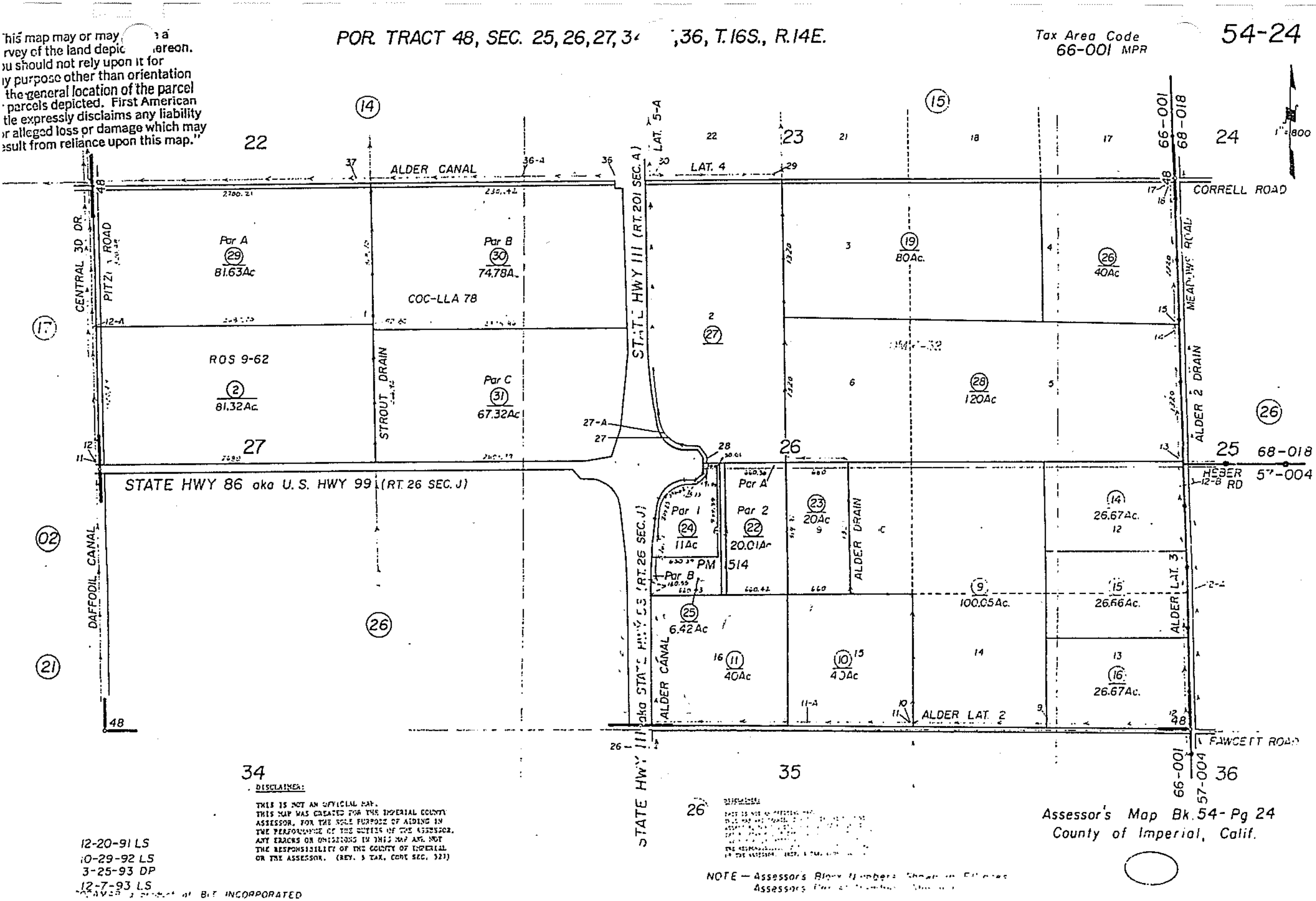
APPENDIX A

LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN IS SITUATED IN THE STATE OF CALIFORNIA, COUNTY OF IMPERIAL, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF TRACT 48, TOWNSHIP 16 SOUTH, RANGE 14 EAST, SAN BERNARDINO MERIDIAN, IN AN UNINCORPORATED AREA OF THE COUNTY OF IMPERIAL, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF, SHOWN AND INDICATED AS LOT 2 ON MAP NO. 361 IN BOOK 6, PAGE 32 OF OFFICIAL MAPS ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF IMPERIAL COUNTY.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED APRIL 20, 1964 IN BOOK 1181, PAGE 1060 OF OFFICIAL RECORDS.



his map may or may a
rvey of the land depic ereon.
ou should not rely upon it for
iy purpose other than orientation
the general location of the parcel
parcels depicted. First American
tle expressly disclaims any liability
or alleged loss or damage which may
esult from reliance upon this map."
POR. TRACT 48, SEC. 25, 26, 27, 3 ,36, T.16S., R.14E.
Tax Area Code
66-001 MPR
54-24
1"=800
ALDER CANAL
LAT. 4
CORRELL ROAD
CENTRAL 30 DR.
PITZER ROAD
STATE HWY III (RT. 201 SEC. A)
LAT. 5-A
MEADOWS ROAD
ALDER 2 DRAIN
Par A
29
81.63Ac
Par B
30
74.78Ac
COC-LLA 78
ROS 9-62
2
81.32Ac
STROUT DRAIN
Par C
31
67.32Ac
27
19
80Ac.
26
40Ac
28
120Ac
STATE HWY 86 aka U.S. HWY 99 (RT. 26 SEC. J)
HEBER RD
68-018
57-004
DAFFODIL CANAL
aka STATE HWY 111 (RT. 26 SEC. J)
Par A
Par 1
24
11Ac
Par 2
22
20.01Ac
PM 514
Par B
23
20Ac
ALDER DRAIN
14
26.67Ac.
15
26.66Ac.
9
100.05Ac.
ALDER LAT. 3
25
6.42Ac
ALDER CANAL
11
40Ac
10
40Ac
16
26.67Ac.
ALDER LAT. 2
FAWCETT ROAD
66-001
68-018
34
35
36
STATE HWY 111
DISCLAIMER:
THIS IS NOT AN OFFICIAL MAP.
THIS MAP WAS CREATED FOR THE IMPERIAL COUNTY
ASSESSOR, FOR THE SOLE PURPOSE OF AIDING IN
THE PERFORMANCE OF THE DUTIES OF THE ASSESSOR.
ANY ERRORS OR OMISSIONS IN THIS MAP ARE NOT
THE RESPONSIBILITY OF THE COUNTY OF IMPERIAL
OR THE ASSESSOR. (REV. & TAX. CODE SEC. 327)
Assessor's Map Bk. 54 - Pg 24
County of Imperial, Calif.
12-20-91 LS
10-29-92 LS
3-25-93 DP
12-7-93 LS
NOTE — Assessors Block Numbers Shown in Ellipses

APPENDIX B

Kevin A. Dahl, P.E., R.L.S.
Christopher D. Robins, P.E.
Juan N. Lomeli', R.L.S.
Douglas J. Nicholls, P.E.

DAHL, ROBINS & ASSOCIATES, INC.

CIVIL ENGINEERING ■ SURVEYING ■ TRAFFIC

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Yuma, Arizona 85364
Phone:(928) 819-0825
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E-mail:dra@dahlrobins.com

May 20, 2002

Development Design Engineering, LLC
1122 State Street, Suite D
El Centro, CA 92243

Attention: Mr. Tom Dubose, Manager

Reference: Imperial Center Traffic Impact Study

Dear Mr. Dubose:

We have received the accident data from the California Department of Transportation to provide a response to Bill Figge's comments on the Imperial Center Traffic Impact Study. The following are our replies to his comments:

- **A review of collision history at all impacted locations with SR-111 should be included and mitigation provided to any increase in collision history as a result of increased volumes from this project. Impacted locations would include Jasper Road and SR-111, McCabe Road and SR-111, Heber Road and SR-111 and Dogwood Road and Heber/SR-86.**

- **All proposed signals on SR-111 or to be coordinated with SR-111 should be analyzed to meet not only volume warrants, but also collision history warrants, and mitigated as necessary.**

The existing accident rate for each intersection was determined using the 1998-2001 data provided by CalTrans. By making the gross assumption this rate would stay constant as traffic volumes increased, the numbers of accidents were projected in to the future years.

At the Heber Road and SR-111 intersection, there are currently about 7 accidents per year. Based on the increased volume, that number could be expected to increase to 15 per year by 2020. The number of accidents correctable by signal installation would be four (realizing signals are already in place at this location). The primary type of accident occurring at this intersection is the rear end collision. In order to decrease the frequency of these types of accidents, it is recommended some form of advance flasher be installed notifying motorists when the light is expected to turn red for their approach. Since this intersection is already experiencing 5 of these types of crashes per year, this would be a good mitigation measure to implement immediately, independent of any development at this site.

At the Jasper Road and SR-111 intersection, there are currently about 4 accidents per year. Based on the increased volume, that number could be expected to increase to 7 per year by 2020. The number of accidents correctable by signal installation would be five. This was the only intersection that would warrant a signal based on accidents (in 2010). Since it also meets volume warrants, a signal was previously recommended for this location. The angle accidents are the primary type of crashes occurring, so no other mitigation is expected to be needed.

At the McCabe Road and SR-111 intersection, there are currently about 2 accidents per year. Based on the increased volume, that number could be expected to increase to 3 per year by 2020. The number of accidents correctable by signal installation would be three. The proposal to install a signal at this location when volume warrants are met should adequately mitigate the majority of the accidents occurring here.

At the Heber Road and Dogwood Road intersection, there is currently an average of 1 accident per year. Based on the increased volume, that number could be expected to increase to 2 per year by 2020. None of the accidents are correctable by signal installation. This minimal increase in the number of accidents does not suggest mitigation would be necessary.

Sincerely,
DAHL, ROBINS & ASSOCIATES, INC.

FOR RANDY HOSKINS

Randy Hoskins

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APPENDICES

I. INTRODUCTION AND SUMMARY

A. Purpose of Report and Study Objectives

At the request of Development Design & Engineering, LLC, **Dahl, Robins & Associates, Inc.**, has prepared this report to present the results of a Traffic Impact Study conducted for the Imperial Center proposed north Calexico in Imperial County, California. The purpose of this study is to determine and analyze the potential traffic impacts of the proposed development and recommend improvements necessary to ensure safe and efficient operation on the major roadway system. This report describes the existing roadway conditions, identifies peak traffic volumes, forecasts and distributes future traffic volumes, and projects the impacts of additional trip generation. Conclusions based on the impacts of any increased traffic on the roadway system have been identified and recommendations for mitigating areas of concern are provided. The specific study objectives are as follows:

- ❒ Evaluate the intersection of SR 111 & SR 86/Heber Road, SR 111 & McCabe Road, SR 111 & Jasper Road, SR 86 & Dogwood Road, Bowker Road & Jasper Road, Bowker Road & Heber Road, Bowker Road & McCabe Road and recommend any necessary improvements;
- ❒ Evaluate the site access driveways and recommend any necessary improvements.

B. Executive Summary

1. Site Location and Study Area

The proposed development is located in Imperial County north of the City of Calexico on the northeast corner of Highway 111 and Heber Road (Highway 86) (See Figure 1). The study area analyzed for impacts from the proposed development encompasses the intersections of SR 111 & SR 86/Heber Road, SR 111 & McCabe Road, McCabe & Yourman, SR 111 & Jasper Road, SR 86 & Dogwood Road, Bowker Road & Jasper Road, Bowker Road & Heber Road, Bowker Road & McCabe Road

8. Development Description

The Imperial Center is a proposed 75 acre commercial development to be located north of Calexico. The project is bounded by Highway 111 on the west, Correll Road on the north, the Alder Drain on the west and Heber Road on the south (See Figures 2 and 3).

The Imperial Center is expected to have two accesses onto Heber Road. The majority of the access for the site will be provided off of Yourman Road, which is proposed for realignment within the project boundary. The other access for the site will be off of Correll Road on the north side of the project.

The Imperial Center will consist of a truck stop/gas station, an outlet mall and a number of out lots that will house a variety of comm ercial uses. The project is expected to be developed in five phases. The first phase is expected to be completed in 2002, with each additional phase requiring two years for build-out.

9. Principal Findings

The results of this traffic impact analysis indicate that the area roadway system will require improvements to accommodate the traffic volumes generated by the proposed development. The development should provide for convenient site ingress and egress upon completion of the construction of the recommended improvements.

10. Conclusions

The proposed development is expected to generate a combined 38,377 new daily trips upon completion. These trips will access the site from Heber Road, Yourman Road and Correll Road. For the purposes of this study the complete buildout of the project is anticipated for the year 2010. During the 2010 AM Peak Hour 1,969 trips will be generated with 1,141 of these entering the site and 828 exiting the site. During the 2010 PM Peak Hour 3,614 trips will be generated with 1,811 of these entering the site and 1,803 exiting the site.

11. Recommendations

Based on the results of this traffic impact analysis, it is our opinion that the following recommended improvements will provide for safe, convenient site ingress and egress to this development. It has been shown that at full buildout of the project, the service level of the internal and adjacent streets will be adequate to handle the traffic from this project. For a detailed summary of improvements see Section VII Conclusions and Recommendations.

On-site Improvements

Yourman Road

The preliminary site layout for this project shows the relocation of Yourman Road farther east from its current alignment. The road is also shown as being reconstructed as a two lane roadway with medians and left turn lanes at driveway openings. It will be necessary to clearly sign Yourman Road for northbound traffic where it turns to the west so that through traffic does not end up in the Imperial Center parking lot.

Site Access Driveways

Three driveways are shown from the site onto Heber Road. The easternmost two driveways will allow full turning movements. These driveways should be constructed with one lane in and two lanes out. Due to the close proximity of the western driveway to Yourman Road, it is recommended that this driveway be limited to right turns out only. This will help reduce some of the traffic using the Yourman/Heber intersection, improving the Level Of Service of that intersection.

The other driveways into the site will function adequately with one lane in and one lane out. Traffic volumes will be spread out over these driveways, coupled with the fact that they are onto lower volume roads, providing for high service levels.

Off-site Improvements

Heber Road

It is recommended that Heber Road be widened to five lanes prior to Phase IV (2008) from Scaroni Road on the west to the east edge of the project. This will provide the necessary capacity at the Highway 111 intersection and the project driveways. An additional southbound left turn lane and a northbound right turn lane will be needed to accommodate 2010 traffic.

Jasper Road and Highway 111

A traffic signal will likely be warranted at the Highway 111 and Jasper Road intersection with the addition of Phase I traffic. Though this phase adds little traffic to this intersection, the intersection is currently operating at poor levels of service. This project will add an additional 1,084 trips to this intersection at build-out, or 32%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $40,000.

McCabe Road & Highway 111

A traffic signal will likely be warranted at the Highway 111 and McCabe Road intersection at project build-out. This intersection is currently operating at poor levels of service for eastbound and westbound traffic. This project will add an additional 630 trips to this intersection at build-out, or 18%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $22,500. It is also recommended that McCabe Road be marked with two lanes approaching the intersection, a left turn lane and a combined through/right turn lane.

Yourman Road and Heber Road

In addition to the previously described improvements to Heber Road, a traffic signal will be needed at this intersection with the addition of Phase IV (2008) traffic. The Level Of Service calculations show a northbound Level Of Service of D in 2006, but if the roadway is realigned as proposed, this will not be the case. Since the need for this signal is due almost entirely to project generated traffic, the entire cost for this signal would be assigned to the developer. It will be important to coordinate this signal with the signal on Highway 111 so that backups do not occur along Heber.

Heber Road & Highway 111
At project build-out, dual southbound left turn lanes will be required, as well as a northbound right turn lane.

Dogwood Road and Heber Road
A traffic signal will likely be warranted at the Dogwood Road and Heber Road intersection at project build-out. This project will add an additional 723 trips to this intersection at build-out, or 43%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $53,750.

Bowker Road and Heber Road
At project build-out, left turn lanes will be needed for northbound and southbound traffic at this intersection.

The design of all intersections and roadways shall be in accordance with Caltrans Standard Drawings, Imperial County guidelines and the latest editions of the MUTCD and AASHTO Green Book.

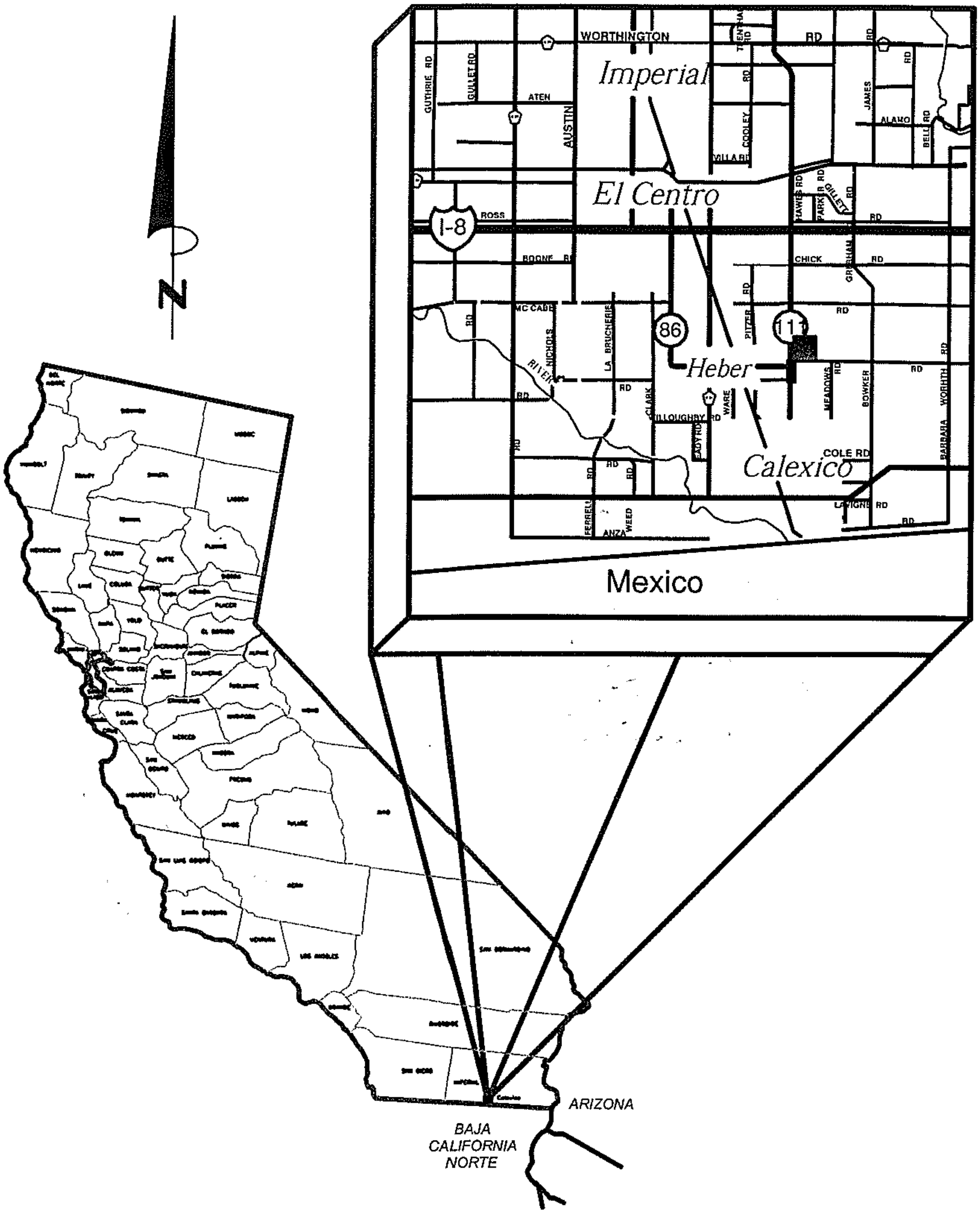

FIGURE 1
VICINITY MAP

II. PROPOSED DEVELOPMENT

A. Off-site Development

With both developed and undeveloped property surrounding this site the potential for future development which could have an impact on the existing roadway network is fairly significant. Traffic is expected to increase considerably on Heber Road over the next ten years.

B. On-site Development

1. Land Use and Intensity

Anticipated land use within the proposed development is shown in Figure 2 and broken down as follows:

Hotel	200	Rooms
Movie w/Matinee	16	Screens
Specialty Retail Center	15	KSF
Discount Store	5	KSF
Factory Outlet Center	460	KSF
Quality Restaurant	5	KSF
High Turnover Sit-Down Restaurant	5	KSF
Fast Food w/Drive Through	10	KSF
Fast Food w/o Drive Through	13	KSF
Gas w/Convenience Market	18	Fueling Positions
Quick Lube Shop	5	Service Positions
Tire Store	5	KSF
Video Rental	5	KSF
Drive-In Bank	10	KSF

2. Location

The proposed development is located on the northeast corner of Heber Road and SR 111.

3. Site Plan

The Proposed Development Site Plan shown in Figure 2 depicts the commercial subdivision lot layout and internal street layout for the project.

4. Phasing and Timing

It is anticipated that construction on the proposed development will begin in the year 2002. For the purposes of this study it was assumed that construction of the overall project would occur in five phases. Beginning in the year 2002 the four remaining phases would come "on line" in the years 2004, 2006, 2008 and 2010.

Phase I of the Imperial Center will be built out and generating traffic from a gas station/convenience market/truck stop, a tire store and a quick lube facility. Phase II, analyzed for the year 2004 includes the hotel. Phase III, analyzed for the year 2006 includes build out of half of the out-lots and the following phase, Phase IV, analyzed for the year 2008 would include the rest of the out- lots. Phase V is expected in the year 2010 and would include the outlet mall and theater.

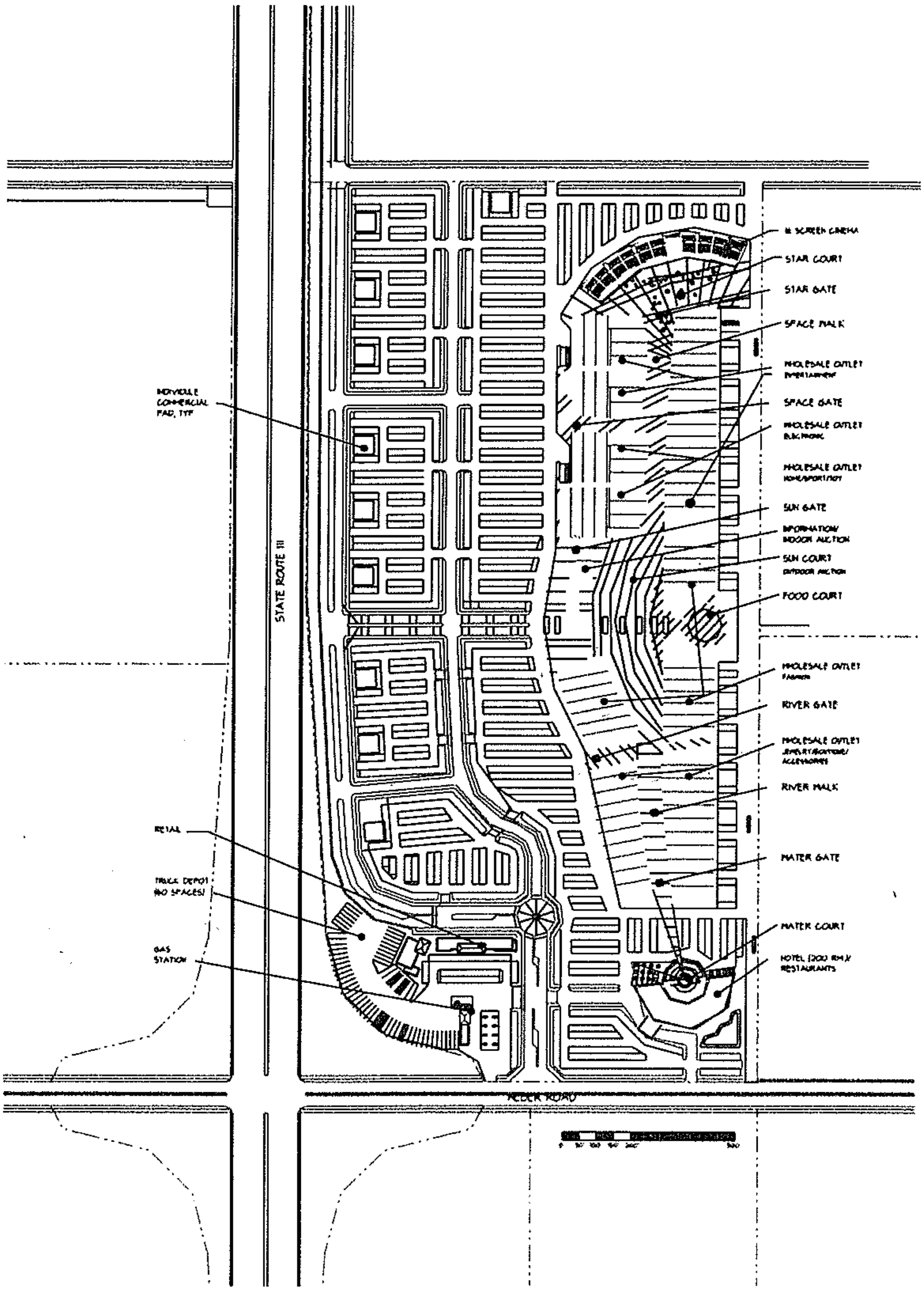

FIGURE 2
PROPOSED DEVELOPMENT SITE PLAN

III. AREA CONDITIONS

A. Study Area

1. Area of Influence

For the purposes of this study, the geographic area of influence will be defined roughly by southern Imperial County. It was assumed that a majority of the site trips generated will begin or end within this region. The existing street network located in the area of significant traffic impact is depicted in Figure 3. The intersections within this area which were analyzed as part of this study are also shown.

2. Scope of Study

The scope of this study was determined during meetings with staff from Imperial County. For the preparation of this Traffic Impact Study we have used the methodology set forth in the *Guidelines for Traffic Impact Studies* and *Traffic Access and Impact Studies for Site Development,* published by the Institute of Transportation Engineers (ITE), establish uniform guidelines for conducting traffic impact analyses.

3. Area of Significant Traffic Impact

Roadway and intersection geometric information was also gathered.

B. Study Area Land Use

1. Existing Land Uses

Land Use surrounding the proposed development is comprised of mostly agricultural and industrial uses. A trucking company is located adjacent to the subject property on the south side of Heber Road.

2. Anticipated Future Development

With both developed and undeveloped property surrounding this site the potential for future development which could have an impact on the existing roadway network is fairly significant. The current land use in the area of the Imperial Center is primarily agricultural in nature. Future uses in this area will likely be industrial or commercial in nature. Other uses at this intersection have been discussed with the County in the past, though none appear to be actively moving forward at this time.

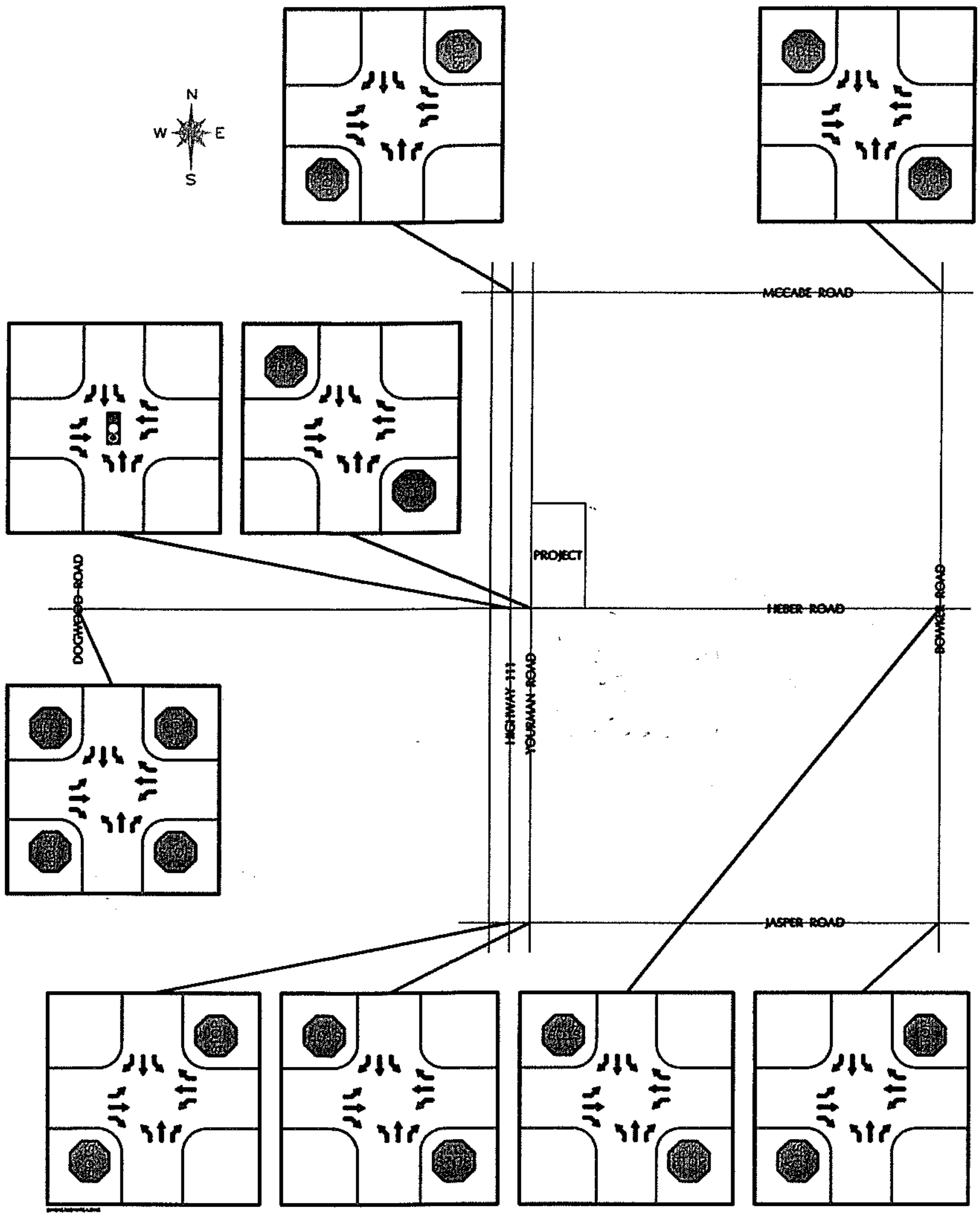

FIGURE 3
STUDY AREA

C. Site Accessibility

1. Existing Area Roadway System

Direct access to the site will be gained via Heber Road on the south, Correll Road on the north and Yourman Road on the west. Three driveways into the site are proposed off of Heber Road and Correll Road, with 5 accesses located along Yourman Road.

Heber Road is a two lane, paved street on the south side of this development. Heber widens out to add an exclusive right turn lane at its intersection with Highway 111. West of Highway 111, Heber is designated as Highway 86. On the west edge of the town of Heber, Heber Road intersects with Dogwood Road at a 4-way stop. Both roads have one lane in each direction, with an additional right turn lane for westbound Heber.

Yourman Road is currently a two-lane road on the west side of the development. It functions as a frontage road for Highway 111. Yourman road is offset approximately 500' from Highway 111 where it intersects Jasper and Heber. At its intersection with McCabe, there is only about 30' separating the two roads. Yourman is stop controlled at its intersection with all three main cross streets in the study area.

Correll Road is currently a farm access road on the north side of the Imperial Center development. Correll Road tees into Yourman, where it is stop controlled, and does not access Highway 111.

The Alder Drain forms the eastern boundary of the project site. It is not expected that a the crossing of the Alder Drain will be necessary for traffic purposes. Any gains in improved traffic handling of such a crossing would likely not be sufficient enough to outweigh the considerable cost of building such a crossing.

Highway 111 is a four-lane, divided, access controlled roadway adjacent to the project site. There are intersections on Highway 111 approximately every mile. Jasper and McCabe are stop controlled at their intersections with Highway 111, while the Heber Road intersection is controlled by a traffic signal. Left turn lanes are provided at every median crossing in 111.

Jasper Road, located one mile south of the project, is a two-laned road with exclusive right turn lanes at its intersection with Highway 111. McCabe Road, which is approximately 1 mile north of the project site, has one lane in each direction. It widens out at the Highway 111 intersection, but specific turning lanes are not designated.

Bowker Road is a two-laned road approximately 2 miles east of the site. Bowker stops for McCabe Road and Heber Road, while Jasper Road is stop controlled at its intersection with Bowker.

2. Average Traffic Volumes and Conditions

Average weekday traffic volumes were determined for the roadway network in the vicinity of the site. A review of daily traffic volumes was used in determining area traffic flows, annual growth and seasonal fluctuations.

3. Peak Hour Traffic Volumes

In order to accurately assess roadway capacities and Level of Service, hourly traffic volumes during the peak periods of travel were obtained. Peak hour traffic volume data was collected during the peak weekday periods at the intersections.

Initial turning movement counts were conducted in late July of 2001. Following a meeting with Imperial County staff, additional analysis was requested. Counts for the additional intersections were taken in November. Counts were taken for the peak twelve hours through the day, from 6 AM to 6 PM. From this data the AM Peak Hour, Midday Peak Hour and PM Peak Hour were determined at the locations. All turning movements were recorded in 15 minute intervals. Traffic count data sheets are presented in Appendix A. Typical peak periods generally occur in the morning between 7:00 am and 9:00 am and again in the evening between 4:00 pm and 6:00 pm. Due to the nature of the proposed development and the existing traffic characteristics the development was analyzed using both the AM and PM Peak Hour. The AM Peak Hour traffic volumes and PM Peak Hour traffic volumes were combined with the AM and PM Peak Hour site generated traffic to determine intersection Level of Service.

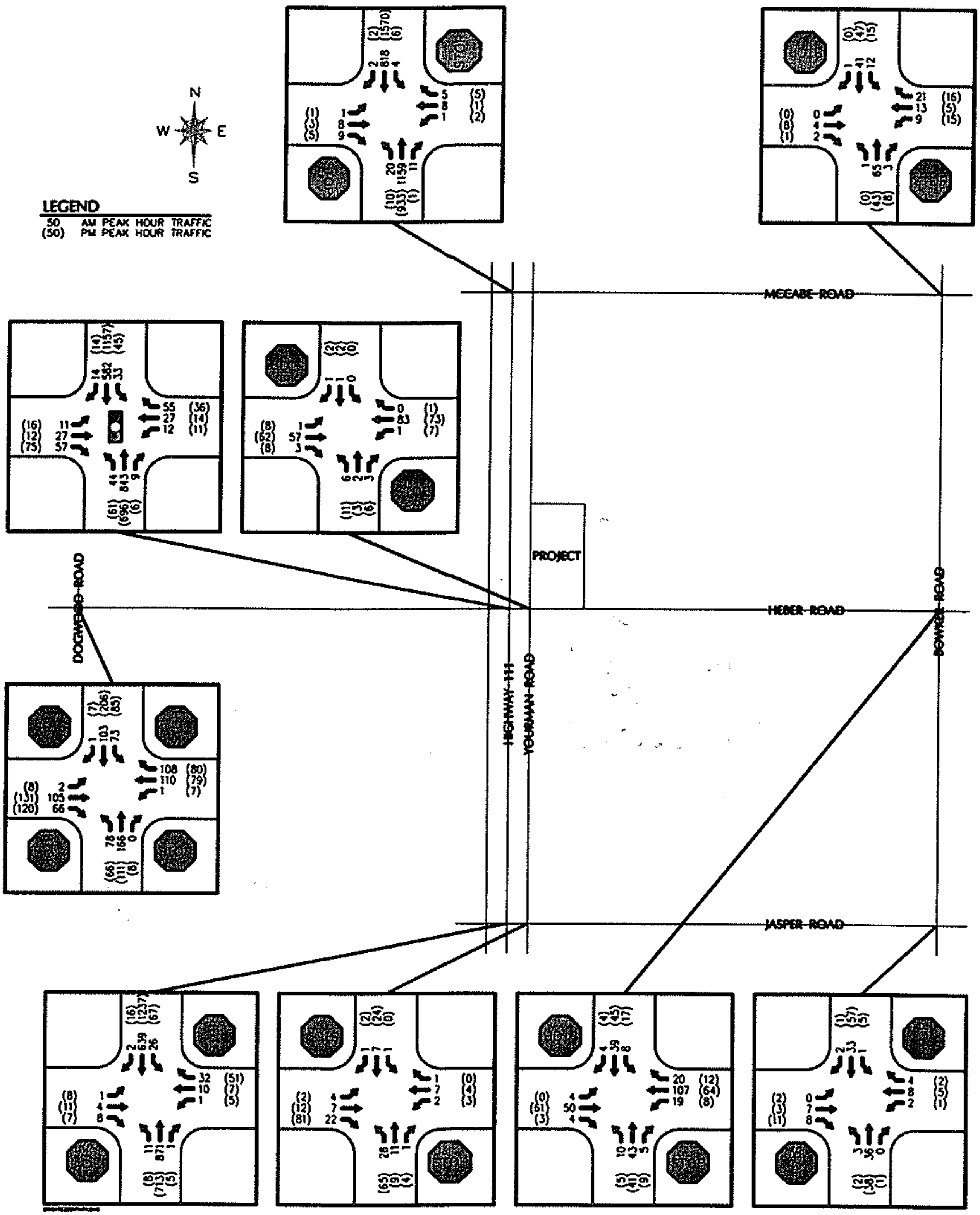

FIGURE 4
NOVEMBER 2001 PEAK HOUR BACKGROUND TRAFFIC VOLUMES

IV. PROJECTED TRAFFIC

A. Site Traffic

1. Trip Generation

In order to evaluate the traffic impacts of the site, the amount of traffic from the proposed project needs to be generated and assigned to the surrounding roadway network. Trip generation information for the proposed project was determined using the Institute of Transportation Engineer's *Trip Generation*, Sixth Edition, 1997. Peak hour volumes represent the highest volume of traffic generated during a one-hour period for the morning and evening peak. The various ITE land use codes were used for this study. Trip generation for the proposed land use was developed based on the trip rates presented in Table 1 below:

TABLE 1
LAND USE TRIP GENERATOR

Land Use	Category Code	Units	Daily Rate	AM Peak	Enter	Exit	PM Peak	Enter	Exit
Hotel	310	Rooms	8.23	0.56	61%	39%	0.61	53%	47%
Movie w/ Matinee	444	Screens	153.33	---	---	---	44.53	52%	48%
Spec. Retail Center	814	KSF	40.67	6.41	48%	52%	2.59	43%	57%
Discount Store	815	KSF	56.63	0.99	66%	34%	4.24	50%	50%
Factory Outlet	823	KSF	26.59	0.67	73%	27%	2.29	47%	53%
Quality Rest	831	KSF	89.95	0.81	50%	50%	7.49	67%	33%
High TO Sit Down Rest	832	KSF	130.34	9.27	52%	48%	10.86	60%	40%
FF Rest. w/o Drive Thru	833	KSF	716	43.87	60%	40%	26.15	51%	49%
FF Rest. w/ Drive Thru	834	KSF	496.12	49.86	51%	49%	33.48	52%	48%
Quick Lube Shop	837	Service Positions	40.00	3.00	67%	33%	5.19	55%	45%

Gas w/Conv Mart	**845**	Fueling Positions	162.78	10.06	50%	50%	13.38	50%	50%
Tire Store	**848**	Bays	---	2.24	65%	35%	3.47	42%	58%
Video Rental	**896**	KSF	---	---	---	---	13.60	46%	54%
Drive-In Bank	**912**	KSF	265.21	12.63	56%	44%	54.77	50%	50%

KSF - 1000 Square Feet of Gross Floor Area
FF - Fast Food

TABLE 2
SITE GENERATED TRAFFIC

Phase	AM Peak	Enter	Exit	PM Peak	Enter	Exit
I	207	108	99	284	142	142
I - II	319	176	143	406	207	199
I - III	990	546	444	1,127	576	551
I - IV	1,661	916	745	1,848	945	903
I - V	1,969	1,141	828	3,614	1,811	1,803

2. Directional Distribution

Before the impact of site traffic can be determined, it is necessary to develop a reasonable approximation of the directional distribution of the site traffic. The directions by which vehicles approach or leave this development have been estimated by evaluation of area traffic flows, review of the local roadway network, as well as knowing the existing and future attractions in the area. It is assumed that the number of trips originating or terminating at the site in each direction is roughly proportional to the population of that area and the proportion of traffic that currently exists. Based on existing traffic patterns and the location of residential and commercial centers, traffic to and from the site is expected to be distributed as shown in Figure 5.

3. Primary Trip Traffic

Primary Trip Traffic Volumes are estimated to account for the majority of the total site generated traffic.

4. Pass-By/Diverted Link Trip Traffic

Pass-by traffic varies relative to the specific land use and location under consideration. Because of the nature and location of this development, it was assumed that not all of the traffic would be making primary trips. Since this area is not located near a residential area, 60% of the trips to the gas station (phase I) from Highway 111are expected to be either linked or diverted trips. When the center builds out more, 40% of the out-lot traffic (phases III & IV) will likely be linked trips, where people will use more than one of the site stores on each trip.

5. Traffic Assignment

Total site generated traffic was assigned according to the directional distributions and Linked/Diverted trips mentioned previously. Total Site Generated Traffic added to Peak Hour Background traffic less Linked/Diverted trips is shown in Figures 6, 7, 8 and 9.

6. Annual Growth Factor

Future growth in this area is expected to increase the amount of existing traffic by two percent per year. Using 2002 as the opening year of the Imperial Center, traffic volumes that will use the existing streets were determined. It was assumed that each phase of the project would be built out over the course of two years.

7. Delivery Traffic

For the purposes of this study, it was assumed that most of the delivery truck traffic would use the easternmost access off of Heber Road. Some delivery traffic was also assigned to the driveway to the west of that. Additional delivery traffic would be expected to use Correll Road and the easternmost driveway from the project site.

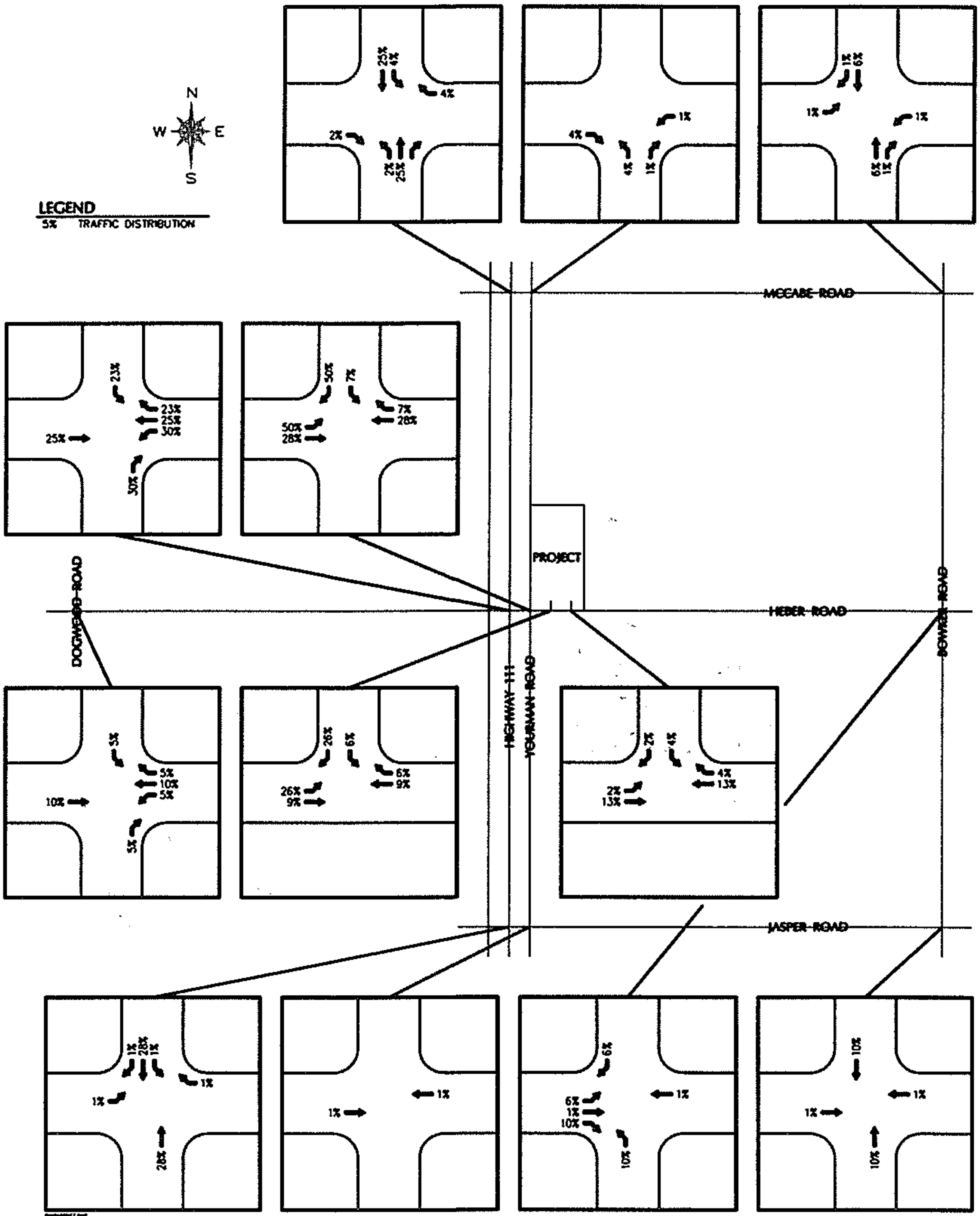

FIGURE 5
DIRECTIONAL DISTRIBUTION
SITE GENERATED TRAFFIC VOLUMES

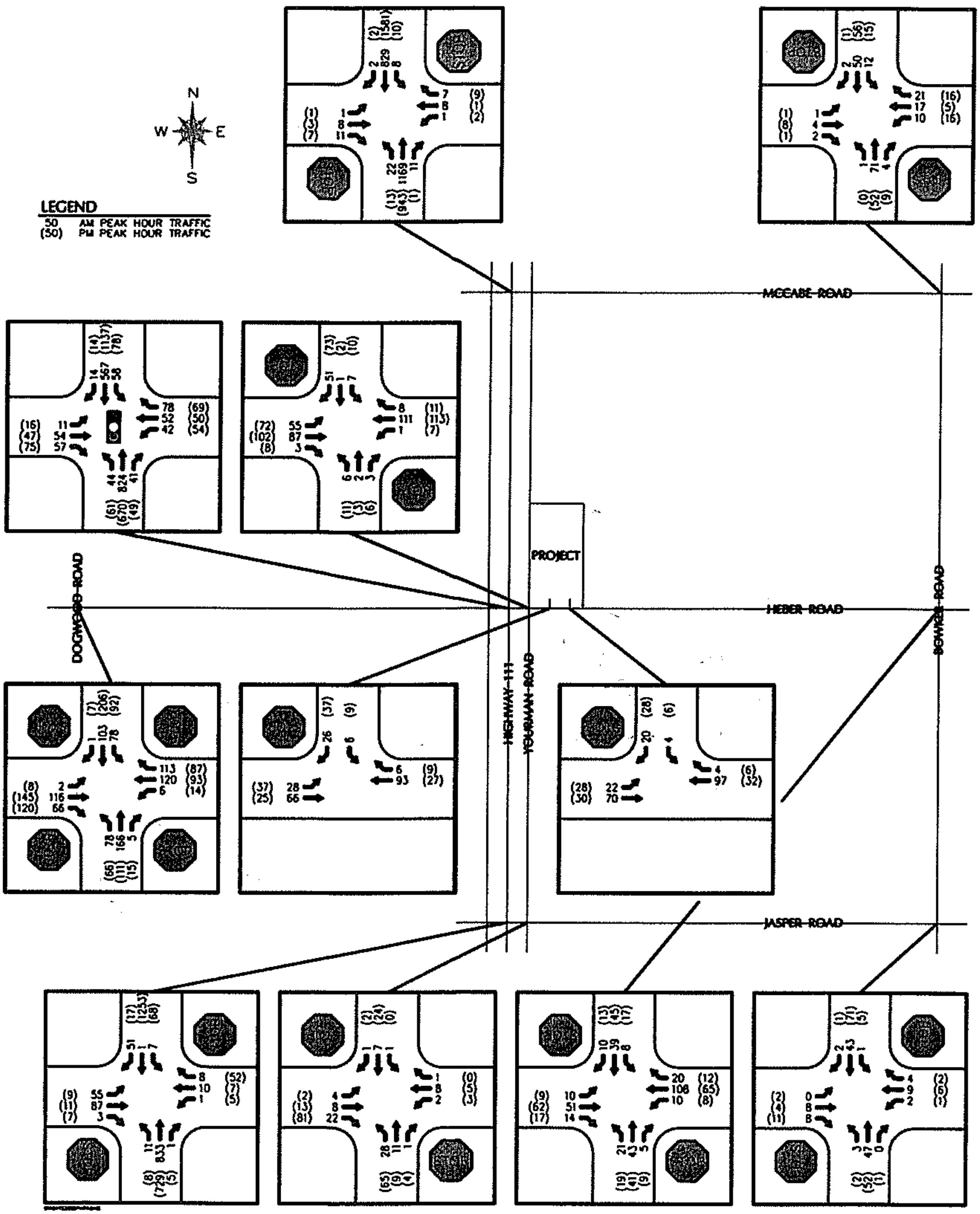

FIGURE 6
2002 PEAK HOUR TRAFFIC VOLUMES

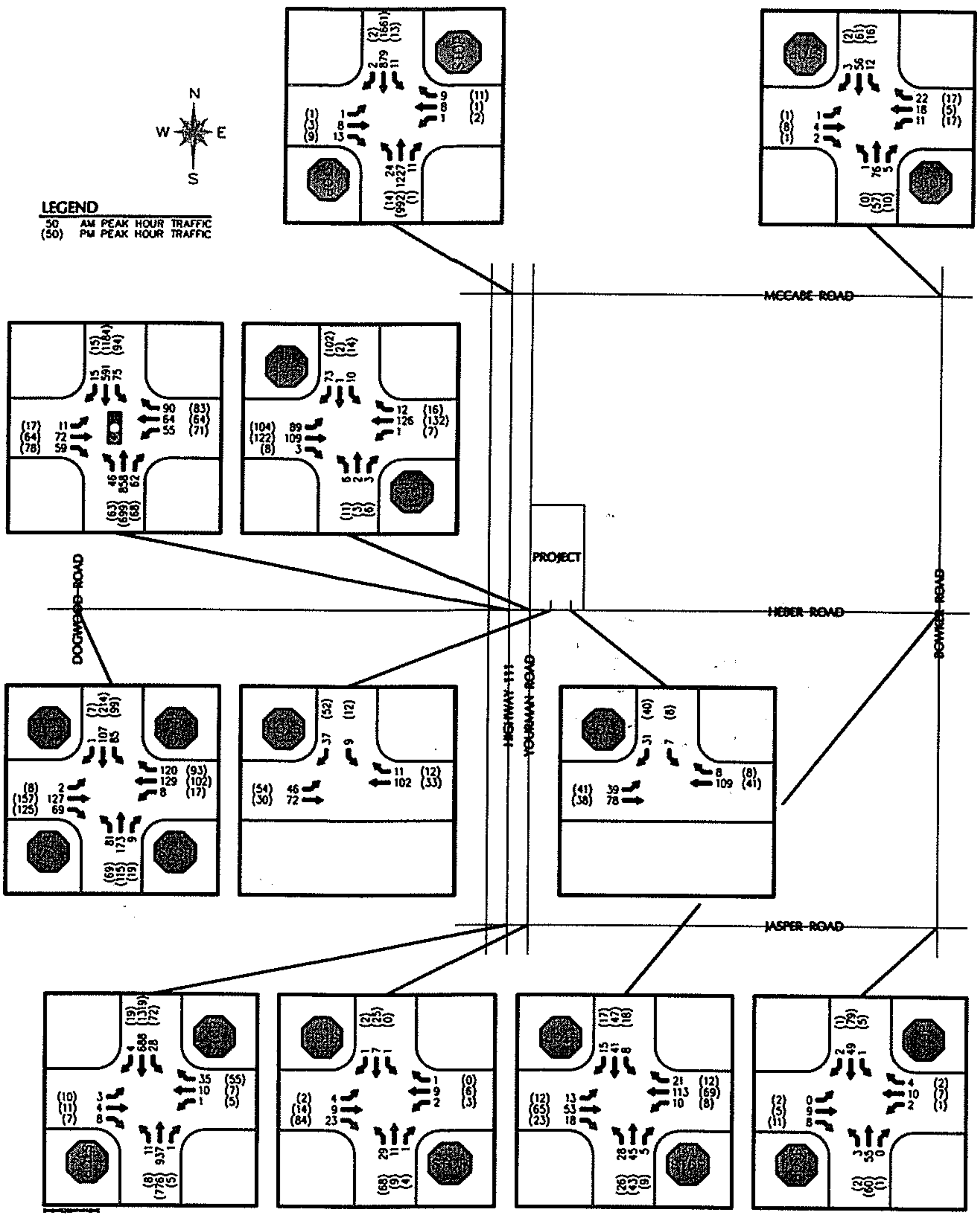

FIGURE 7
2004 PEAK HOUR TRAFFIC VOLUMES

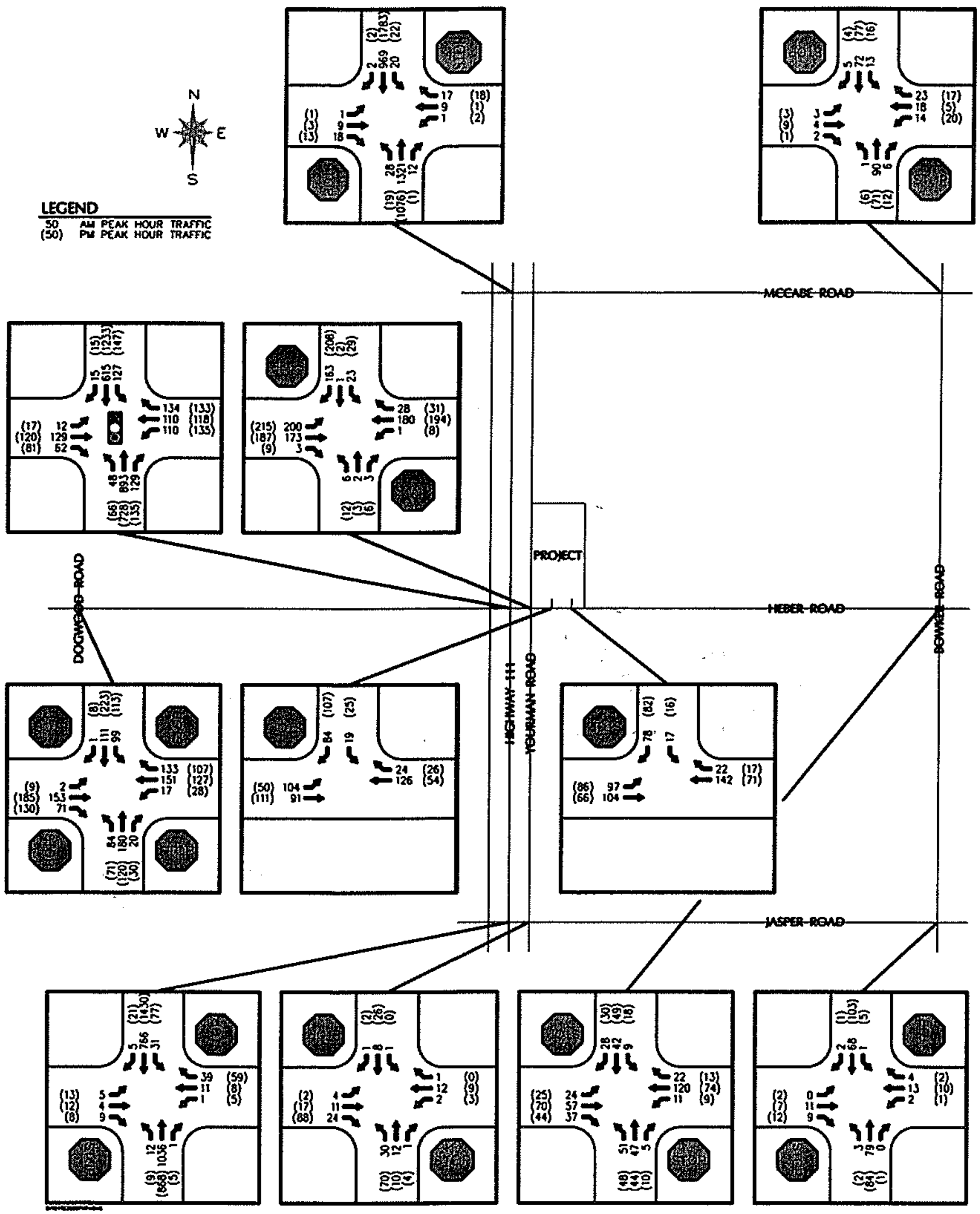

FIGURE 8
2006 PEAK HOUR TRAFFIC VOLUMES

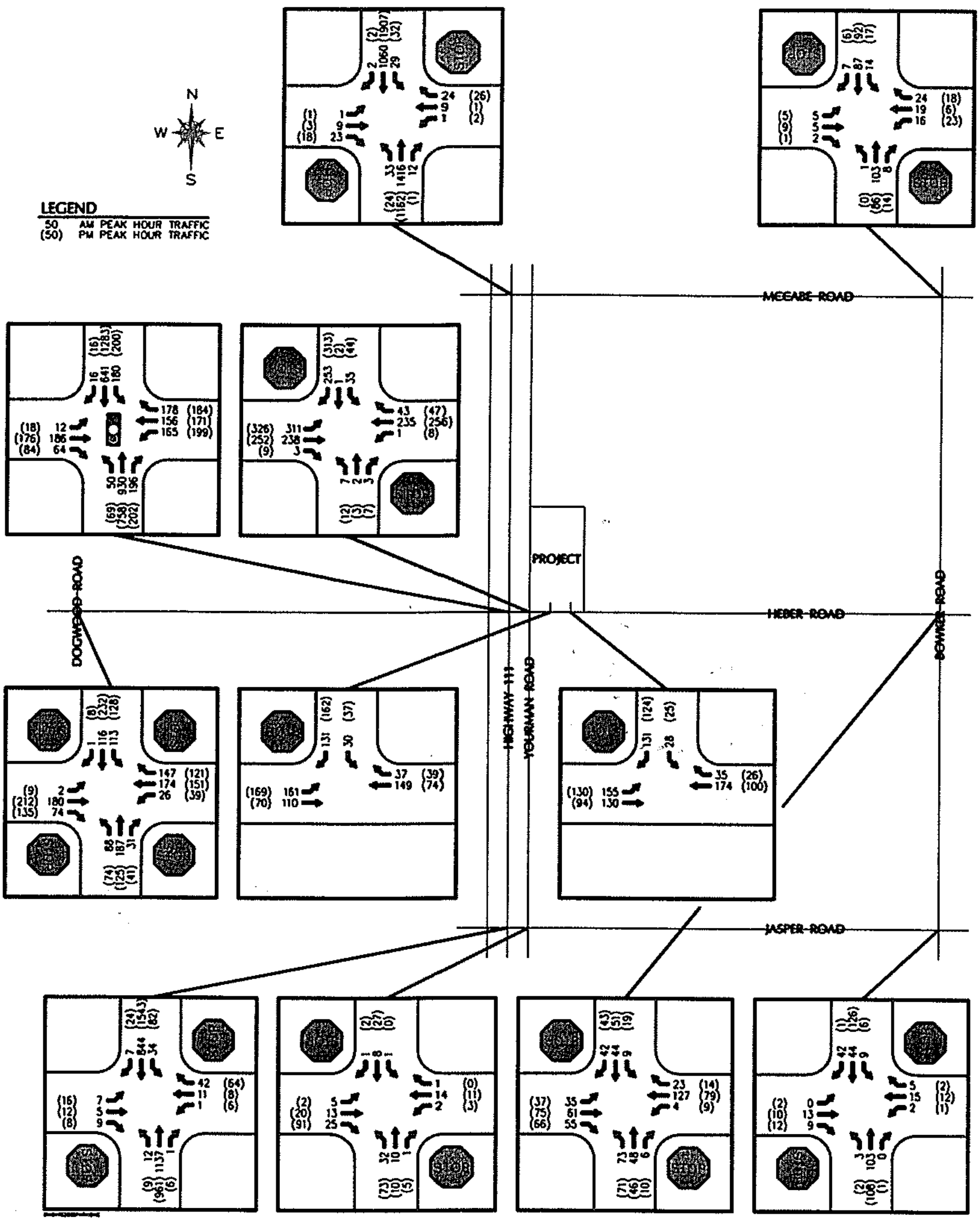

FIGURE 9
2008 PEAK HOUR TRAFFIC VOLUMES

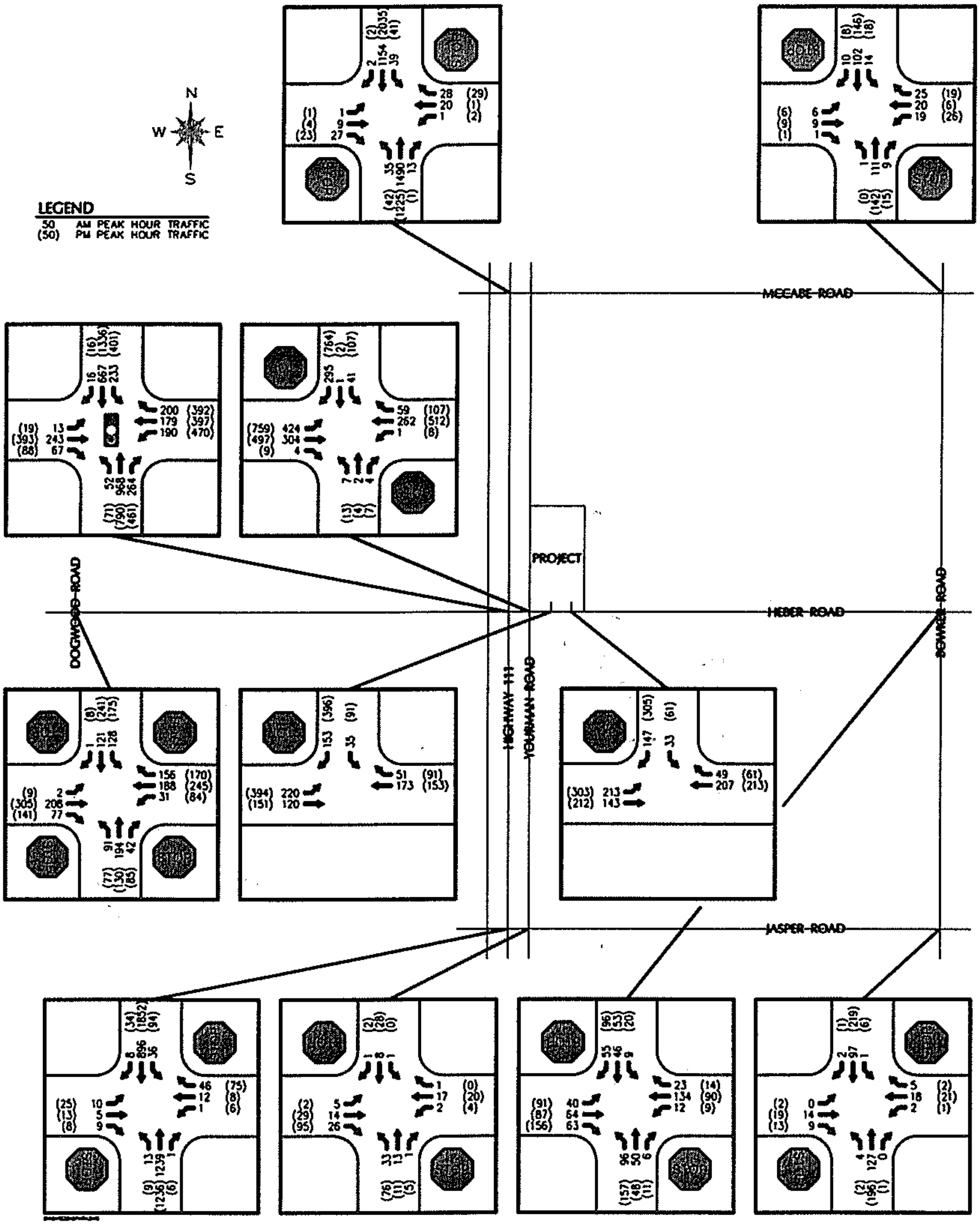

FIGURE 10
2010 PEAK HOUR TRAFFIC VOLUMES

V. TRAFFIC ANALYSIS

Level of Service (LOS) is a standard technique used in traffic engineering to evaluate the performance of roadways and intersections. Briefly defined, it is the qualitative measure of operating conditions of a roadway. These conditions incorporate several variables that affect the quality of traffic flow: speed and travel time, freedom of maneuver, traffic interruptions, comfort and convenience, vehicular delays, and safety. In practice, six Levels of Service ranging from A at best to F at worst are defined and used to describe the traffic flow in terms of delays experienced by motorists. Each of the six service levels defines a subjective range of traffic operating characteristics. The criteria for signalized intersections are shown in Table 3 and for unsignalized intersections are shown in Table 4. Further amplification of LOS A through LOS F for both types of intersection is given in Appendix C.

TABLE 3
LEVEL OF SERVICE DEFINITIONS
SIGNALIZED INTERSECTIONS

Level of Service	Stopped Delay per Vehicle (sec)	Qualitative Description
A	≤ 5.0	Drivers can maintain speed with little or no delay
B	5.1 to 15.0	Drivers have reasonable freedom to select speed
C	15.1 to 25.0	Drivers feel somewhat restricted
D	25.1 to 40.0	Drivers have little freedom to maneuver
E	40.1 to 60.0	Substantial restriction and delay
F	> 60.0	Long delays and stoppages - Drivers frequently divert to other routes

TABLE 4
LEVEL OF SERVICE DEFINITIONS
UNSIGNALIZED INTERSECTIONS

Level of Capacity Service	Average Total Delay(Sec/Veh)	Qualitative Description
A	≤5	Little or no delays
B	>5 and ≤10	Short traffic delays
C	>10 and ≤20	Average traffic delays
D	>20 and ≤30	Long traffic delays
E	>30 and ≤45	Very long traffic delays
F	>45	*

* When demand volume exceeds the capacity of the lane extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvements to the intersection.

Level of Service analysis was conducted for traffic flows at the intersections using techniques described in the 2000 *Highway Capacity Manual* (HCM). HiCAP 2000 was used to determine Level of Service for signalized and unsignalized intersections.

Unsignalized Analyses (Chapter 10, HCM) typically result in problems in interpretation of the Level of Service. Capacities defined by unsignalized methodology understate the actual capacity of the minor street. Levels of Service defined by Chapter 17 of the HCM are typically E for any intersecting street of an arterial regardless of the minor street volumes. This does not imply unacceptable operations but should be expected due to arterial street volumes.

Regional transportation studies commonly concentrated on the Levels of Service of the various roadway segments within a study area. Those are often the segments which are designated as having a desirable level of service of C. However, the critical locations within the circulation system are the intersections. The intersections will typically have a lower Level of Service than the segments between intersections. It will often be true that Level of Service C can be maintained on the roadway segments even though the adjacent intersections may operate at Level of Service D, or in some cases E.

In consideration of the above, the Institute of Transportation Engineers, representing transportational professionals throughout the country, have conducted a number of studies to determine the appropriate Levels of Service. The result has been the recommendation for the maintenance of urbanized intersections at Level of Service D. That level represents an acceptable compromise between the exorbitant costs of the higher Levels of Service and the increasing delays to traffic at the lower Levels of Service.

A. Capacity and Level of Service

The term Level Of Service (LOS) is a standard method used to quantify the operational efficiency of an intersection. The efficiency of the intersection takes into account several variables that affect the quality of traffic flow, namely speed and travel time, freedom to maneuver, traffic interruptions, comfort and conveniënce, vehicular delays and safety. The service levels range from LOS A (free flowing traffic) to LOS F (intersection failure). For initial construction, LOS C or better is generally the project's targeted designed level of operation. LOS D is generally considered the lowest advisable service level based on future traffic increases. A summary of the meanings of the various service levels is included in the appendix.

Unsignalized intersection LOS was calculated using the Highway Capacity Software. Analysis of unsignalized intersections typically result in problems in interpretation of the LOS. Capacities defined by unsignalized methodology understate the actual capacity of the minor street. Service levels defined by Chapter 17 of the Highway Capacity Manual are typically LOS E for any street intersecting an arterial, regardless of the minor street volumes. This does not necessarily imply unacceptable operations, but should be expected due to arterial street volumes. When certain movements reach unacceptable levels, traffic will often find other routes of travel.

Level of Service (LOS) analyses were conducted for the intersections using Peak Hour traffic volumes for six separate cases:

- ❒ **2001 Peak Hour Traffic Volumes** — Existing Peak Hour volumes (See Figure 4).
- ❒ **2002 Peak Hour Traffic Volumes** — Peak Hour projected into the 2002 Peak Season with the addition of traffic generated by Phase I (See Figure 6).
- ❒ **2004 Peak Hour Traffic Volumes** — Peak Hour projected to the 2004 Peak Season with the addition of traffic generated by Phase I & II (See Figure 7).

- **2006 Peak Hour Traffic Volumes** — Peak Hour projected into the 2006 Peak Season with the addition of traffic generated by Phase I, II and III (See Figure 8).

- **2008 Peak Hour Traffic Volumes** — Peak Hour projected into the 2008 Peak Season with the addition of traffic generated by Phase I, II, III and IV (See Figure 9).

- **2010 Peak Hour Traffic Volumes** — Peak Hour projected into the 2010 Peak Season with the addition of traffic generated by Phase I, II, III, IV (See Figure 10).

- **2020 Peak Hour Traffic Volumes** — Peak Hour projected into the 2020 Peak Season with the addition of traffic generated by Phase I, II, III, IV.

The Level of Service calculation sheets for traffic flows at the intersections are provided in the Appendices and Level of Service impacts are summarized in Tables 5 - 9 on the following pages.

Service levels were initially completed for the existing volumes. These are shown in the column for 2001. The next step was calculating the Level Of Service for each of the other conditions. It was then determined whether or not the service level had depreciated substantially to the point where mitigation measures were required. Additional analyses were performed when necessary to determine what measures of mitigation would be necessary to bring the degraded levels up.

As shown in the attached chart, five of the studied intersections do not need any mitigation at all. At both project driveways onto Heber, Yourman & Jasper, McCabe & Bowker, and Jasper & Bowker, all turning movements are found to have acceptable service levels through the project build-out.

Based on the analysis, four intersections will need traffic signals at project build-out. These intersections are Jasper & Highway 111, Heber & Yourman, McCabe & Highway 111, and Heber & Dogwood. While the Jasper & Highway 111 intersection and the Heber & Yourman intersection show individual movements below Level Of Service C, the overall intersection Level Of Service is C or better. By making minor changes to the signal timings to improve these lower service levels, the required Level Of Service C can still be maintained for the intersection as a whole.

The mitigation measures needed to bring the other intersections to Level Of Service C or better are described in Section VII.

TABLE 5
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	2001		2002		2004		2006		2008		2010	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
McCabe Rd & Highway 111	WB	F	F	F	F	F	F	F	F	F	F	F	F
	EB	F	F	F	F	F	F	F	F	F	F	F	F
	NBLT	A	C	C	C	C	C	C	C	C	C	B	D
	SBLT	B	B	B	B	B	B	B	B	B	B	C	B
Highway 111 & Jasper Rd	NBLT	A	B	A	B	A	B	A	B	A	B	B	C
	SBLT	B	A	B	A	B	B	B	A	B	A	B	B
	EB	D	F	E	F	E	F	E	F	E	F	F	F
	WB	C	E	D	F	D	F	D	F	D	F	F	F
Yourman Rd & Heber Rd	NB	A	A	B	B	B	B	C	D	F	F	F	F
	SB	A	A	A	A	A	B	B	C	D	F	D	F
	EBLT	A	A	A	A	A	A	A	A	A	A	A	E
	WBLT	A	A	A	A	A	A	A	A	A	A	A	A
Yourman Rd & Jasper Rd	NBLT	A	A	A	A	A	A	A	A	A	A	A	B
	SBLT	A	A	A	A	A	A	A	A	A	A	A	B
	EB	A	A	A	A	A	A	A	A	A	A	A	A
	WB	A	A	A	A	A	A	A	A	A	A	A	A
Heber Rd & Bowker Rd	NBLT	B	B	B	B	B	B	B	B	B	B	C	D
	SBLT	B	B	B	B	B	B	B	B	B	B	B	B
	EB	A	A	A	A	A	A	A	A	A	A	A	A
	WB	A	A	A	A	A	A	A	A	A	A	A	A
McCabe Rd & Bowker Rd	NB	A	A	A	A	A	A	A	A	A	A	B	B
	SB	A	A	A	A	A	A	A	A	A	A	B	B
	EBLT	A	A	A	A	A	A	A	A	A	A	A	A
	WBLT	A	A	A	A	A	A	A	A	A	A	A	A
Dogwood Rd & Heber Rd	NBLT	B	B	B	B	B	B	B	B	B	B	C	C
	SBLT	B	B	B	B	B	B	B	B	B	B	B	D
	EBLT	B	B	B	B	B	B	B	B	B	C	B	D

	WBLT	A	B	A	B	A	B	A	B	A	B	B	D
	INT	B	B	B	B	B	B	B	B	B	C	B	D
Jasper Rd & Bowker Rd	NBLT	A	A	A	A	A	A	A	A	A	A	A	A
	SBLT	A	A	A	A	A	A	A	A	A	A	A	A
	EB	A	A	A	A	A	A	A	A	A	A	B	B
	WB	A	A	A	A	A	A	A	A	A	A	B	B
Heber Rd & West Dr.	SB	-	-	B	C	B	C	B	C	B	C	B	C
	EBLT	-	-	A	A	A	A	A	A	A	A	A	A
Heber Rd & East Dr.	SB	-	-	B	C	B	C	B	C	B	C	B	C
	EBLT	-	-	A	A	A	A	A	A	A	A	A	A

A LEVEL OF SERVICE
– NOT ANALYZED

TABLE 6
SIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	2001	2002	2004	2006	2008	2010
Heber Road & Highway 111	SB	A/A	-	A/B	B/C	C/B	B/D
	WB	C/C	-	C/D	C/C	C/C	C/B
	NB	A/A	-	B/B	B/B	C/B	B/C
	EB	C/D	-	C/D	C/C	C/C	C/B
	INT	A/A	-	B/B	B/B	C/C	B/C

TABLE 7
SIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	Jasper & Hwy 111	Heber & Yourman	McCabe & Hwy 111	Heber & Dogwood
2010	SB	B/B	B/C	A/A	B/C
	WB	D/E	D/C	C/C	B/B
	NB	A/A	B/C	A/A	B/C
	EB	C/C	C/C	C/C	B/B
	INT	A/B	C/C	A/A	B/B

A/B AM PEAK HOUR LOS or DELAY/PM PEAK HOUR LOS or DELAY
– NOT ANALYZED

TABLE 8
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	2020 AM	2020 PM
Yourman Rd & Jasper Rd	NBLT	A	B
	SBLT	A	B
	EB	A	A
	WB	A	A
Heber Rd & Bowker Rd	NBLT	C	D
	SBLT	B	B
	EB	A	A
	WB	A	A
McCabe Rd & Bowker Rd	NB	B	B
	SB	B	B
	EBLT	A	A
	WBLT	A	A
Jasper Rd & Bowker Rd	NBLT	B	B
	SBLT	B	B
	EB	A	A
	WB	A	A
Heber Rd & West Dr.	SB	B	D
	EBLT	A	A
Heber Rd & East Dr.	SB	B	C
	EBLT	A	A

TABLE 9
SIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	Jasper & Hwy 111	Heber & Yourman	McCabe & Hwy 111	Heber & Hwy 111	Heber & Dogwood
2020	SB	C/C	C/C	C/C	D/B	C/B
	WB	D/F	E/C	C/C	C/C	C/B
	NB	A/B	B/C	A/A	C/D	B/C
	EB	A/D	B/C	A/C	B/C	C/D
	INT	A/C	C/C	A/B	C/C	C/C

B. Accident Analysis

The existing accident rate for each intersection was determined using the 1998-2001 data provided by CalTrans. By making the gross assumption this rate would stay constant as traffic volumes increased, the numbers of accidents were projected in to the future years.

At the Heber Road and SR-111 intersection, there are currently about 7 accidents per year. Based on the increased volume, that number could be expected to increase to 15 per year by 2020. The number of accidents correctable by signal installation would be four (realizing signals are already in place at this location). The primary type of accident occurring at this intersection is the rear end collision. In order to decrease the frequency of these types of accidents, it is recommended some form of advance flasher be installed notifying motorists when the light is expected to turn red for their approach. Since this intersection is already experiencing 5 of these types of crashes per year, this would be a good mitigation measure to implement immediately, independent of any development at this site.

At the Jasper Road and SR-111 intersection, there are currently about 4 accidents per year. Based on the increased volume, that number could be expected to increase to 7 per year by 2020. The number of accidents correctable by signal installation would be five. This was the only intersection that would warrant a signal based on accidents (in 2010). Since it also meets volume warrants, a signal was previously recommended for this location. The angle accidents are the primary type of crashes occurring, so no other mitigation is expected to be needed.

At the McCabe Road and SR-111 intersection, there are currently about 2 accidents per year. Based on the increased volume, that number could be expected to increase to 3 per year by 2020. The number of accidents correctable by signal installation would be three. The proposal to install a signal at this location when volume warrants are met should adequately mitigate the majority of the accidents occurring here.

At the Heber Road and Dogwood Road intersection, there is currently an average of 1 accident per year. Based on the increased volume, that number could be expected to increase to 2 per year by 2020. None of the accidents are correctable by signal installation. This minimal increase in the number of accidents does not suggest mitigation would be necessary.

VI. Findings

A. Site Accessibility

The conceptual site development plan for this proposed project was reviewed to ensure that external access points onto adjacent roadways would provide for proper vehicle, pedestrian and bicycle safety. Upon construction of the recommended improvements, this development should provide for convenient access to and from the adjacent roadways.

B. Traffic Impacts

The proposed development is expected to generate a combined 38,377 new daily trips upon completion. These trips will access the site from Heber Road, Yourman Road and Correll Road. For the purposes of this study the complete buildout of the project is anticipated for the year 2010. During the 2010 AM Peak Hour 1,969 trips will be generated with 1,141 of these entering the site and 828 exiting the site. During the 2010 PM Peak Hour 3,614 trips will be generated with 1,811 of these entering the site and 1,803 exiting the site.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. Site Access

This report has analyzed and evaluated the traffic impacts of the proposed development for the opening year of each unit of the project. Improvements are required to mitigate the traffic impacts due to this development. Based on the results of this traffic impact analysis, it is our opinion that these proposed improvements will provide for safe, convenient site ingress and egress to and from this development.

The Imperial Center will create approximately 38,377 new trips each day. These trips will access the site from Heber Road, Yourman Road and Correll Road. It has been shown that at full build-out of the project, the service level of the internal and adjacent streets will be adequate to handle the traffic from this project. The following recommendations will ensure safe and efficient handling of the traffic:

On-site Improvements

Yourman Road

The preliminary site layout for this project shows the relocation of Yourman Road farther east from its current alignment. The road is also shown as being reconstructed as a two lane roadway with medians and left turn lanes at driveway openings. It will be necessary to clearly sign Yourman Road for northbound traffic where it turns to the west so that through traffic does not end up in the Imperial Center parking lot.

Site Access Driveways

Three driveways are shown from the site onto Heber Road. The easternmost two driveways will allow full turning movements. These driveways should be constructed with one lane in and two lanes out. Due to the close proximity of the western driveway to Yourman Road, it is recommended that this driveway be limited to right turns out only. This will help reduce some of the traffic using the Yourman/Heber intersection, improving the Level Of Service of that intersection. It is noted that in 2020, the southbound movement at this intersection drops to Level Of Service D. Since this location is not suitable for signalization, southbound traffic will have to endure the longer delay.

The other driveways into the site will function adequately with one lane in and one lane out. Traffic volumes will be spread out over these driveways, coupled with the fact that they are onto lower volume roads, providing for high service levels.

Off-site Improvements

Heber Road
It is recommended that Heber Road be widened to five lanes prior to Phase IV (2008) from Scaroni Road on the west to the east edge of the project. This will provide the necessary capacity at the Highway 111 intersection and the project driveways. An additional southbound left turn lane and a northbound right turn lane will be needed to accommodate 2010 traffic.

Jasper Road and Highway 111
A traffic signal will likely be warranted at the Highway 111 and Jasper Road intersection with the addition of Phase I traffic. Though this phase adds little traffic to this intersection, the intersection is currently operating at poor levels of service. This project will add an additional 1,084 trips to this intersection at build-out, or 32%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $40,000.

McCabe Road & Highway 111
A traffic signal will likely be warranted at the Highway 111 and McCabe Road intersection at project build-out. This intersection is currently operating at poor levels of service for eastbound and westbound traffic. This project will add an additional 630 trips to this intersection at build-out, or 18%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $22,500. It is also recommended that McCabe Road be marked with two lanes approaching the intersection, a left turn lane and a combined through/right turn lane.

Yourman Road and Heber Road
In addition to the previously described improvements to Heber Road, a traffic signal will be needed at this intersection with the addition of Phase IV (2008) traffic. The Level Of Service calculations show a northbound Level Of Service of D in 2006, but if the roadway is realigned as proposed, this will not be the case. Since the need for this signal is due almost entirely to project generated traffic, the entire cost for this signal would be assigned to the developer. It will be important to coordinate this signal with the signal on Highway 111 so that backups do not occur along Heber.

Heber Road & Highway 111
At project build-out, dual southbound left turn lanes will be required, as well as a northbound right turn lane.

Based on existing accident data, it is recommended that some form of advance notice be given to Highway 111 traffic of impending signal changes. This will help to reduce the number of rear end accidents occurring at this location. Since this is a pre-existing condition, it would not be the responsibility of this development.

Dogwood Road and Heber Road
A traffic signal will likely be warranted at the Dogwood Road and Heber Road intersection at project build-out. This project will add an additional 723 trips to this intersection at build-out, or 43%. Based on a signal cost of $125,000, the fair share cost to the Imperial Center project towards this signal would be $53,750.

Bowker Road and Heber Road
At project build-out, left turn lanes will be needed for northbound and southbound traffic at this intersection.

The design of all intersections and roadways shall be in accordance with Caltrans Standard Drawings, Imperial County guidelines, City of Calexico Standards and the latest editions of the MUTCD and AASHTO Green Book.

APPENDIX B

LEVEL OF SERVICE ANALYSIS

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowjas
Site Code : 0000000
Start Date : 11/13/200
Page No : 3

	BOWKER RD From North					JASPER RD From East					BOWKER RD From South					JASPER RD From West					
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																					
Intersecti on	15:45																				
Volume	1	57	5	0	63	2	5	1	0	8	1	38	2	0	41	11	3	2	0	16	128
Percent	1.6	90. 5	7.9	0.0		25. 0	62. 5	12. 5	0.0		2.4	92. 7	4.9	0.0		68. 8	18. 8	12. 5	0.0		
Volume	1	57	5	0	63	2	5	1	0	8	1	38	2	0	41	11	3	2	0	16	128
Volume	0	13	3	0	16	0	0	1	0	1	0	14	0	0	14	3	0	0	0	3	34
Peak Factor																					0.941
High Int.	16:00					15:45					16:00					16:15					
Volume	0	13	3	0	16	0	4	0	0	4	0	14	0	0	14	3	1	1	0	5	
Peak Factor					0.98 4					0.50 0					0.73 2					0.80 0	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowjas
Site Code : 0000000
Start Date : 11/13/20

Groups Printed- Unshifted

	BOWKER RD From North				JASPER RD From East				BOWKER RD From South				JASPER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	0	13	3	0	0	0	1	0	0	14	0	0	3	0	0	0	34
16:15	0	15	1	0	2	1	0	0	0	8	0	0	3	1	1	0	32
16:30	1	15	0	0	0	0	0	0	1	9	1	0	1	2	1	0	31
16:45	0	10	0	0	3	0	0	0	0	7	0	0	0	3	0	0	23
Total	1	53	4	0	5	1	1	0	1	38	1	0	7	6	2	0	120
17:00	0	10	1	0	2	0	2	0	0	12	1	0	0	5	0	0	33
17:15	0	11	0	0	0	1	1	0	0	5	0	0	0	0	0	0	18
17:30	1	6	1	0	0	0	1	0	0	9	0	0	1	4	0	0	23
17:45	1	4	0	0	0	2	0	0	0	7	0	0	0	2	1	0	17
Total	2	31	2	0	2	3	4	0	0	33	1	0	1	11	1	0	91
Grand Total	11	338	14	0	16	37	14	0	11	302	19	0	33	45	10	0	850
Apprch %	3.0	93.1	3.9	0.0	23.9	55.2	20.9	0.0	3.3	91.0	5.7	0.0	37.5	51.1	11.4	0.0	
Total %	1.3	39.8	1.6	0.0	1.9	4.4	1.6	0.0	1.3	35.5	2.2	0.0	3.9	5.3	1.2	0.0	

	BOWKER RD From North					JASPER RD From East					BOWKER RD From South					JASPER RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																					
Intersection	06:45																				
Volume	2	33	1	0	36	4	8	2	0	14	0	36	3	0	39	8	7	0	0	15	104
Percent	5.6	91.7	2.8	0.0		28.6	57.1	14.3	0.0		0.0	92.3	7.7	0.0		53.3	46.7	0.0	0.0		
Volume	2	33	1	0	36	4	8	2	0	14	0	36	3	0	39	8	7	0	0	15	104
Volume	2	11	0	0	13	1	2	0	0	3	0	14	1	0	15	2	2	0	0	4	35
Peak Factor																					0.743
High Int.	07:15					07:30					07:15					06:45					
Volume	2	11	0	0	13	1	3	1	0	5	0	14	1	0	15	5	0	0	0	5	
Peak Factor					0.692					0.700					0.650					0.750	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																					
Intersection	13:00																				
Volume	0	44	0	0	44	2	5	0	0	7	2	26	2	0	30	3	4	1	0	8	89
Percent	0.0	100.0	0.0	0.0		28.6	71.4	0.0	0.0		6.7	86.7	6.7	0.0		37.5	50.0	12.5	0.0		
Volume	0	44	0	0	44	2	5	0	0	7	2	26	2	0	30	3	4	1	0	8	89
Volume	0	20	0	0	20	0	1	0	0	1	1	4	1	0	6	0	0	1	0	1	28
Peak Factor																					0.795
High Int.	13:30					13:00					13:00					13:15					
Volume	0	20	0	0	20	1	1	0	0	2	0	9	1	0	10	3	1	0	0	4	
Peak Factor					0.550					0.875					0.750					0.500	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

o's Shopping Center
Traffic Impact Study

File Name : 01104bowjas
Site Code : 00000000
Start Date : 11/13/200
Page No : 1

Groups Printed- Unshifted

	BOWKER RD From North				JASPER RD From East				BOWKER RD From South				JASPER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	0	3	0	0	0	0	0	0	1	5	0	0	0	2	0	0	11
06:15	1	5	0	0	0	1	0	0	0	11	1	0	1	0	1	0	21
06:30	0	10	0	0	0	2	0	0	0	7	0	0	0	2	0	0	21
06:45	0	10	0	0	1	2	1	0	0	7	1	0	5	0	0	0	27
Total	1	28	0	0	1	5	1	0	1	30	2	0	6	4	1	0	80
07:00	0	3	0	0	1	1	0	0	0	4	1	0	1	2	0	0	13
07:15	2	11	0	0	1	2	0	0	0	14	1	0	2	2	0	0	35
07:30	0	9	1	0	1	3	1	0	0	11	0	0	0	3	0	0	29
07:45	0	8	0	0	0	1	0	0	2	9	0	0	0	1	0	0	21
Total	2	31	1	0	3	7	1	0	2	38	2	0	3	8	0	0	98
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	8	0	0	0	0	0	0	0	5	0	0	0	0	0	0	13
09:15	1	3	0	0	0	0	0	0	0	3	1	0	0	0	0	0	8
09:30	0	7	0	0	0	1	0	0	0	7	0	0	2	0	0	0	17
09:45	0	9	0	0	0	2	0	0	3	7	2	0	1	1	0	0	25
Total	1	27	0	0	0	3	0	0	3	22	3	0	3	1	0	0	[illegible]
10:00	0	3	0	0	0	0	0	0	0	12	1	0	0	1	0	0	17
10:15	0	7	0	0	2	1	0	0	1	12	2	0	1	1	0	0	27
10:30	2	5	1	0	0	1	1	0	0	8	2	0	0	1	2	0	23
10:45	0	3	0	0	0	1	3	0	0	7	0	0	0	0	0	0	14
Total	2	18	1	0	2	3	4	0	1	39	5	0	1	3	2	0	81
11:00	1	4	1	0	0	1	0	0	0	1	0	0	0	3	0	0	11
11:15	0	8	1	0	0	0	0	0	1	7	0	0	0	0	1	0	18
11:30	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11:45	0	11	1	0	0	0	0	0	0	3	0	0	0	1	1	0	17
Total	1	23	3	0	0	1	0	0	1	12	0	0	0	4	2	0	47
12:00	0	5	0	0	0	2	1	0	0	5	0	0	1	0	0	0	14
12:15	0	8	0	0	0	1	0	0	0	10	0	0	0	2	0	0	21
12:30	1	9	1	0	0	0	0	0	0	6	1	0	0	0	0	0	18
12:45	0	8	0	0	0	1	1	0	0	7	0	0	0	0	1	0	18
Total	1	30	1	0	0	4	2	0	0	28	1	0	1	2	1	0	71
13:00	0	6	0	0	1	1	0	0	0	9	1	0	0	1	0	0	19
13:15	0	8	0	0	0	2	0	0	1	8	0	0	3	1	0	0	23
13:30	0	20	0	0	0	1	0	0	1	4	1	0	0	0	1	0	28
13:45	0	10	0	0	1	1	0	0	0	5	0	0	0	2	0	0	19
Total	0	44	0	0	2	5	0	0	2	26	2	0	3	4	1	0	89
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
15:00	0	9	0	0	0	0	1	0	0	9	0	0	2	0	0	0	21
15:15	0	16	0	0	1	1	0	0	0	13	0	0	2	2	0	0	35
15:30	0	14	1	0	0	0	0	0	0	7	1	0	0	0	0	0	23
15:45	0	14	1	0	0	4	0	0	0	7	1	0	4	0	0	0	31
Total	0	53	2	0	1	5	1	0	0	36	2	0	8	2	0	0	110

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowheb
Site Code : 0000000
Start Date : 11/14/2001
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	BOWKER RD From North					HEBER RD From East					BOWKER RD From South					HEBER RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																					
Intersection	16:00																				
Volume	4	45	17	0	66	12	64	8	0	84	9	41	5	0	55	3	61	0	0	64	269
Percent	6.1	68.2	25.8	0.0		14.3	76.2	9.5	0.0		16.4	74.5	9.1	0.0		4.7	95.3	0.0	0.0		
Volume	4	45	17	0	66	12	64	8	0	84	9	41	5	0	55	3	61	0	0	64	269
Volume	2	8	5	0	15	6	20	3	0	29	2	9	2	0	13	1	19	0	0	20	77
Peak Factor																					0.873
High Int.	16:15					16:00					16:45					16:00					
Volume	1	12	4	0	17	6	20	3	0	29	3	14	2	0	19	1	19	0	0	20	
Peak Factor					0.971					0.724					0.724					0.800	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowheb
Site Code : 00000000
Start Date : 11/14/200
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Groups Printed- Unshifted

	BOWKER RD From North				HEBER RD From East				BOWKER RD From South				HEBER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	2	8	5	0	6	20	3	0	2	9	2	0	1	19	0	0	77
16:15	1	12	4	0	1	12	1	0	2	8	1	0	1	11	0	0	54
16:30	0	12	5	0	3	17	1	0	2	10	0	0	1	17	0	0	68
16:45	1	13	3	0	2	15	3	0	3	14	2	0	0	14	0	0	70
Total	4	45	17	0	12	64	8	0	9	41	5	0	3	61	0	0	269
17:00	0	14	3	0	1	13	7	0	1	6	1	0	0	10	2	0	58
17:15	0	8	7	0	5	12	5	0	2	8	2	0	0	18	0	0	67
17:30	1	4	2	0	1	12	4	0	3	5	1	0	0	19	0	0	52
17:45	1	6	5	0	3	11	1	0	0	6	2	0	0	13	1	0	49
Total	2	32	17	0	10	48	17	0	6	25	6	0	0	60	3	0	226
Grand Total	38	325	101	0	114	623	76	0	53	317	59	0	23	451	26	0	2206
Apprch %	8.2	70.0	21.8	0.0	14.0	76.6	9.3	0.0	12.4	73.9	13.8	0.0	4.6	90.2	5.2	0.0	
Total %	1.7	14.7	4.6	0.0	5.2	28.2	3.4	0.0	2.4	14.4	2.7	0.0	1.0	20.4	1.2	0.0	

	BOWKER RD From North					HEBER RD From East					BOWKER RD From South					HEBER RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
eak Hour From 06:00 to 09:45 - Peak 1 of 1																					
Intersection	07:00																				
Volume	4	39	8	0	51	20	107	10	0	137	5	43	10	0	58	4	50	4	0	58	304
Percent	7.8	76.5	15.7	0.0		14.6	78.1	7.3	0.0		8.6	74.1	17.2	0.0		6.9	86.2	6.9	0.0		
Volume	4	39	8	0	51	20	107	10	0	137	5	43	10	0	58	4	50	4	0	58	304
Volume	1	13	2	0	16	5	29	3	0	37	2	14	3	0	19	1	11	2	0	14	86
Peak Factor																					0.884
High Int.	07:45					07:45					07:45					07:30					
Volume	1	13	2	0	16	5	29	3	0	37	2	14	3	0	19	2	17	1	0	20	
Peak Factor					0.797					0.926					0.763					0.725	
eak Hour From 10:00 to 13:45 - Peak 1 of 1																					
Intersection	13:00																				
Volume	3	48	8	0	59	7	55	9	0	71	4	27	3	0	34	2	41	2	0	45	209
Percent	5.1	81.4	13.6	0.0		9.9	77.5	12.7	0.0		11.8	79.4	8.8	0.0		4.4	91.1	4.4	0.0		
Volume	3	48	8	0	59	7	55	9	0	71	4	27	3	0	34	2	41	2	0	45	209
Volume	0	15	2	0	17	3	14	1	0	18	0	11	1	0	12	0	11	1	0	12	59
Peak Factor																					0.886
High Int.	13:45					13:45					13:15					13:00					
Volume	0	17	3	0	20	2	20	3	0	25	1	10	1	0	12	1	12	0	0	13	
Peak Factor					0.738					0.710					0.708					0.865	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

Lo's Shopping Center
Traffic Impact Study

File Name : 01104bowheb
Site Code : 0000000(
Start Date : 11/14/2001
Page No : 1

Groups Printed- Unshifted

	BOWKER RD From North				HEBER RD From East				BOWKER RD From South				HEBER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	1	2	0	0	1	0	3	0	0	5	0	0	0	8	3	0	23
06:15	1	7	2	0	3	18	1	0	1	7	1	0	0	10	1	0	52
06:30	0	11	2	0	5	25	2	0	0	9	1	0	0	13	1	0	69
06:45	2	9	2	0	4	28	2	0	1	8	1	0	0	16	0	0	73
Total	4	29	6	0	13	71	8	0	2	29	3	0	0	47	5	0	217
07:00	1	9	2	0	5	30	1	0	2	6	1	0	0	9	0	0	66
07:15	1	8	0	0	3	26	2	0	1	9	3	0	1	13	1	0	68
07:30	1	9	4	0	7	22	4	0	0	14	3	0	2	17	1	0	84
07:45	1	13	2	0	5	29	3	0	2	14	3	0	1	11	2	0	86
Total	4	39	8	0	20	107	10	0	5	43	10	0	4	50	4	0	304
08:00	2	5	7	0	5	21	1	0	0	9	2	0	0	9	1	0	62
08:15	2	7	0	0	3	21	1	0	1	8	3	0	0	6	3	0	55
08:30	0	7	2	0	3	14	1	0	1	9	2	0	1	4	0	0	44
08:45	1	5	1	0	2	12	1	0	0	5	0	0	1	8	1	0	37
Total	5	24	10	0	13	68	4	0	2	31	7	0	2	27	5	0	198
09:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	4
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	
10:00	1	5	3	0	0	10	0	0	2	8	2	0	0	5	0	0	36
10:15	0	7	0	0	2	12	0	0	1	8	0	0	0	13	0	0	43
10:30	0	1	2	0	1	13	1	0	1	9	4	0	0	3	0	0	35
10:45	1	2	2	0	3	18	0	0	1	4	2	0	0	12	0	0	45
Total	2	15	7	0	6	53	1	0	5	29	8	0	0	33	0	0	159
11:00	1	3	4	0	4	18	0	0	0	12	2	0	1	9	0	0	54
11:15	0	4	5	0	5	16	1	0	2	5	2	0	4	12	0	0	56
11:30	1	9	2	0	4	15	1	0	0	6	0	0	0	9	2	0	49
11:45	1	5	0	0	2	13	2	0	3	8	1	0	0	13	1	0	49
Total	3	21	11	0	15	62	4	0	5	31	5	0	5	43	3	0	208
12:00	3	2	1	0	1	9	2	0	1	7	1	0	0	12	0	0	39
12:15	1	4	0	0	4	10	1	0	1	8	0	0	2	7	3	0	41
12:30	1	9	1	0	4	9	2	0	3	4	2	0	0	7	0	0	42
12:45	2	8	1	0	2	8	4	0	0	7	0	0	1	7	0	0	40
Total	7	23	3	0	11	36	9	0	5	26	3	0	3	33	3	0	162
13:00	1	5	0	0	1	13	3	0	1	6	1	0	1	12	0	0	44
13:15	2	11	3	0	1	8	2	0	1	10	1	0	1	11	1	0	52
13:30	0	15	2	0	3	14	1	0	0	11	1	0	0	11	1	0	59
13:45	0	17	3	0	2	20	3	0	2	0	0	0	0	7	0	0	54
Total	3	48	8	0	7	55	9	0	4	27	3	0	2	41	2	0	209
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15:00	2	12	4	0	3	14	1	0	2	11	2	0	0	15	0	0	66
15:15	0	12	2	0	0	13	1	0	2	7	2	0	0	13	1	0	53
15:30	2	13	4	0	2	10	3	0	4	11	5	0	1	12	0	0	67
15:45	0	12	4	0	2	20	1	0	2	6	0	0	3	14	0	0	64
Total	4	49	14	0	7	57	6	0	10	35	9	0	4	54	1	0	250

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowmcc
Site Code : 00000000
Start Date : 11/14/2001

	BOWKER RD From North					MCCABE RD From East					BOWKER RD From South					MCCABE RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
ak Hour From 14:00 to 17:45 - Peak 1 of 1																					
ntersection	16:30																				
Volume	0	47	15	0	62	16	5	15	0	36	8	43	0	0	51	1	8	0	0	9	158
Percent	0.0	75.8	24.2	0.0		44.4	13.9	41.7	0.0		15.7	84.3	0.0	0.0		11.1	88.9	0.0	0.0		
Volume	0	47	15	0	62	16	5	15	0	36	8	43	0	0	51	1	8	0	0	9	158
Volume	0	10	1	0	11	6	0	6	0	12	2	15	0	0	17	1	2	0	0	3	43
Peak Factor																					0.919
High Int.	16:30					16:45					16:45					17:15					
Volume	0	14	3	0	17	6	0	6	0	12	2	15	0	0	17	0	5	0	0	5	
Peak Factor					0.912					0.750					0.750					0.450	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104bowmcc
Site Code : 0000000[illegible]
Start Date : 11/14/200[illegible]
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Groups Printed- Unshifted

	BOWKER RD From North				MCCABE RD From East				BOWKER RD From South				MCCABE RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	0	13	3	0	3	0	2	0	0	12	0	0	0	1	0	0	34
16:15	0	9	1	0	3	1	7	0	2	8	1	0	0	2	0	0	34
16:30	0	14	3	0	4	1	3	0	3	9	0	0	0	0	0	0	37
16:45	0	10	1	0	6	0	6	0	2	15	0	0	1	2	0	0	43
Total	0	46	8	0	16	2	18	0	7	44	1	0	1	5	0	0	148
17:00	0	11	6	0	5	2	4	0	1	7	0	0	0	1	0	0	37
17:15	0	12	5	0	1	2	2	0	2	12	0	0	0	5	0	0	41
17:30	0	7	6	0	3	2	3	0	2	5	1	0	0	1	0	0	30
17:45	0	8	0	0	3	2	0	0	2	6	1	0	0	1	0	0	23
Total	0	38	17	0	12	8	9	0	7	30	2	0	0	8	0	0	131
Grand Total	5	352	90	0	113	85	86	0	56	382	12	0	16	57	5	0	1259
Apprch %	1.1	78.7	20.1	0.0	39.8	29.9	30.3	0.0	12.4	84.9	2.7	0.0	20.5	73.1	6.4	0.0	
Total %	0.4	28.0	7.1	0.0	9.0	6.8	6.8	0.0	4.4	30.3	1.0	0.0	1.3	4.5	0.4	0.0	

	BOWKER RD From North					MCCABE RD From East					BOWKER RD From South					MCCABE RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																					
Intersection	07:15																				
Volume	1	44	12	0	57	21	17	9	0	47	3	65	1	0	69	2	4	0	0	6	179
Percent	1.8	77.2	21.1	0.0		44.7	36.2	19.1	0.0		4.3	94.2	1.4	0.0		33.3	66.7	0.0	0.0		
Volume	1	44	12	0	57	21	17	9	0	47	3	65	1	0	69	2	4	0	0	6	179
Volume	0	12	3	0	15	5	9	1	0	15	1	21	0	0	22	1	0	0	0	1	53
Peak Factor																					0.844
High Int.	08:00					07:30					07:30					07:15					
Volume	1	15	3	0	19	5	9	1	0	15	1	21	0	0	22	0	3	0	0	3	
Peak Factor					0.750					0.783					0.784					0.500	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																					
Intersection	13:00																				
Volume	0	42	11	0	53	8	9	14	0	31	5	27	2	0	34	2	5	0	0	7	125
Percent	0.0	79.2	20.8	0.0		25.8	29.0	45.2	0.0		14.7	79.4	5.9	0.0		28.6	71.4	0.0	0.0		
Volume	0	42	11	0	53	8	9	14	0	31	5	27	2	0	34	2	5	0	0	7	125
Volume	0	13	2	0	15	0	2	5	0	7	2	10	1	0	13	0	1	0	0	1	36
Peak Factor																					0.868
High Int.	13:45					13:15					13:30					13:45					
Volume	0	15	7	0	22	3	3	5	0	11	2	10	1	0	13	1	2	0	0	3	
Peak Factor					0.602					0.705					0.654					0.583	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

Lo's Shopping Center
Traffic Impact Study

File Name : 01104bowmcd
Site Code : 00000000
Start Date : 11/14/200.
Page No : 1

Groups Printed- Unshifted

	BOWKER RD From North				MCCABE RD From East				BOWKER RD From South				MCCABE RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	1	5	1	0	0	0	0	0	3	6	0	0	0	0	0	0	16
06:15	0	10	3	0	4	0	0	0	4	6	0	0	2	4	1	0	34
06:30	0	11	4	0	4	1	1	0	2	10	0	0	0	1	0	0	34
06:45	0	9	1	0	2	4	3	0	3	8	1	0	0	1	0	0	32
Total	1	35	9	0	10	5	4	0	12	30	1	0	2	6	1	0	116
07:00	0	10	5	0	7	3	2	0	0	13	0	0	0	0	0	0	40
07:15	0	6	2	0	7	1	3	0	1	8	0	0	0	3	0	0	31
07:30	0	12	3	0	5	9	1	0	1	21	0	0	1	0	0	0	53
07:45	0	11	4	0	4	3	4	0	0	20	1	0	1	1	0	0	49
Total	0	39	14	0	23	16	10	0	2	62	1	0	2	4	0	0	173
08:00	1	15	3	0	5	4	1	0	1	16	0	0	0	0	0	0	46
08:15	0	6	1	0	3	4	1	0	2	11	0	0	0	2	0	0	30
08:30	0	9	1	0	1	0	1	0	2	10	1	0	0	1	1	0	27
08:45	0	5	0	0	2	2	0	0	0	8	0	0	0	0	0	0	17
Total	1	35	5	0	11	10	3	0	5	45	1	0	0	3	1	0	120
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
10:00	0	2	2	0	2	3	3	0	1	8	0	0	2	1	0	0	24
10:15	0	2	3	0	3	2	3	0	1	7	0	0	0	0	0	0	21
10:30	0	4	1	0	3	4	1	0	1	7	0	0	0	1	1	0	23
10:45	1	6	2	0	4	5	1	0	1	8	0	0	0	1	0	0	29
Total	1	14	8	0	12	14	8	0	4	30	0	0	2	3	1	0	97
11:00	0	3	1	0	0	2	2	0	1	14	0	0	2	3	1	0	29
11:15	0	9	1	0	1	0	0	0	1	10	0	0	2	3	0	0	27
11:30	0	7	1	0	1	2	1	0	2	12	1	0	0	4	0	0	31
11:45	0	5	2	0	0	2	1	0	0	8	1	0	0	1	0	0	20
Total	0	24	5	0	2	6	4	0	4	44	2	0	4	11	1	0	107
12:00	1	4	1	0	2	3	1	0	1	8	0	0	0	0	0	0	21
12:15	0	5	3	0	4	0	0	0	3	12	1	0	1	1	0	0	30
12:30	1	9	1	0	2	2	1	0	1	6	0	0	0	2	0	0	25
12:45	0	10	0	0	1	1	1	0	2	5	1	0	0	2	0	0	23
Total	2	28	5	0	9	6	3	0	7	31	2	0	1	5	0	0	99
13:00	0	6	0	0	1	3	3	0	3	5	0	0	0	1	0	0	22
13:15	0	8	2	0	3	3	5	0	0	10	1	0	1	1	0	0	34
13:30	0	13	2	0	0	2	5	0	2	10	1	0	0	1	0	0	36
13:45	0	15	7	0	4	1	1	0	0	2	0	0	1	2	0	0	33
Total	0	42	11	0	8	9	14	0	5	27	2	0	2	5	0	0	125
14:00	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	[illegible]
15:00	0	11	1	0	1	3	4	0	0	13	0	0	0	3	1	0	37
15:15	0	13	2	0	1	2	2	0	2	8	0	0	1	0	0	0	31
15:30	0	15	4	0	3	1	3	0	1	10	0	0	0	2	0	0	39
15:45	0	12	1	0	5	2	4	0	0	8	0	0	0	2	0	0	34
Total	0	51	8	0	10.	8	13	0	3	39	0	0	1	7	1	0	141

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104yrmjas
Site Code : 0000000ᐢ
Start Date : 08/02/2.
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Groups Printed- Traffic Volumes

	YOURMAN RD From North			JASPER RD From East			YOURMAN RD From South			JASPER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	3	4	0	0	1	0	1	4	19	23	1	0	56
16:15	0	7	0	0	1	0	3	3	15	6	1	0	36
16:30	0	5	0	0	2	2	0	5	9	9	3	0	35
16:45	0	6	0	0	1	2	1	3	15	22	3	1	54
Total	3	22	0	0	5	4	5	15	58	60	8	1	181
17:00	0	8	0	0	0	0	1	3	22	17	4	0	55
17:15	0	6	0	0	1	1	2	2	14	19	1	0	46
17:30	2	4	0	0	2	0	0	1	14	23	4	1	51
17:45	0	3	0	0	1	2	0	2	15	13	1	0	37
Total	2	21	0	0	4	3	3	8	65	72	10	1	189
Grand Total	15	114	3	3	56	22	24	101	555	431	64	22	1410
Apprch %	11.4	86.4	2.3	3.7	69.1	27.2	3.5	14.9	81.6	83.4	12.4	4.3	
Total %	1.1	8.1	0.2	0.2	4.0	1.6	1.7	7.2	39.4	30.6	4.5	1.6	

	YOURMAN RD From North				JASPER RD From East				YOURMAN RD From South				JASPER RD From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																	
Intersection 07:15																	
Volume	1	7	1	9	1	7	2	10	1	11	28	40	22	7	4	33	
Percent	11.1	77.8	11.1		10.0	70.0	20.0		2.5	27.5	70.0		66.7	21.2	12.1		
Volume	1	7	1	9	1	7	2	10	1	11	28	40	22	7	4	33	92
Volume	0	1	0	1	1	3	0	4	0	1	10	11	5	2	2	9	25
Peak Factor																	0.920
High Int.	07:15				07:45				07:30				08:00				
Volume	0	4	0	4	1	3	0	4	0	5	7	12	7	4	0	11	
Peak Factor				0.563				0.625				0.833				0.750	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																	
Intersection 12:15																	
Volume	0	11	0	11	0	4	6	10	5	12	86	103	50	4	4	58	182
Percent	0.0	100.0	0.0		0.0	40.0	60.0		4.9	11.7	83.5		86.2	6.9	6.9		
Volume	0	11	0	11	0	4	6	10	5	12	86	103	50	4	4	58	182
Volume	0	4	0	4	0	1	3	4	1	1	28	30	11	2	0	13	51
Peak Factor																	0.892
High Int.	13:00				13:00				13:00				12:15				
Volume	0	4	0	4	0	1	3	4	1	1	28	30	17	1	2	20	
Peak Factor				0.688				0.625				0.858				0.725	
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																	
Intersection 16:45																	
Volume	2	24	0	26	0	4	3	7	4	9	65	78	81	12	2	95	206
Percent	7.7	92.3	0.0		0.0	57.1	42.9		5.1	11.5	83.3		85.3	12.6	2.1		
Volume	2	24	0	26	0	4	3	7	4	9	65	78	81	12	2	95	206
Volume	0	8	0	8	0	0	0	0	1	3	22	26	17	4	0	21	55
Peak Factor																	0.936
High Int.	17:00				16:45				17:00				17:30				
Volume	0	8	0	8	0	1	2	3	1	3	22	26	23	4	1	28	
Peak Factor				0.813				0.583				0.750				0.848	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

o's Shopping Center
raffic Impact Study

File Name : 01104yrmjas
Site Code : 0000000
Start Date : 08/02/20
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Groups Printed- Traffic Volumes

	YOURMAN RD From North			JASPER RD From East			YOURMAN RD From South			JASPER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	0	0	0	0	1	1	0	1	1	5	1	0	10
06:15	0	1	0	0	0	0	0	1	5	0	1	0	8
06:30	0	1	0	0	2	0	0	1	3	4	1	2	14
06:45	1	1	0	0	0	2	0	2	5	5	0	0	16
Total	1	3	0	0	3	3	0	5	14	14	3	2	48
07:00	1	1	0	0	4	0	1	1	6	2	1	3	20
07:15	0	4	0	0	1	1	1	4	6	3	1	1	22
07:30	0	0	0	0	2	1	0	5	7	7	0	1	23
07:45	0	1	0	1	3	0	0	1	10	5	2	2	25
Total	1	6	0	1	10	2	2	11	29	17	4	7	90
08:00	1	2	1	0	1	0	0	1	5	7	4	0	22
08:15	1	1	0	0	1	0	0	3	8	6	0	0	20
08:30	0	2	0	0	2	0	1	1	5	9	1	0	21
08:45	0	2	0	0	2	0	2	2	11	6	0	0	25
Total	2	7	1	0	6	0	3	7	29	28	5	0	88
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	3	0	0	1	0	0	1	16	19	2	0	[illegible]
10:15	0	2	0	0	0	1	0	0	13	12	3	0	31
10:30	0	1	0	0	3	1	1	1	12	15	4	1	39
10:45	1	1	0	0	2	0	1	3	22	7	1	1	39
Total	1	7	0	0	6	2	2	5	63	53	10	2	151
11:00	0	5	0	0	0	0	1	5	15	14	1	1	42
11:15	1	3	1	0	2	0	0	0	24	11	1	1	44
11:30	1	4	0	0	3	0	0	4	16	10	2	0	40
11:45	0	3	0	0	1	0	0	4	16	13	0	0	37
Total	2	15	1	0	6	0	1	13	71	48	4	2	163
12:00	1	1	0	0	0	1	0	7	15	11	3	0	39
12:15	0	2	0	0	1	1	0	4	19	17	1	2	47
12:30	0	3	0	0	1	2	2	2	18	13	0	2	43
12:45	0	2	0	0	1	0	2	5	21	9	1	0	41
Total	1	8	0	0	3	4	4	18	73	50	5	4	170
13:00	0	4	0	0	1	3	1	1	28	11	2	0	51
13:15	0	0	0	1	1	0	0	4	15	13	2	1	37
13:30	0	5	0	0	1	0	0	4	16	4	1	1	32
13:45	0	3	0	0	2	0	0	0	17	7	1	0	30
Total	0	12	0	1	5	3	1	9	76	35	6	2	150
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	1	3	0	0	1	0	0	2	15	16	3	0	[illegible]
15:15	0	4	0	0	1	0	0	3	13	13	2	0	36
15:30	0	2	0	0	5	1	0	3	18	12	2	0	43
15:45	1	4	1	1	1	0	3	2	31	13	2	1	60
Total	2	13	1	1	8	1	3	10	77	54	9	1	180

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104yrmheb
Site Code : 0000000[illegible]
Start Date : 07/24/20[illegible]
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Groups Printed- Traffic Volumes

	YOURMAN RD From North			HEBER RD From East			YOURMAN RD From South			HEBER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	1	0	0	0	20	0	3	1	2	2	15	0	44
16:15	1	0	0	1	13	0	1	1	2	0	14	0	33
16:30	2	0	0	0	17	0	0	0	1	1	8	0	29
16:45	0	0	2	0	7	0	1	0	2	3	11	0	26
Total	4	0	2	1	57	0	5	2	7	6	48	0	132
17:00	0	1	0	0	13	1	0	0	3	4	13	1	36
17:15	1	0	0	0	15	2	0	0	1	4	14	1	38
17:30	0	0	0	0	14	0	0	0	2	2	18	1	37
17:45	0	0	0	0	11	2	1	1	1	3	17	0	36
Total	1	1	0	0	53	5	1	1	7	13	62	3	147
Grand Total	25	17	3	8	589	40	36	42	67	62	418	13	1320
Apprch %	55.6	37.8	6.7	1.3	92.5	6.3	24.8	29.0	46.2	12.6	84.8	2.6	
Total %	1.9	1.3	0.2	0.6	44.6	3.0	2.7	3.2	5.1	4.7	31.7	1.0	

	YOURMAN RD From North				HEBER RD From East				YOURMAN RD From South				HEBER RD From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																	
Intersection	07:00																
Volume	1	1	0	2	0	83	1	84	3	2	6	11	3	57	1	61	
Percent	50.0	50.0	0.0		0.0	98.8	1.2		27.3	18.2	54.5		4.9	93.4	1.6		
Volume	1	1	0	2	0	83	1	84	3	2	6	11	3	57	1	61	158
Volume	1	1	0	2	0	22	1	23	2	1	2	5	2	15	0	17	47
Peak Factor																	0.840
High Int.	07:30				07:15				07:30				07:45				
Volume	1	1	0	2	0	23	0	23	2	1	2	5	1	18	1	20	
Peak Factor				0.250				0.913				0.550				0.763	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																	
Intersection	10:45																
Volume	4	3	0	7	1	62	7	70	7	21	10	38	13	27	1	41	156
Percent	57.1	42.9	0.0		1.4	88.6	10.0		18.4	55.3	26.3		31.7	65.9	2.4		
Volume	4	3	0	7	1	62	7	70	7	21	10	38	13	27	1	41	156
Volume	1	0	0	1	1	24	4	29	1	4	2	7	5	10	0	15	52
Peak Factor																	0.750
High Int.	11:00				10:45				11:30				10:45				
Volume	2	1	0	3	1	24	4	29	0	16	5	21	5	10	0	15	
Peak Factor				0.583				0.603				0.452				0.683	
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																	
Intersection	15:15																
Volume	2	2	0	4	1	73	7	81	6	3	11	20	8	62	1	71	176
Percent	50.0	50.0	0.0		1.2	90.1	8.6		30.0	15.0	55.0		11.3	87.3	1.4		
Volume	2	2	0	4	1	73	7	81	6	3	11	20	8	62	1	71	176
Volume	0	0	0	0	1	19	4	24	1	1	2	4	1	25	1	27	55
Peak Factor																	0.800
High Int.	15:15				15:45				15:15				15:45				
Volume	0	2	0	2	1	19	4	24	1	0	5	6	1	25	1	27	
Peak Factor				0.500				0.844				0.833				0.657	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

.o's Shopping Center
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File Name : 01104yrmheb
Site Code : 00000000
Start Date : 07/24/200
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Groups Printed- Traffic Volumes

	YOURMAN RD From North			HEBER RD From East			YOURMAN RD From South			HEBER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	1	0	0	2	9	1	1	0	1	0	7	1	23
06:15	0	2	0	0	10	0	0	0	1	0	5	0	18
06:30	0	0	0	0	19	0	0	0	1	0	6	0	26
06:45	1	0	0	2	16	1	1	0	0	0	8	1	30
Total	2	2	0	4	54	2	2	0	3	0	26	2	97
07:00	0	0	0	0	17	0	0	0	1	0	14	0	32
07:15	0	0	0	0	23	0	0	0	0	0	10	0	33
07:30	1	1	0	0	22	1	2	1	2	2	15	0	47
07:45	0	0	0	0	21	0	1	1	3	1	18	1	46
Total	1	1	0	0	83	1	3	2	6	3	57	1	158
08:00	0	0	0	0	13	2	1	0	0	0	16	0	32
08:15	1	0	0	0	19	0	0	0	1	0	12	0	33
08:30	0	1	0	0	16	0	2	0	0	0	10	2	31
08:45	0	0	0	0	13	1	0	0	1	1	7	0	23
Total	1	1	0	0	61	3	3	0	2	1	45	2	119
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	1	1	0	0	6	2	0	2	2	3	3	0	2[illegible]
10:15	1	1	0	0	13	0	2	0	3	0	9	0	29
10:30	1	0	0	1	16	1	0	3	1	1	6	0	30
10:45	1	0	0	1	24	4	1	4	2	5	10	0	52
Total	4	2	0	2	59	7	3	9	8	9	28	0	131
11:00	2	1	0	0	20	2	4	1	2	2	6	0	40
11:15	0	1	0	0	8	1	2	0	1	5	6	1	25
11:30	1	1	0	0	10	0	0	16	5	1	5	0	39
11:45	0	0	0	0	15	3	1	0	2	1	10	0	32
Total	3	3	0	0	53	6	7	17	10	9	27	1	136
12:00	3	0	0	0	16	2	1	1	1	1	7	0	32
12:15	0	1	0	0	15	0	1	3	1	0	3	0	24
12:30	0	3	0	0	2	0	1	0	2	4	7	0	19
12:45	0	0	0	0	14	1	0	0	3	1	8	1	28
Total	3	4	0	0	47	3	3	4	7	6	25	1	103
13:00	5	1	1	0	21	2	0	1	1	0	12	1	45
13:15	0	0	0	0	11	0	1	2	2	6	10	0	32
13:30	0	0	0	0	9	2	2	0	3	0	12	0	28
13:45	0	0	0	0	21	1	2	1	2	1	9	0	37
Total	5	1	1	0	62	5	5	4	8	7	43	1	142
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	7	1	1	1	0	2	10	1	2[illegible]
15:15	0	2	0	0	15	0	1	0	5	3	12	0	38
15:30	1	0	0	0	19	3	1	1	2	2	10	0	39
15:45	0	0	0	1	19	4	1	1	2	1	25	1	55
Total	1	2	0	1	60	8	4	3	9	8	57	2	155

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104111jas
Site Code : 0000000[illegible]
Start Date : 08/02/2[illegible]
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Groups Printed- Traffic Volumes

	HWY 111 From North			JASPER RD From East			HWY 111 From South			JASPER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	4	245	20	14	4	0	2	165	2	3	0	3	462
16:15	4	293	9	16	1	0	0	208	4	3	0	2	540
16:30	6	280	12	6	1	0	0	145	6	2	1	2	461
16:45	1	295	15	9	2	2	1	181	1	2	2	1	512
Total	15	1113	56	45	8	2	3	699	13	10	3	8	1975
17:00	4	318	15	20	0	0	1	201	3	2	3	2	569
17:15	1	354	18	12	1	0	0	180	2	2	2	3	575
17:30	10	270	19	10	4	3	3	151	2	1	4	2	479
17:45	1	296	11	14	2	1	0	156	0	1	0	5	487
Total	16	1238	63	56	7	4	4	688	7	6	9	12	2110
Grand Total	69	7664	378	488	79	15	50	7167	136	92	61	36	16235
Apprch %	0.9	94.5	4.7	83.8	13.6	2.6	0.7	97.5	1.8	48.7	32.3	19.0	
Total %	0.4	47.2	2.3	3.0	0.5	0.1	0.3	44.1	0.8	0.6	0.4	0.2	

	HWY 111 From North				JASPER RD From East				HWY 111 From South				JASPER RD From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																	
Intersection	07:30																
Volume	2	639	26	667	32	10	1	43	1	871	11	883	8	4	1	13	1
Percent	0.3	95.8	3.9		74.4	23.3	2.3		0.1	98.6	1.2		61.5	30.8	7.7		
Volume	2	639	26	667	32	10	1	43	1	871	11	883	8	4	1	13	1606
Volume	0	165	6	171	10	1	0	11	1	278	4	283	2	0	1	3	468
Peak Factor																	0.858
High Int.	07:45				07:45				07:30				08:00				
Volume	0	174	6	180	12	3	0	15	1	278	4	283	3	3	0	6	
Peak Factor				0.926				0.717				0.780				0.542	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																	
Intersection	11:30																
Volume	4	705	43	752	60	12	1	73	6	797	12	815	8	5	2	15	1655
Percent	0.5	93.8	5.7		82.2	16.4	1.4		0.7	97.8	1.5		53.3	33.3	13.3		
Volume	4	705	43	752	60	12	1	73	6	797	12	815	8	5	2	15	1655
Volume	2	189	9	200	14	6	0	20	1	207	2	210	2	1	0	3	433
Peak Factor																	0.956
High Int.	11:45				11:30				12:15				12:00				
Volume	0	197	9	206	14	6	0	20	2	209	5	216	2	2	2	6	
Peak Factor				0.913				0.913				0.943				0.625	
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																	
Intersection	16:45																
Volume	16	1237	67	1320	51	7	5	63	5	713	8	726	7	11	8	26	2135
Percent	1.2	93.7	5.1		81.0	11.1	7.9		0.7	98.2	1.1		26.9	42.3	30.8		
Volume	16	1237	67	1320	51	7	5	63	5	713	8	726	7	11	8	26	2135
Volume	1	354	18	373	12	1	0	13	0	180	2	182	2	2	3	7	575
Peak Factor																	0.928
High Int.	17:15				17:00				17:00				17:00				
Volume	1	354	18	373	20	0	0	20	1	201	3	205	2	3	2	7	
Peak Factor				0.885				0.788				0.885				0.929	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

's Shopping Center
affic Impact Study

File Name : 01104111jas
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Groups Printed- Traffic Volumes

	HWY 111 From North			JASPER RD From East			HWY 111 From South			JASPER RD From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	1	58	3	2	0	0	0	121	2	2	3	0	192
06:15	0	59	2	5	0	0	0	132	4	2	0	0	204
06:30	0	89	5	3	2	0	0	188	6	0	2	0	295
06:45	2	82	2	5	1	0	1	181	4	3	3	0	284
Total	3	288	12	15	3	0	1	622	16	7	8	0	975
07:00	1	111	1	6	2	1	2	150	3	1	3	0	281
07:15	0	131	3	6	2	0	1	182	6	1	1	0	333
07:30	0	165	6	10	1	0	1	278	4	2	0	1	468
07:45	0	174	6	12	3	0	0	235	1	1	1	0	433
Total	1	581	16	34	8	1	4	845	14	5	5	1	1515
08:00	0	150	8	5	2	0	0	187	3	3	3	0	361
08:15	2	150	6	5	4	1	0	171	3	2	0	0	344
08:30	1	160	6	3	1	1	0	177	4	5	2	1	361
08:45	0	172	3	9	1	0	0	157	5	3	1	0	351
Total	3	632	23	22	8	2	0	692	15	13	6	1	1417
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	2	149	14	14	2	0	3	172	8	1	3	1	36[illegible]
10:15	1	151	16	11	2	0	3	168	3	1	1	0	357
10:30	1	165	15	15	2	0	2	168	5	1	2	0	376
10:45	0	178	8	19	4	1	1	158	3	3	1	0	376
Total	4	643	53	59	10	1	9	666	19	6	7	1	1478
11:00	0	155	11	10	0	0	2	186	3	3	2	1	373
11:15	0	184	9	22	1	1	2	169	2	5	1	1	397
11:30	2	189	9	14	6	0	1	207	2	2	1	0	433
11:45	0	197	9	12	2	1	2	180	1	4	0	0	408
Total	2	725	38	58	9	2	7	742	8	14	4	2	1611
12:00	1	167	12	19	1	0	1	201	4	2	2	2	412
12:15	1	152	13	15	3	0	2	209	5	0	2	0	402
12:30	1	181	8	20	1	0	2	167	5	6	3	0	394
12:45	5	195	6	16	1	0	1	184	2	3	3	0	416
Total	8	695	39	70	6	0	6	761	16	11	10	2	1624
13:00	2	185	7	24	3	0	4	179	6	3	1	1	415
13:15	1	189	13	12	1	0	1	137	2	2	1	1	360
13:30	1	210	3	14	4	0	1	195	3	1	0	1	433
13:45	4	207	3	15	5	0	4	188	4	1	2	2	435
Total	8	791	26	65	13	0	10	699	15	7	4	5	1643
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	3	221	16	12	0	0	1	192	5	5	3	2	46[illegible]
15:15	3	239	13	16	1	0	1	202	3	4	0	0	482
15:30	1	261	11	14	4	2	3	208	4	3	0	1	512
15:45	2	237	12	22	2	1	1	151	1	1	2	1	433
Total	9	958	52	64	7	3	6	753	13	13	5	4	1887

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

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Site Code : 0000000
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Groups Printed- Traffic Volumes

	HWY 111 From North			HEBER RD From East			HWY 111 From South			HWY 86 From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	5	227	10	16	2	3	3	186	13	21	9	5	500
16:15	4	241	7	4	5	1	0	175	11	25	7	5	485
16:30	1	248	9	8	6	4	1	200	11	17	1	5	511
16:45	4	223	8	6	1	2	1	147	18	17	5	2	434
Total	14	939	34	34	14	10	5	708	53	80	22	17	1930
17:00	5	337	10	9	3	3	3	193	18	23	5	2	611
17:15	4	349	18	13	4	2	1	156	14	18	1	7	587
17:30	0	243	9	8	2	2	3	184	14	20	8	2	495
17:45	0	220	16	4	2	2	3	141	11	12	6	2	419
Total	9	1149	53	34	11	9	10	674	57	73	20	13	2112
Grand Total	128	6910	265	361	217	111	81	7065	499	593	192	136	16558
Apprch %	1.8	94.6	3.6	52.4	31.5	16.1	1.1	92.4	6.5	64.4	20.8	14.8	
Total %	0.8	41.7	1.6	2.2	1.3	0.7	0.5	42.7	3.0	3.6	1.2	0.8	

	HWY 111 From North				HEBER RD From East				HWY 111 From South				HWY 86 From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																	
Intersection	07:15																
Volume	14	582	33	629	55	27	12	94	9	843	44	896	57	27	11	95	17
ercent	2.2	92.5	5.2		58.5	28.7	12.8		1.0	94.1	4.9		60.0	28.4	11.6		
Volume	14	582	33	629	55	27	12	94	9	843	44	896	57	27	11	95	1714
Volume	4	165	10	179	17	4	3	24	2	252	17	271	20	7	1	28	502
Peak Factor																	0.854
High Int.	07:30				07:15				07:30				07:45				
Volume	4	165	10	179	17	17	1	35	2	252	17	271	17	10	4	31	
Peak Factor				0.878				0.671				0.827				0.766	
ak Hour From 10:00 to 13:45 - Peak 1 of 1																	
Intersection	13:00																
Volume	13	735	26	774	28	27	13	68	14	705	60	779	71	15	15	101	1722
Percent	1.7	95.0	3.4		41.2	39.7	19.1		1.8	90.5	7.7		70.3	14.9	14.9		
Volume	13	735	26	774	28	27	13	68	14	705	60	779	71	15	15	101	1722
Volume	3	185	5	193	10	7	5	22	4	215	15	234	18	5	2	25	474
Peak Factor																	0.908
High Int.	13:30				13:45				13:45				13:15				
Volume	2	197	6	205	10	7	5	22	4	215	15	234	23	3	7	33	
eak Factor				0.944				0.773				0.832				0.765	
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																	
ntersection	16:30																
Volume	14	1157	45	1216	36	14	11	61	6	696	61	763	75	12	16	103	2143
Percent	1.2	95.1	3.7		59.0	23.0	18.0		0.8	91.2	8.0		72.8	11.7	15.5		
Volume	14	1157	45	1216	36	14	11	61	6	696	61	763	75	12	16	103	2143
Volume	5	337	10	352	9	3	3	15	3	193	18	214	23	5	2	30	611
eak Factor																	0.877
High Int.	17:15				17:15				17:00				17:00				
Volume	4	349	18	371	13	4	2	19	3	193	18	214	23	5	2	30	
eak Factor				0.819				0.803				0.891				0.858	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

o's Shopping Center
raffic Impact Study

File Name : 0110411186
Site Code : 00000000
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Groups Printed- Traffic Volumes

	HWY 111 From North			HEBER RD From East			HWY 111 From South			HWY 86 From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	3	69	3	7	6	1	1	114	6	2	5	2	219
06:15	2	75	5	15	8	1	0	135	4	6	3	2	256
06:30	1	94	2	15	5	0	2	190	11	6	1	0	327
06:45	4	79	10	9	7	0	0	188	8	7	2	4	318
Total	10	317	20	46	26	2	3	627	29	21	11	8	1120
07:00	4	105	6	13	6	1	1	207	17	10	6	3	379
07:15	2	135	8	17	17	1	3	200	5	11	7	3	409
07:30	4	165	10	17	4	3	2	252	17	20	7	1	502
07:45	5	130	7	13	4	6	3	187	13	17	10	4	399
Total	15	535	31	60	31	11	9	846	52	58	30	11	1689
08:00	3	152	8	8	2	2	1	204	9	9	3	3	404
08:15	6	147	6	12	7	1	0	156	9	21	9	3	377
08:30	0	145	3	7	6	2	2	165	10	20	6	3	369
08:45	1	156	6	10	2	1	1	164	14	15	1	2	373
Total	10	600	23	37	17	6	4	689	42	65	19	11	1523
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	3	144	3	5	9	2	4	167	9	4	3	2	3[illegible]
10:15	4	143	4	12	3	3	2	166	8	9	0	4	358
10:30	5	155	3	11	5	2	4	182	12	4	4	5	392
10:45	9	123	5	11	10	6	1	187	18	16	3	3	392
Total	21	565	15	39	27	13	11	702	47	33	10	14	1497
11:00	0	129	6	14	6	3	2	202	17	5	5	5	394
11:15	0	140	0	4	4	2	4	139	12	17	4	4	330
11:30	2	161	2	6	6	2	1	184	10	18	2	1	395
11:45	5	139	3	3	5	5	2	167	13	13	4	4	363
Total	7	569	11	27	21	12	9	692	52	53	15	14	1482
12:00	1	148	2	3	4	11	1	173	11	14	9	3	380
12:15	4	158	4	7	10	4	0	227	14	20	2	7	457
12:30	6	148	4	1	2	2	3	177	18	23	7	1	392
12:45	4	170	5	8	9	8	3	171	16	16	3	3	416
Total	15	624	15	19	25	25	7	748	59	73	21	14	1645
13:00	6	161	7	8	6	3	1	156	17	15	5	2	387
13:15	2	192	8	3	5	2	3	169	16	23	3	7	433
13:30	2	197	6	7	9	3	6	165	12	15	2	4	428
13:45	3	185	5	10	7	5	4	215	15	18	5	2	474
Total	13	735	26	28	27	13	14	705	60	71	15	15	1722
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	4	188	9	4	2	0	3	171	12	17	11	9	43[illegible]
15:15	3	229	7	7	9	5	3	173	13	15	3	3	470
15:30	3	241	11	12	7	4	2	165	12	15	5	3	480
15:45	4	219	10	14	0	1	1	165	11	19	10	4	458
Total	14	877	37	37	18	10	9	674	48	66	29	19	1838

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104111mcc
Site Code : 0000000
Start Date : 11/15/200
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	HWY 111 From North					MCCABE RD From East					HWY 111 From South					MCCABE RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 14:00 to 17:45 - Peak 1 of 1																					
Intersection	16:30																				
Volume	2	1570	6	0	1578	5	1	2	0	8	1	933	10	0	944	5	3	1	0	9	2539
Percent	0.1	99.5	0.4	0.0		62.5	12.5	25.0	0.0		0.1	98.8	1.1	0.0		55.6	33.3	11.1	0.0		
Volume	2	1570	6	0	1578	5	1	2	0	8	1	933	10	0	944	5	3	1	0	9	2539
Volume	0	435	1	0	436	2	1	0	0	3	0	251	2	0	253	0	0	0	0	0	692
Peak Factor																					0.917
High Int.	17:00					17:00					17:00					16:45					
Volume	0	435	1	0	436	2	1	0	0	3	0	251	2	0	253	2	2	0	0	4	
Peak Factor					0.905					0.667					0.933					0.563	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

File Name : 01104111mcc
Site Code : 00000000
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Groups Printed- 1 - Unshifted

	HWY 111 From North				MCCABE RD From East				HWY 111 From South				MCCABE RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	0	339	2	0	0	3	1	0	1	225	1	0	7	0	0	0	579
16:15	4	353	1	0	2	0	0	0	0	241	5	0	3	2	0	0	611
16:30	0	392	1	0	0	0	2	0	0	220	5	0	0	0	1	0	621
16:45	1	372	1	0	1	0	0	0	1	212	1	0	2	2	0	0	593
Total	5	1456	5	0	3	3	3	0	2	898	12	0	12	4	1	0	2404
17:00	0	435	1	0	2	1	0	0	0	251	2	0	0	0	0	0	692
17:15	1	371	3	0	2	0	0	0	0	250	2	0	3	1	0	0	633
17:30	0	361	1	0	0	0	0	0	0	226	1	0	2	1	0	0	592
17:45	0	323	0	0	0	0	0	0	0	195	0	0	1	0	0	0	519
Total	1	1490	5	0	4	1	0	0	0	922	5	0	6	2	0	0	2436
Grand Total	22	9398	39	0	43	42	14	0	28	9051	107	1	64	44	9	0	18862
Apprch %	0.2	99.4	0.4	0.0	43.4	42.4	14.1	0.0	0.3	98.5	1.2	0.0	54.7	37.6	7.7	0.0	
Total %	0.1	49.8	0.2	0.0	0.2	0.2	0.1	0.0	0.1	48.0	0.6	0.0	0.3	0.2	0.0	0.0	

	HWY 111 From North					MCCABE RD From East					HWY 111 From South					MCCABE RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
ak Hour From 06:00 to 09:45 - Peak 1 of 1																					
ction	07:30																				
Volume	2	818	4	0	824	5	8	1	0	14	11	1159	20	0	1190	9	8	1	0	18	2046
Percent	0.2	99.3	0.5	0.0		35.7	57.1	7.1	0.0		0.9	97.4	1.7	0.0		50.0	44.4	5.6	0.0		
Volume	2	818	4	0	824	5	8	1	0	14	11	1159	20	0	1190	9	8	1	0	18	2046
Volume	0	222	2	0	224	0	0	0	0	0	0	360	6	0	366	3	2	1	0	6	596
Peak Factor																					0.858
ligh Int.	07:45					08:15					07:45					07:45					
Volume	0	222	2	0	224	3	4	0	0	7	0	360	6	0	366	3	2	1	0	6	
Peak Factor					0.920					0.500					0.813					0.750	
ak Hour From 10:00 to 13:45 - Peak 1 of 1																					
itersection	13:00																				
Volume	1	908	3	0	912	3	5	0	0	8	0	870	10	0	880	6	4	0	0	10	1810
Percent	0.1	99.6	0.3	0.0		37.5	62.5	0.0	0.0		0.0	98.9	1.1	0.0		60.0	40.0	0.0	0.0		
Volume	1	908	3	0	912	3	5	0	0	8	0	870	10	0	880	6	4	0	0	10	1810
Volume	0	265	1	0	266	0	0	0	0	0	0	215	5	0	220	1	1	0	0	2	488
Peak Factor																					0.927
ligh Int.	13:45					13:00					13:15					13:15					
Volume	0	265	1	0	266	1	3	0	0	4	0	240	2	0	242	2	2	0	0	4	
Peak Factor					0.857					0.500					0.909					0.625	

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Lo's Shopping Center
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	HWY 111 From North				MCCABE RD From East				HWY 111 From South				MCCABE RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	1	67	0	0	1	5	0	0	0	141	3	0	0	2	0	0	220
06:15	2	89	1	0	1	0	0	0	0	220	3	0	0	1	0	0	317
06:30	0	106	0	0	2	2	1	0	0	235	3	0	0	1	1	0	351
06:45	0	142	1	0	2	0	0	0	0	210	3	0	2	1	0	0	361
Total	3	404	2	0	6	7	1	0	0	806	12	0	2	5	1	0	1249
07:00	0	117	1	0	1	1	0	0	0	205	1	0	0	0	1	0	327
07:15	0	150	0	0	3	2	1	0	0	259	2	0	2	2	0	0	421
07:30	1	221	1	0	1	1	1	0	0	328	3	0	2	2	0	0	561
07:45	0	222	2	0	0	0	0	0	0	360	6	0	3	2	1	0	596
Total	1	710	4	0	5	4	2	0	0	1152	12	0	7	6	2	0	1905
08:00	0	201	1	0	1	3	0	0	9	233	8	0	2	1	0	0	459
08:15	1	174	0	0	3	4	0	0	2	238	3	0	2	3	0	0	430
08:30	0	180	1	0	2	1	0	0	11	210	1	0	0	1	0	0	407
08:45	1	188	0	0	1	0	0	0	0	212	3	0	0	2	1	0	408
Total	2	743	2	0	7	8	0	0	22	893	15	0	4	7	1	0	1704
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:00	0	177	1	0	0	2	0	0	0	186	3	0	1	2	1	0	373
10:15	1	153	2	0	3	0	0	0	0	222	1	0	1	1	0	0	384
10:30	0	181	2	0	0	1	0	0	0	193	7	0	3	0	0	0	387
10:45	0	185	0	0	0	1	2	0	0	220	2	0	0	1	1	0	412
Total	1	696	5	0	3	4	2	0	0	821	13	0	5	4	2	0	1556
11:00	1	189	2	0	1	2	0	0	0	190	1	0	0	0	0	0	386
11:15	0	211	1	0	3	1	0	0	0	196	1	0	1	1	1	0	416
11:30	1	195	1	0	1	0	1	0	1	227	2	0	2	2	0	0	433
11:45	1	222	0	0	1	1	3	0	1	193	0	0	1	1	0	0	424
Total	3	817	4	0	6	4	4	0	2	806	4	0	4	4	1	0	1659
12:00	1	212	0	0	0	1	0	0	0	210	1	0	1	1	0	0	427
12:15	0	215	0	0	0	0	0	0	0	217	2	1	1	2	0	0	438
12:30	0	234	1	0	0	1	0	0	0	252	2	0	2	2	1	0	495
12:45	0	225	1	0	0	1	0	0	0	187	1	0	0	0	0	0	415
Total	1	886	2	0	0	3	0	0	0	866	6	1	4	5	1	0	1775
13:00	0	212	0	0	1	3	0	0	0	189	2	0	2	0	0	0	409
13:15	1	202	1	0	1	2	0	0	0	240	2	0	2	2	0	0	453
13:30	0	229	1	0	1	0	0	0	0	226	1	0	1	1	0	0	460
13:45	0	265	1	0	0	0	0	0	0	215	5	0	1	1	0	0	488
Total	1	908	3	0	3	5	0	0	0	870	10	0	6	4	0	0	1810
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15:00	0	320	4	0	0	1	1	0	0	241	4	0	2	0	0	0	573
15:15	1	307	0	0	1	1	0	0	0	281	3	0	2	1	0	0	597
15:30	0	349	2	0	3	0	0	0	1	232	9	0	5	1	0	0	602
15:45	2	311	1	0	2	1	1	0	1	263	2	0	5	1	0	0	590
Total	3	1287	7	0	6	3	2	0	2	1017	18	0	14	3	0	0	2362

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

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	DOGWOOD RD From North					HEBER RD From East					DOGWOOD RD From South					HEBER RD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
eak Hour From 14:00 to 17:45 - Peak 1 of 1																					
Intersection	15:30																				
Volume	7	206	85	0	298	80	79	7	0	166	8	111	66	0	185	120	131	8	0	259	908
Percent	2.3	69.1	28.5	0.0		48.2	47.6	4.2	0.0		4.3	60.0	35.7	0.0		46.3	50.6	3.1	0.0		
Volume	7	206	85	0	298	80	79	7	0	166	8	111	66	0	185	120	131	8	0	259	908
Volume	0	63	17	0	80	20	21	0	0	41	2	29	23	0	54	29	29	1	0	59	234
Peak Factor																					0.970
High Int.	16:00					15:45					15:30					15:45					
Volume	1	54	28	0	83	24	24	0	0	48	2	29	23	0	54	27	46	2	0	75	
Peak Factor					0.898					0.865					0.856					0.863	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

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Groups Printed- Unshifted

	DOGWOOD RD From North				HEBER RD From East				DOGWOOD RD From South				HEBER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
16:00	1	54	28	0	22	16	3	0	2	26	18	0	27	25	3	0	225
16:15	4	50	19	0	14	18	4	0	1	33	12	0	37	31	2	0	225
16:30	1	47	18	0	9	12	1	0	1	36	20	0	36	20	0	0	201
16:45	2	57	16	0	13	20	0	0	1	27	10	0	41	23	1	0	211
Total	8	208	81	0	58	66	8	0	5	122	60	0	141	99	6	0	862
17:00	0	68	23	0	5	25	3	0	2	20	12	0	44	35	1	0	238
17:15	0	54	20	0	17	25	2	0	2	22	17	0	40	28	2	1	230
17:30	0	42	15	0	7	16	1	0	0	23	9	0	28	29	2	0	172
17:45	1	40	15	0	14	20	1	0	2	26	11	0	34	20	3	0	187
Total	1	204	73	0	43	86	7	0	6	91	49	0	146	112	8	1	827
Grand Total	34	1254	550	0	567	723	48	0	46	1164	585	0	898	894	34	1	6798
Apprch %	1.8	68.2	29.9	0.0	42.4	54.0	3.6	0.0	2.6	64.8	32.6	0.0	49.2	48.9	1.9	0.1	
Total %	0.5	18.4	8.1	0.0	8.3	10.6	0.7	0.0	0.7	17.1	8.6	0.0	13.2	13.2	0.5	0.0	

	DOGWOOD RD From North					HEBER RD From East					DOGWOOD RD From South					HEBER RD From West					
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1																					
Intersection	07:30																				
Volume	1	103	73	0	177	108	110	1	0	219	0	166	78	0	244	66	105	2	0	173	813
Percent	0.6	58.2	41.2	0.0		49.3	50.2	0.5	0.0		0.0	68.0	32.0	0.0		38.2	60.7	1.2	0.0		
Volume	1	103	73	0	177	108	110	1	0	219	0	166	78	0	244	66	105	2	0	173	813
Volume	0	25	19	0	44	38	28	0	0	66	0	57	27	0	84	25	37	1	0	63	257
Peak Factor																					0.791
High Int.	08:00					07:45					07:45					07:45					
Volume	0	27	19	0	46	38	28	0	0	66	0	57	27	0	84	25	37	1	0	63	
Peak Factor					0.962					0.830					0.726					0.687	
Peak Hour From 10:00 to 13:45 - Peak 1 of 1																					
Intersection	11:45																				
Volume	9	120	60	0	189	71	80	5	0	156	10	122	61	0	193	103	91	4	0	198	736
Percent	4.8	63.5	31.7	0.0		45.5	51.3	3.2	0.0		5.2	63.2	31.6	0.0		52.0	46.0	2.0	0.0		
Volume	9	120	60	0	189	71	80	5	0	156	10	122	61	0	193	103	91	4	0	198	736
Volume	1	33	19	0	53	18	24	1	0	43	0	34	13	0	47	24	27	1	0	52	195
Peak Factor																					0.944
High Int.	12:00					12:00					11:45					12:00					
Volume	1	33	19	0	53	18	24	1	0	43	6	39	18	0	63	24	27	1	0	52	
Peak Factor					0.892					0.907					0.766					0.952	

DAHL, ROBINS & ASSOCIATES, INC.
Turning Movement Counts

o's Shopping Center
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File Name : 01220dogheb
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Groups Printed- Unshifted

	DOGWOOD RD From North				HEBER RD From East				DOGWOOD RD From South				HEBER RD From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
06:30	1	20	5	0	8	10	1	0	1	36	17	0	5	8	1	0	113
06:45	0	19	5	0	6	15	0	0	0	39	7	0	4	19	0	0	114
Total	1	42	10	0	14	25	1	0	1	75	24	0	9	27	1	0	230
07:00	0	12	6	0	6	21	1	0	0	38	8	0	11	20	1	0	124
07:15	0	19	8	0	18	22	3	0	1	33	18	0	16	24	0	0	162
07:30	1	25	15	0	29	35	0	0	0	47	18	0	11	23	0	0	204
07:45	0	25	19	0	38	28	0	0	0	57	27	0	25	37	1	0	257
Total	1	81	48	0	91	106	4	0	1	175	71	0	63	104	2	0	747
08:00	0	27	19	0	23	24	1	0	0	31	16	0	14	26	0	0	181
08:15	0	26	20	0	18	23	0	0	0	31	17	0	16	19	1	0	171
08:30	0	24	16	0	11	21	1	0	2	27	14	0	22	19	1	0	158
08:45	0	19	15	0	10	21	3	0	2	28	17	0	15	20	1	0	151
Total	0	96	70	0	62	89	5	0	4	117	64	0	67	84	3	0	661
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:00	2	22	9	0	12	8	1	0	0	33	14	0	30	19	1	0	151
10:15	0	24	21	0	14	15	0	0	1	31	24	0	19	16	0	0	165
10:30	2	36	9	0	17	14	1	0	2	19	17	0	17	21	0	0	155
10:45	1	22	12	0	12	18	4	0	1	36	14	0	29	19	0	0	168
Total	5	104	51	0	55	55	6	0	4	119	69	0	95	75	1	0	639
11:00	0	25	16	0	7	16	0	0	0	32	12	0	19	22	0	0	149
11:15	1	26	9	0	20	24	3	0	4	37	19	0	26	30	1	0	200
11:30	0	29	6	0	11	11	3	0	0	32	10	0	24	19	0	0	145
11:45	2	27	12	0	19	21	0	0	6	39	18	0	25	23	1	0	193
Total	3	107	43	0	57	72	6	0	10	140	59	0	94	94	2	0	687
12:00	1	33	19	0	18	24	1	0	0	34	13	0	24	27	1	0	195
12:15	4	26	18	0	14	24	3	0	3	27	10	0	28	18	1	0	176
12:30	2	34	11	0	20	11	1	0	1	22	20	0	26	23	1	0	172
12:45	2	33	9	0	11	15	3	0	0	21	22	0	19	29	0	0	164
Total	9	126	57	0	63	74	8	0	4	104	65	0	97	97	3	0	707
13:00	1	27	12	0	19	18	0	0	1	33	12	0	15	26	1	0	165
13:15	1	35	14	0	12	16	0	0	1	36	17	0	19	18	1	0	170
13:30	0	32	22	0	16	18	2	0	0	18	15	0	25	14	3	0	165
13:45	0	10	3	0	6	5	0	0	1	11	5	0	8	10	0	0	59
Total	2	104	51	0	53	57	2	0	3	98	49	0	67	68	5	0	559
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15:00	2	29	17	0	10	30	1	0	2	31	28	0	27	33	0	0	210
15:15	0	51	11	0	17	18	0	0	1	40	11	0	36	26	0	0	211
15:30	0	63	17	0	20	21	0	0	2	29	23	0	29	29	1	0	234
15:45	2	39	21	0	24	24	0	0	3	23	13	0	27	46	2	0	224
Total	4	182	66	0	71	93	1	0	8	123	75	0	119	134	3	0	879

APPENDIX A

TRAFFIC COUNT DATA

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CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

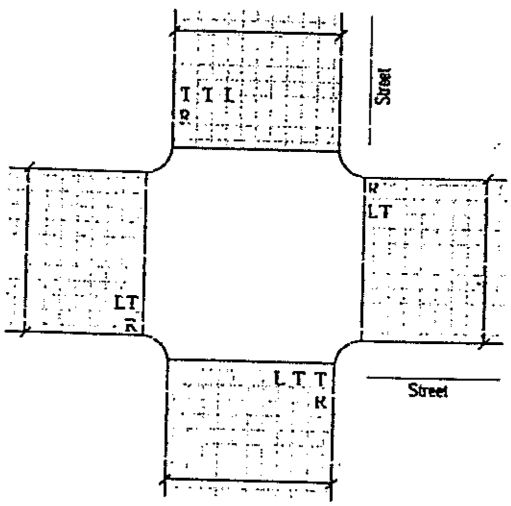
General Information

Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	AM PEAK 2001
Comment	EXISTING VOLUMES

Site Information

Jurisdiction/Date	IMP. CO. 12/10/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration		LT	R		LT	R
No. of lanes		1	1		1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

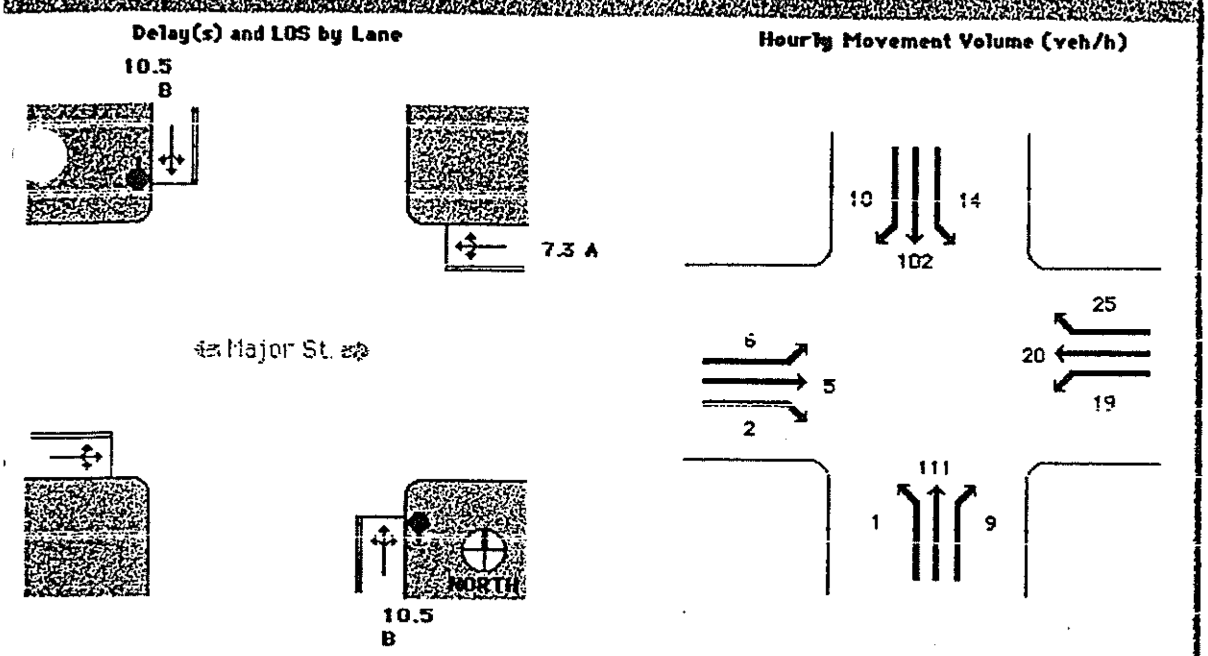
	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	11	27	57	12	27	55	44	843	9	33	582	14
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

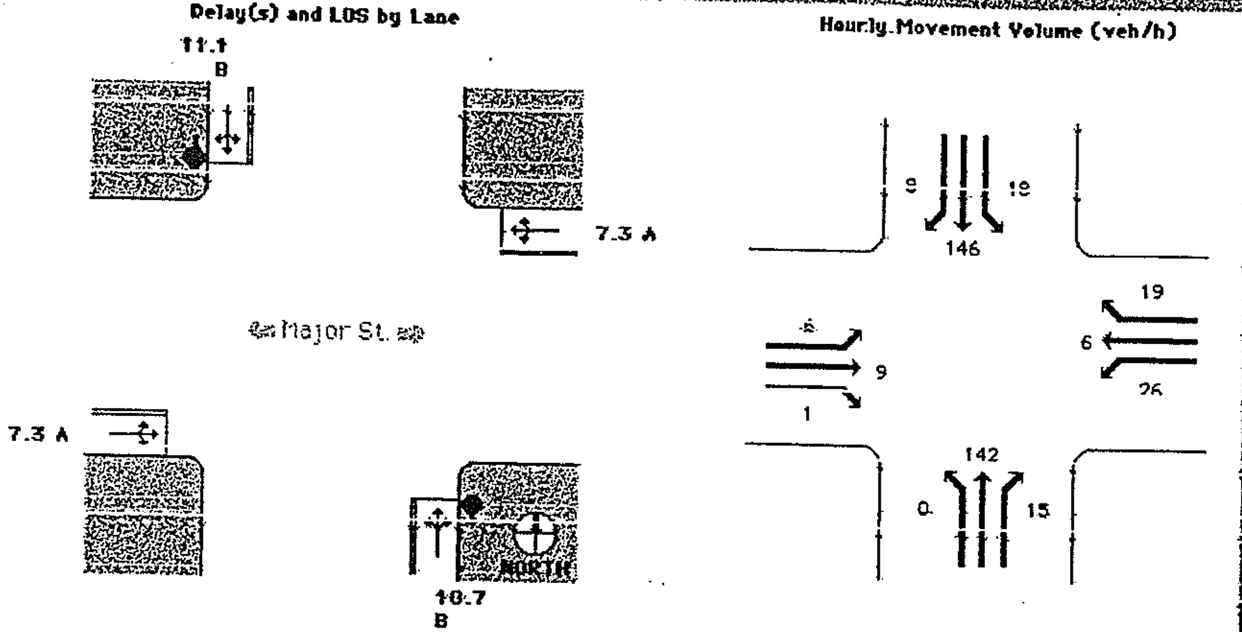


Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/8/01
Period	AM PEAK 2010
Major St.	MCCABE ROAD
Minor St.	BOWKER RD

Approach	Delay		LOS
Minor St. (NB)	10.5	s	B
Minor St. (SB)	10.5	s	B
Major LT (EB)	7.3	s	A
Major LT (WB)	7.3	s	A

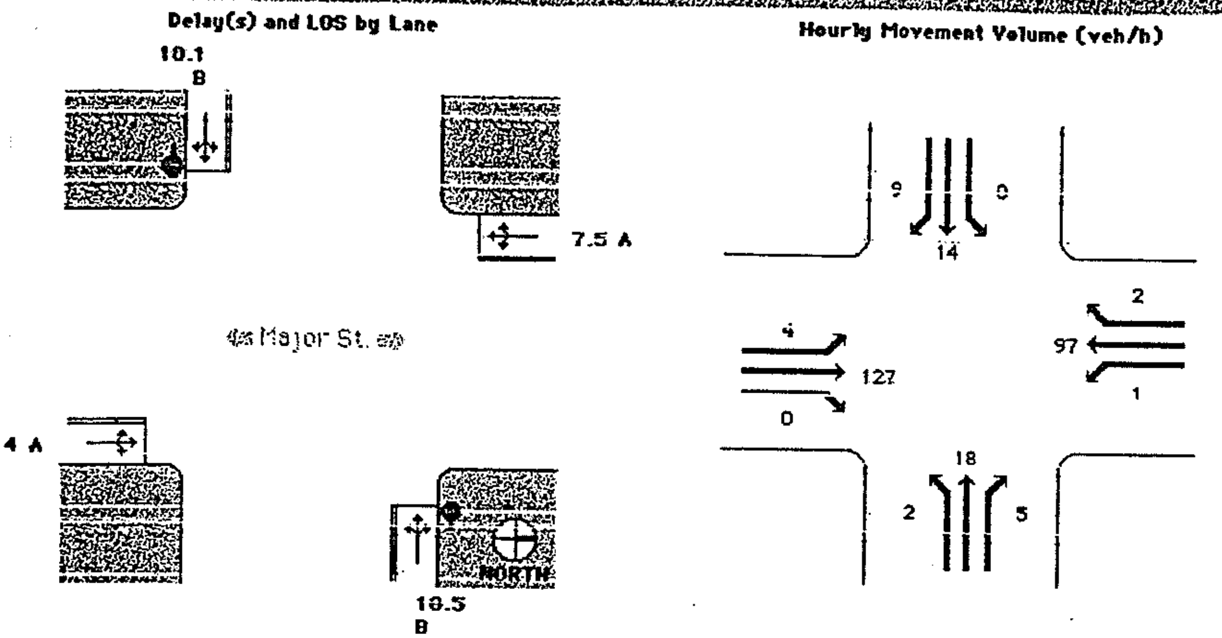
HiCAP 2000 - Graphical Output



Chapter 17 – TWSC – Summary of Analysis

Analyst	RVH
Agency	DRA
Date	12/8/01
Period	PM PEAK 2010
Major St.	MCCABE ROAD
Minor St.	BOWKER RD

Approach	Delay		LOS
Minor St. (NB)	10.7	s	B
Minor St. (SB)	11.1	s	B
Major LT (EB)	7.3	s	A
Major LT (WB)	7.3	s	A

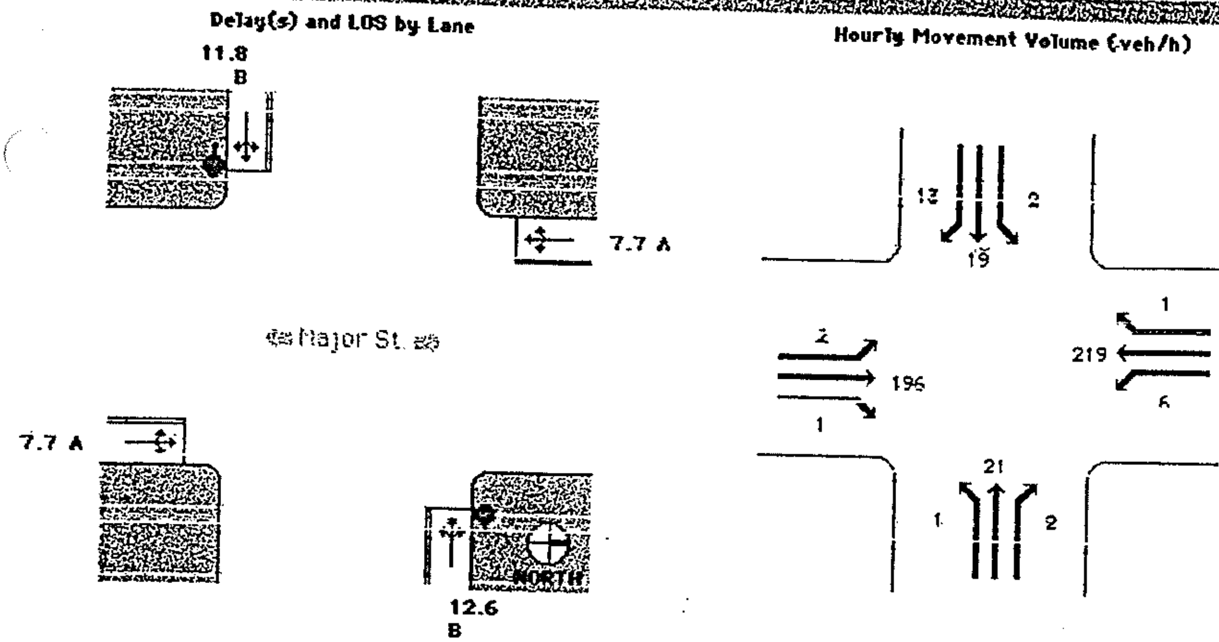


Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/8/01
Period	AM PEAK 2010
Major St.	BOWKER ROAD
Minor St.	JASPER ROAD

Approach	Delay		LOS
Minor St. (WB)	10.5	s	B
Minor St. (EB)	10.1	s	B
Major LT (NB)	7.4	s	A
Major LT (SB)	7.5	s	A

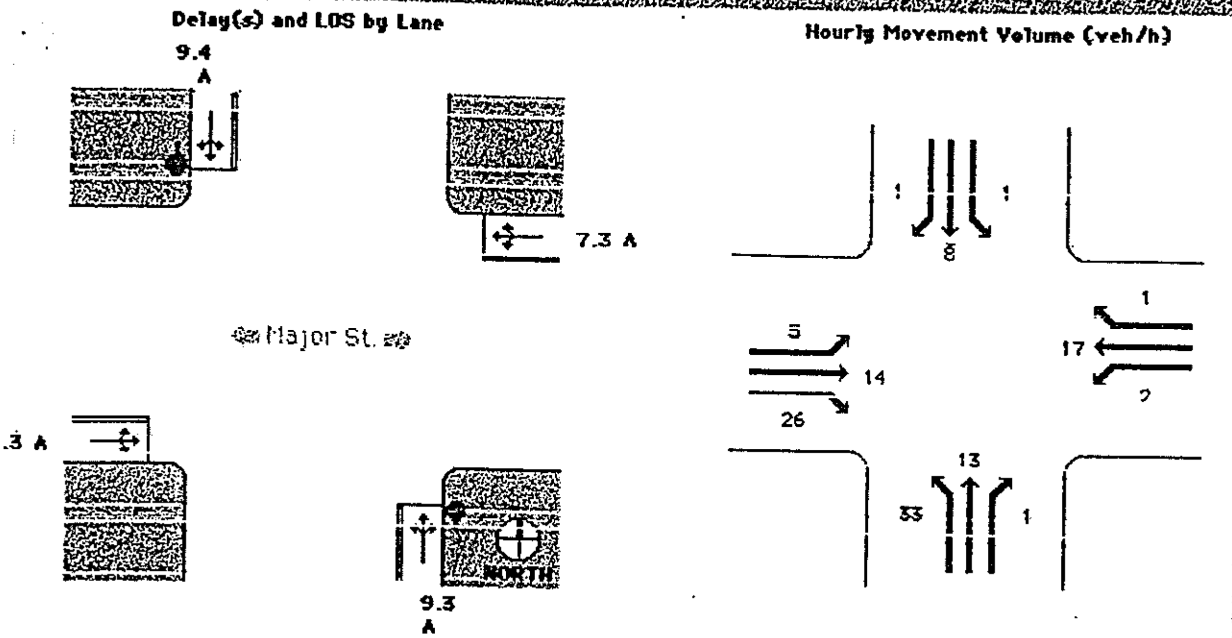
HiCAP 2000 - Graphical Output



Chapter 17 - TWSC - Summary of Analysis

Analyst: RWH
Agency: DRA
Date: 12/8/01
Period: PM PEAK 2010
Major St.: BOWKER ROAD
Minor St.: JASPER ROAD

Approach	Delay	LOS
Minor St. (WB)	12.6 s	B
Minor St. (EB)	11.8 s	B
Major LT (NB)	7.7 s	A
Major LT (SB)	7.7 s	A



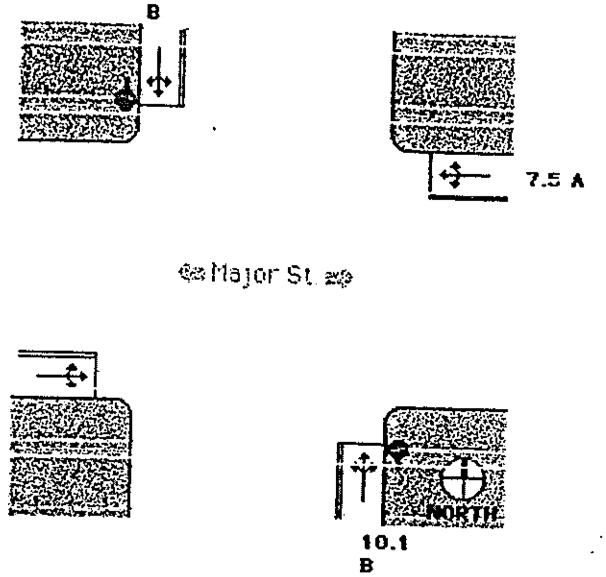
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/8/01
Period	AM PEAK 2010
Major St.	JASPER ROAD
Minor St.	YOURMAN ROAD

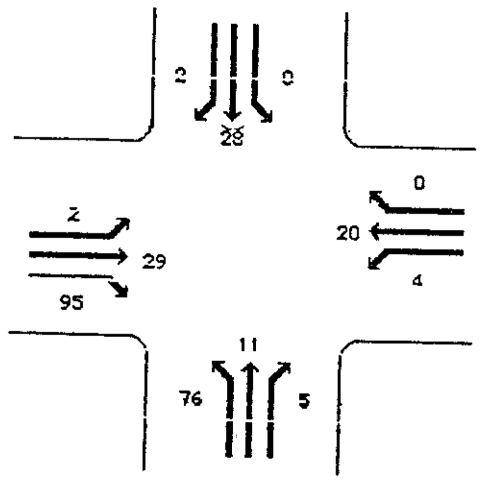
Approach	Delay		LOS
Minor St. (NB)	9.3	s	A
Minor St. (SB)	9.4	s	A
Major LT (EB)	7.3	s	A
Major LT (WB)	7.3	s	A

HiCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

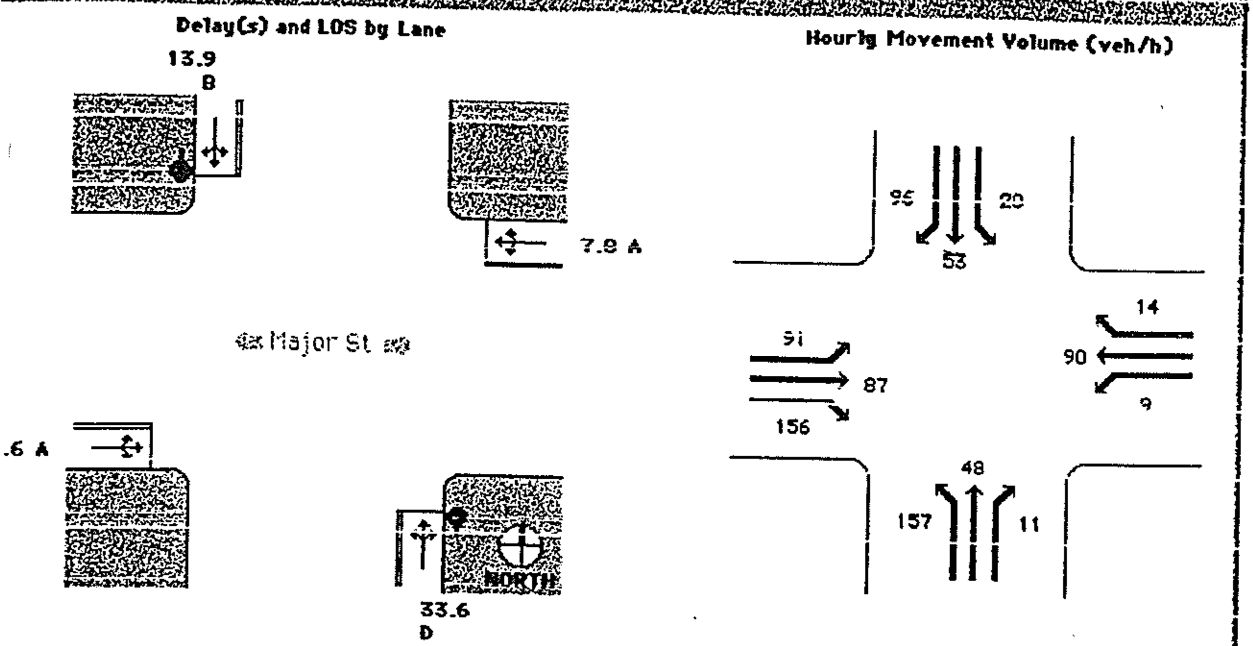


Chapter 17 - TWSC - Summary of Analysis

Analyst	RVH
Agency	DRA
Date	12/8/01
Period	PM PEAK 2010
Major St.	JASPER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay		LOS
Minor St. (NB)	10.1	s	B
Minor St. (SB)	10.1	s	B
Major LT (EB)	7.3	s	A
Major LT (WB)	7.5	s	A

HCAP 2000 - Graphical Output

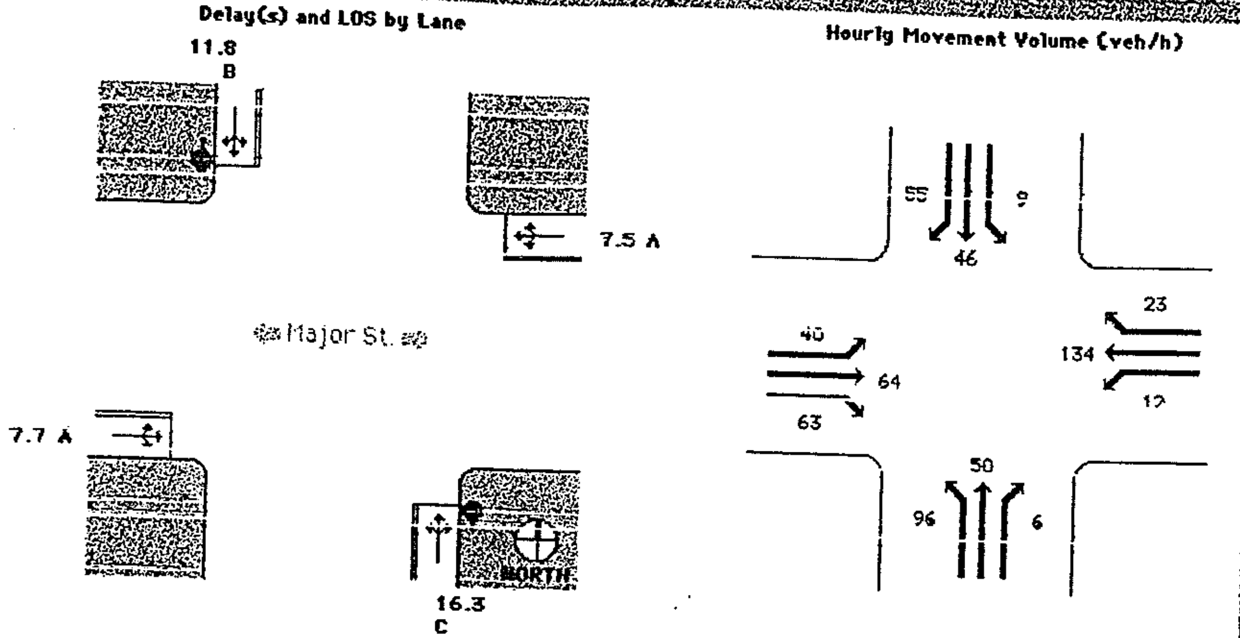


Chapter 17 - TWSC - Summary of Analysis

Analyst RWH
Agency DRA
Date 12/8/01
Period PM PEAK
Major St. HEBER ROAD
Minor St. BOWKER ROAD

Approach	Delay		LOS
Minor St. (NB)	33.6	s	D
Minor St. (SB)	13.9	s	B
Major LT (EB)	7.6	s	A
Major LT (WB)	7.8	s	A

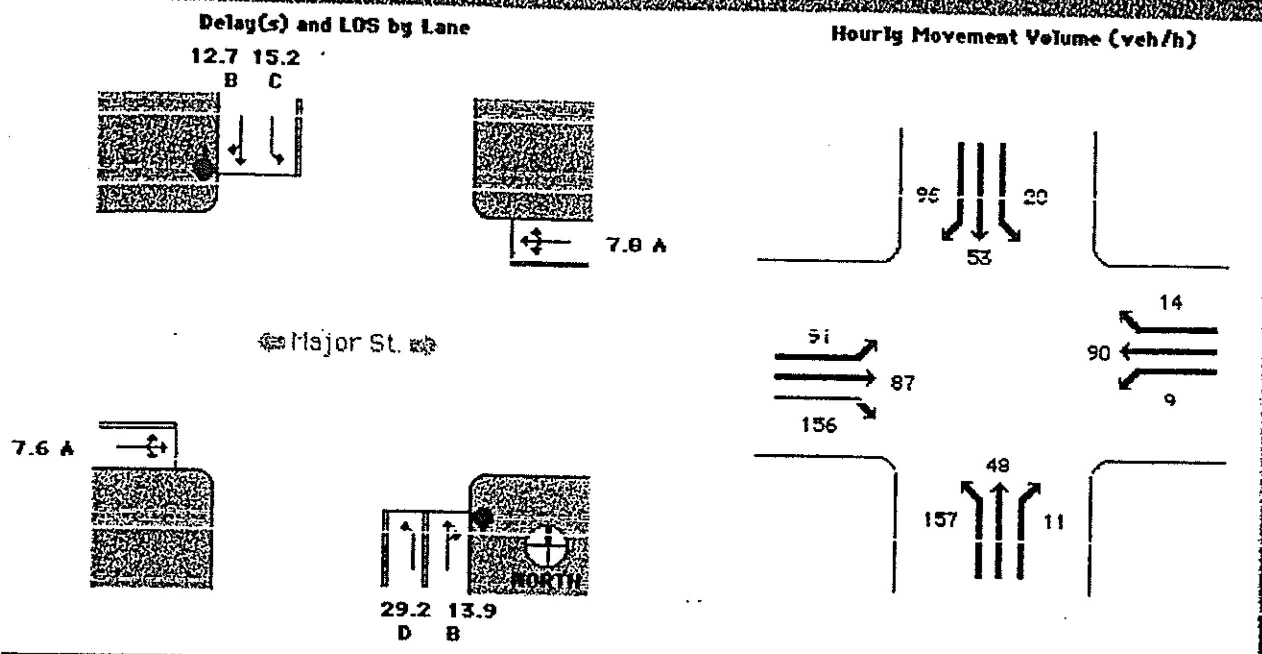
HiCAP 2000 - Graphical Output



Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/8/01
Period	AM PEAK 2010
Major St.	HEBER ROAD
Minor St.	BOWKER ROAD

Approach	Delay	LOS
Minor St. (NB)	16.3 s	C
Minor St. (SB)	11.8 s	B
Major LT (EB)	7.7 s	A
Major LT (WB)	7.5 s	A



Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/8/01
Period	PM PEAK 2010
Major St.	HEBER ROAD
Minor St.	BOWKER ROAD

Approach	Delay		LOS
Minor St. (NB)	25.0	s	C
Minor St. (SB)	13.0	s	B
Major LT (EB)	7.6	s	A
Major LT (WB)	7.8	s	A

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING

East-West Phasing Plan

	Phase No. 1	Phase No. 2	Phase No. 3
Selected plan (Exhibit A10-8) I			
Movement codes	EWT		
Critical phase volume, CV (veh/h)	42		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

	Phase No. 1	Phase No. 2	Phase No. 3
Selected plan (Exhibit A10-8) I			
Movement codes	NST		
Critical phase volume, CV (veh/h)	753		
Lost time/phase, t_L (s)	4		

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	795
Lost time/cycle, L (s) $L = \sum t_L$	8
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.583
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	6.7		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	53.3		

Control Delay and LOS

	EB	WB	NB		SB	
Lane group	LTR	LTR	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	10	10	38	1620	42	1254
Green ratio, g/C	.046	.046	0	.821	0	.821
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.139	.139		.627		.486
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	72	72		2583		2583
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	27.5	27.5		2		1.6
Incremental delay, d_2 (s/veh) (Equation 16-12)	4	4		1.2		.7
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	31.5	31.5		3.1		2.3
LOS by lane group	C	C		A		A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	31.5	31.5	3.1		2.3	
LOS by approach	C	C	A		A	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	3.6	Intersection LOS (Exhibit 16-2)			A	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

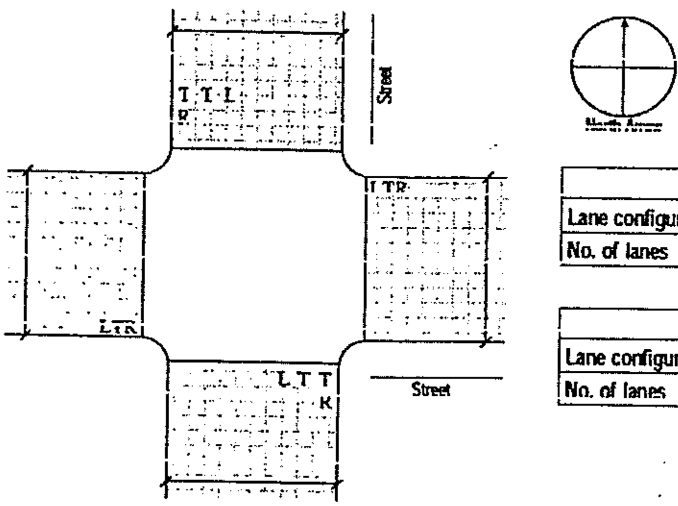
General Information

Analyst: RWH
Agency or Company: DRA
Analysis Period/Year: AM PEAK 2010
Comment: EXISTING

Site Information

Jurisdiction/Date: IMP. CO. 12/19/01
Intersection: MC CABE ROAI HIWAY 111
Area Type: ☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration		LTR			LTR	
No. of lanes		1			1	

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	1	9	27	1	9	28	35	1490	13	39	1154	2
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	100	100	-	100	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	4			4			4			4		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING

East-West Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	35		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NST		
Critical phase volume, CV (veh/h)	1019		
Lost time/phase, t_L (s)	4		

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	1054
Lost time/cycle, L (s) $L = \sum t_L$	8
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.773
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	5.7		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	54.3		

Control Delay and LOS

	EB	WB	NB		SB	
Lane group	LTR	LTR	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	5	1	46	1332	45	2212
Green ratio, g/C	.029	.029	0	.838	0	.838
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.1	.03		.505		.839
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	46	46		2636		2636
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	28.4	28.3		1.4		2.7
Incremental delay, d_2 (s/veh) (Equation 16-12)	4.3	1.2		.7		3.4
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	32.7	29.5		2.1		6.1
LOS by lane group	C	C		A		A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	32.7	29.5	2.1		6.1	
LOS by approach	C	C	A		A	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	5.1	Intersection LOS (Exhibit 16-2)			A	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

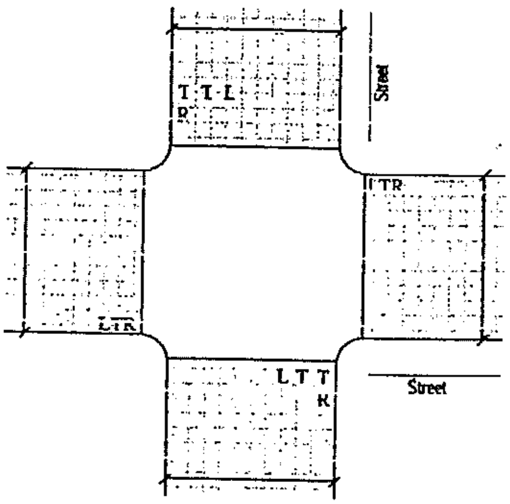
General Information

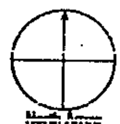
Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2010
Comment	EXISTING

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	MC CABE ROAI HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry





	EB			WB		
Lane configuration		LTR			LTR	
No. of lanes		1			1	

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	1	4	23	2	1	29	42	1225	1	41	2035	2
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	100	100	-	100	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	4			4			4			4		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description ADD SB LT

East-West Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	480		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 2a	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	SLT	NST	
Critical phase volume, CV (veh/h)	184	305	
Lost time/phase, t_L (s)	4	4	

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	969
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \dfrac{L}{1 - \left[\dfrac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \dfrac{CS}{RS\left(1 - \dfrac{L}{C}\right)}$	.77
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C-L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	27.8		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C-L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	13.1	19.1	

Control Delay and LOS

	EB	WB		NB	SB	
Lane group	LTR	LT	R	LTR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	332	267	185	142	190	262
Green ratio, g/C	.396	.396	.396	.252	.152	.471
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	1573
v/c ratio, X $X = \dfrac{V/s}{g/C}$	.533	.428	.297	.358	.795	.354
Lane group capacity, c (veh/h) $c = \dfrac{V}{X}$	623	623	623	397	239	741
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	13.9	13.2	12.4	18.4	24.5	10.1
Incremental delay, d_2 (s/veh) (Equation 16-12)	3.2	2.1	1.2	2.5	23.3	1.3
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	17.1	15.3	13.6	20.9	47.9	11.4
LOS by lane group	B	B	B	C	D	B
Delay by approach, d_A (s/veh) $\dfrac{\sum(d)(V)}{\sum V}$	17.1	14.6		20.9	26.8	
LOS by approach	B	B		C	C	
Intersection delay, d_I (s/veh) $d_I = \dfrac{\sum(d_A)(V_A)}{\sum V_A}$	19.4	Intersection LOS (Exhibit 16-2)			B	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

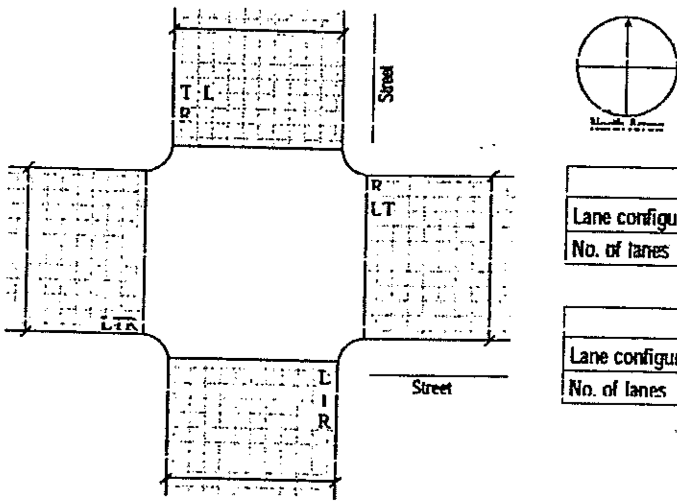
General Information

Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2010
Comment	ADD SB LT

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD DOGWOOD ROA
Area Type	☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration	LTR				LT	R
No. of lanes	1				1	1

	NB			SB		
Lane configuration	LTR			L	TR	
No. of lanes	1			1	1	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	9	305	141	84	245	170	77	130	85	175	241	8
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	100	100	-	0	100	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	4			4			4			4		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description ADD SB LT

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	300		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NST		
Critical phase volume, CV (veh/h)	338		
Lost time/phase, t_L (s)	4		

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	638
Lost time/cycle, L (s) $L = \sum t_L$	8
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \dfrac{L}{1 - \left[\dfrac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \dfrac{CS}{RS\left(1 - \dfrac{L}{C}\right)}$	.468
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	28.4		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	31.6		

Control Delay and LOS

	EB	WB		NB	SB	
Lane group	LTR	LT	R	LTR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	226	204	170	211	139	132
Green ratio, g/C	.407	.407	.407	.46	0	.46
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	1573
v/c ratio, X $X = \dfrac{V/s}{g/C}$	.354	.319	.265	.292		.182
Lane group capacity, c (veh/h) $c = \dfrac{V}{X}$	640	640	640	723		723
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	12.3	12.1	11.8	10.1		9.6
Incremental delay, d_2 (s/veh) (Equation 16-12)	1.5	1.3	1	1		.6
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	13.9	13.4	12.8	11.1		10.1
LOS by lane group	B	B	B	B		B
Delay by approach, d_A (s/veh) $\dfrac{\sum(d)(V)}{\sum V}$	13.9	13.2		11.1	10.1	
LOS by approach	B	B		B	B	
Intersection delay, d_I (s/veh) $d_I = \dfrac{\sum(d_A)(V_A)}{\sum V_A}$	12.4	Intersection LOS (Exhibit 16-2)			B	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

General Information

Analyst ________

Agency or Company: DRA

Analysis Period/Year: AM PEAK 2010

Comment: ADD SB LT

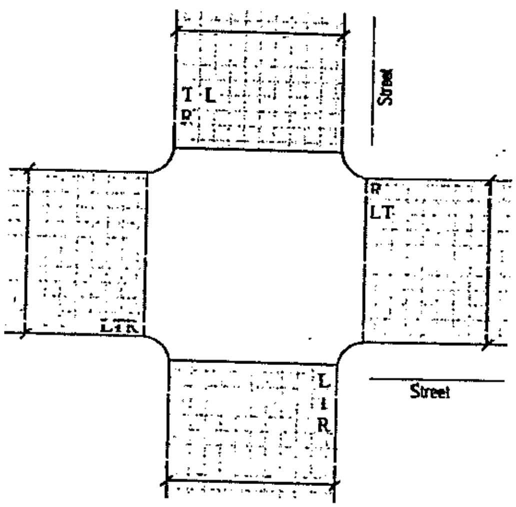
Site Information

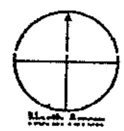
Jurisdiction/Date: IMP. CO. 12/20/01

Intersection: HEBER ROAD DOGWOOD ROA

Area Type: ☐ CBD ☑ Other

Intersection Geometry





	EB			WB		
Lane configuration		LTR			LT	R
No. of lanes		1			1	1

	NB			SB		
Lane configuration		LTR		L	TR	
No. of lanes		1		1	1	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	2	208	77	31	188	156	91	194	42	128	121	1
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	100	100	-	0	100	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	4			4			4			4		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING

East-West Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	1307		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NST		
Critical phase volume, CV (veh/h)	1140		
Lost time/phase, t_L (s)	4		

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	2446
Lost time/cycle, L (s) $L = \sum t_L$	8
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	150
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	1.642
Intersection status (Exhibit A10-9)	OVER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	79.8		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	70.2		

Control Delay and LOS

	EB	WB	NB	SB
Lane group	LTR	LTR	LTR	LTR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	545	557	4	10
Green ratio, g/C	.506	.506	.441	.441
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573
v/c ratio, X $X = \frac{V/s}{g/C}$	.685	.7	.006	.014
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	795	795	694	694
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	28	28.4	23.5	23.6
Incremental delay, d_2 (s/veh) (Equation 16-12)	4.8	5.1	0	0
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	32.8	33.5	23.5	23.6
LOS by lane group	C	C	C	C
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	32.8	33.5	23.5	23.6
LOS by approach	C	C	C	C
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	30	Intersection LOS (Exhibit 16-2)		C

Notes

1. RS = 1710(PHF)(f_a), where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

HICAP 2000 ™

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

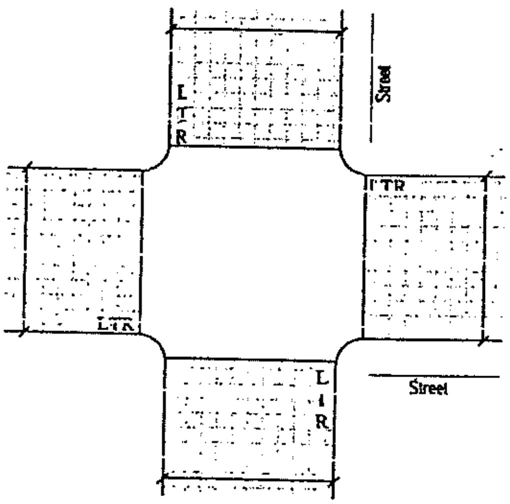
General Information

Analyst: RWH
Agency or Company: DRA
Analysis Period/Year: PM PEAK 2010
Comment: EXISTING

Site Information

Jurisdiction/Date: IMP. CO. 12/20/01
Intersection: HEBER ROAD YOURMAN ROA
Area Type: ☐ CBD ☑ Other

Intersection Geometry



	EB		WB	
Lane configuration	LTR		LTR	
No. of lanes	1		1	

	NB		SB	
Lane configuration	LTR		LTR	
No. of lanes	1		1	

Volume and Signal Input

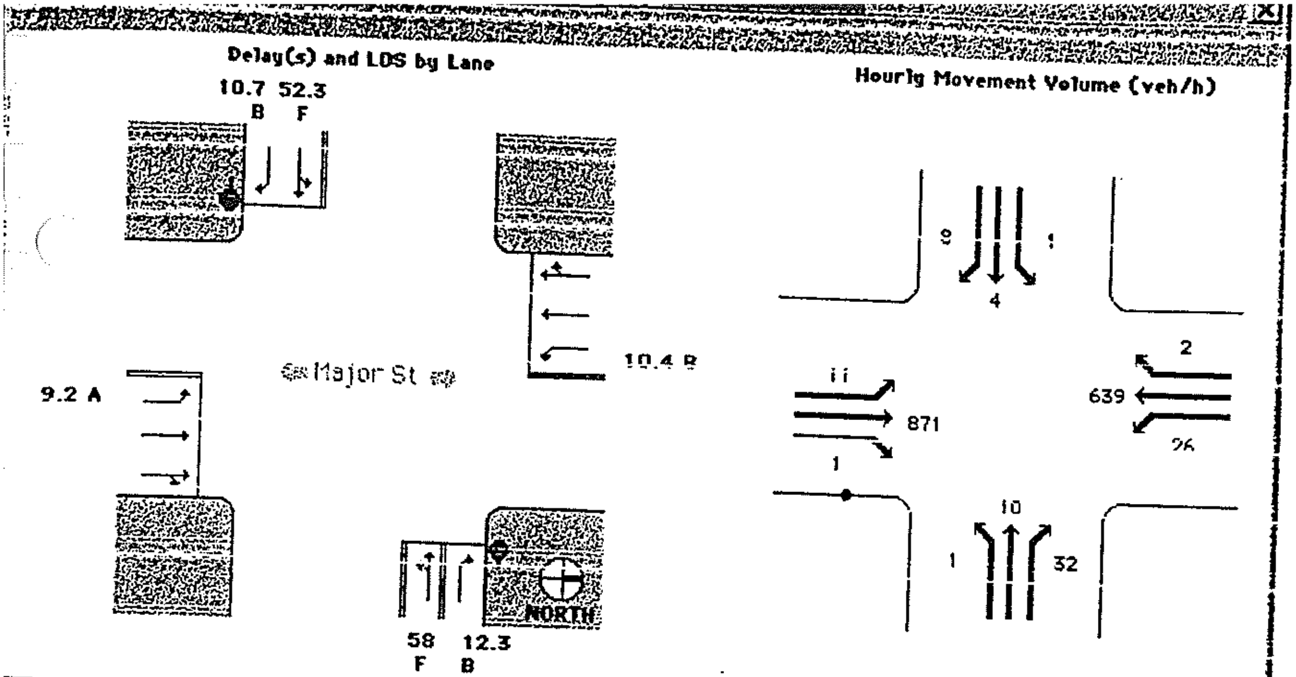
	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	759	497	9	8	512	107	13	4	7	107	2	764
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	100	100	-	100	100	-	100	100	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	3			4			4			4		

Peak-hour factor, PHF: .92

Cycle length: Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

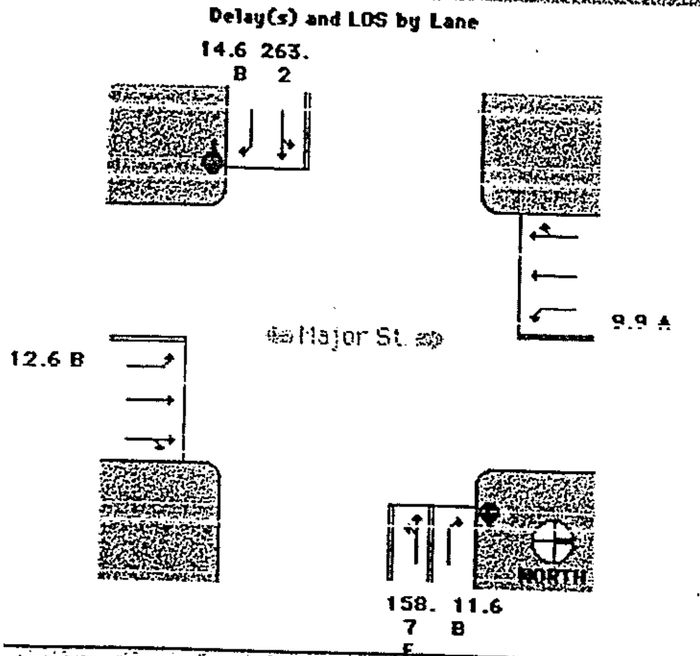


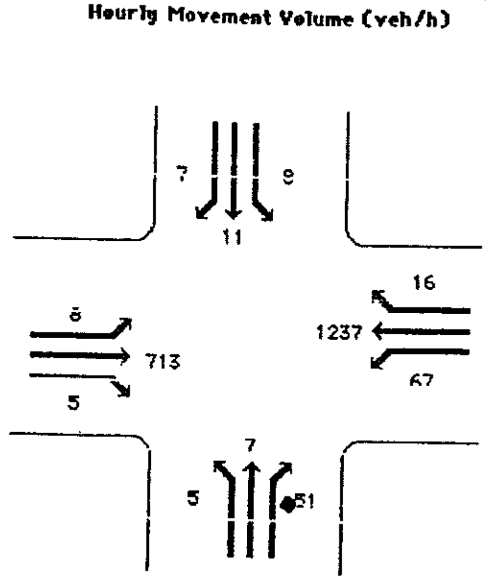
Chapter 17 – TWSC – Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	HIWAY 111
Minor St.	JASPER ROAD

Approach	Delay		LOS
Minor St. (WB)	24.0	s	C
Minor St. (EB)	26.7	s	D
Major LT (NB)	9.2	s	A
Major LT (SB)	10.4	s	B

HiCAP 2000 - Graphical Output

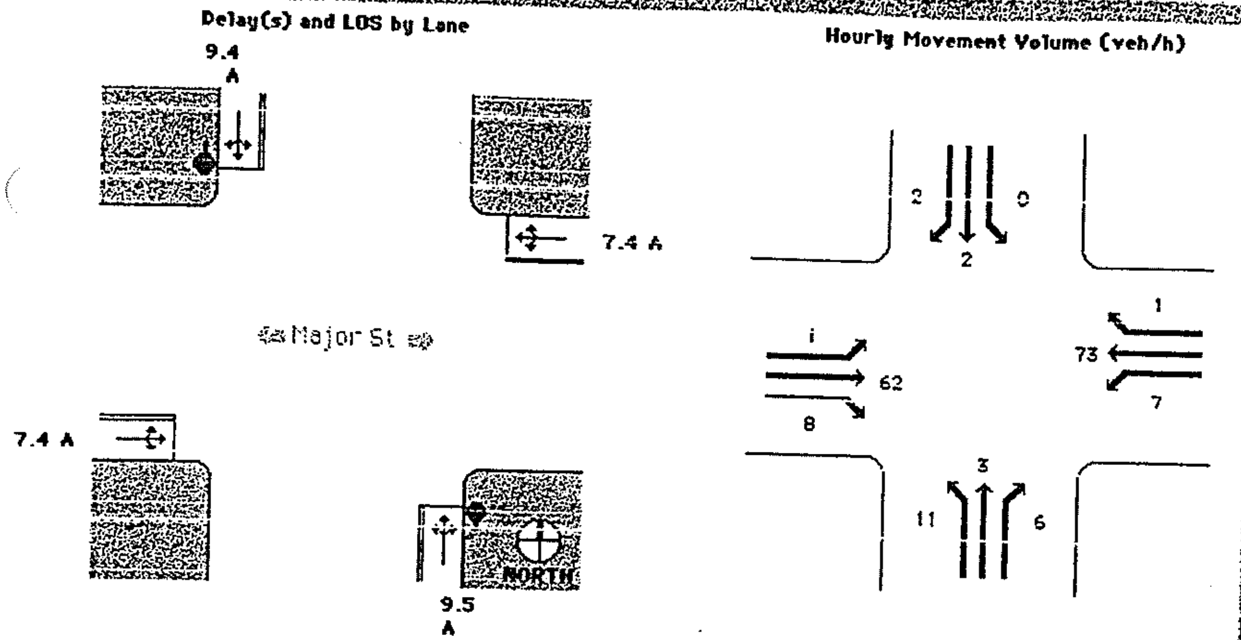




Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	HIWAY 111
Minor St.	JASPER ROAD

Approach	Delay		LOS
Minor St. (WB)	39.6	s	E
Minor St. (EB)	196.3	s	F
Major LT (NB)	12.6	s	B
Major LT (SB)	9.9	s	A

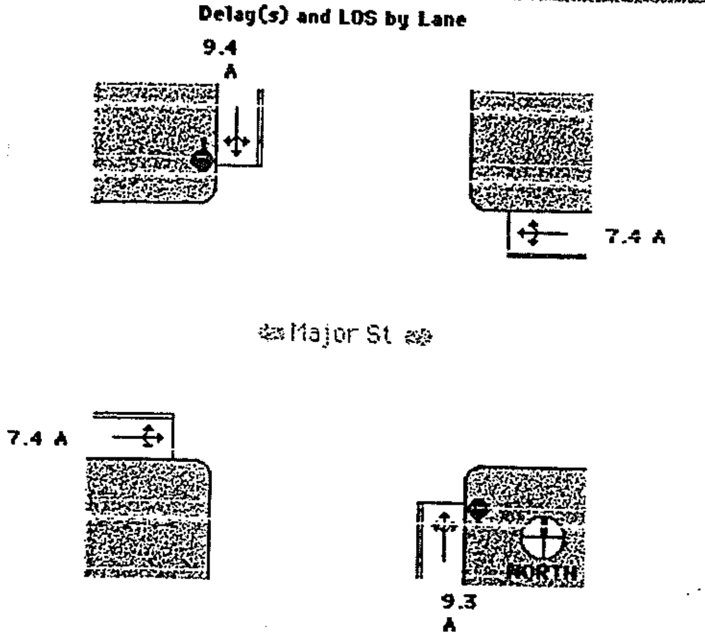


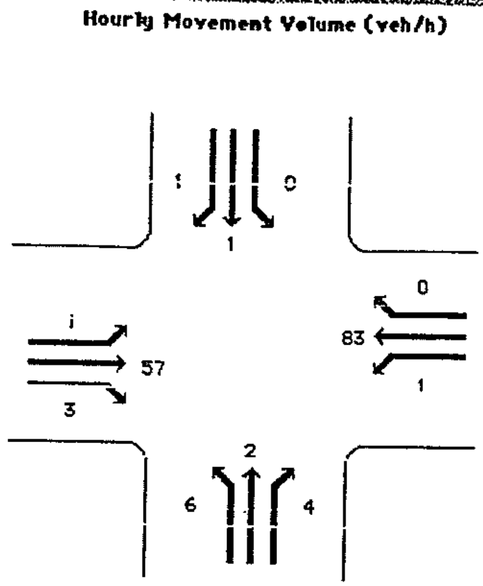
Chapter 17 — TWSC — Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay		LOS
Minor St. (NB)	9.5	s	A
Minor St. (SB)	9.4	s	A
Major LT (EB)	7.4	s	A
Major LT (WB)	7.4	s	A

HiCAP 2000 - Graphical Output





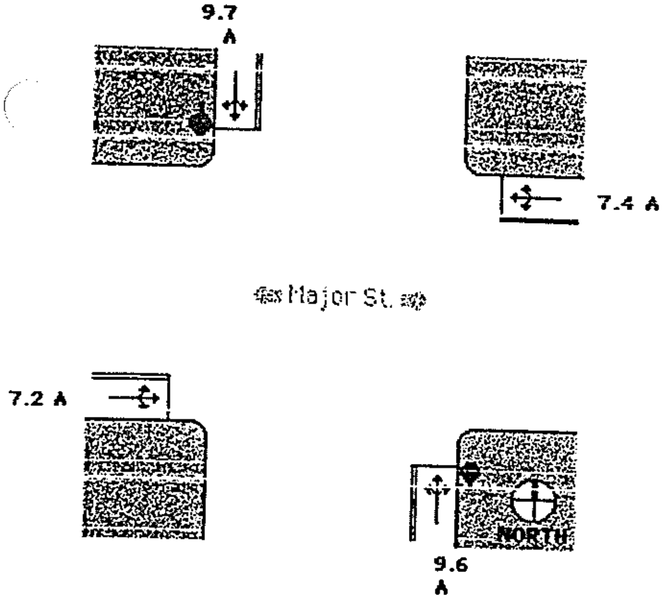
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

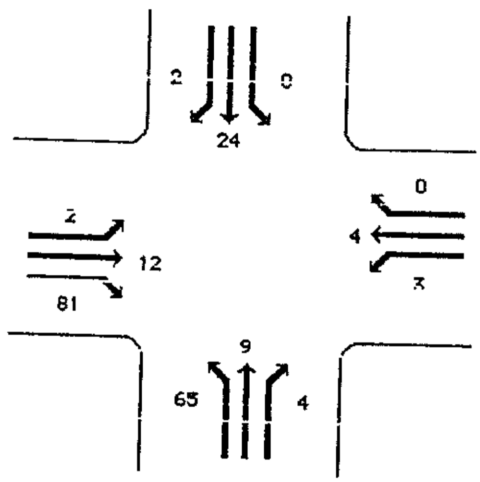
Approach	Delay		LOS
Minor St. (NB)	9.3	s	A
Minor St. (SB)	9.4	s	A
Major LT (EB)	7.4	s	A
Major LT (WB)	7.4	s	A

HiCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)



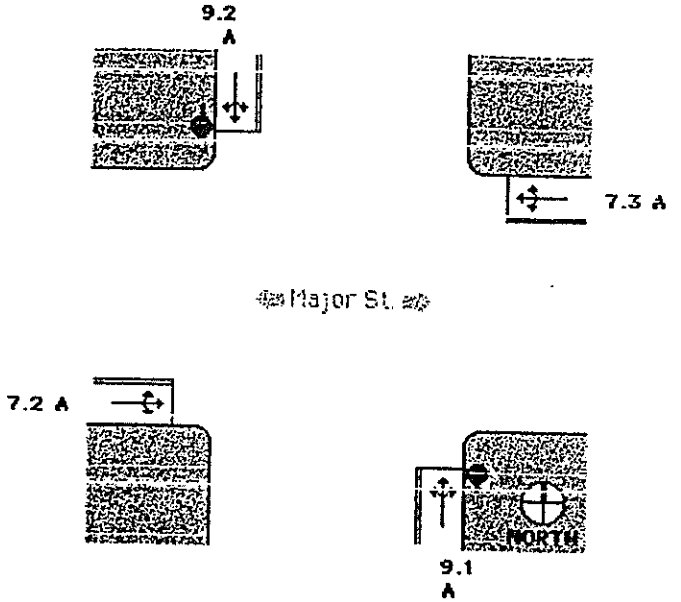
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	JASPER ROAD
Minor St.	YOURMAN ROAD

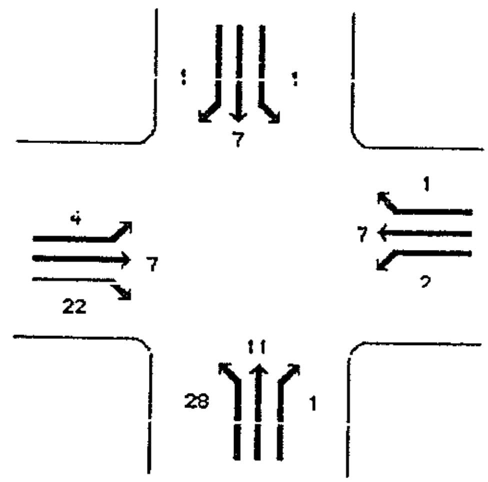
Approach	Delay		LOS
Minor St. (NB)	9.6	s	A
Minor St. (SB)	9.7	s	A
Major LT (EB)	7.2	s	A
Major LT (WB)	7.4	s	A

HICAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

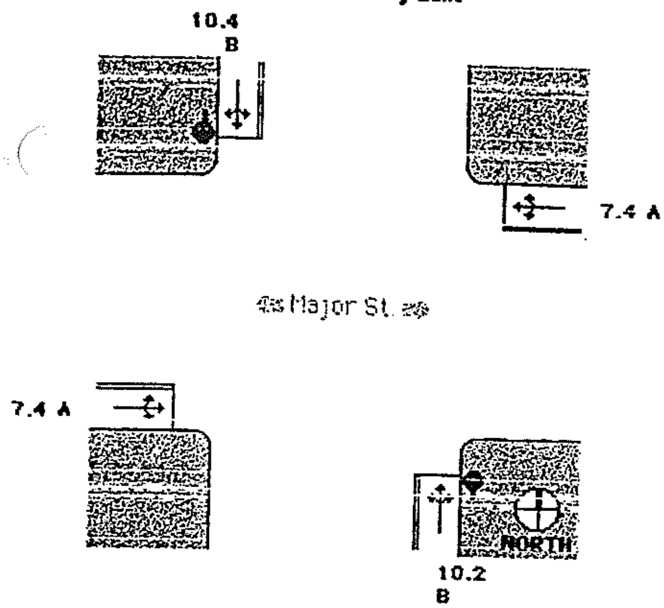


Chapter 17 - TWSC - Summary of Analysis

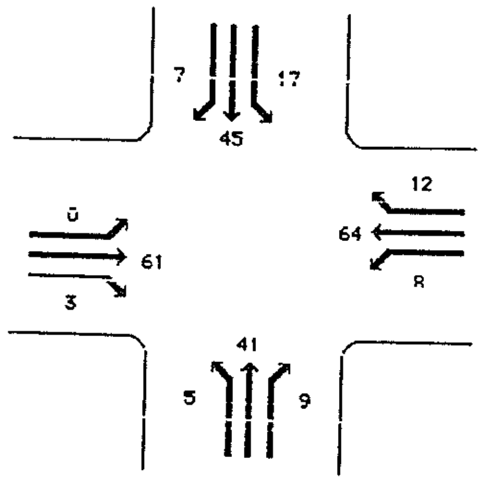
Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	JASPER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay	LOS
Minor St. (NB)	9.1 s	A
Minor St. (SB)	9.2 s	A
Major LT (EB)	7.2 s	A
Major LT (WB)	7.3 s	A

Delay(s) and LOS by Lane



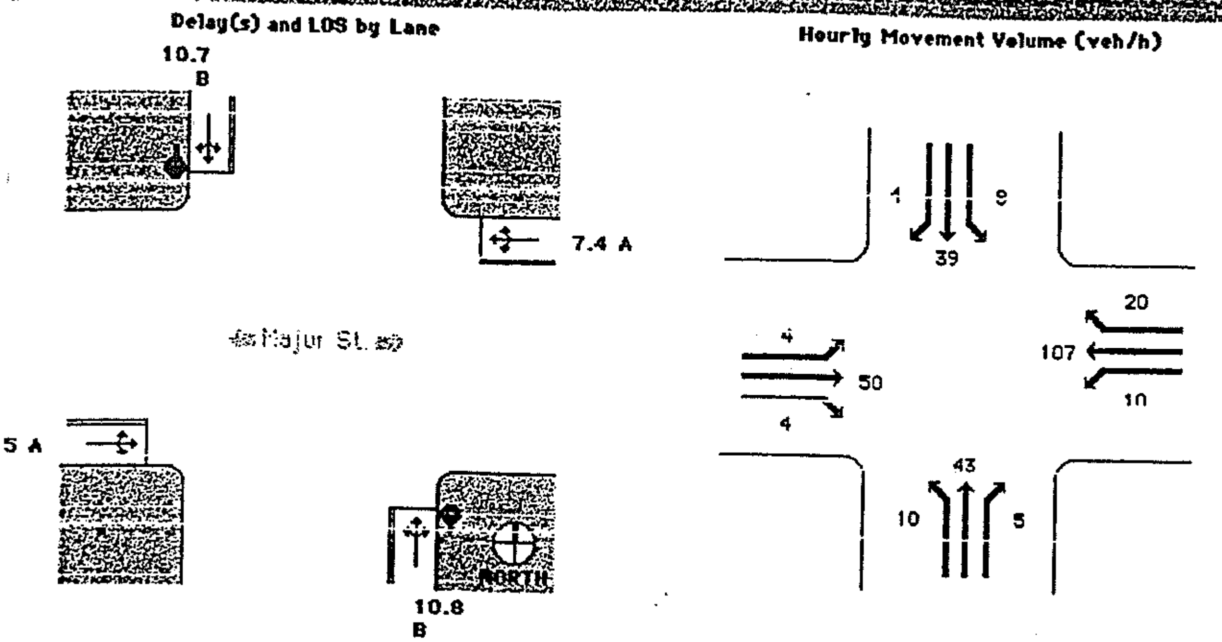
Hourly Movement Volume (veh/h)



Chapter 17 — TWSC — Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	HEBER ROAD
Minor St.	BOWKER ROAD

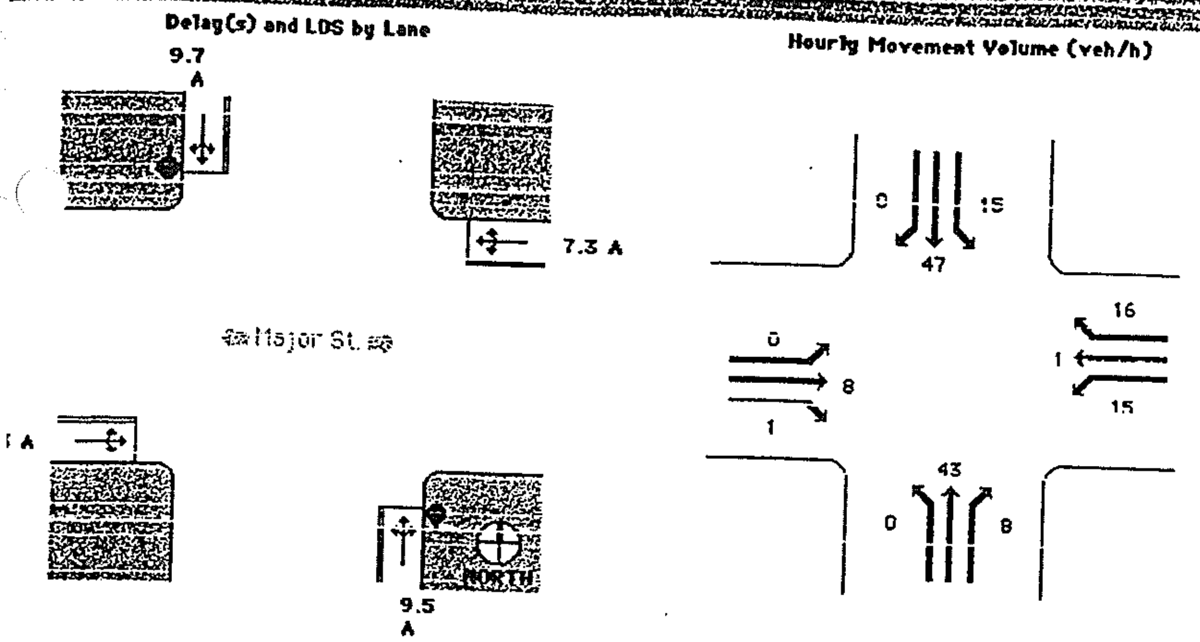
Approach	Delay	LOS
Minor St. (NB)	10.2 s	B
Minor St. (SB)	10.4 s	B
Major LT (EB)	7.4 s	A
Major LT (WB)	7.4 s	A



Chapter 17 — TWSC — Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	HEBER ROAD
Minor St.	BOWKER ROAD

Approach	Delay		LOS
Minor St. (NB)	10.8	s	B
Minor St. (SB)	10.7	s	B
Major LT (EB)	7.5	s	A
Major LT (WB)	7.4	s	A



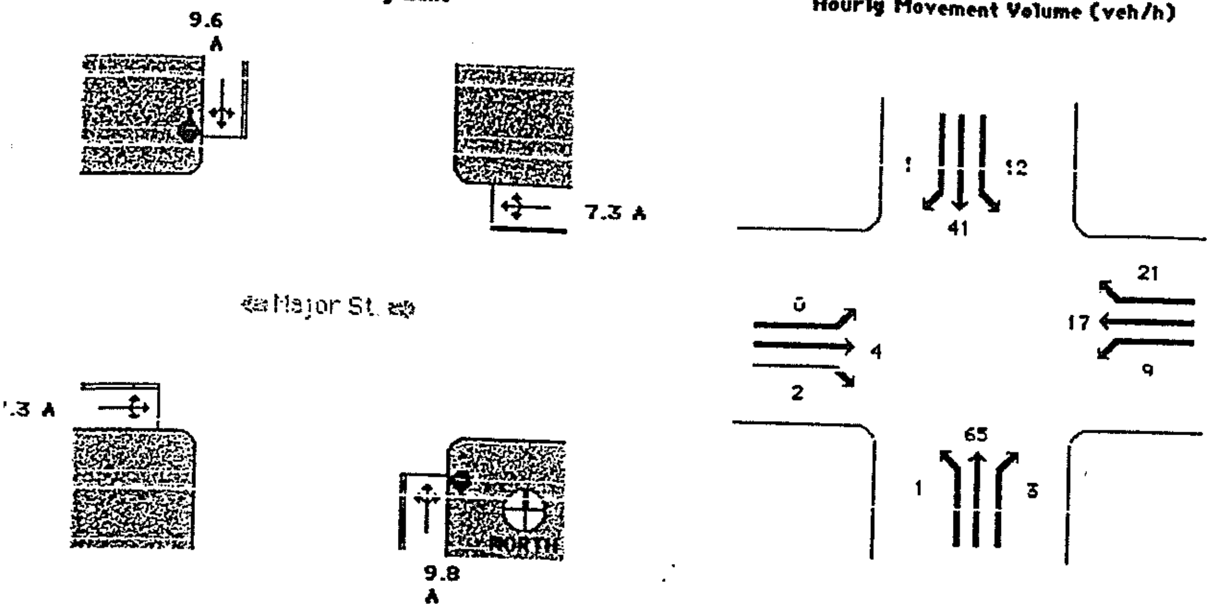
Chapter 17 - TWSC - Summary of Analysis

Analyst: RWH
Agency: DRA
Date: 12/10/01
Period: PM PEAK 2001
Major St.: MCCABE ROAD
Minor St.: BOWKER RD

Approach	Delay	LOS
Minor St. (NB)	9.5 s	A
Minor St. (SB)	9.7 s	A
Major LT (EB)	7.3 s	A
Major LT (WB)	7.3 s	A

Delay(s) and LOS by Lane

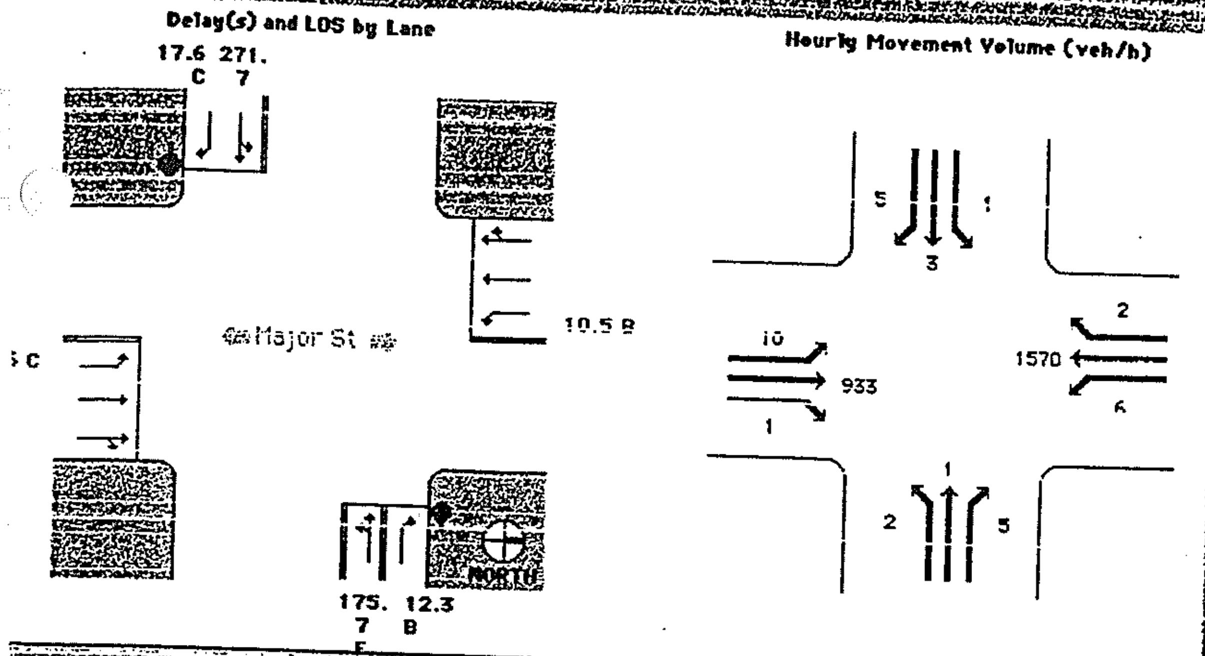
Hourly Movement Volume (veh/h)



Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	MCCABE ROAD
Minor St.	BOWKER RD

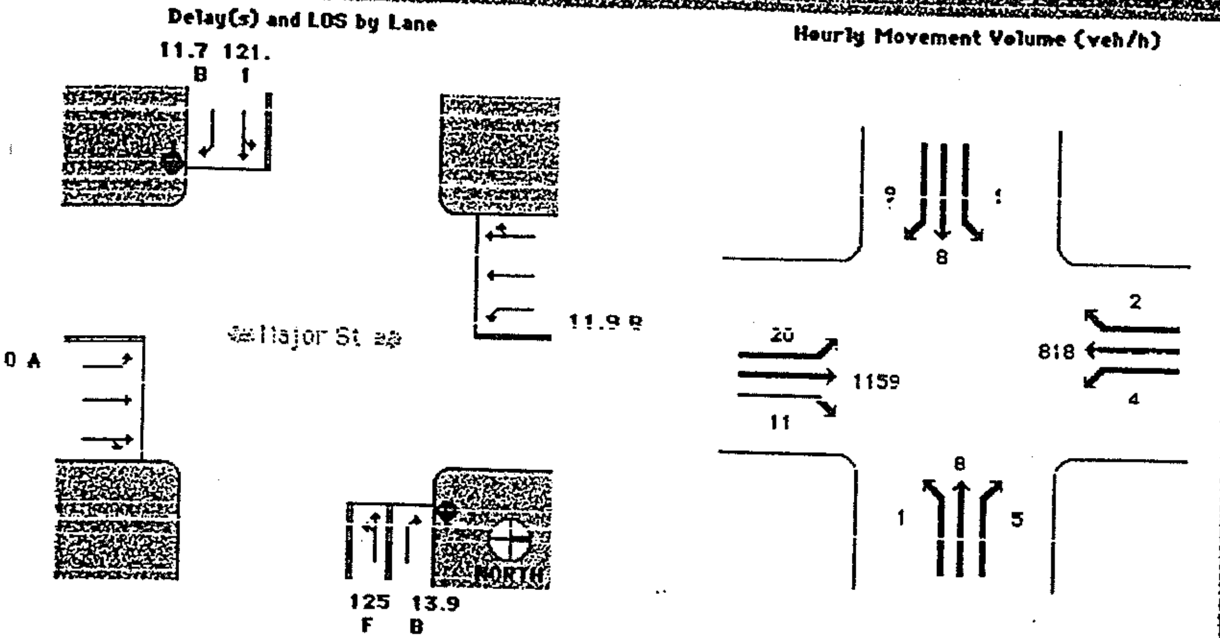
Approach	Delay		LOS
Minor St. (NB)	9.8	s	A
Minor St. (SB)	9.6	s	A
Major LT (EB)	7.3	s	A
Major LT (WB)	7.3	s	A



Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	HIWAY 111
Minor St.	MCCABE ROAD

Approach	Delay	LOS
Minor St. (WB)	73.6 s	F
Minor St. (EB)	130.5 s	F
Major LT (NB)	15.6 s	C
Major LT (SB)	10.5 s	B

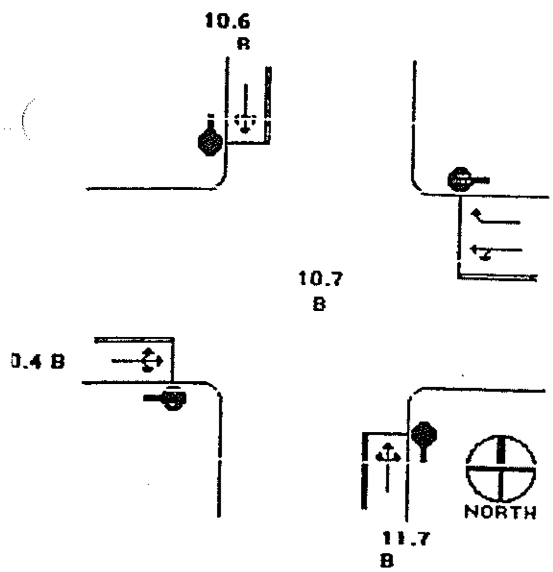


Chapter 17 - TWSC - Summary of Analysis

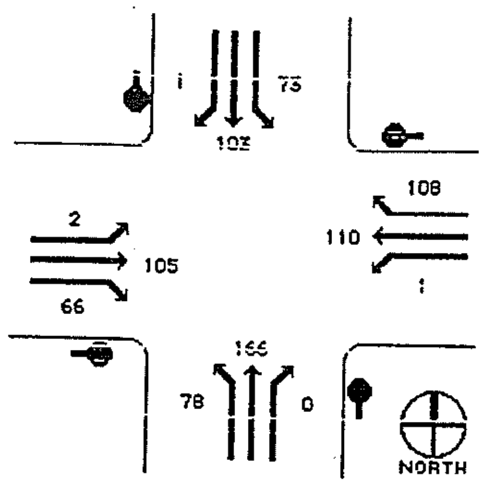
Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	HIWAY 111
Minor St.	MCCABE ROAD

Approach	Delay		LOS
Minor St. (WB)	85.3	s	F
Minor St. (EB)	66.4	s	F
Major LT (NB)	10.0	s	A
Major LT (SB)	11.9	s	B

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

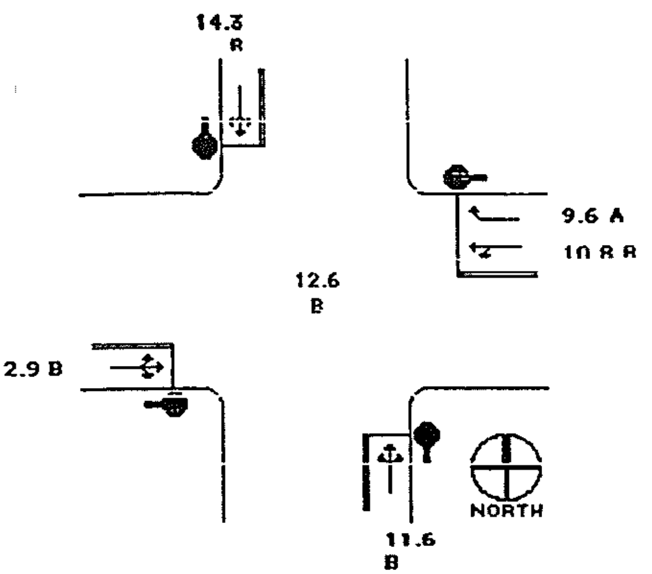


Chapter 17 — AWSC — Summary of Analysis

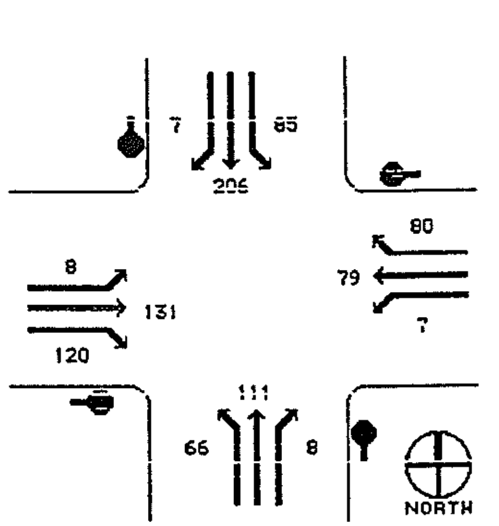
Analyst	RWH
Agency	DKA
Date	12/10/01
Period	AM PEAK 2001
EB/WB St.	HEBER ROAD
NB/SB St.	DOGWOOD ROAD

Approach	Delay	LOS
Northbound	11.7 s	B
Southbound	10.6 s	B
Eastbound	10.4 s	B
Westbound	9.9 s	A
Intersection	10.7 s	B

Delay(s) and LOS by Lane

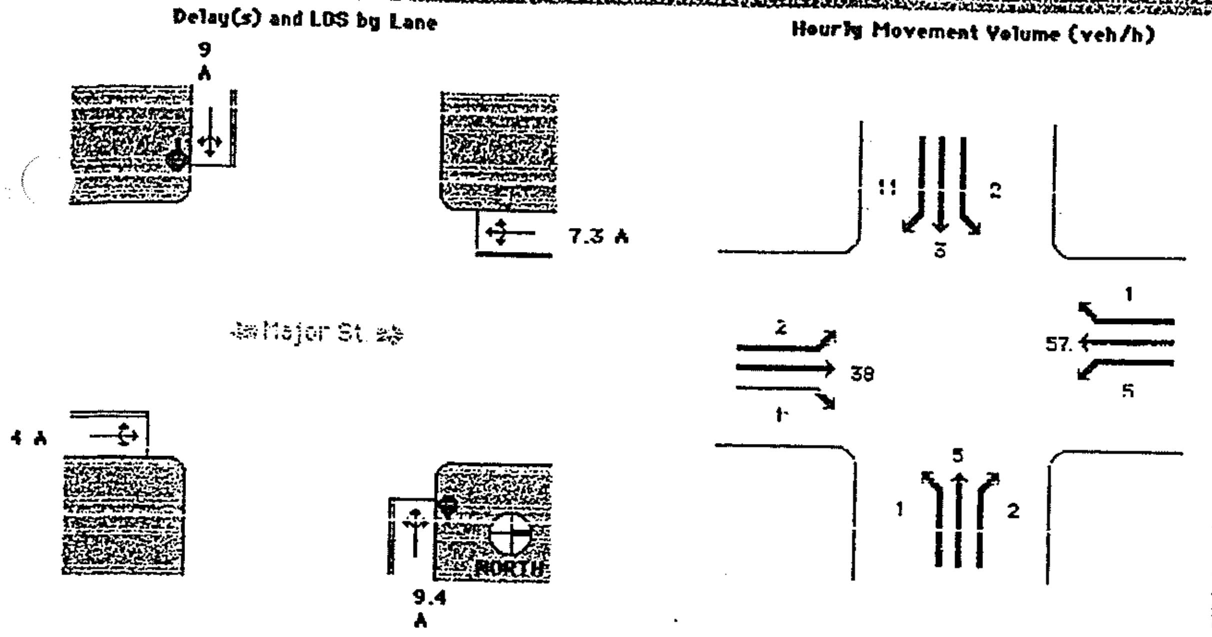


Hourly Movement Volume (veh/h)



Chapter 17 - AWSC - Summary of Analysis

		Approach	Delay		LOS
Analyst	RWH	Northbound	11.6	s	B
Agency	DKA	Southbound	14.3	s	B
Date	12/10/01	Eastbound	12.9	s	B
Period	PM PEAK 2001	Westbound	10.2	s	B
EB/WB St.	HEBER ROAD	Intersection	12.6	s	B
NB/SB St.	DOGWOOD ROAD				



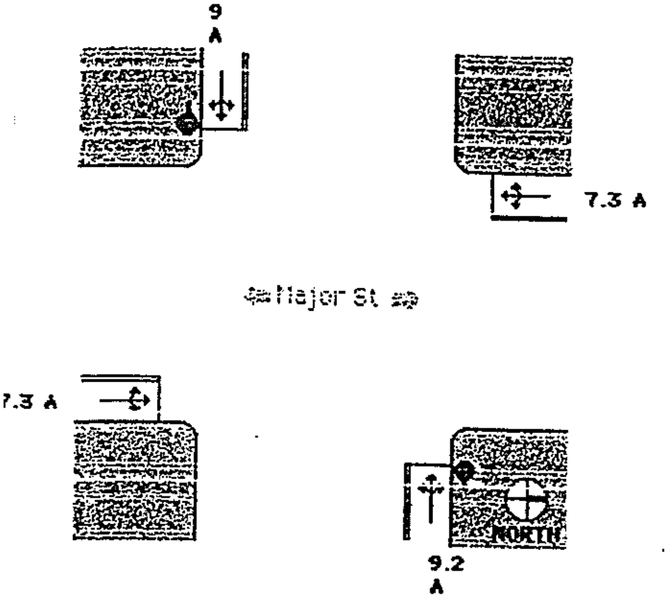
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2001
Major St.	BOWKER ROAD
Minor St.	JASPER ROAD

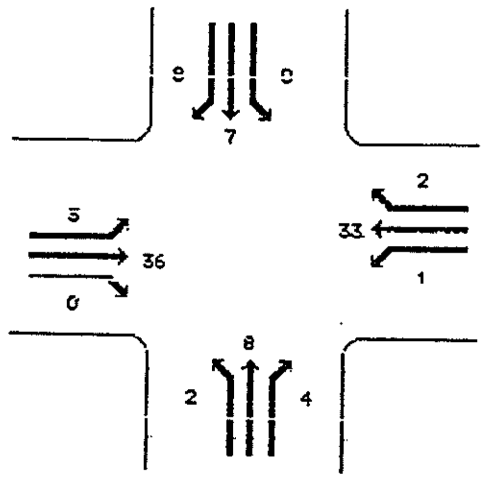
Approach	Delay		LOS
Minor St. (WB)	9.4	s	A
Minor St. (EB)	9.0	s	A
Major LT (NB)	7.4	s	A
Major LT (SB)	7.3	s	A

HCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



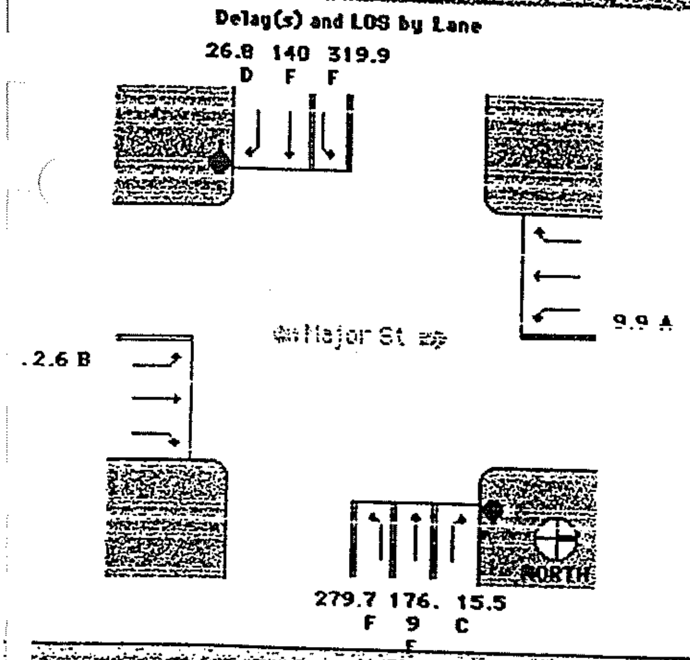
Hourly Movement Volume (veh/h)

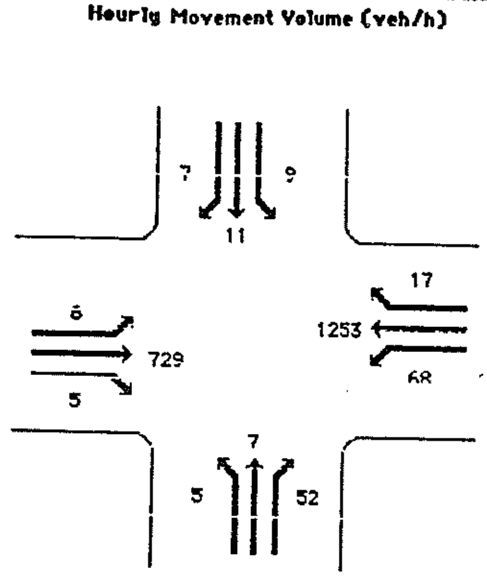


Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2001
Major St.	BOWKER ROAD
Minor St.	JASPER ROAD

Approach	Delay	LOS
Minor St. (WB)	9.2 s	A
Minor St. (EB)	9.0 s	A
Major LT (NB)	7.3 s	A
Major LT (SB)	7.3 s	A



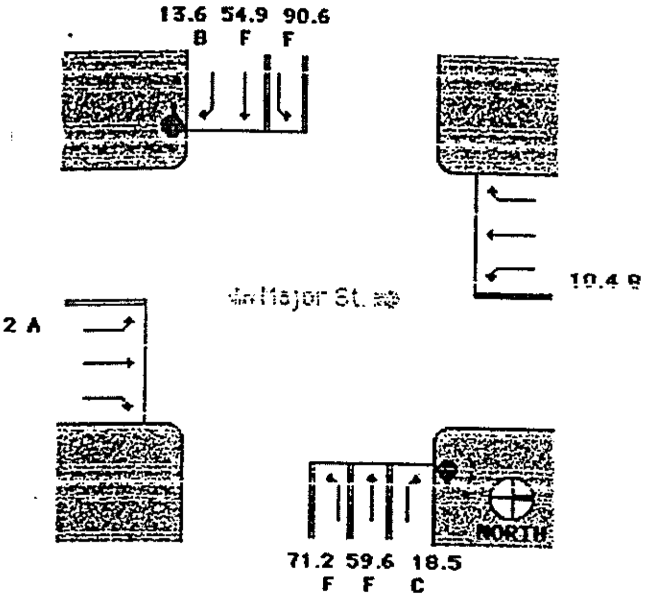


Chapter 17 – TWSC – Summary of Analysis

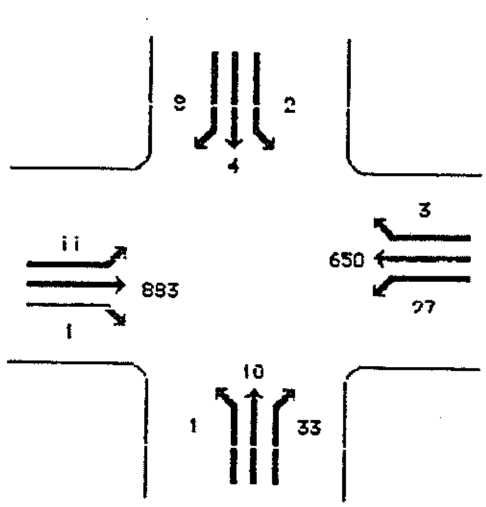
Analyst	RWH
Agency	DRA
Date	12/20/01
Period	PM PEAK 2002
Major St.	HIWAY 111
Minor St.	JASPER ROAD

Approach	Delay		LOS
Minor St. (WB)	56.3	s	F
Minor St. (EB)	115.6	s	F
Major LT (NB)	12.6	s	B
Major LT (SB)	9.9	s	A

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

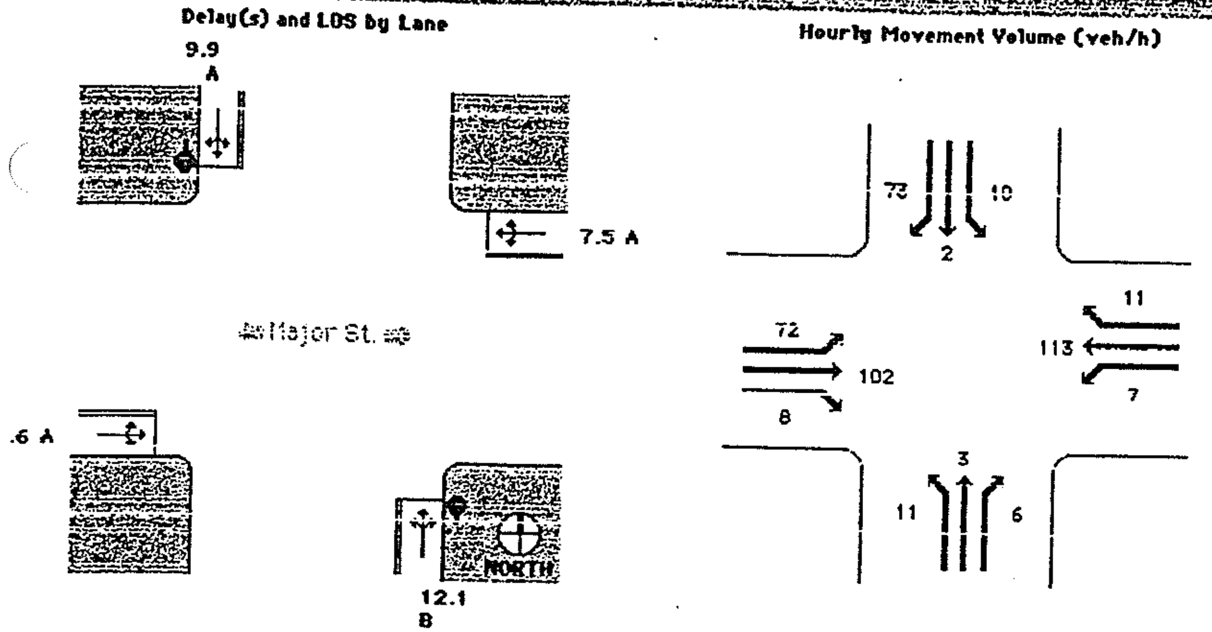


Chapter 17 – TWSC – Summary of Analysis

Analyst	RVH
Agency	DRA
Date	12/20/01
Period	AM PEAK 2002
Major St.	HIWAY 111
Minor St.	JASPER ROAD

Approach	Delay		LOS
Minor St. (WB)	28.6	s	D
Minor St. (EB)	40.0	s	E
Major LT (NB)	9.2	s	A
Major LT (SB)	10.4	s	B

HCS2000 - Graphical Output



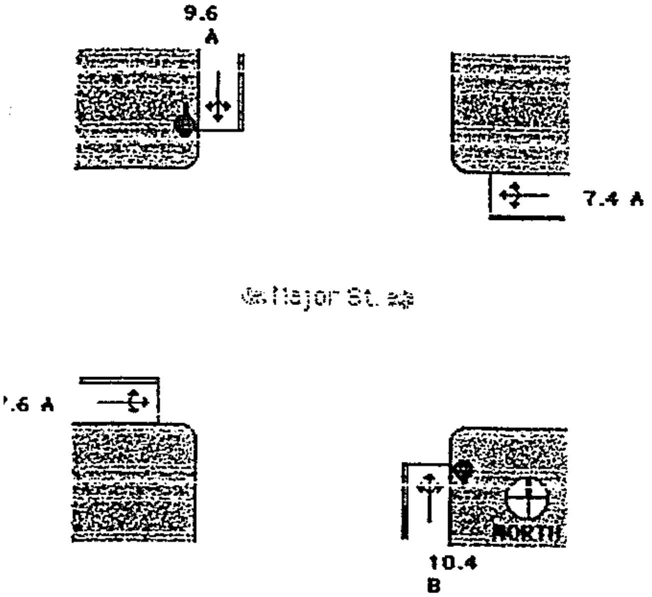
Chapter 17 – TWSC – Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/21/01
Period	PM PEAK 2002
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

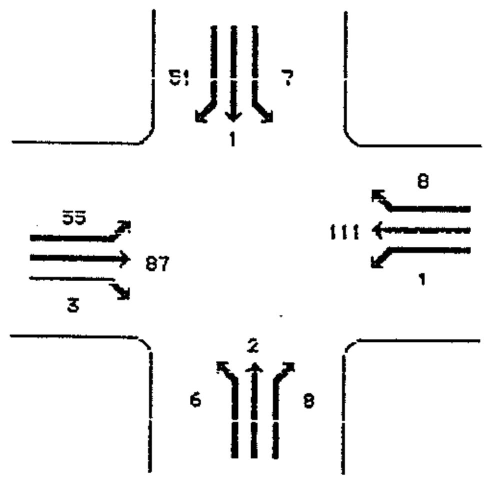
Approach	Delay		LOS
Minor St. (NB)	12.1	s	B
Minor St. (SB)	9.9	s	A
Major LT (EB)	7.6	s	A
Major LT (WB)	7.5	s	A

HCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



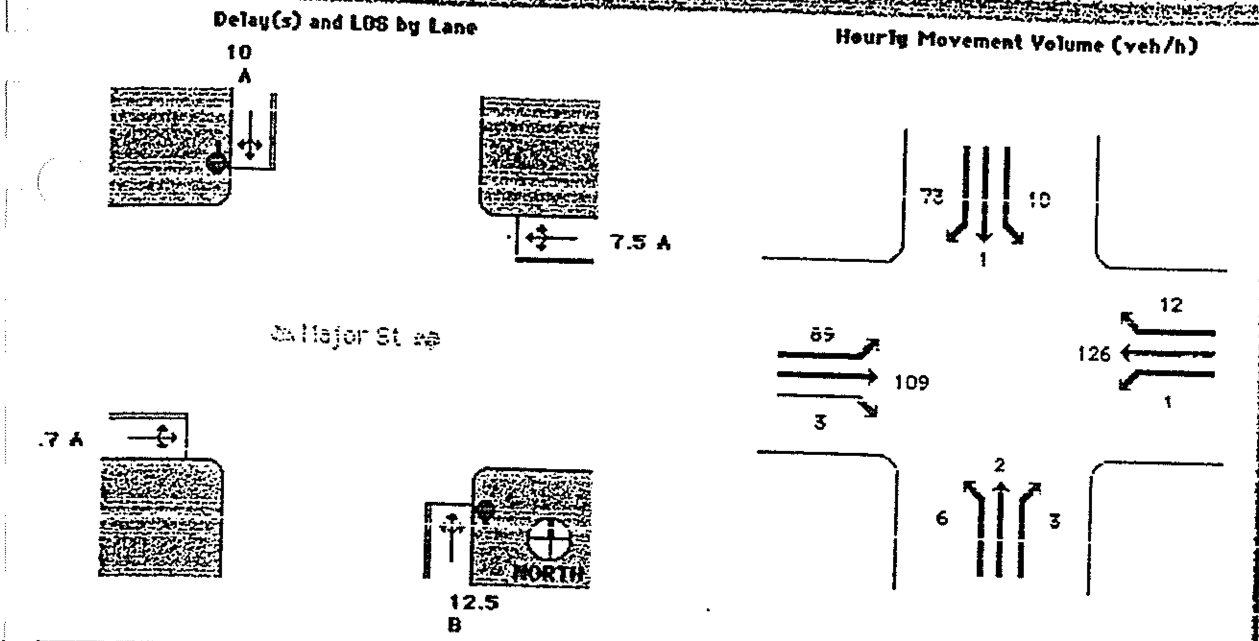
Hourly Movement Volume (veh/h)



Chapter 17 - TWSC - Summary of Analysis

Analyst	RVH
Agency	DRA
Date	12/20/01
Period	AM PEAK 2002
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay	LOS
Minor St. (NB)	10.4 s	B
Minor St. (SB)	9.6 s	A
Major LT (EB)	7.6 s	A
Major LT (WB)	7.4 s	A

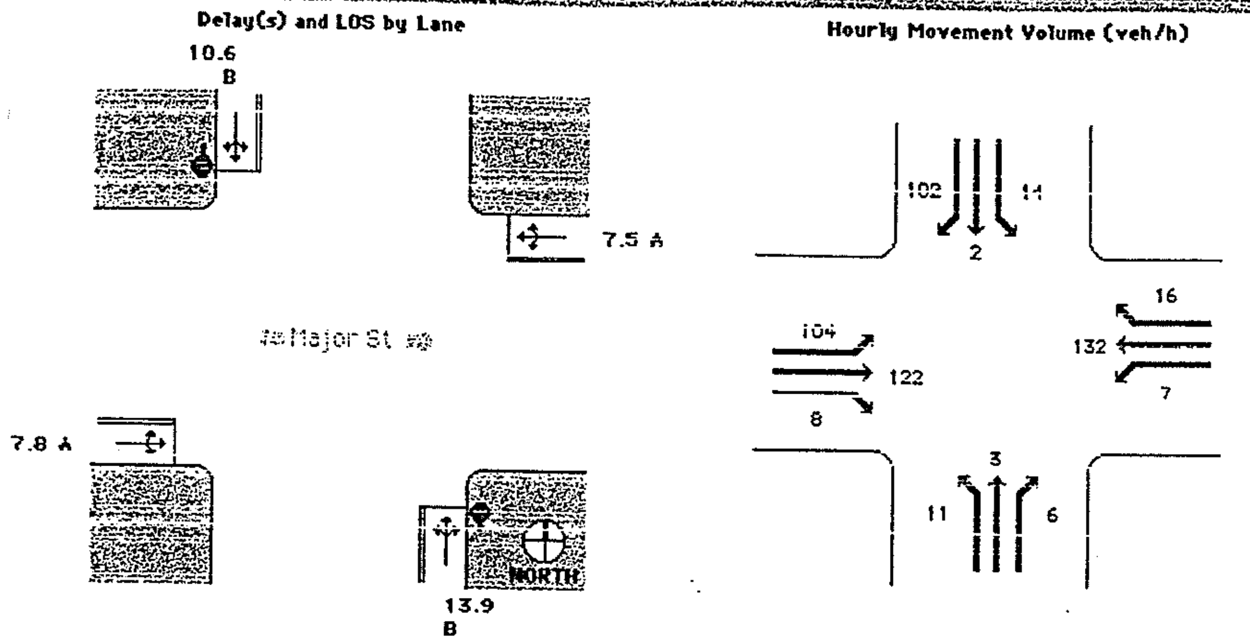


Chapter 17 – TWSC – Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/21/01
Period	AM PEAK 2004
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay	LOS
Minor St. (NB)	12.5 s	B
Minor St. (SB)	10.0 s	A
Major LT (EB)	7.7 s	A
Major LT (WB)	7.5 s	A

HiCAP 2000 - Graphical Output

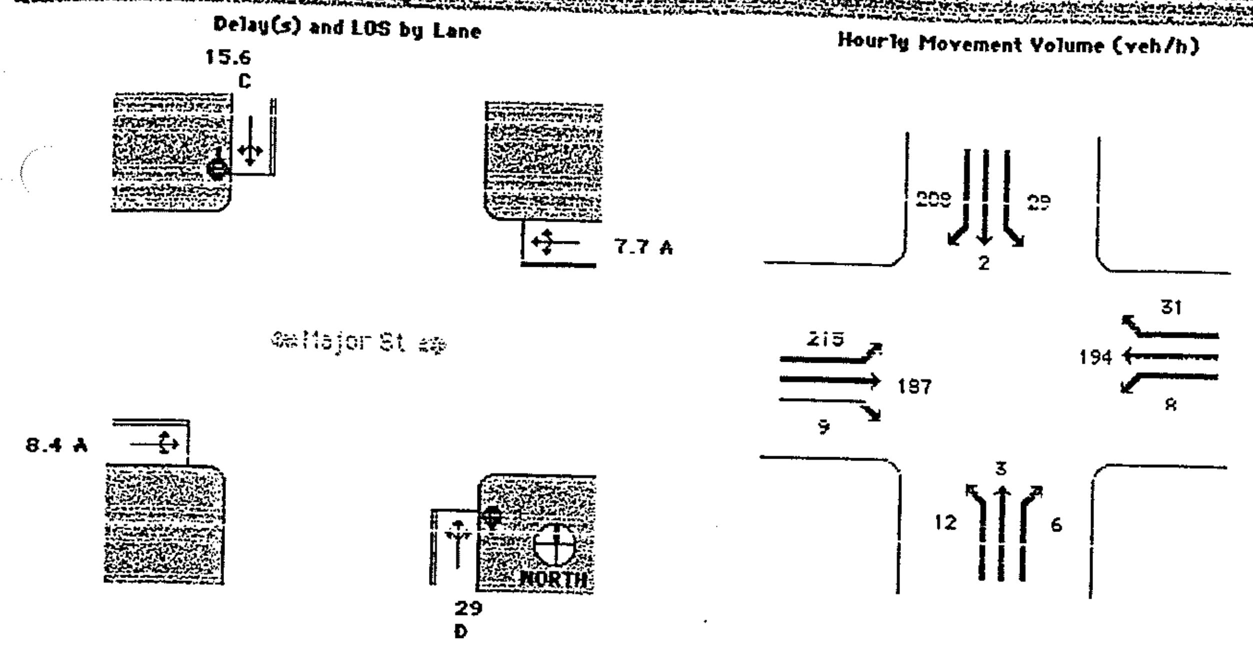


Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/21/01
Period	PM PEAK 2004
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay		LOS
Minor St. (NB)	13.9	s	B
Minor St. (SB)	10.6	s	B
Major LT (EB)	7.8	s	A
Major LT (WB)	7.5	s	A

HCAP 2000 - Graphical Output



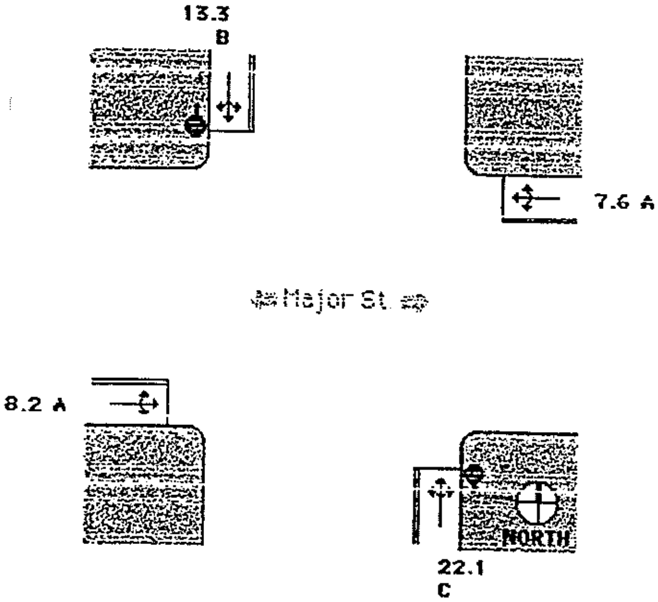
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/21/01
Period	PM PEAK 2006
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

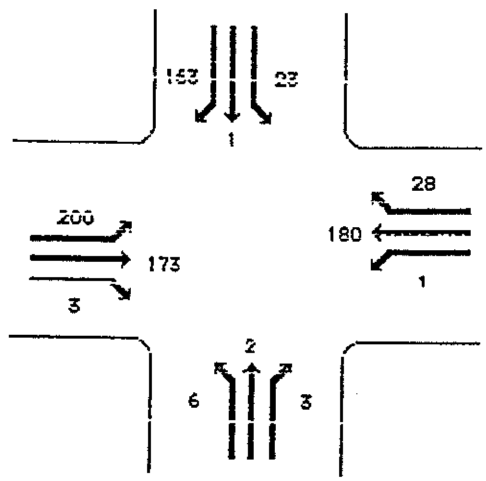
Approach	Delay		LOS
Minor St. (NB)	29.0	s	D
Minor St. (SB)	15.6	s	C
Major LT (EB)	8.4	s	A
Major LT (WB)	7.7	s	A

HiCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

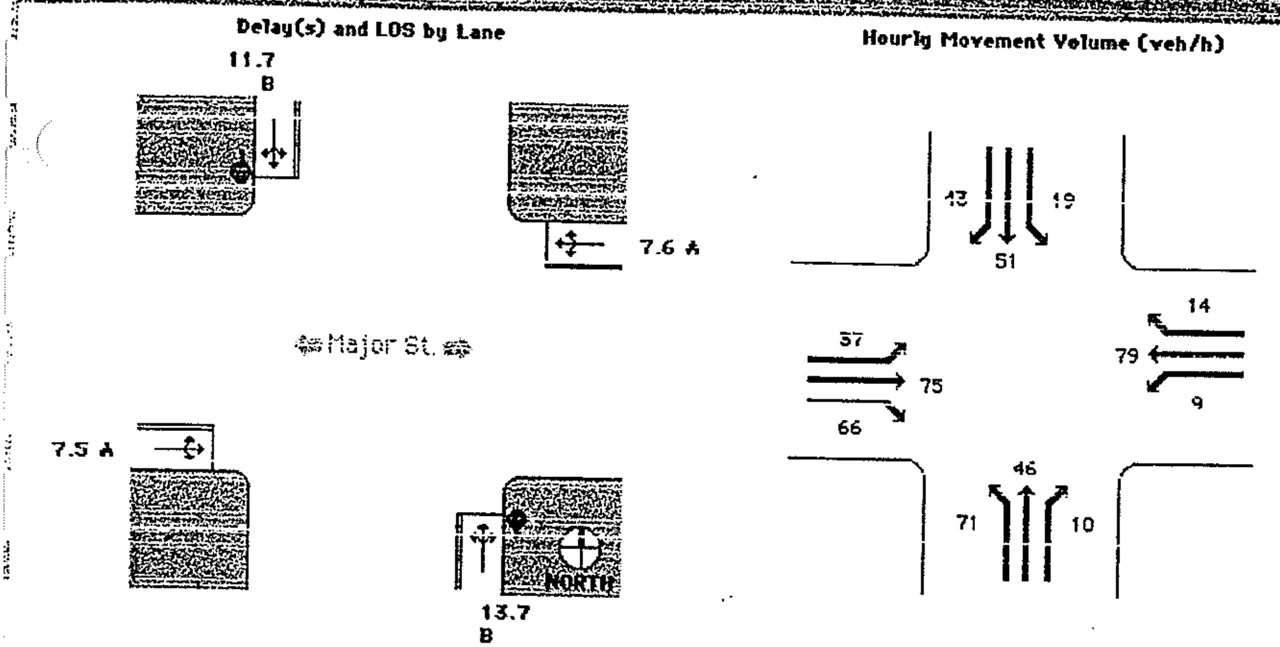


Chapter 17 — TWSC — Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/21/01
Period	AM PEAK 2006
Major St.	HEBER ROAD
Minor St.	YOURMAN ROAD

Approach	Delay		LOS
Minor St. (NB)	22.1	s	C
Minor St. (SB)	13.3	s	B
Major LT (EB)	8.2	s	A
Major LT (WB)	7.6	s	A

HICAP 2000 - Graphical Output



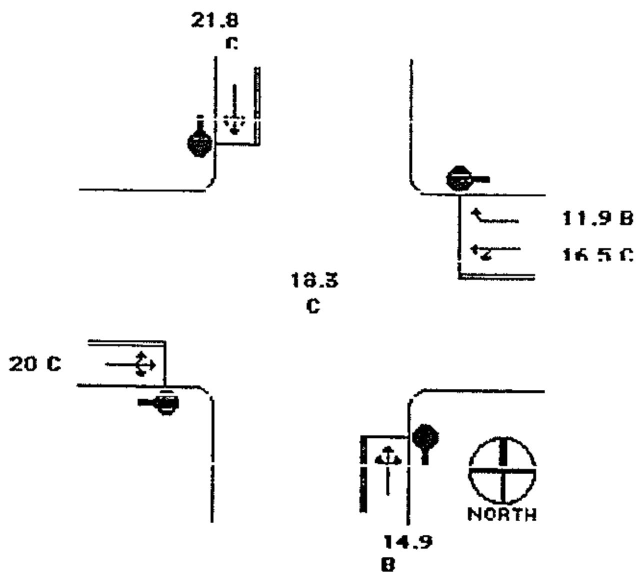
Chapter 17 — TWSC — Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/23/01
Period	PM PEAK 2008
Major St.	HEBER ROAD
Minor St.	BOWKER ROAD

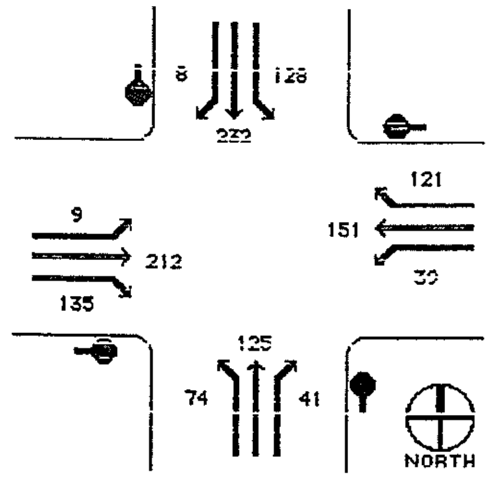
Approach	Delay	LOS
Minor St. (NB)	13.7 s	B
Minor St. (SB)	11.7 s	B
Major LT (EB)	7.5 s	A
Major LT (WB)	7.6 s	A

HCS 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

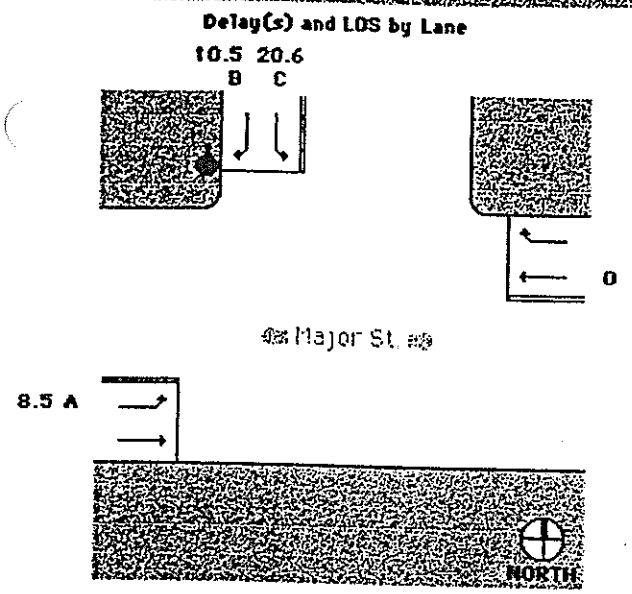


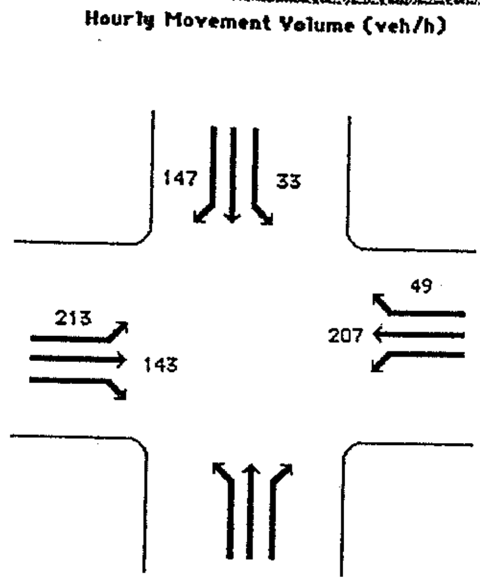
Chapter 17 - AWSC - Summary of Analysis

Analyst	RWH
Agency	DKA
Date	12/23/01
Period	PM PEAK 2008
EB/WB St.	HEBER ROAD
NB/SB St.	DOGWOOD ROAD

Approach	Delay	LOS
Northbound	14.9 s	B
Southbound	21.8 s	C
Eastbound	20.0 s	C
Westbound	14.7 s	B
Intersection	18.3 s	C

HCS2000 - Graphical Output





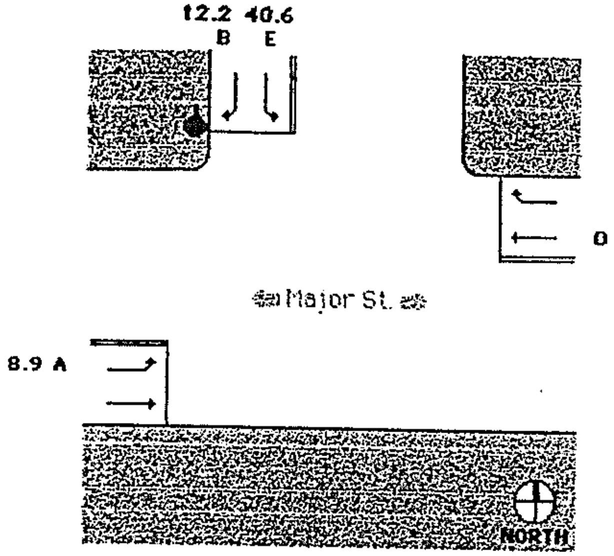
Chapter 17 – TWSC – Summary of Analysis

Analyst: RWH
Agency: DRA
Date: 12/10/01
Period: AM PEAK 2010
Major St.: HEBER ROAD
Minor St.: EAST DRIVEWAY

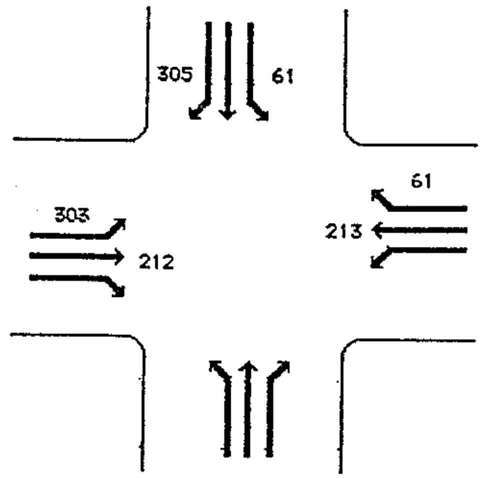
Approach	Delay	LOS
Minor St. (NB)	s	
Minor St. (SB)	12.3 s	B
Major LT (EB)	8.5 s	A
Major LT (WB)	s	

HiCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)

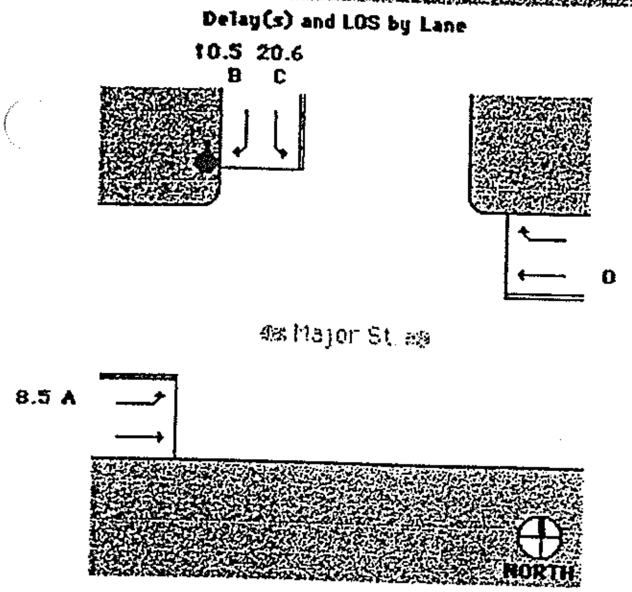


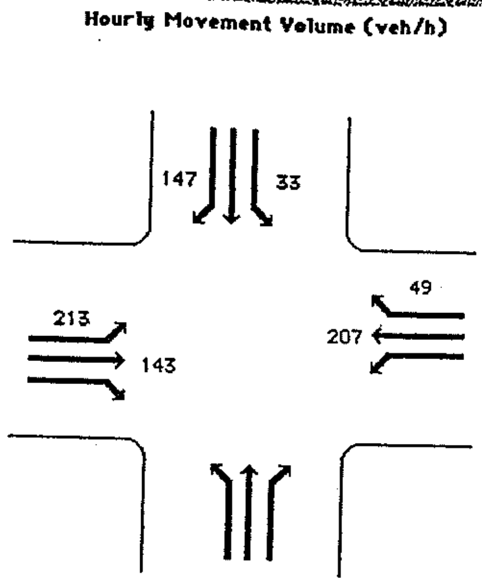
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2010
Major St.	HEBER ROAD
Minor St.	EAST DRIVEWAY

Approach	Delay	LOS
Minor St. (NB)	s	
Minor St. (SB)	17.0 s	C
Major LT (EB)	8.9 s	A
Major LT (WB)	s	

HiCAP 2000 - Graphical Output





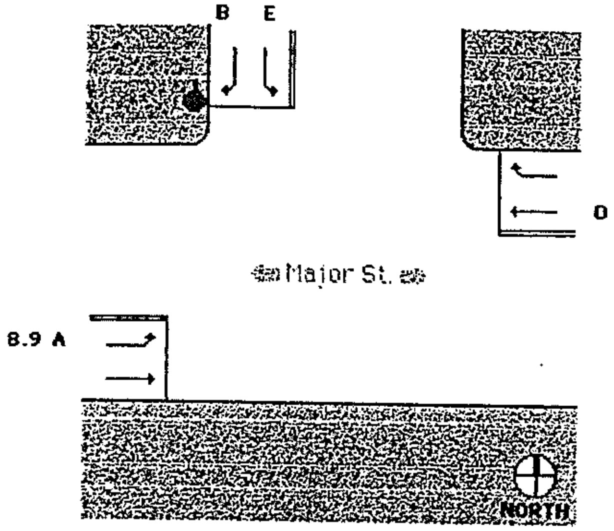
Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	AM PEAK 2010
Major St.	HEBER ROAD
Minor St.	EAST DRIVEWAY

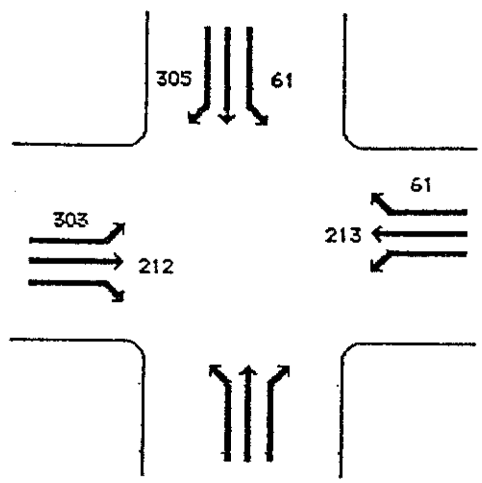
Approach	Delay	LOS
Minor St. (NB)	s	
Minor St. (SB)	12.3 s	B
Major LT (EB)	8.5 s	A
Major LT (WB)	s	

HiCAP 2000 - Graphical Output

Delay(s) and LOS by Lane



Hourly Movement Volume (veh/h)



Chapter 17 - TWSC - Summary of Analysis

Analyst	RWH
Agency	DRA
Date	12/10/01
Period	PM PEAK 2010
Major St.	HEBER ROAD
Minor St.	EAST DRIVEWAY

Approach	Delay	LOS
Minor St. (NB)	s	
Minor St. (SB)	17.0 s	C
Major LT (EB)	8.9 s	A
Major LT (WB)	s	

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING VOLUMES

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	67		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3a	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	NLT	NST
Critical phase volume, CV (veh/h)	35	12	415
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	529
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \dfrac{L}{1 - \left[\dfrac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \dfrac{CS}{RS\left(1 - \dfrac{L}{C}\right)}$	.42
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	10.1		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	7.2	1.1	41.7

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	29	62	29	60	48	916	36	633
Green ratio, g/C	.101	.101	.101	.101	.07	.646	.053	.628
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \dfrac{V/s}{g/C}$	.184	.388	.184	.374	.434	.451	.434	.32
Lane group capacity, c (veh/h) $c = \dfrac{V}{X}$	160	160	160	160	110	2032	83	1977
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	24.7	25.2	24.7	25.2	26.8	5.3	27.6	5.2
Incremental delay, d_2 (s/veh) (Equation 16-12)	2.5	7	2.5	6.6	11.9	.7	15.7	.4
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	27.2	32.2	27.2	31.8	38.7	6	43.3	5.6
LOS by lane group	C	C	C	C	D	A	D	A
Delay by approach, d_A (s/veh) $\dfrac{\sum(d)(V)}{\sum V}$	30.6		30.3		7.7		7.6	
LOS by approach	C		C		A		A	
Intersection delay, d_I (s/veh) $d_I = \dfrac{\sum(d_A)(V_A)}{\sum V_A}$	8.5		Intersection LOS (Exhibit 16-2)				A	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

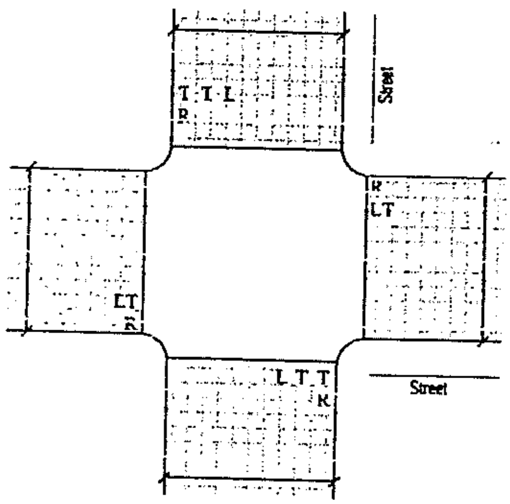
General Information

Analyst RWH
Agency or Company DRA
Analysis Period/Year PM PEAK 2001
Comment EXISTING VOLUMES

Site Information

Jurisdiction/Date IMP. CO. 12/10/01
Intersection HEBER ROAD HIWAY 111
Area Type ☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration		LT	R		LT	R
No. of lanes		1	1		1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	16	12	75	11	14	36	61	696	6	45	1157	14
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description: EXISTING VOLUMES

East-West Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	88		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3a	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	NLT	NST
Critical phase volume, CV (veh/h)	47	17	587
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	739
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate, RS (veh/h)[1]	1573
Cycle length, C (s) $C = \dfrac{L}{1 - \left[\dfrac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \dfrac{CS}{RS\left(1 - \dfrac{L}{C}\right)}$	.587
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	9.7		

North-South Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\dfrac{CV}{CS}\right) + t_L\right]$	7.1	1.1	42.1

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	13	82	15	39	66	757	49	1258
Green ratio, g/C	.095	.095	.095	.095	.069	.653	.051	.635
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \dfrac{V/s}{g/C}$	.087	.543	.102	.26	.606	.368	.606	.629
Lane group capacity, c (veh/h) $c = \dfrac{V}{X}$	150	150	150	150	109	2055	81	1998
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	24.8	25.9	24.8	25.2	27.1	4.7	27.9	6.7
Incremental delay, d_2 (s/veh) (Equation 16-12)	1.1	13.3	1.4	4.2	22.5	.5	29.5	1.5
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	25.9	39.2	26.1	29.3	49.6	5.3	57.4	8.2
LOS by lane group	C	D	C	C	D	A	E	A
Delay by approach, d_A (s/veh) $\dfrac{\Sigma(d)(V)}{\Sigma V}$	37.4		28.4		8.8		10	
LOS by approach	D		C		A		A	
Intersection delay, d_I (s/veh) $d_I = \dfrac{\Sigma(d_A)(V_A)}{\Sigma V_A}$	9.9		Intersection LOS (Exhibit 16-2)				A	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

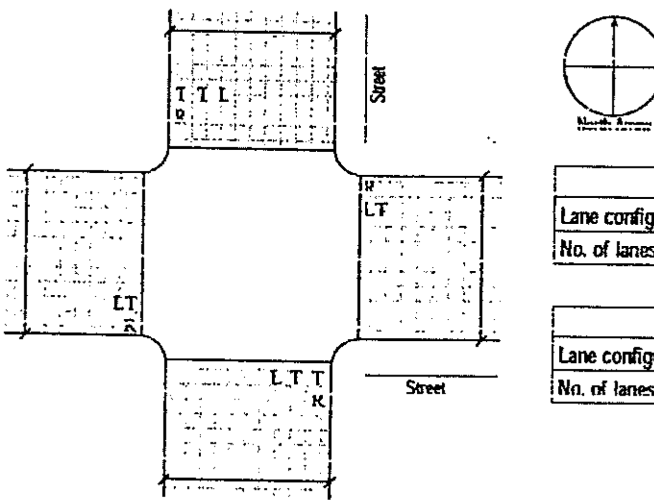
General Information

Analyst: RWH
Agency or Company: DRA
Analysis Period/Year: AM PEAK 2004
Comment: EXISTING GEOMETRY

Site Information

Jurisdiction/Date: IMP. CO. 12/19/01
Intersection: HEBER ROAD HIWAY 111
Area Type: ☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration		LT	R		LT	R
No. of lanes		1	1		1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	11	54	57	55	64	90	46	858	62	75	591	15
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description: EXISTING GEOMETRY

East-West Phasing Plan

Selected plan (Exhibit A10-8): 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	106		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8): 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	48	31	465
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	650
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate, RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.517
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	11.8		

North-South Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	7.6	2.3	38.4

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	59	62	70	98	50	933	82	642
Green ratio, g/C	.13	.13	.13	.13	.06	.573	.097	.61
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.287	.302	.341	.477	.534	.518	.534	.335
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	205	205	205	205	94	1802	153	1920
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	23.6	23.6	23.7	24.2	27.4	7.8	25.8	5.7
Incremental delay, d_2 (s/veh) (Equation 16-12)	3.5	3.8	4.5	7.8	20.1	1.1	12.7	.5
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	27.1	27.4	28.2	32	47.5	8.9	38.5	6.2
LOS by lane group	C	C	C	C	D	A	D	A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	27.2		30.4		10.8		9.8	
LOS by approach	C		C		B		A	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	11.7		Intersection LOS (Exhibit 16-2)				B	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

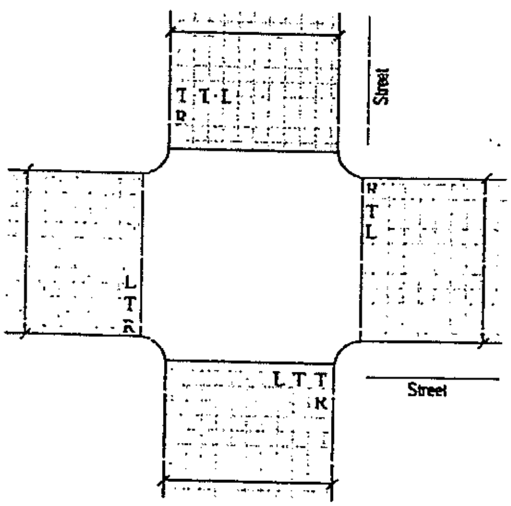
General Information

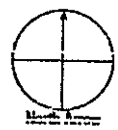
Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2004
Comment	EXISTING GEOMETRY

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry





	EB			WB		
Lane configuration	L	T	R	L	T	R
No. of lanes	1	1	1	1	1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	17	64	78	71	64	83	63	699	68	94	1184	15
Proportion of LT or RT (P_{LT} or P_{RT})[2]	0	-	0	0	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description: EXISTING GEOMETRY

East-West Phasing Plan

Selected plan (Exhibit A10-8): 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	98		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8): 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	66	33	568
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	765
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$, $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.608
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	10.1		

North-South Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	8.2	2	39.7

Control Delay and LOS

	EB			WB			NB		SB	
Lane group	L	T	R	L	T	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	18	70	85	77	70	90	68	760	102	1287
Green ratio, g/C	0	.102	.102	0	.102	.102	.069	.594	.104	.628
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$		.433	.528		.433	.561	.627	.406	.627	.651
Lane group capacity, c (veh/h) $c = \frac{V}{X}$		161	161		161	161	109	1870	163	1977
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)		25.3	25.6		25.3	25.7	27.2	6.5	25.8	7
Incremental delay, d_2 (s/veh) (Equation 16-12)		8.3	11.9		8.3	13.4	24.3	.7	16.9	1.7
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)		33.6	37.4		33.6	39.1	51.4	7.2	42.7	8.7
LOS by lane group		C	D		C	D	D	A	D	A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	35.7			36.7			10.8		11.2	
LOS by approach	D			D			B		B	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	12.6			Intersection LOS (Exhibit 16-2)			B			

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

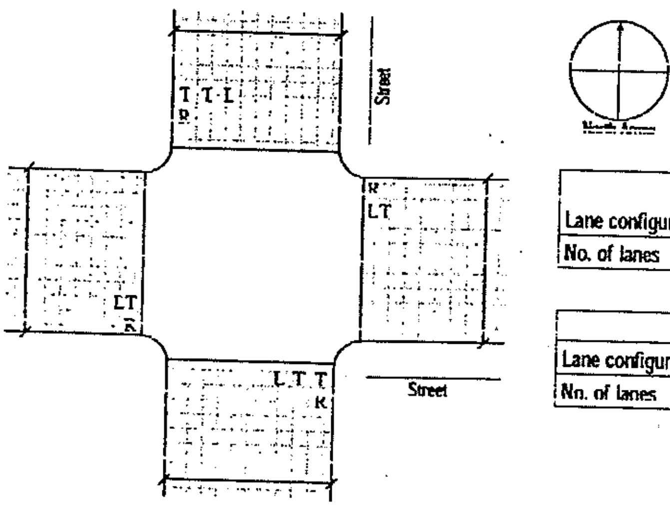
General Information

Analyst: RWH
Agency or Company: DRA
Analysis Period/Year: AM PEAK 2006
Comment: EXISTING GEOMETRY

Site Information

Jurisdiction/Date: IMP. CO. 12/19/01
Intersection: HEBER ROAD HIWAY 111
Area Type: ☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration		LT	R		LT	R
No. of lanes		1	1		1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB LT	EB TH	EB RT[1]	WB LT	WB TH	WB RT[1]	NB LT	NB TH	NB RT[1]	SB LT	SB TH	SB RT[1]
Volume, V (veh/h)	12	129	62	110	110	134	48	893	129	127	615	16
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING GEOMETRY

East-West Phasing Plan

Selected plan (Exhibit A10-8) I	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
~~Critical phase volume, CV (veh/h)~~	203		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	51	83	522
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	859
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.683
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
~~Green time, g (s)~~ $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	~~15.4~~		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	6.8	4.6	33.2

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	140	67	120	146	52	971	138	668
Green ratio, g/C	.189	.189	.189	.189	.047	.486	.124	.564
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.471	.226	.403	.489	.705	.635	.705	.377
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	298	298	298	298	74	1530	196	1774
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	21.6	20.6	21.3	21.7	28.2	11.5	25.2	7.3
Incremental delay, d_2 (s/veh) (Equation 16-12)	5.3	1.8	4	5.6	43.7	2	19.2	.6
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	26.9	22.4	25.4	27.4	71.9	13.5	44.4	7.9
LOS by lane group	C	C	C	C	E	B	D	A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	25.4		26.5		16.5		14.1	
LOS by approach	C		C		B		B	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	16.9		Intersection LOS (Exhibit 16-2)				B	

Notes

1. RS = 1710(PHF)(f_a), where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

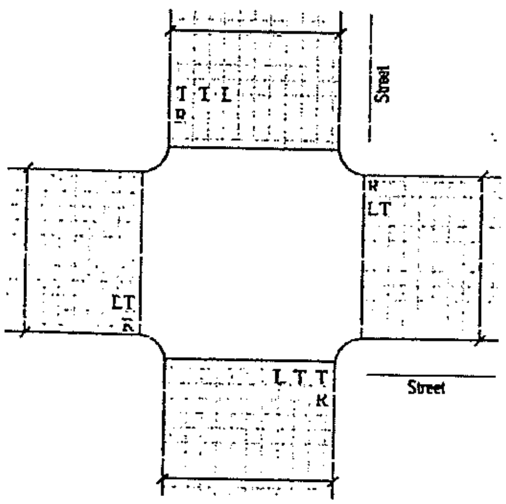
General Information

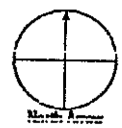
Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2006
Comment	EXISTING GEOMETRY

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry





	EB				WB		
Lane configuration		LT	R		LT	R	
No. of lanes		1	1		1	1	

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	17	120	81	135	118	133	66	728	135	147	1233	15
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description EXISTING GEOMETRY

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	261		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	69	85	540
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	956
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.76
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	17.1		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	7.5	4.3	31.1

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	130	88	129	145	72	792	160	1340
Green ratio, g/C	.219	.219	.219	.219	.058	.452	.129	.523
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.379	.256	.375	.42	.784	.557	.784	.814
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	344	344	344	344	91	1422	204	1646
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	20	19.4	20	20.2	27.9	12	25.3	11.9
Incremental delay, d_2 (s/veh) (Equation 16-12)	3.2	1.8	3.1	3.7	47.9	1.6	25.5	4.5
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	23.1	21.2	23.1	23.9	75.8	13.6	50.8	16.4
LOS by lane group	C	C	C	C	E	B	D	B
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	22.4		23.5		18.8		20.1	
LOS by approach	C		C		B		C	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	19.9		Intersection LOS (Exhibit 16-2)				B	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

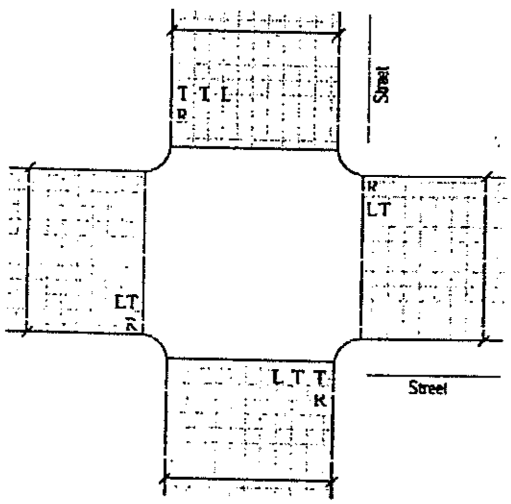
General Information

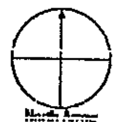
Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	AM PEAK 2008
Comment	EXISTING GEOMETRY

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry





	EB			WB		
Lane configuration		LT	R		LT	R
No. of lanes		1	1		1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	12	186	64	165	156	178	50	930	196	180	641	16
Proportion of LT or RT (P_{LT} or P_{RT})[2]	100	-	0	100	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description: EXISTING GEOMETRY

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	406		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	53	137	580
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	1175
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$, $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.934
Intersection status (Exhibit A10-9)	NEAR CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	20.6		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	6.1	5.6	27.7

Control Delay and LOS

	EB		WB		NB		SB	
Lane group	LT	R	LT	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	202	70	170	193	54	1011	196	697
Green ratio, g/C	.276	.276	.276	.276	.036	.395	.129	.488
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$	.465	.16	.393	.445	.964	.814	.964	.454
Lane group capacity, c (veh/h) $c = \frac{V}{X}$	434	434	434	434	56	1243	203	1536
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)	18	16.4	17.6	17.9	28.9	16.2	26	10.1
Incremental delay, d_2 (s/veh) (Equation 16-12)	3.6	.8	2.7	3.3	110	5.9	54.6	1
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)	21.6	17.2	20.3	21.2	138.9	22.1	80.6	11.1
LOS by lane group	C	B	C	C	F	C	F	B
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	20.5		20.8		28.1		26.3	
LOS by approach	C		C		C		C	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	26.3		Intersection LOS (Exhibit 16-2)				C	

Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

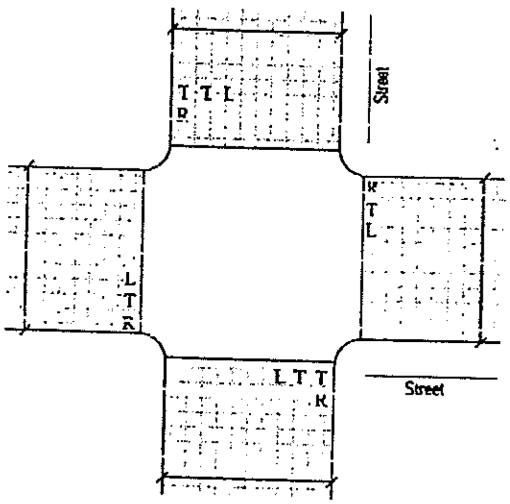
General Information

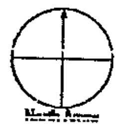
Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2008
Comment	ADD EB & WB LT LANE

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry





	EB			WB		
Lane configuration	L	T	R	L	T	R
No. of lanes	1	1	1	1	1	1

	NB			SB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	18	176	84	199	171	184	69	758	202	200	1283	16
Proportion of LT or RT (P_{LT} or P_{RT})[2]	0	-	0	0	-	0	0	-	100	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description ADD EB & WB LT LANE

East-West Phasing Plan

	Phase No. 1	Phase No. 2	Phase No. 3
Selected plan (Exhibit A10-8) 1			
Movement codes	EWT		
Critical phase volume, CV (veh/h)	216		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

	Phase No. 1	Phase No. 2	Phase No. 3
Selected plan (Exhibit A10-8) 3b			
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	73	138	513
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	940
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.747
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	15.1		
North-South Phasing	**Phase No. 1**	**Phase No. 2**	**Phase No. 3**
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	7.7	7	30.2

Control Delay and LOS

	EB			WB			NB		SB	
Lane group	L	T	R	L	T	R	L	TR	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	20	191	91	216	186	200	75	824	217	1395
Green ratio, g/C	0	.184	.184	0	.184	.184	.062	.437	.179	.554
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	1573	1573	3146	1573	3146
v/c ratio, X $X = \frac{V/s}{g/C}$		.66	.315		.641	.69	.771	.6	.771	.8
Lane group capacity, c (veh/h) $c = \frac{V}{X}$		290	290		290	290	97	1374	282	1743
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)		22.7	21.2		22.6	22.9	27.7	12.9	23.5	10.7
Incremental delay, d_2 (s/veh) (Equation 16-12)		11.2	2.8		10.4	12.7	43.8	1.9	18.3	4
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)		34	24		33.1	35.5	71.5	14.8	41.7	14.7
LOS by lane group		C	C		C	D	E	B	D	B
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	30.8			34.4			19.6		18.3	
LOS by approach	C			C			B		B	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	***20.7***			Intersection LOS (Exhibit 16-2)					C	

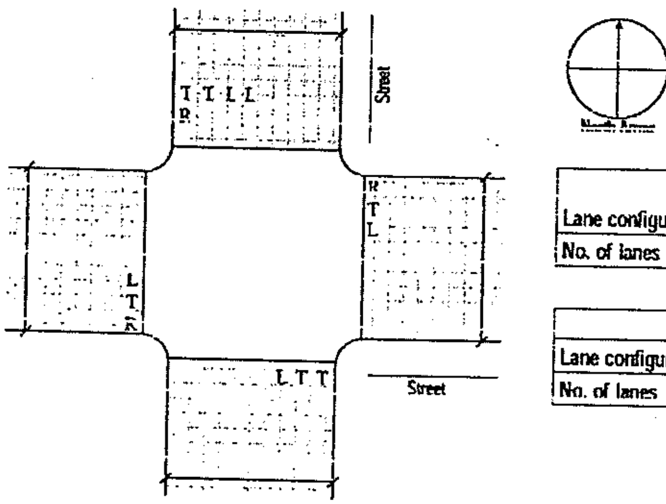
Notes

1. $RS = 1710(PHF)(f_a)$, where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

General Information		Site Information	
Analyst	RWH	Jurisdiction/Date	IMP. CO. 12/8/01
Agency or Company	DRA	Intersection	HEBER ROAD HIWAY 111
Analysis Period/Year	AM PEAK 2010	Area Type	☐ CBD ☑ Other
Comment	E/W LT LANE, NB RT LANE, 2ND SB LT		

Intersection Geometry



	EB			WB		
Lane configuration	L	T	R	L	T	R
No. of lanes	1	1	1	1	1	1

	NB			SB		
Lane configuration	L	T		L	TR	
No. of lanes	1	2		2	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	13	243	67	190	179	200	52	968	264	233	667	16
Proportion of LT or RT (P_{LT} or P_{RT})[2]	0	-	0	0	-	0	0	-	0	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description E/W LT LANE, NB RT LANE, 2ND SB LT

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	243		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	55	72	484
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \sum CV$	854
Lost time/cycle, L (s) $L = \sum t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$ $C_{min} \le C \le C_{max}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.678
Intersection status (Exhibit A10-9)	UNDER CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	17.7		

North-South Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	7.1	4	31.2

Control Delay and LOS

	EB			WB			NB		SB	
Lane group	L	T	R	L	T	R	L	T	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	14	264	73	207	195	217	57	1052	253	725
Green ratio, g/C	0	.228	.228	0	.228	.228	.051	.454	.119	.521
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	1573	1573	1573	1573	1573	1573	3146	3146	3146
v/c ratio, X $X = \frac{V/s}{g/C}$		.737	.203		.543	.607	.7	.737	.678	.442
Lane group capacity, c (veh/h) $c = \frac{V}{X}$		358	358		358	358	81	1427	373	1639
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)		21.5	18.8		20.4	20.8	28	13.5	25.3	8.9
Incremental delay, d_2 (s/veh) (Equation 16-12)		12.7	1.3		5.8	7.4	40.2	3.4	9.5	.9
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)		34.2	20		26.2	28.2	68.2	16.9	34.9	9.8
LOS by lane group		C	B		C	C	E	B	C	A
Delay by approach, d_A (s/veh) $\frac{\sum(d)(V)}{\sum V}$	31.2			27.3			19.5		16.3	
LOS by approach	C			C			B		B	
Intersection delay, d_I (s/veh) $d_I = \frac{\sum(d_A)(V_A)}{\sum V_A}$	20.5			Intersection LOS (Exhibit 16-2)					C	

Notes

1. RS = 1710(PHF)(f_a), where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

CHAPER 16 - SIGNAL PLANNING INPUT WORKSHEET

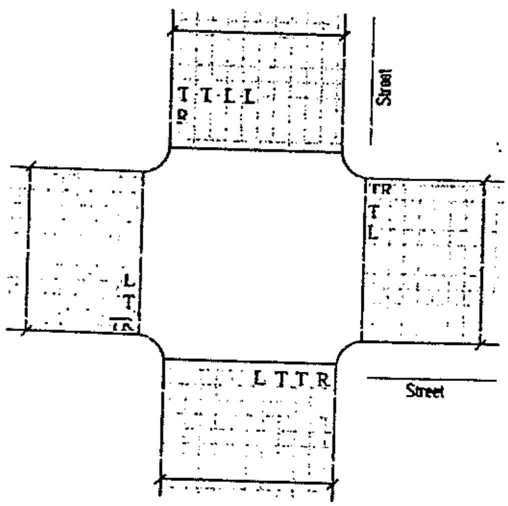
General Information

Analyst	RWH
Agency or Company	DRA
Analysis Period/Year	PM PEAK 2010
Comment	ADD SB LT, EB & WB T & LT, NB RT

Site Information

Jurisdiction/Date	IMP. CO. 12/19/01
Intersection	HEBER ROAD HIWAY 111
Area Type	☐ CBD ☑ Other

Intersection Geometry



	EB			WB		
Lane configuration	L	TR		L	TR	
No. of lanes	1	2		1	2	

	NB			SB		
Lane configuration	L	T	R	L	TR	
No. of lanes	1	2	1	2	2	

Volume and Signal Input

	EB			WB			NB			SB		
	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]	LT	TH	RT[1]
Volume, V (veh/h)	19	393	88	470	397	392	71	790	461	401	1336	16
Proportion of LT or RT (P_{LT} or P_{RT})[2]	0	-	100	0	-	100	0	-	0	0	-	100
Parking (Yes/No)	N			N			N			N		
Left-turn treatment (permitted, protected, not opposed) (if known)	1			1			2			2		

Peak-hour factor, PHF .92

Cycle length Minimum, C_{min} 60 s Maximum, C_{max} 150 s Lost time/phase 4 s

Notes

1. RT volumes, as shown, exclude RTOR.
2. P_{LT} = 1.000 for exclusive left-turn lanes, and P_{RT} = 1.000 for exclusive right-turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group.

CHAPTER 16 - SIGNAL PLANNING CONTROL DELAY AND LOS WORKSHEET

General Information

Description ADD SB LT, EB & WB T & LT, NB RT

East-West Phasing Plan

Selected plan (Exhibit A10-8) 1	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	EWT		
Critical phase volume, CV (veh/h)	429		
Lost time/phase, t_L (s)	4		

North-South Phasing Plan

Selected plan (Exhibit A10-8) 3b	Phase No. 1	Phase No. 2	Phase No. 3
Movement codes	NSL	SLT	NST
Critical phase volume, CV (veh/h)	75	143	542
Lost time/phase, t_L (s)	4	0	4

Intersection Status Computation

Critical sum, CS (veh/h) $CS = \Sigma CV$	1189
Lost time/cycle, L (s) $L = \Sigma t_L$	12
Reference sum flow rate RS (veh/h)[1]	1573
Cycle length, C (s) $C_{min} \le C \le C_{max}$ $C = \frac{L}{1 - \left[\frac{\min(CS, RS)}{RS}\right]}$	60
Critical v/c ratio, X_{cm} $X_{cm} = \frac{CS}{RS\left(1 - \frac{L}{C}\right)}$	.945
Intersection status (Exhibit A10-9)	NEAR CAPACITY

Green Time Calculation

East-West Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	21.3		

North-South Phasing	Phase No. 1	Phase No. 2	Phase No. 3
Green time, g (s) $g = \left[(C - L)\left(\frac{CV}{CS}\right) + t_L\right]$	7	5.8	25.9

Control Delay and LOS

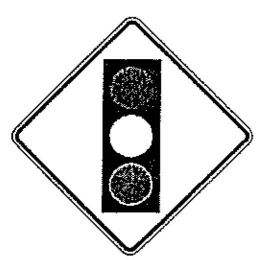
	EB		WB		NB			SB	
Lane group	L	TR	L	TR	L	T	R	L	TR
Lane group adjusted volume from lane volume worksheet, V (veh/h)	21	427	511	434	77	859	501	436	1452
Green ratio, g/C	0	.289	0	.289	.05	.365	.365	.147	.461
Lane group saturation flow rate, s (veh/h) s = RS * number of lanes in lane group	1573	3146	1573	3146	1573	3146	1573	3146	3146
v/c ratio, X $X = \frac{V/s}{g/C}$		.471		.478	.976	.748	.873	.945	1.001
Lane group capacity, c (veh/h) $c = \frac{V}{X}$		908		908	79	1148	574	461	1451
Progression adjustment factor, PF (Exhibit 16-12)	1	1	1	1	1	1	1	1	1
Uniform delay, d_1 (s/veh) (Equation 16-11)		17.6		17.6	28.5	16.6	17.8	25.4	16.2
Incremental delay, d_2 (s/veh) (Equation 16-12)		1.7		1.8	94.7	4.5	16.7	30.2	23.8
Initial queue delay, d_3 (s/veh) (Appendix F, Ch. 16)	0	0	0	0	0	0	0	0	0
Delay, $d = d_1(PF) + d_2 + d_3$ (s/veh)		19.3		19.4	123.1	21.1	34.5	55.6	40
LOS by lane group		B		B	F	C	C	E	D
Delay by approach, d_A (s/veh) $\frac{\Sigma(d)(V)}{\Sigma V}$	19.3		19.4		31.3			43.6	
LOS by approach	B		B		C			D	
Intersection delay, d_I (s/veh) $d_I = \frac{\Sigma(d_A)(V_A)}{\Sigma V_A}$	31.4		Intersection LOS (Exhibit 16-2)					C	

Notes

1. RS = 1710(PHF)(f_a), where f_a is area adjustment factor (0.90 for CBD and 1.0 for all others).

APPENDIX C

LEVEL OF SERVICE CRITERIA



LEVEL OF SERVICE CRITERIA
LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

Level of Service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, level of service criteria is stated in terms of the average stopped delay per vehicle for a 15 minute analysis period. The criteria are given in the table below.

Level of Service	Stopped Delay per Vehicle (sec)
A	≤ 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	> 60.0

Delay is dependent on a number of variables, including the quality of progression, cycle length, the green ratio, and the volume to capacity ratio for the lane group or approach in question.

Level of Service A, describes operations with very low delay. Average delays are less than 5.0 seconds per vehicle and most vehicles do not stop at all. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Short cycle lengths may also contribute to low delay.

Level of Service B, describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This condition occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level of Service C, describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of Service D, describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level of Service E, describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. The high delay values generally indicate poor progression, long cycle lengths and high volume to capacity ratios. Individual cycle failures are frequent occurrences.

Level of Service F, describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation and high volume to capacity ratios. There are many individual cycle failures in this level. Poor progression and long cycle lengths may also be major contributing causes of the delays.

Source: *Highway Capacity Manual, Special Report No. 209,* published by the Transportation Research Board, National Research Council, Washington, D.C., 1985, pages 9-4 and 9-5.

LEVEL OF SERVICE CRITERIA
LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS

It is not possible to directly compare an unsignalized intersection level of service with a signalized intersection level of service. Level of service criteria for unsignalized intersections is related to general delay ranges. The criteria are given in the table on the following below.

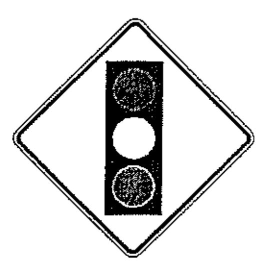
Level of Capacity Service	Average Total Delay(Sec/Veh)	Qualitative Description
A	≤5	Little or no delays
B	>5 and ≤10	Short traffic delays
C	>10 and ≤20	Average traffic delays
D	>20 and ≤30	Long traffic delays
E	>30 and ≤45	Very long traffic delays
F	>45	*

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvements to the intersection.

Source: *Highway Capacity Manual, Special Report No. 209,* published by the Transportation Research Board, National Research Council, Washington, D.C., 1994, Table 10-3, page 10-12.

APPENDIX D

CORRESPONDENCE



Kevin A. Dahl, P.E., R.L.S.
Christopher D. Robins, P.E.
Juan N. Lomeli', R.L.S.
Douglas J. Nicholls, P.E.

DAHL, ROBINS & ASSOCIATES, INC.

CIVIL ENGINEERING ■ SURVEYING ■ TRAFFIC

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April 15, 2002

Development Design Engineering, LLC
1122 State Street, Suite D
El Centro, CA 92243

Attention: Mr. Tom Dubose, Manager

Reference: Imperial Center Traffic Impact Study

Dear Mr. Dubose:

We have reviewed the comments to the Imperial Center Traffic Impact Study provided by Bill Figge of the California Department of Transportation. The following is our response to his comments:

- **A 2020 Traffic Impact Study should be completed and include any future development planned in the area so that traffic impacts to the state system and surrounding facilities can be determined. The report currently shows projections through build out at 2010, and does not include any planned development in the area that may also impact SR-111 and State Route (SR-86). The analysis should also include future AM and PM peak period traffic and its impact to highway facilities.**

Traffic volumes have been inflated to estimate 2020 conditions. Level Of Service analyses are attached for this time period (Tables 8 & 9). In talking with Imperial County officials, there is currently no planned development near this location. As a result, no attempt was made to assume what future uses might be in place near the Imperial Center in 2020. Any future traffic studies in this area will need to take into account the Imperial Center traffic and make the appropriate adjustments.

- **The Traffic Study indicates that there are several phases (Phase I - Phase V) to this project. Each phase of the project needs to be outlined in detail, with impacts to SR-111 and SR-86 for each phase.**

The estimated phasing and timing of the development was described in Section II.B.4 of the report. Beginning in 2002, it is anticipated that a new phase will be completed every two years. The first phase will consist of the truck stop and gas station/convenience mart, along with ancillary uses. The second phase, in 2004, will include a hotel. The third phase, estimated in 2006, would comprise half of the outlots on the property. Phase IV, in 2008, would be the other half of the outlots. Potential uses on the outlots would include banks, a video store, restaurants and strip center type uses. The final phase in 2010, would include the outlet mall and theater. The traffic generated by each phase is noted in Table 2. Table 5 shows the impacts on the surrounding roads. Blank columns indicate no significant changes between the previous phase.

- **Heber Road and SR-111 - As noted on page 30 and 31 of the report, any additional widening of Heber Road, southbound left turn lanes and northbound right turn lane will be required by build out. Mitigation and fair share must be included for these items.**
- **McCabe and SR-111 - As noted on page 30 of the report, any additional improvements such as restriping or reconfiguration of the intersection to accommodate a left turn lane and combine through/right turn lane will require mitigation and a fair share contribution.**

These are acknowledged.

- **The circulation plans for truck delivery access should be included in the traffic study.**

For the purposes of this study, it was assumed that most of the delivery truck traffic would use the easternmost access off of Heber Road. Some delivery traffic was also assigned to the driveway to the west of that. Additional delivery traffic would be expected to use Correll Road and the easternmost driveway from the project site.

- **The Transportation Concept Report shows that SR-111 may be widened in the future. The developer should realize that this might require additional Right of Way in the vicinity of the developers proposed project.**

This is acknowledged.

The comment letter also asked for additional detail regarding the transportation facilities that might serve the development, including Yourman Road, right-of-way lines and pedestrian traffic areas. DDE would need to provide details on these items.

There were also two additional comments regarding accident data. This data has been requested from CalTrans on multiple occasions and still has not been received. Once we have obtained that data, we will process our response to those comments.

Sincerely,
DAHL, ROBINS & ASSOCIATES, INC.

FOR RANDY HOCKINS

Randy Hoskins

TABLE 8
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	2020	
		AM	PM
Yourman Rd & Jasper Rd	NBLT	A	B
	SBLT	A	B
	EB	A	A
	WB	A	A
Heber Rd & Bowker Rd	NBLT	C	D
	SBLT	B	B
	EB	A	A
	WB	A	A
McCabe Rd & Bowker Rd	NB	B	B
	SB	B	B
	EBLT	A	A
	WBLT	A	A
Jasper Rd & Bowker Rd	NBLT	B	B
	SBLT	B	B
	EB	A	A
	WB	A	A
Heber Rd & West Dr.	SB	B	D
	EBLT	A	A
Heber Rd & East Dr.	SB	B	C
	EBLT	A	A

Kevin A. Dahl, P.E., R.L.S.
Christopher D. Robins, P.E.
Juan N. Lomelí, R.L.S.
Douglas J. Nicholls, P.E.

DAHL, ROBINS & ASSOCIATES, INC.

CIVIL ENGINEERING ■ SURVEYING ■ TRAFFIC

1560 South 5th Avenue
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July 1, 2002

Development Design Engineering, LLC
1122 State Street, Suite D
El Centro, CA 92243

Attention: Mr. Tom Dubose, Manager

Reference: Imperial Center Traffic Impact Study

Dear Mr. Dubose:

We have reviewed the comments on the Imperial Center Traffic Impact Study provided by Bill Figge of the California Department of Transportation dated May 29, 2002. The following are our replies to his comments:

- **The Traffic Study indicates that there are several phases (Phase I - Phase V) to this project. Each phase of the project needs to be outlined in detail, with impacts to State Route 111 (SR-111) and State Route 86 (SR-86) for each project. The response by Dahl Robins does not adequately answer this question. Section II.B.4 of the latest Preliminary Traffic Impact Study on pages 6 and 7 only outlines years that buildings will come online, it does not address "Impacts" to SR-111 and SR-86 by phase as requested. Impacts are changes in Traffic Volumes, mitigated changes to the state highway system etc. as a result of planned project.**

The estimated phasing and timing of the development was described in Section II.B.4 of the report. The traffic generated by each phase is noted in Table 2, with Figures 6-10 showing resulting peak hour traffic volumes. Tables 5-7 show the impacts on the Level Of Service of surrounding roads for each phase of the project. Tables 8 & 9 show ultimate service levels in the year 2020. Any needed improvements for mitigating the intersections are outlined in Section VII.A, and it is noted at which phase the improvements will need to be completed.

- **A review of collision history at all impacted locations with SR-111 should be completed and mitigation provided to any increase in collision history as a**

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Fax History Report for
Dahl, Robins & Assoc
520-819-0826
May 20 2002 10:07am

Last Fax

Date	Time	Type	Identification	Duration	Pages	Result
May 20	9:58am	Sent	17603526408	0:55	2	OK

Result:
OK - black and white fax
OK color - color fax

occurring at this intersection is the rear end collision. In order to decrease the frequency of these types of accidents, it is recommended some form of advance flasher be installed notifying motorists when the light is expected to turn red for their approach. Since this intersection is already experiencing 5 of these types of crashes per year, this would be a good mitigation measure to implement immediately, independent of any development at this site.

At the Jasper Road and SR-111 intersection, there are currently about 4 accidents per year. Based on the increased volume, that number could be expected to increase to 7 per year by 2020. The number of accidents correctable by signal installation would be five. This was the only intersection that would warrant a signal based on accidents (in 2010). Since it also meets volume warrants, a signal was previously recommended for this location. The angle accidents are the primary type of crashes occurring, so no other mitigation is expected to be needed.

At the McCabe Road and SR-111 intersection, there are currently about 2 accidents per year. Based on the increased volume, that number could be expected to increase to 3 per year by 2020. The number of accidents correctable by signal installation would be three. The proposal to install a signal at this location when volume warrants are met should adequately mitigate the majority of the accidents occurring here.

At the Heber Road and Dogwood Road intersection, there is currently an average of 1 accident per year. Based on the increased volume, that number could be expected to increase to 2 per year by 2020. None of the accidents are correctable by signal installation. This minimal increase in the number of accidents does not suggest mitigation would be necessary.

Sincerely,
DAHL, ROBINS & ASSOCIATES, INC.

FOR RANDY HOSKINS

Randy Hoskins

Kevin A. Dahl, P.E., R.L.S.
Christopher D. Robins, P.E.
Juan N. Lomelí, R.L.S.
Douglas J. Nicholls, P.E.

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May 20, 2002

Development Design Engineering, LLC
1122 State Street, Suite D
El Centro, CA 92243

Attention: Mr. Tom Dubose, Manager

Reference: Imperial Center Traffic Impact Study

Dear Mr. Dubose:

We have received the accident data from the California Department of Transportation to provide a response to Bill Figge's comments on the Imperial Center Traffic Impact Study. The following are our replies to his comments:

- **A review of collision history at all impacted locations with SR-111 should be included and mitigation provided to any increase in collision history as a result of increased volumes from this project. Impacted locations would include Jasper Road and SR-111, McCabe Road and SR-111, Heber Road and SR-111 and Dogwood Road and Heber/SR-86.**

- **All proposed signals on SR-111 or to be coordinated with SR-111 should be analyzed to meet not only volume warrants, but also collision history warrants, and mitigated as necessary.**

The existing accident rate for each intersection was determined using the 1998-2001 data provided by CalTrans. By making the gross assumption this rate would stay constant as traffic volumes increased, the numbers of accidents were projected in to the future years.

At the Heber Road and SR-111 intersection, there are currently about 7 accidents per year. Based on the increased volume, that number could be expected to increase to 15 per year by 2020. The number of accidents correctable by signal installation would be four (realizing signals are already in place at this location). The primary type of accident

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Apr 15	12:41pm	Sent	17603526408	1:24	5	OK

Result:
OK - black and white fax
OK color - color fax

TABLE 9
SIGNALIZED INTERSECTION LEVEL OF SERVICE IMPACT

Intersection	Mvmt	Jasper & Hwy 111	Heber & Yourman	McCabe & Hwy 111	Heber & Hwy 111	Heber & Dogwood
2020	SB	C/C	C/C	C/C	D/B	C/B
	WB	D/F	E/C	C/C	C/C	C/B
	NB	A/B	B/C	A/A	C/D	B/C
	EB	A/D	B/C	A/C	B/C	C/D
	INT	A/C	C/C	A/B	C/C	C/C

result of increased volumes from this project. Impacted locations would include Jasper Road and SR-111, McCabe Road and SR-111, Heber Road and SR-111, and Dogwood Road and Heber/SR-86.

As outlined in section V.B of the report, the existing accident rate for each intersection was determined using the 1998-2001 data provided by CalTrans. By making the gross assumption this rate would stay constant as traffic volumes increased, the numbers of accidents were projected in to the future years.

At the Heber Road and SR-111 intersection, there are currently about 7 accidents per year. Based on the increased volume, that number could be expected to increase to 15 per year by 2020. The number of accidents correctable by signal installation would be four (realizing signals are already in place at this location). The primary type of accident occurring at this intersection is the rear end collision. In order to decrease the frequency of these types of accidents, it is recommended some form of advance flasher be installed notifying motorists when the light is expected to turn red for their approach. Since this intersection is already experiencing 5 of these types of crashes per year, this would be a good mitigation measure to implement immediately, independent of any development at this site.

At the Jasper Road and SR-111 intersection, there are currently about 4 accidents per year. Based on the increased volume, that number could be expected to increase to 7 per year by 2020. The number of accidents correctable by signal installation would be five. This was the only intersection that would warrant a signal based on accidents (in 2010). Since it also meets volume warrants, a signal was previously recommended for this location. The angle accidents are the primary type of crashes occurring, so no other mitigation is expected to be needed.

At the McCabe Road and SR-111 intersection, there are currently about 2 accidents per year. Based on the increased volume, that number could be expected to increase to 3 per year by 2020. The number of accidents correctable by signal installation would be three. The proposal to install a signal at this location when volume warrants are met should adequately mitigate the majority of the accidents occurring here.

At the Heber Road and Dogwood Road intersection, there is currently an average of 1 accident per year. Based on the increased volume, that number could be expected to increase to 2 per year by 2020. None of the accidents are correctable by signal installation. This minimal increase in the number of accidents does not suggest mitigation would be necessary.

Sincerely,
DAHL, ROBINS & ASSOCIATES, INC.

Randy Hoskins

01104corr.wpd

LINSCOTT LAW & GREENSPAN engineers

TRAFFIC IMPACT ANALYSIS ADDENDUM

IMPERIAL CENTER

Imperial County, California
March 28, 2005
Revised March 21, 2006

Prepared for:

Development, Design Engineering
1122 State Street, Suite D
El Centro, California 92243

LLG Ref. 3-04-1371

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TRAFFIC IMPACT ANALYSIS ADDENDUM

IMPERIAL CENTER

Imperial County, California
March 28, 2005
Revised March 21, 2006

1.0 INTRODUCTION

Linscott, Law & Greenspan Engineers (LLG) has been retained to prepare this traffic study addendum to update the traffic impact analysis conducted by Dahl Robbins and Associates (DRA) in January 2002. The proposed Imperial Center project is located in Imperial County, on the northeast corner of SR 111 and Heber Road. The DRA study is included in ***Appendix A***. The proposed project consists of a 611,000 square foot retail complex, 110,000 square feet of plaza / auction / exhibit space as well as a 37,000 square foot gas station and convenience store, and a hotel. Proposed access to / from the site is via SR 111 to Yourman Road and Abatti Road. The project site is currently farmland. The project area and the site location map can be found in the DRA study. The site plan is shown in ***Figure 1–1***.

2.0 EXISTING CONDITIONS

2.1 Study Area

The existing street descriptions and detailed discussion of the site location can be found in the DRA study (*Appendix A*). ***Figure 2–1*** in this addendum illustrates the existing conditions, including lane geometry and control types, for the key intersections in the study area.

2.2 Existing Traffic Volumes

The majority of the existing traffic volumes for this addendum were commissioned by LLG in March 2005 and thus are an update of the existing counts used in the Dahl, Robbins & Associates study. The 2005 intersection counts accompany DRA report in *Appendix A*. The existing traffic volumes for the intersections of SR 111 / McCabe Road, SR 111 / Jasper Road, and Yourman Road / Jasper Road are, however, taken from the DRA study. These counts were commissioned in 2002 and an 8% growth factor was applied to the volumes. Currently, the McCabe and Jasper Road intersections with SR 111 have been partially closed and therefore, it was not possible to conduct 2005 counts. According to CALTRANS, these intersections will be re-opened once traffic signals have been installed. The Yourman Road / Jasper Road intersection is directly affected by the SR 111 / Jasper Road intersection closure. Traffic on the west leg of the Yourman Road / Jasper Road intersection is not permitted from the SR 111 / Jasper Road intersection. ***Figure 2–2*** depicts the existing baseline volumes.

3.0 TRIP GENERATION, DISTRIBUTION & ASSIGNMENT

3.1 Trip Generation

The *ITE Trip Generation Manual* (7th Edition) was used to determine the traffic generated for the project. Project trips were calculated using the fitted curve equations and the assigned rates for each of the time periods analyzed. ***Appendix B*** contains copies of the ITE Trip Generation Equations. ***Table 3–1*** shows the trip generation estimates for the project.

It is necessary to highlight two aspects of the trip generation table for greater clarity.

1.) Four components of the proposed project (wholesale outlet, food court, multiplex cinema, independent pads) are grouped together for the purposes of calculating the trip generation. These components, totaling 611,000 square feet operate as a shopping center in that customers make one trip to complete several tasks in several stores in the same location rather than making several trips to different locations to complete the same tasks. The individual components of the shopping center are shown in the table for informational purposes.

2.) The plaza / auction / exhibit space is not included in the shopping center calculations because this use is not expected to generate traffic consistently or regularly. The space is intended for special events that are assumed to occur primarily on weekends; on most days, this space would not generate any traffic.

The proposed project is calculated to generate 26,370 ADT, with 433 inbound and 310 outbound trips during the AM peak hour, and 1,175 inbound and 1,251 outbound trips during the PM peak hour.

TABLE 3–1
PROJECT TRIP GENERATION SUMMARY

Land Use	Size	Daily Trip Ends		AM Peak Hour Trips				PM Peak Hour Trips			
		Rate	ADT	Rate	In:Out Split	Volume		Rate	In:Out Split	Volume	
						In	Out			In	Out
Convenience Market with a Filling Station	37,000 sf	162.78[a]	2,930	10.06[a]	50:50	91	91	13.38[a]	50:50	120	120
Hotel with Restaurant	200 Rooms	8.17[b]	1,420	0.56[c]	61:39	59	38	0.59[d]	53:47	63	56
Shopping Center:	611, 000 sf	[e]	22,020	[f]	61:39	283	181	[g]	48:52	992	1,075
Wholesale Outlet	460,000 sf	—	16,520	—	61:39	212	136	—	48:52	744	806
Food Court	13,000 sf	—	440	—	61:39	6	4	—	48:52	20	22
Multiplex Cinema	83,000 sf	—	3,080	—	61:39	40	25	—	48:52	139	150
Independent Pads	55,000 sf	—	1,980	—	61:39	25	16	—	48:52	89	97
Plaza / Auction Court [h]	95,000 sf	—	—	—	—	—	—	—	—	—	—
Information / Exhibit / Auction Center [h]	15,000 sf	—	—	—	—	—	—	—	—	—	—
Totals:		**–**	**26,370**	**–**	**–**	**433**	**310**	**–**	**–**	**1,175**	**1,251**

General Notes:
Source: ITE Trip Generation Manual, 7th Edition.
Average Daily Trips (ADT) rounded to nearest 10.

Footnotes:
a. Rate is a trip-end per fueling position. Rate used because an equation is not available. Eighteen fueling positions are assumed for trip generation calculation purposes.
b. Rate is a trip-end per room (200 rooms assumed) and includes the hotel restaurant traffic. ITE Equation: T=8.95(x) – 373.16, x – number of rooms.
c. ITE Equation: Ln(T) = 1.24(x) –2.00
d. Rate used because an equation is not available.
e. Rate is a trip-end per thousand square feet. ITE Equation: Ln(T) = 0.65 Ln(x) + 5.83, x – 1,000 square feet gross leasable space
f. ITE Equation: Ln(T) = 0.60 Ln(x) + 2.29
g. ITE Equation: Ln(T) = 0.66 Ln(x) + 3.40
h. Given that the plaza / auction / exhibit space will not be used on a daily or consistent basis, and considering that the space is intended primarily for special events, these uses were assumed not to contribute to the trip generation of the site.

3.2 Trip Distribution & Assignment

The project traffic was distributed and assigned to the street system based on the project's access, its proximity to State Highways and arterials, the locations of potential retail and business zones, and the project's proximity to the U.S. / Mexico International Border. The DRA study project trip distribution was also considered in the update of this distribution.

Figure 3–1 shows the regional trip distribution in the project area, and ***Figure 3–2*** shows the project traffic volumes. ***Figure 3–3*** combines the existing + project traffic volumes.

4.0 NEAR-TERM CUMULATIVE PROJECTS

There are other planned projects in the adjacent area, which will add traffic to the roadways surrounding the project. Based on a review of other approved or nearly approved near-term projects in the area, it was determined that 32 specific cumulative development projects in the vicinity of the study area should be included in the near-term analysis. The following is a brief description of these near-term cumulative projects.

4.1 Description of Projects

Linda Vista Mixed Use The proposed project consists of developing 182 single-family dwelling units along with a 6-acre commercial lot. The project site is currently undeveloped agricultural land. Based on the trip generation calculations, the total project is calculated to generate 7,175 ADT, with 109 inbound and 143 outbound trips during the AM peak hour, and 349 inbound and 327 outbound trips during the PM peak hour. The traffic study for this project was prepared by Linscott, Law & Greenspan, Engineers (LLG) (August 2004).

Desert Village Mixed Use The proposed project consists of developing 95 single-family residential homes along with 260 apartment units and 7.3 acres of commercial space. The project site is currently undeveloped agricultural land. Based on the trip generation calculations, the total project is calculated to generate 8,740 ADT, with 129 inbound and 202 outbound trips during the AM peak hour, and 431 inbound and 387 outbound trips during the PM peak hour. The traffic study for this project was prepared by LLG (February 2005).

Countryside Estates The proposed project consists of developing a 152-unit residential subdivision on 39.80 acres. The project site is currently undeveloped agricultural land. Based on the trip generation calculations, the total project is calculated to generate 1,530 ADT, with 29 inbound and 87 outbound trips during the AM peak hour, and 98 inbound and 58 outbound trips during the PM peak hour. The traffic study for this project was prepared by LLG (November 2004).

Venezia Planned Community The proposed project consists of developing approximately 250 single-family units and 135,100 square feet of commercial space. The project is located southeast of SR 98, east of Bowker Road and south of the All American Canal. The traffic study for this project was prepared by LLG (March 2005).

The McCabe Ranch is a proposed 428-unit detached home development located south of I-8 Freeway and west of Dogwood Road. The project is calculated to generate 3,550 ADT. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (July 2002).

The Correll Road Elementary School is a proposed 600 student K-6 grade school. The school is proposed to be located north of Correll Road, east of Dogwood Road and south of McCabe Road. The project traffic was manually calculated using *ITE Trip Generation Handbook, 6th Ed.* The project is calculated to generate 620 ADT, with 105 inbound and 75 outbound trips during the AM peak hour, and 75 inbound and 85 outbound trips during the PM peak hour.

The Imperial Valley Mall (Phase I and II) development proposes the construction of a 1,460,000 square-foot regional indoor shopping center mall with a small amount of residential units. The site is to be located on approximately 160 acres of existing farmland. The project proposes to be developed in two phases. The total project is calculated to generate 47,300 ADT. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (April 17, 2003).

The Calexico International Center (Phase I) proposes the development of a hotel, restaurant, Gasoline Station / Food Mart and RV Park. The project is located at the southwest corner of the Jasper Road / Scaroni Road intersection in the City of Calexico. The project is calculated to generate 5,130 ADT, with 45 inbound and 39 outbound trips during the AM peak hour, and 225 inbound and 195 outbound trips during the PM peak hour. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (April, 2000).

The Calexico Wal-Mart project proposes to redevelop the existing Wal-Mart site to provide a 203,007 square-foot "Super" Wal-Mart, as well as retail, restaurant (fast-food) and gasoline sale uses on several adjacent out-parcels. The site is located on the east side of Yourman Road, north of Cole Road in the City of Calexico. The net (or new) project traffic is calculated by subtracting the existing site traffic from the proposed project traffic. The net project generates 1,960 ADT, with 2 inbound and 78 outbound trips during the AM peak hour, and 59 inbound and 98 outbound trips during the PM peak hour. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (September 24, 2003).

Buena Vista Park is a proposed 465-unit detached home development located south of I-8 Freeway and west of Clark Road. The project is calculated to generate 4,450 ADT. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (April, 2001).

Desert Estates / Wildflower / Santa Rosa is a proposed 325-unit detached home development bound to the north by Main Street, to the south by Ross Avenue, the west by Austin Road / Central Main Canal and the east by the Lotus Drain. The project is calculated to generate about 3,110 average daily trips (1,555 inbound / 1,555 outbound) with 60 inbound trips and 180 outbound trips during the AM peak hour and 210 inbound/115 outbound trips during the PM peak hour. This project has been approved by the City of El Centro. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (June, 2000).

Heber Meadows proposes development of a single-family residential subdivision consisting of 219 dwelling units. In addition to the single-family residential subdivision, the project proposes to construct a 336-unit apartment complex directly north of the single-family residential subdivision. The site is located on the southwest corner of the future Correll Road / Pitzer Road intersection. It is calculated that the proposed project will generate 6,370 ADT, with 87 inbound and 304 outbound trips during the AM peak hour, and 325 inbound and 175 outbound trips during the PM peak hour. Trip generation, distribution, and assignment data were obtained from a traffic study prepared by LLG (October, 2003).

Countryside is a proposed 330-unit detached home development located south of I-8 Freeway and east of SR 86. The project will generate 3,300 ADT, with 53 inbound and 211 outbound trips during the AM peak hour, and 231 inbound and 99 outbound trips during the PM peak hour.

The Imperial Valley Commons project consists of a Conditional Use Permit to allow development of a commercial retail center. The proposed project consists of the development of approximately 700,000 square feet of commercial retail space divided into individual retail stores varying in size from approximately 4,000 square feet to approximately 196,000 square feet. An application for the project has been submitted to the City of El Centro and an EIR is currently being prepared.

Anderson/Waterford is a proposed project involving a 1300-acre mixed-use development located south of I-8 to McCabe Road and from Alder Canal/Heber Drain east to Highway 111. The initial phases of the multi-year buildout project in this report includes the near-term analysis.

Imperial Plaza consists of the proposed development of 31.88 acres into 341,516 square feet of General Commercial development. The project site is located 330 feet east of Imperial Avenue (SR 86), between the Central Drain and North 12th Street (extended). It is calculated that the proposed project will generate a total of 15,088 ADT primary trips, with 677 inbound/733 outbound trips during the PM peak hour. An application for this project has been submitted to the City and a Mitigated Negative Declaration (MND) is currently out for public review.

Rosswood is a proposed project developing 40 acres into 152 single-family units, south of Ross Road, about ½ mile east of Dogwood. The project requires an annexation and Change of Zone.

Willowbend is a 38.46-acre project proposing 122 single-family units and a park, north of McCabe Road, east of 8th Street and west of Highway 86.

Citrus Grove is a proposed project involving the residential development of approximately 50 acres of land east of SR 86 and north of McCabe Road.

Wake Avenue Auto Park is an approved commercial development project covering 34.62 net acres consisting of an auto dealership, strip commercial, and an apartment complex. The site is located on the east side of Clark Road, just south of I-8, in Imperial County. It is calculated that this approved project will generate 11,040 ADT, with 215 inbound and 227 outbound trips during the AM peak hour, and 505 inbound and 435 outbound trips during the PM peak hour.

Farmer Estates is a proposed 190-unit detached residential development located south of I-8 Freeway and east of La Brucherie Ave. Based on discussions with the Farmer Estates staff, the project is currently in its final phase of construction. Therefore, the trip generation was calculated based on 89 dwelling units. It is calculated that the proposed project will generate 934 ADT, with 18 inbound and 61 outbound trips during the AM peak hour, and 61 inbound and 36 outbound trips during the PM peak hour.

Lotus Ranch is a proposed development involving 616 single-family homes and a 600-student elementary school. The site is located south of Interstate 8 (I-8) along the west side of La Brucherie Road in the County of Imperial. The project site is proposed for annexation by the City of El Centro. The total project is calculated to generate 5,830 ADT, with 163 inbound and 366 outbound trips during the AM peak hour, and 369 inbound and 236 outbound trips during the PM peak hour.

Miller Burson is a proposed project involving 599 residential units and a park site, north of I-8, south of Ross Road, and east of Austin Road. The project requires an Annexation and Change of Zone.

Lerno-Verhaegen (Las Aldeas) Specific Plan is a proposed mixed-use development of approximately 2,708 dwelling units. The project consists of 680 acres on the west side of the City of El Centro. The project includes a zone change, Tentative Map, an amendment of the City's General Plan and an annexation. The total project is calculated to generate 41,553 ADT, 2,860 AM peak hour trips, and 4,227 PM peak hour trips. Trip generation/distribution/assignment data were obtained from a traffic study currently being prepared by LLG.

Kline Property is a proposed project involving 447 single-family units and a school on 10.14 acres, park on 9.23 acres. The project site is bounded on the east by Fourth St (SR86), south by Mccabe Road, north by a fallow agricultural field and west by Date Drain No. 3 D and Clark Road.

Las Ventanas Development is a proposed project involving 879 single-family lots, 454 multi-family units, a 6.3 acres school area, and 28.6 acres of retail/commercial area. The project site is located in Calexico.

Los Lagos Development is a proposed project involving 1,109 single-family lots, 776 multi-family units, a 6.3 acres school area, and 24.0 acres of retail/commercial area. The project site is located in Calexico.

Rancho Diamante Development is a proposed project involving 2,560 single-family lots, 1,729 multi-family units, a 62.6 acres school area, and 22.0 acres of retail/commercial area. The project site is located in Calexico.

Estrella is a proposed project involving subdivision of existing farmland into single-family units and multi family attached units with developments of school and park. The project site is bounded on the east by Meadow Road between Jasper Road and Meadow Road and southeast corner of the Alder Canal and Central Main Canal and north by a Jasper Road.

Courtyard Villas is a proposed project involving 54 single-family units and a park on 21.5 acres, east of Austin Road and south of Orange Avenue.

El Centro Wal-Mart is an approved project to develop a retail supercenter consisting of approximately 203,007 square feet and is bounded by Waterman Avenue to the east, La Brucherie Road to the west, and Bradshaw Road to the south. There is also 47,000 square feet of outparcel buildings that will consist of 3,500 square feet fast food restaurant and 43,500 square feet general office.

The Plaza at Imperial is a proposed project involving 350,102 square feet of commercial / retail space divided into individual retail stores varying in size. The project is located in the southeastern portion of the City of El Centro south of Interstate 8 (I-8), north of Danenberg Drive, and east of Dogwood Avenue.

Figure 4–1 depicts the total cumulative project traffic volumes in the area. ***Figure 4–2*** shows the existing + project + cumulative project traffic volumes for the vicinity.

5.0 ANALYSIS OF NEAR-TERM SCENARIOS

Appendix C contains the intersection level of service analysis worksheets as well as those for the Intersection Lane Volumes (ILV) analysis. ***Appendix D*** contains the data and calculation sheets for the freeway mainline analysis.

5.1 Existing

5.1.1 *Intersection Operations*

Table 5–1 shows that all of the existing intersections operate at a level of service (LOS) D or better except for the following:

- Jasper Road / SR 111 (minor street left turns at LOS F in the PM)

5.1.2 *ILV Operations*

Table 5–2 shows that the operating capacity of the SR 86 / SR 111 intersection under existing conditions is under capacity in the AM peak hour and near capacity in the PM peak hour.

5.1.3 *Freeway Mainline Operations*

Freeway LOS analysis is based on procedures developed by CALTRANS District 11 and based on methods described in the Highway Capacity Manual. The procedure involves comparing the peak hour volume of the mainline segment to the theoretical capacity of the roadway (V/C). Directional and truck factors are also used to calculate the future freeway volumes. V/C ratios are then compared to V/C thresholds to determine the LOS of each segment.

Table 5–3 shows the existing freeway mainline operations within the project area. Under existing conditions, freeway operations for the two key mainline segments are calculated to operate at LOS A and B in the AM and PM peak hours.

5.2 Existing + Project

5.2.1 *Intersection Operations*

With the addition of the project traffic, all of the intersections in *Table 5–1* operate at a LOS D or better except for the following, which are newly or further adversely affected by the project:

- Heber Road / Dogwood Road (LOS F in the PM peak hour)
- Heber Road / SR 111 (LOS F in the PM peak hour)
- Heber Road / Yourman Road (west) (LOS F in the PM peak hour)
- Heber Road / Yourman Road (east) (LOS F in the PM peak hour)
- Jasper Road / SR 111 (LOS F in the AM and PM peak hours)

5.2.2 *ILV Operations*

Table 5–2 shows that the operating capacity of the SR 86 / SR 111 intersection under existing + project conditions is over capacity in both the AM and PM peak hours.

5.2.3 *Freeway Mainline Operations*

Table 5–3 comprises the existing + project mainline operations along with the change calculated between the existing and the existing + project scenarios. Again, the segments operate at LOS B or better in the AM and PM.

5.3 Existing + Project + Cumulative Projects

5.3.1 *Intersection Operations*

All of the intersections listed under the Existing + Project + Cumulative Projects column in *Table 5–1* operate at a LOS D or better except for the following:

- McCabe Road / SR 111 (LOS F in the AM and PM peak hours)
- McCabe Road / Bowker Road (LOS F in the AM and PM peak hours)
- Heber Road / Dogwood Road (LOS F in the AM and PM peak hours)
- Heber Road / SR 111 (LOS F in the AM and PM peak hours)
- Heber Road / Yourman Road (west) (LOS F in the PM peak hour)
- Heber Road / Yourman Road (east) (LOS F in the AM and PM peak hours)
- Heber Road / Bowker Road (LOS F in the PM peak hour)
- Jasper Road / SR 111 (LOS F in the AM and PM peak hours)

5.3.2 *ILV Operations*

Table 5–2 shows that the operating capacity of the SR 86 / SR 111 intersection under existing + project + cumulative projects conditions is over capacity in both the AM and PM peak hours.

5.3.3 *Freeway Mainline Operations*

Table 5–3 shows the existing + project + cumulative project mainline operations both operate at LOS C or better in the AM and PM. There are no significant impacts at either of the two freeway mainline segments.

TABLE 5–1
NEAR-TERM INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing		Existing + Project		Δ[c]	Existing + Project + Cumulative Projects	
			Delay[a]	LOS[b]	Delay	LOS		Delay	LOS
McCabe Road / SR 111	Signal[d]	AM	14.5	B	15.6	B	1.1	**>100.0**	**F**
		PM	19.0	B	33.9	C	14.9	**>100.0**	**F**
McCabe Road / Bowker Road	TWSC[e]	AM	9.9	A	10.2	B	0.3	**>100.0**	**F**
		PM	10.4	B	11.9	B	1.5	**>100.0**	**F**
Heber Road (SR 86) / Dogwood Road	AWSC[f]	AM	11.0	B	14.1	B	3.1	**>100.0**	**F**
		PM	20.0	C	**91.7**	**F**	>2.0	**>100.0**	**F**
Heber Road / SR 111	Signal	AM	21.1	C	51.8	D	>2.0	**>100.0**	**F**
		PM	28.3	C	**>100.0**	**F**	>2.0	**>100.0**	**F**
Heber Road / Yourman Road (west)[f]	TWSC	AM	11.2	B	19.3	C	8.1	24.4	C
		PM	11.6	B	**>100.0**	**F**	>2.0	**>100.0**	**F**
Heber Road / Yourman Road (east)[f]	TWSC	AM	–	–	27.2	D	–	**>100.0**	**F**
		PM	–	–	**>100.0**	**F**	–	**>100.0**	**F**
Heber Road / Bowker Road	TWSC	AM	11.1	B	12.8	B	1.7	15.9	C
		PM	11.5	B	24.7	C	13.2	**>100.0**	**F**
Jasper Road / SR 111	TWSC	AM	30.4	D	**63.9**	**F**	>2.0	**>100.0**	**F**
		PM	>100.0	F	**>100.0**	**F**	>2.0	**>100.0**	**F**
Jasper Road / Yourman Road	TWSC	AM	9.2	A	9.7	A	0.5	10.4	B
		PM	9.8	A	12.1	B	2.3	18.4	C
Jasper Road / Bowker Road	TWSC	AM	9.2	A	9.8	A	0.6	10.4	B
		PM	9.9	A	11.9	B	2.0	13.3	B

General Notes:
Bold and shading indicate significant impacts.

Footnotes:
a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. Increase in delay due to the project.
d. McCabe Road / SR 111 is assumed to be signalized as this improvement is a condition of the Imperial Valley Mall project.
e. TWSC – Two-Way Stop Controlled intersection. Minor street approach delay is reported.
f. Heber Road / Yourman Road becomes two intersections (east and west) with the construction of the project.

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

TABLE 5–2
SIGNALIZED INTERSECTION OPERATIONS
ILV METHODOLOGY

Intersection	Peak Hour	Existing		Existing + Project		Existing + Project + Cumulative Projects		Existing + Project + Cumulative Projects with Mitigation	
		ILV	Capacity	ILV	Capacity	ILV	Capacity	ILV	Capacity
SR 86 / SR 111	AM	1,110	Under	1,507	Over	2,385	Over	1,494	Near
	PM	1,350	Near	2,617	Over	4,568	Over	2,743	Over

STATUS

ILV / Hour	Capacity
< 1,200	UNDER
>1,200 but ≤ 1,500	NEAR
> 1,500	OVER

TABLE 5–3
NEAR - TERM FREEWAY MAINLINE OPERATIONS
INTERSTATE 8

Freeway Segment	Dir.	Number of Lanes [a]	Hourly Capacity [a]	ADT [b]	Peak Hour Volume [c,d,e]		V/C[f]		LOS [g]	
					AM	PM	AM	PM	AM	PM
Existing										
Dogwood Road to SR 111	EB	2M	4,400	34,500	1,174	1,413	0.267	0.321	A	A
	WB	2M	4,400		1,564	2,154	0.355	0.490	A	B
SR 111 to Bowker Road	EB	2M	4,400	14,600	568	684	0.129	0.155	A	A
	WB	2M	4,400		756	1,042	0.172	0.237	A	A
Existing + Project										
Dogwood Road to SR 111	EB	2M	4,400	34,500	1,174	1,413	0.267	0.321	A	A
	WB	2M	4,400		1,564	2,154	0.355	0.490	A	B
SR 111 to Bowker Road	EB	2M	4,400	14,600	568	684	0.129	0.155	A	A
	WB	2M	4,400		756	1,042	0.172	0.237	A	A
Existing + Project + Cumulative Projects										
Dogwood Road to SR 111	EB	2M	4,400	34,500	1,595	2,243	0.362	0.510	A	B
	WB	2M	4,400		1,916	3,042	0.435	0.691	B	C
SR 111 to Bowker Road	EB	2M	4,400	14,600	664	929	0.151	0.211	A	A
	WB	2M	4,400		864	1,276	0.196	0.290	A	A

Footnotes:

a. Capacity calculated at 2,200 vehicles per hour per lane (M: Mainline)

b. Existing ADT Volumes from CALTRANS (*Appendix D*)

c. Peak Hour Volume = ((ADT)(K)(D)/Truck Factor)

d. Peak Hour Percentage (K) and Direction Split (D) from CALTRANS "2003 Traffic Volumes", May 2004 (*Appendix D*)

e. Truck Factor from "2002 Annual Average Daily Truck Traffic on the California State Highway System", February 2004 (*Appendix D*)

f. V/C = ((ADT)(K)(D)/Truck Factor/Capacity)

g. Level of Service

FREEWAY

V/C / LOS THRESHOLDS

V /C	LOS
< 0.41	A
0.62	B
0.80	C
0.92	D
1.00	E
1.25	F(0)
1.35	F(1)
1.45	F(2)
> 1.46	F(3)

6.0 YEAR 2025 ANALYSIS

The Year 2025 intersection volumes were calculated by using the relationship between the existing average daily traffic (ADT) volumes and the Year 2025 ADT volumes, and applying that relationship to the existing peak hour turning movement volumes. The 2025 ADT volumes were obtained from the Imperial Country Travel Model (ICTM), maintained by CALTRANS. These volumes can be found in ***Appendix E*** along with the Year 2025 intersection analysis reports.

Specific improvements were assumed for the intersections studied in the Year 2025 analysis, for example dual left-turn lanes, signalization, and right-turn overlap phases. ***Figure 6–1*** shows the traffic volumes for the Year 2025.

The intersection operations calculated for the Year 2025 are calculated to operate at LOS D or better, as shown in ***Table 6–1***, except for the following:

- McCabe Road / SR 111 (LOS F in the AM and PM peak hours)
- Heber Road / SR 111 (LOS F in the AM and PM peak hours)
- Jasper Road / SR 111 (LOS F in the AM and PM peak hours)

SR 111 was assumed to be a 6-lane highway in this analysis, however, due to the exceptionally high volumes on SR 111, the analysis shows that a grade-separated facility would be necessary to accommodate the forecast traffic volumes.

TABLE 6–1
YEAR 2025 INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Year 2025[a] Delay[b]	Year 2025[a] LOS[c]
McCabe Road / SR 111	Signal	AM	>100.0	F
		PM	>100.0	F
McCabe Road / Bowker Road	Signal	AM	31.1	C
		PM	31.6	C
Heber Road (SR 86) / Dogwood Road	Signal	AM	31.9	C
		PM	49.0	D
Heber Road / SR 111	Signal	AM	>100.0	F
		PM	>100.0	F
Heber Road / Yourman Road (west)	TWSC[d]	AM	11.2	B
		PM	19.8	C
Heber Road / Yourman Road (east)	Signal	AM	17.1	B
		PM	19.4	B
Heber Road / Bowker Road	Signal	AM	32.6	C
		PM	36.9	D
Jasper Road / SR 111	Signal	AM	>100.0	F
		PM	>100.0	F
Jasper Road / Bowker Road	Signal	AM	32.6	C
		PM	52.2	D

Footnotes:

a. For the Year 2025 analysis, SR 111 was assumed to have three through lanes in each direction.
b. Average delay expressed in seconds per vehicle.
c. Level of Service.
d. TWSC–Two-Way Stop Controlled intersection. Minor street left turn delay is reported.

SIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS	UNSIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

7.0 SIGNIFICANCE OF IMPACTS AND MITIGATION MEASURES

7.1 Significance of Impacts

The following locations were determined to be *directly* or *cumulatively* impacted by the project, based on the results of *Table 5–1*.

7.1.1 *Direct Impacts*

1. Heber Road (SR 86) / SR 111
2. Heber Road / Yourman Road (west)
3. Heber Road / Yourman Road (east)
4. Heber Road (SR 86) / Dogwood Road
5. SR 111 / Jasper Road

7.1.2 *Cumulative Impacts*

6. SR 111 / McCabe Road
7. Heber Road / Bowker Road
8. McCabe Road / Bowker Road

7.2 Mitigation Measures

The numbering of the following mitigation measures matches the significance of impacts numbering. ***Table 7–1*** shows the existing + project intersection operations without and with the following mitigations.

1. Heber Road (SR 86) / SR 111 intersection:

   Widen and improve the Heber Road / SR 111 intersection to provide the following lane geometry.

   Westbound: 2 left turn lanes
   2 through lanes
   1 right turn lane (with overlap phase)

   Northbound: 2 left turn lanes
   2 through lanes
   1 right turn lane (with overlap phase)

   Eastbound: 2 left turn lanes
   2 through lanes
   1 right turn lane (with overlap phase)

   Southbound: 2 left turn lanes
   2 through lanes
   1 right turn lane (with overlap phase)

In addition, while the above geometry mitigates all project impacts but not all cumulative impacts, it is also recommended that the project contribute a fair share towards the planned widening of SR 111 to 6 lanes.

2. Heber Road / Yourman Road (west) intersection:

   Prohibit left turns to / from Yourman Road on to Heber Road. Provide an additional through lane in both the eastbound and westbound directions on Heber Road. A plan should be put into place in the future to realign Yourman Road south of Heber Road so that it is aligned opposite the planned realigned Yourman Road north of Heber Road.

3. Heber Road / Yourman Road (east) intersection:

   Signalize and widen the Heber Road / Yourman Road (east) realigned intersection to provide the following lane geometry:

   Westbound: 1 right turn lane (with overlap phase)
   2 through lanes

   Eastbound: 2 left turn lanes
   2 through lanes

   Southbound: 2 left turn lanes
   1 right turn lane (with overlap phase)

   The southbound approach should be designed such that dedicated northbound and southbound through lanes could be provided once Yourman Road south of Heber Road is realigned opposite Yourman Road north of Heber Road.

4. Heber Road (SR 86) / Dogwood Road intersection:

   Signalize the Dogwood Road / SR 86 intersection and provide dedicated left-turn lanes at all of the approaches. Dual southbound left-turn lanes and a dedicated westbound right-turn lane with an overlap phase should be provided. The Imperial Valley Mall is also conditioned to improve this intersection.

5. SR 111 / Jasper Road intersection:

   Contribute a fair share towards the signalization, and the associated geometric improvements, of the SR 111 / Jasper Road intersection. A fair share contribution is recommended and several other projects are also conditioned to improve this intersection.

6. SR 111 / McCabe Road intersection:

   Contribute a fair share towards the signalization, and the associated geometric improvements, of the SR 111 / McCabe Road intersection. Dedicated left-turn, through and right-turn lanes should be provided on the westbound approach. The Imperial Valley Mall project is also conditioned to improve this intersection.

In addition, while the above geometry mitigates all project impacts but not all cumulative impacts, it is also recommended that the project contribute a fair share towards the planned widening of SR 111 to 6 lanes.

7. Heber Road / Bowker Road intersection:

   Contribute a fair share towards the future signalization of the intersection, and the associated geometric improvements.

8. McCabe Road / Bowker Road intersection:

   Contribute a fair share towards the future signalization of the intersection, and the associated geometric improvements.

9. In addition, several other access-related improvements are recommended:

   - Provide clear signing that indicates that access to SR111 is available via Abatti Road to Yourman Road to McCabe Road. It is important to have a viable access point to the project other than the Heber Road / Yourman Road intersection.
   - Construct Yourman Road as a 4-lane Major Collector (84 feet of right-of-way (ROW)) between Heber Road and Abatti Road.
   - Construct Abatti Road along the project frontage to 4-lane Major Collector standards.
   - Construct Heber Road along the project frontage to 6-lane Prime Arterial standards (126 feet of ROW).

The intersection analysis reports for the mitigated intersection operations listed below are attached in ***Appendix F***.

TABLE 7–1
MITIGATED INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing + Project		Existing + Project With Mitigation	
			Delay[a]	LOS[b]	Delay	LOS
Heber Road (SR 86) / Dogwood Road	Signal	AM	21.5	C	19.3	B
		PM	>100.0	F	23.2	C
Heber Road / SR 111	Signal	AM	52.6	D	25.7	C
		PM	>100.0	F	43.0	D
Heber Road / Yourman Road (west)	TWSC[c]	AM	19.3	C	15.7	C
		PM	>100.0	F	17.3	C
Heber Road / Yourman Road (east)	Signal	AM	22.7	C	16.2	B
		PM	>100.0	F	18.2	B
Jasper Road / SR 111	Signal	AM	59.6	F	14.6	B
		PM	>100.0	F	19.8	B

Footnotes:
a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. TWSC – Two-Way Stop Controlled intersection. Minor street approach delay is reported.

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

Imperial Center Subdivision
Preliminary Infrastructure Study

In an unincorporated area of the County of Imperial, State of California

Presented to:

The Imperial County Planning Department
Imperial County Courthouse
939 West Main Street
El Centro, California 92243

Prepared by:

Development Design & Engineering, Inc.
May 5, 2006

A. PROJECT DESCRIPTION AND SETTING

1. Project and Site Description:

The proposed project is a mixed-use 77.64-acre commercial development. The project site is bounded by Yourman Road on the west, Heber Road on the south, Abatti Road on the north and the Alder Drain on the east. Reference is made to the Tentative Subdivision Map for this project titled "Imperial Center Subdivision" A copy of the tentative map is included in the map portion of this study. The project is to be developed in phases.

The site is located east of the unincorporated community of Heber. The project site lies outside the boundaries of both the Heber Urban Area Plan and the "HPUD Expanded Sphere of Influence Area of the Heber Public Utilities District". However, HPUD's master water and sewer plans make provisions for providing water and sanitary sewer services. The Imperial Center Specific Plan proposes to annex the Specific Plan Area into both the Heber Urban Area and HPUD's Expanded Sphere of Influence Area.

Additionally, other basic utilities including storm drain and electrical services are available to the project through the Imperial Irrigation District. Specific services are addressed later in this study.

2. Land use:

The project site is suitable for the proposed use as evidenced by similar commercial developments along Highway 111 that exist relatively near the site including the Wal-Mart/Toys R Us complex on the northerly city limits of Calexico.

The project site is zoned A2-SPA and is currently under agricultural production. Adjacent properties are zoned consistent with existing uses. The property to the immediate south is a mixed zoned of C2N-SPA and A2G-SPA. The properties to the immediate east and north (all existing farmlands) are all zoned as A2 and A3 respectively. The properties to the west are zoned A2G-SPA.

B. PUBLIC FACILITIES EVALUATION

This document outlines a plan to provide public facilities and infrastructure to the Imperial Center. Currently, the Heber Public Utility District (HPUD) is not able to provide future water service to the Imperial Center Specific Plan Area. However, this document will outline three distinct plans that are able to be implemented at any time, assuming the financing is in place, to provide future water services to the Imperial Center. This document also briefly discusses several different financing options that the Imperial Center may pursue to implement this public facilities plan.

The Imperial Center Specific Plan proposes three different alternatives to providing the development within the specific plan area with sewer and water services. The alternative the developers of Imperial Center will select will depend on developer goals.

1. Existing and Planned Ultimate Sanitary Sewer Service Facilities

A. Existing Sanitary Sewer Facilities:

No sanitary sewer services currently exist on the project site. The nearest point of connection to existing services includes:

1) A manhole located in Rockwood Avenue adjacent to the HPUD Sanitary Sewage Treatment Plant.

B. Project Proposed Sanitary Sewer Facilities:

1) Alternative One

The sanitary sewer improvements proposed for Alternative One are to include a local collection system consisting of gravity flow lines located in the streets, Yourman Road, of the proposed Imperial Center Subdivision. A 12" gravity flow line is to run along the west side of the project site to provide service to the areas south of the project site as they are developed.

An on-site (self-serving) treatment facility will be provided. The facility is to be purchased and owned by the landowner (with HPUD approval). The landowner will pay for maintenance; however, HPUD will operate the on-site facility. HPUD and the landowner will enter into an operating agreement that will specifically detail responsibilities and liabilities associated with the operating of the plant.

a. Type of Facility Needed

The following information was assessed to address sewer treatment facilities for the Imperial Center. The following information is based on treatment for up to 75,000 Gallons/Day:

i. 10,000 S.F. Building

ii. Sand/Rock Filter

iii. Estimated installation cost is $8.50/Gal treated = $637.500

iv. Add ozonation to effluent that will meet disinfection criteria of title 22 reclaimed water for irrigation - add $1.50/Gal for this upgrade

v. Effluent Quality = 2 mg/l BODs & suspended solids

vi. Power Consumption 55 to 60 KWH/Day (about $4.50/day)

b. Location

Lot 3 of the project area will be the temporary location of the sewer facility.

c. Sewage Discharge

i. It is assumed that 80 percent of the water supplied to a connection is sent to the sewer systems. Based on that assumption, the sewer flow for such areas will be approximately 40 gallons per person per day, while peak flow is 2 times the average flow, therefore:

ii. Average Flow: (40 p/ac x 40 gd/p) /(24hrs x 60 min) = 1.11 gpm/ac.

iii. Peak Flow: 1.11 gpm/ac x 2 = 2.22 gpm/ac.

iv. Sewer discharge required for the 77.64-acre parcel is 2.22 gpm/ac x 77.64 = 172.36 gpm.

Exhibit 1 provides a graphical detail of the proposed Alternative One.

2) Alternative Two

HPUD would provide sewer services to the Imperial Center in Alternative Two. Alternative Two proposes to extend single project specific sewer lines to the Imperial Center project.

Like Alternative One, the sanitary sewer improvements proposed for Alternative Two are to include a local collection system consisting of gravity flow lines located in the streets, Yourman Road, of the proposed Imperial Center Subdivision. A 12" gravity flow line is to run along the west side of the project site to provide service to the areas south of the project site as they are developed.

Specifically, the area to be developed by the project site is to be served by:

i. Installing a pump station with 2 pumps on the Imperial Center.

ii. Installing a 12 inch sewer force main from the Imperial Center to the Wastewater Treatment Plant (along

Correll Road and Rockwood Road crossing Highway 111 underneath).

Exhibit 2 provides a graphical detail of the proposed Alternative Two.

3) Alternative Three

HPUD would provide sewer services to Imperial Center in Alternative Three. The proposed infrastructure would include improvements that are included, as a full-buildout, in the Heber Public Utility District Service Area Plan.

The sanitary sewer improvements proposed for Alternative Three are to include a local collection system consisting of gravity flow lines located in the streets, Yourman Road, of the proposed Imperial Center Subdivision. A 12" gravity flow line is to run along the west side of the project site to provide service to the areas south of the project site as they are developed.

Specifically, the area to be developed by the project site is to be served by:

i. Installing a pump station with 2 pumps.

ii. Installing a 12 inch sewer force main from the lift station to an intermediate point along Correll Road (between Pitzer Road and Highway 111), continuing with a 30 inch sewer main to a point at Correll Road and Pitzer Road, then along Correll Road to the Wastewater Treatment Plant.

Exhibit 3 provides a graphical detail of the proposed Alternative Three.

C. Effects on Existing Sanitary Sewer Facilities:

No negative effects are expected on the existing facilities due to the following facts:

1) The Imperial Center is included in the Heber Public Utility District's Service Area Plan. This plan has provided for a plan that will enable HPUD to expand their services without negative impacts to their existing facilities. The plan indicates that the Imperial Center will be built-out between the dates of 2004-2008. It is clearly the intention of the Heber Public Utility District to serve this project.

2) HPUD currently has sufficient capacity to support the project with sewer services if sewer lines are installed as indicated above in Alternative Two and Alternative Three.

3) The landowner will be ultimately liable for any penalties for the operation of the Imperial Center sewer plant as outlined in Alternative One. HPUD will only be on the sewer plant permit as an operator of the plant. As stated above, an operating agreement between the landowner and HPUD will define any and all liability and risk exposure to HPUD for operating the sewer plant.

4) Planned construction of sanitary sewer infrastructure for the project is to be in accordance with HPUD instructions.

2. **Existing and Planned Ultimate Water Service Facilities**

A. Existing Water Facilities:

Some existing water services currently exist on the project site and include:

1) According to the HPUD director an 8" water line is located in State Highway 86 which terminates near Pitzer Road. Also, according to HPUD this line is to up-graded to a 12" line within the next year. Note that the proposed 12" line is not consistent with the 24" water line requirements of the Heber Public Utilities – "Water Master Plan – Water Transmission Pipelines".

2) A 12" water line located in Correll Road which terminates at a point just west of the Southern Pacific Railroad R/W. Note, 12" line is consistent with the requirements of the Heber Public Utilities – "Water Master Plan – Water Transmission Pipelines".

B. Project Proposed Water Facilities:

1) Alternative One

Alternative One provides for a plan to accommodate the Imperial Center water demands. This alternative calls for the Imperial Center Specific Plan area to be annexed into the Heber Public Utility District service area.

The water plant will be located in Lot 3 in the northern section of the project. It will be located adjacent to the sewer plant. The water plant will be located an appropriate distance from the sewer plant as determined by the Heber Public Utility District and State of California. The following is a summary of the plan to construct and operate a water plant within the Imperial Center Specific Plan Area:

i. Total area of the water facility will be approximately four acres.

ii. Water Plant building (50' x 40').

iii. Potable Water Tank Storage (600,000 gallons)

iv. The water plant will contain two water ponds with a total volume of 874,528 gallons.

v. Peak fire capacity = 2,000 gallons per minute for a four (4) hour duration plus domestic.

vi. Potable Water Pumps: 2,000 Gallons per Minute @ 80 psi

vii. Raw Water Irrigation Pumps: 200 Gallons per Minute @ 60 psi

The minimum and maximum potable water use for the project is estimated to be 100,000 gallons per day (gpd) and 200,000 gpd respectively, irrigation water is an additional 37,5000 and 70,000 gpd respectively. For planning purposes 200,000 was assumed to be the average day water demand for the project. This estimate represents the high side of water usage should be reevaluated as development proceeds to determine if some facilities proposed could be reduced in size. Table 1 provides the water use factors used to estimate project flows.

Water Use Factors		
LAND USE	**MINIMUM**	**MAXIMUM**
Potable	1250 GPD/AC	2500 GPD/AC
Irrigation	500 gpd/ac	1000 gpd/ac

Table 1-Water Use Factors

Peaking factors of 2 and 4 were used to estimate maximum day and peak hour demands respectively.

The water distribution system was sized to provide a 2,000 gpm fire flow under maximum day demands with a residual pressure of no less than 20 psi or no more than 10 psi pressure drop anywhere in the system under peak hour demands, whichever is greater.

Water storage, treatment and pumping facilities will all be located on on-site. The source of water for the project will be Imperial Irrigation district's All American Canal. Storage for the project will be kept in a potable water tank and raw water reservoir, then the All American Canal. The potable water reservoir will hold two average day's storage plus fire flow requirements. The raw water reservoir will hold seven and a half days storage requirement.

Water will flow by gravity to the raw water reservoir and will be pump to the water treatment plan when needed. The treatment plant is proposed to be a package system, consisting of modular units, where each unit contains a rapid mix tank, flocculation tank, settling basin and a filter. The modular unit concept will allow the treatment plant to be constructed incrementally, as needed.

Once water passes through the treatment plant, it will flow by gravity to the treated water storage tank. A potable water booster pump station will pump water from the treated storage tank to the water distribution system.

The distribution system will have a 12 inch diameter pipe looped within the project which will allow the project to be phased while still maintaining the infrastructure necessary to provide fire flow.

Design and operations of the water treatment facilities, storage reservoirs, and distribution systems will conform to guidelines from the following:

i. California Department of Health Services
ii. County Department of Health Services Environmental Health
iii. Air Pollution Control District
iv. Department of Water Resources Division of Safety of Dams
v. Insurance Services Office
vi. National Fire Protection Code

Water facilities discussed in this plan are preliminary and may be re-evaluated as development proceeds. Additional water facility options may be proposed and approved as part of the tentative mapping process. For example, smaller pipes may be used if originally anticipated water demands are less than anticipated.

Exhibit 1 provides a graphical detail of the proposed Alternative One. Table 2 provides an engineers estimate for potable water demand for Imperial Center.

i. Reclaimed Water Imperial Center

In an effort to conserve water at the Center, this Alternative will use reclaimed water for all landscaping on site. Standards shall meet County requirements. As an alternative, the Imperial Center management may wish to undertake landscaping irrigation with nearby agricultural water.

2) Alternative Two

HPUD would provide water services to Imperial Center in Alternative Two. Alternative Two proposes to extend single project specific water lines to the Imperial Center project. This alternative would include upgrading the capacity of HPUD's water plant.

As stated above, this alternative would have a single project specific eight inch water line extended from an existing point of connection to Imperial Center. Two pump stations, one for both sewer and water, would be utilized in this alternative. It would not include a looped infrastructure water lines. Specifically, the area to be developed by the project site is to be served by:

i. Installing an 8 inch water line along Rockwood Road from the existing point of connection (approx. 600 ft. south of Correll Road) to Correll Road, then along Correll Road to the Imperial Center (crossing Highway 111 underneath).

ii. Connecting to a potable water storage tank.

iii. Installing a pump station with 3 pumps and accessories.

Alternative Two would provide water to the Imperial Center during peak hours using water that will be stored in an 800,000 gallon water tank. This tank will be located in Lot 3 on the tentative map. HPUD would replenish the tank during off-peak hours. Fire pressure and water availability would be sufficient to satisfy all fire protection needs.

Alternative Two is estimated to cost $2.3 million for infrastructure improvements. HPUD has stated that they intend to upgrade their water treatment plant. These improvements may be financed by a variety of mechanisms. Community Facility Districts (CFD's) or developer fees with reimbursement agreements may be used to finance these improvements.

The demand for water from the Imperial Center will increase in Alternative Two from Alternative One because the Imperial Center will not be able to use recycled water for irrigation purposes. For this reason, water demand for irrigation purposes will increase by 40,186 gallons per day.

Exhibit 2 provides a graphical detail of the proposed Alternative Two. Table 2 provides an engineers estimate for potable water demand for Imperial Center.

3) Alternative Three

HPUD would provide water services to Imperial Center in Alternative Three. The proposed infrastructure would include improvements that are included, as a full-build out, in the Heber Public Utility District Service Area Plan.

The HPUD would upgrade its water plant capacity under this alternative. This alternative would also include a looped water infrastructure system. Specifically, the area to be developed by the project site is to be served by:

i. Installing a 20 inch water pipe from the point of connection on Correll Road and Pitzer Road (where Heber Meadows project will leave the water line) to the Imperial Center (crossing Highway 111 underneath).

ii. Installing a 12 inch water pipe along the west side of Highway 111, from Correll Road to Heber Road/Highway 86, continue the water line along Highway 86 from west side of Highway 111 to the existing water line on Highway 86 and Pitzer Road.

iii. Extend the 12 inch water line along Highway 86 from west side of Highway 86 to the Imperial Center (crossing Highway 111 underneath).

Alternative Three is estimated to cost $2.4 million for infrastructure improvements. HPUD has stated that they intend to upgrade its infrastructure. These improvements may be financed by a variety of mechanisms. Community Facility Districts (CFD's) or developer fees with reimbursement agreements may be used to finance these improvements.

Like Alternative Two, the demand for water from the Imperial Center will increase in Alternative Two from Alternative One because the Imperial Center will not be able to use recycled water for irrigation purposes. For this reason, water demand for irrigation purposes will increase by 40,186 gallons per day.

Exhibit 3 provides a graphical detail of the proposed Alternative Three. Table 2 provides an engineers estimate for potable water demand for Imperial Center.

Engineers Estimate for Potable Water Demand for Imperial Center								
Facility	**Area**	**Occupancy ft^2/ Person**	**People/Unit**	**Gallons/day per capita**	**Average Gallons/ day**	**Usage Hours**	**Peak Flow Factor**	**Peak Gallons /min**
Information Exhibit Rest Rooms	15,000 ft^2	30	500	10	5,000	6	3	42
Wholesale Outlet Mall Restrooms, Interior Landscaping, Food Service Facilities	460,000 ft^2	30	15,333	3	46,000	10	2	153
Multiplex Cinema Restrooms, Food Service	83,000 ft^2	14	5,929	3	17,786	6	3	148
Hotel 200 Rooms Rooms, Laundry, Interior Landscape, Janitorial Services, Banquet Services	135,000 ft^2	200	675	52	35,000	11	3	159
Hotel/Plaza Restaurant Restrooms, Kitchen	10,000 ft^2	15	667	30	20,000	12	3	83
Plaza Auction Court Restrooms, Janitorial	95,000 ft^2	30	3,167	9	28,5000	6	3	238
Convenience Market/Gas Restroom, Kitchen, Food Service	37,000 ft^2	30	1,233	6	7,400	12	2	21
Retail Pads (eleven) Restrooms, Kitchens	55,000 ft^2	30	1833.33	10	18,333	12	2	51
Total of all Above			29,337		**178,019**			895

Table 2-Engineers Estimate for Potable Water Demand for Imperial Center

C. Effects on Existing Water Facilities:

No negative effects are expected on the existing facilities due to the following facts:

1) The Imperial Center is included in the Heber Public Utility District's Service Area Plan. This plan has provided for a plan that will enable HPUD to expand their services without negative impacts to their existing facilities. The plan indicates that the Imperial Center will be built-out between the dates of 2004-2008. It is clearly the intention of the Heber Public Utility District to serve this project.

2) The landowner will be ultimately liable for any penalties for the operation of the Imperial Center water plant as outlined in Alternative One. HPUD will only be on the water plant permit as an operator of the plant. As stated above, an operating agreement between the landowner and HPUD will define any and all liability and risk exposure to HPUD for operating the sewer plant.

3) HPUD will have the sufficient capacity and the capability to be able to continue to support the project. As indicated above, HPUD is currently planning to expand its plant. If this does not happen, Imperial Center will implement Alternative One to receive water services.

4) Planned construction of water pipeline transmission infrastructure for the project is to be in accordance with HPUD's master plan.

3. Temporary Septic and Leech Field System

Sewage treatment will be scaled down for Phase A by allowing temporary septic tank and leach field systems to be installed at the temporary wastewater treatment plant site as well as the lift station site in the western basin. Phasing is discussed in more detail in Chapter 9, Phasing. This system will be temporary until the infrastructure from HPUD is extended to the project site or the packaged plant system can be constructed. All septic tank and leach field systems will be installed in with approval from and in accordance to the County of Imperial Environmental Services Department.

Each septic system will be sized to handle approximately 25 thousand GPD. Once one or both of these temporary systems reach their capacity, transition into a packaged plant or first phase pond-based wastewater treatment system will be implemented at the permanent treatment plant site thus terminating the use of both of the temporary facilities. Collection and conveyance pipelines will be installed concurrently with the initial backbone roads and as more fully described in the appropriate final engineering improvement plans.

4. Existing and Planned Ultimate Storm Drainage Service Facilities

A. Existing Storm Drainage Facilities:

A countywide drainage and flood control manual has been prepared and is currently under review by the Imperial Irrigation District. As of the date of this writing, the countywide drainage and flood control manual has not been adopted. In the absence of a formal policy, the I.I.D. as the lead agency in drainage and flood control in Imperial County has had as a standing policy, the limitation of drainage from subdivisions to a single 12" outlet line into IID facilities. The resultant is that on-site retention basins exist on the majority of commercial/industrial and residential developments within the county and cities in Imperial Valley including the subdivisions adjacent to the project site. This has been the local practice for at least the last 25 years.

Existing I.I.D. drainage facilities currently available to the project site include:

1) The Imperial Irrigation Alder Drain is located along the eastern boundary of the project site.

B. Ultimate Storm Drainage Facilities:

No specific recommendations or requirements could be found in applicable documents the project site; Recommendations in the area generally state that developers should continue the local practice of designing site specific detention basins that outflow to IID facilities. However, some local agency staffs have made a determination that it may be in their best interest to pursue the concept of “Regional Detention Basins” that ultimately outflow to IID facilities. One such “Regional Detention Basin” being considered at present is located along the Strout Drain in Calexico.

C. Project Proposed Storm Drainage Facilities:

As stated above, local policy has been to allow for site specific detention basins that outflow to Imperial Irrigation District facilities. Therefore, at present, on-site detention basins/parks have been proposed for this project.

D. Effects on Existing Storm Drainage Facilities:

Preliminary engineering calculations for the sizing of on-site detention basin located on the project site are attached to this study. More detailed calculations may be required by the Imperial Irrigation District prior to granting of an encroachment permit for ultimate delivery of drainage flows to their facilities.

5. Existing and Planned Ultimate Electrical Service Facilities

A. Existing Electrical Service Facilities:

Some electrical services currently exist on or near the project site. The nearest points of connection to existing services include:

1) The Imperial Irrigation District provides electrical services to the surrounding properties via overhead and underground power lines.
2) Overhead power lines run along and Abatti Road.

B. Ultimate Electrical Service Facilities:

Ultimate electrical services requirements include:

1) No specific recommendations or requirements could be found in applicable documents the project site,

C. Project Proposed Electrical Service Facilities:

Proposed electrical services improvements include:

1) Overhead and underground lines are to be installed as directed and requested by agreement with the Imperial Irrigation District.

D. Effects on Existing Electrical Service Facilities:

Effects on electrical services facilities are to be determined and evaluated by the Imperial Irrigation District Power Department and any adverse effects identified and mitigated to the satisfaction of the I.I.D.

6. **Traffic Service Facilities**

A. Existing, Ultimate, Proposed and Effects on and for Traffic Service Facilities:

A Traffic Impact Study has been prepared by Dahl, Robins and is attached to this study. Additionally, an addendum to this traffic study was completed last year by Linscott Long & Greenspan. They are currently in the process of completing another addendum. This addendum will be submitted to for your review when it is completed.

C. SUMMARY

1. **Analysis of Existing, Proposed and Ultimate Infrastructure conditions and requirements and Effects on Infrastructure by project:**

A. Summary:

Adequate infrastructure exists and/or can be constructed such that the project site can be developed as proposed by the enclosed Tentative Map. Further, no significant impacts on were identified as effecting the existing infrastructure that could not be mitigated.

Several financing options may be pursued to implement the public facilities and infrastructure plan outlined above. Developer fees, Community Facilities Districts or private developer financing may be used to finance the infrastructure projects detailed above. No financing will come from HPUD or fees from HPUD's current customers.

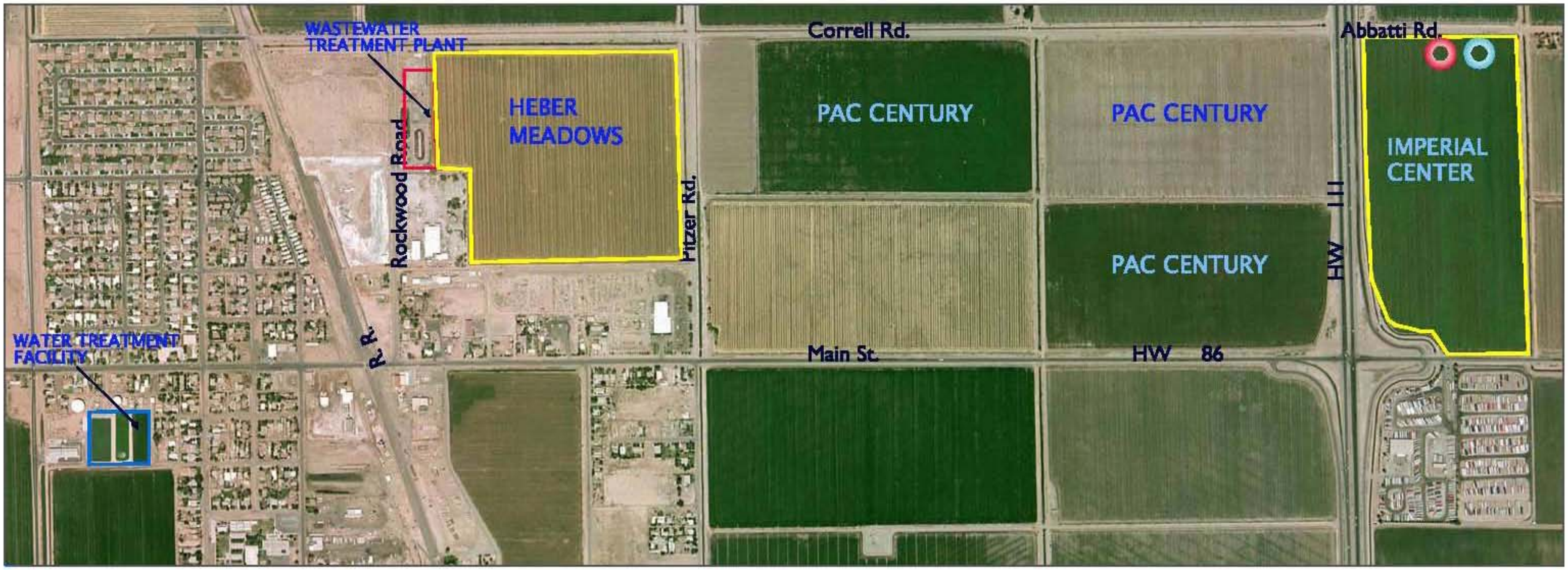
Development Design & Engineering, LLC

Ken Cluskey
Project Manager

Enc: (1) Tentative Tract Map

Cc: file

IMPERIAL CENTER UTILITY ALTERNATIVES



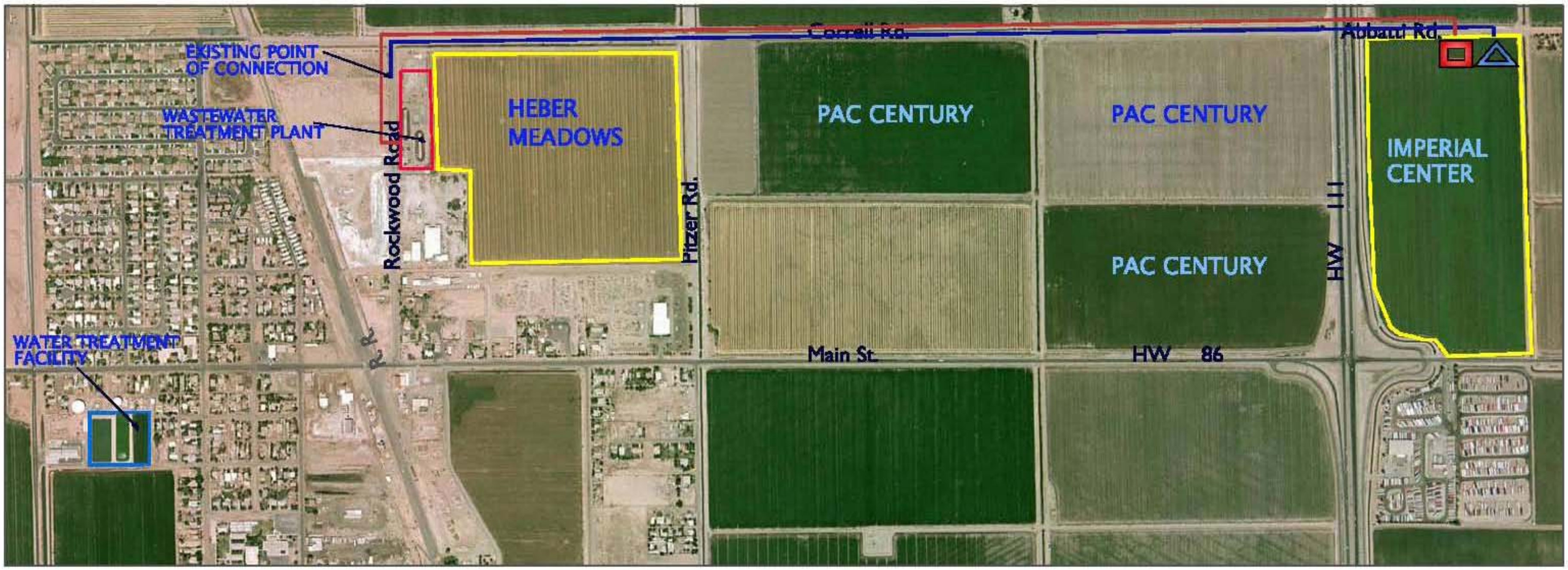
LEGEND

- PROPOSED ON SITE WASTEWATER TREATMENT PLANT
- PROPOSED ON SITE WATER TREATMENT PLANT

EXHIBIT NO. 1

Exhibit 1 - Alternative One - Sewer & Water System Plan

IMPERIAL CENTER UTILITY ALTERNATIVES



LEGEND

WATER SYSTEM

PROPOSED 8 INCHES LINE

PROPOSED WATER STORAGE TANK AND PUMP STATION

SANITARY SEWER SYSTEM

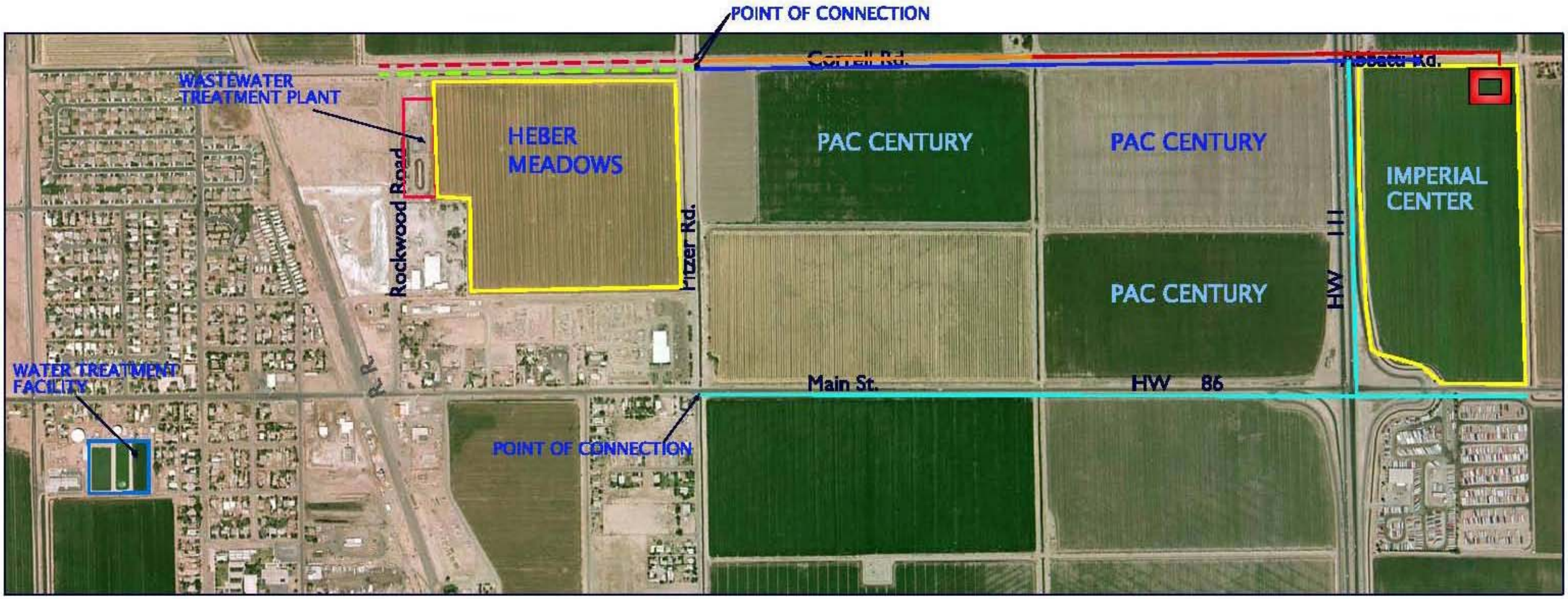
PROPOSED 12 INCHES FORCE MAIN

PROPOSED SEWAGE PUMP STATION

EXHIBIT NO. 2

Exhibit 2 - Alternative Two - Sewer & Water System Plan

IMPERIAL CENTER UTILITY ALTERNATIVES



LEGEND

WATER SYSTEM

- FUTURE 20 INCHES LINE
- PROPOSED 20 INCHES LINE
- PROPOSED 12 INCHES LINE

SANITARY SEWER SYSTEM

- FUTURE 30 INCHES LINE
- PROPOSED 30 INCHES LINE
- PROPOSED 12 INCHES FORCE MAIN
- PROPOSED SEWAGE PUMP STATION

EXHIBIT NO. 3

Exhibit 3 - Alternative Three - Sewer & Water System Plan

Focused Burrowing Owl Survey
77-Acre Imperial Center Project
Imperial County, California

Peter H. Bloom
October 8, 2003

Introduction

As requested by Development Design Engineering, UltraSystems Environmental, Inc. conducted three diurnal and three nocturnal field surveys for the Burrowing Owl (*Athene cunicularia*) at the 77 acre Imperial Center site just east Heber and north of Calexico, Imperial County, California. The project is bordered on the north by Abatti Road, the east by the Alder Canal, the south by Heber Road and the west by Yourman Road and Highway 111. This site can also be described as being located within Section 26 of Township 16 South, Range 14 East.

The Burrowing Owl is a small, pale, buffy-brown owl that is unique in its habit of nesting in subterranean burrows. It occurs in grassland and other open habitats throughout much of the western United States, with a disjunct population in Florida. In California, the species is often found in areas containing California Ground Squirrels (*Spermophilus beecheyi*), whose burrows are used by the owls. It is opportunistic in its use of burrow sites, and can use pipes or other suitable cavities at or below ground level. Burrows can be up to 10 feet long, and enlarged nesting chambers are constructed at the terminus. The entrances to burrows are often decorated with bits of animal dung, feathers, litter, and other objects. Clutches of up to 12 eggs are laid, primarily from February to May.

The Imperial Valley is a stronghold for the Burrowing Owl in southern California, with recent estimates of up to 5,600 pairs. Irrigation canals and drains are commonly used as nesting sites in this area. Prey items identified in the Imperial Valley include insects, spiders, earwigs, windscorpions, isopodes, and small rodents.

The Burrowing Owl is a California Department of Fish and Game (CDFG) Species of Special Concern, and a Federal Species of Concern. The CDF&G is currently evaluating a petition to have the species listed as either Threatened or Endangered. This species is declining in many portions of its range, but has increased in some areas. The CDFG has issued a staff report addressing survey and mitigation guidelines for the owl (CDFG 1995).

Methods

Diurnal and nocturnal surveys were conducted by Jeff W. Kidd, biologist, from September 26th to September 28th on clear, calm days with maximum temperatures of 98 degrees. During each survey the project site was searched for Burrowing Owls and their sign (burrows, pellets, feathers, scat, litter, and animal dung). Night vision optics were utilized during the nocturnal surveys to help increase owl detection rates.

Results

Project Site Description and Habitats

As is characteristic of the topography of this region, the Imperial Center site is flat and has a recent and long history of agriculture. Canals and ditches are used to transport water to fields and are the most frequent nest locations of the burrowing owl in Imperial Valley. Roadside berms are also used regularly. The site is bordered by agricultural fields to the north and east. Properties located to the west and south consist of industrial yards, housing and sewage treatment plants. The entire site was recently harvested for corn. Vegetation was therefore sparse and ranged in height from 0-12 inches.

Birds observed on–site included ring-necked pheasant (*Phasianus colchicus*), rock dove (*Columba livia*), mourning dove (*Zenaidura macroura*), burrowing owl (*Athene cunicularia*), red-winged blackbird (*Aeglaius phoeniceus*), great-tailed grackle (*Cassidix mexicanus*), house finch (*Carpodacus mexicanus*), cattle egret (*Bubulcus ibis*), great egret (*Ardea alba*), killdeer (*Charadrius vociferus*), mallard (*Anas platyrhyncos*), greater roadrunner (*Geococcyx californianus*), meadowlark (*Sturnella neglecta*), American kestrel (*Falco sparverius*), northern mockingbird (*Mimus polyglottos*), northern harrier (*Circus cyaneus*), Cooper's hawk (Accipiter cooperii) and American avocet (*Recurvirostra americana*).

Mammals observed on-site included Audubon's cottontail (*Sylvilagus audubon*i), round-tailed ground squirrel (*Spermophilus tereticaudus*) and antelope ground squirrel (*Ammospermophilus leucurus*). No amphibians or reptiles were detected.

Burrowing owls are colonial species and can nest in extremely high densities when conditions are good. The conditions at the Heber Subdivision site are good for burrowing owls. Alfalfa fields provide suitable nesting and foraging habitats where rodents and arthropods are abundant. The canals and roadside berms provide the topography and substrate, and squirrels and irrigation pipes provide nesting habitat.

Survey Results

The immediate 77-acre site and perimeter supports 12 pairs of burrowing owls and an additional 40 pairs were found directly adjacent to the project boundary (Figure 1). Since burrowing owls in the Central Valley are known to regularly travel more than 1,000 meters (Gervais et. al 2003) away from their nest burrows during the breeding season, the above estimate of 52 pairs would likely be impacted by the project (Exhibit 3).

Impacts

As planned, the proposed project would result in the direct loss of all on-site nest burrows, on-site foraging habitat and the 12 burrowing owl pairs currently nesting on-site. The proposed project would also negatively impact about 40 breeding pairs on adjacent properties by removal of foraging habitat, increased intraspecific competition and road mortality. Some adjacent pairs would probably also be eliminated during project construction, or directly after project completion.

Mitigation

- Prior to any earth moving, all on-site burrows need to be evaluated by an experienced BUOW biologist and confirmed as not having any owls in them before being closed. This can be accomplished by a combination of behavioral observations, ecological clues at the burrow entrances, fiber optics scoping of the nest chambers, trapping, banding, and on-site release of the owls. Closure of the nest burrows can only be accomplished by an experienced BUOW biologist and only during the non-breeding season from approximately August 15 to approximately February 15.

- Adult owls can be captured and translocated to an off-site permanently protected reserve where the adults would be temporarily held in breeding enclosures for 1-5 months and then released, usually when they have produced eggs or young. Ideally project development would be initiated while the birds were maintained in captivity at the release site.

- Coupled with the above options is the possibility, and probable requirement of purchasing mitigation lands or conservation easements, swapping land, providing artificial nest burrows, and caring for or breeding owls in captivity. BUOW and certain agricultural reserves complement each other.

- A pre-construction survey, possibly several, must be undertaken within a month before earth disturbance (construction). The surveys should be conducted as close to the actual construction initiation date as possible. Depending upon the success of previous owl removal efforts, a monitor may need to be present until the entire site has been graded.

- Meetings need to be set up with the California Department of Fish and Game (CDFG) and U. S. Fish & Wildlife (USFWS) Service to approve translocation methods. The CDFG and/or USFWS may also request additional surveys to determine the number of young produced from this location and/or other research/conservation projects.

DRAINAGE STUDY

IMPERIAL CENTER SUBDIVISION

DESIGN CRITERIA

The design criteria used for this report include the following items:

1. Retention basin will detain the runoff of the entire area.
2. Retention basins shall be sized for a 100-year/24 –hour storm (assumed to be a total of 3 inches of rain).
3. Retention basin will drain out to the I.I.D. Alder Drain located on the east side of the property.
4. CONTECH Corrugated Metal Pipe Runoff Detention Systems, is proposed under the parking lot of the Commercial Center to detain 100% of the runoff of the entire site.

5. BASIN AREAS

Land Use	Area
Commerciall	69.83 Ac
Street Area	7.81 Ac
Total	77.64 Ac.

6. RUNOFF ANALYSIS

The runoff analysis for the developed condition was performed using the *Rational Method.*

$$Q = C\ I\ A$$

Q = Required storage,
C = Runoff coefficient (1.0),
i = Rainfall intensity total (3 inches),
A = Area of basin in acres.

7. REQUIRED STORAGE

$$Q = C\ I\ A$$

Q = Required storage,
C = Runoff coefficient (1.0),
i = Rainfall intensity total (3 inches),
A = Area of basin in acres (77.64 acres)

$Q_{req'd}$ = 3/12 x 1 x 77.64 = 19.31 ac-ft
Qreq'd= 841,144 cf.

8. RETENTION BASIN SIZING

A 48”corrugated metal pipe is proposed for the runoff storage under the parking lot.

A 48” pipe can store 12.5 cf/lf

841,144/12.5 = 67,291.52 lf of 48” pipe is required to store the runoff of the entire site.

APPENDIX I

STORM WATER POLLUTION PREVENTION PLAN FOR

IMPERIAL CENTER

<u>Owner</u>
Suilo Investment Corporation
c/o Mr. James Lo
77288 Desert Drive
Rancho Mirage, CA 92270
(760) 837-3570

<u>Developer</u>
Tom DuBose
1122 State Street, Ste. D
El Centro, CA 92243
(760) 353-8110

Prepared by Laura D. Zahn Planner/Environmental Consultant

Date Notice of Intent Filed

State Water Resources Control Board Permit No.

TABLE OF CONTENTS

1. Site Evaluation and Design Development Phase

A. Site Information

a. * Existing Soils Information

Geology

Imperial County can generally be divided into three geomorphic provinces: the Peninsular Range, the Salton Trough, and the Mojave Desert. The Salton Trough is the most significant of the three provinces, as it under lays a majority of Imperial County. Also known as the Salton Sink, Cahuilla Basin and Salton Basin, the Salton Trough is basically a northwestern landward continuation of the Gulf of California rift, which was formed by gradual settling in association with uplift of the surrounding mountains during the Miocene, Pliocene and Pleistocene epochs. Much of the land surface within this province is below sea level, and the Trough extends from near Palm Springs approximately 180 miles south to the head of the Gulf of California.

The project site is located in the Colorado Desert Province of southeast California. The dominant feature of the Colorado Desert is also the Salton Trough. Thick sequences of sedimentary rocks of up to 20,000 feet underlie the alluvial cover of the area.

The Salton Trough has experienced continual in filling with both marine and non-marine sediments since its formation in the Miocene epoch (30 million years before present). The specific stratigraphy incorporates Middle and/or Lower Pliocene marine, undivided Pliocene non-marine, and quaternary non-marine terrace deposits. The Middle and/or Lower Pliocene marine deposits consist of light-gray clay stone containing some arkosic sandstones, calcareous oyster shell reefs, and fossilferous calcareous sandstone. The undivided Pliocene non-marine formations consist of interbedded arkosic sandstones and reddish clays. The Quaternary non-marine terrace deposits are believed to be Pleistocene in age.

Soils

Utilizing the Soil Survey of Imperial County, published by the U.S. Department of Agriculture Soil Conservation Service (SCS 1981), four differing soil types were identified within the project boundaries. They include: Holtville silty clay, Imperial silty clay, Imperial-Glenbar silty clay loams, and Meloland very fine sand loam. The following discussion identifies the characteristics associated with each soil:

- Holtville Silty Clay; this very deep, stratified soil is on flood plains and alluvial basin floors. The soil formed in water-laid sediment from mixed sources. Typically, the surface layer of this Holtville soil is light brown silty clay approximately 17 inches thick. Underlying this is light brown and very pale brown silty clay and silt loam approximately 18 inches thick. Below this to a depth of 60 inches is very pale brown loamy very fine sand. In other areas the surface layer is silty clay loam or clay loam, and it is over sandy strata. Permeability is slow in the clayey layer and moderately rapid in the underlying material. Available water capacity is high to very high and the Holtville soil is non-saline to slightly saline. In addition, surface run-off is slow, and the hazard of erosion is slight.

- Imperial Silty Clay; this very deep soil is on flood plains and in basins and lakebeds. It is formed in clayey sediment from mixed sources. Typically, the Imperial silty clay, wet, is pinkish gray and light brown silty clay to a depth of 60 inches or more. Efflorescence's of gypsum and brown stains are common in the cracks and pores. In some places the surface layer is silty clay loam or clay loam. Permeability is slow, and available water capacity is very high. The soil is slightly saline. Surface run-off is slow, and the hazard of erosion is slight.

- Imperial-Glenbar Silty Clay Loams; these nearly level soil are on flood plains and lakebeds within the irrigated areas of Imperial Valley. Refer to the Imperial soil discussion above for additional detail regarding soil characteristics of the Imperial silty clay. The Glenbar soil is very deep and formed in alluvium of mixed origin. Typically, the surface layer is pinkish gray silty clay loam approximately 13 inches thick. The underlying material is stratified light brown clay loam and silty clay loam, with thin lenses of silty clay and sandy clay loam to a depth of 60 inches. Permeability of this Glenbar soil is moderately slow, and available water capacity is very high. The soil is non-saline to slightly saline. Surface run-off is slow and the hazard of erosion is slight. In addition, the hazard of soil blowing is moderate.

- Meloland Very Fine Sandy Loam; this very deep, nearly level soil is on flood plains and alluvial basin floors and was formed in alluvial or Aeolian sediments of mixed origin. Typically, the surface layer of this Meloland soil is light brown very fine sandy loam approximately 12 inches thick. The underlying material is stratified; very pale brown loamy fine sand and silt loam approximately 14 inches thick. Below this is pink silty clay to a depth of 71 inches that has gypsum efflorescences in the cracks. In some places, the surface layer is silt loam, or fine sandy loam. Permeability is slow and available water capacity is high to very high. Surface run-off is slow and the hazard of erosion is slight. The soil is non-saline to slightly saline in the surface layer but is moderately saline below a depth of approximately 2 feet.

b. Existing Runoff Water Quality: The site is flat vacant land. If there was a rain event, the water would contain sediment from the land as it flowed over the site.

c. Location of Surface Waters on the Construction Site: There are no "surface waters" on this flat site.

d. Name of Receiving Water: Salton Sea

B. Site Plan

a. Sensitive Areas: This land has been disturbed by agricultural production for 70 years, which eliminates any sensitive areas.

b. Steep Slopes/Unstable Slopes: The topography of this land is "flat" land leveled land.

c. Surface Waters/Wetlands: This land does not contain any surface waters, nor is it near any wetlands.

d. Existing Drainage Channels: The Alder Canal runs north to south along the western boundary of the project site. Storm water that cannot be discharged through the existing restricted connection to the Drain must be retained on-site until it can drain through the allocated connection. For on farm irrigation this is not a problem, however the system as currently operated does not allow for storm water run-off without on-site detention to allow for gradual release.

e. Areas Preserved or Open Space: The overall project will provide for a minimum of 10% open space/landscaped areas. The project will offer numerous walking paths to access the various retail opportunities. These paths will be landscaped with a variety of colorful vegetation, shade trees, benches and water elements. There will be an outdoor shaded auction center that will also serve as a community gathering place for public and private venues.

C. Construction Activity

a. Purpose of Construction Project:

b. Soil Disturbing Activities:

1) Demolition: There are no existing buildings on the project site.

2) Clearing/Excavation:

3) Stockpiling:

4) Rough Grading:

5) Final/Finish Grading:

6) Seeding or Planting:

D. Pollution Prevention Site Map: See Attached

2. Assessment Phase:

A. Site Area:
   1) Parcel/Property Area:
   2) Disturbed Area:
   3)

B. Drainage Areas:

C. Runoff Coefficient:

Table 1. Typical "C" Values:

3. Control Selection/Plan Design Phase:

A State and Local Requirements: This project will be controlled by the following
Documents:

* National Pollution Discharge Elimination System Permit (NPDES)
* Environmental Protection Agency-Storm Water Management For Construction Activities Manual
* Regional Water Quality Control Board – Notice of Intent and Waste Discharge Identification Number
* General Construction Storm Water Permit
* Storm Water Pollution Prevention Plan (SWPPP)

B Erosion Controls:

Stabilization: The following Best Management Practices (BMPs) will be implemented which have been adopted from the Cal Trans Construction Site Manual.

1) Temporary Seeding:

2) Permanent Seeding:

3) Mulching:

C Sediment Controls:

1) Earth Dike:

2) Silt Fence:

3) Sediment Trap:

4) Sediment Basin:

D Other Controls:

1) Construction Site Waste Materials:

2) Sanitary Wastes:

3) Dust and Tracking Controls:

4) Non-Storm Water Discharges:

E Storm Water Management Controls:

1) Retention Pond:

2) Detention Pond:

3) Infiltration Measures:

4) Vegetated Swales/Natural Depressions:

F. Location of Controls on Site Map: Please See Attached Map

G. Inspection and Maintenance Plan: Inspection = Twenty-four hours prior to a storm event, during a storm event and after the storm event. Maintenance = Repairing and or reinforcing of any control measures.

H. Description of Major Activities:

I. Sequence of Major Activities:

<u>4. Certification and Notification Phase:</u>

A. Certification of the Pollution Prevention Plan:

B. Notice of Intent:

5. Construction/Implementation Phase:

A. Controls:

B. Maintenance of Controls:

1) Inspection:

2) Maintenance/Repairs:

C. Construction Activity Report:

D. Update/Changes:

E. Record of Reportable Quantities Released:

F. Plan Location and Access:

6. Stabilization/Termination Phase:

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction of supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed:____________________________________
Laura D. Zahn
Planner/Environmental Consultant

Date:__________________________

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollution Discharge Elimination System (NPDES) permit that authorizes the storm water discharge associated with industrial activity from the construction site Identified as part of this certification.

Signature	**For**	**Responsible For**
____________________ ________________	________________	
Date:________________		
____________________ ________________	________________	
Date:________________		
____________________ ________________	________________	
Date:________________		

Heber Public Utility District

Service Area Plan

FINAL

Prepared for

Heber Public Utility District

June 2004

Prepared by

Nolte Associates, Inc.

NOLTE

BEYOND ENGINEERING

HEBER PUBLIC UTILITY DISTRICT

2004 SERVICE AREA PLAN

Heber, CA

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SUMMARY

The Heber Public Utility District (District) contracted Nolte Associates, Inc. to prepare a Service Area Plan. The purpose of this plan is to furnish the District with a master planning tool for the services that it provides. These services include water treatment and distribution, wastewater collection and treatment, lighting, and park operations and maintenance. This plan assesses the services currently provided and outlines the infrastructure improvements required to supply those services to anticipated developments within the District's sphere of influence. Also contained in this Service Area Plan is a financial plan to fund the District's operations and infrastructure improvements to provide service to the District's customers over the next five years. The plan is based on anticipated growth in the area over the next 15 years in 5-year increments.

This plan contains a Capital Improvements Plan (CIP) for the water treatment facility, water distribution system, wastewater collection system, and wastewater treatment facility. This plan contains estimated costs for treatment facility improvements, but does not include a detailed study of each facility. This plan does not address water purveyance to the Heber Public Utility District by the Imperial Irrigation District or other agency.

Street lighting and parks services are included in the financial plan. The capital costs for expanding these facilities shall be borne by developers and not by the District. As such, a CIP for these facilities has not been prepared or included in this plan.

Water System Recommendations

- A key part of the future distribution system will be a looped 20- and 30-inch pipe that surrounds the existing service area. This loop will ultimately be the backbone of the system, ensuring adequate pressures throughout the distribution network.
- The District should encourage developments closest to the existing water distribution network to connect first. This will permit connection fees and operating revenues, while keeping pipeline capital costs low by reducing and postponing the linear footage of pipeline necessary to serve the proposed developments.
- The loop will connect with a system of 12-inch pipelines that will provide service to customers inside and outside of the loop
- Distribution pipelines should be constructed in phases corresponding to growth patterns in the District

- Connect parallel pipelines and remove dead ends by looping
- Prepare a fire hydrant replacement program
- Increase system operating pressure as developments occur south of the existing township
- The District should prepare a detailed technical Master Plan for the Expansion of the water treatment facility, including potable water storage and distribution pumping.
- The District should maintain treatment facility capacity greater than the anticipated maximum day demand.

Wastewater System Recommendations

- The District should encourage developments closest to the wastewater treatment facility to connect first. This will permit connection fees and operating revenues, while keeping pipeline capital costs low by reducing and postponing the linear footage of pipeline necessary to serve the proposed developments.
- The existing wastewater collection system capacity will not support new developments. All wastewater from new developments will have to travel to the treatment facility via new pipelines.
- The District should begin a program of video inspection of the gravity pipelines to identify deteriorating pipelines and areas with groundwater infiltration
- The District shall prepare a detailed technical study of the wastewater treatment facility.
- The District will increase treatment facility capacity as necessary and as scheduled in this document to ensure that flows are less than 80% of permitted capacity.

Additional Recommendations

- The District should reexamine development and infrastructure improvement plans every five years. The district should employ the water and wastewater system models to help determine what improvements should be made
- The District should update and calibrate the water and wastewater models every few years to ensure their accuracy

2004-2008 Capital Improvements

This phase represents the most accurate outlook for development. During this phase, improvements will be concentrated in areas northwest and east of the exiting Township. The developments include housing, commercial developments, and one school.

Water Improvements

The first portions of the 20- and 30-inch loop will be constructed. These large improvements will be a base for future growth, while providing capacity for fire flows at the new developments. Several connections will be made between existing parallel pipelines to improve system performance. The District should also begin the fire hydrant replacement program as part of its annual small capital outlay, replacing a few hydrants every year. The water treatment facility has only 700,000 gallons of excess capacity. It will need to significantly increase its capacity. The treatment capacity increase schedule is shown in the Appendix.

Wastewater Improvements

All future developments will require new pipelines to the treatment facility. Large diameter pipelines near the treatment facility will convey consolidated flows from all future developments. During this phase, the improvements will take place north and east of the existing Township. The treatment facility has approximately 420,000 gpd of excess capacity. Generation from proposed developments will eclipse that capacity within the first five years. The wastewater treatment facility will need to increase its capacity. The treatment capacity increase schedule is shown in the Appendix.

2009-2013 Capital Improvements

Further development during this phase will again take place east and west of the existing Township. These developments will include commercial centers and single-family housing.

Water Improvements

The remaining portions of the 20-inch loop will be completed during this phase. Significant expansion of the network will take place southeast of the Township to serve Heber Ranch and the Scaroni Property. Minor improvements will be made to provide service to new service areas northwest of the Township. Additional capacity at the water treatment facility will be required.

Wastewater Improvements

Gravity additions will be made east of the Township to service the Imperial Center. Additional capacity at the wastewater treatment facility will be required.

2014-2018 Capital Improvements

This time period represents a conservative conceptual outlook at a full build-out scenario. With these improvements, the water distribution network and the wastewater collection system will be completed. Additional capacity improvements will be required at both treatment facilities.

Table S-1 Capital Improvements Summary

Year	Water Distribution System Improvements	Water Treatment Improvements	Water Treatment and Distribution System Improvements	Wastewater Collection System Improvements	Wastewater Treatment Improvements	Wastewater Treatment and Distribution System Improvements
2004-2008	$ 6,027,600	$ 9,000,000	$ 15,027,600	$ 4,245,120	$ 3,600,000	$ 7,845,120
2009-2013	$ 5,471,500	$ 22,500,000	$ 27,971,500	$ 2,506,600	$ 9,570,000	$ 12,076,600
2014-2018	$ 3,379,200	$ 3,000,000	$ 6,379,200	$ 2,148,000	$ 2,400,000	$ 4,548,000
Total	$ 14,878,300	$ 34,500,000	$ 49,378,300	$ 8,899,720	$ 15,570,000	$ 24,469,720

Financial Summary

Capacity fees will be a primary means of funding the proposed water and wastewater improvements. The water system improvements will require the District to incur long term debt to finance the projects outlined in the Capital Improvements Plan. The wastewater system, due in large part to the excess capacity at the wastewater treatment facility, will not have to incur long term debt to finance those projects. The capital improvements can be paid for through connection fees. Significantly increased property tax revenue will permit the District's General Fund to fund administrative, parks, and lighting services, as well as establish a cash reserve.

Plan Methodology

The water distribution and wastewater collection system improvements schedule were determined with the assistance of system modeling software. With information from the District on the existing systems' infrastructure, water usage history and wastewater flows, the hydraulic models were developed and calibrated to represent the existing system. Landowners in the service area were contacted to determine development plans, including the type and schedule for the development. For areas where development is not planned, single-family housing is assumed. This provides a conservative outlook for a conceptual full build out scenario. Using the calibrated model of the existing system as a base, the demands from the planned developments and the assumed housing were placed into the model to determine what the fully built water distribution and wastewater collection system would look like.

With the full build out system established, the improvements required to serve the developments planned in the first five years were determined. These improvements are pieces of the eventual, fully constructed systems. Using this method, the District will avoid installing parallel water lines and relief sewers in the future. For the next five-year phase, the anticipated additional demands were examined to determine what additional infrastructure would be necessary.

INTRODUCTION

Purpose of Plan

The purpose of this plan is to furnish the Heber Public Utility District (District) with a master plan tool for providing services to existing and future customers. These services include and are limited to water treatment, water distribution, wastewater collection, wastewater treatment, street lighting, and park operations and maintenance. This plan is based on anticipated growth in the area over the next 15 years in 5-year increments.

This plan establishes a Capital Improvements Plan for water distribution and wastewater collection systems. The improvements are separated into five-year increments, based on scheduled and anticipated demand increases within the respective systems. This plan also includes a timeline for capital improvements to the water treatment facility and wastewater treatment facility to ensure that there is sufficient capacity for the projected additional demands. The plan includes estimated costs for treatment facility improvements, but a detailed study of each facility is not included and is not within the scope of work. This plan does not address the purveyance of untreated water to the Heber Public Utility District from the Imperial Irrigation District.

This plan's financial analysis addresses the operations and maintenance costs of the street lighting and parks services. The capital costs for constructing new facilities shall be borne by developers; therefore a Capital Improvements Plan for these services is not included and has not been prepared.

Summary tables of the projected water demands and wastewater generations are presented in this document. Detailed tables of water demands and wastewater generations can be found in the Appendix.

This Service Area Plan has been developed concurrently with an Annexation Plan by The Holt Group for the District.

Content and Methodology

This plan has been assembled according to State Guidelines and the *Service Area Plan Guidelines (1995)* provided by Imperial County LAFCo. The basis of this Service Area Plan is the anticipated developments outlined in Figure 1. These developments drive the necessary improvements to the water and wastewater systems and the financial plan to fund the necessary improvements. From the anticipated development types and schedule, the improvements required for the water and wastewater systems were determined. These improvements were assembled into a Capital Improvements Plan for the water and wastewater systems. The CIP's were then used as the basis for the financial analyses. Also shown on Figure 1 are the existing Sphere of Influence (SOI), the proposed expanded SOI, and the existing District Service Boundary.

Key items in the development of this Service Area Plan are the water and wastewater system models. These models are aimed to simulate the two systems under various loading scenarios. These models will allow the District to schedule and prepare infrastructure improvements in the water distribution and wastewater collection systems to accommodate additional demands as developments come forward.

Area Description

Heber is an unincorporated community of Imperial County, California, located six miles north of the United States-Mexico Border between the cities of El Centro and Calexico on Highway 86. Heber is 60 miles west of Yuma, AZ and 120 miles east of San Diego, CA. Its northern border is one mile south of Interstate 8 (McCabe Road) and Highway 111 is its easterly boundary. Jasper Road and the City of Calexico form its southern boundary. See Figure 1.

The central service area can be characterized as residential and industrial, with agriculture surrounding the Township of Heber. The Union Pacific Railroad has an important branch that traverses the Township from the northwest to the southeast. The topography of the area is essentially flat, with the ground surface generally sloped downward toward the north. The Imperial Irrigation District has several canals, drains, and laterals in the northeast portion of the Township.

District Background

The District's residents elect a five member Board of Directors. A General Manager reports directly to the Board of Directors and is charged with overseeing District operations and employees. The District contracts legal counsel that reports to the Board of Directors and the General Manager. Operations, administration, parks, and consultants hired by the District report to the General Manager. Refer to the Appendix for an organizational chart of the District dated December 2001.

The District has a total of 8 full time employees, including three office and five operations staff members. The District is searching for a General Manager. The District has temporary help on occasion as needed. FY2004 expenses for salaries, wages, and fringe benefits totals $412,000.

This cost is divided among the Water Enterprise Fund, Wastewater Enterprise Fund, and General Fund.

Existing Water Distribution Facilities

The existing distribution facilities are generally small pipelines, with diameters ranging from 3 to 10 inches. There is a small amount of 18-inch pipe along Dogwood Road south of Main Street, and 12-inch pipe in the new Heberwood Estates development. Pipe materials are a mix of asbestos cement and polyvinyl chloride (PVC). Most of the older system is of small diameter, asbestos cement pipes. During the mid and late 1980's, several 8-inch, 10-inch, and 12-inch pipelines were installed parallel to these pipelines. The normal system operating pressure is 45 psi. Please refer to Figure 2 in the Appendix for a map of the existing distribution system.

Many of the fire hydrants are of substandard design. For much of the area, the pipelines surrounding the hydrants are less than six inches in diameter, causing substantial pressure drops in the outlying portions of the network. The Imperial County Fire Marshal reports that the old part of the Township uses cast iron hydrants that are substandard. In general, available fire flows are below acceptable levels. This is a result of the small diameter pipelines in the network and the system's age. Available fire flows in single family home areas should be approximately 2,500 gpm; in multifamily, commercial, industrial, and school areas, 4,000 gpm should be available. Currently the water distribution system cannot deliver these flow volumes. The District will replace some of the substandard hydrants every year through the small capital outlay until all of the substandard hydrants are replaced.

Existing Wastewater Collection Facilities

Most of the system's pipelines are 8-inch diameter pipe, generally of vitrified clay and polyvinyl chloride, with some 12-inch pipe along Hawk Avenue. The pipeline system flows via gravity pipelines and forcemains toward the wastewater treatment facility east of Rockwood Street, one block north of Sixth Avenue. Due to the shallow groundwater, flat topography and the location of wastewater treatment facility, several lift stations are required throughout the system. Including the lift station at the treatment facility, there are seven pump stations in the system. Most of these are above ground, positive suction stations. Figure 6 shows the existing wastewater collection system.

Existing Water Demands

Most of the District's water customers are single and multi family units. Other customers include the geothermal plant, schools, and the County Roads facility. The average daily water consumption in the district is 750,000 gpd. As is the case with most communities in the Imperial Valley, water consumption rises significantly in the summer months. Due to climate, irrigation of parks, schools, and landscaping, water consumption increases substantially. According to District records, the average daily consumption in winter months is less than 500,000 gpd. During summer months, the average daily consumption is over 1,000,000 gpd.

Existing Wastewater Generation

Similar to the water system, the wastewater is generated from residences with a few other sources such as schools, the geothermal plant, and small stores. The average daily wastewater flow to the treatment facility is approximately 350,000 gallons per day. This remains stable throughout the year; it does not increase substantially during hot summer months. During peak hours in the morning, the rate of wastewater flowing into the treatment facility is generally double the average daily flow.

BUILDOUT PROJECTIONS

Land Use Modification Plans

Anticipating land use changes is key to establishing a Capital Improvements Plan for the District. Knowing the planned uses for properties not currently served by the District allows it to plan infrastructure improvements to service those areas with water and sewer services. Timing the land use changes, and thus the water and wastewater improvements, is the basis for the Capital Improvements Plan for each system.

Landowners were contacted to determine their plans for development in the service area. Areas for which no plans for development exist were relegated to the Full Build Out scenario. These areas are assumed to be developed with single family housing.

For this plan, a full buildout was used as the basis for expanding the water and wastewater systems. The full buildout scenario contains all of the developments shown in Figure 1 and single family housing comprising the remaining areas within the Sphere of Influence described in the Introduction. Single family housing has been assumed for areas outside of the developments shown in Figure 1 and after 2013 because it is a likely and conservative scenario for most of those areas. The District should reexamine the anticipated developments every few years to reevaluate the needs to expand the pipeline, pumping, and treatment facilities.

PHASING PROJECTIONS

Shown in Figure 1, there are several planned housing developments in the areas northwest and east of the existing Township. These developments have a proposed number of housing units. Tables 1 and 2 outline the anticipated additional water demands and wastewater generation for the areas with known developments, respectively. For years beyond 2008, four houses per acre were assumed for areas without known development plans. Refer to the Appendix for detailed water demand and wastewater generation formulation tables.

2004- 2008

In this time period, development plans are known for several areas near the existing Township. These housing, school, and commercial plans are considered fixed to continue toward construction and occupancy. Developments in this time period are a base upon which the District should develop construction improvement plans. Diagrams 1 and 2 highlight this phase's plans. In the diagrams, blue text is for additional demand during that phase and black text is for demand that is already present at the beginning of the phase.

Table 1 2004-2008 Additional Water Demand

Development	Type	Total Additional Average Day Water Demand (gpd)	Total Additional Max Day Water Demand (gpd)	Total Additional Peak Hour Water Demand (gpd)
McCabe Ranch 1	Residential and Comm.	145,350	363,375	436,050
Heberwood Estates	Residential	193,200	483,000	579,600
Chelsea	Residential	25,600	64,000	76,800
Correll Estates	Residential	121,900	304,750	365,700
Heber Elementary School	School	12,000	30,000	36,000
Heber Meadows	Residential	251,600	629,000	754,800
Heber 142	Residential and Comm.	688,550	1,721,375	2,065,650
Imperial Center	Commercial	18,500	46,250	55,500
Heber Foundation	Residential	11,040	27,600	33,120
Total		**1,467,740**	**3,669,350**	**4,403,220**

Diagram 1 2004-2008 Additional Average Daily Water Demand

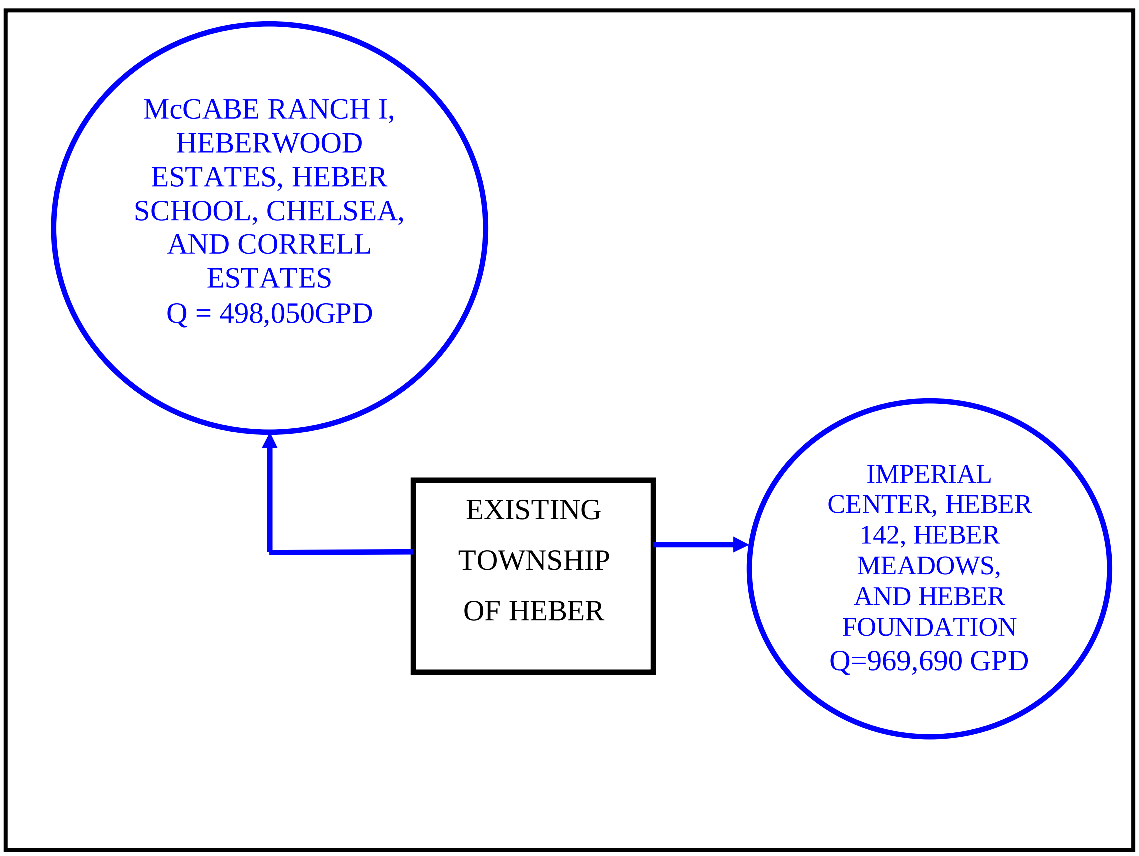
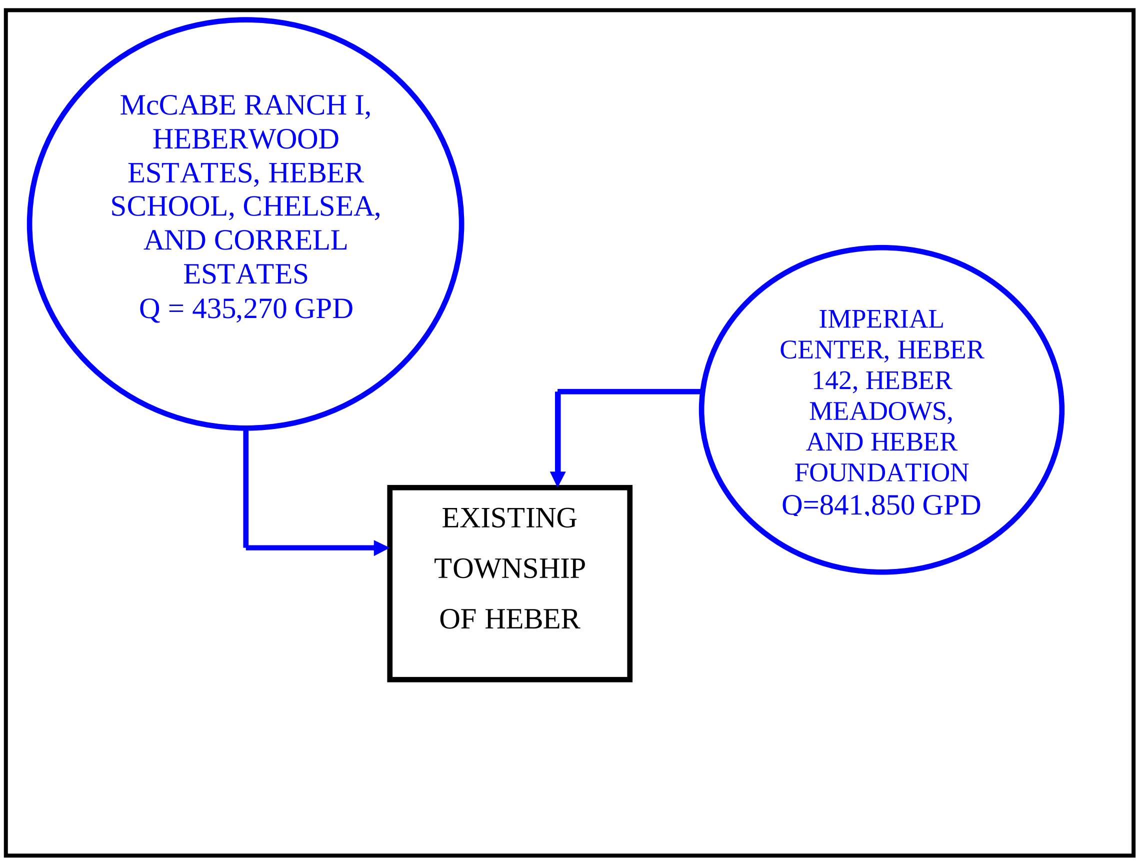


Table 2 2004-2008 Additional Wastewater Generation

Development	Type	Total Additional Average Day Wastewater Generation (gpd)	Total Additional Peak Hour Wastewater Generation (gpd)
McCabe Ranch 1	Residential and Comm.	126,870	252,750
Heberwood Estates	Residential	168,000	336,000
Chelsea	Residential	22,400	44,800
Correll Estates	Residential	106,000	212,000
Heber Elementary School	School	12,000	12,000
Heber Meadows	Residential	219,600	439,200
Heber 142	Residential and Comm.	601,350	1,197,750
Imperial Center	Commercial	11,300	11,300
Heber Foundation	Residential	9,600	19,200
Total		**1,277,120**	**2,525,000**

Diagram 2 2004-2008 Additional Average Day Wastewater Generation



2009-2013

This time period includes a few planned developments for housing and commercial developments in the service area. In general, this time period extends beyond the planning horizon that can be considered reliable and fixed. Diagrams 3 and 4 highlight the development plans for this phase. As stated earlier regarding the Diagrams, blue text is for additional demand during that phase and black text is for demand that is already present at the beginning of the phase.

Table 3 2009-2013 Additional Water Demand

Development	Type	Total Additional Average Day Water Demand (gpd)	Total Additional Max Day Water Demand (gpd)	Total Additional Peak Hour Water Demand (gpd)
McCabe Ranch 2	Residential and Comm.	430,460	1,076,150	1,291,380
Scaroni Property	Residential and Comm.	805,320	2,013,300	2,415,960
Heber Ranch	Residential and Comm.	1,610,640	4,026,600	4,831,920
Total		**2,846,420**	**7,116,050**	**8,539,260**

Diagram 3 2009-2013 Additional Average Day Water Demand

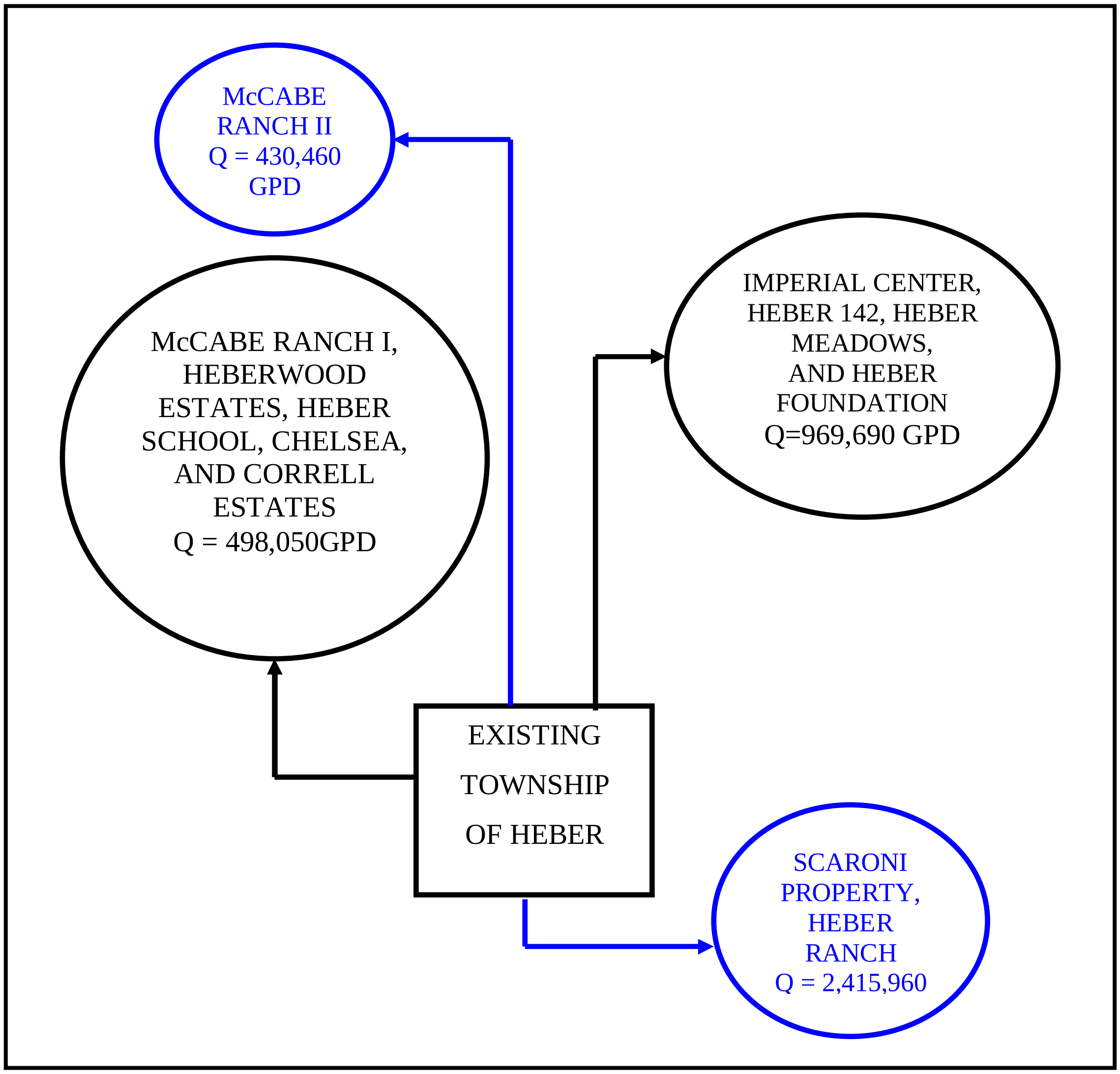
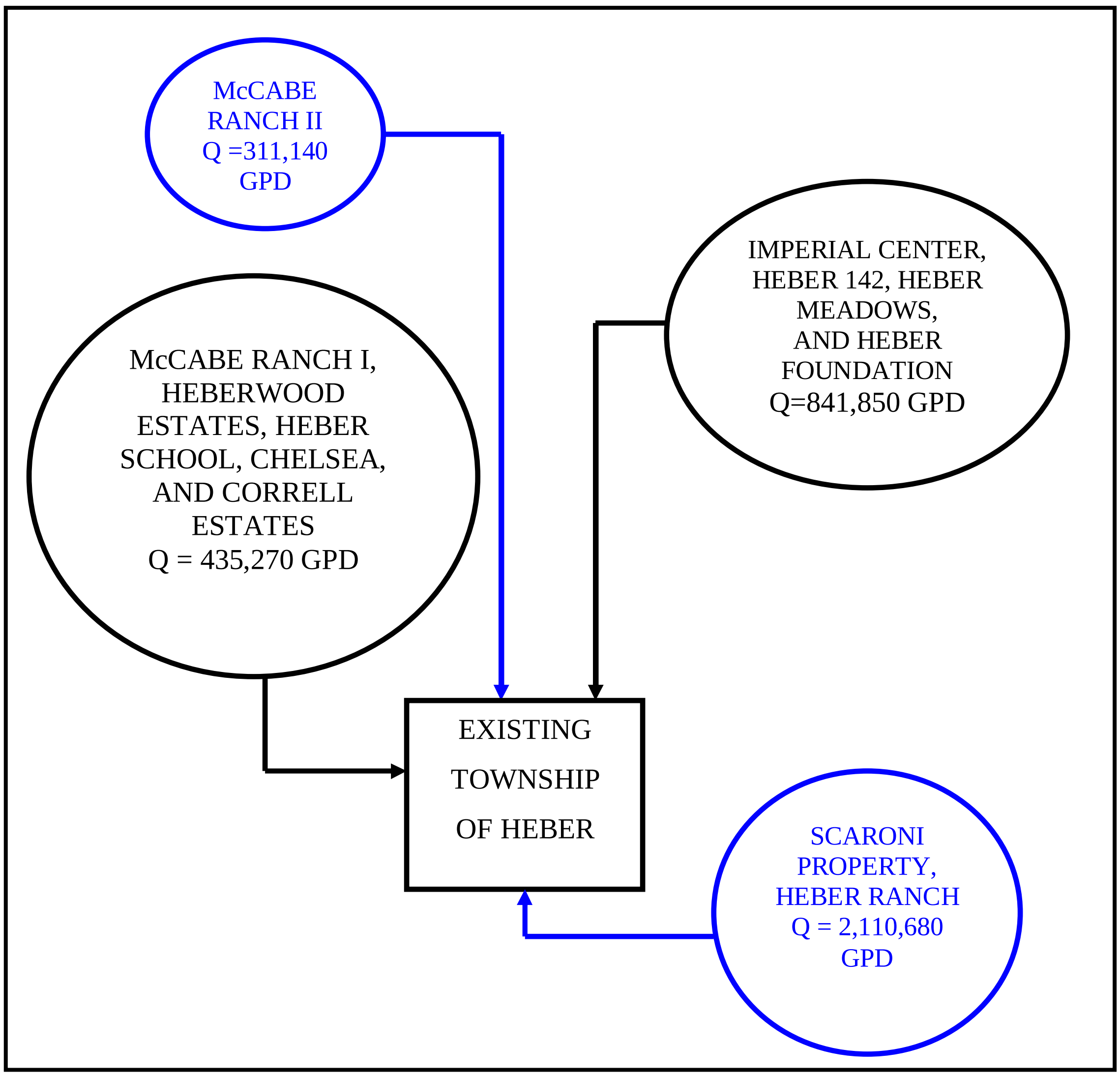


Table 4 2009-2013 Additional Wastewater Generation

Development	Type	Total Additional Average Day Wastewater Generation (gpd)	Total Additional Peak Hour Wastewater Generation (gpd)
McCabe Ranch 2	Residential and Comm.	311,140	613,180
Scaroni Property	Residential and Comm.	703,560	1,400,520
Heber Ranch	Residential and Comm.	1,407,120	2,801,040
Total		**2,421,820**	**4,814,740**

Diagram 4 2009-2013 Additional Wastewater Generation



2014-2018

This time period provides a conceptual full build-out scenario upon which the District can base future growth plans beyond the initial 5 and 10 years. This represents a scenario for the District in which single family homes are assumed for areas that do not have specified development plans. Although single family homes will not constitute the entire remaining area in the District, it does present a conservative demand scenario for the future. Based on the full build-out demand, the District will have a conceptual outlook for an eventual distribution network. The District should reexamine the anticipated improvements within the next five years to formulate a more accurate and precise version of what these improvements will be.

Water System Model

The water distribution system was modeled using WaterCAD v. 4.5 from Haestad Methods. The model employed the Hazen-Williams formula.

Information on the existing distribution network was obtained through various sources. Among them were construction drawings for improvements during the last few decades:

Water and Sewer Pipelines - Waddell Engineering June 1984

Water and Sewer Pipelines - Waddell Engineering March 1987

Water and Wastewater Improvements - Garver Engineers September 2000

Potable Water and Sanitary Sewer Pipelines - Nolte Associates, Inc. July 2002

The model was calibrated by comparing pressures and flows in the model and in the physical system at several locations in the network, generally at locations away from the water treatment facility. To adjust the model to match the physical system, several system properties could be modified. These modifications included system demands and pipeline roughness coefficients.

Demand Scenarios

Several scenarios were examined using this model. Average Day, Peak Hour, and Maximum Day Plus Fire flow demand scenarios were developed for years 2004 (existing), 2008, 2013, and 2018. These flow conditions were based on scheduled and assumed developments as shown in Figure 1. Infrastructure (pipelines) and projected demands were placed into the model to determine what infrastructure improvements would be needed to match the anticipated demand scenarios.

The improvements were the divided into five-year increments for the Capital Improvements Plan. System improvements were selected based on the anticipated growth shown in Figure 1.

Wastewater System Model

The wastewater collection system was modeled using SewerCAD v.5.0 from Haestad Methods. Information on the existing distribution network was obtained through various sources. Among them were a system map and construction drawings for improvements during the last few decades.

General Plan Sewage Facilities - Bryant, Jehle & Associates June 1969
Water and Sewer Pipelines - Waddell Engineering June 1984
Water and Sewer Pipelines - Waddell Engineering March 1987
Water and Wastewater Improvements – Garver Engineers September 2000
Potable Water and Sanitary Sewer Pipelines - Nolte Associates, Inc. July 2002

Demand Scenarios

Several scenarios were examined using this model. Average Day and Peak Hour flow scenarios were developed for years 2004 (existing), 2008, 2013 and 2018. These flow conditions were based on scheduled and anticipated developments as outlined in Figure 1. Infrastructure was placed into the model to determine what improvements would be needed to match the anticipated demand scenarios.

REQUIREMENTS FOR PUBLIC SERVICES

Planning and Design Criteria

The planning and design criteria set forth in this section are used to assess the capabilities of the existing water and wastewater infrastructure to meet current and future service demands. The criteria are also used to recommend facilities and infrastructure for resolving identified deficiencies. These criteria are recommended and are not intended to be restrictive or absolute. They are based on generally accepted criteria of the water and wastewater industry and professional judgment. Table 5 shows the criteria for the water distribution system. Table 6 shows the criteria for the wastewater collection system.

Table 5 Water Distribution System Criteria

Item	Criteria
Maximum pipeline velocity	
Max day plus fireflow	15 feet per second
Peak hour	7 feet per second
Hazen Williams roughness coefficient (including normal aging, bends, and valve losses)	
New pipe (<10 years old)	140
Old pipe (>10 years old)	100
Pipe materials	PVC or HDPE
Minimum new pipe diameter	8 inches
Normal operating presssure	45 psi
Maximum system pressure	80 psi
Minimum pressure	
Fireflow conditions	20 psi
Peak hour flow conditions	35 psi
Minimum valve spacing	600 feet
Pipeline service life	40 years

Table 6 Wastewater Collection System Criteria

Item	Criteria
Pipeline velocity	
Minimum in gravity pipelines (peak hour flow)	2 fps
Minimum forcemain velocity	2 fps
Maximum forcemain velocity	7 fps
Design flow depth	
8-15 inch pipeline	1/2 pipe diameter
> 15 inch pipeline	3/4 pipe diameter
Mannings roughness coefficient	
New pipe (HDPE or PVC)	0.011
Existing pipe	0.013
Hazen Williams roughness coefficient	
New pipe (<10 years old)	140
Old pipe (>10 years old)	100
Maximum manhole spacing	400 feet
Pipeline service life	40 years
Lift Stations	
Minimum capacity	2 times peak hour flow (including backup)
Minium storage	4 hours of peak hour flow
Emergency back up	Portable generator
Number of starts per hour	1/2 of manufacturer's recommendation
Minimum pipe slope	
6 inch diameter	0.005
8 inch diameter	0.004
10 inch diameter	0.003
12 inch diameter	0.0022
15 inch diameter	0.0018
18 inch diameter	0.0015
21 inch diameter	0.0012
24 inch diameter	0.0009

Guidelines for System Improvements and Expansion

The District is developing guidelines for improvements to the water and wastewater systems. The guidelines should be approved by the District's Board of Directors in summer 2004.

Water System Recommendations

The existing distribution system does not extend to the proposed developments and does not have the capacity to serve them. A key part of the future distribution system will be a looped 20-inch pipe that surrounds the existing service area. Portions of this pipeline near the treatment facility will have a diameter of 30-inches to accommodate the high flows exiting the treatment facility before branching to other distribution pipes. This pipeline will ultimately be the backbone of the system. This pipeline will help ensure adequate pressures throughout the distribution network. This pipeline should be constructed in phases corresponding to growth patterns in the district. This means that the pipeline will be constructed piecemeal as developments in the area proceed. Branching off the loop should be 12-inch pipelines that will connect to the proposed developments.

The District has 700,000 gallons of excess capacity at the water treatment facility during maximum day demand. Therefore, additional capacity will be required to support all of the anticipated developments. Capacity increases will take place in stages over the first phase.

The improvements through 2018 represent a conceptual look at what the distribution network should look like at full build-out. The most accurate projection for development and required infrastructure improvements is the first five-year phase. It is recommended that the District reexamine development and infrastructure improvement plans every five years. Likewise, the district should employ the water system model to help determine what improvements should be made. The District should update and calibrate the model every few years to ensure its accuracy.

2004-2008

During this time period, development of housing and a school northwest and east of the existing service area are planned. Commercial and residential construction is also planned in areas east of the Township. The number of services should more than triple. For this reason, most of the improvements lie northwest and east of the existing Township. Here, the 20-inch and 30-inch loop will begin. The 30-inch portion of the loop will be used in areas near the treatment plant. The larger diameter is required because of the higher flows that this pipe will handle between the treatment facility and when other pipes can absorb more of the flow. In this phase, the northern and much of the east and west segments of the 20-inch and 30-inch loop will be constructed, along with the 12-inch pipelines that will complement the loop.

The distribution network has several pipelines that flow parallel and adjacent to each other for long distances, but do not connect. This does not maximize the performance of the pipelines. Periodic connections of parallel pipelines will enhance the system's performance at a minimal cost. Another gain is a decrease in "dead-ends" where water remains stagnant for long periods of time, which can result in poor water quality.

The District should implement a program to replace old fire hydrants. The District should work with the Imperial County Fire Department to establish a replacement schedule for the remaining substandard hydrants. This program will be financed annually by small capital outlays as shown in the Financial section of the document.

Capacity upgrades will be necessary at the water treatment facility to permit the District to supply sufficient potable water to future customers. These improvements will be done in a modular fashion, adding treatment units and processes prior to allowing new developments to connect to the system. The existing demand, capacity, and schedule for these improvements are outlined in the Appendix.

2009-2013

During this phase, large commercial and housing developments are anticipated in the areas southeast and northwest of the existing service area. More additions to the network should also be continued in the northern part of the service area.

Water consumption will also increase substantially during this period. The additional demand requires the completion of the 20-inch and 30-inch loop. A 30-inch pipeline should be built from the treatment plant to the intersection of Heber Road and Dogwood Road. The existing pipeline is too small. With the additional flow, the pressure losses in the existing pipe will substantially lower the pressure of the entire network.

2014-2018

This time period represents a conceptual full build-out scenario for the District. The development in this period is unknown. For purposes of this plan, single-family housing was anticipated in the remaining undeveloped portions of the District's service area. As recommended earlier, the District should reexamine the development plans every five years.

The surface elevation of the service area rises as one heads south toward Calexico. Because of this, there will be substantially lower pressure in the southeast portion of the system. Therefore, the District should increase the normal operating pressure of the system. This will help ensure that adequate pressures are available in that area, especially during fire.

If redevelopment of portions of the existing Township occurs, it can be a very cost effective opportunity to replace and increase the sizes of pipelines to enhance the service reliability to existing and future customers. In such a case, the District should reexamine the models to see what improvements should be made.

Wastewater System Recommendations

The most important finding of this study is that the existing collection system does not have the capacity for additional developments. New developments should connect to the wastewater treatment facility through new pipelines. The existing pipelines nearest the treatment facility do not have the capacity to handle additional demands. Therefore, several new trunk sewers are proposed for the conceptual full build-out scenario. These new trunk sewers should be large diameter pipelines. This allows for future growth and permits the pipelines to be placed at a flatter slope, reducing the need for lift stations. Because of a high groundwater table within and the flat topography throughout the service area, additional lift stations will be required.

The District should begin a program of video inspection of their existing gravity pipelines to determine which pipes are in poor condition and have infiltration problems. This can help determine which pipes should be replaced or lined to ensure reliable service, prevent spills, avoid costly pipeline failure, and reduce the volume of infiltration entering the existing system. Likewise, the District should regularly flush all of their gravity pipelines at least once per year to remove grease buildups and other blockages.

The District's wastewater treatment facility has excess capacity. Due to the high level of anticipated development, additional capacity will be added at two stages over the next five years. Treatment capacity will be added in a modular fashion, so that all units at the facility hydraulically balance.

The District should calibrate the wastewater collection system model every three years. Similarly, when a development is proposed, the model should be reexamined to verify that proper service is provided without adverse effects on the existing system and its customers.

2004-2008

This time period provides the most definite scenario for growth. The demands produced by these developments should be considered first, but within the overall conceptual vision of the ultimate build-out scenario. This phase will be the first step in the construction of that system.

During this time, there will be a large amount of residential and commercial developments, as well as a 600-student elementary school north of Correll Estates. Growth is projected to take place west, northwest and east of the existing Township.

New large diameter pipes are required for areas close to the wastewater treatment facility. This will allow developments after this phase to connect into the system, and will prevent the future construction of relief sewers through inhabited portions of the community. Pump Stations are required for areas north of the wastewater treatment facility, where surface elevations are lower and the topography substantially inhibits the use of gravity pipelines.

The treatment facility will need to increase its capacity during the next five years. The existing demand, capacity, and schedule for these improvements are shown in the Appendix.

2009-2013

During this phase, large residential and commercial developments are planned for areas southeast of the existing Township. Additional residential developments are planned for an area northwest of the existing Township. Much of the infrastructure needed for these areas has been outlined for construction during the 2004-2008 phase. During this phase, a 15-inch pipeline should be constructed north of Correll Road. Several large diameter pipelines will be required to serve Heber Ranch's and the Scaroni Property's developments. Additional treatment plant capacity will be necessary.

2014-2018

This time period represents a conceptual full build-out for the District's service area. Here, a complete wastewater system has been outlined. For purposes of this model, single family housing was assumed for the remaining undeveloped areas. This provides a conservative estimate for future growth, upon which the District should plan its infrastructure improvements.

The District should reexamine development plans for its service area at least every five years. Based on this, proper adjustments should be made to the wastewater model and future infrastructure plans.

If the existing wastewater treatment plant is replaced during the next few decades, it should be located north of the existing service area where surface elevations are lower. This will allow greater use of gravity pipelines and less dependence on pumping stations and forcemains. This can substantially lower operations and maintenance costs for the collection system. The capacity of the District's treatment facility will need to increase.

If a major redevelopment project takes place within the existing Township, the District should look at this as an inexpensive opportunity to replace and/or upsize existing pipelines. At such a time, the model should be reexamined to maximize the effects of such improvements.

Water Distribution System Capital Improvements Plan

This section contains estimated costs for the proposed improvements that were outlined in the Water System Recommendations section. The improvements have been divided into five-year phases: 2004-2008, 2009-2013, and 2014-2018. The Capital Improvements for the water distribution system during 2004-2008, 2009-2013, and 2014-2018 are shown in Tables 7, 8, and 9 respectively.

2004-2008

During this time period, the majority of the improvements will take place northwest and northeast of the existing Township. Here, much of the 20-inch and 30-inch loop will be constructed. Several pipeline connections should take place within the existing distribution network at locations shown on Figure 3. Table 7 below outlines the estimated costs for the improvements.

Table 7 2004-2008 Water Distribution System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Fransworth Rd	Between Correll and Unnamed Road North of Correll	Pipeline	20"	2,650	$150	$397,500
Fransworth Rd	Between Correll and W Heber	Pipeline	30"	2,700	$200	$540,000
Dogwood Rd	Between Correll and Unnamed Road North of Correll	Pipeline	12"	2,650	$80	$212,000
Dogwood Rd	South of Correll	Pipeline	12"	450	$80	$36,000
Ware Rd	Between Correll and Unnamed Road North of Correll	Pipeline	20"	2,660	$150	$399,000
Rockwood Rd	South of Correll	Pipeline	12"	700	$80	$56,000
Pitzer Rd	Between Correll and W Heber	Pipeline	12"	2,740	$80	$219,200
Unnamed East of Pitzer	Between Correll and W Heber	Pipeline	20"	2,820	$150	$423,000
Hwy 111- Frontage	Between Correll and W Heber	Pipeline	12"	2,830	$80	$226,400
Unnamed North of Correll	Between Fransworth and Dogwood	Pipeline	20"	2,610	$150	$391,500
Unnamed North of Correll	Between Dogwood and Ware	Pipeline	20"	2,750	$150	$412,500
Correll Rd	Between Fransworth and Rockwood	Pipeline	12"	5,360	$80	$428,800
Correll Rd	Between Rockwood and Unnamed Road East of Pitzer	Pipeline	20"	5,150	$150	$772,500
Correll Rd	Between Unnamed East of Pitzer and Hwy 111	Pipeline	20"	2,840	$150	$426,000
Correll Rd	Beneath 111 to Imperial Center	Pipeline	20"	200	$500	$100,000
W Heber Rd	Between Dogwood and Fransworth	Pipeline	30"	2,600	$200	$520,000
W Heber Rd	Between Pitzer and Hwy 111	Pipeline	12"	5,340	$80	$427,200
Hwy 86 and Pitzer Rd		Connection	10"	40	$125	$5,000
Heber Rd		Connection	8"	40	$125	$5,000
Heffernan Rd/9th St		Connection	10"	40	$125	$5,000
Heffernan Rd		Connection	10"	40	$125	$5,000
Fawcett Rd		Connection	10"	40	$125	$5,000
Eleventh St/Heber Ave		Connection	10"	40	$125	$5,000
Clifford Ave		Connection	10"	40	$125	$5,000
Pitzer Rd		Connection	10"	40	$125	$5,000
Total 2004-2008				**27,170**		**$6,027,600**

2009-2013

Here, the majority of the 20-inch and 30-inch pipeline loop will be completed. The additional demands in this phase will come from the commercial and residential developments east and west of the existing Township. The additional 30-inch pipeline near the treatment facility will be necessary to ensure the supply of water during fire to the commercial areas. Table 8 below outlines the estimated costs for the improvements shown in Figure 4.

Table 8 2009-2013 Water Distribution System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Fransworth Rd	Between McCabe Rd and Unnamed Road North of Correll	Pipeline	12"	2,640	$80	$211,200
Dogwood Rd	Between McCabe Rd and Unnamed Road North of Correll	Pipeline	12"	2,670	$80	$213,600
Dogwood Rd	Between Fawcett and WTP	Pipeline	30"	2,280	$200	$456,000
Dogwood Rd	Between Unnamed South of Fawcett and Fawcett	Pipeline	20"	2,800	$150	$420,000
Unnamed East of Pitzer	Between Heber and Unnamed South of Fawcett	Pipeline	20"	5,420	$150	$813,000
Unnamed East of Pitzer	South of Unnamed South of Fawcett	Pipeline	12"	2,740	$80	$219,200
Hwy 111-Frontage	Between Heber Rd and Jasper Rd	Pipeline	12"	8,200	$80	$656,000
McCabe Rd	Between Fransworth and Dogwood	Pipeline	12"	2,640	$80	$211,200
Fawcett Rd	Between Pitzer and Hwy 111	Pipeline	12"	5,310	$80	$424,800
Unnamed South of Fawcett	Between Unnamed East of Pitzer and Hwy 111	Pipeline	12"	2,660	$80	$212,800
Unnamed South of Fawcett	Between Dogwood and Pitzer	Pipeline	20"	8,070	$150	$1,210,500
Jasper Rd	Between Pitzer and Hwy 111	Pipeline	12"	5,290	$80	$423,200
Total 2009-2013				**50,720**		**$5,471,500**

2014-2018

This time period represents a conceptual outlook at the scenario at which the service area is completely developed. As stated earlier, the Service Area Plan should be updated every few years to determine what infrastructure improvements will be required. Table 9 below shows the estimated capital costs for the improvements outlined in Figure 5.

Table 9 2014-2018 Water Distribution System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Hwy 86/Corfman Rd	Between McCabe Rd and Willoughby Rd	Pipeline	12"	16,100	$80	$1,288,000
Fransworth Rd	Between Willoughby Rd and Heber Rd	Pipeline	12"	8,100	$80	$648,000
Dogwood	Between Willoughby Rd and Unnamed South of Fawcett	Pipeline	12"	3,000	$80	$240,000
Ware Rd	Between McCabe Rd and Unnamed North of Correll	Pipeline	12"	2,680	$80	$214,400
Pitzer Rd	Between McCabe Rd and Correll Rd	Pipeline	12"	5,350	$80	$428,000
Unnamed East of Pitzer	Between McCabe Rd and Correll Rd	Pipeline	12"	5,300	$80	$424,000
Hwy 111	Between McCabe and Correll	Pipeline	12"	5,250	$80	$420,000
McCabe Rd	Between Fransworth and Hwy 86	Pipeline	12"	2,600	$80	$208,000
McCabe Rd	Between Dogwood and Hwy 111	Pipeline	12"	10,750	$80	$860,000
Unnamed North of Correll	Between Ware and Hwy 111	Pipeline	12"	8,000	$80	$640,000
Unnamed North of Correll	Between Fransworth and Hwy 86	Pipeline	12"	2,600	$80	$208,000
Correll Rd	Between Fransworth and Hwy 86	Pipeline	12"	2,600	$80	$208,000
Heber Rd	Between Fransworth and Hwy 86	Pipeline	12"	2,600	$80	$208,000
Fawcett Rd	Between Dogwood and Corfman	Pipeline	12"	5,230	$80	$418,400
Unnamed South of Fawcett	Between Dogwood and Corfman	Pipeline	12"	5,230	$80	$418,400
Willoughby Rd	Between Dogwood and Corfman	Pipeline	12"	5,230	$80	$418,400
Total 2014-2018				**42,240**		**$3,379,200**

Wastewater Collection System Capital Improvements Plan

This section contains estimated costs for the proposed improvements that were outlined in the Wastewater System Recommendations section. The improvements have been divided into five-year phases: 2004-2008, 2009-2013, and 2014-2018. The Capital Improvements for the wastewater collection system during 2004-2008, 2009-2013, and 2014-2018 are shown in Tables 10, 11, and 12 respectively.

2004-2008

Improvements for this phase are the first step in the eventual collection system. The developments for this phase are the most certain, but the infrastructure plans for this should also permit additional growth beyond this time period. Here, substantial developments are planned for areas northwest and east of the existing Township. The developments include single family and multi family housing, a school, and commercial developments.

As stated earlier, future developments will require new pipelines leading toward the wastewater treatment facility. The pipelines close to the facility will be large diameters due to consolidated flows from the surrounding area. New lift stations are also required because of the high groundwater level and the flat topography. Table 10 below outlines the estimated wastewater improvement costs for the 2004-2008 phase. The proposed improvements are shown on Figure 7.

Table 10 2004-2008 Wastewater Collection System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Fransworth Rd	Between Correll and Unnamed Road N. of Correll	Pipeline	18"	2,560	$120	$307,200
Fransworth Rd	Between W. Heber Rd and Correll Road	Pipeline	18"	2,750	$120	$330,000
Rockwood Rd	Between Correll Rd to WWTP	Pipeline	30"	1,070	$200	$214,000
Unnamed East of Pitzer	Between W. Heber Rd and Correll Rd	Pipeline	18"	2,776	$120	$333,120
Correll Road	Between Fransworth Rd and Rockwood Rd	Pipeline	30"	5,550	$200	$1,110,000
Correll Road	Between Unnamed East of Pitzer and Rockwood Rd	Pipeline	30"	5,230	$200	$1,046,000
Correll Road	Between Unnamed East of Pitzer and Hwy 111	Pipeline	12"	2,560	$80	$204,800
Correll Road	Beneath 111 to Imperial Center	Pipeline	12"	200	$500	$100,000
Correll Road	East of WWTP	Lift Station			$300,000	$300,000
Correll Road	West of WWTP	Lift Station			$300,000	$300,000
Correll Road	Imperial Center	Lift Station			$250,000	$300,000
Total 2004-2008				**22,696**		**$4,245,120**

2009-2013

During this phase, a large commercial and residential development is planned southeast of the existing Township. A residential development is also planned for northwest of the existing Township. Most of the infrastructure required for these developments will already be in place; they would have been constructed between 2004 and 2008 as part of that phase’s improvements.

Refer to Figure 8. The estimated cost for the improvements to the wastewater collection system is shown in Table 10 below.

Table 11 2009-2013 Wastewater Collection System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Pitzer Road	Between Canal and Unnamed South of Fawcett	Pipeline	15"	2,620	$100	$262,000
Unnamed East of Pitzer	Between Fawcett Rd and W. Heber Rd	Pipeline	18"	2,780	$120	$333,600
Unnamed East of Pitzer	Between Unnamed South of Fawcett and Fawcett Rd	Pipeline	15"	2,640	$100	$264,000
Scaroni Road	Along Hwy 111 South of Unnamed South of Fawcett	Pipeline	15"	1,040	$100	$104,000
Unnamed N. of Correll Rd	Between Fransworth Rd and Railroad	Pipeline	15"	2,580	$100	$258,000
Fawcett Rd	Between Pitzer Rd and Unnamed East of Pitzer	Pipeline	12"	2,790	$80	$223,200
Fawcett Rd	Between Unnamed East of Pitzer and Hwy 111	Pipeline	12"	2,510	$80	$200,800
Unnamed South of Fawcett	Between Hwy 111 and Pitzer Road	Pipeline	15"	5,230	$100	$523,000
Fransworth Road	Intersection between Fransworth Road and Unnamed Road N of Correll Rd	Lift Station			$300,000	$300,000
Unnamed South of Fawcett	Intersection between Unnamed South of Fawcett and Unnamed East of Pitzer	Lift Station			$300,000	$300,000
Total 2009-2013				**19,570**		**$2,506,600**

2014-2018

Improvements during this phase will complete the full build-out scenario for the wastewater collection system. This is a conceptual look at the ultimate collection system, upon which the District should plan infrastructure improvements. This conceptual look should be reexamined periodically through the use of the model and by contacting developers, so that a more reliable outlook for development can be ascertained. The improvements are outlined in Table 12 below. Refer to Figure 9 for the conceptual full build-out system.

Table 12 2014-2018 Wastewater Collection System Capital Improvements

Street	Location	Description	Size (in)	Length (ft)	Cost per LF	Total Estimated Cost ($2004)
Fransworth Road	Between W Heber Road and Fawcett Road	Pipeline	18"	2,750	$120	$330,000
Fransworth Road	South of Fawcett Road	Pipeline	15"	5,470	$100	$547,000
Unnamed East of Pitzer	North of Correll Road	Pipeline	18"	2,550	$120	$306,000
Unnamed N. of Correll Rd	Between Railroad and Unnamed East of Pitzer	Pipeline	15"	2,580	$100	$258,000
Unnamed N. of Correll Rd	Between Fransworth Rd and Hwy 86	Pipeline	12"	2,595	$80	$207,600
Unnamed N. of Correll Rd	West of Unnamed East of Pitzer	Pipeline	15"	5,200	$100	$520,000
Unnamed N. of Correll Rd	East of Unnamed East of Pitzer	Pipeline	12"	2,690	$80	$215,200
Correll Road	Between Fransworth Rd and Hwy 86	Pipeline	12"	2,610	$80	$208,800
Fawcett Road	Between Fransworth Rd and Corfman Rd	Pipeline	12"	2,630	$80	$210,400
Fawcett Road	Between Fransworth Rd and S Dogwood Rd	Pipeline	12"	2,560	$80	$204,800
Willoughby Road	East of Fransworth Rd	Pipeline	12"	4,040	$80	$323,200
Total 2014-2018				**24,905**		**$2,148,000**

Treatment Facility Improvements

The water demand and wastewater generation are projected to increase substantially during the next five years. It is beyond the scope of this Plan to detail specific improvements to the water and wastewater treatment facilities. Sufficient capacity is necessary at each of the treatment plants prior to connecting additional customers. Refer to the Appendix for a table showing the existing capacity, demand, and expansion schedule for the treatment facilities. Improvements to treatment plants should not be completed to increase capacity just above projected demand. For treatment facilities to properly work, process units should be the same size. The District shall prepare a detailed study that addresses how to expand the capacities of the water and wastewater treatment facilities.

Water Treatment Facility Improvements

The water treatment facility's 2003 capacity is 1.3 MGD. Two new treatment units are under construction that will replace the existing treatment infrastructure. Each of the two new units has a capacity of 2.0 MGD. Therefore, upon completion of construction, the District will have an excess capacity of approximately 700,000 gallons. one of the new treatment units should be kept as a standby. The maximum day water demand is projected to increase by approximately 3.7 MGD over the next five years. The maximum day water demand should be less than the treatment facility's capacity. Therefore, the District should increase the capacity of the water treatment facility by approximately 3 MGD over the next five years. The financing of these improvements is outlined in the following section. These improvements will be financed primarily by bonds. The District will receive substantial connection fee revenue to offset some of the initial capital costs. In addition, the District may enter special funding agreements with specific developers to fund improvements that are required for those developments to take place.

Wastewater Treatment Facility Improvements

The wastewater treatment facility's 2003 capacity is 0.81 MGD. This is approximately double the current average day wastewater generation. The average day wastewater generation is projected to increase by approximately 1.3 MGD over the next five years. The average day wastewater generation should be less than the treatment facility's capacity. Therefore, the District should increase the capacity of the water treatment facility by approximately 1.2 MGD over the next five years. The existing demand, capacity, and schedule for these improvements are shown in the Appendix. The capacity increases for these improvements will be financed by a combination of short term debt, connection fee revenue, or pay special agreement with specific developers. The finance schedule for these improvements is outlined in the following section.

Public Parks

The District provides service to two public parks: The Tito Huerta Park and the Children's Park. Combined, they have a combined area of 6.5 acres. The District has no improvements proposed for the parks. As parks are constructed concurrently with development within the District's Sphere of Influence, the District assumes responsibility for operating and maintaining the park. For FY2003, approximately $51,000 was allocated for park expenses, including salaries, fringe benefits, training, accounting, and legal expenses.

Existing Lighting Services

Development companies install street lighting facilities to serve their developments. Once construction is completed, the District assumes ownership and responsibility from the developer for the public lighting. The District currently provides lighting to approximately 830 acres. Approximately 1,750 acres in the surrounding township area are in planning stages for commercial, public, and residential developments in the next fifteen years. The District will assume responsibility for lighting services once construction for each development is complete. It is foreseen that the areas served will total 6,100 acres by 2024.

Summary of Proposed Improvements

Table 13 below summarizes the improvements for the water and wastewater systems. The large capital expenditures during the first five-year phase can be attributed to three main factors. First, the first phase is a step into the eventual full build-out. While the infrastructure may seem oversized for the proposed developments, their construction allows for proper planning that will reduce costs in the long-term. Moreover, they will remove the need for infrastructure such as relief sewers, parallel water lines, and costlier construction in developed areas. Second, significant development is occurring simultaneously in two distinct locations. Development will take place northwest of the existing Township and the east of the Township. This mandates that infrastructure improvements occur in two areas, significantly raising capital costs. Third, the District has minimal excess capacity in its water treatment facility.

Table 13 Capital Improvements Summary

Year	Water Distribution System Improvements	Water Treatment Improvements	Water Treatment and Distribution System Improvements	Wastewater Collection System Improvements	Wastewater Treatment Improvements	Wastewater Treatment and Distribution System Improvements
2004-2008	$ 6,027,600	$ 9,000,000	$ 15,027,600	$ 4,245,120	$ 3,600,000	$ 7,845,120
2009-2013	$ 5,471,500	$ 22,500,000	$ 27,971,500	$ 2,506,600	$ 9,570,000	$ 12,076,600
2014-2018	$ 3,379,200	$ 3,000,000	$ 6,379,200	$ 2,148,000	$ 2,400,000	$ 4,548,000
Total	$ 14,878,300	$ 34,500,000	$ 49,378,300	$ 8,899,720	$ 15,570,000	$ 24,469,720

FINANCING

The finances for the water and wastewater services provided by the District are maintained in water and wastewater enterprise funds, respectively. District administration, street lighting, and parks operation and maintenance are maintained in the District's General Fund.

Water and wastewater rates and fees should be examined periodically, especially when planning substantial capital improvement projects. This helps to assure the District's ability to continue to serve existing customers, serve future customers, and remain in good financial condition. This financial analysis of the water and wastewater systems to recommends rate and fee modifications for FY2004 through FY2009.

This section aims to determine what changes, if any, need to be made to the existing water and wastewater rates, rate structure, and fees to support the projects and services outlined in this Service Area Plan. Following the improvements recommended in this Service Area Plan, this section determines what annual revenues will be required to offset anticipated expenditures through FY2009.

Water Enterprise Fund

Assumptions

Several key assumptions make up a substantial portion of the foundation of this analysis. The basis of this analysis is the Capital Improvements Plan (CIP) of this Service Area Plan. The project schedules for the first five years of the CIP will be a principle component of the anticipated expenditures outlined in the plan.

The following were assumed to complete this study:

- Actual revenues and expenditures for FY2003 will be as projected in the Fiscal Year's budget. Actual revenues and expenditures for FY2004 will be as projected in this document. At the time of writing this document, the FY2004 General Purpose Financial statements had not been audited.
- The growth rate outlined in this Service Area Plan will be the actual customer growth rate.
- New accounts will contribute revenue for six months of the first fiscal year of their existence and for 12 months per year thereafter
- Interest income based on a 2.0% interest rate

- Infrastructure projects will be 100% financed through revenue bonds at 5% with a payback period of 25 years
- Total miscellaneous income will total $5,000 annually
- Average water consumption greater than 20,000 gallons/account for the year will be 3,229 for residential customers, zero for multifamily customers, 117,600 for commercial, 94,500 for industrial, and 894,000 for government.
- Capacity Fees will be utilized fully before financing projects with bonds
- New commercial establishments will average 3 acres in size, i.e. every three acres of commercial development will average new commercial establishment.
- Multi-family dwelling units will each be assessed the capacity fee for connecting to the water system. Each multi-family unit will have its own account.
- Monthly service charges shall increase in dollar increments, such as $1 or $2, per direction of the District. Service charges for FY2004 are $2 above those for FY2003, per direction of the District.
- Water rates will be modified on January 1 of each Fiscal Year. This has been typical for previous rate increases.
- Personnel costs increase at a rate of 6% per year
- Personnel additions as outlined in study
- The costs of chemical purchases, training, autos/trucks, plant, fuel, engineering, laboratory, licenses/permit costs will increase 10% annually
- Utility costs (electricity, phones, etc.) will increase 20% annually
- All other operating expenditures will increase 6% annually
- Capital outlay for small equipment, vehicles, software, etc. will be $20,000 in FY2005 and will increase 10% annually throughout the study period

The following documents were used as bases for this study:

- Service Area Plan Capital Improvements Plan
- FY2000, 2001, 2002 General Purpose Financial Statements
- Planned improvements and staffing additions from the District's General Manager
- Pumping, billing, and collection records from District
- NADBank Construction Assistance Grant Agreement No. 40-36/03

Background

There are two funds associated with the water system financial analysis:

Water Enterprise Fund

Water Capacity Fee Fund

The Water Enterprise Fund is used by the District to handle operations, maintenance, salaries, debt service, and equipment purchases to provide potable water to its customers. This is the principle fund that the water system uses. The Water Capacity Fee Fund is used to finance capital projects associated with growth. It receives funds from connection fees paid from new development. A third fund, the Water Capital Projects Fund is comprised money received from grants and loans, generally from Federal and International agencies such as NADBank and USDA, to finance capital projects. This fund is not expected to be utilized for funding the proposed projects. As such, it is not analyzed in this document. Table 14 below shows the balances in each of the funds analyzed in this study.

Table 14 Water Fund Balances

Fund	End FY 2002 Balance
Water Enterprise Fund	$ 101,826
Water Capacity Fund	$ 122,133

The District established the Water Enterprise Fund in 1998. Previously, the water system was funded through a combination of water charges and property taxes. The goal of the Water Enterprise Fund is to create an independent fund that will finance water services without financial assistance from property taxes. Some entanglements remain between the General Fund and the Enterprise Fund in debt service that began prior to the formation of the Enterprise Fund. For purposes of this study, the enterprise fund will handle all future revenues, expenditures, and bond issuances in relation to water services. Property taxes do not contribute revenue to the Water Enterprise Fund.

Description of Existing Water Rates

This section outlines the existing rates charged to water customers. The District's Board of Directors last approved water rates in 2003. Table 15 below shows the rates by customer class for fiscal years 1998 to 2002.

Table 15 Historical and Existing Monthly Water Rates

Rate Code and Description	1998 Rate	2000 Rate	2001 Rate	2002 Rate
(01) WA Flat Q" Residential	$ 18.75	$ 19.69	$ 20.60	$ 21.50
(06) WA Meter Q" Residential	20.75	22.84	23.85	24.85
(07) WA Meter Q" Residential	21.75	22.84	23.85	24.85
(22) WA Meter 2" Apartment	130.50	137.03	143.10	149.10
(27) WA Meter 2-2" Apartment	261.00	274.06	286.20	298.20
(32) WA Meter 2" Commercial	130.50	137.03	143.10	149.10
(33) WA Meter 1" Commercial	117.00	122.85	128.25	133.65
(36) WA Meter Q" Commercial	33.00	34.65	36.20	37.75
(42) WA Meter 2" Industrial	130.50	137.03	143.10	149.10
(43) WA Meter Q" Industrial	33.00	34.65	36.20	37.75
(51) WA Flat Q" Public Agency	33.00	34.65	36.20	37.75
(52) WA Meter 2" Public Agency	130.50	137.03	143.10	149.10
(53) WA Meter Q" Public Agency	33.00	34.65	36.20	37.75
(73) WA Meter 1" Res (McCabe)	43.50	45.68	47.70	49.70
(75) WA Meter 2-2" Res. (McCabe)	99.00	103.96	108.60	113.20

Additionally, $0.35/1,000 gallons are charged for water consumed in excess of 20,000 gallons per month.

There are several customer classes for water billing, all of which are flat rate monthly charges. The District has attempted to consolidate the number of customer classes in recent years. The rates for water service have increased for all customer classes by consistent amounts for several years. Table 16 below outlines the connection fees to be paid to the District to begin water service. Connection fees were modified in 2003. Minutes of the 24 September 2003 Board of Directors meeting adjusting connection fees and user rates are located in the Appendix.

Table 16 Existing Water Connection Fees

Customer Class	2004 (Existing)
For All Connections Less Than 1 Inch	$ 3,500
For All 1 Inch Connections	3,500
For All 1.5 Inch Connections	4,000
For Each 2 inch Connection	7,500

Projected Water Revenue Requirements

Existing Debt Service

The water system is paying off debt from an issuance of $112,000 worth of general obligation bonds in 1972 to construct much of the existing distribution system. Current annual payments are $4,000. Annual payments will increase to $5,000 in 2005 and to $6,000 in 2009. This bond was issued with ad valorem property taxes pledged as security.

The District issued $1,173,000 worth of Certificates of Participation during FY2001 to finance the construction of a new water distribution pipelines. The certificates are owned by the United States Department of Agriculture, and are to be repaid by the District over the subsequent 39 years from the date of issuance. The annual payments for the study period of this rate study are approximately $63,000. Table 17 outlines the existing debt the water debt service requirements.

The District charges its customers one of the lowest rates for water in the Imperial Valley. The revenues from some of the last few fiscal years have not exceeded operating expenses and annual debt service. The North American Development Bank has contributed substantial transition funding to the District for debt service assistance and repair and replacement expenses. These grants are shown in Table 18.

Table 17 Existing Water Debt Service Schedule

Fiscal Year	1972 Series General Obligation	1989 Office and Water Plant Series	2002 Series USDA	Total Yearly Payment from Enterprise Fund
2003	$ 4,000	$ 34,932	$ 63,000	$ 97,932
2004	4,000	38,392	63,000	$ 101,392
2005	5,000	36,455	63,000	$ 99,455
2006	5,000	34,480	63,000	$ 97,480
2007	5,000	37,505	63,000	$ 100,505
2008	5,000	35,135	63,000	$ 98,135
2009	6,000	37,765	63,000	$ 100,765

The District does not meet the income/debt threshold is necessary for revenue bond issuances. The income/debt ratio should be greater than 1.2. This threshold has not been met during the last few fiscal years. The budgeted debt/income ratio should be above that level to provide the District with a financial buffer for unforeseen circumstances (emergency operations costs, cooler temperatures that lower water sales, etc.) Project financing may be difficult, the District may be forced to pay higher interest levels on its debt, or the bonds may be called early if the threshold is not met.

Table 18 NADBank Transition Assistance Grants

Fiscal Year	Debt Service Assistance	Repair and Replacement Assistance
2002	$ -	$ 100,000
2003	$ 26,000	-
2004	33,000	-
2005	48,000	-
2006	36,275	-
2007	54,200	-
2008	38,500	-
Total	$ 235,975	$ 100,000

Capital Improvements

The District has received several grants and loans in recent years from the United States Department of Agriculture and the North American Development Bank to improve its water treatment facility and distribution system. These improvements either are underway or have recently been completed at the time of writing this report.

The Service Area Plan's Capital Improvements Plan outlines the capital projects for the water system. The water distribution system and treatment facility are slated to undergo a substantial expansion to serve new developments northwest and east of the existing customers within the next five years. The anticipated capital expenditures for expanding the water distribution system are distributed evenly through FY2009. The capital expenditures for expanding the water treatment facility (including pumping and storage) are shown on Table 19. The costs for each project are divided into engineering and construction segments. The amounts shown are in 2004 dollars.

Table 19 Water System Capital Improvements

Water Distribution System Project		2004 Estimated Price	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
All Water Distribution Pipelines		$6,027,600					
	Engineering	$602,760	$120,552	$120,552	$120,552	$120,552	$120,552
	Construction	$5,424,840	$1,084,968	$1,084,968	$1,084,968	$1,084,968	$1,084,968
Water Treatment Facility Improvements		$9,000,000					
	Engineering	$900,000	$300,000	$300,000	$300,000	$0	$0
	Construction	$8,100,000	$2,700,000	$2,700,000	$2,700,000	$0	$0
Total Estimated Cost ($2004)		$15,027,600	$4,205,520	$4,205,520	$4,205,520	$1,205,520	$1,205,520
Water System Total Estimated Cost ($2004)		$15,027,600	$4,205,520	$4,205,520	$4,205,520	$1,205,520	$1,205,520
Water System Total Estimated Cost (Adjusted for Inflation (3%))			$4,331,686	$4,461,636	$4,595,485	$1,356,823	$1,356,823

Project Financing

The District plans to finance the proposed projects by existing and projected capacity fees and future bond issuances. For purposes of this study, an annual interest rate of 5% and a payback period of 25 years are assumed for revenue bond issuances. Table 20 shows the finance schedule for the proposed projects.

This study assumes that revenue bonds will be issued only after available most capacity fees have been used. The District is planning substantial improvements during the study period. Capital funding requirements for these projects total just over $15 Million. Bonds will need to be issued three times during the study period.

Most of the capacity fee balance and revenue will be used during FY2005 to partly finance the proposed capital projects. In FY2005, $1,100,000 of revenue bonds will be issued to finance the remaining project costs. Bonds totaling $1,200,000 will be issued in FY2006 to cover the capital debt financing for projects during FYs 2007 and 2008. In total, $2,300,000 of revenue bonds will be issued through FY2007 to finance the improvement projects. No additional debt will be required after FY2007.

Water Capacity Fees

This study is based on the Water Capacity Fee balance of $124,576 on July 1, 2003. Annual capacity fee income is estimated at $3.3M for FY 2005 and $3.6M for FY2006. Capacity fee income is projected to be $4.3M (FY2007), $3.8M (FY2008), and $3.3M (FY2009). This projection is based on all of the anticipated customers being added at the recommended rates shown in Table 22. This study assumes that the funds available from capacity fees will be used prior to revenue bond issuances.

Table 20 Water System Project Financing

Fiscal Year	2004	2005	2006	2007	2008	2009	Total
Requirements							
Capital Funding	$0	$4,331,686	$4,461,636	$4,595,485	$1,356,823	$1,356,823	$14,745,630
Sources							
Existing Available Funding Sources							
Capacity Fee Balance July 1	124,576	127,067	69,609	53,501	73,571	2,523,219	
Capacity Fee Income	2,492	3,342,541	3,633,892	4,320,070	3,806,471	3,276,964	15,107,909
Capacity Fee Expenditures	-	$3,400,000	$3,650,000	$4,300,000	$1,356,823	$1,260,049	13,966,872
Capacity Fee Balance June 30	127,067	69,609	53,501	73,571	2,523,219	4,540,134	
Funds to be Financed	$0	$931,686	$811,636	$295,485	$0	$96,774	2,038,807
New Available Funding Sources							
Bond Balance (July 1)	-	-	168,314	560,886	279,423	286,408	
Bonds (2004, 25 years at 5%)	-						-
Bonds (2005, 25 years at 5%)		1,100,000	-	-	-	-	1,100,000
Bonds (2006, 25 years at 5%)			1,200,000	-	-	-	1,200,000
Bonds (2007, 25 years at 5%)				-	-	-	-
Bonds (2008, 25 years at 5%)					-	-	-
Bond Expenditures	-	931,686	811,636	295,485	0	96,774	2,038,807
Interest from Bonds	-	-	4,208	14,022	6,986	7,160	25,216
Bond Balance (June 30)	$ -	$ 168,314	$ 560,886	$ 279,423	$ 286,408	$ 196,794	

NOLTE
BEYOND ENGINEERING

Personnel Additions

The water collection and treatment systems will require additional staffing during the next five fiscal years. Table 21 lists the anticipated additional staffing needs through FY2009. The District will need to hire one operator in FY2005 that will charge 50% of the time to the wastewater enterprise fund. The remaining 50% will be charged to the water enterprise fund. The cost of these new positions will increase by 6% per year. The staff position for this employee will begin in FY2004 at half-time and will be charged to the Wastewater Enterprise fund. The position will grow to full time in FY2005 with the costs evenly divided between the two funds. The Water Enterprise Fund could not financially support costs from additional employees during FY2004 under the forecasted rate increase for FY2004.

Table 21 Proposed Water Staff Additions

Position	2005	2006	2007	2008	2009
Facility Operator (1/2)	$ 15,000	$ 15,900	$ 16,854	$ 17,865	$ 18,937
Total Cost	**$ 15,000**	**$ 15,900**	**$ 16,854**	**$ 17,865**	**$ 18,937**

Operating Expenses

Total operating expenses include personal services, supplies and services, and general and administrative costs. The District's FY2002, 2003, and 2004 General Purpose Financial Statements were used as a base for these costs. From those base costs, personal services costs are increased 6% annually through 2009. Chemical purchases, auto, training, plant, fuel, engineering, licenses, and permits are increased 10% annually through 2008. Utility costs are estimated to rise 20% annually. All other expenses are projected to increase at 6% annually. Table 25 shows the projected total operating costs of the water system through FY2009.

Development and Recommendation of Rate Changes

This section outlines the requirements and guidelines for changes to the water rates and shows and describes the rate changes. It also compares the recommended rates to those charged by nearby communities.

Budget Requirements and Guidelines

Several key criteria were used as guidelines and regulations to establish new water rates. The Rate increases were determined utilizing the following guidelines:

- The water utility fund should have positive net income
- Operating income must be at least 1.2 times the net debt service
- Maintain rate increases to a minimum so that the impact to customers is minimized
- Increase monthly charge rates by dollar increments

Recommendation of Rate and Fee Modifications

Utilizing these criteria, the rate and fee increases shown in Tables 22 and 23 are necessary to ensure quality water treatment, provide adequate fire protection, and implement various infrastructure improvements.

Over the next five fiscal years, rates will increase $1 annually for residences. Water rates were increased by $2 in FY2004, per direction of the District, to help the District maintain positive income and adequate debt coverage. The FY2004 increase was not sufficient to provide the District with an income to debt service ratio of 1.2. During the following Fiscal Years the ratio is projected to be sufficient. The monthly rate increases are not due to capital expenses associated with growth; they are necessary to meet the operating revenue and existing debt requirements of the water enterprise fund.

Table 22 Recommended Water Rate Modifications

Customer Class	2004 (Existing)	2005	2006	2007	2008	2009
Single Family Residential (<1" meter)	$ 27.85	$ 28.85	$ 29.85	$ 30.85	$ 31.85	$ 31.85
Single Family Residential (2")	60.90	62.90	63.90	64.90	65.90	65.90
Mutliple Family Residential, Commercial, Irrigation, Public Agency (<1")	41.00	42.00	43.00	44.00	45.00	45.00
Mutliple Family Residential, Commercial, Irrigation, Public Agency (1")	141.05	143.05	145.05	147.05	149.05	149.05
Mutliple Family Residential, Commercial, Irrigation, Public Agency (2")	157.10	159.10	161.10	163.10	165.10	165.10
Per 1,000 Gallon Charge over 20,000 Gallons	0.37	0.38	0.39	0.40	0.40	0.41

Table 23 Recommended Water Capacity Fee Modifications

Customer Class	2004 (Existing)	2005	2006	2007	2008	2009
For All Connections Less Than 1 Inch	$ 3,500	$ 3,500	$ 3,500	$ 4,000	$ 4,000	$ 4,250
For All 1 Inch Connections	3,500	4,500	4,500	5,000	5,000	5,250
For All 1.5 Inch Connections	4,000	5,000	5,500	6,000	6,000	6,250
For Each 2 inch Connection	7,500	8,500	8,500	9,000	9,000	9,250

Rate Comparison

The recommended rates are compared with existing rates from nearby communities below in Table 24 and in Chart 1 on the following page for single family homes. Heber's existing monthly residential rate and the recommended rate are than those for El Centro, Imperial, Brawley, and Seeley. As shown, the recommended rates will be significantly lower than some of the other rates in the Imperial Valley.

Table 24 Monthly Water Rate Comparison

Community	Total Monthly Cost for 20,000 gallons
Heber (Approved 2004)	$27.85
Heber (2003)	$25.85
Imperial	$48.61
Seeley Co. WD	$37.00
Brawley**	$35.44
El Centro	$30.06
Westmorland*	$28.50

Values based on 20,000 gallon water usage for a single family home
*Based on inside city limit rate
**Based on front footage less than 50 feet

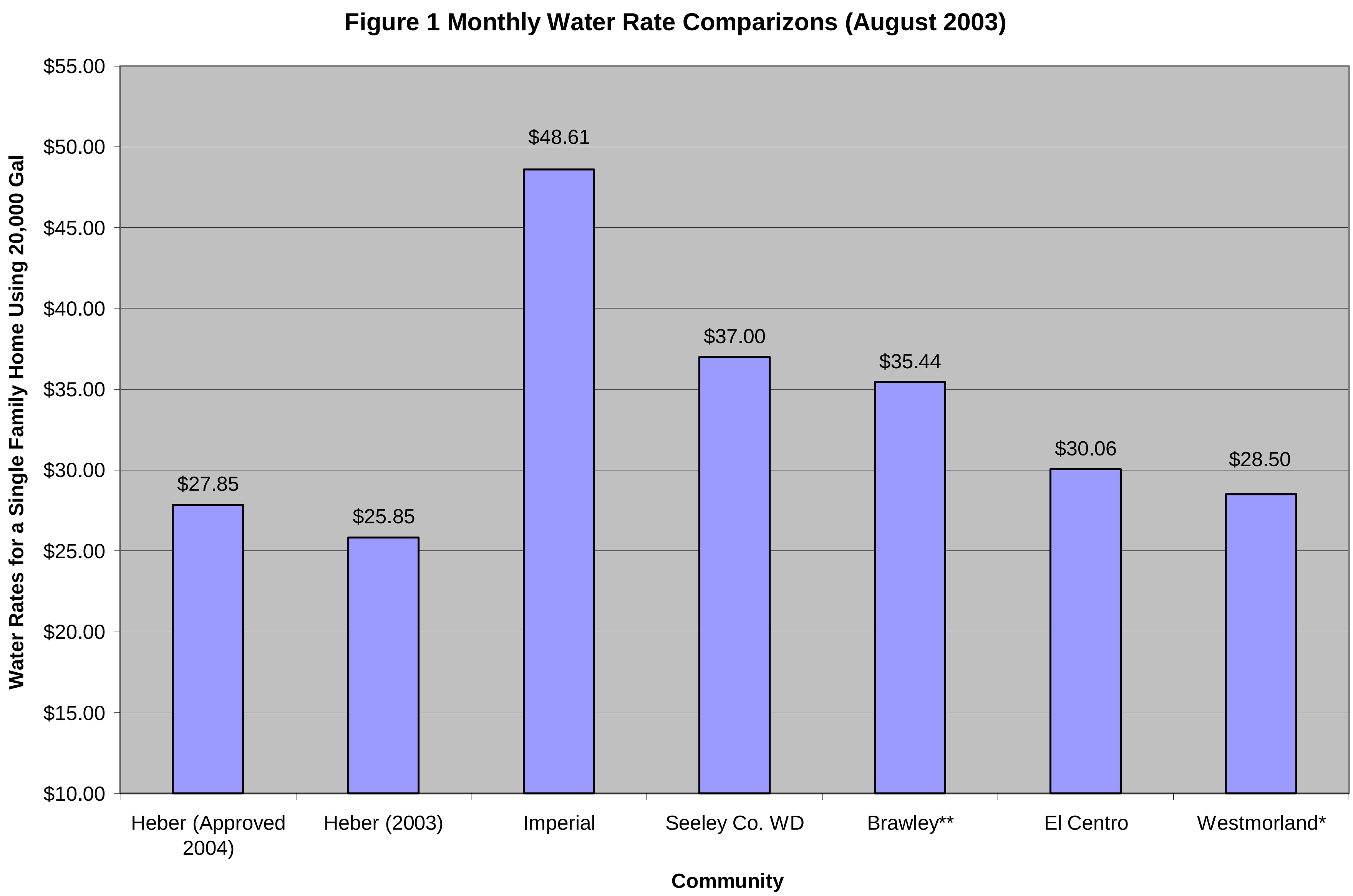


Figure 1 Monthly Water Rate Comparizons (August 2003)
Water Rates for a Single Family Home Using 20,000 Gal
$55.00
$50.00
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$27.85
$25.85
$48.61
$37.00
$35.44
$30.06
$28.50
Heber (Approved 2004)
Heber (2003)
Imperial
Seeley Co. WD
Brawley**
El Centro
Westmorland*
Community

Water Utility Fund Budgets and Debt Service Schedule

This section contains the projected Water Enterprise fund budgets and the annual net debt service throughout the lives of the bond issuances. The recommended rate increases are used in developing the projected operating income.

The projected budgets were formulated using the projected expenditures outlined in Table 19, the debt service and NADBank assistance in Tables 17 and 18 respectively, the rate and fee increases outlined in Tables 22 and 23, and the growth scenario and revenue formulation in the Appendix. In each Fiscal Year beyond FY2004, the operating income is at least 1.2 times the net debt service and the fund has positive income. The projected Water Enterprise Fund Budgets, including projected annual debt service, are shown in Table 25.

Detailed growth scenarios and the revenue formulation and analysis are presented in the Appendix.

Table 25 Projected Water Enterprise Fund Budget

Fiscal Year		2003	2004	2005	2006	2007	2008	2009
Operating Revenues								
Service Fees		$328,520	$ 375,545	$ 564,018	$ 928,148	$ 1,327,887	$ 1,726,717	$ 2,070,893
Single Family Residential		255,000	297,523	370,743	510,685	680,409	859,969	999,080
Mutli-Family Residential		17,000	16,014	117,817	326,011	539,654	744,704	933,464
Commercial		15,000	20,159	28,636	37,297	46,178	55,192	64,091
Industrial		25,020	24,970	29,211	33,528	37,945	42,439	48,053
Public Agencies		16,500	16,878	17,610	20,627	23,700	24,413	26,205
Penalty		4,667	500	500	500	500	500	500
Interest			1,144	218	1,792	8,126	20,375	39,372
Reconnection Charge		667						
Miscellaneous Revenue		1,400						
Other Revenue		30,000	5,000	5,000	5,000	5,000	5,000	5,001
Total Opeating Income		365,254	382,189	569,735	935,440	1,341,513	1,752,592	2,115,766
Operating Expenses	**Percent Increase**							
Personal Services		153,553	162,766	187,532	198,784	210,711	223,354	236,755
Salaries and Wages	6	105,944	112,301	119,039	142,081	150,606	159,642	169,221
Salaries and Wages (Staff Additions)		-	-	15,000	-	-	-	-
Fringe Benefits	6	47,609	50,466	53,493	56,703	60,105	63,712	67,534
Supplies, Services, General and Admin		177,717	198,511	222,265	249,469	280,700	316,641	358,100
Office Services	6	2,500	2,650	2,809	2,978	3,156	3,346	3,546
Supplies	6	8,300	8,798	9,326	9,885	10,479	11,107	11,774
Postage	6	1,250	1,325	1,405	1,489	1,578	1,673	1,773
Chemical Purchases	10	22,500	24,750	27,225	29,948	32,942	36,236	39,860
Miscellaneous/County Fees	6	2,000	2,120	2,247	2,382	2,525	2,676	2,837
Training	10	5,400	5,940	6,534	7,187	7,906	8,697	9,566
Sponsorships	6	-	-	-	-	-	-	-
Autos/Trucks	10	667	734	807	888	977	1,074	1,182
Plant	10	12,500	13,750	15,125	16,638	18,301	20,131	22,145
Fuel	10	2,400	2,640	2,904	3,194	3,514	3,865	4,252
Office Repairs	6	600	636	674	715	757	803	851
Accounting/Auditing	6	2,500	2,650	2,809	2,978	3,156	3,346	3,546
Engineering	10	31,000	34,100	37,510	41,261	45,387	49,926	54,918
Legal	6	3,750	3,975	4,214	4,466	4,734	5,018	5,319
Operations	6	8,400	8,904	9,438	10,005	10,605	11,241	11,916
Planning	6	2,250	2,385	2,528	2,680	2,841	3,011	3,192
Laboratory	10	2,300	2,530	2,783	3,061	3,367	3,704	4,075
Waste Collection	6	-	-	-	-	-	-	-
Memberships	6	1,300	1,378	1,461	1,548	1,641	1,740	1,844
Mileage Reimbursement/Allowance	6	350	371	393	417	442	468	496
Meals	6	1,250	1,325	1,405	1,489	1,578	1,673	1,773
Travel & Conference	6	6,000	6,360	6,742	7,146	7,575	8,029	8,511
Licenses/Permits	10	1,500	1,650	1,815	1,997	2,196	2,416	2,657
General Insurance	6	2,000	2,120	2,247	2,382	2,525	2,676	2,837
Equipment Rental	6	500	530	562	596	631	669	709
Utilities	20	50,000	60,000	72,000	86,400	103,680	124,416	149,299
Raw Water Purchases	6	6,500	6,890	7,303	7,742	8,206	8,698	9,220
Capital Outlay (Equipment)	0	6,667						
Total Operating Expenses		337,937	361,277	409,797	448,253	491,411	539,995	594,855
Operating Income (Loss)		27,317	20,912	159,938	487,186	850,101	1,212,597	1,520,911
Changes in Assets and Liabilities		-	-	-	-	-	-	-
Interest Income		-	1,144	218	1,792	8,126	-	1
Capital Outlay- sml eq, hydrants, vehic	10			30,000	33,000	36,300	39,930	43,923
NADBank Repair/Replace Assistance								
Existing Debt Service		(97,932)	(101,392)	(99,455)	(97,480)	(100,505)	(98,135)	(98,135)
New Debt Service		-	-	-	(78,045)	(163,185)	(163,185)	(163,185)
2005 Series					(78,045)	(78,045)	(78,045)	(78,045)
2006 Series						(85,140)	(85,140)	(85,140)
2007 Series							-	-
NADBank Debt Service Assistance		26,000	33,000	48,000	36,275	54,200	38,500	38,501
Net Debt Service Paid Out		71,932	68,392	51,455	139,250	209,490	222,820	222,819
Operating Income/Net Debt Service		0.38	0.31	3.11	3.50	4.06	5.44	6.83
Net Increase (Decrease) in Cash and Cash Equivalents		(44,615)	(46,335)	78,701	316,728	612,437	949,847	1,254,170
Cash and Cash Equivalents - July 1		101,826	57,211	10,876	89,576	406,304	1,018,742	1,968,589
Cash and Cash Equivalents - June 30		$ 57,211	$ 10,876	$ 89,576	$ 406,304	$ 1,018,742	$ 1,968,589	$ 3,222,759

Wastewater Enterprise Fund

Assumptions

Several key assumptions make up a substantial portion of the foundation of this analysis. The basis of this study is the Capital Improvements Plan (CIP) of this Service Area Plan. The projects scheduled for the first five years of the CIP will be a principle component of the anticipated expenditures outlined in the plan.

The following were assumed to complete this study:

- Actual revenues and expenditures for FY2003 will be as projected in the 2003 Fiscal Year's budget. Actual revenues and expenditures for FY2004 will be as projected in this document. As of the writing of this document, the FY2004 financial statements had not been audited.
- The growth anticipated in this Service Area Plan is what will actually take place. The first five year phase's growth assumptions in this Service Area Plan will take place at the rate shown in the Appendix.
- New accounts will contribute revenue for six months of the first fiscal year of their existence and for 12 months per year thereafter
- Interest income will be based on a 2.0% interest rate
- Infrastructure projects will be 100% financed through revenue bonds at 5% with a payback period of 25 years
- Capacity Fees will be utilized fully before financing projects with bonds
- Monthly wastewater rates will be modified on January 1 of each Fiscal Year, as has been done in previous years.
- Monthly wastewater rates will be adjusted by even dollar amounts, such as $1 or $2.
- Personnel costs increase at a rate of 6% per year
- Personnel additions are as outlined in study
- The costs of chemical purchases, training, autos/trucks, plant, fuel, engineering, laboratory, licenses/permit costs will increase 10% annually
- Utility costs (electricity, phones, etc.) will increase 20% annually
- All other operating expenditures will increase 6% annually
- Capital outlay for small equipment, vehicles, software, etc. will be $20,000 in FY 2004 and will increase 10% annually throughout the study period

- Late penalties will contribute $500 annually to revenues

The following documents were used as bases for this study:

- This Service Area Plan's Wastewater Capital Improvements Plan
- FY2000, 2001, 2002 General Purpose Financial Statements
- FY2003 Wastewater Enterprise Fund Budget
- Planned improvements and staffing additions from the District's General Manager
- Pumping, billing, and collection records from District
- NADBank Construction Assistance Grant Agreement No. 14-34/00

Background

There are two funds associated with the wastewater rate study:

Wastewater Enterprise Fund

Wastewater Capacity Fee Fund

The Wastewater Enterprise Fund is used by the District to handle operations, maintenance, salaries, debt service, and equipment purchases. This is the principle fund that the wastewater system uses. The Wastewater Capacity Fee Fund is used to finance capital projects associated with growth. It receives funds from connection fees paid from new development. A third fund, the Wastewater Capital Projects Fund, is comprised solely of money received from grants and loans, generally from Federal and International agencies such as NADBank and USDA, to finance capital projects. Table 26 below shows the balances in each of the funds analyzed in this study.

Table 26 Wastewater Fund Balances

Fund	End FY 2002 Balance
Wastewater Enterprise Fund	$74,000
Wastewater Capacity Fe Fund	$113,000

The District established the Wastewater Enterprise Fund in 1998. Previously, the wastewater system was funded through a combination of wastewater charges and property taxes. The goal of the Wastewater Enterprise Fund is to create an independent fund that will finance wastewater services without financial assistance from property taxes. Some entanglements remain between the General Fund and the Enterprise Fund in debt service that began prior to the formation of the Enterprise Fund. For purposes of this study, the enterprise fund will handle all future revenues, expenditures, and bond issuances in relation to wastewater services.

Description of Existing Wastewater Rates

This section outlines the existing rates charged to wastewater customers. The District's Board of Directors last approved wastewater rates in 2003. Table 27 below shows the rates by customer class for fiscal years 1998 to 2003.

Table 27 Historical Monthly Wastewater Rates

Customer Class	1998	2000	2001	2002	2003
Single Family Residential	$ 22.00	$ 23.00	$ 24.00	$ 25.00	$ 26.00
Mutliple Family Residential, Commercial, Irrigation, Public Agency	33.00	34.50	36.00	37.50	39.00
Heber Village No. 24	792.00	828.00	864.00	900.00	936.00

There are three customer classes for wastewater billing, all of which are flat rate monthly charges. The rates for wastewater service have increased for all customer classes by consistent amounts for several years. Table 28 below outlines the connection fees to be paid to the District to begin wastewater service. Connection fees have not been adjusted for several years. Minutes of the 24 September 2003 Board of Directors meeting adjusting connection fees and user rates are located in the Appendix.

Table 28 Historical Wastewater Connection Fees

Connection Fee	
For All Residential Connections (4")	$ 2,500
For All 6 inch Connections	3,500
For All 8 inch Connections	5,000

For connections over 8 inches in diameter, the charge shall be a minimum of $7,000 plus cost to the District for all necessary labor and materials, and in addition thereto the sum of 10% of such actual costs.

Projected Wastewater Revenue Requirements

Existing Debt Service

The California Department of Commerce loaned the District $195,231 in 1988 to finance an infrastructure expansion project. The District makes monthly payments of $1,810.85. The District was scheduled to completely repay the 180-month loan as of the end of FY 2003.

The wastewater system is paying off debt from an issuance of $180,000 worth of general obligation bonds in 1968 to construct much of the existing collection system. Remaining annual principal installments are $6,000. This debt will be completely repaid as of June 30, 2009. This bond was issued with ad valorem property taxes pledged as security.

The District issued $1,008,500 worth of Certificates of Participation during FY2001 to retire outstanding certificates totaling $285,000 and to provide funds to finance the construction of a new wastewater treatment facility. The certificates are owned by the United States Department of Agriculture, and are to be repaid by the District over the subsequent 39 years from the date of issuance. The annual payments for the study period of this rate study include $10,000 of principal plus accrued interest at a fixed rate of 4.50%. The annual payments will increase at several times by the year of maturity, FY2004. The outstanding certificates totaling $285,000 mentioned above proceed from certificates issued in 1986 for the purchase of land for water and sewer expansion ($55,000) and from certificates issued in 1989 for the construction of a new office building and rehabilitation of the water treatment facility. Table 29 outlines the existing debt the wastewater debt service requirements.

The revenues from some of the last few fiscal years have not exceeded operating expenses and annual debt service. The North American Development Bank has contributed substantial transition funding to the District for debt service assistance and repair and replacement expenses. These grants are shown in Table 30. The budgeted debt/income ratio should be above 1.2 to provide the District with a financial buffer for unforeseen circumstances (emergency operations costs, cooler temperatures that lower water sales, etc.).

Table 29 Existing Wastewater Debt Service Schedule

Fiscal Year	1968 Series General Obligation	2000 Series USDA	Total Yearly Payment from Enterprise Fund
2003	$ 6,000	$ 54,257.50	$ 54,258
2004	6,000	53,807.50	53,808
2005	6,000	53,357.50	53,358
2006	6,000	52,907.50	52,908
2007	6,000	52,557.50	52,558
2008	6,000	52,007.50	52,008
2009		51,332.50	51,333

Table 30 NADBank Transition Assistance Grants

Fiscal Year	Debt Service Assistance	Repair and Replacement Assistance
2000	$ 54,000	$ 55,000.00
2001	42,000	15,000.00
2002	26,000	30,000.00
2003	58,000	-
2004	2,725	-
Total	**$ 182,725**	**$ 100,000**

Capital Improvements

This Service Area Plan contains a Capital Improvements Plan that outlines most of the capital projects for the wastewater system. The wastewater collection system is slated to undergo a substantial expansion to serve new developments northwest and east of the existing customers within the next five years. The anticipated improvements, outlined and described in the Service Area Plan, are shown on Table 31 on the following page. The wastewater treatment facility will also undergo a major expansion beginning in FY2005. The costs to expand the treatment facility, $3.6 Million, were distributed among three of the five fiscal years of this analysis. The anticipated expenditures are distributed through FY2009. The costs for each project are divided into engineering and construction segments. The amounts shown are in 2004 dollars except where noted.

Table 31 Wastewater System Improvements

Wastewater Treatment Plant Project		2004 Estimated Price	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Wastewater Treatment Plant Expansion		$3,600,000						
	Engineering	$360,000		$240,000	$120,000			
	Construction	$3,240,000		$2,160,000		$1,080,000		
Total Estimated Cost ($2004)		$3,600,000	$0	$2,400,000	$120,000	$1,080,000	$0	$0

Wastewater Collection System Projects		2004 Estimated Price	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Pipeline - Fransworth between Correll and Unnamed Road N. of Correl		$307,200						
	Engineering	$30,720					$30,720	
	Construction	$276,480						$276,480
Pipeline - Fransworth between W. Heber Road and Correll Road		$330,000						
	Engineering	$33,000					$33,000	
	Construction	$297,000						$297,000
Pipeline - Rockwood between Correll Road to WWTP		$214,000						
	Engineering	$21,400	$21,400					
	Construction	$192,600	$192,600					
Pipeline - East of Pitzer between W. Heber Road and Correll Road		$333,120						
	Engineering	$33,312		$33,312				
	Construction	$299,808		$299,808				
Pipeline - Correll Road between Fransworth and Rockwood Road		$1,110,000						
	Engineering	$111,000			$111,000			
	Construction	$999,000				$999,000		
Pipeline - Correll Road between E. of Pitzer and Rockwood Road		$1,046,000						
	Engineering	$104,600		$104,600				
	Construction	$941,400			$941,400			
Pipeline - Correll Road between E. of Pitzer and Highway 111		$204,800						
	Engineering	$20,480		$20,480				
	Construction	$184,320			$184,320			
Lift Station - East of WWTP		$300,000						
	Engineering	$30,000		$30,000				
	Construction	$270,000			$270,000			
Lift Station - West of WWTP		$300,000						
	Engineering	$30,000				$30,000		
	Construction	$270,000					$270,000	
Lift Station - Imperial Center		$300,000						
	Engineering	$30,000		$30,000				
	Construction	$270,000			$270,000			
Total Estimated Cost ($2004)		$4,445,120	$214,000	$518,200	$1,776,720	$1,029,000	$333,720	$573,480
Wastewater System Total Estimated Cost ($2004)		$8,045,120	$214,000	$2,918,200	$1,896,720	$2,109,000	$333,720	$573,480
Wastewater System Total Estimated Cost (Adjusted for Inflation (3%))			$227,033	$3,188,796	$2,134,775	$2,444,909	$398,479	$684,765

Project Financing

The District will be able to finance the proposed projects by existing and projected capacity fees. Table 32 shows the finance schedule for the proposed projects.

This study assumes that revenue bonds will be issued only after available capacity fees have been used. From Table 31, the District is planning substantial improvements during the study period. Capital funding requirements for these projects total over $9 Million after adjusting for inflation. Due to the existing capacity at the treatment facility, the District should not have to issue long term debt to finance the proposed improvements. The District should receive connection fees from developers prior to the construction of the facilities in those areas. Failure to do so will cause the District to issue substantial short term debt which will have to be repaid by collected connection fees. This scenario has not been analyzed in this study.

Wastewater Capacity Fees

This study assumes that the Wastewater Capacity Fee balance is $115,688 on July 1, 2003. Annual capacity fee income is projected to be greater than $2,500,000 annually. Annual totals are shown on Table 32. This study assumes that the funds available from these fees will be used prior to revenue bond issuances.

Table 32 Wastewater System Project Financing

Fiscal Year	2004	2005	2006	2007	2008	2009	Total
Requirements							
Capital Funding		$227,033	$3,188,796	$2,134,775	$2,444,909	$398,479	$684,765
Sources							
Existing Available Funding Sources							
Capacity Fee Balance July 1	115,688	118,002	2,879,329	3,059,370	4,468,782	5,174,749	
Capacity Fee Income	2,314	2,988,360	3,368,837	3,544,187	3,150,876	2,647,495	13,056,842
Capacity Fee Expenditures	$0	$227,033	$3,188,796	$2,134,775	$2,444,909	$398,479	7,995,513
Capacity Fee Balance June 30	118,002	2,879,329	3,059,370	4,468,782	5,174,749	7,423,765	
Funds to be Financed	$0	($0)	($0)	$0	$0	$0	(0)
New Available Funding Sources							
Bond Balance (July 1)	-	-	0	0	0	0	
Bonds (2004, 25 years at 5%)	-						-
Bonds (2005, 25 years at 5%)		-					-
Bonds (2006, 25 years at 5%)			-				-
Bonds (2007, 25 years at 5%)				-			-
Bonds (2008, 25 years at 5%)					-		-
Bonds (2009, 25 years at 5%)						-	-
Bond Expenditures	-	(0)	(0)	0	0	0	(0)
Interest from Bonds	-	-	0	0	0	0	0
Bond Balance (June 30)	$ -	$ 0	$ 0	$ 0	$ 0	$ 0	

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Personnel Additions

The wastewater collection and treatment systems will require additional staffing during the next five fiscal years. Table 33 lists the anticipated additional staffing needs through FY2009. The District will need to hire one operator in FY2004 that will charge 50% of the time to the wastewater enterprise fund. The remaining 50% will be charged to the water enterprise fund. This position will begin half-time in FY2004 and grow to full time in FY2005. In FY2004, the position will be funded entirely by the Wastewater Enterprise Fund. In 2005, the costs for this position will be evenly divided between the water and wastewater enterprise funds. The projected annual cost of these new positions will increase by 6% per year.

Table 33 Proposed Wastewater Staff Additions

Position	2004	2005	2006	2007	2008	2009
Facility Operator (1/2)	$ 15,000	$ 15,900	$ 16,854	$ 17,865	$ 18,937	$ 20,073
Total Cost	**$ 15,000**	**$ 15,900**	**$ 16,854**	**$ 17,865**	**$ 18,937**	**$ 20,073**

Operating Expenses

Total operating expenses include personal services, supplies and services, and general and administrative costs. The District's FY2002 General Purpose Financial Statements and FY2003 Wastewater Enterprise Fund Budget were used as a basis for these costs. From those base costs, personal services costs are increased 6% annually through FY2009. Chemical purchases, auto, training, plant, fuel, engineering, licenses, and permits are increased 10% annually through 2009. Utility costs are estimated to rise 20% annually. All other expenses are projected to increase at 6% annually. Table 37 at the end of this report shows the projected total operating costs of the wastewater system through 2008.

Development and Recommendation of Rate Changes

This section outlines the requirements and guidelines for changes to the wastewater rates and shows and describes the rate changes. It also compares the recommended rates to those charged by nearby communities.

Budget Requirements and Guidelines

Several key criteria were used as guidelines and regulations to establish new wastewater rates. The Rate increases were determined utilizing the following guidelines:

- The wastewater utility fund should have positive net income
- Operating income must be at least 1.2 times the net debt service
- Maintain rate increases to a minimum so that the impact to customers is minimized
- Monthly sewer rates shall increase $1 for FY2004 per direction of the District
- Monthly sewer rates shall increase in even dollar increments, such as $1 or $2

Recommendation of Rate and Fee Modifications

Utilizing these criteria, the rate and charge increases shown in Tables 34 and 35 are necessary to ensure quality wastewater treatment, keep risk of sewage spills and other environmental risks to a minimum, and implement various treatment facility improvements.

Over the next five fiscal years, the sewer rates will not rise substantially. With the exception of FY2004, rates will increase $1 annually. Sewer rates were raised $2 in FY2004 per direction of the District.

Wastewater Capacity Fees for all 4” connections were raised to $3,500 per connection in FY2004.

Table 34 Recommended Wastewater Rate Modifications

Customer Class	2004 (Existing)	2005	2006	2007	2008	2009
Single Family Residential	$ 27.00	$ 28.00	$ 29.00	$ 30.00	$ 31.00	$ 31.00
Mutliple Family Residential, Commercial, Irrigation, Public Agency	40.00	41.00	42.00	43.00	44.00	44.00
Heber Village No. 24	960	984	1,008	1,032	1,056	1,056

Table 35 Recommended Wastewater Capacity Fee Modifications

Customer Class	2004 (Existing)	2005	2006	2007	2008	2009
For All Residential Connections (4")	$ 3,500	$ 3,500	$ 3,750	$ 3,750	$ 3,750	$ 3,750
For All 6 inch Connections	4,500	4,500	4,500	4,500	4,500	4,500
For All 8 inch Connections	6,000	6,000	6,000	6,000	6,000	6,000

Rate Comparison

The recommended rates are compared with existing rates from nearby communities below in Table 36 and in Chart 2 on the following page for single family homes. Heber's existing rate and the recommended rate are generally among the lowest in the Imperial Valley. Westmorland, El Centro, Imperial, Brawley, and Seeley have rates higher than the recommended rates for Heber. However, the recommended rates are comparable to the other rates in the County.

Table 36 Monthly Wastewater Rate Comparisons

Community	Monthly Sewer Bill
Heber (Approved)	$ 27.00
Heber (FY2002)	26.00
Westmorland*	31.85
El Centro	29.00
Seeley Co. WD	28.00
Imperial	27.82
Brawley**	26.35

Values based on 20,000 gallon water usage for a single family home
*Based on inside city limit rate
**Based on front footage less than 50 feet

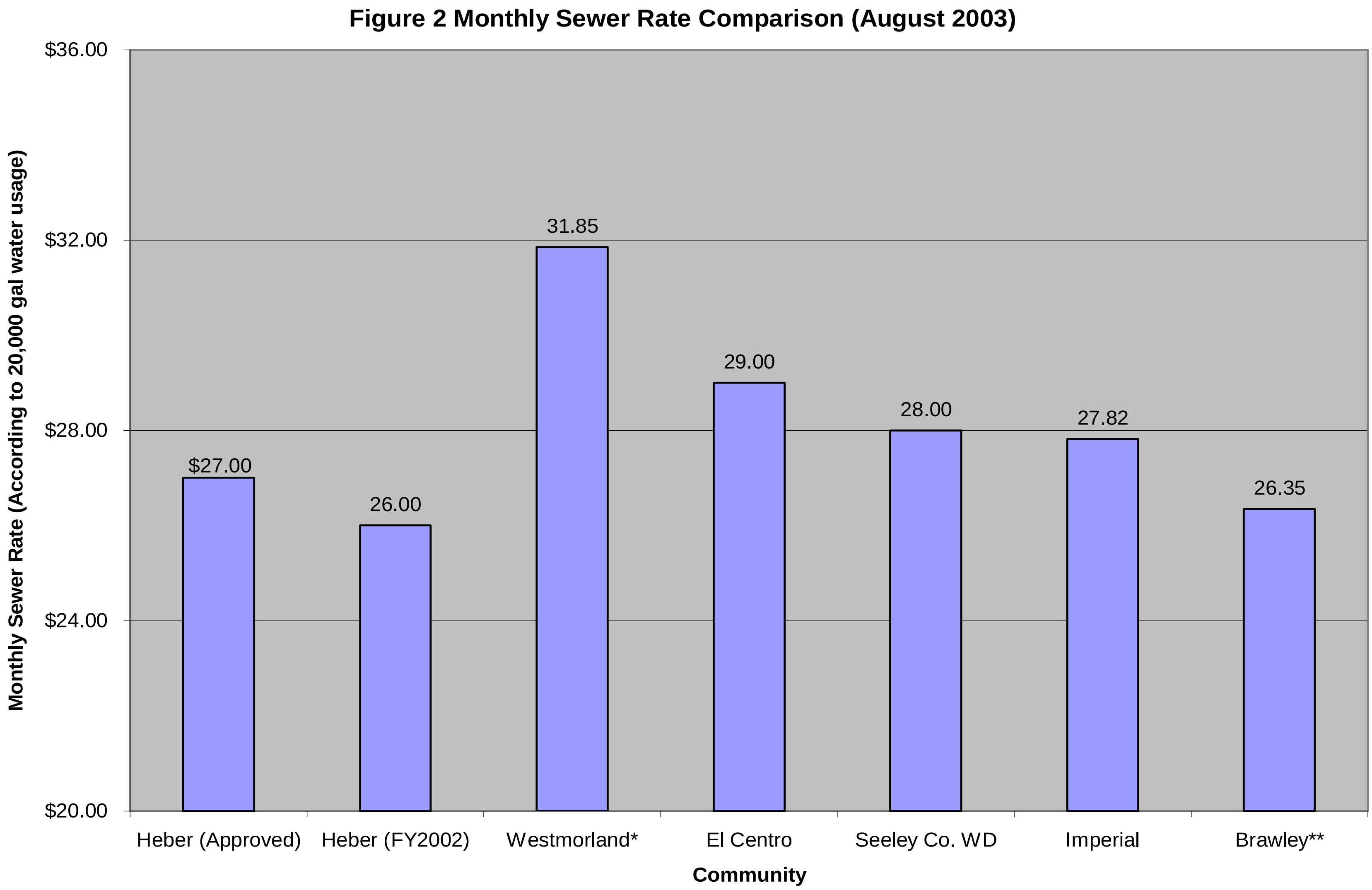


Figure 2 Monthly Sewer Rate Comparison (August 2003)
$36.00
$32.00
$28.00
$24.00
$20.00
Monthly Sewer Rate (According to 20,000 gal water usage)
$27.00
26.00
31.85
29.00
28.00
27.82
26.35
Heber (Approved)
Heber (FY2002)
Westmorland*
El Centro
Seeley Co. WD
Imperial
Brawley**
Community

Wastewater Utility Fund Budgets and Debt Service Schedule

This section contains the projected wastewater Enterprise Fund budgets and the annual net debt service through FY2009. The future budgets were formulated using the revenues and expenditures projected from the assumptions presented in this study, the debt service and bond revenue in Table 32, and the rate increases outlined in Tables 34 and 35. In each fiscal year, the operating income is at least 1.2 times the net debt service and the fund has positive income. For FY2004, the rate increase was predetermined by the District. Table 37 on the following page shows the projected Wastewater Enterprise Fund budgets through FY2009.

Additional growth scenarios and revenue formulation and analysis are presented in the Appendix.

Table 37 Proposed Wastewater Enterprise Fund Budget

Fiscal Year		2003	2004	2005	2006	2007	2008	2009
Operating Revenues								
Service Fees		$232,380	$ 310,302	$ 477,222	$ 819,912	$ 1,200,418	$ 1,585,742	$ 1,911,968
Single Family Residential		197,720	276,978	342,198	477,408	641,712	815,892	950,832
Mutli-Family Residential		22,560	14,838	114,348	317,832	526,860	727,776	912,384
Commercial		4,640	6,636	7,788	9,972	15,262	23,534	28,424
Industrial		3,800	7,110	7,782	8,970	10,206	11,490	12,672
Public Agencies		3,660	4,740	5,106	5,730	6,378	7,050	7,656
Penalty		4,667	500	500	500	500	500	500
Reconnection Charge		667	-	-	-	-	-	-
Interest		-	1,695	1,224	2,353	9,607	23,834	45,177
Miscellaneous Revenue		56,000						
Other Revenue		1,400						
Total Opeating Income		295,114	312,497	478,946	822,765	1,210,525	1,610,076	1,957,645
Operating Expenses	**Percent Increase**							
Personal Services		126,262	148,838	157,768	167,234	177,268	187,904	199,179
Salaries and Wages	6	79,541	84,313	105,272	111,589	118,284	125,381	132,904
Salaries and Wages (Staff Additions)		-	15,000	-	-	-	-	1
Fringe Benefits	6	46,721	49,524	52,496	55,645	58,984	62,523	66,275
Supplies, Services, General and Admin		153,317	171,435	192,091	215,696	242,732	273,767	309,473
Office Services	6	2,500	2,650	2,809	2,978	3,156	3,346	3,546
Supplies	6	4,300	4,558	4,831	5,121	5,429	5,754	6,100
Postage	6	1,250	1,325	1,405	1,489	1,578	1,673	1,773
Chemical Purchases	10	10,500	11,550	12,705	13,976	15,373	16,910	18,601
Miscellaneous/County Fees	6	2,600	2,756	2,921	3,097	3,282	3,479	3,688
Training	10	5,400	5,940	6,534	7,187	7,906	8,697	9,566
Sponsorships	6	-	-	-	-	-	-	-
Autos/Trucks	10	667	734	807	888	977	1,074	1,182
Plant	10	10,000	11,000	12,100	13,310	14,641	16,105	17,716
Fuel	10	2,400	2,640	2,904	3,194	3,514	3,865	4,252
Office Repairs	6	600	636	674	715	757	803	851
Accounting/Auditing	6	2,500	2,650	2,809	2,978	3,156	3,346	3,546
Engineering	10	26,000	28,600	31,460	34,606	38,067	41,873	46,061
Legal	6	3,750	3,975	4,214	4,466	4,734	5,018	5,319
Operations	6	-	-	-	-	-	-	-
Planning	6	2,250	2,385	2,528	2,680	2,841	3,011	3,192
Laboratory	10	25,000	27,500	30,250	33,275	36,603	40,263	44,289
Waste Collection	6	-	-	-	-	-	-	-
Memberships	6	500	530	562	596	631	669	709
Mileage Reimbursement/Allowance	6	350	371	393	417	442	468	496
Meals	6	1,250	1,325	1,405	1,489	1,578	1,673	1,773
Travel & Conference	6	6,000	6,360	6,742	7,146	7,575	8,029	8,511
Licenses/Permits	10	3,000	3,300	3,630	3,993	4,392	4,832	5,315
General Insurance	6	2,000	2,120	2,247	2,382	2,525	2,676	2,837
Equipment Rental	6	500	530	562	596	631	669	709
Utilities	20	40,000	48,000	57,600	69,120	82,944	99,533	119,439
Raw Water Purchases	6	-	-	-	-	-	-	-
Capital Outlay (Equipment)	0	6,667						
Total Operating Expenses		286,246	320,272	349,859	382,930	420,000	461,671	508,652
Operating Income (Loss)		8,868	(7,775)	129,086	439,834	790,525	1,148,405	1,448,993
Changes in Assets and Liabilities		-	-	-	-	-	-	-
Interest Income		-	-	-	-	-	-	-
Capital Outlay- sml eq, vehic, software	10		20,000	22,000	24,200	26,620	29,282	32,210
NADBank Repair/Replace Assistance		30,000						
Existing Debt Service		(54,258)	(53,808)	(53,358)	(52,908)	(52,558)	(52,008)	(52,008)
New Debt Service		-	-	-	-	-	-	-
2004 Series				-	-	-	-	-
2005 Series					-	-	-	-
2006 Series						-	-	-
2007 Series							-	-
2008 Series								-
2009 Series								
NADBank Debt Service Assistance		26,000	58,000	2,725				
Net Debt Service Paid Out (In)		28,258	(4,193)	50,633	52,908	52,558	52,008	52,008
Operating Income/Net Debt Service		0.31	1.85	2.55	8.31	15.04	22.08	27.86
Net Increase (Decrease) in Cash and Cash Equivalents		10,611	(23,582)	56,454	362,727	711,348	1,067,116	1,364,775
Cash and Cash Equivalents - July 1		74,162	84,773	61,190	117,644	480,371	1,191,719	2,258,834
Cash and Cash Equivalents - June 30		$ 84,773	$ 61,190	$ 117,644	$ 480,371	$ 1,191,719	$ 2,258,834	$ 3,623,609

General Fund

Assumptions

Several key assumptions make up a substantial portion of the foundation of this analysis. The following were assumed to complete this portion of the study:

- The growth anticipated in this Service Area Plan is what will actually take place.
- The District will receive property tax totaling 0.25% of the projected assessed values
- Projected property values as shown in Table 38
- Existing properties will not have their assessed values changed, i.e. they will not be bought or sold. This is a conservative estimate. If existing properties are sold, then the assessed value will likely increase, which in turn will provide additional revenue to the District
- Interest income will be based on a 2.0% interest rate
- Salaries, wages, benefits, training, equipment repairs, fuel, accounting, engineering, temporary employment services, mileage reimbursement, meal reimbursement, travel and conference, licenses, and utilities will rise at an annual rate of 10% per year
- All other operating expenditures will increase 6% annually
- Capital outlay for office equipment will increase 10% per year, starting at $12,730 in FY2002
- Royalties will provide income of $8,000 per year
- Other Revenue will provide income of $3,500 annually
- No sales of assets
- New service fees will total $2,000 annually

The following documents were used as bases for this study:

- FY2002 General Purpose Financial Statements

Table 38 Projected Assessed Property Values for New Units

Description	2005	2006	2007	2008	2009
Apartments/Condos	$ 50,000	$ 55,000	$ 60,000	$ 65,000	$ 70,000
Commercial	$ 250,000	$ 260,000	$ 270,000	$ 280,000	$ 290,000
Industrial	$ 250,000	$ 260,000	$ 270,000	$ 280,000	$ 290,000
Residential	$ 200,000	$ 210,000	$ 220,000	$ 230,000	$ 240,000

Background

The District's General Fund is used by the District to handle parks and lighting operations and maintenance, administrative and office staff wages and benefits, mailings, billing, legal, and most travel costs. This fund is supported almost entirely by property tax revenue, with some revenue from interest and other fees.

Property Tax Revenue Projection

The major source of revenue for this fund is property tax. Table 39 on the following page shows the projected property tax revenue for new developments from FY2005 through FY2009. This projected revenue is based entirely on the projected number of new units (homes, condos, etc), projected assessed values, and the District receiving 0.025% of the assessed values.

Projected General Fund Budget

Due to the projected development and the resulting increased property values, the District will see substantially increases in its General Fund income over the next five years. Personnel and other expenses will rise as well, but the District's annual excess revenue should increase substantially over the same time period. This will permit the District to accumulate a larger cash reserve that will be necessary due to the District's increased size. The projected budgets for the General Fund are shown in Table 40.

Table 39 Projected New Property Tax Revenues

Account Type	Description	2005	2006	2007	2008	2009
A	Apartments/Condos					
	Estimated Assessed Value of New Properties	$ 50,000	$ 55,000	$ 60,000	$ 65,000	$ 70,000
	Property Tax per Unit	$ 125	$ 138	$ 150	$ 163	$ 175
	Projected Number of New Units	403	403	387	336	336
	Total New Property Tax Revenue	$ 50,375	$ 55,413	$ 58,050	$ 54,600	$ 58,800
C	Commercial					
	Estimated Assessed Value of New Properties	$ 250,000	$ 260,000	$ 270,000	$ 280,000	$ 290,000
	Property Tax per Unit	$ 625	$ 650	$ 675	$ 700	$ 725
	Projected Number of New Units	4	4	16	15	3
	Total New Property Tax Revenue	$ 2,500	$ 2,600	$ 10,575	$ 10,267	$ 2,175
I	Industrial					
	Estimated Assessed Value of New Properties	$ 250,000	$ 260,000	$ 270,000	$ 280,000	$ 290,000
	Property Tax per Unit	$ 625	$ 650	$ 675	$ 700	$ 725
	Projected Number of New Units	1	1	1	1	1
	Total New Property Tax Revenue	$ 625	$ 650	$ 675	$ 700	$ 725
R	Single Family Residential					
	Estimated Assessed Value of New Properties	$ 200,000	$ 210,000	$ 220,000	$ 230,000	$ 240,000
	Property Tax per Unit	$ 500	$ 525	$ 550	$ 575	$ 600
	Projected Number of New Units	326	391	442	392	268
	Total New Property Tax Revenue	$ 163,000	$ 205,275	$ 243,100	$ 225,400	$ 160,800
	Total Annual Additional Property Tax Revenue	$ 216,500	$ 263,938	$ 312,400	$ 290,967	$ 222,500

Table 40 Projected General Fund Budget

Fiscal Year		2002	2003	2004	2005	2006	2007	2008	2009
Income									
Interest		$ 2,317	$ 2,500	$ 2,500	$ 5,560	$ 9,890	$ 15,168	$ 21,416	$ 27,236
Royalties		7,978	8,000	8,000	8,000	8,000	8,000	8,000	8,000
Other Revenue		3,353	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Payment Center Revenue		446	500	500	500	500	500	500	500
Property Taxes		263,987	263,987	263,987	480,487	744,425	1,056,825	1,347,791	1,570,291
Sale of Assets			-	-	-	-	-	-	-
New Service Fee		1,700	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Total Income		279,781	277,987	277,987	494,487	758,425	1,070,825	1,361,791	1,584,291
Expenditures	**Percent Increase**								
Personal Services		84,939	93,433	102,776	113,054	124,359	136,795	150,475	165,522
Salaries and Wages	10	59,079	64,987	71,486	78,634	86,498	95,147	104,662	115,128
Fringe Benefits	10	25,860	28,446	31,291	34,420	37,862	41,648	45,813	50,394
Office Services	6	13,741	14,565	15,439	16,366	17,348	18,389	19,492	20,661
Supplies	6	6,796	7,204	7,636	8,094	8,580	9,095	9,640	10,219
Postage	6	800	848	899	953	1,010	1,071	1,135	1,203
Special Mailings	6	125	133	140	149	158	167	177	188
Miscellaneous	6	5,152	5,461	5,789	6,136	6,504	6,895	7,308	7,747
Training	10	131	144	159	174	192	211	232	255
Sponsorships/Contributions	6	-	1,000	1,060	1,124	1,191	1,262	1,338	1,419
Equipment Repairs	10	-	1,000	1,100	1,210	1,331	1,464	1,611	1,772
Fuel	10	181	199	219	241	265	292	321	353
Office Repairs	6	814	863	915	969	1,028	1,089	1,155	1,224
Director's Fees	6	23,800	25,228	26,742	28,346	30,047	31,850	33,761	35,786
Accounting/Auditing	10	2,240	2,464	2,710	2,981	3,280	3,608	3,968	4,365
Engineering	10	326	359	394	434	477	525	578	635
Legal	6	18,044	19,127	20,274	21,491	22,780	24,147	25,596	27,132
Planning	6	7,874	8,346	8,847	9,378	9,941	10,537	11,169	11,840
Temporary Employment Services	10	-	1,000	1,100	1,210	1,331	1,464	1,611	1,772
Memberships	6	2,010	2,131	2,258	2,394	2,538	2,690	2,851	3,022
Subscriptions	6	27	29	30	32	34	36	38	41
Mileage Reimbursement/Allowance	10	3,295	3,625	3,987	4,386	4,824	5,307	5,837	6,421
Meal Reimbursement/Allowance	10	1,190	1,309	1,440	1,584	1,742	1,917	2,108	2,319
Travel & Conference	10	6,753	7,428	8,171	8,988	9,887	10,876	11,963	13,160
Licenses/Permits	10	-	1,000	1,100	1,210	1,331	1,464	1,611	1,772
General Insurance	6	3,597	3,813	4,042	4,284	4,541	4,814	5,102	5,409
Equipment Rental	6	238	252	267	283	300	318	338	358
Utilities	10	24,826	27,309	30,039	33,043	36,348	39,983	43,981	48,379
Capital Outlay (Office)	10	12,730	14,003	15,403	16,944	18,638	20,502	22,552	24,807
Total Operating Expenses		219,629	242,271	262,938	285,459	310,004	336,765	365,947	397,778
Excess Revenues Over (Under) Expenses		60,152	35,716	15,049	209,028	448,420	734,060	995,844	1,186,513
Net Transfers In (Out)		(102,014)	-	-	-	-	-	-	-
Excess of Revenue and Other Sources Over (Under) Expenditures		(41,862)	35,716	15,049	209,028	448,420	734,060	995,844	1,186,513
Cash and Cash Equivalents - July 1		86,907	45,045	80,761	95,809	304,838	753,258	1,487,317	2,483,161
Cash and Cash Equivalents - June 30		$ 45,045	$ 80,761	$ 95,809	$ 304,838	$ 753,258	$ 1,487,317	$ 2,483,161	$ 3,669,675

Disclosure Statement

Numerous assumptions were made to project revenue, expenses, and debt for the Water Enterprise Fund, Wastewater Enterprise Fund, and General Fund over the length of the study period for this analysis. These assumptions were based off of several sources, including but not limited to the Service Area Plan recommendations and the assumptions therein, guidelines and assumptions from the District, and the District's previous years' audited financial statements.

Several factors may influence the projected revenue, expense, and debt of the District's General and Enterprise Funds. These include, but are not limited to the interest rate on bond issuances; the actual number, type, and schedule of additional accounts during the study period; unforeseen regulatory and water quality requirements; abnormal weather that affects water consumption and irrigation; projected expenses, such as utility and permitting costs; and reaction by existing customer base to rises in water usage by consuming less water. Nolte cannot be held liable for the accuracy of the financial projections presented in this report.

APPENDIX

Methodology

For purposes of this study, Nolte closely looked at planned development in Heber over the next 15 years and estimated increases in water demand and wastewater generation. Results from the study will be used to reassess existing water and wastewater facilities and to aid in pipe sizing and locations for new lift stations.

To obtain background information for this study, Nolte contacted the District and local developers to assemble possible future development in the area. Nolte then verified each project's status and obtained detailed totals for housing, schools, and commercial acres. The information was then used to calculate average and max day water demands, as well as average and peak hour wastewater generation.

Nolte assumed that proposed projects will be completed at a constant rate over the course of construction. For instance, Heberwood Estates is planned to be under construction from 2004-2008 and will contain 420 single family homes upon completion. This study assumes that 84 houses will be built in each of 2004, 2005, 2006, 2007 and 2008.

For commercial development, Nolte calculated water demand and wastewater generation by using parking space totals. According to Wastewater Engineering, Metcalf and Eddy, 1991, approximately 2 gpd should be assumed for both water demand and wastewater generation for each parking space present. Nolte assumed that approximately half of commercial acreage is covered by parking lots. Only half of the parking lot area is used for spaces, with the rest taken by roads and landscaping. For each acre (43,560 ft^2), a quarter of the area is used for parking spots (approx 11,000 ft^2). Assuming the average parking space is 20'x10' (200 ft^2), 11,000 ft^2 divided by 200 ft^2 gives a value of 55 parking spots per acre. Assuming the 2 gpd value for water and wastewater mentioned above, each acre of commercial zoning is assumed to demand 110 gpd of water and generate 110 gpd of wastewater.

Nolte used Wastewater Engineering, Metcalf and Eddy, 1991, as a guideline to estimate water demands and wastewater generation for residential areas. Residential housing was split into two groups for this project: Single Family and Multiple Family. Single family housing is assumed to use more water than multiple family mostly because of yard irrigation. Multiple family housing usually contains less landscaping and therefore uses less irrigation water. The same theory applies to wastewater, as single families generate an average of 30 gpcd per housing member more than their multiple family housing counterparts. Both single family and multiple family homes are assumed to contain an average of 4 people.

In schools, water demand is calculated by the number of enrolled students. On average, each student uses approximately 20 gpd. It is assumed that wastewater generation equals 20 gpd as well.

Schools will also be built in McCabe Ranch as part of its community construction. McCabe Ranch I will contain one school, which will be completed by 2006. Nolte assumed that the school will service McCabe Ranch children almost entirely. Plans show that 200 houses will be built by 2007. Nolte safely estimated that there will be an average of one school-aged child in each house. Using those numbers and adding some extra room for expansion, Nolte came up with an estimated student body of 250.

For water, Nolte used a multiplier of 2.5 to calculate maximum day water demand and a peaking factor of 3.0 to calculate peak hour water demand. Nolte also used a multiplier of 2.0 to calculate peak hour wastewater generation per unit using the average daily wastewater generation per unit. Because Nolte assumed the peak hours for water demand to take place from 6-8am, only residential customers were subject to the peak hour usage calculations. Commercial and school customers do not normally experience above-average water demand during those hours.

For restaurants, Nolte assumes 300 customers per day. This number was determined after speaking to a local restaurant manager.

Based on information provided to Nolte by Hale Engineering and Linscott, Law & Greenspan Engineers, 16.3 acres of Heber Meadows and 39 acres of Heber 142 will be used for multifamily housing. Each has a proposed density of 29 units per acre.

29 units per acre is the value used for all multifamily housing in this study.

When presenting estimated costs for treatment plant expansions, including potable water storage and distribution pumping, $3 per gallon of capacity increase was used.

All information pertaining to proposed development locations, sizes, zoning breakdowns and construction timeframes is based on information given to Nolte from developers in the Heber area. Due to the dynamic nature of this study, findings and other information presented in this report are subject to change.

Water and Wastewater Treatment Facility Demands, Capacities, and Improvement Schedules

Treatment Plant Capacities and Future Improvement Costs

Water Demand							
Year	Additional Max Day Water Demand For New Development gpd	Total Max Day Water Demand gpd	Water Treatment Plant Capacity gpd	Excess Treatment Plant Capacity, Less One 2MGD Unit gpd	Demand as Percentage of Capacity Less 2MGD Unit	Capacity Increase to be Constructed During Time Period gpd[2]	Cost of Capacity Increase
2003 (Current)[1,3,4]		1,330,000	1,300,000	-30,000	102.3%	2,700,000	$0
2004	700,600	2,030,600	4,000,000	-30,600	50.8%	1,000,000	$3,000,000
2005	775,350	2,805,950	5,000,000	194,050	93.5%	1,000,000	$3,000,000
2006	868,725	3,674,675	6,000,000	325,325	91.9%	1,000,000	$3,000,000
2007	745,200	4,419,875	7,000,000	580,125	88.4%		$0
2008	579,475	4,999,350	7,000,000	650	100.0%		$0
2009-2013	7,116,050	12,115,400	14,500,000	384,600	96.9%	7,500,000	$22,500,000
2014-2018	1,375,625	13,491,025	15,500,000	8,975	99.9%	1,000,000	$3,000,000

$3.00 :Assumed price per gallon of water capacity increase

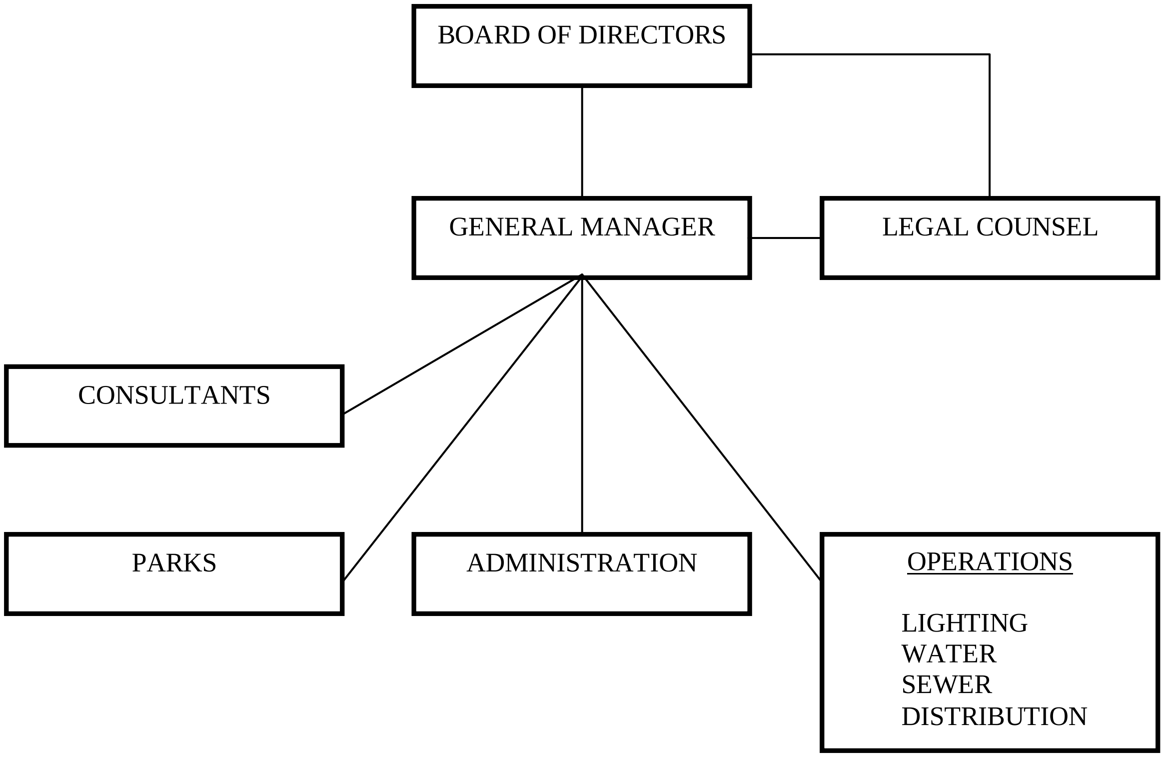
Wastewater Generation							
Year	Additional Average Day Wastewater Generation From New Development gpd	Total Average Day Wastewater Generation gpd	Wastewater Capacity gpd	Excess Treatment Plant Capacity gpd	Demand as Percentage of Capacity	Capacity Increase to be Constructed During Time Period gpd[2]	Cost of Capacity Increase
2003 (Current)[1]		386,000	810,000	424,000.00	47.7%	0	$0
2004	244,560	630,560	810,000	179,440.00	77.8%	800,000	$2,400,000
2005	270,560	901,120	1,610,000	708,880.00	56.0%	0	$0
2006	302,210	1,203,330	1,610,000	406,670.00	74.7%	400,000	$1,200,000
2007	257,520	1,460,850	2,010,000	549,150.00	72.7%	0	$0
2008	202,270	1,663,120	2,010,000	346,880.00	82.7%	0	$0
2009-2013	2,421,820	4,084,940	5,200,000	1,115,060.00	78.6%	3,190,000	$9,570,000
2014-2018	415,730	4,500,670	6,000,000	1,499,330.00	75.0%	800,000	$2,400,000

$3.00 :Assumed price per gallon of wastewater capacity increase

[1] Source: Heber Public Utility District 2003 Flow Records
[2] Constructed capacity Increase in 2008 should be reexamined by 2007
[3] Currently under construction and scheduled to be completed by August 2004
[4] Two units are currently under construction and will replace existing treatment process. Each unit has capacity of 2MGD. One 2MGD unit kept for backup

HPUD Board of Directors Minutes Approving Water and Wastewater Rates

HPUD Organization Chart



Updated: December 2001

HPUD Audited Financial Statements

COUNTY OF IMPERIAL

WATER SUPPLY ASSESSMENT AND VERIFICATION REPORT

Project: Imperial Center

Prepared by:

Development Design & Engineering, Inc.

September 1, 2005

(DRAFT)

Table of Contents

Purpose

This Water Supply Assessment and Verification Report (WSA&V Report) has been prepared by the Development Design & Engineering, Inc. for the County of Imperial. The assessment was prepared pursuant California Water Code Sections 10631, 10657, 10910, 10911, 10912, and 10915 referred to as SB 610 and Business and Professions Code Section 11010 and Government Code Sections 65867.5, 66455.3, and 66473.7 referred to as SB 221. SB 610 and SB 221 amended state law, effective January 1, 2002, to improve the link between information on water supply availability and certain land use decisions made by cities and counties. SB 610 requires that the water purveyor of the public water system prepare a water supply assessment to be included in the environmental documentation of certain proposed projects. SB 221 requires affirmative written verification from the water purveyor of the public water system that sufficient water supplies are available for certain commercial subdivisions of property prior to approval of a tentative map.

The County of Imperial requested the water assessment as part of the environmental review of the project known as Imperial Center. The project description is provided below. This water assessment is intended for use by the County of Imperial in its water assessment evaluation of water supplies. The assessment evaluation the following water issues:

- Water available during a normal year
- Water available during multiple dry water years
- Water available during a 20-year projection to meet existing demands
- Expected demands of the project
- Reasonably foreseeable planned future water demands to be served by the Imperial Irrigation District.

The assessment will detail the water received by the project area in prior years and Urban Water Shortage Management and Emergency Preparedness programs.

Project Description

The anticipated land uses at the Imperial Center will provide a variety of commercial uses are intended to serve the needs of regional shoppers and the wholesale market. The Imperial Center is expected to provide approximately one million square feet of commercial facilities. The following summarizes the primary potential uses of the project area:

- Information/Exhibit/Auction Center 15,000 square feet
- A wholesale outlet 460,000 square feet
- Food court 13,000 square feet
- Multiplex cinema 83,000 square feet
- Hotel (200 rooms) 135,000 square feet
- Plaza/Auction Court 95,000 square feet
- Hotel Plaza/Restaurant 5,000-10,000 square feet
- Convenience Market with a Filling Station 37,000 square feet
- Eleven pads each for 5,000 square feet of retail

The highest and best uses identified above are driving the project. However, due to the changing economics and the expected long life of the project area, the listed land uses are subject to change.

Proposal

Currently, the Heber Public Utility District (HPUD) is not able to provide future water service to the Imperial Center Specific Plan Area, although, it is currently in the process of upgrading its water plant. With this new capacity, HPUD will be able to offer both sewer and water services to the Imperial Center.

The Imperial Center will have three different alternatives to pursue to provide the development within the specific plan area sewer and water services. These alternatives are all feasible and approved by the Heber PUD. Which alternative the developers of Imperial Center will select will depend on developer goals.

Alternative One

The following is a summary of the plan to construct and operate a water plant to service Imperial Center:

- Total area of the water facility will be approximately four acres.
- Water Plant building (50’ x 40’).
- Potable Water Tank Storage (600,000 gallons)
- The water plant will contain two water ponds with a total volume of 874,528 gallons.
- Peak fire capacity = 2,000 gallons per minute for a four (4) hour duration plus domestic.
- Potable Water Pumps: 2,000 Gallons per Minute @ 80 psi
- Raw Water Irrigation Pumps: 200 Gallons per Minute @ 60 psi

This alternative calls for the Imperial Center Specific Plan area to be annexed into the Heber Public Utility District service area.

The water plant would be located in Lot 3 in the northern section of the project. It will be located adjacent to the sewer plant. The water plant will be located an appropriate distance from the sewer plant as determined by the Heber Public Utility District and State of California. The following is a summary of the plan to construct and operate a water plant within the Imperial Center Specific Plan Area:

- Total area of the water facility will be approximately four acres.

- Water Plant building (50' x 40').

- Potable Water Tank Storage (600,000 gallons)

- The water plant will contain two water ponds with a total volume of 874,528 gallons.

- Peak fire capacity = 2,000 gallons per minute for a four (4) hour duration plus domestic.

- Potable Water Pumps: 2,000 Gallons per Minute @ 80 psi

- Raw Water Irrigation Pumps: 200 Gallons per Minute @ 60 psi

Peaking factors of 2 and 4 were used to estimate maximum day and peak hour demands respectively.

The water distribution system was sized to provide a 2,000-gpm fire flow under maximum day demands with a residual pressure of no less than 20 psi or no more than 10-psi pressure drop anywhere in the system under peak hour demands, whichever is greater.

Water storage, treatment and pumping facilities will all be located on on-site. The source of water for the project will be Imperial Irrigation district's All American Canal. Storage for the project will be kept in a potable water tank and raw water reservoir, then the All American Canal. The potable water reservoir will hold two average day's storage plus fire flow requirements. The raw water reservoir will hold seven and a half days storage requirement.

Water will flow by gravity to the raw water reservoir and will be pump to the water treatment plan when needed. The treatment plant is proposed to be a package system, consisting of modular units, where each unit contains a rapid mix tank, flocculation tank, settling basin and a filter. The modular unit concept will allow the treatment plant to be constructed incrementally, as needed.

Once water passes through the treatment plant, it will flow by gravity to the treated water storage tank. A potable water-booster pump station will pump water from the treated storage tank to the water distribution system.

The distribution system will have a 12-inch diameter pipe looped within the project, which will allow the project to be phased while still maintaining the infrastructure necessary to provide fire flow.

Design and operations of the water treatment facilities, storage reservoirs, and distribution systems will conform to guidelines from the following:

- California Department of Health Services
- County Department of Health Services Environmental Health
- Air Pollution Control District
- Department of Water Resources Division of Safety of Dams
- Insurance Services Office
- National Fire Protection Code

Water facilities discussed in this plan are preliminary and may be re-evaluated as development proceeds. Additional water facility options may be proposed and approved as part of the tentative mapping process. For example, smaller pipes may be used if originally anticipated water demands are less than anticipated.

Exhibit 1 provides a graphical detail of the proposed Alternative One.

Reclaimed Water Imperial Center

In an effort to conserve water at the Center, this Alternative will use reclaimed water for all landscaping on site. Standards shall meet County requirements. As an alternative, the Imperial Center management may wish to undertake landscaping irrigation with nearby agricultural water.

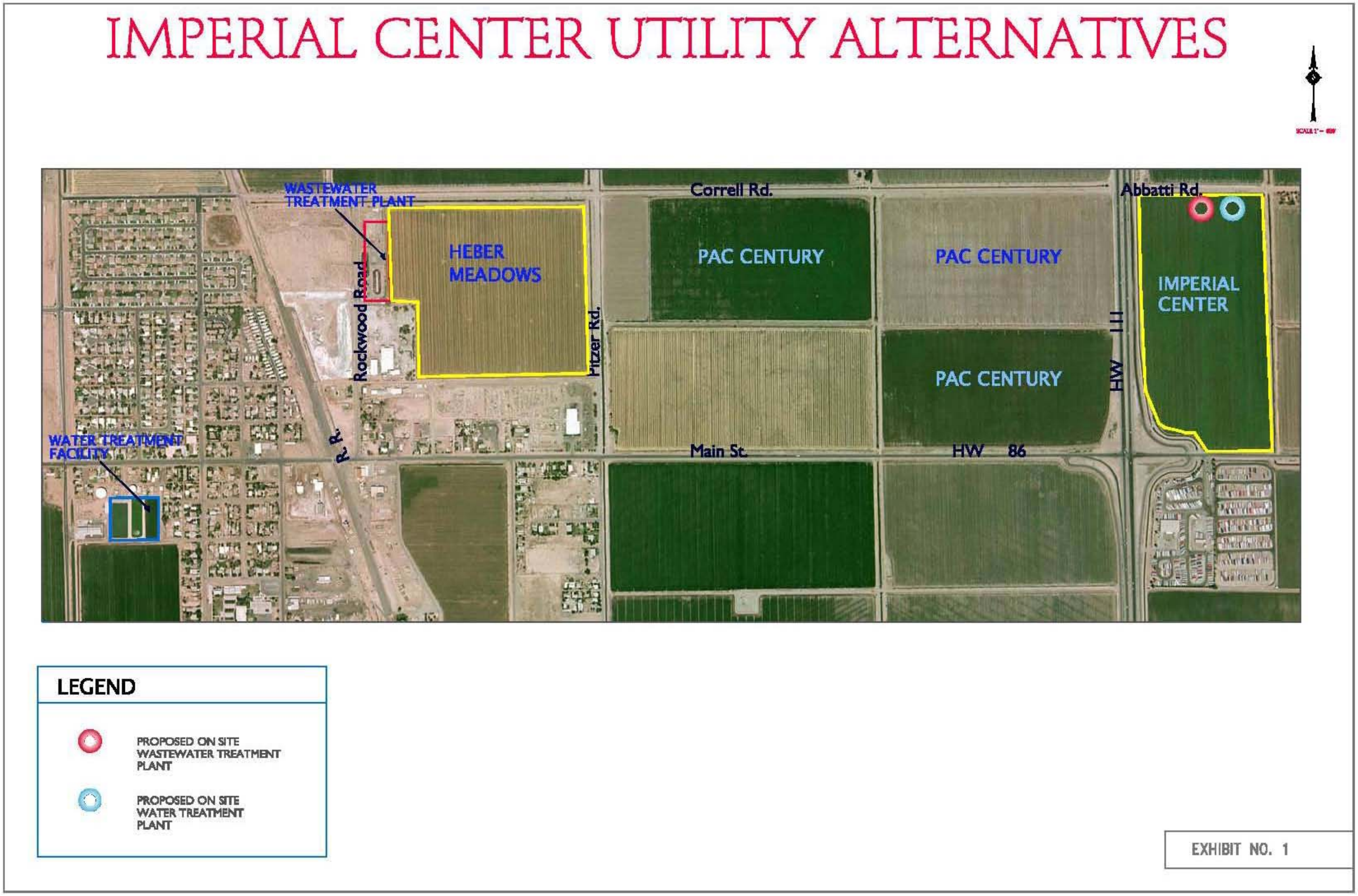


Exhibit 1: **Alternative One**

Alternative Two

HPUD would provide both water and sewer services to HPUD in Alternative Two. Alternative Two proposes to extend single project specific sewer and water lines to the Imperial Center project. This alternative would include upgrading the capacity of HPUD's water plant.

The single project specific eight-inch water line would extend from an existing point of connection to Imperial Center. A 12-inch force main sewer line will also be extended from an existing point of connection to Imperial Center. Two pump stations, one for both sewer and water, would be utilized in this alternative. It would not include a looped infrastructure water lines.

Alternative Two would provide water to the Imperial Center during peak hours using water that will be stored in an 800,000-gallon water tank. This tank will be located in Lot 3 on the tentative map. HPUD would replenish the tank during off-peak hours. Fire pressure and water availability would be sufficient to satisfy all fire protection needs.

Alternative Two is estimated to cost $2.3 million for infrastructure improvements. HPUD has stated that they intend to upgrade their water treatment plant. These improvements may be financed by a variety of mechanisms. Community Facility Districts (CFD's) or developer fees with reimbursement agreements may be used to finance these improvements.

Unlike Alternative One, The demand for water from the Imperial Center will increase in Alternative Two from Alternative One because the Imperial Center will not be able to use recycled water for irrigation purposes. For this reason, water demand for irrigation purposes will increase by 40,186 gallons per day.

Exhibit 2 provides a graphical detail of the proposed Alternative Two.

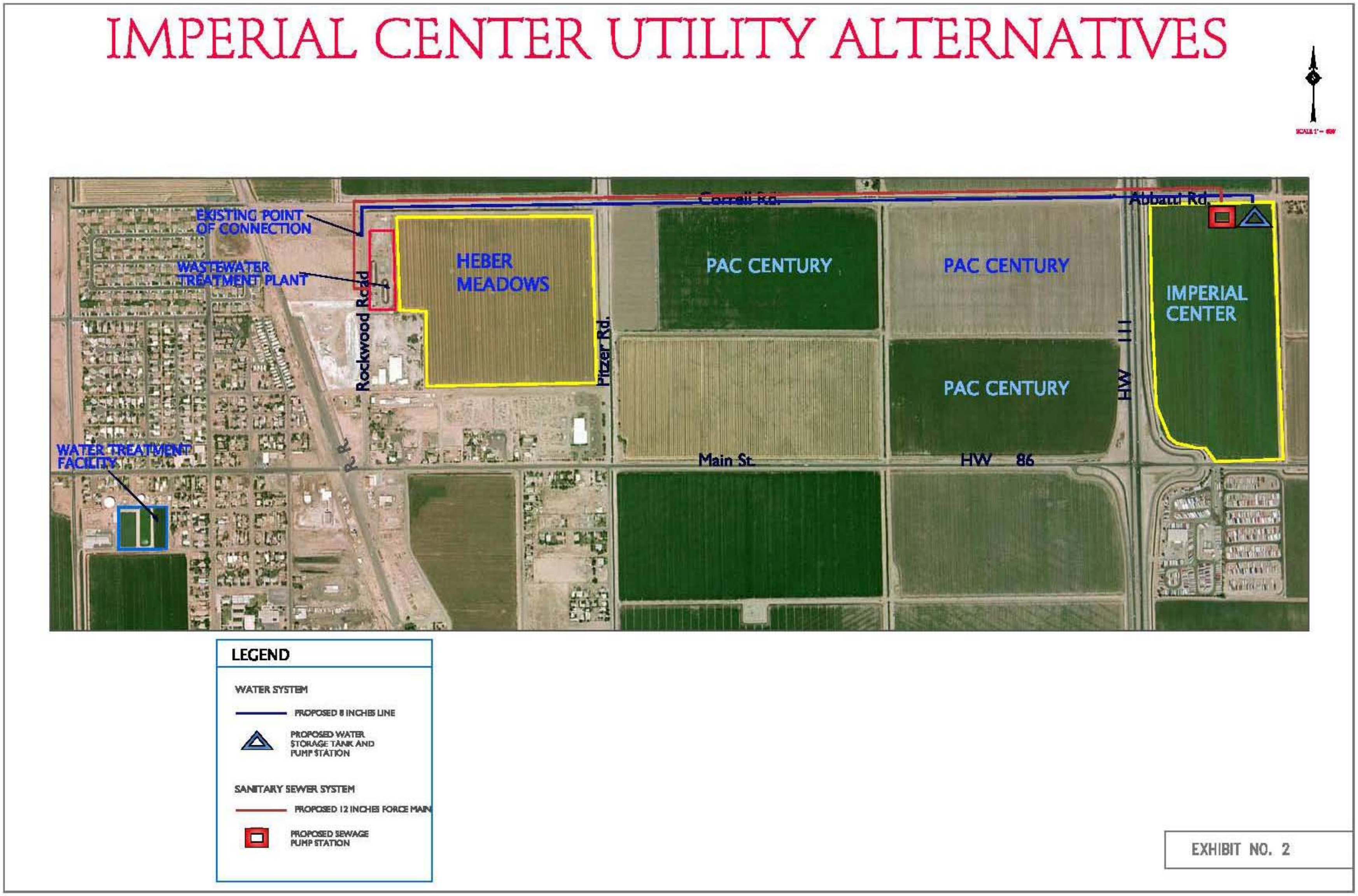


Exhibit 2: **Alternative Two**

Alternative Three

HPUD would provide both sewer and water services to Imperial Center in Alternative Three. The proposed infrastructure would include improvements that are included, as a full-buildout, in the Heber Public Utility District Service Area Plan.

The HPUD would upgrade its water plant capacity under this alternative. This alternative would also include a looped water infrastructure system.

Alternative Three is estimated to cost $2.4 million for infrastructure improvements. HPUD has stated that they intend to upgrade its infrastructure. These improvements may be financed by a variety of mechanisms. Community Facility Districts (CFD's) or developer fees with reimbursement agreements may be used to finance these improvements.

As in the case of Alternative Two, Alternative Three would not be able to use recycled water for irrigation purposes. The Imperial Center water demand in Alternative Three would be 40,186 gpd greater than in Alternative One.

Exhibit 3 provides a graphical detail of the proposed Alternative Three.

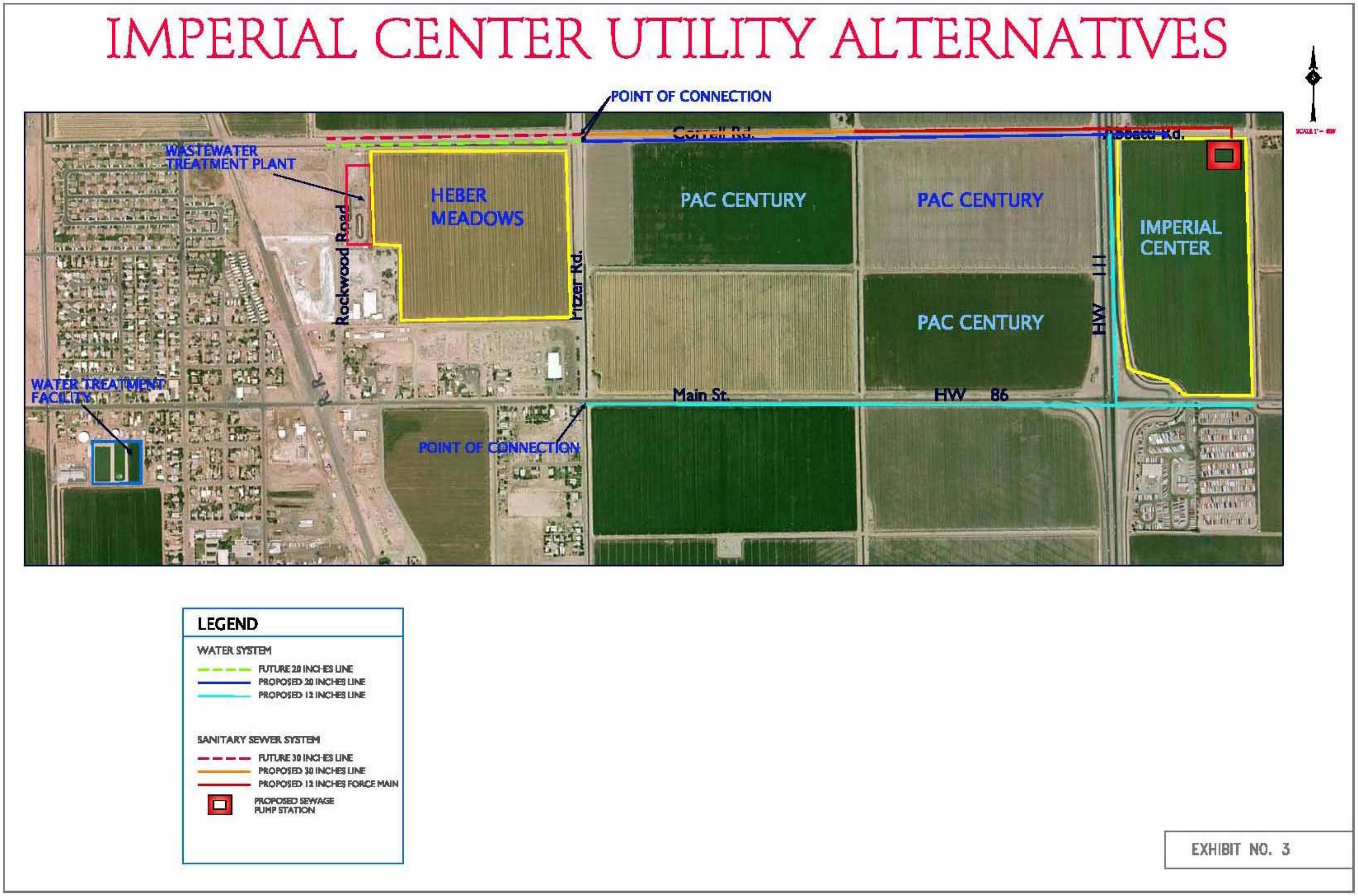


Exhibit 3: **Alternative Three**

Heber Public Utility District

Area Description

Heber is an unincorporated community of Imperial County, California, located six miles north of the United States-Mexico Border between the cities of El Centro and Calexico on Highway 86. Heber is 60 miles west of Yuma, AZ and 120 miles east of San Diego, CA. The development is bounded to the north by McCabe Road (one mile south of Interstate 8), to the east by State Highway 111, to the south by Jasper Road, and the City of Calexico form its southern boundary.

The central service area can be characterized as residential and industrial, with agriculture surrounding the Township of Heber. The Union Pacific Railroad has an important branch that traverses the Township from the northwest to the southeast. The topography of the area is essentially flat, with the ground surface generally sloped downward toward the north. The Imperial Irrigation District has several canals, drains, and laterals in the northeast portion of the Township.

Heber Public Utilities District Background

The Heber Public District's (The District) residents elect a five member Board of Directors. A General Manager reports directly to the Board of Directors and is charged with overseeing District operation and employees. The District contracts legal counsel that reports to the Board of Directors and the General Manager. Operations, administration, parks, and consultants hired by the District report to the General Manager.

The District has a total for eight full time employees, including three office and five operations staff members. The District is searching for a General Manager. The District has temporary help on occasion as needed. FY 2004 expenses for salaries, wages, and fringe benefits totals $412,000. This cost is divided amount the Water Enterprise Fund, Wastewater Enterprise Fund, and General Fund.

Imperial Irrigation District

Service Area Description

Imperial County is located in the southeastern corner of California. It is bordered on the west by San Diego County, on the north by Riverside County, on the east by the Colorado River, which forms the Arizona boundary, and on the south by 84 miles of International Boundary with the Republic of Mexico. The Imperial County encompasses an area of 4,597 square miles or 2,942,080 acres.

Approximately fifty percent of lands in Imperial County are undeveloped and under federal ownership and jurisdiction. One-fifth of the nearly 3 million acres in Imperial Valley are irrigated for agricultural purposes, most notably the central area known as Imperial Valley. The Imperial Valley irrigated agriculture consists of 512,163 acres (Imperial County General Plan, 1998, Overview p. 7.) The developed area, where Imperial County's incorporated cities, unincorporated communities, and supporting facilities are situated, comprises less than one percent of the land. The Salton Sea accounts for approximately seven percent of Imperial County surface area.

The Imperial Valley is located in Imperial County. The Imperial Valley area is in the south-central part of Imperial County, and is bounded by Mexico on the south, the Algodones San Hills on the east, the Salton Sea on the north, San Diego County on the northwest, and the alluvial fans bordering the Coyote Mountains and the Yuha Desert on the Southwest. The Imperial Valley Area encompasses 989,450 acres (U.S. Department of Agriculture Soil Conservation Service, 1981, p.1).

The Imperial Irrigation District's irrigation services are laying entirely within Imperial County is divided into four units: Imperial, West Mesa, East Mesa, and Pilot Knob, with a gross acreage of 1,061,637 acres.

The Imperial Irrigation water supplier service area is located within the Imperial Valley and is defined as the Imperial Unit of the Imperial Irrigation District's Irrigation Service Area (Imperial Unit). The Imperial Unit includes the urban areas for the cities of Brawley, Calexico, and El Centro and part of the Imperial County's unincorporated area. The Management Plan's water supplier service area, also known as the Imperial Unit, has a total area of 694,346 acres. See Exhibit 4 for the Imperial Unit's boundaries.

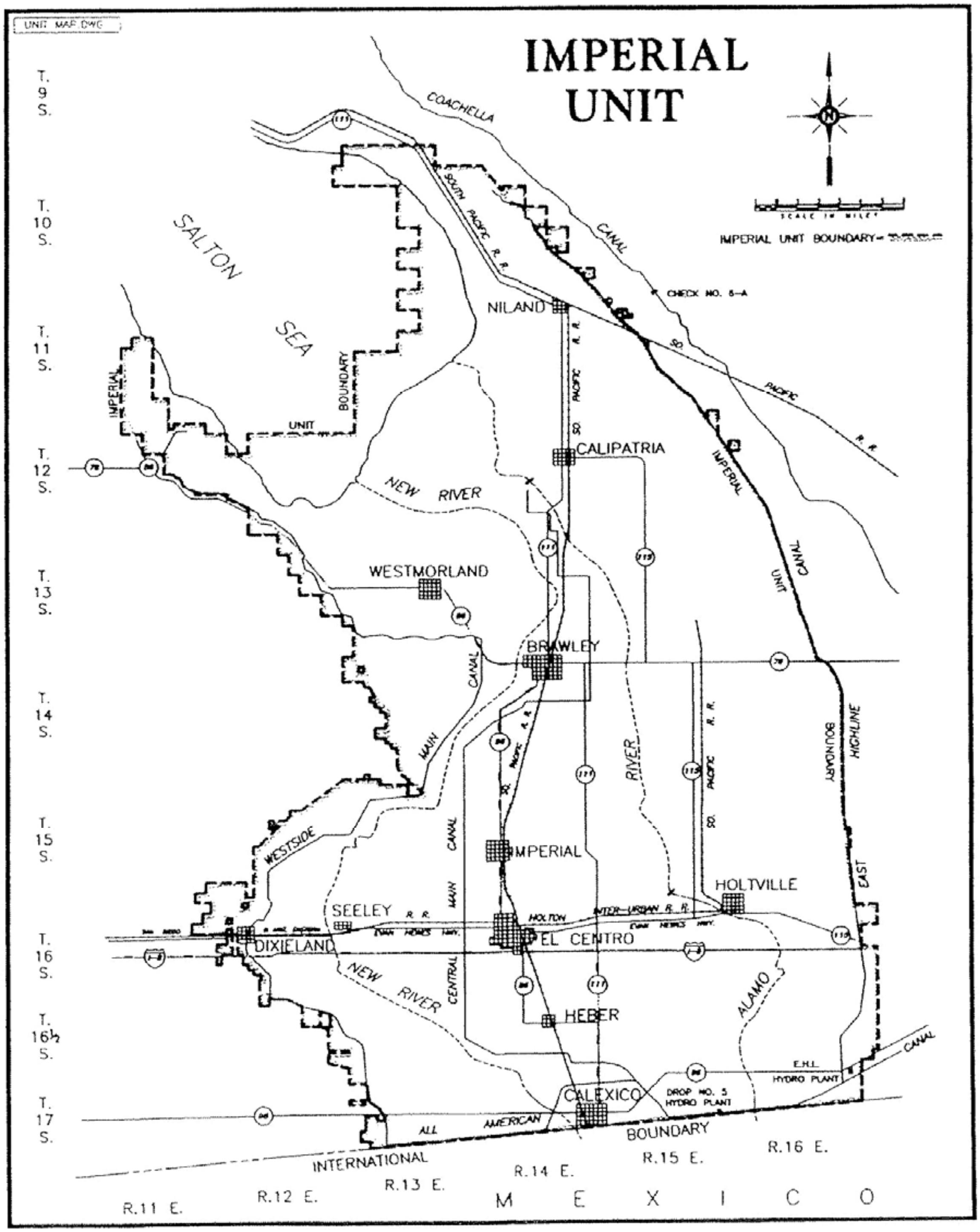


Exhibit 4: Imperial Unit

Climate Factors

The Imperial County has an arid desert climate, characterized by hot, dry summers and mild winters. Summer temperatures typically exceed 100 degrees Fahrenheit and the winter low temperatures rarely drop below 32 degrees Fahrenheit. The remainder of the year has a relatively mild climate with temperatures averaging in the mid-70's. The average annual air temperature is 72 degrees Fahrenheit, and the average frost-free season is about 300 days per year.

The average annual rainfall in the Imperial Valley is less than three inches, with most rainfall associated with brief but intense storms. The majority of the rainfall occurs from November through March. Periodic summer thunderstorms are common in the region.

Imperial Valley elevations range from sea level to 273 feet below sea level. The Mexican Border is located at the southern end of Imperial Valley and the elevation is sea level. The southern end of the Salton Sea is located at the northern end of Imperial Valley and the elevation is sea level. The southern end of the Salton Sea is located at the northern end of Imperial Valley and the elevation is 273 feet below sea level. The relatively flat topography of the Imperial Valley and surrounding areas in conjunction with strong night and day temperatures differentials, particularly in the summer months, produce moderate winds and deep thermal circulation systems. The thermal systems facilitate general dispersion of the air.

Population

The Population Research Unit of the California Department of Finance (DOF) estimates annual changes in population. According to DOF's 2004 estimates, the population of Imperial County's unincorporated areas was 34,300 and Imperial County's total population was 156,600. This compares to the 2000 census results of 32,773 people for Imperial County's unincorporated area and 142,361 people for Imperial County's total population.

Population Projections			
	2000[1]	2004[2]	2010[3]
Imperial County (IC)	143,361	156,600	178,201
Unincorporated IC	32,773	34,300	
California	33,871,648	36,144,000	39,246,767

Table 1: Population Projections

Land Use

The Imperial Unit is predominantly an agriculture area. Agriculture development in the Imperial Valley began at the turn of the twentieth century and now includes approximately 500,000 acres of irrigated land that support a $1 billion annual local agriculture economy. Imperial Irrigation District is the regional water supplier in Imperial County, delivering Colorado River flows to all agricultural lands and urban water retailers within its contracted water service area. The Imperial Irrigation District operates open channel gravity flow irrigation and drainage systems and continually strives to develop innovative ways to improve its operations, increase reliability and to conserve water.

While the agriculture-based economy is expected to continue, land use will vary somewhat over the years as urbanization and growth occurs in the rural areas adjacent to existing urban areas. The developed areas within the Imperial Unit include unincorporated cities, unincorporated communities, and supporting facilities. The seven incorporated cities in the Imperial Unit are Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland. Heber, Niland and Seeley are unincorporated communities.

Future Land Uses

The economy within the Imperial Unit is gradually becoming more diverse. Agriculture, however, will continue to be the primary industry within the Imperial Unit over the next twenty years. The two principal factors that will affect the increase or reduction of crop acreage within the Imperial Unit will be urban development and the economics of the agricultural market. Over the next twenty years, urbanization is expected to slightly decrease the historically constant acreage of the land developed to agriculture.

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[1] 2000 US Census Information
[2] State of California Department of Finance, http://www.dof.ca.gov/html/demograp/table1.xls, 2/21/05
[3] State of California Department of Finance, http://www.dof.ca.gov/html/demograp/E-1table.xls, 2/21/05

The majority of urban development should occur in and around the ten incorporated and unincorporated cities and communities. Urban development is expected to remain concentrated near the currently established urban centers. There are now two international border crossings in the Imperial Unit, the Calexico Port of Entry and the International Port of Entry. The industrial Mexico/United States International Port of Entry, located east of Calexico, is expected to facilitate urban development within the Imperial Unit.

Undeveloped areas that are being developed or could possibly be developed include areas that surround the incorporated cities, area that surround the unincorporated communities, and areas within the Specific Plan Areas. Specific Plans are used to implement the Imperial County General Plan for large development projects such as a planned community, or to designate an area of Imperial County where further studies are needed for development. When adopted, a Specific Plan serves as an amendment to the Imperial County General Plan for a very defined and detailed area. Some of Imperial County's Specific Plan areas area adjacent to incorporated cities and unincorporated communities. Some Specific Plan areas have not completed all of their possible developments.

In October 2001, the total urban area surrounding cities and communities is 49,790 acres or 7.2 percent of the total Imperial Unit. This percentage has increased slightly due to the increase in development we have seen in the past couple of years. The majority of land area is currently being farmed.

Urban areas yet to be developed will be characterized by a full level of urban services, in particular public water and sewer systems, and will contain or propose a broad range of residential, commercial and industrial uses. It is anticipated that most urban developments, yet to be developed, will eventually be annexed or incorporated into existing cities, and provide the full range of public infrastructure normally associated with municipalities such as public sewer and water, drainage improvements, street lights, fire hydrants, and fully improved paved streets with curbs and sidewalks that are consistent with city standards.

Trends in land use point to an increase in the development of existing urban areas to provide for larger residential capacity an increased population. Within an increase in the development of existing urban areas, there will be associated increases in service and infrastructure. The total urban land use in the years 2000 through 2020 will remain small in comparison to agriculture land uses within the Imperial Unit.

Historical and Projected Water Demands

Project Specific

The minimum and maximum potable water use for the project is estimated to be 100,000 gallons and 200,000 (gpd) respectively. Irrigation water is an additional 37,500 and 70,000 gpd respectively. For planning purposes, we assumed the higher estimate, or a 200,000-gpd, as the average daily water demand for the project. This estimate should be re-evaluated as development proceeds to determine if some facilities proposed could be reduced in size. Table 1 provides the water use factors used to estimate project flows. Table 2 provides an engineers' estimate for potable water demand for Imperial Center.

Water Use Factors		
LAND USE	**MINIMUM**	**MAXIMUM**
Potable	1250 GPD/AC	2500 GPD/AC
Irrigation	500 gpd/ac	1000 gpd/ac

Table 2: Water Use Factors

Engineers' Estimate for Potable Water Demand for Imperial Center								
Facility	**Area**	**Occupancy ft^2/ Person**	**People/Unit**	**Gallons/day per capita**	**Average Gallons/ day**	**Usage Hours**	**Peak Flow Factor**	**Peak Gallons /min**
Information Exhibit Rest Rooms	15,000 ft^2	30	500	10	5,000	6	3	42
Wholesale Outlet Mall Restrooms, Interior Landscaping, Food Service Facilities	460,000 ft^2	30	15,333	0.10	46,000	10	2	153
Multiplex Cinema Restrooms, Food Service	83,000 ft^2	14	5,929	3	17,786	6	3	148
Hotel 200 Rooms Rooms, Laundry, Interior Landscape, Janitorial Services, Banquet Services	135,000 ft^2	200	1.75	100	35,000	11	3	159
Hotel/Plaza Restaurant Restrooms, Kitchen	10,000 ft^2	15	667	10	20,000	12	3	83
Plaza Auction Court Restrooms, Janitorial	95,000 ft^2	30	3,167	3	28,5000	6	3	238
Convenience Market/Gas Restroom, Kitchen, Food Service	37,000 ft^2	30	1,233	3	7,400	12	2	21
Retail Pads (eleven) Restrooms, Kitchens	5,000 ft^2	30	167	5	18,333	12	2	560
Total of all Above			26,997		**178,019**			1,404

Table 3: Engineers' Estimate for Potable Water Demand for Imperial Cent

Heber PUD's Water Treatment Facility Demands & Capacities

Existing Water Demands

Most of the HPUD's water customers are single and multi family units. Other customers include the geothermal plant, schools, and the County Roads Facility. The average daily water consumption in the district is 750,000 gpd. As is the case with most communities in the Imperial Valley, water consumption rises significantly in the summer months. Due to climate, irrigation of parks, schools and landscaping, water consumption increase substantially. According to District records, the average daily consumption in winter months is less than 500,000 gpd. During summer months, the average daily consumption is over 1,000,000 gpd.

Imperial Irrigation District

Water Use / Demand

The Imperial Irrigation District provides wholesale water service. Demand for water in the Imperial Unit service area is divided into three basic categories: agricultural, municipal, and industrial. Historically the Imperial Irrigation District has delivered 98.2 percent of its annual flows to agricultural water users, 1.2 percent to municipalities, and 0.6 percent for industrial purposes.

The seven incorporated and three unincorporated cities within the Imperial Unit each divert water from Imperial Irrigation District's canal system to their treatment facilities prior to distribution to individual water users within their municipalities.

The primary industrial water users outside the urban areas are geothermal plants, Holly Sugar Corporation, chemical and fertilizer producers, a state prison (a second state prison located in the Imperial Unit is served treated water through a private water company), and the U.S. Naval Air Facility.

The Imperial Irrigation District is not a public water system and does not supply potable drinking water. The Imperial Irrigation District does provide raw untreated canal water to small acreage and service pipe connections, some of which are rural homes without any alternative water source. In these instances, the Imperial Irrigation District has complied with state and federal Safe Drinking Water Acts (SDWA) though an exclusionary process unique to irrigation districts. The Imperial Irrigation District ensures that all rural water users (with indoor uses of canal water) also have a source of water delivered to their property for cooking and drinking purposes from a California Department of Health Services Approved Provider. Water use by the Cities of Brawley, Calexico, and El Centro are listed in Table 4.3.1.

The Imperial Irrigation District's consumptive use values include the total use of raw water in the Imperial Unit. These consumptive use values include agriculture, small acreage, service pipes, municipalities, industrial, losses and unaccounted-for raw water. There is no available data that completely distinguishes between these uses of raw water.

Water distribution systems lose water during distribution for several reasons. Specific water distribution losses depend on the type of distribution system. A piped water distribution system can lose water due to pipe failures or leaks. Open channels, ponds, reservoirs, and water basins can lose water from seepage through the soil, surface evaporation into the air, and plant consumption. The Imperial Irrigation District has an open channel gravity flow water distribution system. Its water distribution system losses result from three major conditions: seepage, operational discharges, and evaporation. Operational discharges are excess flows discharged from a channel into another channel or drain. Operational discharges can result from carriage water that is required to fill and empty the reaches of sloping channels; excess water delivered to a channel to ensure adequate and constant delivery to the water users; increases in water user flexibility for water ordering and delivery scheduling; and terminating water deliveries during rainfall events, storm runoff, and flood flows.

The Imperial Irrigation District's water distribution system losses have been reduced through the years by numerous water conservation and demand management programs and projects. The demand management programs and projects are described in detail in the Imperial Irrigation District Demand Management Section of this plan. Table 5 details the Imperial Irrigation District's recent and projected water usages. The total consumption is projected to remain stable after 2005 as agricultural usage declines and transfer agreements take effect.

Imperial Irrigation District Annual Water Use (Historical, Projected, and Water Conservation and Transfer Program/Projects)							
Water Use	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Consumptive Use[4,5 & 6] (includes agricultural, service pipe, municipalities, industrial, losses, and unaccounted for)	3,054,188[4]	3,070,582[4]	3,112,951[52]	2,910,000[6]	2,722,300[6]	2,677,300[6]	2,625,300[6]
Water Conservation & Transfers							
IID/MWD Transfer[7&8]	6,6110[7]	74,570[7]	109,460[7]	110,000[8]	110,000[8]	110,000[8]	110,000[8]
IID/San Diego County Water Authority Transfer[9]	0	0	0	80,000	180,000	200,000	70,000
IID/Coachella Valley Water District Transfer[10]	0	0	0	0	20,000	45,000	70,000
AAC Lining Conservation (MWD) [11]	0	0	0	0	56,200	56,200	56,200
AAC Lining Conservation (San Luis Rey Indian Water Rights Settlement Act) [11]	0	0	0	0	11,500	11,500	11,500
Total (Acre-Feet)	3,060,298	3,145,152	3,222,411	3,100,000	3,100,000	3,100,000	3,100,000
Units of Measure: Acre-Feet							

Table 4: Imperial Irrigation District Annual Water Use

4 Decree accounting consumptive use data from Compilation of Records in Accordance with Article V. of the Decree of the Supreme Court of the United States in Arizona v. California Dated march 9, 1964 for Calendar Years 1990 1995, by the US Department of the Interior Bureau of Reclamation Lower Colorado River Region, pp.14-17.
5 Estimated using provisional water use data from Diversion from Mainstream-Available Return Flow & Consumptive use of Such Water Calendar Year 2000, by the US Department of the Interior Bureau of Reclamation Lower Colorado River Operations, March 7, 2001, Provisional Water use 2000.
6 Voluntary cap as per the proposed Quantification Settlement Agreement (QSA) for the Colorado River, value closes "Total" to 3,100,000 acre-feet.
7 Imperial Irrigation District All American Canal (38 Years), p.1.
8 Key Terms for Quantification Settlement among the State of California, IID, CVWD, and MWD, October 15, 1999 p.4.
9 Agreement for Transfer of Conserved Water by and between Imperial Irrigation District, a California irrigation district ("IID"), and San Diego County Water Authority, a California county water authority ("Authority"), 1998, Article 3 Quantity, p.13. At full implementation, project savings are between 130,000 and 200,000 acre-feet.
10 Key Terms for Quantification Settlement among the State of California, IID, CVWD, and MWD, October 15, 1999, pp. 6 & 8
11 Key Terms for Quantification Settlement among the State of California, IID, CVWD, and MWD, October 15, 1999, pp. 10 & 11

Historic Water Usage on this Land

The Imperial Center development will demand less water than the current agricultural land-use does. The Imperial Irrigation District provided the historic water use figures, which appear in Tables 6, 7 and 8. These historical usages are close to 50,000 gpd greater than the highest such figure from Imperial Center, for Alternates Two and Three, which appear in table 9. The discrepancy in water consumption between the two land uses would be even greater; but the average was brought down by the fact that the land went un-irrigated in 1994 and 1995.

Annual Water Usage 1987-1995								
1987	1988	1989	1990	1991	1992	1993	1994	1995
514.7	395.1	438.2	485.2	384.0	405.6	209.5	0	0

Table 5: Water Consumption with Agricultural Land Use, 1987-1995

Annual Water Usage 1996-2003							
1996	1997	1998	1999	2000	2001	2002	2003
322.7	425.3	428.4	385.6	368.7	128.1	265.8	355.6

Table 6: Water Consumption with Agricultural Land Use, 1995-2003

Water Consumption with Agricultural Land-Use	
Average Annual Usage	324.3
Acres of Land	77.64
Acre Feet/Acre/Year	4.2
Gallons/Acre Foot	326,000.0
Gallons/Year	105,710,294.0
Days/Year	365.0
Gallons/Day	289,617.0

Table 7: Annual Water Usage 1987-2003

Projected Water Usage Per Day (gpd)		
	Low-End	High-End
Alternative One	100,000	200,000
Alternative Two	140,186	240,186
Alternative Three	140,186	240,186

Table 8: Projected Water Usage Per Day (gpd)

Historical and Project Water Supplies

Heber Public Utility District

The Heber Public Utility District (HPUD) receives all of its water from the Imperial Irrigation District. Based on the 2000 Imperial Irrigation District Urban Plan, the link between water from the Imperial Irrigation District and urban water consumers like HPUD is strong. The plan states that the Imperial irrigation District prioritizes urban water delivery in dry years. Under a worst-case water supply scenario, the Imperial Irrigation District is confident that urban water users (which comprise less than two percent of its annual water deliveries) can be assured delivery of their required water supply. The Plan states that even under the "multiple reduced demand years" where water is restricted, urban water deliveries will not be reduced. Due to its present perfected water rights and the relatively small water demand of non-agricultural water users, the Imperial Irrigation District would not reduce or cut back urban water deliveries even in years of reduced deliveries. Since its inception in 1911, the Imperial Irrigation District has never been denied the right to divert the amount of water it has requested for agricultural purposes and other beneficial uses."

The Imperial Irrigation District supplies raw water to HPUD, which subsequently treats it. The water is then distributed to HPUD customers through it distribution facilities.

The existing distribution facilities are generally small pipelines, with diameters ranging from three to 10 inches. There is a small amount of 18-inch pipe along Dogwood Road south of Main Street, and 12-inch pipe in the new Heberwood Estates development. Pipe materials are a mix of asbestos cement and polyvinyl chloride (PVC). Most of the older systems are of small diameter, asbestos cement pipes. During the mid and late 1980s, several 8-inch, 10-inch and 12-inch pipelines were installed parallel to these pipelines. The normal system operating pressure is 45 psi.

Historical Origins of Imperial Irrigation District's Water Rights

The Imperial Unit depends solely on the Colorado River for surface water inflows. The Imperial District imports raw Colorado River water and distributes it primarily for agricultural purposes. The Imperial Irrigation District also delivers untreated flows for municipal and industrial uses. Municipal and/or industrial users treat the raw water to meet state and federal drinking water standards before distribution to urban users.

Rainfall is less that three inches per year and does not contribute to Imperial Irrigation District's water supply, although at times it may reduce agriculture water demand. The groundwater in the Imperial Unit is of poor quality and is generally unsuitable for domestic or irrigation uses.

The Imperial Irrigation District was formed in 1911 to acquire properties of the bankrupt California Development Company and its Mexican Subsidiary. By 1922, the Imperial Irrigation District had acquired 13 mutual water companies, which had developed and operated distribution canals in the Imperial Valley. By the mid-1920's, the Imperial Irrigation District was delivering water to nearly 500,000 acres. Since 1942, water has been diverted at the Imperial Dam on the Colorado River through the All-American Canal, both of which the Imperial Irrigation District operates and maintains.

The Imperial Irrigation District's rights to divert Colorado River water are long standing. Imperial Irrigation District holds legal titles to all its water and water rights in trust for landowners within the district (California Water Code 20529 and 22437; Bryand v. Yellen, 447 U.S. 352, 371 (1980), fn.23.). Beginning in 1885 a number of individuals, as well as the California Development Company, made a series of appropriations of Colorado River water under California law for use in the Imperial Valley. Pursuant to then-existing California laws, these appropriations were initiated by the posting of public notices of 10,000 cfs each at the point of diversion and recording such notices in the off of the county recorder. The individual appropriations were subsequently assigned to the California Development Company, whose entire assets, including its water rights, were later bought by the Southern Pacific Company. After the Imperial Irrigation District was formed in 1911, the Southern Pacific Company conveyed all of its water rights to the Imperial Irrigation District on June 22, 1916.

The Imperial Irrigation District's predecessor right holders made reasonable progress in putting their pre-1914 appropriative water rights to beneficial use. By 1929, 424,145 acres of the Imperial Valley were under irrigation. Had the Imperial Irrigation District not subsequently modified its pre-1914 appropriative rights, it would have perfected its pre-1914 appropriative water right at over 7 million acre-feet annually.

Subsequently, in 1921 representatives from the seven Colorado River basin states, with the authorization for their legislatures and at the urging of the Federal government, began negotiations regarding the distribution of waters from the Colorado River. In November of 1922, the representatives form the upper (Colorado, New Mexico, Utah, Wyoming) and lower (Arizona, California, and Nevada) basin states signed the Colorado River Compact (Compact), an interstate agreement giving each basin perpetual rights to annual appropriations of 7.5 million acre-feet of the Colorado River water annually.

The Compact was made effective by provisions in the 1928 Boulder Canyon Project Act (45 Statute 1056), which authorized the construction of Hoover Dam and the All-American Canal and served as the United States consent to accept the Compact. Officially, enacted on June 25, 1929 through a Presidential Proclamation, this act resulted in the ratification of the Compact by six of the basin states and required California to limit its annual consumptive use to 4.4million acre-feet of the lower basin's apportionment, plus not less than half of any surplus water unapportioned by the Compact. Arizona refused to sign and subsequently filed a lawsuit. California abided by this federal mandate through the implementation of it 1929 Limitation Act. The Boulder Canyon Project Act moreover authorized the Secretary of the Interior (Secretary) to "contract for the storage of water…and for the delivery thereof…for irrigation and domestic uses", and further defined the lower basin's apportionment split by allocating 0.3 million acre-feet of water to Nevada and 2.8 million acre-feet of water to Arizona. While the three states never formally accepted or agreed to these terms, a 1964 Supreme Court decision (Arizona vs. California, 373 U.S. 546) declared their consent to be inconsequential since the Boulder Canyon Project Act was authorized by the Secretary.

Following the implantation of the Boulder Canyon Project Act, the Secretary requested California make recommendations regarding the distribution of its allocation of the Colorado River water. In August of 1931, under the direction of the Chairmanship of the State Engineer, the California Seven-Party Agreement was developed and authorized by the affected parties in order to prioritize California water rights. The Secretary accepted this recommendation agreement and established these priorities through General Regulations issued in September of 1931. The first four priority allocations account for California's 4.4 million acre-feet allotment, with agricultural entities utilizing 3.85 million acre-feet of that total. The remaining priorities are defined for years in which the Secretary declares that excess waters are available. Finally, it should also be noted that a 1944 treaty entitles Mexico to an annual apportionment of 1.5 million acre-feet of Colorado River water and additional 200,000 acre-feet in years that excess water is available.

Pursuant to the provisions of the Boulder Canyon Project Act, adopted in 1929, the California Limitation Act (Act of March 4, 1929; Chapter 16, 48th Session; Statutes and Amendments to the Codes, 1929, p. 38-39.), and the Secretary's contracts, California was apportioned an annual 4.4 million acre-feet out of the lower basin allocation of 7.5 million acre-feet annually, plus 50% of any available surplus water. The Secretary of the Interior made the further apportionment of California's share of Colorado River water by entering into contracts with California water right holders. On December 1, 1932 the Secretary, acting on behalf of the United States, executed a contract with Imperial Irrigation District to deliver Colorado River water.

The Imperial Irrigation District agreed to limit its California pre-1914 appropriative water rights in quantity and priority to the apportionments and priorities contained in the Seven-Party Agreement. Following execution of the Seven-Party Agreement, the Imperial Irrigation District filed eight California applications between 1933 and 1936 to appropriate water pursuant to the California Water Commission Act. The Imperial Irrigation District filed such applications without waiving its rights as a pre-1914 appropriator, and the applications sought rights to the same quantity of Colorado water as had been originally appropriated – over 7 million acre-feet annually. However, the applications also incorporated the terms of the Seven-Party Agreement, thus incorporating the apportionment and priority parameters of the Seven-Party Agreement into Imperial Irrigation District's appropriative applications. Permits were granted on the applications in 1950.

At the time the Imperial Irrigation District entered into its contract with the Secretary of the Interior, it was anticipated that the lands to be served with Colorado River water in the Coachella Valley to the north would become a part of the Imperial Irrigation District. However, the Coachella farmers eventually decided that they preferred to have their own delivery contract with the Secretary, and an action was brought by the Coachella Valley Water District to protest the Imperial Irrigation District's court validation of the 1932 Imperial Irrigation District water service and repayment contract with the Secretary of the Interior. In 1934, Imperial Irrigation District and Coachella Valley Water District executed a compromise agreement, which paved the way for Coachella Valley Water District to have its own contract with the Secretary provided it subordinated its

California Colorado River Annual Water Right Priorities			
Priority Order	User	Apportionment	Present Perfected Rights
1.	Palo Verde Irrigation District (for use exclusively upon 104,500 acres of Valley land in, and adjoining district)	3,850,00 AF	219,791 AF (or the consumptive use of 33,604 acres)
2.	Yuma Project (for use on California Division, not exceeding 25,000 acres of land)		38,270 AF (or the consumptive use of 6,294 acres)
3a.	Imperial Irrigation District (lands served by All-American Canal in Imperial and Coachella Valleys)		2,600,000 AF (Imperial Irrigation District only) (or the consumptive use of 424,145 acres)
3b.	Palo Verde Irrigation District (for use exclusively on an additional 16,000 acres of mesa lands)		
4.	Metropolitan Water District (for use on the Southern California Coastal Plain)	550,000 AF	
	Subtotal: [California's Limit (not including surplus waters) of Colorado River Water as per the Boulder Canyon Project Act and the 1929 Limitation Act]	4,400,000 AF	
5a.	Metropolitan Water District (for use on the Southern California Coastal Plain)	550,000 AF	
5b.	City and County of San Diego (through MWD)	112,000 AF	
6a.	Imperial Irrigation District (lands served by the All-American Canal in Imperial and Coachella Valleys)	300,000 AF	
6b.	Palo Verde Irrigation District (for use exclusively on an additional 16,000 acres of mesa lands)		
7.	California Agricultural Use (Colorado River Basin lands in California)	All remaining available water	

Table 9: California Colorado River Annual Water Right Priorities

Colorado River entitlement, in perpetuity, to the Imperial Irrigation District entitlement. In other words, within the third, sixth and seventh priority agricultural pool, as set forth in the Seven-Party Agreement and various California water deliver contracts, Imperial Irrigation District's water use takes precedence over Coachella Valley Water District's use. Under the third priority Coachella Valley Water District receives water out of the annual .385 million acre-feet agricultural pool after water uses y Palo Verde, Yuma Project and the Imperial Irrigation District are deducted.

Both the Colorado River Compact and the Boulder Canyon Project Act contained provisions that required satisfaction of "present perfected rights", or appropriate rights acquired pursuant to state law that were in existence prior to enacting legislation. Imperial Irrigation District's water rights can be classified as two typed, "present perfected" and/or "contract." The 1964 Supreme Court decree (Arizona vs. California, 373 U.S. 546), in conjunction with a supplemental 1979 decree (Arizona vs. California, 439 U.S. 419, 429), awarded the Imperial Irrigation District a "present perfected right" to 2.6 million acre-feet of Colorado River Water annually. This legal decision reinforced the rights to this water that the Imperial Irrigation District had previously established through appropriations based on historical usage. These present perfeced rights are essential to the Imperial Irrigation District as the guarantee priority access to Colorado River water before those without these rights (after Mexico's allotment has been satisfied). Of the Seven-Party Agreement entities, only Palo Verde Irrigation District (PVID), Imperial Irrigation District, and the Yuma Project (non-Indian portions) have present perfected rights. Imperial Irrigation District's remaining water allocations are based on "contract rights" from the December 1932 contract with the Secretary of the Interior (as modified by the 1934 Compromise Agreement with the Coachella Valley Water District). Contract rights for all California entities are described in Article 17 of the 1932 Contract and in their individual contracts with the Secretary. While signatories to the 1931 Seven Party Agreement, Los Angeles, San Diego, and the County of San Diego, who originally was granted a forth priority of 550,000 acre-feet allotment of California's 4.4 million acre-feet apportionment.

Water Supply Sources

Groundwater in the Imperial Unit is of Poor quality and is unsuitable for domestic or irrigation use. Total dissolved solids (TDS) range from a few hundred to more than 10,000 milligrams per liter (mg/l). Generally, the groundwater's fluoride concentration is higher than that recommended for drinking water, while its boron concentration exceeds that recommended for certain agricultural crops.

Surface water is dependent on the inflow of irrigation water from the Colorado River and is non-potable without treatment. There are three general categories of surface water in the Imperial Unit: freshwater, brackish water, and saline water. The freshwater (with TDS generally less than 1,000 ppm) includes all Colorado River inflows delivered by the All American Canal and other canals and laterals within Imperial Irrigation District's Service Area. Brackish water (with TDS in the range of 1,000 to 4,000 ppm) can be found within the Alamo River, New River, and the agricultural drains that discharge into these rivers or directly to the Salton Sea. The Alamo River derives nearly all of its flow from the irrigation water return flows (tailwater and tile water) in the Imperial Unit. The New River derives roughly 65 percent of its volume from irrigation water return flows from the Imperial Unit, with the remaining 35 percent is derived from drainage that flows from the Mexicali Valley across the international border.

The Imperial Irrigation District serves as the regional water supplier, importing raw Colorado River water and delivering it, untreated, to agricultural, municipal, and industrial water users within its service area. Imperial Dam, located 20 miles northeast of Yuma Arizona, serves as Imperial Irrigation District's point of diversion from the Colorado River to the All American Canal.

The Imperial Dam is 147 miles downstream from Parker Dam. It was constructed for diversion of water into the All American Canal and the Gila Gravity Main Canal. The All American Canal diverts water to the Reservation and Valley Divisions of the Yuma Project and to Imperial and Coachella Valleys. The Gila Gravity Main Canal diverts water east of the river to the North and South Gila Valleys, to the Welton-Mohawk Irrigation and Drainage District, and to the Yuma Mesa areas. All the water arriving at Imperial dam is accounted for. Water passing Imperial Dam through the sluiceways or otherwise related to the river blow Imperial Dam is normally scheduled for delivery to Mexico. Imperial Irrigation District staff is responsible for correct delivery and operational accounting for all water released at Parker Dam and delivered to agency diverters along the Colorado River and at Imperial Dam. Imperial Irrigation District staff operates the Imperial Dam.

The All American Canal is an 82-mile long gravity flow canal that conducts water to the Imperial Valley from the Imperial Dam. The All American Canal delivers water to three main canals, the East Highline, Central main, and the Westside Main and hundreds of laterals. Through 1,668 miles of canals and laterals, the Imperial Irrigation District delivers water throughout the Imperial Unit. The Imperial Irrigation District has seven regulating and three interceptor reservoirs that have a total storage capacity of approximately 3,400 acre-feet of water. The reservoirs provide increased flexibility and reduce operational losses, but are not designed for long-term storage. The Imperial Irrigation District delivers water through approximately 5,600 delivery gates for irrigation purposes and operates/maintains about 1,460 miles of drainage ditches used to collect surface runoff and subsurface drainage from the 33,600 miles of private farm tile drains. Surface runoff and flows from the tile drains enter the drainage system and ultimately outlet into the Salton Sea via the Alamo and New Rivers. The conveyance system and the off-farm drainage collection system are operated by Imperial Irrigation District, while the tile drains and tailwater discharge systems have been constructed and are operated by landowners.

Current And Projected Water Supplies						
Agency	**Water Supply Source**	**2000**	**2005**	**2010**	**2015**	**2020**
Imperial Irrigation District (IID)	Colorado River Water Rights[12]	3,296,775 AF[13]	3,100,000 AF[14]	3,100,000 AF[14]	3,100,000 AF[14]	3,100,000 AF[14]
City of Brawley	IID	2,701 MG	3,139 MG	3,942 MG	4,709 MG	5,840 MG
City of Calexico	IID	1,856 MG	1,965 MG	2,005 MG	2,101 MG	2,200 MG
City of El Centro	IID	8,586 AF	8,843 AF	9,108 AF	9,382 AF	9,663 AF
Units of Measure: AF=Acre Feet MG=Million Gallons						

Table 10: Current and Projected Water Supplies

12 See Table 4.0.1. Imperial Irrigation District's water right is not defined volume but rather a quantity of water to serve a defined area of land.
13 Water Supply calculated using provisional water use data from Diversions from Mainstream-Available Return Flow & Consumptive Use of Such Water Calendar year 2000, by US Department of the Interior Bureau of Reclamation Lower Colorado River Operations, March 7, 2001, Provisional Water Use 2000.
14 Voluntary cap as per the proposed Quantification Settlement Agreement (QSA) for the Colorado River.

Reliability Comparison

Imperial Irrigation District's present perfected and contract water rights are highly unlikely to be affected by the usual state and regional drought conditions. The water of the Colorado River is used by both the Upper Basin States (Colorado, New Mexico, Utah, and Wyoming) and the lower basin states (Arizona, California and Nevada), as well as by Mexico. Assuming drought conditions on the Colorado River, California's 4.4 million acre-feet water apportionment is not likely to be impacted due to the massive storage quantities in the Colorado River reservoir system and the structure of water priorities. Arizona's Central Arizona Project must reduce its water diversions by one million acre-feet before any other lower basin water entitlement is affected. Additionally, Imperial Irrigation District's 2.6 million acre-feet of present perfected water rights theoretically protect its water users unless changed by future legislative action. Imperial Irrigation District holds legal titles to all its water and water rights in trust for landowners within this service area (California Water Code 20529 and 22437; Bryant v. Yellen, 447 US 352, 371 (1980), fin.23.). While groundwater in the imperial Unit is not used for commercial or major sources of water due to the high salt content, Imperial Irrigation District's Colorado River water supply is consistent and reliable.

The selected average or normal water year for this report is 1995 as it was the median water use year from 1994 through 1998. For the purposes of this plan, the "single dry water year" term is changed to "single reduced demand water year" as Imperial Irrigation District's senior water rights are such that drought conditions have never affected its water supply. Thus for the purpose of this plan, 1992 was selected as the "single reduced demand water year" as this year had the lowest Imperial Irrigation District water usage during the 1989 to 1998 time period. In the 1992, Imperial Irrigation District's available water supply was calculated to be 3,463,992 acre-feet.

Imperial Irrigation District does not have a quantified water right but instead is allotted the right to use flows within a 3.85 million acre-feet agricultural entitlement. Four agencies share this entitlement, and the right to use these flows is prioritized with the highest priority water user diverting flows first, followed in order of priority by the other three agricultural entities. Thus, Imperial Irrigation District's third priority water right gives it the right to use whatever flows it can put to reasonable and beneficial use after diversions by the Palo Verde Irrigation District and Yuma Project Reservation Division. Coachella Valley Water District holds the last priority to this agricultural entitlement, as is legally entitled to use whatever flows remain from the 3.85 million acre-feet allotment that have not already been diverted by the first three priority holders. Thus, in any year each of the agricultural water users' available water supplied can be determined by subtracting the annual diversions of the higher priority water users from the 3.85 million acre-feet agricultural entitlement. In 1992 Imperial Irrigation District's available water supply was calculated by subtracting Palo Verde Irrigation District and Yuma Project Reservation Division diversions (386,008 acre-feet cumulatively) from the 3.85 million acre-foot supply. However, Imperial Irrigation District's 1992 consumptive use was only 2,572,659 acre-feet so the remaining 1,277,341 acre-feet of flows would have been available for Coachella Valley Water District and lower priority Colorado River contractors.

The Imperial Irrigation District's lowest water use during the 1989 through 1998 time period, were 1991 and 1992 with 1992 being lower than 1991. The term "multiple dry water years" is changed to "multiple reduced demand water years." Historically, the most recent California drought period was from 1987 to 1992. For the ten-year period from 1989 through 1998, the Imperial Irrigation District's lowest water use years were 1991, 1992, and 1993.

Imperial Irrigation District Annual Water Supply Reliability					
			Multiple Reduced Demand Water Years		
	Average/Normal Water Year (1995)	**Single Reduced Demand Water Year (1992)**	**Year 1 (1991)**	**Year 2 (1992)**	**Year 3 (1993)**
Water Use[15]	3,070,582	2,572,659	2,898,963	2,572,695	2,772,148
Water Supply[16]	3,373,233	3,463,992	3,375,173	3,463,992	3,457,909
Unit of Measure is Acre-Feet					

Table 11: Imperial Irrigation District Annual Water Supply Reliability

For the purposes of this report and compliance with the Urban Water Management Planning Act, three years were selected to estimate a minimum annual water supply. The selected three years are 2001, 2002, and 2003. If during the years 2001, 2002, and

15 Decree accounting consumptive use from the Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California Dated March 9, 1964 Calendar Years 1991, 1992, 1993, and 1995, by the US Department of the Interior Bureau of Reclamation Lower Colorado Region.

16 Water Supply calculated using data from the *Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California Dated March 9, 1964* Calendar Years 1991, 1992, 1993, and 1995, by the US Department of the Interior Bureau of Reclamation Lower Colorado Region.

2003 there were a minimum water volume supply from the Colorado River, it would be 3.1 million acre-feet according to a voluntary self-imposed cap proposed in the QSA.

Under a worst-case water supply scenario, the Imperial Irrigation District is confident that urban water users (which comprise less than two percent of its annual water deliveries) can be assured delivery of their required water supply. Due to its present perfected water rights and the relatively small water demand of non-agricultural water users, the Imperial Irrigation District would not reduce or cut back urban water deliveries even in years of reduced deliveries. Since its inception in 1911, the Imperial Irrigation District has never been denied the right to divert the amount of water it has requested for agricultural purposes and other beneficial uses. Current and projected water supplies exceed current projected water demands for Imperial Unit water consumers.

Project Specific

The HPUD will sign a “will-serve” agreement with Imperial Center ensuring that it plans to service the development with water from the Imperial Irrigation District. This agreement is a guarantee to Imperial Center that it will be supplied with the necessary quantities of water.

Supply and Demand Comparison

Supply and Demand Comparison

Increased water demand in the Imperial Unit will be offset in future years with increased water conversion measures.

The selected average or normal water year for this report is 1995. The Imperial Irrigation District’s yearly median water use volume for 1994 through 1998 is equal to 1995’s volume of water. For the purposes of this plan, the “single dry water year” term is changed to “single reduced demand water year.”

Projected Supply and Demand Comparison[17]					
	2000	**2005**	**2010**	**2015**	**2020**
Imperial Irrigation District Totals[18]	3,296,775[18]	3,100,000[19]	3,100,000[19]	3,100,000[19]	3,100,000[19]
Imperial Irrigation District Demand Totals[18&19]	3,112,951[18]	3,100,000[19]	3,100,000[19]	3,100,000[19]	3,100,000[19]
Difference	183,824	0	0	0	0
Unit of Measure is Acre-feet/Year					

Table 12: Projected Supply and Demand Comparison

The 1992 annual water use volume was lower than the 1991 annual water use volume. The Imperial Irrigation District's lowest water use year during the 1989 through 1998 period, was the years 1991 and 1992.

Supply Reliability and Demand Comparison					
	1995 Avg./Normal Water Year	**1992 Single Reduced Demand Water Year**	**Multiple Reduced Demand Water Years**		
			Year 1 (1991)	**Year 2 (1992)**	**Year 3 (1993)**
Imperial Irrigation District Supply Totals[20]	3,373,233	3,463,992	3,375,173	3,463,992	3,457,909
Imperial Irrigation District Demand Totals[21]	3,070,582	2,572,659	2,898,963	2,572,659	2,772,148
Difference	302,651	891,333	476,210	891,333	685,761
Unit of Measure is Acre-feet/Year					

Table 13: Supply Reliability and Demand Comparison

17 Estimated using provisional water use data from Diversions from Mainstream—Available Return Flow and Consumptive use of Such Water Calendar year 2000, by the US Department of the interior Bureau of Reclamation Lower Colorado River Operations, March 17, 2001, Provisional Water Use 2000.

18 Water supply calculated using provisional water use data from Diversion from Mainstream—Available Return Flow and Consumptive Use of Such Water calendar Year 2000, by US Department of the Interior Bureau of Reclamation Lower Colorado River Operations, March 17, 2001, Provisional Water use 2000.

19 Voluntary cap per the proposed Quantification Settlement Agreement (QSA) for the Colorado River Annual Water Rights Priorities are listed in Table 4.0.1.

20 Water supply calculated using data in the Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California Dated march 9, 1964, Calendar Years 1991, 1992, 1993, and 1995 by the US Department of the Interior Bureau of Reclamation Lower Colorado Region.

21 Decree accounting consumptive use from the *Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California Dated march 9, 1964*, Calendar Years 1991, 1992, 1993, and 1995 by the US Department of the Interior Bureau of Reclamation Lower Colorado Region.

Urban Water Shortage Management

It is unlikely that the urban water supply of Imperial Irrigation District would ever be affected, even under shortage or drought conditions on the Colorado River. Urban water use in the Imperial Unit makes up less than two percent of the total water delivered by the Imperial Irrigation District. Under a worst-case water supply scenario, the Imperial Irrigation District is confident it can meet the demands of urban water users.

Due to the high quality of the Imperial Irrigation District's water rights, Colorado River flows, and the storage facilities on the Colorado River it is highly unlikely that Imperial Irrigation District's water supply will be affected, even in dry years. The entire southern California region, both urban and agricultural, would be in a severe drought emergency before the Imperial Valley's water supply is threatened. Historically, the Imperial Irrigation District has never been denied the right to divert the amount of water it has requested for agricultural irrigation and other beneficial uses.

In the event that there is a water shortage in the Lower Colorado River Basin, the Imperial Irrigation District/San Diego County Water Authority water transfer agreement states that both agencies will share, on a pro-rata basis, any reductions in water to Imperial Irrigation District should a shortage declaration by the Secretary of the Interior for the Lower Colorado River Basin affect the Imperial Irrigation District's water conservation and transfer programs. When the amount of water in usable storage in Lake Mead is less than 15 million acre-feet and the unregulated inflow into Lake Powell is forecasted to be less than 8.8 million acre-feet, the Imperial irrigation District and the San Diego County Water Authority have agreed to meet and confer to discuss a supplemental water transfer agreement in anticipation of the shortage.

Should operating conditions on the Colorado River indicate Imperial Irrigation District may be impacted by reductions in water deliveries, the Imperial Irrigation District will notify all of its water users by mail and will conduct an educational outreach program in conjunction with the local media and municipal water systems. The notice will request all water suppliers, and in particular residential, industrial, and commercial water users, to conserve water on a voluntary basis. Urban water suppliers will be responsible for notifying their customers and implementing their own voluntary water conservation measures and programs.

Urban water supply reductions in the Imperial Unit are not likely to occur during the next twenty years. Action stages are noted in this plan in order to comply with California's Urban Water Management Planning Act requirements, and have not been approved by any of the agencies participating in this plan. Urban water supply shortage stage one is voluntary, has cut back conditions of less than 15 percent, and is estimated to provide up to 79 percent of the reduction goal for urban water suppliers. Urban water supply shortage stage two is voluntary, has cut back conditions of less than 15 percent to less than 25 percent, and its estimated to provide 7 to 12 percent of the reduction goal for urban water suppliers. Urban water supply shortage stage 3 is mandatory has cut back conditions of 25b percent to less than 35 percent, and is estimated to provide the remainder of any reduction goals for urban water suppliers. Mandatory provisions to reduce individual urban consumer water use are beyond the jurisdiction of the Imperial Irrigation District. Any urban water use reductions or restrictions are the responsibility of individual urban water suppliers who treat and distribute water within the Imperial Unit. This includes enforcement of any policies to achiever target goals. The Imperial Irrigation District does not expect to enter a stage one or greater urban water shortage at any time over the next 20 years.

Emergency Preparedness

Emergency actions and procedures to be taken by Imperial Irrigation District Water Department staff during an emergency or time of disaster are described in the Emergency Preparedness Plan. The Emergency Preparedness Plan includes required staffs action and procedure to respond to events that impair water operation of canals, laterals, drains, dams, and other facilities. These responses are not normal operation and maintenance activities. Generally, any occurrence that requires and immediate response is classified as an extreme event or emergency.

The Emergency Preparedness Plan defines the role each responsible employee will play during an emergency. Water Department staff conducts emergency and/or disaster response planning in the Water Control Center. Coordination of staffs with other departments will take place in the General Manger's conference room. All American Canal River Division staff planning will be centered in the Imperial Dam Control House. Other staffs meet and coordinate actions at designated areas.

Established actions and procedures exist for extreme events and emergencies that endanger operation of the water system. Possible emergencies/extreme events that endanger operation of the water system could include earthquakes, storms, rain, runoff from desert washes, flooding, facility or structure damage, power outages, fire, vehicles in canals, equipment theft/vandalism, or other disaster. The Imperial Irrigation District's water delivery and drainage systems do not totally shut down during an emergency.

The Imperial Irrigation District has conducted Emergency Preparedness Exercises in the past. Emergency preparedness exercises will be updated with the development of new emergency preparedness exercises. Water Department staffs trained and participated with the US Department of the Interior Bureau of Reclamation's Tabletop Exercise for emergency preparedness.

For the cities in the Imperial Unit, there is a ten-day storage holding capacity requirement. The Imperial County Office of Emergency Services requires this storage holding capacity for the cities (Imperial Irrigation District, 1998, p.22)

Conclusion

Every link in the water supply chain for the Imperial Center is solid. Thus, adequate water supplies for the Imperial Center project are ensured.

The Imperial Center has a detailed plan for water usage, which states how much water will be necessary for each aspect of the finished development, including capacity for emergency situations. This plan will actually represents a decrease in water usage from the land's historical use. This decease in use is because the amount of water that is projected to be consumed by the project is less than what the same property has consumed as an agricultural property.

The local public utility, HPUD, has signed a "will-serve" letter guaranteeing that they will make all the necessary water available to this development or enter into negotiations to operate the Imperial Center's on-site temporary water plant. In turn, their water supplier, Imperial Irrigation District, has more than sufficient water capacity to service this development. The District has a present perfected right to Colorado River water, and its usage has yet to come near to its limit.

The amount of water available and the stability of the water supply chain ensure that this development's water needs will be met, even in the dry years, during a 20-year projection.