26.0%	17.7%	2.4%	2.7%	-	-
#81 CTH "J"	55.7%	22.8%	15.5%	0.8%	5.2%	-	-
#82 USH 41N	37.8%	35.1%	10.1%	2.6%	13.3%	1.1%	-
#83 STH 96	68.0%	19.2%	8.4%	2.3%	1.8%	-	0.3%
#84 CTH "Z"	63.1%	20.9%	11.6%	2.3%	2.1%	-	-
#85 CTH "CE"	62.9%	20.4%	11.1%	2.0%	3.6%	-	-
#90 USH 45S	36.3%	39.4%	7.8%	5.0%	5.1%	4.5%	1.9%
#91 CTH "A" S	47.6%	22.8%	13.7%	3.9%	8.8%	2.5%	0.7%
#93 USH 41S	39.4%	27.1%	3.3%	9.4%	16.8%	4.0%	-
OVERALL AVERAGE	50.8%	24.7%	9.5%	3.8%	9.5%	1.5%	0.2%

VEHICLE OCCUPANCY

Last but not least of the information collected is the vehicle occupancy averages for each of the thirty-two origin-destination station locations. Vehicle occupancy refers to the average number of people traveling in each of the vehicles recorded throughout the Appleton urban area survey.

The vehicle occupancy rates range from a low of 1.26 on CTH "G" to a high of 1.57 on Shady Lane with an overall average of 1.41 persons per vehicle. Typically the major highway routes around an urban area survey are slightly above the overall occupancy average. In this instance, USH 10 West and USH 41 North were in excess of 1.5 persons per vehicle.

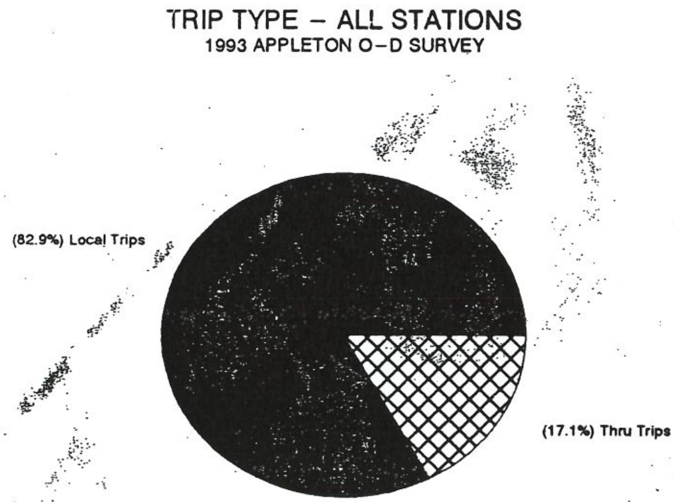
SUMMARY

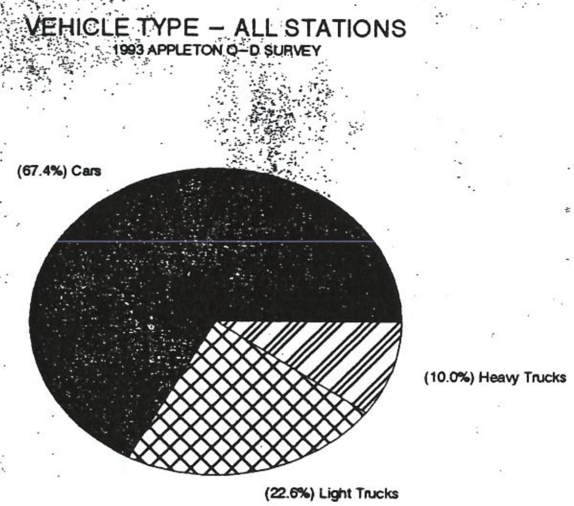
The external origin-destination analysis provides a general overview of the trip-making behavior of all vehicles traveling through as well as between the Appleton urban area and locations outside the region. This particular study was conducted during the latter part of May and all of June, 1993 and encompassed thirty-two interview stations and nearly four hundred internal zones. It allows the reader to independently assess any distinctive characteristics of the project and leaves open the possibility of interpretation from varying viewpoints. In light of this fact the survey data has been presented in a format which attempts to limit any degree of bias necessary in providing a factual account of the results. The last page of the report provides another look at the vehicle type, trip purpose and trip type distribution for all stations of the Appleton O-D survey.

TABLE F
Vehicle Occupancy

Station#	Average Occupancy
#30 STH 114	1.40
#31 USH 10E	1.39
#32 STH 55S	1.47
#33 CTH "KK"	1.35
#34 Shady Ln	1.57
#35 STH 150	1.32
#36 Oakridge	1.32
#37 Breezewood	1.36
#38 CTH "G"	1.26
#39 CTH "GG"	1.30
#67 CTH "BB"	1.39
#68 USH 10W	1.56
#69 USH 45N	1.49
#70 CTH "JJ"	1.34
#71 STH 76	1.38
#72 Mayflower	1.39
#73 CTH "A" N	1.47
#74 STH 47	1.35
#75 Meade	1.44
#76 CTH "EE"	1.36
#77 CTH "E"	1.37
#78 French	1.38
#79 CTH "N"	1.49
#80 STH 55N	1.45
#81 CTH "J"	1.48
#82 USH 41N	1.54
#83 STH 96	1.38
#84 CTH "Z"	1.51
#85 CTH "CE"	1.36
#90 USH 45S	1.27
#91 CTH "A" S	1.35
#93 USH 41S	1.31
OVERALL AVERAGE	1.41

SELECTED ALL STATION PIE CHARTS





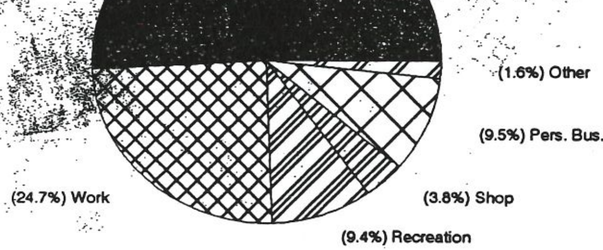


Figure 5

APPENDIX D

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/12/04
Analysis Time Period:	
Freeway/Direction:	northbound
From/To:	STH 15 to STH 47
Jurisdiction:	
Analysis Year:	2000

Description: No Interchange 2000 count northbound

Flow Inputs and Adjustments

Volume, V	3064	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	851	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5*	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1787	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.33	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1787	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S	60.2	mi/h
Number of lanes, N	2	
Density, D	29.7	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/12/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	STH 47 to STH 15
Jurisdiction:	
Analysis Year:	2000

Description: No Interchange 2000 count southbound

Flow Inputs and Adjustments

Volume, V	3086	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	857	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5*	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1800	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.33	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1800	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S	60.1	mi/h
Number of lanes, N	2	
Density, D	30.0	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	7/01/04
Analysis Time Period:	
Freeway/Direction:	northbound
From/To:	STH 47 to CTH E
Jurisdiction:	
Analysis Year:	2000

Description: No Interchange 2000 count northbound

Flow Inputs and Adjustments

Volume, V	2842	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	789	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5*	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1658	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.33	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1658	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S	60.5	mi/h
Number of lanes, N	2	
Density, D	27.4	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	7/01/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	STH 47 to CTH E
Jurisdiction:	
Analysis Year:	2000

Description: No Interchange 2000 count southbound

Flow Inputs and Adjustments

Volume, V	2886	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	802	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5*	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1684	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.33	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1684	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S	60.4	mi/h
Number of lanes, N	2	
Density, D	27.9	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/15/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 SB
Junction: STH 47 SB On-ramp
Jurisdiction:
Analysis Year: 2000
Description: STH 47 SB on-ramp, 2000 existing

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2298	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	788	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2298		788			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	638		219			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2681	919	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2681 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3600	4700	No
v_{R12}	3600	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 28.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.389	
Space mean speed in ramp influence area,	S_R = 56.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 56.1	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/15/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 NB
Junction: NB off-ramp at STH 47
Jurisdiction:
Analysis Year: 2000
Description: STH 47 NB off-ramp, 2000 existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3064	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	522	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3064		522			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	851		145			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3575	609	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3575 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3575	4700	No
v_{12}	3575	4400	No
$v_{FO} = v_F - v_R$	2966	4700	No
v_R	609	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 33.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.288

Space mean speed in ramp influence area, S_R = 58.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 58.4 mph

```
                HCS2000: Unsignalized Intersections Release 4.1d

______________________TWO-WAY STOP CONTROL SUMMARY__________________________

Analyst:               MAH
Agency/Co.:            OMNNI
Date Performed:        6/14/02
Analysis Time Period:
Intersection:          CTH A & CTH JJ
Jurisdiction:          Outagamie County
Units: U. S. Customary
Analysis Year:         2000
Project ID:
East/West Street:      CTH JJ
North/South Street:    CTH A
Intersection Orientation: NS                Study period (hrs):  0.25

_____________________Vehicle Volumes and Adjustments________________________
Major Street:  Approach        Northbound              Southbound
               Movement     1      2      3       |  4      5      6
                            L      T      R       |  L      T      R
____________________________________________________________________________
Volume                             357    86         74     175
Peak-Hour Factor, PHF              0.90   0.90       0.90   0.90
Hourly Flow Rate, HFR              396    95         82     194
Percent Heavy Vehicles             --     --         8      --     --
Median Type/Storage         Undivided               /
RT Channelized?                           No
Lanes                              1   1                 1  1
Configuration                      T   R                  L T
Upstream Signal?                   No                       No
____________________________________________________________________________
Minor Street:  Approach        Westbound               Eastbound
               Movement     7      8      9       |  10     11     12
                            L      T      R       |  L      T      R
____________________________________________________________________________
Volume                      54            131
Peak Hour Factor, PHF       0.90          0.90
Hourly Flow Rate, HFR       60            145
Percent Heavy Vehicles      8             8
Percent Grade (%)                  0                        0
Flared Approach:  Exists?/Storage                /                    /
Lanes                          1       1
Configuration                   L      R
____________________________________________________________________________

_________________Delay, Queue Length, and Level of Service__________________
Approach         NB     SB        Westbound               Eastbound
Movement         1      4   |  7      8      9      |  10     11     12
Lane Config             L   |  L             R      |
____________________________________________________________________________
v (vph)                 82     60            145
C(m) (vph)              1042   339           640
v/c                     0.08   0.18          0.23
95% queue length        0.26   0.63          0.87
Control Delay           8.7    17.9          12.3
LOS                      A      C             B
Approach Delay                        13.9
Approach LOS                           B
____________________________________________________________________________
```

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/02
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2000
Project ID:
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		357	86	74	175	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		99	24	21	49	
Hourly Flow Rate, HFR		396	95	82	194	
Percent Heavy Vehicles		--	--	8	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	54		131			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	15		36			
Hourly Flow Rate, HFR	60		145			
Percent Heavy Vehicles	8		8			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			No			
Lanes	1		1			
Configuration	L		R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			8	8		8			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		8	8		8			
t(f)		2.3	3.6		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		491	754		396			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	396	
Potential Capacity	640	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	640	
Probability of Queue free St.	0.77	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	491	
Potential Capacity	1042	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1042	
Probability of Queue free St.	0.92	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	754	
Potential Capacity	368	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.92
Maj. L, Min T Adj. Imp Factor.		0.94
Cap. Adj. factor due to Impeding mvmnt	0.92	0.73
Movement Capacity	339	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	754	
Potential Capacity	368	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.92
Maj. L, Min T Adj. Imp Factor.		0.94
Cap. Adj. factor due to Impeding mvmnt	0.92	0.73
Movement Capacity	339	

Results for Two-stage process:		
a		
y		
C t	339	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	60		145			
Movement Capacity (vph)	339		640			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	339		640			
Volume	60		145			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		82	60		145			
C(m) (vph)		1042	339		640			
v/c		0.08	0.18		0.23			
95% queue length		0.26	0.63		0.87			
Control Delay		8.7	17.9		12.3			
LOS		A	C		B			
Approach Delay				13.9				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.92
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		8.7
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2000
Project ID: STH 47 & CTH A Intersection, no interchange
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	8	262			142	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Hourly Flow Rate, HFR	8	262			142	
Percent Heavy Vehicles	8	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				240		2
Peak Hour Factor, PHF				1.00		1.00
Hourly Flow Rate, HFR				240		2
Percent Heavy Vehicles				8		8
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	8						242	
C(m) (vph)	1405						578	
v/c	0.01						0.42	
95% queue length	0.02						2.06	
Control Delay	7.6						15.6	
LOS	A						C	
Approach Delay							15.6	
Approach LOS							C	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2000
Project ID: STH 47 & CTH A Intersection, no interchange
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	8	262			142	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Peak-15 Minute Volume	2	66			36	
Hourly Flow Rate, HFR	8	262			142	
Percent Heavy Vehicles	8	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				240		2
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				60		0
Hourly Flow Rate, HFR				240		2
Percent Heavy Vehicles				8		8
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0	0	
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	262	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		8					8		8
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2					6.5		6.3
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	8					8		8
t(f)	2.3					3.6		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	142					420		142
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		142
Potential Capacity		890
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		890
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows		142
Potential Capacity		1405
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1405
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		420
Potential Capacity		579
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		576

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		420
Potential Capacity		579
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		576
Results for Two-stage process:		
a		
y		
C t		576

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				240		2
Movement Capacity (vph)				576		890
Shared Lane Capacity (vph)					578	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				576		890
Volume				240		2
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					578	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	8						242	
C(m) (vph)	1405						578	
v/c	0.01						0.42	
95% queue length	0.02						2.06	
Control Delay	7.6						15.6	
LOS	A						C	
Approach Delay							15.6	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	262	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

APPENDIX E

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FAX 920-830-6100

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JOB NUMBER		SHEET NO.	
CLIENT			
PROJECT			
MADE BY	MAH	DATE	
CHECKED BY		DATE	

Existing counts - 2000
USH 41 - STH 15 - 47
northbound 27600
southbound 27800

Peak hour factor 11.1 (K_{30})
peak hour northbound 27600 x .111 = 3064
peak hour southbound 27800 x .111 = 3086

2000 count NB + SB = 55400
No Interchange projection 2020 67000
D = 55/45
K_{30} = 11.1

Peak hour one direction
67000 * .55 * .111 = 4090

Capacity 66,000

Assume straight line growth between 2000 and 2020

$$\frac{X - 2000}{2020 - 2000} = \frac{66{,}000 - 54000}{67000 - 54000} \qquad X = 2018.5$$

say 2019

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst: MAH
Agency or Company: OMNNI
Date Performed: 1/8/2004
Analysis Time Period:
Freeway/Direction: one way
From/To: STH 47 to STH 15
Jurisdiction:
Analysis Year: 2020
Description: No Interchange

Flow Inputs and Adjustments

Volume, V	4090	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1136	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2386	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2386	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	1/8/2004
Analysis Time Period:	
Freeway/Direction:	one way
From/To:	STH 47 to STH 15
Jurisdiction:	
Analysis Year:	2020
Description:	No Interchange 3 lanes

Flow Inputs and Adjustments

Volume, V	4090	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1136	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1591	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1591	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	62.0	mi/h
Number of lanes, N	3	
Density, D	25.7	pc/mi/ln

Level of service, LOS	C

Overall results are not computed when free-flow speed is less than 55 mph.

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JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

Existing counts USH 41 - STH 47 to CTH E

NB 25600 ADT 2842 phv
SB 26000 ADT 2886 phv

$K_{30} = 11.1$ T(DHV) = 10.5

2020
No Interchange USH 41 - STH 47 to CTH E

74000 ADT $K_{30} = 11.1$ T(DHV) = 10.5 D = 55/45

74000 * .111 * .55 = 4518 phv

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	7/1/04
Analysis Time Period:	
Freeway/Direction:	one way
From/To:	STH 47 to CTH E
Jurisdiction:	
Analysis Year:	2020
Description:	No Interchange

Flow Inputs and Adjustments

Volume, V	4518	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1255	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2636	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2636	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

hone: Fax:
-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
ate Performed:	7/1/04
nalysis Time Period:	
Freeway/Direction:	one way
rom/To:	STH 47 to CTH E
urisdiction:	
Analysis Year:	2020

Description: No Interchange 6 lanes on USH 41

Flow Inputs and Adjustments

olume, V	4518	veh/h
eak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1255	v
Trucks and buses	10	%
ecreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1757	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1757	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	61.6	mi/h
Number of lanes, N	3	
Density, D	28.5	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

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JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

Existing Counts 2000 - STH 47 - CTH E
26000 SB
25600 NB
51600 TOTAL

Projected 2020 volumes No Interchange 74000

Assume straight line growth between - yr @ 66,000

$$\frac{x - 2000}{2020 - 2000} = \frac{66{,}000 - 51{,}600}{74{,}000 - 51{,}600} \qquad x = 2012.9$$

say 2013

Existing 2000 counts on STH 47 interchange
SB on Ramp 7100 ADT
NB off Ramp 4700 ADT

$K_{30} = 11.1$ T(DHV) = 10.5

SB on Ramp 788
NB off Ramp 522

USH 41 @ SB on Ramp (27800 - 7100 = 20,700)
20700 x .111 = 2298 vph

USH 41 @ NB off Ramp 27600 x .111 = 3064

No Interchange 2020 Projection

NB off 7000 ADT 777 vph
SB ON 7000 ADT 777 vph, vs 788 (2000 count)
SB USH 41 - 26500 ADT
26500 x .111 = 2942
NB USH 41 - 33500 x .111 = 3719

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/15/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 SB
Junction:	STH 47 SB On-ramp
Jurisdiction:	
Analysis Year:	2020
Description:	STH 47 SB on-ramp, 2020 4 lanes

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2942	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	788	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2942		788			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	817		219			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3432	919	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3432 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4351	4700	No
v_{R12}	4351	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 34.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.548		
Space mean speed in ramp influence area,	S_R = 52.4	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 52.4	mph	

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/15/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 SB
Junction: STH 47 SB On-ramp
Jurisdiction:
Analysis Year: 2020
Description: STH 47 SB on-ramp, 2020 6 lanes

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2942	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	788	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2942		788			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	817		219			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3432	919	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2054 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4351	7050	No
v_{R12}	2973	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.322	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = 61.8	mph
Space mean speed for all vehicles,	S = 58.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/15/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 NB
Junction:	NB off-ramp at STH 47
Jurisdiction:	
Analysis Year:	2020

Description: STH 47 NB off-ramp, 2020 4 lane

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3719	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	777	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3719		777			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1033		216			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4339	907	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4339 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4339	4700	No
v_{12}	4339	4400	No
$v_{FO} = v_F - v_R$	3432	4700	No
v_R	907	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 39.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, D_S = 0.315

Space mean speed in ramp influence area, S_R = 57.8 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

_______________Diverge Analysis_______________

Analyst:	MAH
Agency/Co.:	
Date performed:	6/15/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 NB
Junction:	NB off-ramp at STH 47
Jurisdiction:	
Analysis Year:	2020
Description:	STH 47 NB off-ramp, 2020 6 lane

_______________Freeway Data_______________

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3719	vph

_______________Off Ramp Data_______________

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	777	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

_______________Adjacent Ramp Data (if one exists)_______________

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

_______________Conversion to pc/h Under Base Conditions_______________

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3719		777			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1033		216			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4339	907	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.610 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3000 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4339	7050	No
v_{12}	3000	4400	No
$v_{FO} = v_F - v_R$	3432	7050	No
v_R	907	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 28.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.315

Space mean speed in ramp influence area, S_R = 57.8 mph

Space mean speed in outer lanes, S_0 = 70.0 mph

Space mean speed for all vehicles, S = 61.1 mph

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FAX 920-830-6100

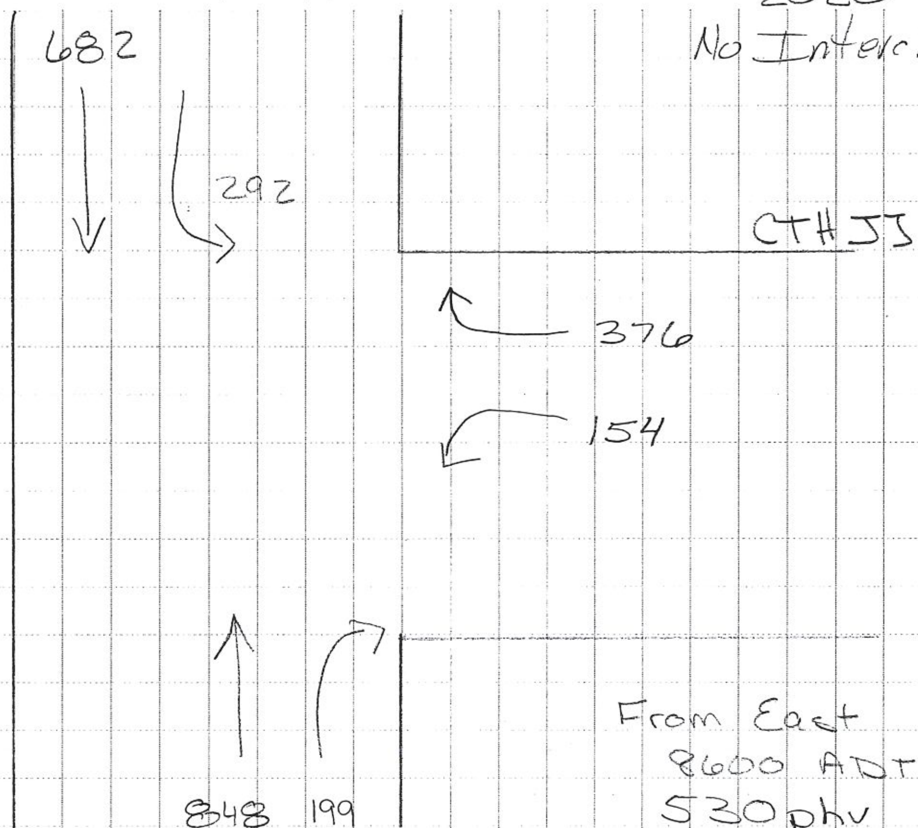
OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER		SHEET NO.	
CLIENT			
PROJECT			
MADE BY		DATE	
CHECKED BY		DATE	

CTH A

2020
No Interchange

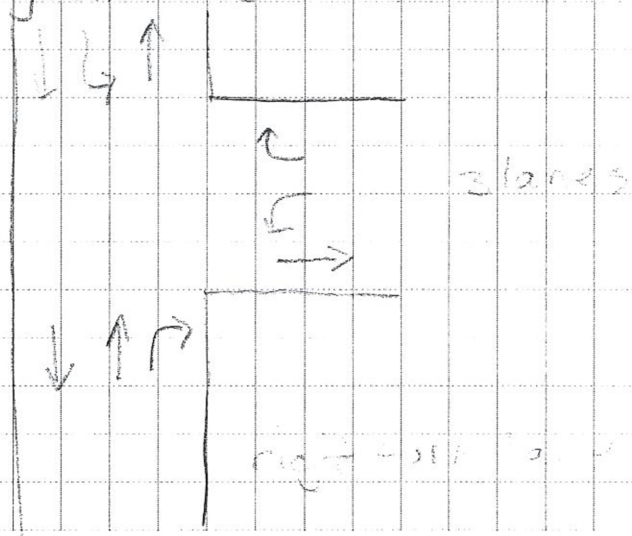
From North
15800 ADT
974 phv
30% LT
70% thur



From South
17000 ADT
1047 phv
81% thur
19% RT

From East
8600 ADT
530 phv
29% LT
71% RT

Existing geometrics



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JOB NUMBER SHEET NO.
CLIENT
PROJECT
MADE BY DATE
CHECKED BY DATE

CTH JJ and CTH A Intersection

From 3-23-00 counts

Peak hour 4:15 - 5:15

From north 74 L, 175 Th 249 total
From south 357 thru, 86 R 443 total
From East 54 L, 131 RT, 185 total

Assume same truck % for CTH JJ as CTH A

Total trucks 9.6%
T (PHV) 5.8%
T (DHV) 7.7%

use 7.7% for stop control intersection analysis

No Interchange - Year 2020

Assume same % of turn movements as existing

From north 15800 ADT 2020
From south 17000 ADT 2020
From East 8600 ADT 2020

K_{30} 11.2
D = 55/45

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2020
Project ID:
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		848	199	292	682	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		942	221	324	757	
Percent Heavy Vehicles		--	--	8	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	154		376			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	171		417			
Percent Heavy Vehicles	8		8			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		324	171		417			
C(m) (vph)		580	17		311			
v/c		0.56	10.06		1.34			
95% queue length		3.43	22.15		20.78			
Control Delay		18.8	4516		206.7			
LOS		C	F		F			
Approach Delay				1460				
Approach LOS				F				

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2020
Project ID:
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		848	199	292	682	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		236	55	81	189	
Hourly Flow Rate, HFR		942	221	324	757	
Percent Heavy Vehicles		--	--	8	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	154		376			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	43		104			
Hourly Flow Rate, HFR	171		417			
Percent Heavy Vehicles	8		8			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			No			
Lanes	1	1				
Configuration	L	R				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			8	8		8			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		8	8		8			
t(f)		2.3	3.6		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

```
Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)
_______________________________________________________________________________
Computation 2-Proportion of TWSC Intersection Time  blocked
                                            Movement 2          Movement 5
                                         V(t)   V(l,prot)  V(t)   V(l,prot)
_______________________________________________________________________________
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c,max)
Min platooned flow, V(c,min)
Duration of blocked period, t(p)
Proportion time blocked, p                      0.000             0.000
_______________________________________________________________________________
Computation 3-Platoon Event Periods      Result
_______________________________________________________________________________
p(2)                                     0.000
p(5)                                     0.000
p(dom)
p(subo)
Constrained or unconstrained?
_______________________________________________________________________________
Proportion
unblocked                  (1)            (2)            (3)
for minor             Single-stage         Two-Stage Process
movements, p(x)          Process         Stage I        Stage II
_______________________________________________________________________________
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
_______________________________________________________________________________
Computation 4 and 5
Single-Stage Process
Movement                  1      4      7      8      9     10     11     12
                          L      L      L      T      R      L      T      R
_______________________________________________________________________________
V c,x                          1163   2347          942
s
Px
V c,u,x
_______________________________________________________________________________
C r,x
C plat,x
_______________________________________________________________________________
Two-Stage Process
                       7              8              10             11
```

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	942	
Potential Capacity	311	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	311	
Probability of Queue free St.	0.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	1163	
Potential Capacity	580	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	580	
Probability of Queue free St.	0.44	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.44	0.44
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	2347	
Potential Capacity	38	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.44
Maj. L, Min T Adj. Imp Factor.		0.56
Cap. Adj. factor due to Impeding mvmnt	0.44	0.00
Movement Capacity	17	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.44	0.44
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity

Part 2 - Second Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity

Part 3 - Single Stage		
Conflicting Flows	2347	
Potential Capacity	38	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.44
Maj. L, Min T Adj. Imp Factor.		0.56
Cap. Adj. factor due to Impeding mvmnt	0.44	0.00
Movement Capacity	17	

Results for Two-stage process:		
a		
y		
C t	17	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	171		417			
Movement Capacity (vph)	17		311			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	17		311			
Volume	171		417			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		324	171		417			
C(m) (vph)		580	17		311			
v/c		0.56	10.06		1.34			
95% queue length		3.43	22.15		20.78			
Control Delay		18.8	4516		206.7			
LOS		C	F		F			
Approach Delay				1460				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.44
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		18.8
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Signalized Intersections Release 4.1d

Analyst: MAH	Inter.: CTH A & CTH JJ East
Agency:	Area Type: All other areas
Date: 6/14/2004	Jurisd: Outagamie County
Period:	Year : 2020
Project ID: CTH A & CTH JJ (East), 2020	No Interchange Add Lanes
E/W St: CTH JJ	N/S St: CTH A

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Volume				154		376		848	199	292	682	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left				
Thru					Thru		P		
Right					Right		P		
Peds					Peds				
WB Left	P				SB Left	P	P		
Thru					Thru	P	P		
Right	P				Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right	P			
Green	22.0					15.0	40.0		
Yellow	3.0					3.0	3.0		
All Red	2.0					0.0	2.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	441	1805	0.39	0.24	30.9	C	23.3	C
R	754	1615	0.55	0.47	20.2	C		
Northbound								
TR	1594	3586	0.62	0.44	21.0	C	21.0	C
Southbound								
DefL	441	1805	0.73	0.64	24.5	C		
T	1224	1900	0.62	0.64	11.8	B	15.6	B

Intersection Delay = 19.3 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: MAH
Agency/Co.:
Date Performed: 6/14/2004
Analysis Time Period:
Intersection: CTH A & CTH JJ East
Area Type: All other areas
Jurisdiction: Outagamie County
Analysis Year: 2020
Project ID: CTH A & CTH JJ (East), 2020 No Interchange Add Lanes

East/West Street: CTH JJ
North/South Street: CTH A

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				154		376		848	199	292	682	
% Heavy Veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
PK 15 Vol				43		104		236	55	81	189	
Hi Ln Vol												
% Grade					0			0			0	
Ideal Sat				1900		1900		1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			
Adj Flow				171		418		985		324	758	
%InSharedLn												
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.044			0.000	
Peds Bikes	0			0			0					
Buses				0		0		0		0	0	
%InProtPhase										0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0		0.0	0.0	
Arriv. Type				3		3		3		3	3	
Unit Ext.				3.0		3.0		3.0		3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0		2.0	2.0	
Ext of g				2.0		2.0		2.0		2.0	2.0	

Ped Min g				

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left				
	Thru						Thru		P		
	Right						Right		P		
	Peds						Peds				
WB	Left	P				SB	Left	P	P		
	Thru						Thru	P	P		
	Right	P					Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	P			
Green		22.0						15.0	40.0		
Yellow		3.0						3.0	3.0		
All Red		2.0						0.0	2.0		

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V				154		376		848	199	292	682	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Adj flow				171		418		942	43	324	758	
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
Lane group				L		R		TR		DefL	T	
Adj flow				171		418		985		324	758	
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.044			0.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound				Northbound		Southbound		
LG				L		R		TR		DefL	T	
So				1900		1900		1900		1900	1900	
Lanes	0	0	0	1	0	1	0	2	0	0	2	0
fW				1.000		1.000		1.000		1.000	1.000	
fHV				1.000		1.000		1.000		1.000	1.000	
fG				1.000		1.000		1.000		1.000	1.000	
fP				1.000		1.000		1.000		1.000	1.000	
fBB				1.000		1.000		1.000		1.000	1.000	
fA				1.00		1.00		1.00		1.00	1.00	
fLU				1.00		1.00		0.95		1.00	1.00	
fRT						0.850		0.993			1.000	
fLT				0.950				1.000		0.950	1.000	
Sec.										0.154		
fLpb				1.000				1.000		1.000	1.000	
fRpb						1.000		1.000			1.000	
S				1805		1615		3586		1805	1900	
Sec.										293		

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Westbound							
Prot							
Perm							
Left	L	171	1805	# 0.09	0.24	441	0.39
Prot							
Perm							
Thru							
Right	R	418	1615	0.26	0.47	754	0.55
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	TR	985	3586	# 0.27	0.44	1594	0.62
Right							
Southbound							
Prot		301	1805	0.17	0.167	301	1.00
Perm		23	293	0.08	0.478	140	0.16
Left	DefL	324			0.64	441	0.73
Prot							
Perm							
Thru	T	758	1900	# 0.40	0.64	1224	0.62
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.77
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.92

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound												
Westbound												
L	0.39	0.24	28.4	1.000	441	0.50	2.6	0.0	30.9	C	23.3	C
R	0.55	0.47	17.3	1.000	754	0.50	2.9	0.0	20.2	C		
Northbound												
TR	0.62	0.44	19.1	1.000	1594	0.50	1.8	0.0	21.0	C	21.0	C
Southbound												
DefL	0.73	0.64	14.1	1.000	441	0.50	10.4	0.0	24.5	C		

```
T    0.62  0.64  9.5   1.000 1224  0.50   2.4   0.0   11.8   B   15.6   B
```

```
        Intersection delay = 19.3  (sec/veh)   Intersection LOS = B
```

```
_______________SUPPLEMENTAL PERMITTED LT WORKSHEET_______________
                     for exclusive lefts
Input
                                                  EB    WB    NB    SB
Cycle length, C                           90.0   sec
Total actual green time for LT lane group, G (s)                    58.0
Effective permitted green time for LT lane group, g(s)              43.0
Opposing effective green time, go (s)                               40.0
Number of lanes in LT lane group, N                                 1
Number of lanes in opposing approach, No                            2
Adjusted LT flow rate, VLT (veh/h)                                  324
Proportion of LT in LT lane group, PLT                              1.000
Proportion of LT in opposing flow, PLTo                             0.00
Adjusted opposing flow rate, Vo (veh/h)                             985
Lost time for LT lane group, tL                                     5.00
Computation
LT volume per cycle, LTC=VLTC/3600                                  8.10
Opposing lane util. factor, fLUo                              1.00  0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)                 12.96
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g                               0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)                   1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]                        0.56
gq, (see Exhibit C16-4,5,6,7,8)                                     20.23
gu=g-gq if gq>=gf, or = g-gf if gq<gf                               22.77
n=Max(gq-gf)/2,0)                                                   10.11
PTHo=1-PLTo                                                         1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]                                  1.00
EL1 (refer to Exhibit C16-3)                                        3.44
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g                                  0.09
gdiff=max(gq-gf,0)                                                  0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)                 0.15
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT                                           0.154

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_______________SUPPLEMENTAL PERMITTED LT WORKSHEET_______________
                       for shared lefts
Input
                                                  EB    WB    NB    SB
Cycle length, C                           90.0   sec
Total actual green time for LT lane group, G (s)
Effective permitted green time for LT lane group, g(s)
Opposing effective green time, go (s)
Number of lanes in LT lane group, N
Number of lanes in opposing approach, No
```

```
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT                          0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo                                1.00  0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_______________SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET_______________
Permitted Left Turns
                                                          EB    WB    NB    SB
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Pedestrian flow rate, Vpedg (p/h)
OCCpedg
Opposing queue clearing green, gq (s)
Eff. ped. green consumed by opp. veh. queue, gq/gp
OCCpedu
Opposing flow rate, Vo (veh/h)
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion of left turns, PLT
Proportion of left turns using protected phase, PLTA
Left-turn adjustment, fLpb
Permitted Right Turns
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Conflicting bicycle volume, Vbic (bicycles/h)
Vpedg
OCCpedg
Effective green, g (s)
Vbicg
OCCbicg
```

OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						324
v/c ratio from Capacity Worksheet, X						0.73
Protected phase effective green interval, g (s)						15.0
Opposing queue effective green interval, gq						20.23
Unopposed green interval, gu						22.77
Red time r=(C-g-gq-gu)						32.0
Arrival rate, qa=v/(3600(max[X,1.0]))						0.09
Protected ph. departure rate, Sp=s/3600						0.501
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						0.15
XPerm						1.11
XProt						0.56
Case						3
Queue at beginning of green arrow, Qa						3.25
Queue at beginning of unsaturated green, Qu						1.82
Residual queue, Qr						0.37
Uniform Delay, d1						14.1

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 19.3 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound

LaneGroup				L		R		TR		DefL	T	
Init Queue				0.0		0.0		0.0		0.0	0.0	
Flow Rate				171		418		518		324	758	
So				1900		1900		1900		1900	1900	
No.Lanes	0	0	0	1	0	1	0	2	0	0	2	0
SL				1805		1615		1887		684	1900	
LnCapacity				441		754		838		441	1224	
Flow Ratio				0.09		0.26		0.27		0.47	0.40	
v/c Ratio				0.39		0.55		0.62		0.73	0.62	
Grn Ratio				0.24		0.47		0.44		0.64	0.64	
I Factor					1.000			1.000			1.000	
AT or PVG				3		3		3		3	3	
Pltn Ratio				1.00		1.00		1.00		1.00	1.00	
PF2				1.00		1.00		1.00		1.00	1.00	
Q1				3.6		7.5		9.9		3.3	11.2	
kB				0.6		0.9		1.0		0.6	1.3	
Q2				0.4		1.1		1.6		1.6	2.1	
Q Average				4.0		8.7		11.5		4.9	13.3	
Q Spacing				25.0		25.0		25.0		25.0	25.0	
Q Storage				0		0		0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%				1.2		1.2		1.2		1.2	1.2	
BOQ				4.9		10.5		13.9		6.0	16.0	
QSRatio												
85th Percentile Output:												
fB%				1.5		1.5		1.4		1.5	1.4	
BOQ				6.1		12.6		16.4		7.4	18.9	
QSRatio												
90th Percentile Output:												
fB%				1.7		1.6		1.6		1.7	1.5	
BOQ				6.9		13.7		17.8		8.3	20.4	
QSRatio												
95th Percentile Output:												
fB%				2.1		1.8		1.7		2.0	1.7	
BOQ				8.1		15.4		19.5		9.7	22.2	
QSRatio												
98th Percentile Output:												
fB%				2.4		2.0		1.9		2.3	1.8	
BOQ				9.4		17.0		21.3		11.1	24.0	
QSRatio												

ERROR MESSAGES

No errors to report.

ENGINEERING
ARCHITECTURE
ENVIRONMENTAL

ONE SYSTEMS DRIVE
APPLETON, WI 54914-1654
920-735-6900
1-800-571-6677
FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER		SHEET NO.	
CLIENT			
PROJECT			
MADE BY	MAH	DATE	
CHECKED BY		DATE	

STH 47; CTH A

Existing turn counts 3-30-00

Peak hr 3:45 - 4:45

From North 47/A to S 47	142 vph	52%
From North 47/A to S CTH A	132 vph - By Pass Lr	48%
From South 47 to S CTH A	8 vph	3%
From South 47 to N 47	262 vph	97%
From West (South) CTH A to N 47	240 vph	99%
From West (south) CTH A to S 47	2 vph	1%

T(DHV) = 7.7%
D = 55/45
K_{30} = 11.2

Proposed 2020 No Interchange

Assume same % of vehicle movement

CTH A
STH 47
15700 ADT
15700 x .55 . 112 = 967
464
503 vph

7400 x .55 x .112 = 456

461 vph
5 vph
7400 ADT
CTH A
13 vph
STH 47
9500 ADT
9500 x .55 x .112 = 585
567 vph

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, no interchange
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	18	567			503	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Hourly Flow Rate, HFR	18	567			503	
Percent Heavy Vehicles	8	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				451		5
Peak Hour Factor, PHF				1.00		1.00
Hourly Flow Rate, HFR				451		5
Percent Heavy Vehicles				8		8
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						456	
C(m) (vph)	1031						224	
v/c	0.02						2.04	
95% queue length	0.05						34.03	
Control Delay	8.6						516.8	
LOS	A						F	
Approach Delay							516.8	
Approach LOS							F	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, no interchange
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	18	567			503	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Peak-15 Minute Volume	4	142			126	
Hourly Flow Rate, HFR	18	567			503	
Percent Heavy Vehicles	8	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				451		5
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				113		1
Hourly Flow Rate, HFR				451		5
Percent Heavy Vehicles				8		8
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0	0	
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	567	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		8					8		8
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2					6.5		6.3
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	8					8		8
t(f)	2.3					3.6		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	503					1106		503
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		503
Potential Capacity		557
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		557
Probability of Queue free St.	1.00	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		503
Potential Capacity		1031
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1031
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1106
Potential Capacity		227
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98
Movement Capacity		223

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		1106
Potential Capacity		227
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98
Movement Capacity		223

Results for Two-stage process:		
a		
y		
C t		223

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				451		5
Movement Capacity (vph)				223		557
Shared Lane Capacity (vph)					224	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				223		557
Volume				451		5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					224	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						456	
C(m) (vph)	1031						224	
v/c	0.02						2.04	
95% queue length	0.05						34.03	
Control Delay	8.6						516.8	
LOS	A						F	
Approach Delay							516.8	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	567	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	8.6	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

APPENDIX F

ENGINEERING
ARCHITECTURE
ENVIRONMENTAL

ONE SYSTEMS DRIVE
APPLETON, WI 54914-1654
920-735-6900
1-800-571-6677
FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER | SHEET NO.
CLIENT
PROJECT
MADE BY | DATE
CHECKED BY | DATE

Partial Interchange

USH 41 - CTH OO/STH 15 to CTH A

Assume straight line growth between existing 2000 count and 2020 projection for partial option
Capacity = 66,000 4 lanes

$\frac{x - 2000}{2020 - 2000} = \frac{66,000 - 55400}{74400 - 55400}$ $x = 2011$

2020 Projections $K_{30} = 11.1$ $T(DHV) = 10.5$
74,400 ADT $D = 55/45$

Peak hr one direction
74,400 x .55 x .111 = 4542 vph

USH 41 - CTH A to STH 47

2020 Projection 61400 ADT

Peak hr one direction
61400 x .55 x .111 = 3748 vph

Ramp junctions

STH 47 SB on Ramp
4200 ADT Ramp .111 x 4200 = 466 vph
26500 ADT prior to SB on ramp 26500 x .111 = 2942

STH 47 NB off
4200 ADT 466 vph
30700 ADT 30700 x .111 = 3407

ENGINEERING
ARCHITECTURE
ENVIRONMENTAL

ONE SYSTEMS DRIVE
APPLETON, WI 54914-1654
920-735-6900
1-800-571-6677
FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

CTH A SB on Ramp

6500 ADT — 6500 * .111 = 722 vph
30700 SB USH 41 — 30700 * .111 = 3408 vph

CTH A NB off Ramp

6500 ADT — 722 vph
37200 NB USH 41 — 37200 x .111 = 4129

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 15
Jurisdiction:	
Analysis Year:	2020

Description: Partial Interchange 4 lanes

Flow Inputs and Adjustments

Volume, V	4542	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1262	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2650	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2650	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 15
Jurisdiction:	
Analysis Year:	2020
Description:	Partial Interchange 6 lanes

Flow Inputs and Adjustments

Volume, V	4542	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1262	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1766	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1766	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	61.6	mi/h
Number of lanes, N	3	
Density, D	28.7	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 47
Jurisdiction:	
Analysis Year:	2020

Description: Partial Interchange 4 lanes

Flow Inputs and Adjustments

Volume, V	3748	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1041	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2186	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2186	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S	54.7	mi/h
Number of lanes, N	2	
Density, D	40.0	pc/mi/ln

vel of service, LOS E

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 47
Jurisdiction:	
Analysis Year:	2020

Description: Partial Interchange 6 lanes

Flow Inputs and Adjustments

Volume, V	3748	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1041	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1458	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1458	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	62.0	mi/h
Number of lanes, N	3	
Density, D	23.5	pc/mi/ln

Level of service, LOS	C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH41 Southbound
Junction: STH 47 on ramp
Jurisdiction:
Analysis Year: 2020
Description: STH47 southbound on ramp Partial

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2942	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	466	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2942	466		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	817	129		v
Trucks and buses	10	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

eavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3432	544	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) = 3432$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3976	4700	No
v_{R12}	3976	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 31.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.454		
Space mean speed in ramp influence area,	S_R = 54.6	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 54.6	mph	

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH41 Southbound
Junction:	STH 47 on ramp
Jurisdiction:	
Analysis Year:	2020

Description: STH47 southbound on ramp Partial

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2942	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	50.0	mph
Volume on ramp	466	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2942		466			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	817		129			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3432	544	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2054 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3976	7050	No
v_{R12}	2598	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 20.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.298	
Space mean speed in ramp influence area,	S_R = 58.1	mph
Space mean speed in outer lanes,	S_0 = 61.8	mph
Space mean speed for all vehicles,	S = 59.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/15/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 NB
Junction:	NB off-ramp at STH 47
Jurisdiction:	
Analysis Year:	2020
Description:	STH 47 NB off-ramp, 2020 4 lane P

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3407	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	466	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3407		466			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	946		129			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3975	544	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3975 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3975	4700	No
v_{12}	3975	4400	No
$v_{FO} = v_F - v_R$	3431	4700	No
v_R	544	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 36.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable,	D_S = 0.282	
Space mean speed in ramp influence area,	S_R = 58.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/15/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 NB
Junction:	NB off-ramp at STH 47
Jurisdiction:	
Analysis Year:	2020
Description:	STH 47 NB off-ramp, 2020 6 lane P

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3407	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	466	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3407		466			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	946		129			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3975	544	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.636 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2725 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3975	7050	No
v_{12}	2725	4400	No
$v_{FO} = v_F - v_R$	3431	7050	No
v_R	544	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 25.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.282	
Space mean speed in ramp influence area,	S_R = 58.5	mph
Space mean speed in outer lanes,	S_0 = 70.3	mph
Space mean speed for all vehicles,	S = 61.8	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.: OMNNI
Date performed: 6/28/04
Analysis time period:
Freeway/Dir of Travel: SB USH 41
Junction: CTH A SB On ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A SB On-ramp 2020 4 lanes Par

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3408	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	722	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3408		722			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	947		201			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3976	842	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3976 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4818	4700	Yes
v_{R12}	4818	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 38.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M_S = 0.721	
Space mean speed in ramp influence area,	S_R = 48.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 48.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.: OMNNI
Date performed: 6/28/04
Analysis time period:
Freeway/Dir of Travel: SB USH 41
Junction: CTH A SB On ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A SB On-ramp 2020 6 lanes Par

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3408	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	722	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3408	722		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	947	201		v
Trucks and buses	10	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3976	842	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2380 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4818	7050	No
v_{R12}	3222	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.336

Space mean speed in ramp influence area, S_R = 57.3 mph

Space mean speed in outer lanes, S_0 = 61.1 mph

Space mean speed for all vehicles, S = 58.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Northbound
Junction: CTH A NB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A NB Off Ramp 4 lanes Partial

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4129	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	722	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4129		722			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1147		201			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4817	842	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4817 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4817	4700	Yes
v_{12}	4817	4400	Yes
$v_{FO} = v_F - v_R$	3975	4700	No
v_R	842	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 43.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.309

Space mean speed in ramp influence area, S_R = 57.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 Northbound
Junction:	CTH A NB off Ramp
Jurisdiction:	
Analysis Year:	2020

Description: CTH A NB Off Ramp 6 lanes Partial

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4129	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	722	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4129		722			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1147		201			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4817	842	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.601 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3230 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4817	7050	No
v_{12}	3230	4400	No
$v_{FO} = v_F - v_R$	3975	7050	No
v_R	842	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 30.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.309	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = 69.0	mph
Space mean speed for all vehicles,	S = 61.1	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 Northbound
Junction:	CTH A NB off Ramp
Jurisdiction:	
Analysis Year:	2020

Description: CTH A NB Off Ramp 6 lanes Partial, 500' Taper

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4129	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	722	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4129		722			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1147		201			v
Trucks and buses	10		10			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.952	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4817	842	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.601 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3230 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4817	7050	No
v_{12}	3230	4400	No
$v_{FO} = v_F - v_R$	3975	7050	No
v_R	842	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 27.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.309	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = 69.0	mph
Space mean speed for all vehicles,	S = 61.1	mph

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920-735-6900
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FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

CTH JJ & CTH A
2020 Partial Interchange
K_{30} = 10.9 T(DHV) = 8.9
D: 55/45

CTH A

From North
17700 ADT
1061 vph
30% LT
70% thru

743 318

CTH JJ

400

164

From South
22000 ADT
1319 vph
81% thru
19% RT

1068 251

From East
9400 ADT
564 vph
29% LT
71% RT

Assume same % of turning movements as 2020 no interchange option

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2020
Project ID: Partial interchange option
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1068	251	318	743	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		1186	278	353	825	
Percent Heavy Vehicles		--	--	9	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	164		400			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	182		444			
Percent Heavy Vehicles	9		9			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		353	182		444			
C(m) (vph)		441	4		222			
v/c		0.80	45.50		2.00			
95% queue length		7.25	24.98		32.82			
Control Delay		38.7	21811		501.6			
LOS		E	F		F			
Approach Delay				6697				
Approach LOS				F				

HCS2000: Unsignalized Intersections Release 4.1d

```
Phone:                                           Fax:
E-Mail:

______________________TWO-WAY STOP CONTROL(TWSC) ANALYSIS_____________________

Analyst:                  MAH
Agency/Co.:               OMNNI
Date Performed:           6/14/04
Analysis Time Period:
Intersection:             CTH A & CTH JJ
Jurisdiction:             Outagamie County
Units: U. S. Customary
Analysis Year:            2020
Project ID:  Partial interchange option
East/West Street:         CTH JJ
North/South Street:       CTH A
Intersection Orientation: NS                     Study period (hrs):   0.25

________________________Vehicle Volumes and Adjustments________________________
Major Street Movements          1       2       3       4       5       6
                                L       T       R       L       T       R
_______________________________________________________________________________
Volume                                  1068    251     318     743
Peak-Hour Factor, PHF                   0.90    0.90    0.90    0.90
Peak-15 Minute Volume                   297     70      88      206
Hourly Flow Rate, HFR                   1186    278     353     825
Percent Heavy Vehicles                  --      --      9       --      --
Median Type/Storage             Undivided               /
RT Channelized?                                 No
Lanes                                   1    1             1    1
Configuration                           T    R             L    T
Upstream Signal?                        No                      No
_______________________________________________________________________________
Minor Street Movements          7       8       9       10      11      12
                                L       T       R       L       T       R
_______________________________________________________________________________
Volume                          164             400
Peak Hour Factor, PHF           0.90            0.90
Peak-15 Minute Volume           46              111
Hourly Flow Rate, HFR           182             444
Percent Heavy Vehicles          9               9
Percent Grade (%)                       0                       0
Flared Approach:  Exists?/Storage                       /                       /
RT Channelized?                                 No
Lanes                               1       1
Configuration                        L      R
_______________________________________________________________________________

______________________Pedestrian Volumes and Adjustments_______________________
Movements                         13      14      15      16
_______________________________________________________________________________
Flow (ped/hr)                     0       0       0       0
```

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			9	9		9			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		9	9		9			
t(f)		2.3	3.6		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		1464	2717		1186			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	1186	
Potential Capacity	222	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	222	
Probability of Queue free St.	0.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	1464	
Potential Capacity	441	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	441	
Probability of Queue free St.	0.20	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.20	0.20
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	2717	
Potential Capacity	22	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.20
Maj. L, Min T Adj. Imp Factor.		0.34
Cap. Adj. factor due to Impeding mvmnt	0.20	0.00
Movement Capacity	4	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.20	0.20
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	2717	
Potential Capacity	22	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.20
Maj. L, Min T Adj. Imp Factor.		0.34
Cap. Adj. factor due to Impeding mvmnt	0.20	0.00
Movement Capacity	4	

Results for Two-stage process:		
a		
y		
C t	4	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	182		444			
Movement Capacity (vph)	4		222			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	4		222			
Volume	182		444			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		353	182		444			
C(m) (vph)		441	4		222			
v/c		0.80	45.50		2.00			
95% queue length		7.25	24.98		32.82			
Control Delay		38.7	21811		501.6			
LOS		E	F		F			
Approach Delay				6697				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.20
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		38.7
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Signalized Intersections Release 4.1d

Analyst: MAH
Agency:
Date: 6/14/2004
Period:
Project ID: CTH A & CTH JJ (East), 2020 Partial Exist Geometry
E/W St: CTH JJ

Inter.: CTH A & CTH JJ East
Area Type: All other areas
Jurisd: Outagamie County
Year : 2020
N/S St: CTH A

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
LGConfig				L		R		T	R	L	T	
Volume				164		400		1068	251	318	743	
Lane Width				12.0		12.0		12.0	12.0	12.0	12.0	
RTOR Vol						0			160			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left				
	Thru						Thru		P		
	Right						Right		P		
	Peds						Peds				
WB	Left	P				SB	Left	P	P		
	Thru						Thru	P	P		
	Right	P					Right				
	Peds						Peds				
NB	Right	P				EB	Right				
SB	Right					WB	Right				
Green		25.0						12.0	40.0		
Yellow		3.0						3.0	3.0		
All Red		2.0						0.0	2.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	501	1805	0.36	0.28	28.1	C		
							59.4	E
R	449	1615	0.99	0.28	72.2	E		
Northbound								
T	844	1900	1.41	0.44	215.0	F	198.3	F
R	1256	1615	0.08	0.78	2.5	A		
Southbound								
L	326	1805	1.08	0.61	101.1	F		
T	1161	1900	0.71	0.61	15.8	B	41.3	D

Intersection Delay = 110.3 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: MAH
Agency/Co.:
Date Performed: 6/14/2004
Analysis Time Period:
Intersection: CTH A & CTH JJ East
Area Type: All other areas
Jurisdiction: Outagamie County
Analysis Year: 2020
Project ID: CTH A & CTH JJ (East), 2020 Partial Exist Geometry

East/West Street: CTH JJ
North/South Street: CTH A

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				164		400		1068	251	318	743	
% Heavy Veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
PK 15 Vol				46		111		297	70	88	206	
Hi Ln Vol												
% Grade					0			0			0	
Ideal Sat				1900		1900		1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
LGConfig				L		R		T	R	L	T	
Lane Width				12.0		12.0		12.0	12.0	12.0	12.0	
RTOR Vol						0			160			
Adj Flow				182		444		1187	101	353	826	
%InSharedLn												
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.000	1.000		0.000	
Peds Bikes	0			0			0					
Buses				0		0		0	0	0	0	
%InProtPhase										0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0	0.0	0.0	0.0	
Arriv. Type				3		3		3	3	3	3	
Unit Ext.				3.0		3.0		3.0	3.0	3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0	2.0	2.0	2.0	
Ext of g				2.0		2.0		2.0	2.0	2.0	2.0	

Ped Min g				

PHASE DATA

Phase Combination	1	2	3	4			5	6	7	8
EB	Left				NB	Left				
	Thru					Thru		P		
	Right					Right		P		
	Peds					Peds				
WB	Left	P			SB	Left	P	P		
	Thru					Thru	P	P		
	Right	P				Right				
	Peds					Peds				
NB	Right	P			EB	Right				
SB	Right				WB	Right				

	1	2	3	4	5	6	7	8
Green	25.0				12.0	40.0		
Yellow	3.0				3.0	3.0		
All Red	2.0				0.0	2.0		

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V				164		400		1068	251	318	743	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Adj flow				182		444		1187	101	353	826	
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
Lane group				L		R		T	R	L	T	
Adj flow				182		444		1187	101	353	826	
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.000	1.000		0.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG				L		R		T	R	L	T	
So				1900		1900		1900	1900	1900	1900	
Lanes	0	0	0	1	0	1	0	1	1	1	1	0
fW				1.000		1.000		1.000	1.000	1.000	1.000	
fHV				1.000		1.000		1.000	1.000	1.000	1.000	
fG				1.000		1.000		1.000	1.000	1.000	1.000	
fP				1.000		1.000		1.000	1.000	1.000	1.000	
fBB				1.000		1.000		1.000	1.000	1.000	1.000	
fA				1.00		1.00		1.00	1.00	1.00	1.00	
fLU				1.00		1.00		1.00	1.00	1.00	1.00	
fRT						0.850		1.000	0.850		1.000	
fLT				0.950				1.000		0.950	1.000	
Sec.										0.093		
fLpb				1.000				1.000		1.000	1.000	
fRpb						1.000		1.000	1.000		1.000	
S				1805		1615		1900	1615	1805	1900	
Sec.										177		

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Westbound							
Prot							
Perm							
Left	L	182	1805	0.10	0.28	501	0.36
Prot							
Perm							
Thru							
Right	R	444	1615	# 0.27	0.28	449	0.99
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	1187	1900	0.62	0.44	844	1.41
Right	R	101	1615	0.06	0.78	1256	0.08
Southbound							
Prot		241	1805	# 0.13	0.133	241	1.00
Perm		112	177	# 0.63	0.478	85	1.32
Left	L	353			0.61	326	1.08
Prot							
Perm							
Thru	T	826	1900	0.43	0.61	1161	0.71
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.04
Total lost time per cycle, L = 10.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.17

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound												
Westbound												
L	0.36	0.28	26.1	1.000	501	0.50	2.0	0.0	28.1	C	59.4	E
R	0.99	0.28	32.4	1.000	449	0.50	39.8	0.0	72.2	E		
Northbound												
T	1.41	0.44	25.0	1.000	844	0.50	190.0	0.0	215.0	F	198.3	F
R	0.08	0.78	2.4	1.000	1256	0.50	0.1	0.0	2.5	A		
Southbound												
L	1.08	0.61	27.4	1.000	326	0.50	73.8	0.0	101.1	F		

T	0.71	0.61	12.0	1.000	1161	0.50	3.7	0.0	15.8	B	41.3	D

Intersection delay = 110.3 (sec/veh)   Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Cycle length, C	90.0 sec				
Total actual green time for LT lane group, G (s)					55.0
Effective permitted green time for LT lane group, g(s)					43.0
Opposing effective green time, go (s)					40.0
Number of lanes in LT lane group, N					1
Number of lanes in opposing approach, No					1
Adjusted LT flow rate, VLT (veh/h)					353
Proportion of LT in LT lane group, PLT					1.000
Proportion of LT in opposing flow, PLTo					0.00
Adjusted opposing flow rate, Vo (veh/h)					1187
Lost time for LT lane group, tL					5.00
Computation					
LT volume per cycle, LTC=VLTC/3600					8.82
Opposing lane util. factor, fLUo				1.00	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					29.67
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					0.56
gq, (see Exhibit C16-4,5,6,7,8)					35.08
gu=g-gq if gq>=gf, or = g-gf if gq<gf					7.92
n=Max(gq-gf)/2,0)					17.54
PTHo=1-PLTo					1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					1.00
EL1 (refer to Exhibit C16-3)					3.96
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					0.09
gdiff=max(gq-gf,0)					0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					0.09
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					0.093

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Cycle length, C	90.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					

```
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT                                 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo                                       1.00  1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_______________SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET_______________
Permitted Left Turns
                                                         EB    WB    NB    SB
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Pedestrian flow rate, Vpedg (p/h)
OCCpedg
Opposing queue clearing green, gq (s)
Eff. ped. green consumed by opp. veh. queue, gq/gp
OCCpedu
Opposing flow rate, Vo (veh/h)
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion of left turns, PLT
Proportion of left turns using protected phase, PLTA
Left-turn adjustment, fLpb
Permitted Right Turns
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Conflicting bicycle volume, Vbic (bicycles/h)
Vpedg
OCCpedg
Effective green, g (s)
Vbicg
OCCbicg
```

OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						353
v/c ratio from Capacity Worksheet, X						1.08
Protected phase effective green interval, g (s)						12.0
Opposing queue effective green interval, gq						35.08
Unopposed green interval, gu						7.92
Red time r=(C-g-gq-gu)						35.0
Arrival rate, qa=v/(3600(max[X,1.0]))						0.09
Protected ph. departure rate, Sp=s/3600						0.501
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						0.27
XPerm						1.84
XProt						0.71
Case						3
Queue at beginning of green arrow, Qa						4.95
Queue at beginning of unsaturated green, Qu						3.18
Residual queue, Qr						1.78
Uniform Delay, d1						27.4

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 110.3 sec/veh   Intersection LOS F

BACK OF QUEUE WORKSHEET

Eastbound	Westbound	Northbound	Southbound

LaneGroup				L		R		T	R	L	T	
Init Queue				0.0		0.0		0.0	0.0	0.0	0.0	
Flow Rate				182		444		1187	101	353	826	
So				1900		1900		1900	1900	1900	1900	
No.Lanes	0	0	0	1	0	1	0	1	1	1	1	0
SL				1805		1615		1900	1615	532	1900	
LnCapacity				501		449		844	1256	326	1161	
Flow Ratio				0.10		0.27		0.62	0.06	0.66	0.43	
v/c Ratio				0.36		0.99		1.41	0.08	1.08	0.71	
Grn Ratio				0.28		0.28		0.44	0.78	0.61	0.61	
I Factor					1.000			1.000			1.000	
AT or PVG				3		3		3	3	3	3	
Pltn Ratio				1.00		1.00		1.00	1.00	1.00	1.00	
PF2				1.00		1.00		1.00	1.00	1.00	1.00	
Q1				3.7		11.1		29.7	0.6	4.0	14.2	
kB				0.7		0.7		1.0	1.3	0.5	1.3	
Q2				0.4		5.7		46.1	0.1	6.8	2.9	
Q Average				4.1		16.8		75.8	0.7	10.7	17.1	
Q Spacing				25.0		25.0		25.0	25.0	25.0	25.0	
Q Storage				0		0		0	0	0	0	
Q S Ratio												
70th Percentile Output:												
fB%				1.2		1.2		1.2	1.3	1.2	1.2	
BOQ				5.0		20.2		91.0	0.9	13.0	20.6	
QSRatio												
85th Percentile Output:												
fB%				1.5		1.4		1.4	1.7	1.4	1.4	
BOQ				6.2		23.6		106	1.2	15.4	24.1	
QSRatio												
90th Percentile Output:												
fB%				1.7		1.5		1.5	1.9	1.6	1.5	
BOQ				7.0		25.4		114	1.4	16.7	26.0	
QSRatio												
95th Percentile Output:												
fB%				2.0		1.6		1.6	2.5	1.7	1.6	
BOQ				8.3		27.4		121	1.8	18.4	28.0	
QSRatio												
98th Percentile Output:												
fB%				2.4		1.8		1.7	3.0	1.9	1.7	
BOQ				9.6		29.4		129	2.1	20.1	30.0	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Signalized Intersections Release 4.1d

Analyst: MAH
Agency:
Date: 6/14/2004
Period:
Project ID: CTH A & CTH JJ (East), 2020 Partial, Add Lanes
E/W St: CTH JJ

Inter.: CTH A & CTH JJ East
Area Type: All other areas
Jurisd: Outagamie County
Year : 2020
N/S St: CTH A

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Volume				164		400		1068	251	318	743	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left				
	Thru						Thru		P		
	Right						Right		P		
	Peds						Peds				
WB	Left	P				SB	Left	P	P		
	Thru						Thru	P	P		
	Right	P					Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	P			
Green		22.0						15.0	40.0		
Yellow		3.0						3.0	3.0		
All Red		2.0						0.0	2.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	441	1805	0.41	0.24	31.4	C	24.0	C
R	754	1615	0.59	0.47	21.0	C		
Northbound								
TR	1586	3568	0.81	0.44	26.4	C	26.4	C
Southbound								
DefL	386	1805	0.91	0.64	54.5	D		
T	1224	1900	0.67	0.64	13.1	B	25.5	C

Intersection Delay = 25.6 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: MAH
Agency/Co.:
Date Performed: 6/14/2004
Analysis Time Period:
Intersection: CTH A & CTH JJ East
Area Type: All other areas
Jurisdiction: Outagamie County
Analysis Year: 2020
Project ID: CTH A & CTH JJ (East), 2020 Partial, Add Lanes

East/West Street: CTH JJ
North/South Street: CTH A

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				164		400		1068	251	318	743	
% Heavy Veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
PK 15 Vol				46		111		297	70	88	206	
Hi Ln Vol												
% Grade					0			0			0	
Ideal Sat				1900		1900		1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			
Adj Flow				182		444		1288		353	826	
%InSharedLn												
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.078			0.000	
Peds Bikes	0			0			0					
Buses				0		0		0		0	0	
%InProtPhase										0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0		0.0	0.0	
Arriv. Type				3		3		3		3	3	
Unit Ext.				3.0		3.0		3.0		3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0		2.0	2.0	
Ext of g				2.0		2.0		2.0		2.0	2.0	

Ped Min g					

PHASE DATA

Phase Combination		1	2	3	4
EB	Left				
	Thru				
	Right				
	Peds				
WB	Left	P			
	Thru				
	Right	P			
	Peds				
NB	Right				
SB	Right				
Green		22.0			
Yellow		3.0			
All Red		2.0			

		5	6	7	8
NB	Left				
	Thru		P		
	Right		P		
	Peds				
SB	Left	P	P		
	Thru	P	P		
	Right				
	Peds				
EB	Right				
WB	Right	P			
Green		15.0	40.0		
Yellow		3.0	3.0		
All Red		0.0	2.0		

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V				164		400		1068	251	318	743	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Adj flow				182		444		1187	101	353	826	
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
Lane group				L		R		TR		DefL	T	
Adj flow				182		444		1288		353	826	
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.078			0.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound	Westbound		Northbound	Southbound	
LG		L	R	TR	DefL	T
So		1900	1900	1900	1900	1900
Lanes	0 0 0	1 0	1 0	2 0	0	2 0
fW		1.000	1.000	1.000	1.000	1.000
fHV		1.000	1.000	1.000	1.000	1.000
fG		1.000	1.000	1.000	1.000	1.000
fP		1.000	1.000	1.000	1.000	1.000
fBB		1.000	1.000	1.000	1.000	1.000
fA		1.00	1.00	1.00	1.00	1.00
fLU		1.00	1.00	0.95	1.00	1.00
fRT			0.850	0.988		1.000
fLT		0.950		1.000	0.950	1.000
Sec.					0.093	
fLpb		1.000		1.000	1.000	1.000
fRpb			1.000	1.000		1.000
S		1805	1615	3568	1805	1900
Sec.					177	

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Westbound							
Prot							
Perm							
Left	L	182	1805	# 0.10	0.24	441	0.41
Prot							
Perm							
Thru							
Right	R	444	1615	0.27	0.47	754	0.59
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	TR	1288	3568	# 0.36	0.44	1586	0.81
Right							
Southbound							
Prot		301	1805	0.17	0.167	301	1.00
Perm		52	177	0.29	0.478	85	0.61
Left	DefL	353			0.64	386	0.91
Prot							
Perm							
Thru	T	826	1900	# 0.43	0.64	1224	0.67
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.90
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.08

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
Westbound												
L	0.41	0.24	28.6	1.000	441	0.50	2.8	0.0	31.4	C	24.0	C
R	0.59	0.47	17.7	1.000	754	0.50	3.4	0.0	21.0	C		
Northbound												
TR	0.81	0.44	21.7	1.000	1586	0.50	4.6	0.0	26.4	C	26.4	C
Southbound												
DefL	0.91	0.64	25.9	1.000	386	0.50	28.6	0.0	54.5	D		

```
T    0.67  0.64  10.1  1.000 1224  0.50   3.0   0.0   13.1   B    25.5   C

_______________________________________________________________________________
         Intersection delay = 25.6  (sec/veh)   Intersection LOS = C


______________________SUPPLEMENTAL PERMITTED LT WORKSHEET______________________
                                for exclusive lefts
Input
                                                      EB     WB     NB     SB
Cycle length, C                               90.0    sec
Total actual green time for LT lane group, G (s)                          58.0
Effective permitted green time for LT lane group, g(s)                    43.0
Opposing effective green time, go (s)                                     40.0
Number of lanes in LT lane group, N                                       1
Number of lanes in opposing approach, No                                  2
Adjusted LT flow rate, VLT (veh/h)                                        353
Proportion of LT in LT lane group, PLT                                    1.000
Proportion of LT in opposing flow, PLTo                                   0.00
Adjusted opposing flow rate, Vo (veh/h)                                   1288
Lost time for LT lane group, tL                                           5.00
Computation
LT volume per cycle, LTC=VLTC/3600                                        8.82
Opposing lane util. factor, fLUo                                   1.00   0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)                       16.95
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g                                     0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)                         1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]                              0.56
gq, (see Exhibit C16-4,5,6,7,8)                                           30.21
gu=g-gq if gq>=gf, or = g-gf if gq<gf                                     12.79
n=Max(gq-gf)/2,0)                                                         15.10
PTHo=1-PLTo                                                               1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]                                        1.00
EL1 (refer to Exhibit C16-3)                                              4.65
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g                                        0.09
gdiff=max(gq-gf,0)                                                        0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)                       0.09
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT                                                 0.093

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

______________________SUPPLEMENTAL PERMITTED LT WORKSHEET______________________
                                  for shared lefts
Input
                                                      EB     WB     NB     SB
Cycle length, C                               90.0    sec
Total actual green time for LT lane group, G (s)
Effective permitted green time for LT lane group, g(s)
Opposing effective green time, go (s)
Number of lanes in LT lane group, N
Number of lanes in opposing approach, No
```

```
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT                               0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo                                     1.00  0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_______________SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET_______________
Permitted Left Turns
                                                          EB    WB    NB    SB
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Pedestrian flow rate, Vpedg (p/h)
OCCpedg
Opposing queue clearing green, gq (s)
Eff. ped. green consumed by opp. veh. queue, gq/gp
OCCpedu
Opposing flow rate, Vo (veh/h)
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion of left turns, PLT
Proportion of left turns using protected phase, PLTA
Left-turn adjustment, fLpb
Permitted Right Turns
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Conflicting bicycle volume, Vbic (bicycles/h)
Vpedg
OCCpedg
Effective green, g (s)
Vbicg
OCCbicg
```

OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						353
v/c ratio from Capacity Worksheet, X						0.91
Protected phase effective green interval, g (s)						15.0
Opposing queue effective green interval, gq						30.21
Unopposed green interval, gu						12.79
Red time r=(C-g-gq-gu)						32.0
Arrival rate, qa=v/(3600(max[X,1.0]))						0.10
Protected ph. departure rate, Sp=s/3600						0.501
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						0.17
XPerm						1.99
XProt						0.61
Case						3
Queue at beginning of green arrow, Qa						5.24
Queue at beginning of unsaturated green, Qu						2.96
Residual queue, Qr						2.10
Uniform Delay, d1						25.9

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 25.6 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

Eastbound	Westbound	Northbound	Southbound

LaneGroup				L		R		TR		DefL	T	
Init Queue				0.0		0.0		0.0		0.0	0.0	
Flow Rate				182		444		677		353	826	
So				1900		1900		1900		1900	1900	
No.Lanes	0	0	0	1	0	1	0	2	0	0	2	0
SL				1805		1615		1877		598	1900	
LnCapacity				441		754		834		386	1224	
Flow Ratio				0.10		0.27		0.36		0.59	0.43	
v/c Ratio				0.41		0.59		0.81		0.91	0.67	
Grn Ratio				0.24		0.47		0.44		0.64	0.64	
I Factor					1.000			1.000			1.000	
AT or PVG				3		3		3		3	3	
Pltn Ratio				1.00		1.00		1.00		1.00	1.00	
PF2				1.00		1.00		1.00		1.00	1.00	
Q1				3.8		8.2		14.7		3.7	13.0	
kB				0.6		0.9		1.0		0.6	1.3	
Q2				0.4		1.3		3.7		3.4	2.6	
Q Average				4.3		9.5		18.4		7.1	15.6	
Q Spacing				25.0		25.0		25.0		25.0	25.0	
Q Storage				0		0		0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%				1.2		1.2		1.2		1.2	1.2	
BOQ				5.3		11.5		22.1		8.7	18.8	
QSRatio												
85th Percentile Output:												
fB%				1.5		1.4		1.4		1.5	1.4	
BOQ				6.5		13.7		25.9		10.5	22.0	
QSRatio												
90th Percentile Output:												
fB%				1.7		1.6		1.5		1.6	1.5	
BOQ				7.3		14.9		27.8		11.5	23.7	
QSRatio												
95th Percentile Output:												
fB%				2.0		1.8		1.6		1.8	1.6	
BOQ				8.6		16.6		29.9		13.1	25.6	
QSRatio												
98th Percentile Output:												
fB%				2.3		1.9		1.7		2.1	1.8	
BOQ				10.0		18.2		31.9		14.7	27.5	
QSRatio												

ERROR MESSAGES

No errors to report.

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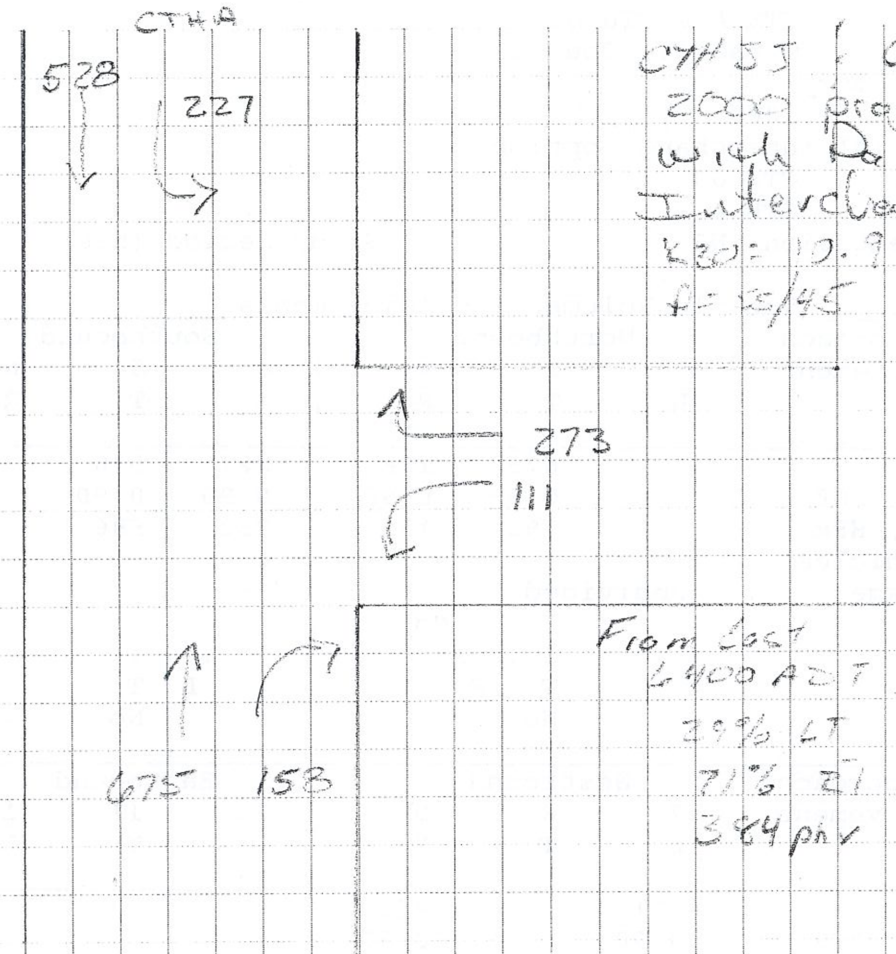
920-735-6900
1-800-571-6677
FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

From North
12600 ADT
30% LT
70% thru
735 phv

CTH JJ & CTH A
2000 projection
with Partial
Interchange
K30 = 10.9%, T(DHV) = 1.3
D = 55/45



From South
13900 ADT
81% thru
19% RT
833 phv

From East
6400 ADT
29% LT
71% RT
384 phv

Assume same % of turning movements as no interchange option

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2000 Projected
Project ID: Partial interchange option
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		675	158	227	528	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		750	175	252	586	
Percent Heavy Vehicles		--	--	9	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	111		273			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	123		303			
Percent Heavy Vehicles	9		9			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		252	123		303			
C(m) (vph)		711	51		400			
v/c		0.35	2.41		0.76			
95% queue length		1.60	12.65		6.20			
Control Delay		12.8	814.6		37.2			
LOS		B	F		E			
Approach Delay				261.6				
Approach LOS				F				

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2000
Project ID: Partial interchange option
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		675	158	227	528	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		188	44	63	147	
Hourly Flow Rate, HFR		750	175	252	586	
Percent Heavy Vehicles		--	--	9	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	111		273			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	31		76			
Hourly Flow Rate, HFR	123		303			
Percent Heavy Vehicles	9		9			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			No			
Lanes	1		1			
Configuration	L		R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			9	9		9			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		9	9		9			
t(f)		2.3	3.6		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		925	1840		750			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	750	
Potential Capacity	400	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	400	
Probability of Queue free St.	0.24	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	925	
Potential Capacity	711	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	711	
Probability of Queue free St.	0.65	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.65	0.65
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	1840	
Potential Capacity	79	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.65
Maj. L, Min T Adj. Imp Factor.		0.72
Cap. Adj. factor due to Impeding mvmnt	0.65	0.18
Movement Capacity	51	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.65	0.65
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	1840	
Potential Capacity	79	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.65
Maj. L, Min T Adj. Imp Factor.		0.72
Cap. Adj. factor due to Impeding mvmnt	0.65	0.18
Movement Capacity	51	

Results for Two-stage process:		
a		
y		
C t	51	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	123		303			
Movement Capacity (vph)	51		400			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	51		400			
Volume	123		303			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		252	123		303			
C(m) (vph)		711	51		400			
v/c		0.35	2.41		0.76			
95% queue length		1.60	12.65		6.20			
Control Delay		12.8	814.6		37.2			
LOS		B	F		E			
Approach Delay				261.6				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.65
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		12.8
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

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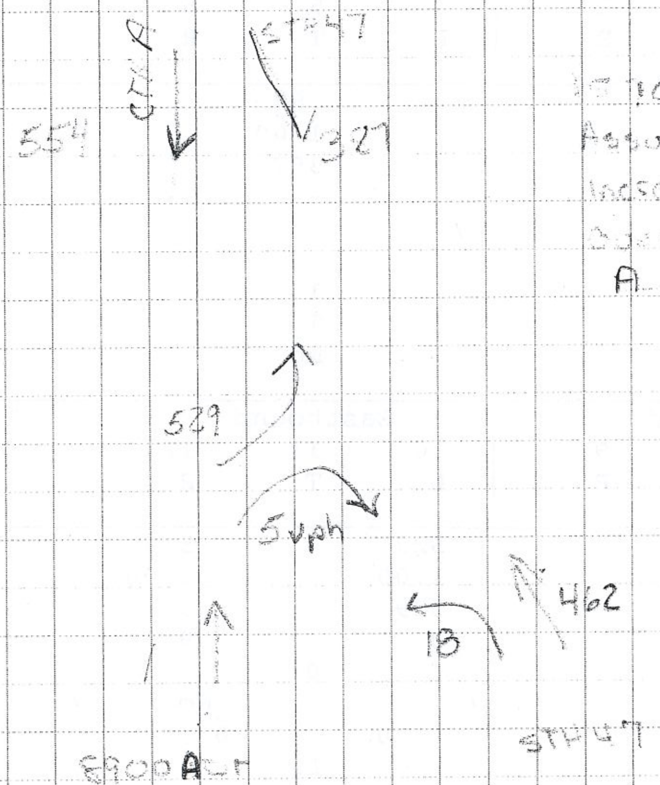
JOB NUMBER ______ SHEET NO. ______
CLIENT ______
PROJECT ______
MADE BY ______ DATE ______
CHECKED BY ______ DATE ______

STH 47 & CTH A Partial Interchange
2020

D = 55/45 K30 = 10.9 T(DHV) 8.9



15100 ADT 15700 x .55 x .109 = 941 vph
Assume CTH A South movement
Increase by 1500 ADT x .55 x .109 = 90
over No interchange option
A 464 + 90 47 941 - 554 = 387

8000 ADT
Assume LT turn same
as no interchange
8000 x .55 x .109 = 480

Assume RT turn same
as no interchange

8900 x .55 x .109 = 534

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, partial
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach	Northbound			Southbound		
	Movement	1	2	3	4	5	6
		L	T	R	L	T	R
Volume		18	462			387	
Peak-Hour Factor, PHF		1.00	1.00			1.00	
Hourly Flow Rate, HFR		18	462			387	
Percent Heavy Vehicles		9	--	--		--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes		0	1			1	
Configuration		LT				T	
Upstream Signal?			No			No	

Minor Street:	Approach	Westbound			Eastbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume					529		5
Peak Hour Factor, PHF					1.00		1.00
Hourly Flow Rate, HFR					529		5
Percent Heavy Vehicles					9		9
Percent Grade (%)			0			0	
Flared Approach:	Exists?/Storage			/		No	/
Lanes					0	0	
Configuration						LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						534	
C(m) (vph)	1134						304	
v/c	0.02						1.76	
95% queue length	0.05						34.55	
Control Delay	8.2						382.9	
LOS	A						F	
Approach Delay							382.9	
Approach LOS							F	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, partial
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	18	462			387	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Peak-15 Minute Volume	4	116			97	
Hourly Flow Rate, HFR	18	462			387	
Percent Heavy Vehicles	9	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				529		5
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				132		1
Hourly Flow Rate, HFR				529		5
Percent Heavy Vehicles				9		9
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	462	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		9					9		9
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2					6.5		6.3
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	9					9		9
t(f)	2.3					3.6		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	387					885		387
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		387
Potential Capacity		646
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		646
Probability of Queue free St.	1.00	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		387
Potential Capacity		1134
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1134
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		885
Potential Capacity		307
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		302

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		885
Potential Capacity		307
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		302
Results for Two-stage process:		
a		
y		
C t		302

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				529		5
Movement Capacity (vph)				302		646
Shared Lane Capacity (vph)					304	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				302		646
Volume				529		5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					304	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						534	
C(m) (vph)	1134						304	
v/c	0.02						1.76	
95% queue length	0.05						34.55	
Control Delay	8.2						382.9	
LOS	A						F	
Approach Delay							382.9	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	462	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	8.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

APPENDIX G

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PROJECT	
MADE BY	DATE
CHECKED BY	DATE

Full Interchange

USH 41 - CTH OO/STH 15 to CTH A

Assume straight line growth between existing 2000 count and 2020 projection

Capacity = 66,000 4 lanes

$$\frac{x-2000}{2020-2000} = \frac{66{,}000-55400}{71000-55400} \qquad x = 2014$$

2020 projection 71,000 $k_{30} = 10.9$ T(OHV) = 10.7

D = 55/45

Peak hr one direction = 71,000 × .55 × .109 = 4256 vph

USH 41 CTH A to STH 47

$$\frac{x-2000}{2020-2000} = \frac{66{,}000-55400}{72000-55400} \qquad x = 2013$$

Peak hr one direction 72000 × .55 .109 = 4316 vph

USH 41 east of STH 47 78000 × .55 × .109 = 4676 vph

Ramp junctions

CTH A SB ON Ramp

6500 ADT 6500 × .109 = 709 vph

29000 ADT 41 prior to ramp 29000 × .109 = 3161 vph

CTH A NB off Ramp

6500 ADT Ramp 709 vph

35500 ADT USH 41 35500 × .109 = 3870

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JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

CTH A SB OFF
7000 ADT   7000 x .109 = 763 phv
36000 ADT 41   36000 x .109 = 3924 phv

CTH A NB ON
7000 ADT   763 phv
29000 ADT 41   29000 x .109 = 3161

STH 47 SB ON Ramp
3500 ADT   3500 x .109 = 382 phv
32500 ADT 41   32500 x .109 = 3543 phv

STH 47 NB OFF Ramp
3500 ADT   382
36000 ADT 41   36000 x .109 = 3924 phv

STH 47 SB OFF Ramp
6500 ADT   6500 x .109 = 709 phv
39000 ADT 41   39000 x .109 = 4251

STH 47 NB ON Ramp
6500 ADT   709 phv
32500   3543 phv

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 15
Jurisdiction:	
Analysis Year:	2020

Description: Full Interchange 4 lanes

Flow Inputs and Adjustments

Volume, V	4256	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1182	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	2494	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2494	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 15
Jurisdiction:	
Analysis Year:	2020
Description:	Full Interchange 6 lanes

Flow Inputs and Adjustments

Volume, V	4256	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1182	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	1663	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1663	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	61.9	mi/h
Number of lanes, N	3	
Density, D	26.9	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 47
Jurisdiction:	
Analysis Year:	2020
Description:	Full Interchange 4 lanes

Flow Inputs and Adjustments

Volume, V	4316	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1199	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	2530	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2530	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	southbound
From/To:	CTH A to STH 47
Jurisdiction:	
Analysis Year:	2020

Description: Full Interchange 6 lanes

Flow Inputs and Adjustments

Volume, V	4316	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1199	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	1686	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1686	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	61.9	mi/h
Number of lanes, N	3	
Density, D	27.3	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	oneway
From/To:	STH 47 East
Jurisdiction:	
Analysis Year:	2020

Description: Full Interchange 4 lanes

Flow Inputs and Adjustments

Volume, V	4676	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1299	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	2741	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	60.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2741	pc/h/ln
Free-flow speed, FFS	60.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln

Level of service, LOS	F

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Basic Freeway Segments Release 4.1d

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	MAH
Agency or Company:	OMNNI
Date Performed:	6/28/04
Analysis Time Period:	
Freeway/Direction:	oneway
From/To:	STH 47 East
Jurisdiction:	
Analysis Year:	2020
Description:	Full Interchange 6 lanes

Flow Inputs and Adjustments

Volume, V	4676	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1299	v
Trucks and buses	11	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.948	
Driver population factor, fp	1.00	
Flow rate, vp	1827	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	62.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1827	pc/h/ln
Free-flow speed, FFS	62.0	mi/h
Average passenger-car speed, S	61.2	mi/h
Number of lanes, N	3	
Density, D	29.8	pc/mi/ln

Level of service, LOS	D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	OMNNI
Date performed:	6/28/04
Analysis time period:	
Freeway/Dir of Travel:	SB USH 41
Junction:	STH 47 SB On ramp
Jurisdiction:	
Analysis Year:	2020

Description: STH 47 SB On-ramp 2020 4 lanes Fu

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3543	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	382	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3543		382			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	984		106			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4153	448	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 4153 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4601	4700	No
v_{R12}	4601	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 36.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 0.627

Space mean speed in ramp influence area, S_R = 50.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 50.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	OMNNI
Date performed:	6/28/04
Analysis time period:	
Freeway/Dir of Travel:	SB USH 41
Junction:	STH 47 SB On ramp
Jurisdiction:	
Analysis Year:	2020
Description:	STH 47 SB On-ramp 2020 6 lanes Fu

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3543	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	382	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3543		382			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	984		106			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4153	448	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2486 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4601	7050	No
v_{R12}	2934	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.312	
Space mean speed in ramp influence area,	S_R = 57.8	mph
Space mean speed in outer lanes,	S_0 = 60.8	mph
Space mean speed for all vehicles,	S = 58.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Northbound
Junction: STH 47 NB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: STH 47 NB Off Ramp 4 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	382	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3924		382			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1090		106			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4600	448	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4600 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4600	4700	No
v_{12}	4600	4400	Yes
$v_{FO} = v_F - v_R$	4152	4700	No
v_R	448	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 41.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.273

Space mean speed in ramp influence area, S_R = 58.7 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 58.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 Northbound
Junction:	STH 47 NB off Ramp
Jurisdiction:	
Analysis Year:	2020

Description: STH 47 NB Off Ramp 6 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	382	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3924		382			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1090		106			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4600	448	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.624 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3040 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4600	7050	No
v_{12}	3040	4400	No
$v_{FO} = v_F - v_R$	4152	7050	No
v_R	448	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 28.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.273

Space mean speed in ramp influence area, S_R = 58.7 mph

Space mean speed in outer lanes, S_0 = 69.1 mph

Space mean speed for all vehicles, S = 61.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 Southbound
Junction:	STH 47 SB off Ramp
Jurisdiction:	
Analysis Year:	2020

Description: STH 47 SB Off Ramp 4 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4251	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4251		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1181		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4983	831	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4983 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4983	4700	Yes
v_{12}	4983	4400	Yes
$v_{FO} = v_F - v_R$	4152	4700	No
v_R	831	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 45.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.308	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Southbound
Junction: STH 47 SB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: STH 47 SB Off Ramp 6 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4251	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4251		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1181		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4983	831	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.597 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3311 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4983	7050	No
v_{12}	3311	4400	No
$v_{FO} = v_F - v_R$	4152	7050	No
v_R	831	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 30.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.308

Space mean speed in ramp influence area, S_R = 57.9 mph

Space mean speed in outer lanes, S_0 = 68.7 mph

Space mean speed for all vehicles, S = 61.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.: OMNNI
Date performed: 6/28/04
Analysis time period:
Freeway/Dir of Travel: NB USH 41
Junction: STH 47 NB On ramp
Jurisdiction:
Analysis Year: 2020
Description: STH 47 NB On-ramp 2020 4 lanes Fu

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3543	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp
Volume, V (vph)	3543	709	vph
Peak-hour factor, PHF	0.90	0.90	
Peak 15-min volume, v15	984	197	v
Trucks and buses	11	11	%
Recreational vehicles	0	0	%
Terrain type:	Level	Level	
Grade	%	%	%
Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4153	831	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F \; (P_{FM})$ = 4153 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4984	4700	Yes
v_{R12}	4984	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 39.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M_S = 0.808	
Space mean speed in ramp influence area,	S_R = 46.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 46.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	OMNNI
Date performed:	6/28/04
Analysis time period:	
Freeway/Dir of Travel:	NB USH 41
Junction:	STH 47 NB On ramp
Jurisdiction:	
Analysis Year:	2020

Description: STH 47 NB On-ramp 2020 6 lanes Fu

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3543	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3543		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	984		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4153	831	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2486 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4984	7050	No
v_{R12}	3317	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 26.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.346	
Space mean speed in ramp influence area,	S_R = 57.0	mph
Space mean speed in outer lanes,	S_0 = 60.8	mph
Space mean speed for all vehicles,	S = 58.2	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.: OMNNI
Date performed: 6/28/04
Analysis time period:
Freeway/Dir of Travel: SB USH 41
Junction: CTH A SB On ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A SB On-ramp 2020 4 lanes Ful

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3161	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3161		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	878		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3705	831	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3705 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4536	4700	No
v_{R12}	4536	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 35.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, M_S = 0.602

Space mean speed in ramp influence area, S_R = 51.1 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 51.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	OMNNI
Date performed:	6/28/04
Analysis time period:	
Freeway/Dir of Travel:	SB USH 41
Junction:	CTH A SB On ramp
Jurisdiction:	
Analysis Year:	2020

Description: CTH A SB On-ramp 2020 6 lanes Ful

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3161	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3161		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	878		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5*		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3705	831	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2217 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4536	7050	No
v_{R12}	3048	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.321

Space mean speed in ramp influence area, S_R = 57.6 mph

Space mean speed in outer lanes, S_0 = 61.4 mph

Space mean speed for all vehicles, S = 58.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	MAH
Agency/Co.:	
Date performed:	6/29/2004
Analysis time period:	
Freeway/Dir of Travel:	USH 41 Northbound
Junction:	CTH A NB off Ramp
Jurisdiction:	
Analysis Year:	2020

Description: CTH A NB Off Ramp 4 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3870	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3870		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1075		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4537	831	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4537 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4537	4700	No
v_{12}	4537	4400	Yes
$v_{FO} = v_F - v_R$	3706	4700	No
v_R	831	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 41.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.308	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Northbound
Junction: CTH A NB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A NB Off Ramp 6 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3870	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	709	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3870		709			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1075		197			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4537	831	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.608 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3086 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4537	7050	No
v_{12}	3086	4400	No
$v_{FO} = v_F - v_R$	3706	7050	No
v_R	831	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 28.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.308

Space mean speed in ramp influence area, S_R = 57.9 mph

Space mean speed in outer lanes, S_0 = 69.5 mph

Space mean speed for all vehicles, S = 61.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Southbound
Junction: CTH A SB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A SB Off Ramp 4 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	763	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3924		763			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1090		212			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4600	894	pcph

Estimation of V12 Diverge Areas

$L_{EQ} =$ (Equation 25-8 or 25-9)

$P_{FD} =$ 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD} =$ 4600 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4600	4700	No
v_{12}	4600	4400	Yes
$v_{FO} = v_F - v_R$	3706	4700	No
v_R	894	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D =$ 41.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, $D_S = 0.313$

Space mean speed in ramp influence area, $S_R = 57.8$ mph

Space mean speed in outer lanes, $S_0 =$ N/A mph

Space mean speed for all vehicles, $S = 57.8$ mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: MAH
Agency/Co.:
Date performed: 6/29/2004
Analysis time period:
Freeway/Dir of Travel: USH 41 Southbound
Junction: CTH A SB off Ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A SB Off Ramp 6 lanes Full

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	50.0	mph
Volume on ramp	763	vph
Length of first accel/decel lane	212	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3924		763			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1090		212			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4600	894	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.604 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3132 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4600	7050	No
v_{12}	3132	4400	No
$v_{FO} = v_F - v_R$	3706	7050	No
v_R	894	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 29.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.313

Space mean speed in ramp influence area, S_R = 57.8 mph

Space mean speed in outer lanes, S_0 = 69.5 mph

Space mean speed for all vehicles, S = 61.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	MAH
Agency/Co.:	OMNNI
Date performed:	6/28/04
Analysis time period:	
Freeway/Dir of Travel:	NB USH 41
Junction:	CTH A NB On ramp
Jurisdiction:	
Analysis Year:	2020

Description: CTH A NB On-ramp 2020 4 lanes Ful

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3161	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	763	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3161		763			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	878		212			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3705	894	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3705 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4599	4700	No
v_{R12}	4599	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 36.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable,	M_S = 0.626		
Space mean speed in ramp influence area,	S_R = 50.6	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 50.6	mph	

HCS2000: Ramps and Ramp Junctions Release 4.1d

Phone: Fax:
E-mail:

Merge Analysis

Analyst: MAH
Agency/Co.: OMNNI
Date performed: 6/28/04
Analysis time period:
Freeway/Dir of Travel: NB USH 41
Junction: CTH A NB On ramp
Jurisdiction:
Analysis Year: 2020
Description: CTH A NB On-ramp 2020 6 lanes Ful

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3161	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	763	vph
Length of first accel/decel lane	750	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3161		763			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	878		212			v
Trucks and buses	11		11			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade		%		%	%	
Length		mi		mi	mi	
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.948	0.948	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3705	894	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.599 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2217 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4599	7050	No
v_{R12}	3111	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.326	
Space mean speed in ramp influence area,	S_R = 57.5	mph
Space mean speed in outer lanes,	S_0 = 61.4	mph
Space mean speed for all vehicles,	S = 58.7	mph

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OMNNI ASSOCIATES
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JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

CTH JJ & CTH A
2020 Full Interchange
$K_{30} = 10.7$ T(DHV) = 10.0
D = 55/45

CTH A

From North
18700 ADT
1100 phv
30 LT
70% Thru

770 330

251

102

From South
24400 ADT
1436 phv
81% thru
19% RT

1163 273

From East
6000 ADT
353 phv
29% LT
71% RT

Assume same % of turning movements as 2020 No Interchange option.

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2020
Project ID: Full interchange option
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume		1163	273	330	770	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		1292	303	366	855	
Percent Heavy Vehicles		--	--	10	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	102		251			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	113		278			
Percent Heavy Vehicles	10		10			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		366	113		278			
C(m) (vph)		389	1		191			
v/c		0.94	113.00		1.46			
95% queue length		10.37	16.56		17.01			
Control Delay		64.9	57407		277.5			
LOS		F	F		F			
Approach Delay				16788				
Approach LOS				F				

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/14/04
Analysis Time Period:
Intersection: CTH A & CTH JJ
Jurisdiction: Outagamie County
Units: U. S. Customary
Analysis Year: 2020
Project ID: Full interchange option
East/West Street: CTH JJ
North/South Street: CTH A
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		1163	273	330	770	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		323	76	92	214	
Hourly Flow Rate, HFR		1292	303	366	855	
Percent Heavy Vehicles		--	--	10	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	102		251			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	28		70			
Hourly Flow Rate, HFR	113		278			
Percent Heavy Vehicles	10		10			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			No			
Lanes	1		1			
Configuration	L		R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			10	10		10			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		10	10		10			
t(f)		2.3	3.6		3.4			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

```
Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)
_______________________________________________________________________
Computation 2-Proportion of TWSC Intersection Time  blocked
                                    Movement 2          Movement 5
                                 V(t)   V(l,prot)  V(t)   V(l,prot)
_______________________________________________________________________
alpha
beta
Travel time, t(a) (sec)
Smoothing Factor, F
Proportion of conflicting flow, f
Max platooned flow, V(c,max)
Min platooned flow, V(c,min)
Duration of blocked period, t(p)
Proportion time blocked, p             0.000            0.000
_______________________________________________________________________
Computation 3-Platoon Event Periods    Result
_______________________________________________________________________
p(2)                                   0.000
p(5)                                   0.000
p(dom)
p(subo)
Constrained or unconstrained?
_______________________________________________________________________
Proportion
unblocked              (1)           (2)           (3)
for minor          Single-stage      Two-Stage Process
movements, p(x)      Process       Stage I       Stage II
_______________________________________________________________________
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
_______________________________________________________________________
Computation 4 and 5
Single-Stage Process
Movement               1     4     7     8     9    10    11    12
                       L     L     L     T     R     L     T     R
_______________________________________________________________________
V c,x                       1595  2879        1292
s
Px
V c,u,x
_______________________________________________________________________
C r,x
C plat,x
_______________________________________________________________________
Two-Stage Process
                    7             8             10            11
```

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	1292	
Potential Capacity	191	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	191	
Probability of Queue free St.	0.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	1595	
Potential Capacity	389	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	389	
Probability of Queue free St.	0.06	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.06	0.06
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	2879	
Potential Capacity	17	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.06
Maj. L, Min T Adj. Imp Factor.		0.16
Cap. Adj. factor due to Impeding mvmnt	0.06	0.00
Movement Capacity	1	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.06	0.06
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	2879	
Potential Capacity	17	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.06
Maj. L, Min T Adj. Imp Factor.		0.16
Cap. Adj. factor due to Impeding mvmnt	0.06	0.00
Movement Capacity	1	

Results for Two-stage process:		
a		
y		
C t	1	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	113		278			
Movement Capacity (vph)	1		191			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	1		191			
Volume	113		278			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		366	113		278			
C(m) (vph)		389	1		191			
v/c		0.94	113.00		1.46			
95% queue length		10.37	16.56		17.01			
Control Delay		64.9	57407		277.5			
LOS		F	F		F			
Approach Delay				16788				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.06
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		64.9
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Signalized Intersections Release 4.1d

Analyst: MAH
Agency:
Date: 6/14/2004
Period:
Project ID: CTH A & CTH JJ (East), 2020 Full, Exist Geometry
E/W St: CTH JJ

Inter.: CTH A & CTH JJ East
Area Type: All other areas
Jurisd: Outagamie County
Year : 2020
N/S St: CTH A

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
LGConfig				L		R		T	R	L	T	
Volume				102		251		1163	273	330	770	
Lane Width				12.0		12.0		12.0	12.0	12.0	12.0	
RTOR Vol						0			160			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left				
Thru						Thru		P		
Right						Right		P		
Peds						Peds				
WB Left	P				SB	Left	P	P		
Thru						Thru	P	P		
Right	P					Right				
Peds						Peds				
NB Right	P				EB	Right				
SB Right					WB	Right				
Green	25.0						12.0	40.0		
Yellow	3.0						3.0	3.0		
All Red	2.0						0.0	2.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	501	1805	0.23	0.28	26.1	C		
							32.2	C
R	449	1615	0.62	0.28	34.7	C		
Northbound								
T	844	1900	1.53	0.44	269.9	F	246.1	F
R	1256	1615	0.10	0.78	2.6	A		
Southbound								
L	326	1805	1.13	0.61	115.9	F		
T	1161	1900	0.74	0.61	16.6	B	46.4	D

Intersection Delay = 137.9 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: MAH
Agency/Co.:
Date Performed: 6/14/2004
Analysis Time Period:
Intersection: CTH A & CTH JJ East
Area Type: All other areas
Jurisdiction: Outagamie County
Analysis Year: 2020
Project ID: CTH A & CTH JJ (East), 2020 Full, Exist Geometry

East/West Street: CTH JJ
North/South Street: CTH A

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				102		251		1163	273	330	770	
% Heavy Veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
PK 15 Vol				28		70		323	76	92	214	
Hi Ln Vol												
% Grade					0			0			0	
Ideal Sat				1900		1900		1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
LGConfig				L		R		T	R	L	T	
Lane Width				12.0		12.0		12.0	12.0	12.0	12.0	
RTOR Vol						0			160			
Adj Flow				113		279		1292	126	367	856	
%InSharedLn												
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.000	1.000		0.000	
Peds Bikes	0			0			0					
Buses				0		0		0	0	0	0	
%InProtPhase										0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0	0.0	0.0	0.0	
Arriv. Type				3		3		3	3	3	3	
Unit Ext.				3.0		3.0		3.0	3.0	3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0	2.0	2.0	2.0	
Ext of g				2.0		2.0		2.0	2.0	2.0	2.0	

Ped Min g					

PHASE DATA

Phase Combination	1	2	3	4			5	6	7	8
EB	Left					NB	Left			
	Thru						Thru		P	
	Right						Right		P	
	Peds						Peds			
WB	Left	P				SB	Left	P	P	
	Thru						Thru	P	P	
	Right	P					Right			
	Peds						Peds			
NB	Right	P				EB	Right			
SB	Right					WB	Right			

	1	2	3	4	5	6	7	8
Green	25.0				12.0	40.0		
Yellow	3.0				3.0	3.0		
All Red	2.0				0.0	2.0		

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V				102		251		1163	273	330	770	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Adj flow				113		279		1292	126	367	856	
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
Lane group				L		R		T	R	L	T	
Adj flow				113		279		1292	126	367	856	
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.000	1.000		0.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG				L		R		T	R	L	T	
So				1900		1900		1900	1900	1900	1900	
Lanes	0	0	0	1	0	1	0	1	1	1	1	0
fW				1.000		1.000		1.000	1.000	1.000	1.000	
fHV				1.000		1.000		1.000	1.000	1.000	1.000	
fG				1.000		1.000		1.000	1.000	1.000	1.000	
fP				1.000		1.000		1.000	1.000	1.000	1.000	
fBB				1.000		1.000		1.000	1.000	1.000	1.000	
fA				1.00		1.00		1.00	1.00	1.00	1.00	
fLU				1.00		1.00		1.00	1.00	1.00	1.00	
fRT						0.850		1.000	0.850		1.000	
fLT				0.950				1.000		0.950	1.000	
Sec.										0.093		
fLpb				1.000				1.000		1.000	1.000	
fRpb						1.000		1.000	1.000		1.000	
S				1805		1615		1900	1615	1805	1900	
Sec.										177		

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Westbound							
Prot							
Perm							
Left	L	113	1805	0.06	0.28	501	0.23
Prot							
Perm							
Thru							
Right	R	279	1615	# 0.17	0.28	449	0.62
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	1292	1900	0.68	0.44	844	1.53
Right	R	126	1615	0.08	0.78	1256	0.10
Southbound							
Prot		241	1805	# 0.13	0.133	241	1.00
Perm		126	177	# 0.71	0.478	85	1.48
Left	L	367			0.61	326	1.13
Prot							
Perm							
Thru	T	856	1900	0.45	0.61	1161	0.74
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.02
Total lost time per cycle, L = 10.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.15

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound												
Westbound												
L	0.23	0.28	25.0	1.000	501	0.50	1.0	0.0	26.1	C	32.2	C
R	0.62	0.28	28.4	1.000	449	0.50	6.3	0.0	34.7	C		
Northbound												
T	1.53	0.44	25.0	1.000	844	0.50	244.9	0.0	269.9	F	246.1	F
R	0.10	0.78	2.4	1.000	1256	0.50	0.2	0.0	2.6	A		
Southbound												
L	1.13	0.61	27.7	1.000	326	0.50	88.3	0.0	115.9	F		

```
T    0.74  0.61  12.4  1.000 1161  0.50   4.2   0.0   16.6   B    46.4   D
_____________________________________________________________________________
        Intersection delay = 137.9 (sec/veh)   Intersection LOS = F


_____________________SUPPLEMENTAL PERMITTED LT WORKSHEET_______________________
                              for exclusive lefts
Input
                                                      EB     WB     NB     SB
Cycle length, C                                 90.0   sec
Total actual green time for LT lane group, G (s)                          55.0
Effective permitted green time for LT lane group, g(s)                    43.0
Opposing effective green time, go (s)                                     40.0
Number of lanes in LT lane group, N                                       1
Number of lanes in opposing approach, No                                  1
Adjusted LT flow rate, VLT (veh/h)                                        367
Proportion of LT in LT lane group, PLT                                    1.000
Proportion of LT in opposing flow, PLTo                                   0.00
Adjusted opposing flow rate, Vo (veh/h)                                   1292
Lost time for LT lane group, tL                                           5.00
Computation
LT volume per cycle, LTC=VLTC/3600                                        9.18
Opposing lane util. factor, fLUo                                   1.00   1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)                       32.30
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g                                     0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)                         1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]                              0.56
gq, (see Exhibit C16-4,5,6,7,8)                                           37.42
gu=g-gq if gq>=gf, or = g-gf if gq<gf                                     5.58
n=Max(gq-gf)/2,0)                                                         18.71
PTHo=1-PLTo                                                               1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]                                        1.00
EL1 (refer to Exhibit C16-3)                                              4.38
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g                                        0.09
gdiff=max(gq-gf,0)                                                        0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)                       0.09
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT                                                 0.093

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.
_____________________SUPPLEMENTAL PERMITTED LT WORKSHEET_______________________
                                for shared lefts
Input
                                                      EB     WB     NB     SB
Cycle length, C                                 90.0   sec
Total actual green time for LT lane group, G (s)
Effective permitted green time for LT lane group, g(s)
Opposing effective green time, go (s)
Number of lanes in LT lane group, N
Number of lanes in opposing approach, No
```

```
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT                             0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo                                   1.00  1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_______________SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET_______________
Permitted Left Turns
                                                          EB    WB    NB    SB
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Pedestrian flow rate, Vpedg (p/h)
OCCpedg
Opposing queue clearing green, gq (s)
Eff. ped. green consumed by opp. veh. queue, gq/gp
OCCpedu
Opposing flow rate, Vo (veh/h)
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion of left turns, PLT
Proportion of left turns using protected phase, PLTA
Left-turn adjustment, fLpb
Permitted Right Turns
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Conflicting bicycle volume, Vbic (bicycles/h)
Vpedg
OCCpedg
Effective green, g (s)
Vbicg
OCCbicg
```

OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						367
v/c ratio from Capacity Worksheet, X						1.13
Protected phase effective green interval, g (s)						12.0
Opposing queue effective green interval, gq						37.42
Unopposed green interval, gu						5.58
Red time r=(C-g-gq-gu)						35.0
Arrival rate, qa=v/(3600(max[X,1.0]))						0.09
Protected ph. departure rate, Sp=s/3600						0.501
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						0.38
XPerm						1.84
XProt						0.71
Case						3
Queue at beginning of green arrow, Qa						4.95
Queue at beginning of unsaturated green, Qu						3.39
Residual queue, Qr						1.78
Uniform Delay, d1						27.7

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 137.9 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

Eastbound	Westbound	Northbound	Southbound

LaneGroup				L		R		T	R	L	T	
Init Queue				0.0		0.0		0.0	0.0	0.0	0.0	
Flow Rate				113		279		1292	126	367	856	
So				1900		1900		1900	1900	1900	1900	
No.Lanes	0	0	0	1	0	1	0	1	1	1	1	0
SL				1805		1615		1900	1615	532	1900	
LnCapacity				501		449		844	1256	326	1161	
Flow Ratio				0.06		0.17		0.68	0.08	0.69	0.45	
v/c Ratio				0.23		0.62		1.53	0.10	1.13	0.74	
Grn Ratio				0.28		0.28		0.44	0.78	0.61	0.61	
I Factor					1.000			1.000			1.000	
AT or PVG				3		3		3	3	3	3	
Pltn Ratio				1.00		1.00		1.00	1.00	1.00	1.00	
PF2				1.00		1.00		1.00	1.00	1.00	1.00	
Q1				2.2		6.1		32.3	0.8	4.1	15.1	
kB				0.7		0.7		1.0	1.3	0.5	1.3	
Q2				0.2		1.0		58.8	0.1	8.1	3.3	
Q Average				2.4		7.1		91.1	0.9	12.2	18.4	
Q Spacing				25.0		25.0		25.0	25.0	25.0	25.0	
Q Storage				0		0		0	0	0	0	
Q S Ratio												
70th Percentile Output:												
fB%				1.3		1.2		1.2	1.3	1.2	1.2	
BOQ				3.0		8.7		109	1.2	14.7	22.2	
QSRatio												
85th Percentile Output:												
fB%				1.6		1.5		1.4	1.7	1.4	1.4	
BOQ				3.8		10.5		128	1.5	17.4	25.9	
QSRatio												
90th Percentile Output:												
fB%				1.8		1.6		1.5	1.9	1.5	1.5	
BOQ				4.3		11.5		137	1.7	18.8	27.9	
QSRatio												
95th Percentile Output:												
fB%				2.2		1.8		1.6	2.4	1.7	1.6	
BOQ				5.3		13.1		146	2.2	20.6	29.9	
QSRatio												
98th Percentile Output:												
fB%				2.6		2.1		1.7	3.0	1.8	1.7	
BOQ				6.3		14.7		155	2.7	22.3	32.0	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Signalized Intersections Release 4.1d

Analyst: MAH
Agency:
Date: 6/14/2004
Period:
Project ID: CTH A & CTH JJ (East), 2020 Full, Add Lanes
E/W St: CTH JJ

Inter.: CTH A & CTH JJ East
Area Type: All other areas
Jurisd: Outagamie County
Year : 2020
N/S St: CTH A

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Volume				102		251		1163	273	330	770	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left				
Thru						Thru		P		
Right						Right		P		
Peds						Peds				
WB Left	P				SB	Left	P	P		
Thru						Thru	P	P		
Right	P					Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right	P			
Green	22.0						15.0	40.0		
Yellow	3.0						3.0	3.0		
All Red	2.0						0.0	2.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	441	1805	0.26	0.24	28.8	C		
							20.3	C
R	754	1615	0.37	0.47	16.9	B		
Northbound								
TR	1583	3562	0.90	0.44	31.4	C	31.4	C
Southbound								
DefL	386	1805	0.95	0.64	62.1	E		
T	1224	1900	0.70	0.64	13.7	B	28.2	C

Intersection Delay = 28.7 (sec/veh) Intersection LOS = C

HCS2000: Signalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: MAH
Agency/Co.:
Date Performed: 6/14/2004
Analysis Time Period:
Intersection: CTH A & CTH JJ East
Area Type: All other areas
Jurisdiction: Outagamie County
Analysis Year: 2020
Project ID: CTH A & CTH JJ (East), 2020 Full, Add Lanes

East/West Street	North/South Street
CTH JJ	CTH A

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				102		251		1163	273	330	770	
% Heavy Veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
PK 15 Vol				28		70		323	76	92	214	
Hi Ln Vol												
% Grade					0			0			0	
Ideal Sat				1900		1900		1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
LGConfig				L		R		TR		DefL	T	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			160			
Adj Flow				113		279		1418		367	856	
%InSharedLn												
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.089			0.000	
Peds Bikes	0			0			0					
Buses				0		0		0		0	0	
%InProtPhase										0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0		0.0	0.0	
Arriv. Type				3		3		3		3	3	
Unit Ext.				3.0		3.0		3.0		3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0		2.0	2.0	
Ext of g				2.0		2.0		2.0		2.0	2.0	

Ped Min g				

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left					NB	Left				
	Thru						Thru		P		
	Right						Right		P		
	Peds						Peds				
WB	Left	P				SB	Left	P	P		
	Thru						Thru	P	P		
	Right	P					Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	P			
Green		22.0						15.0	40.0		
Yellow		3.0						3.0	3.0		
All Red		2.0						0.0	2.0		

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V				102		251		1163	273	330	770	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Adj flow				113		279		1292	126	367	856	
No. Lanes	0	0	0	1	0	1	0	2	0	0	2	0
Lane group				L		R		TR		DefL	T	
Adj flow				113		279		1418		367	856	
Prop LTs								0.000		1.000	0.000	
Prop RTs						1.000		0.089			0.000	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG				L		R		TR		DefL	T	
So				1900		1900		1900		1900	1900	
Lanes	0	0	0	1	0	1	0	2	0	0	2	0
fW				1.000		1.000		1.000		1.000	1.000	
fHV				1.000		1.000		1.000		1.000	1.000	
fG				1.000		1.000		1.000		1.000	1.000	
fP				1.000		1.000		1.000		1.000	1.000	
fBB				1.000		1.000		1.000		1.000	1.000	
fA				1.00		1.00		1.00		1.00	1.00	
fLU				1.00		1.00		0.95		1.00	1.00	
fRT						0.850		0.987			1.000	
fLT				0.950				1.000		0.950	1.000	
Sec.										0.093		
fLpb				1.000				1.000		1.000	1.000	
fRpb						1.000		1.000			1.000	
S				1805		1615		3562		1805	1900	
Sec.										177		

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Westbound							
Prot							
Perm							
Left	L	113	1805	# 0.06	0.24	441	0.26
Prot							
Perm							
Thru							
Right	R	279	1615	0.17	0.47	754	0.37
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	TR	1418	3562	# 0.40	0.44	1583	0.90
Right							
Southbound							
Prot		301	1805	0.17	0.167	301	1.00
Perm		66	177	0.37	0.478	85	0.78
Left	DefL	367			0.64	386	0.95
Prot							
Perm							
Thru	T	856	1900	# 0.45	0.64	1224	0.70
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.91
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.09

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
Westbound												
L	0.26	0.24	27.4	1.000	441	0.50	1.4	0.0	28.8	C	20.3	C
R	0.37	0.47	15.5	1.000	754	0.50	1.4	0.0	16.9	B		
Northbound												
TR	0.90	0.44	23.1	1.000	1583	0.50	8.3	0.0	31.4	C	31.4	C
Southbound												
DefL	0.95	0.64	27.2	1.000	386	0.50	34.9	0.0	62.1	E		

T	0.70	0.64	10.4	1.000	1224	0.50	3.3	0.0	13.7	B	28.2	C

Intersection delay = 28.7 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Cycle length, C	90.0 sec				
Total actual green time for LT lane group, G (s)					58.0
Effective permitted green time for LT lane group, g(s)					43.0
Opposing effective green time, go (s)					40.0
Number of lanes in LT lane group, N					1
Number of lanes in opposing approach, No					2
Adjusted LT flow rate, VLT (veh/h)					367
Proportion of LT in LT lane group, PLT					1.000
Proportion of LT in opposing flow, PLTo					0.00
Adjusted opposing flow rate, Vo (veh/h)					1418
Lost time for LT lane group, tL					5.00
Computation					
LT volume per cycle, LTC=VLTC/3600					9.18
Opposing lane util. factor, fLUo				1.00	0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					18.66
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					0.56
gq, (see Exhibit C16-4,5,6,7,8)					35.41
gu=g-gq if gq>=gf, or = g-gf if gq<gf					7.59
n=Max(gq-gf)/2,0)					17.71
PTHo=1-PLTo					1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					1.00
EL1 (refer to Exhibit C16-3)					5.31
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					0.09
gdiff=max(gq-gf,0)					0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					0.09
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					0.093

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Cycle length, C	90.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					

```
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT                                  0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo                                        1.00  0.95
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
  left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

______________SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET______________
Permitted Left Turns
                                                          EB    WB    NB    SB
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Pedestrian flow rate, Vpedg (p/h)
OCCpedg
Opposing queue clearing green, gq (s)
Eff. ped. green consumed by opp. veh. queue, gq/gp
OCCpedu
Opposing flow rate, Vo (veh/h)
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion of left turns, PLT
Proportion of left turns using protected phase, PLTA
Left-turn adjustment, fLpb
Permitted Right Turns
Effective pedestrian green time, gp (s)
Conflicting pedestrian volume, Vped (p/h)
Conflicting bicycle volume, Vbic (bicycles/h)
Vpedg
OCCpedg
Effective green, g (s)
Vbicg
OCCbicg
```

OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						367
v/c ratio from Capacity Worksheet, X						0.95
Protected phase effective green interval, g (s)						15.0
Opposing queue effective green interval, gq						35.41
Unopposed green interval, gu						7.59
Red time r=(C-g-gq-gu)						32.0
Arrival rate, qa=v/(3600(max[X,1.0]))						0.10
Protected ph. departure rate, Sp=s/3600						0.501
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						0.28
XPerm						2.07
XProt						0.64
Case						3
Queue at beginning of green arrow, Qa						5.53
Queue at beginning of unsaturated green, Qu						3.61
Residual queue, Qr						2.27
Uniform Delay, d1						27.2

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 28.7 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound

LaneGroup				L		R		TR		DefL	T	
Init Queue				0.0		0.0		0.0		0.0	0.0	
Flow Rate				113		279		746		367	856	
So				1900		1900		1900		1900	1900	
No.Lanes	0	0	0	1	0	1	0	2	0	0	2	0
SL				1805		1615		1874		598	1900	
LnCapacity				441		754		833		386	1224	
Flow Ratio				0.06		0.17		0.40		0.61	0.45	
v/c Ratio				0.26		0.37		0.90		0.95	0.70	
Grn Ratio				0.24		0.47		0.44		0.64	0.64	
I Factor					1.000			1.000			1.000	
AT or PVG				3		3		3		3	3	
Pltn Ratio				1.00		1.00		1.00		1.00	1.00	
PF2				1.00		1.00		1.00		1.00	1.00	
Q1				2.3		4.5		17.2		3.9	13.9	
kB				0.6		0.9		1.0		0.6	1.3	
Q2				0.2		0.5		5.7		4.1	2.9	
Q Average				2.5		5.0		22.9		8.0	16.7	
Q Spacing				25.0		25.0		25.0		25.0	25.0	
Q Storage				0		0		0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%				1.3		1.2		1.2		1.2	1.2	
BOQ				3.1		6.2		27.5		9.8	20.1	
QSRatio												
85th Percentile Output:												
fB%				1.6		1.5		1.4		1.5	1.4	
BOQ				4.0		7.6		32.1		11.7	23.6	
QSRatio												
90th Percentile Output:												
fB%				1.8		1.7		1.5		1.6	1.5	
BOQ				4.5		8.5		34.4		12.8	25.4	
QSRatio												
95th Percentile Output:												
fB%				2.2		2.0		1.6		1.8	1.6	
BOQ				5.5		9.9		36.8		14.4	27.4	
QSRatio												
98th Percentile Output:												
fB%				2.6		2.2		1.7		2.0	1.8	
BOQ				6.5		11.3		39.2		16.0	29.3	
QSRatio												

ERROR MESSAGES

No errors to report.

ENGINEERING
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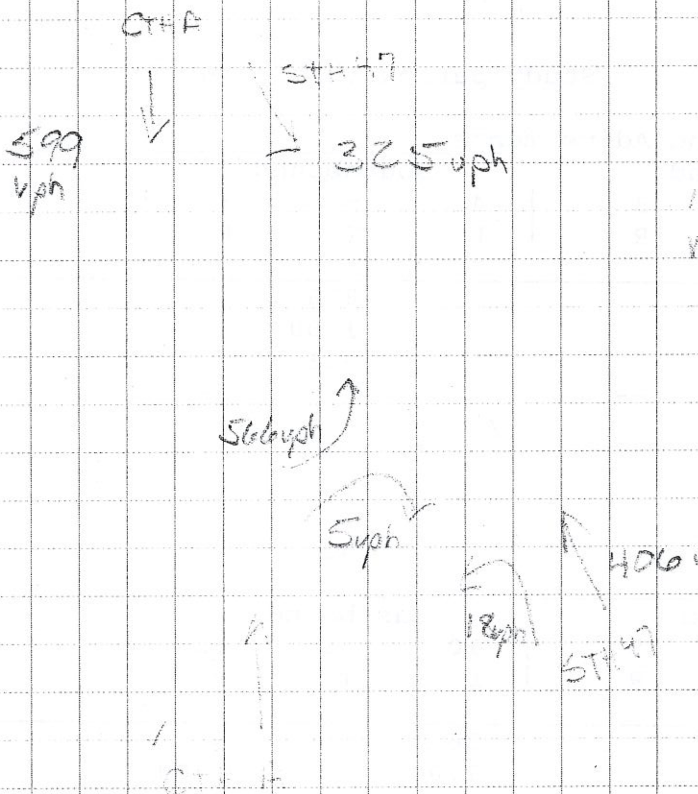
FAX 920-830-6100

OMNNI ASSOCIATES
www.omnni.com

JOB NUMBER	SHEET NO.
CLIENT	
PROJECT	
MADE BY	DATE
CHECKED BY	DATE

STH 47 & CTH A Full Interchange 2020

D = 55/45 K_{30} = 10.7 T(DHV) = 10.0



15700 ADT
15700 * .55 * .107 = 924 phv
Assume CTH A south movement
increase by 2300 ADT over
no interchange option
2300 * .55 * .107 = 135
SB CTH A 464 + 135 = 599
SB STH 47 924 - 599 = 325

7200 ADT
Assume LT turn same
as no interchange
7200 * .55 * .107 = 424

9700 ADT
Assume RT turn same as
no interchange
9700 * .55 * .107 = 571

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, full
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	18	406			325	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Hourly Flow Rate, HFR	18	406			325	
Percent Heavy Vehicles	10	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				566		5
Peak Hour Factor, PHF				1.00		1.00
Hourly Flow Rate, HFR				566		5
Percent Heavy Vehicles				10		10
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						571	
C(m) (vph)	1191						356	
v/c	0.02						1.60	
95% queue length	0.05						33.30	
Control Delay	8.1						311.5	
LOS	A						F	
Approach Delay							311.5	
Approach LOS							F	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MAH
Agency/Co.: OMNNI
Date Performed: 6/25/2004
Analysis Time Period:
Intersection: STH 47 & CTH A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2020
Project ID: STH 47 & CTH A Intersection, full
East/West Street: CTH A
North/South Street: STH 47
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	18	406			325	
Peak-Hour Factor, PHF	1.00	1.00			1.00	
Peak-15 Minute Volume	4	102			81	
Hourly Flow Rate, HFR	18	406			325	
Percent Heavy Vehicles	10	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	
Configuration	LT				T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				566		5
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				142		1
Hourly Flow Rate, HFR				566		5
Percent Heavy Vehicles				10		10
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	406	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		10					10		10
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2					6.5		6.3
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	10					10		10
t(f)	2.3					3.6		3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	325					767		325
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		325
Potential Capacity		698
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		698
Probability of Queue free St.	1.00	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		325
Potential Capacity		1191
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1191
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		767
Potential Capacity		359
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		354

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		767
Potential Capacity		359
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		354
Results for Two-stage process:		
a		
y		
C t		354

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				566		5
Movement Capacity (vph)				354		698
Shared Lane Capacity (vph)					356	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				354		698
Volume				566		5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					356	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	18						571	
C(m) (vph)	1191						356	
v/c	0.02						1.60	
95% queue length	0.05						33.30	
Control Delay	8.1						311.5	
LOS	A						F	
Approach Delay							311.5	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	406	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	8.1	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

APPENDIX H

APPENDIX H
Road User Costs

For the alternates to be economically equal, the additional construction costs of the full or partial interchange alternatives plus incurred costs to peripheral facilities caused by these alternates would have to be offset by savings in road user costs and savings in construction costs of peripheral traffic facilities. Peripheral facilities would include the CTH A/Capitol Drive intersection, USH 41/STH 47 interchange, USH 41, CTH A and the local street system in general.

Following tables show the values that WisDOT central office planners uses in computing road user costs. The costs of the alternates are normally compared over a 50-year period with money valued at 5%.

Vehicle Operating costs ($/vehicle mile)

Auto	$0.17
Single Unit Truck	$0.41
Combination Truck	$0.74

Values of Travel Time ($/hour) 1998 dollars

Auto	$7.50	(per person)
Single Unit Truck	$19.59	(per vehicle)
Combination Truck	$22.25	(per vehicle)

In the year 2020, the north to west movement of the STH 47 interchange is 5,000 vehicles for the no interchange alternate and 2,400 vehicles for the partial interchange alternate. This means that 2,600 vehicles avoided the indirection of STH 47 by using the northwest ramp at CTH A. This also applies to the return trip. The total vehicles avoiding this indirection in year 2020 would be 5,200. See Exhibits 12 and 17 for the projected traffic movements. Using the proportion of traffic decrease on STH 47 in the year 2020, the traffic avoiding the indirection in the year 2000 would be 3,500.

Since there is debate as to whether the travel time costs of persons in passenger cars are legitimate road user costs, these costs will not be included in the calculations. Road user costs will be computed for a 20-year period because that is the time when structures normally need maintenance work such as redecking and would be the logical time to add ramps not built at this time. The right-of-way for ramp construction is already available. For this reason the ramps could also be added at a later date such as adding ramps at time of conversion of USH 41 from four lanes to six lanes.

For the calculation of user costs, the average traffic design parameters were used for CTH A and STH 47 assuming 10% trucks of which 70% would be single unit trucks. Exhibits 13, 18 and 22 show the traffic volumes along CTH A and STH 47 north of USH 41. The amount of traffic at the merge of CTH A and STH 47 is 10,600 vehicles in the year 2000 and 15,700 vehicles in the year 2020. For the partial interchange alternate, 900 vehicles would be diverted from STH 47 to CTH A in year 2000 and 1,400 vehicles in the year 2020. This is the amount of traffic at the merger point that is avoiding the 2.1 mile extra travel distance along STH 47 route to head west and south on USH 41.

For the full interchange alternate the amount of traffic diverted onto CTH A is greater, however, this is traffic that would head east at USH 41 and there would be no indirection for this traffic and no savings in the user costs.

Most of the traffic diverted from the west ramps at STH 47 to the west ramps at CTH A would be generated in the area located between CTH A and STH 47 from USH 41 to the merge of CTH A and STH 47. The following computations assume the indirection of this traffic is one mile and two miles for traffic diverted at the merge.

Road User Cost Computations

CTH A route vs. STH 47 route

Vehicles					**Extra Vehicle Miles**	
Total Year	**2000**		**2020**			
	At Merge	**Rest**	**At Merge**	**Rest**	**2000**	**2020**
Total Vehicles	900	2,600	1,400	3,800	4,400	6600
Passenger Vehicle	810	2,340	1,260	3,420	3,960	5,940
Trucks	90	260	140	380	440	660
Single Unit Trucks	60	180	100	260	300	460
Combination Trucks	30	80	40	120	140	200

Using a 1.5 percent inflation rate, the 1998 user costs would increase by a factor of 1.03 for year 2000 and 1.388 for year 2020. The average travel speed is assumed to be 55 mph.

Year	**2000**	**2020**
Passenger Vehicle Operating Costs	$ 690	$1,400
Single Unit Truck Operating Costs	$ 130	$ 260
Combination Truck Operating Costs	$ 110	$ 210
Single Unit Time Costs	$ 110	$ 230
Combination Truck Time Cost	$ 60	$ 110
Total Cost Per Day	$ 1,100	$2,210
User Cost Per Year	$401,000	$807,000

Following road user costs are incurred by the traveling public due to distance and inconvenience of travel from north of USH 41 via CTH A and CTH "OO". The extra distance traveled is 0.3 miles.

The north to west movement at CTH A for the full and partial interchange alternates is 5,500 vehicles in the year 2020. Subtracting the 2,600 vehicles reduction at STH 47 leaves 2,900 vehicles or a total of 5,800 vehicles in both directions are avoiding the inconvenience and indirection of getting to southbound USH 41 via CTH A and CTH OO. In the year 2000 this number would be 3,700 vehicles.

	Vehicles		**Extra Vehicle Miles**	
Total Year	**2000**	**2020**	**2000**	**2020**
All Vehicles	3,700	5,800	1,110	1,740
Passenger Vehicle	3,330	5,200	1,000	1,560
All Trucks	370	600	110	180
Single Unit Trucks	260	420	80	130
Combination Trucks	110	180	30	50

The assumed average travel speed along USH 41 is 60 mph and the average speed along the CTH A and CTH OO route is 40 mph. To travel the CTH OO route would take 1.7/40 = .043 hours and 1.4/60 = .023 hours via USH 41 route, a difference of .02 hours per vehicle.

Year	**2000**	**2020**
Passenger Vehicle Operating Costs	$ 180	$ 370
Single Unit Truck Operating Costs	$ 30	$ 70
Combination Truck Operating Costs	$ 20	$ 50
Single Unit Time Costs	$ 100	$ 230
Combination Truck Time Cost	$ 50	$ 110
Total Cost Per Day	$ 380	$ 830
User Cost Per Year	$139,000	$303,000

Using present worth factors for a uniform series and gradient series, the present worth of road user costs is $9,500,000 with money valued at 5% over a 20 year period.

These same savings in road user costs would also apply when comparing the full interchange alternate to the no interchange alternate. The full interchange alternate eliminates the same indirection from the north as the partial interchange. The full interchange further eliminates some indirection and inconvenience to the traffic generated from south of USH 41. However these savings in user costs would be very minor when compared to the savings for the traffic from the north and will not be computed.

One of the major cost factors would be associated with the timing of improving USH 41 from four to six lanes. USH 41 is six lanes already from CTH "OO" to the south. The next logical segment to be converted to six lanes would include the area of CTH A and

USH 41 intersection. Exhibit 14 shows the projected traffic for USH 41 in Outagamie County. The segment at CTH A has the least projected traffic when compared to the next three segments to the east. Therefore it would be one of these other segments that would dictate the time of conversion of USH 41 from four lanes to six lanes at CTH A.

Even though the traffic at CTH A on USH 41 will not govern the timing of the conversion of USH 41 from four lanes to six lanes, the costs associated with the timing of the conversion were computed for the alternates. The computations assume that the conversion will be warranted when the daily traffic on USH 41 reaches 66,000 at a cost of $800,000 for a 1½ mile segment in year 2000 dollars.

Another cost to be considered is the timing of when CTH A south of USH 41 will be converted from a rural 2 lane section to an urban four lane section. Using CTH OO (Richmond Street to Meade Street) as an example of such a conversion, the cost would be about $2,000,000 per mile in year 2000 dollars. This conversion was computed for the time when traffic on CTH A would reach 14,300 vehicles per day.

APPENDIX I

Peggy Hawley

-----Original Message-----
From: Walt Raith [mailto:wraith@eastcentralrpc.org]
Sent: Tuesday, September 14, 2004 1:47 PM
To: peggy.hawley@omnni.com
Subject: USH 41/CTH A

Hi Peggy:

East Central Planning staff has historically supported the ½ interchange at CTH A and USH 41 based on the premise it would remove through traffic on portions of CTH A and CTH OO. Origin and destination studies completed in the late 90s, and more recently 2002, show that significant northbound/southbound USH 41/CTH A traffic, currently using the STH 15/CTH OO interchange, would use the ½ interchange with USH 41 and CTH A if provided. Staff's position is that through traffic removed would improve the level of service at the USH 41/STH 15 interchange, and while the USH 41 mainline level of service may suffer from the ½ interchange, it may be a wash.

Walt

MINUTES OF MAY 21, 2001 HIGHWAY AND SOLID WASTE COMMITTEE

MEMBERS PRESENT: William Errington, Marion DeLaHunt, Alfred Krause, Leon Vanevenhoven and Kenneth VandenHeuvel

MEMBERS ABSENT AND EXCUSED: None

OTHERS PRESENT: *Richard Wood, Property Owner
*Joe Guidote, Corporation Counsel
*Philip Stecker, Solid Waste Superintendent
Gene Hojan, Deputy Highway Commissioner
Alvin Geurts, Director of Public Works
Cynthia Roberts, Administrative Assistant

* Attended a portion of the meeting.

MOTION: SUPERVISOR ERRINGTON CALLED THE MEETING TO ORDER AT 8:30 A.M.

MINUTES

MOTION: SUPERVISORS DE LA HUNT/VANEVENHOVEN MOVED APPROVAL OF THE MINUTES OF MAY 7, 2001.

REQUEST FOR ACCESS ON CTH "OO"

Mr. Richard Wood addressed the committee requesting access to his parcel of property located at the northeast corner of CTH "OO" and Conkey Street. Mr. Wood provided a copy of the county construction plans showing his frontage along CTH "OO", and the proposed location of his request. Mr. Wood explained the history of the parcels he previously owned contiguous to the parcel in question.

He advised that an access to CTH "OO" is necessary in order to sell for a commercial venture. He advised that he currently accesses the property by an ingress/egress easement he holds on the neighboring property.

He advised that the city of Appleton acquired a three foot spite strip along Conkey Street to prevent him from accessing Conkey Street, however, the city has since abandoned that strip and has granted permission for an access on the far northern end of the parcel.

He advised that he cooperated with Outagamie County in acquiring the vision corner necessary at the corner. At that time he was concerned about access to his parcel. He advised that Michael Marsden assured him that as long as he was in the city of Appleton he would be okay.

Mr. Wood handed out the Outagamie County Access Control Ordinance and advised that the has a purchase agreement with Motomart and the agreement was contingent upon obtaining access to CTH "OO". Mr. Wood stated that a representative of Motomart had discussions with Mr. Geurts, and according to that individual, Mr. Geurts advised that due to the access control ordinance the access to this parcel of property must be obtained from the secondary road, which is Conkey Street. Mr. Wood then consulted with Mr. Marsden and he advised that there shouldn't be a problem obtaining access to CTH "OO". Mr. Marsden had him refer to Page 3 of the Access Control Ordinance Section 3.b. in that the ordinance doesn't apply because his parcel has been annexed into the city of Appleton. He advised that he submitted an application to relocate the existing access to the west onto his property and Mr. Geurts sent him a letter advising that in order to grant his request we would need permission from the neighboring property owner to relocate their access. Mr. Wood advised that he spoke with the neighbor and they are not willing to relocate their access.

Mr. Wood advised that the access at CTH "OO" & Meade is the same situation as he is requesting, and he doesn't understand why he can't obtain the proposed access.

He then referred to Page 5 (g) of the Ordinance in that Outagamie County should have removed the access when the city of Appleton razed the house on the parcel just east of his. Mr. Guidote asked if he was using the access after the house was razed. Mr. Wood responded that he was continuing to use the access. Mr. Guidote advised that Mr. Wood was stating in one instance that the access was abandoned and in the next instance that he was using the access; he stated that Mr. Wood could not argue both positions. Mr. Guidote advised that his ingress/egress easement doesn't grant him authority to relocate the access without consent of the current owner.

Mr. Geurts advised that the ordinance reads that 1 access shall be granted per parcel, and whenever possible the secondary road shall be accessed. He spoke with Appleton Public Works Director Paula Vandehey and the city is prepared to grant access on Conkey Street to his parcel. He also advised that the parcel was annexed after the Ordinance was implemented in 1982.

Mr. Guidote stated for the record that the Public Works Director's reason for denying access is due to the proposed access' proximity to the corner and the availability of access onto Conkey Street.

Mr. Errington expressed his view that the committee would not support the application.

Mr. Wood indicated that he wished to withdraw his application for driveway access.

MOTION: SUPERVISORS ERRINGTON/DE LA HUNT MOVED TO DENY THE REQUEST TO RELOCATE AN ACCESS ON CTH "OO" FURTHER TO THE WEST TO SERVICE RICHARD WOOD'S PARCEL. <u>MOTION CARRIED UNANIMOUSLY.</u>

<u>VOUCHERS AND PERMITS</u>

The Committee reviewed Highway Voucher Numbers 870 - 925, Solid Waste Voucher Numbers 264 - 302, utility permits, and the cellular telephone report.

RESOLUTION/ORDINANCE REVIEW

Request Lobbyist Assistance With Transportation Aids

MOTION: SUPERVISORS DE LA HUNT/VANDEN HEUVEL MOVED TO AUTHORIZE DRAFTING A RESOLUTION REQUESTING THE LOBBYIST'S ASSISTANCE IN PURSUING TRANSPORTATION AIDS FOR OUTAGAMIE COUNTY. MOTION CARRIED.

HSW.2–2001-02 - CTH "A" & USH 41 Project

Mr. Errington advised that he spoke with State District Director George McLeod if the state will support an interchange at CTH "A" & STH 47 if a partial interchange is constructed at CTH "A" & USH 41. He advised that he was not aware of this concern, however, would consider his request. Mr. Geurts advised that he would not sign the agreement for CTH "A" & USH 41 with the state until they have addressed the concern with the intersection of CTH "A" & STH 47.

MOTION: SUPERVISORS KRAUSE/ERRINGTON MOVED TO AUTHORIZE THE OUTAGAMIE COUNTY DIRECTOR OF PUBLIC WORKS TO EXECUTE THE STATE/MUNICIPAL PROJECT AGREEMENT WITH THE WISDOT COMMITTING TO PROCEED WITH THE CTH "A" BRIDGE OVER USH 41 AND A PARTIAL INTERCHANGE, CONTINGENT UPON THE STATE ADDRESSING THE INTERSECTION OF CTH "A" AND STH 47. MOTION CARRIED.

HSW.3–2001-02 - Budget Adjustments

Mr. Geurts advised that due to the cancellation of the CTH "AA" project funds are available for repairing the slope failures on CTH "K" and CTH "Z".

MOTION: SUPERVISORS DE LA HUNT/ERRINGTON MOVED TO AUTHORIZE TRANSFERRING FUNDS FROM THE CTH "AA" PROJECT TO FUND SLOPE FAILURE REPAIRS ON CTH "K" AND CTH "Z". MOTION CARRIED.

HSWLA.1--2001-02

Mr. Errington advised that this resolution opposes any attempt by the State to shift costs for highway employees to Outagamie County property taxpayers.

MOTION: SUPERVISORS DE LA HUNT/ERRINGTON MOVED TO AUTHORIZE SUBMITTING THIS RESOLUTION TO THE COUNTY BOARD FOR REVIEW. MOTION CARRIED.

SOLID WASTE REPORT

Co-Generation Operation

Mr. Stecker advised that the annual maintenance shutdown was completed. He'll have a more thorough report at the next meeting. Engine No. 1, which is furthest to the east and runs on both methane and natural gas, has the most hours at 51,000 hours. There is an issue with wear on the main bearing and our insurance carrier may be concerned about continuing insurance on this engine, without a major overhaul. The other two engines are at 41,000 and 46,000 hours.

He advised that he will be applying with the DNR for a plan modification to add additional gas collection wells to the site.

Solid Waste Operation

Mr. Stecker advised that he's still looking for a renter for the land around the complex.

He advised that our customers have agreed to 3% interest on the containers they lease from Outagamie County.

He advised that Waste Management has requested a listing of haulers utilizing our facility. He's working with the Corporation Counsel on this matter.

Recycling

Mr. Stecker advised that he will be sending out request for proposals for disposing appliances, as well as recovering the freon from certain appliances.

Regionalization

Mr. Stecker advised that Brown County has the regionalization of recyclables on hold awaiting a decision on the prison labor issue in Winnebago County.

Clean Sweep

Mr. Stecker advised that he would like to submit a grant application for the upcoming agricultural and residential clean sweep programs.

MOTION: SUPERVISORS KRAUSE/DE LA HUNT MOVED TO AUTHORIZE DRAFTING A RESOLUTION TO SUBMIT A GRANT APPLICATION FOR FUNDING THE CLEAN SWEEP PROGRAM. MOTION CARRIED.

BEGIN CLOSED SESSION, PURSUANT TO WISCONSIN STATS §19.85(1)(e) NEGOTIATING THE TERMS OF PUBLIC CONTRACTS WHERE COMPETITIVE OR BARGAINING REASONS REQUIRE A CLOSED SESSION.

AT 9:58 A.M., SUPERVISORS ERRINGTON/DE LA HUNT MOVED TO BEGIN CLOSED SESSION, PURSUANT TO WISCONSIN STATS §19.85(1)(e) NEGOTIATING THE TERMS OF PUBLIC CONTRACTS WHERE COMPETITIVE OR BARGAINING REASONS REQUIRE A CLOSED SESSION. ROLL CALL VOTE: ERRINGTON, AYE; DE LA HUNT, AYE; KRAUSE, AYE; VANDEN HEUVEL, AYE; VANEVENHOVEN, AYE. MOTION CARRIED.

END CLOSED SESSION, AND RESUME REGULAR BUSINESS OF COMMITTEE CHAIRS COMMITTEE

AT 9:26 A.M., SUPERVISORS DE LA HUNT/ERRINGTON MOVED TO END CLOSED SESSION AND RESUME REGULAR BUSINESS OF THE HIGHWAY & SOLID WASTE COMMITTEE MEETING. ROLL CALL VOTE: ERRINGTON, AYE; DE LA HUNT, AYE; KRAUSE, AYE; VANDEN HEUVEL, AYE; VANEVENHOVEN, AYE. MOTION CARRIED.

MOTION: SUPERVISORS ERRINGTON/DE LA HUNT MOVED TO AUTHORIZE SUBMITTING A PROPOSAL TO ONEIDA COUNTY FOR SOLID WASTE DISPOSAL . MOTION CARRIED.

Mr. Geurts advised that he and Mr. Stecker are contacting several local businesses in an attempt to have their solid waste delivered to Outagamie County.

PUBLIC WORKS REPORT

Vine Road Jurisdictional Transfer

Mr. Geurts advised that the town of Freedom has denied acceptance of 1.7 miles of CTH "O", however proposed accepting 2 miles of CTH "J" from CTH "C" to STH 55. Mr. Geurts would like to analyze this prior to making a recommendation.

CTH "F" Project

Mr. Geurts advised that there is one property owner yet to settle with on the CTH "F" project. There are no administrative settlements at this time.

Street Connection on CTH "EE"

The committee reviewed a request for a street connection on the east side of CTH "EE", just south of CTH "O" from Dave & Sandy Lenz.

MOTION: SUPERVISORS DE LA HUNT/VANEVENHOVEN MOVED TO AUTHORIZE GRANTING A STREET CONNECTION ON CTH "EE" CONTINGENT UPON RECEIVING ACCEPTANCE BY THE TOWN OF FREEDOM. MOTION CARRIED UNANIMOUSLY.

Fox River Lift Bridges

Mr. Geurts advised that he attended a meeting to discuss the concern about the lift bridges along the Fox River if the locks system becomes operational. The committee reviewed a report listing all of the bridges between Green Bay and Oshkosh, the structure type, clearance, ownership, etc. There is concern on funding the replacement, maintenance and operations of these bridges, in addition to the locks.

Reports

The committee reviewed the maintenance expense report and contracts with municipalities reports through April 30, 2001.

CTH "J" Street Connection

Mr. Geurts advised that an application for a street connection on CTH "J" in the city of Kaukauna was received, however not yet processed due to concerns. The developer has since started construction of the subdivision and the contractors have been driving through the ditch on CTH "J" in order to access the property. Mr. Geurts will have a meeting with the developers and the city of Kaukauna regarding this issue.

STH 55 & CTH "VV" Intersection

Mr. Geurts advised that he would like to have some improvements made at the intersection of STH 55 and CTH "VV". He will discuss this matter with the WisDOT.

Brewster Street Contamination

Mr. Geurts advised that he received correspondence from the DNR that the application for closure of the Brewster Street site was not approved. There is one well that still has contaminates and recommended four additional testing periods prior to re-application.

CTH "A" (Spencer Street to Wisconsin Avenue)

Mr. Geurts advised that he attended a meeting at East Central Regional Planning Commission and learned that $1.3 million in federal funding has been approved for this project in 2005. Therefore funds need to be allocated for engineering and right of way in 2003 and 2004, to be ready for construction in 2005.

Correspondence

The committee reviewed correspondence to Brown County and Winnebago County regarding the regional recycling partnership.

MEETING SCHEDULE

The next meetings will be June 11, 2001 and June 25, 2001.

ADJOURNMENT

MOTION: SUPERVISORS ERRINGTON/DE LA HUNT MOVED TO ADJOURN AT 11:10 A.M. MOTION CARRIED.

Respectfully submitted,

Cynthia Roberts
Administrative Assistant
May 23, 2001

DATE APPROVED:

FACILITIES AND UTILITIES

As growth and development continues to occur in the Town of Grand Chute through the year 2020, there will be a need to add facilities and various utilities to service the future areas of development. A review of existing utility capacities and plans suggests that development should occur in an orderly manner from west to east. The first area for new utility development should be the industrial-commercial-multi-family area located west of Highway 41 between Greenville road and one quarter mile north of Capitol Drive. The second phase of development should occur north of Capitol Drive and Highway 41 east from Casaloma to Gillette Street. The third phase of future development should occur east of the Wisconsin Central Railroad and Gillette Street north of Highway 41. A sewer lift station will be needed near the northwest corner of Highways 41 and 15, and in sections 5 and 6 (northwest). The last phase of expanded utilities should provide service to the area north of McCarthy Road beginning about one-quarter mile north of Capitol Drive. This is also the area projected for a new water tower.

Transit services are not likely to expand significantly beyond the present limits of service according to the director of Valley Transit due to the projected density of development with the exception being the area proposed for expanded commercial and multiple development west of the mall. The Town should continue to support provision of transit services to accommodate the needs of persons lacking other means of transportation particularly around the Mall and major employment centers.

The Town will need to upgrade existing highways and roads, as well as the construct new roads to provide access and service to the developing areas. Standards for street construction in the Town are included in the appendix to this report. In summary they call for 80 foot rights-of-way for major streets and 66 foot rights-of-way for local streets, see Figure 13. Pavement widths of 37 feet back-to-back-of-curb are the standard. During the planning period, the following highways and roads are recommended for improvements based on town planning, Outagamie County, and the Long - Range Transportation / Land Use Plan - Fox Cities Urbanized Area as prepared by the East Central Wisconsin Regional Planning Commission.

New Roads - Streets

- West Packard should be connected between Casaloma and Mayflower Roads.
- Grand Market Drive should be connected between McCarthy and the present end adjacent to American TV and Appliance (just west of Casaloma)
- Integrity Way should be extended west from the end by Sam's Club (just west of Casaloma) to Mayflower Road where a stub street has been installed.
- McCarthy Road should be extended north from Wisconsin Avenue to link up just south of Greenville Road.
- Frontage Roads should be installed along new Highway 15 west of Casaloma Drive with a connection south to Greenville Road.
- An east-west road north of and parallel to Greenville Road linking McCarthy and Casaloma is needed to service future industrial development in this area.
- A connection west from the north end of Casaloma (about one-half mile north of Capitol) to link up with McCarthy Road is needed.
- A new road connecting Rifle Range Road to County Highway A is needed to open up this area for residential development
- Elsner Road is proposed to be extended west across the tracks from Gillette to County Highway A.
- A collector road will be needed to open up the area east of County Highway A which

links County Highway A and JJ.
- Evergreen Drive should be extended west from Highway 47 to Gillette Street.
- A collector road will be needed to connect Casaloma Drive, just north of Highway 15, to Capitol Drive near Rifle Range Road.

Road Improvements

- Bluemound Road from Wisconsin to College should be widened to 4 lanes to accommodate the increased traffic volumes on the present 2 lane road.
- A new half-interchange at Highway 41 and County Highway A should be constructed.
- Replace the bridge structure over Highway 41 at County Highway A; 4-lanes.
- County Highway A from JJ to BB should be widened to 4 lanes and reconstructed. A connection at the south end to BB will be needed.
- County Highway BB from Highway 41 to Seminole should be widened to 5 lanes.
- The intersection of College Avenue and Mall Drive needs to be redesigned and reconstructed to accommodate traffic flow.
- County Highway JJ (Edgewood Drive) from Highway 47 to Holiday Drive needs to be reconstructed.
- Highway 47 between Ridgeview Drive and County Highway JJ should be reconstructed to a 4 to 5 lane urban section.
- The interchange at Highway 41 and 47 should be reconstructed.
- Highway 125 (College Avenue) between Highway 41 and Westhill Boulevard should be widened to 6 lanes.
- The bridge at Capitol Drive over Highway 41 should be reconstructed and widened to 4 lanes.
- Casaloma Drive should be widened to 4 lanes from College Avenue south to BB.
- Highway JJ between Highway A and French Road should be widened to 4 lanes.
- A pedestrian overpass should be constructed over Highway 41 north of Wisconsin Avenue by Fox Valley Technical College.

Sewer and Water Utilities

Utility studies have been prepared for the town by McMahon Engineers. These studies recommend the following:

- In order to develop areas north of Highway 41 that flow to Gillette Street, replace the 10-inch sanitary sewer in Gillette Street with a 15-inch between Capitol and Highway 41. Estimated cost $108,200.
- In order to develop areas north of Highway 41, and north of Suncrest Lane, replace the 8-inch sanitary sewer in Suncrest Lane with a 10-inch between Capitol and Highway 41. Estimated cost $71,100. Additional costs, not yet estimated, will be needed to tunnel under Highway 41 with the sewer line.
- In order to develop the areas north of Highway 41 north of Bluemound, replace the 8-inch sanitary sewer in Bluemound Drive with a 12-inch between Capitol and Highway 41. Estimated cost $78,700. Additional costs, not yet estimated, will be needed to tunnel under Highway 41 with the sewer line.
- In order to develop areas north of Wisconsin Avenue and west of Casaloma Drive, replace the existing 8-inch sanitary sewer on Old Casaloma Drive between Wisconsin and Parkway with an 18-inch between Wisconsin and Greenville Road and a 12-inch between Greenville Road and Parkway. This upgrade will be needed when

- Construct a new water tower in the northwest section of the Town on McCarthy Road.
- Construct a major storm sewer line on Lynndale Drive discharging to either Mud Creek or directly to the Fox River. Estimated cost $1.6 million.
- Construct detention ponds to manage storm water as outlined earlier. Estimated cost for all ponds $3.5 million.

The following map illustrates the present service areas for the sewer and water services of the Town.

Other Facilities and Services

As the Town of Grand Chute continues to grow, there will be a need to acquire or upgrade various facilities and services in the community. During the planning period the following recommendations are made:

> The Town of Grand Chute is currently studying alternatives to providing police and fire services within the Town. Options may include expanding the present department, joint services with adjacent communities, or contracting with the Outagamie County Sheriff's Department for law enforcement and public safety needs. By the year 2020, Grand Chute is expected to have more than 27,000 residents within its town boundaries, which may be instrumental in determining the level of law enforcement services needed.
>
> During the next several years, the Grand Chute Fire Department is expected to need additional funding from to upgrade or add additional fire equipment and apparatus to the department which will improve fire protection and safety. The possibility of another station on the west side of the Town should be considered.
>
> Discussions should be pursued with the City of Appleton concerning joint library services and establishing a branch facility in the Town possibly in conjunction with the new Town Hall.

ENGINEERING • ARCHITECTURE • ENVIRONMENTAL

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