VILLAGE OF CROSS PLAINS
URBAN SERVICE AREA AMENDMENT REQUEST: WEST SIDE OF BREWERY ROAD

APPLICATION ATTACHMENTS

JULY 17, 2017

VILLAGE OF CROSS PLAINS

TOWN AND COUNTRY ENGINEERING

VANDEWALLE & ASSOCIATES

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Shapes on map represent general recommendations for future land use. Actual boundaries between different land use categories and associated zoning districts may vary somewhat from representations on this map. Please see the Village's Comprehensive Plan document for specific policies related to the land use categories shown on this map. Existing (not future) land use pattern shown for adjacent towns. Environmental Corridors depicted on this map use generalized boundaries of environmental features identified on air photos by the DNR and Dane County. Actual Environmental Corridor boundaries are to be refined through detailed on-site investigation.

Village of Cross Plains Comprehensive Plan

Map 4b: Future Land Use-ETJ View

- Village of Cross Plains Boundary
- Town Boundaries
- Extraterritorial Boundary
- Parcels
- Railroads
- Surface Water

Water Quality Corridors

- Red Zone
- Yellow Zone

- Single Family-Exurban
- Single Family-Urban
- Two-Family/Townhouse
- Mixed Residential
- Planned Neighborhood

1. Single Family-Urban
2. Two-Family/Townhouse
3. Mixed Residential
4. Community Facilities
5. Office/Research
6. Planned Business
7. Parks

- Office/Research
- Neighborhood Business
- Planned Business
- Downtown
- Planned Mixed Use

1. Office/Research
2. Mixed Residential
3. Community Facilities
4. Planned Business

- Light Industrial
- General Industrial
- Community Facilities
- Agriculture/Rural
- Parks
- Conservancy
- Woodlands/Open Space
- Environmental Corridor

0 1,000 2,000 4,000 Feet

VANDEWALLE & ASSOCIATES INC.

Adopted: May 19, 2014
Sources: V & A, Dane County LIO

Village of Cross Plains
Comprehensive Plan
Map 5: Transportation, Utilities, and Community Facilities

- Village of Cross Plains Boundary
- Town Boundaries
- Parcels
- Surface Water

Utilities & Community Facilities

- Existing Urban Service Area
- Potential Future Urban Service Area
- Municipal Wells
- Potential Future Park Site
- Infiltration/Detention
- Conservancy
- Parks and Open Space
- Community Facilities
- Village Hall & Police Department
- Fire Department
- EMS Department
- Library
- Public Works Garage
- Existing Trails
- Potential Future Trail

Transportation

- Potential Intersections Improvement
- Railroads
- Future County/State Transportation Projects
- ##' Proposed Official Map Right-of-Way Widths

Average Daily Traffic Counts

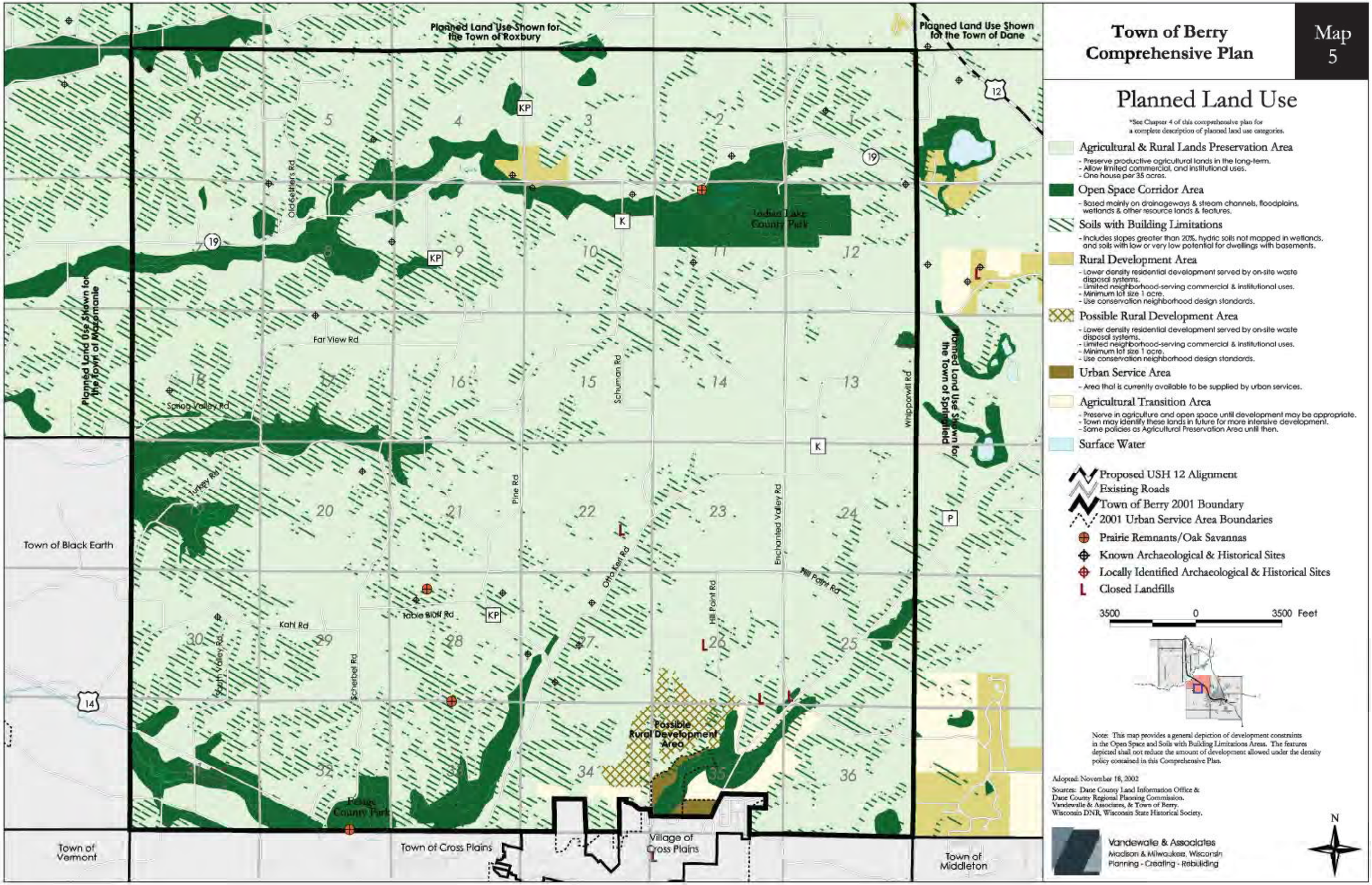
Location	1999	2002	2006
CTH P north of the Village	2,200	3,000	NA
CTH P (Church Street)	4,000	5,700	5500*
CTH P south of the Village	4,100	4,900	4,200
USH 14 east of the Village	6,400	6,500	12,100
USH 14 and Valley Street	13,100	14,900	10,300
USH 14 and CTH KP	11,900	13,600	12,300
USH 14 west of the Village	10,700	13,900	10,100
CTH KP west of the Village	1,100	1,700	NA

*2005 counts

0 500 1,000 2,000 Feet

Vandewalle & Associates
Planning - Creating - Rebuilding
© Vandewalle & Associates 2002

Date: June 9, 2008
Sources: MSA, Dane County LIO, V & A


Town of Berry
Comprehensive Plan
Map 5
Planned Land Use
*See Chapter 4 of this comprehensive plan for a complete description of planned land use categories.
Agricultural & Rural Lands Preservation Area
- Preserve productive agricultural lands in the long-term.
- Allow limited commercial, and institutional uses.
- One house per 35 acres.
Open Space Corridor Area
- Based mainly on drainageways & stream channels, floodplains, wetlands & other resource lands & features.
Soils with Building Limitations
- Includes slopes greater than 20%, hydric soils not mapped in wetlands, and soils with low or very low potential for dwellings with basements.
Rural Development Area
- Lower density residential development served by on-site waste disposal systems.
- Limited neighborhood-serving commercial & institutional uses.
- Minimum lot size 1 acre.
- Use conservation neighborhood design standards.
Possible Rural Development Area
- Lower density residential development served by on-site waste disposal systems.
- Limited neighborhood-serving commercial & institutional uses.
- Minimum lot size 1 acre.
- Use conservation neighborhood design standards.
Urban Service Area
- Area that is currently available to be supplied by urban services.
Agricultural Transition Area
- Preserve in agriculture and open space until development may be appropriate.
- Town may identify these lands in future for more intensive development.
- Same policies as Agricultural Preservation Area until then.
Surface Water
Proposed USH 12 Alignment
Existing Roads
Town of Berry 2001 Boundary
2001 Urban Service Area Boundaries
Prairie Remnants/Oak Savannas
Known Archaeological & Historical Sites
Locally Identified Archaeological & Historical Sites
Closed Landfills
3500 0 3500 Feet
Note: This map provides a general depiction of development constraints in the Open Space and Soils with Building Limitations Areas. The features depicted shall not reduce the amount of development allowed under the density policy contained in this Comprehensive Plan.
Adopted: November 18, 2002
Sources: Dane County Land Information Office & Dane County Regional Planning Commission. Vandewalle & Associates, & Town of Berry. Wisconsin DNR, Wisconsin State Historical Society.
Vandewalle & Associates
Madison & Milwaukee, Wisconsin
Planning - Creating - Rebuilding
N
Planned Land Use Shown for the Town of Roxbury
Planned Land Use Shown for the Town of Dane
Planned Land Use Shown for the Town of Mazomanie
Planned Land Use Shown for the Town of Springfield
Town of Black Earth
Town of Vermont
Town of Cross Plains
Village of Cross Plains
Town of Middleton
Indian Lake County Park
Possible Rural Development Area
Fesage County Park
Old Gethers Rd
Far View Rd
Spring Valley Rd
Turkey Rd
Kahl Rd
South Valley Rd
Scherbel Rd
Table Bluff Rd
Pine Rd
Otto Kerl Rd
Schuman Rd
Hill Point Rd
Enchanted Valley Rd
Whipporwill Rd
KP
K
P
12
14
19

SUNDANCE
DEVELOPMENT PLAN
Cross Plains, Wisconsin

1/23/2017

Owner
Oregon Parks, LLC
5440 Willow Road, Suite 101
Waunakee, WI 53597

Developer
Sundance Development LLC

Engineer
D'Onofrio Kottke
Ronald Klaas, Lead Engineer

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INTRODUCTION

The lands proposed for development lie to the north of the existing corporate limits and are adjacent and contiguous with the Village.

The total acreage, as measured from the center of the right of way, is approximately 142 acres. The lands' topography is high plateau, gently falling to the west in elevation.

The entire parcel, except for the woodland to be preserved and the protected 20 percent slopes, is ready for development. It does not contain wetlands, or any other physical barriers impacting development.

Proposed utility routes are down slope and adjacent to this parcel. Sundance development will be on municipal sewer connecting to the existing sewer at the intersection of Brewery Road and Laufenberg Blvd, along with private wells. The large SR-1 lots which cannot connect to the public sewer via simple gravity feed will be required to use a grinder pump.

Brewery Road, a collector street, is adjacent to the parcel running north-south. It leads to HWY 14 and P, regional traffic interceptors, which lead to the 'central', 'east' and 'west' sides of the Madison metropolitan area. Brewery Road is a key collector street and transportation link to the existing Village roadway system as well as to planned Village expansion to the north as envisioned in the most recent Comprehensive Plan.

The proposed development is a logical direction for the Village to expand:

a) Village growth is circumscribed by ecologically sensitive areas to the south, which are restricted to protect water quality for Black Earth Creek.
b) The entirety of the planned development area is already included in the Village's Comprehensive Plan map as Planned Neighborhood.

The development would require the land involved to be annexed into the Village and would also require an expansion of the Village's Urban Service Area as the area is not currently covered by the existing USA.

SPECIAL FEATURES

The site contains unique features that the development plan incorporates.

1. GEOGRAPHY AND SERVICES

The site is on a high plateau well above the existing pressure levels of the Village water service system. At the same time, the Village needs to support the cost and substantial capacity in its recently upgraded sewer plant. The Sundance development therefore incorporates the use of municipal sewer with private wells for water.

To contribute to the maintenance of water quality, the development also incorporates a swale-based road profile and storm-water system similar to the development on Gil's Way. This

improves water quality and reduces runoff by encouraging much more natural infiltration than a traditional gutter-and-storm-drain system.

Private wells preclude multifamily development (beyond duplex). This is not an impediment to the proposed design because its location and character is suited to higher-end single-family home lots. The absence of fire hydrants can be accommodated by the rural fire fighting capabilities of the local Fire Department.

2. TRAIL CONNECTIVITY

The property is uniquely situated adjacent to the Ice Age Trail (IAT). In cooperation with the Ice Age Trail Association, the development provides connectivity between the IAT and the neighborhood's internal trail network.

The trail network is an attractive amenity for the neighborhood, Village residents and visitors. As trail-goers are likely to take advantage of the site as a mini-trailhead for enjoying the IAT, the development plan includes an off-street parking area giving access to both the local trail network and the IAT.

2. ISOLATED VIEWSHED

Despite it's high elevation, the vast majority of the site is visually isolated from the adjacent Village, as it primarily slopes to the West. The unique combination of connectivity and seclusion enhances the high-end residential value of the planned neighborhood.

LAND USE

Due to its unique geography and sizeable lots, we envision a high-end residential profile for the Sundance development.

The neighborhood design sets aside and dedicates to the Village significantly sized parcels for conservancy.

A 4 acre Village park and a 1/3 acre "tot lot" park are included in the development (identified in the Concept Development map as "Outlot 2" and "Tot Park" respectively—see appendices). The large park connects to conservancy and features an off-street parking lot. The tot park is centrally located in a flat and high-elevation area of the subdivision for easy pedestrian access.

Cross Plains has few lots available for building single family dwellings. In combination with the economic downturn the community—while only six minutes away from Middleton and close to the Madison metropolitan area—has not had significant growth for many years. As a consequence commercial activity has been limited, and Village real estate taxes have flattened out with older structures.

Of the 142 acres Sundance is proposing to annex (not including the Brewery Rd R.O.W):

- 44 acres are devoted to open/green space

- 15 acres constitute the Roessler parcel
- 64 acres (101 lots) are devoted to single family dwellings
- the rest will be right-of-way ("ROW").

With the sizeable green-space areas, the development density is very low at 1.0 dwellings per acre. Vistas are primarily internal to the development and to the surrounding bluffs—there is very little visibility between the proposed development and the existing Village. The Sundance Development would be a premier housing development for Cross plains. The unique geography and large estate-sized lots are likely to attract larger homes with higher values.

The proposed lots are a mixture of large estate lots (SR-1) and medium-sized lots (SR-3) for single family dwellings.

The Zoning will be SR-1 and SR-3 single-family subsequent to development. The Roessler parcel will become (3) SR-3 lots with the remainder as RH-35 rural holding. An additional 17 acres consisting of the Statz parcel—if included pending a final decision by the owner—would be RH-35 rural holding.

ENVIRONMENTAL IMPACT

1. LAND RESOURCES

Any changes in relief and drainage patterns will be designed so as to limit run-off and lead the excess water into on site designated water detention areas expected to improve the existing run off situation.

The 20% slopes are shown on the enclosed map and the lots abutting such areas are designed so that building envelopes conform to the ordinance requiring a 150' buffer from 20% slopes.

There is a drainage way containing more than 5 acres of land (see intermittent stream on map). The drainage way will be preserved as is.

The parcel is a high plateau area with the highest elevation at 1120 feet.

The Dane County Soil survey shows soils which may contain areas with bedrock within 6' from the surface located mostly in the undeveloped and preserved areas.

2. WATER RESOURCES

The woodland area is traversed by an intermittent stream and is shown on the enclosed map. The woodlands are to be preserved in their current state.

3. BIOLOGICAL RESOURCES

The parcel is made up of three significant components. The cropland which is intended for development, the woodland which is intended for preservation and the undeveloped pastureland, which is intended for parkland and conservancy.

We have applied to the Wisconsin DNR for an endangered resources evaluation and there are none. As development is restricted to current farmland areas, and we are not proposing any development in the woodland areas, we don't expect impact on any sensitive plant or animal life.

TRANSPORTATION & TRAFFIC

Brewery Road is a collector street. The development will increase traffic by more than 10% on Brewery Road. However it will not increase traffic by more than 10% on regional collectors HWY 14 and CTH P.

A detailed traffic study was prepared in 2008 and reviewed for the Village by its traffic consultant (Terry Beuthling of HNTB). The study had assumptions well in excess of the current development plan (140 southbound households vs. the 101 currently being proposed). Its findings showed only modest increases in traffic wait times from the completed development. The maximum traffic increase in wait time across key intersections averaged 3.1 seconds. The low was 0.2 seconds (14 & P, Morning Peak), with a high of 6.9 seconds (Brewery & P, Afternoon Peak). "Level of Service" at the intersections remained unchanged—at existing "B" and "C" levels—with the exception of Brewery & P which went from "B" to "C" during the Afternoon Peak hour only. (Level "C" is considered an "average" or "typical" wait time for an intersection).

The reduced number of home lots, and the expansion of HWY 14—including the addition of a traffic light at the intersection of HWY 14 at Brewery Road—will further minimize the impact of the additional traffic created.

An "Emergency Lane" is proposed at the South end of the development. The purpose of the lane is for emergency vehicle access to the development in the event that the primary access along Brewery Rd. is temporarily cut off for some reason--downed tree or power line, etc. This road will be dedicated as Village-owned Right-of-Way. Pedestrian access will be allowed but non-Village vehicle access will be restricted by the use of signage and potentially other measures as needed (gate, etc.).

PROPERTY TAXES AND SCHOOL DISTRICT

Assuming that the new development's children are equally divided between elementary, middle school, and high school the child population of this subdivision when fully built will not increase the school population of any one school more than 7%. We assume the number of students added based on the Middleton Cross Plains School District value of 0.4 children/Single-family Dwelling Unit. It is worth noting, however, that the Sundance development may end up with a somewhat lower average value as estate lots such as are proposed can have slightly less school-age children than average. Homeowners in these types of lots tend to be second-home, move-up buyers whose children are more likely than average to be grown or in college.

Below is conservative estimate of the tax revenue that may be expected by the development, and its economic impact on the school district. (Refer the MSR Economic Impact Analysis commissioned by the Village for additional detail.)

Projected Annual Tax Revenue

Market Value / Single-Family Dwelling Unit	$510,000
TOTAL Value (101 DU)	$51,510,000
Property Tax Value (21.42 mill rate)	$1,103,344
School Share (51%)	$562,706
MATC Share (6.9%)	$76,131

ANNEXATION & PHASING

Annexation will include the development lands as well as the full extent of Brewery Road. This simplifies the ownership and maintenance of the Road, which is currently split between the Village and the Town of Berry. While this creates two “town islands”, it is preferable to:

a) Clarify the situation of Brewery Rd. which is practically a Village road but not currently to Village standards for all its extent.
b) Avoid the forced annexation of any Town residents who do not wish to be annexed at this time.

All Town residents along Brewery Road are currently transportation-isolated from the rest of the Town and must transit through the Village. This situation will remain the same with the new development but Brewery Road up A Street/Outlot 1 will be improved to Village standards, modified as needed to suit the sloping topography. Improvement on Brewery Road North of A Street (including sewer and water as desired by the Village) will be

The development will be constructed in three phases, with construction occurring as lots are sold based on market conditions. Each phase will consist of about 33 home lots and attendant infrastructure. Both parks are included in Phase 1 of the plan. Phase 1 consists of 40 lots plus parks, Phase 2 is 34 lots, and Phase 3 is 26 lots.

APPENDICES

A. Maps
B. Traffic Study

Annexation Map

Annexation

Village

NORTH

Scale 1" = 300'

LOT 2
CSM 5582

LOT 3
CSM 5582

LOT 4
CSM 5582

UNPLATTED LANDS

734,511.83 sq ft

UNPLATTED LANDS

6,178,189.77 sq ft

UNPLATTED LANDS

UNPLATTED LANDS

LOT 1
CSM 9245

LOT 2
CSM 9245

LOT 3
CSM 9245

LOT 2
CSM 9549

East 1/4 Corner
Sec. 34, T8 N, R 7 E

LOT 1 CSM 11202

211,524.89 sq ft

UNPLATTED
LANDS

LOT 1
CSM 8331

LOT 2
CSM 8331

LOT 1 CSM 7294

FIRST ADDITION TO ST. FRANCIS ADDITION

CSM 3705

LOT 1
CSM 9549

LOT 1
CSM 1052

LOT 2

LAUFENBERG BLVRD

SECOND ADDITION
TO WOODSIDE HILLS

Public Sewer Plan

All lots shall be served by public sewer

Water:
Lots will have private wells

NORTH

Scale 1" = 300'

LOT 2
CSM 5582

LOT 3
CSM 5582

LOT 4
CSM 5582

UNPLATTED LANDS

UNPLATTED LANDS

UNPLATTED LANDS

UNPLATTED LANDS

LOT 1 CSM 7294

LOT 1
CSM 9245

LOT 2
CSM 9245

LOT 3
CSM 9245

LOT 2
CSM 9549

390.85'

East 1/4 Corner
Sec. 34, T8 N, R 7 E

LOT 1 CSM 11202

UNPLATTED LANDS

LOT 1
CSM 8331

LOT 2
CSM 8331

8

9

FIRST ADDITION TO ST. FRANCIS ADDITION

55

54

53

52

51

50

49

48

CSM 3705

LOT 1
CSM 9549

44

43

42

LOT 1

LOT 2

CSM 11252

LAUFENBERG BLVRD

SECOND ADDITION
TO WOODSIDE HILLS

USES
RH 35
SingleFamily
Parkland Conservancy
Village Park
Stormwater Detention/dedication
Ex. Trails

NORTH
Scale 1" = 300'

LOT 2
CSM 5582

LOT 3
CSM 5582

LOT 4
CSM 5582

UNPLATTED LANDS

145,234.65 sq ft

15,382.34 sq ft

Stormwater Detention

Stormwater Detention

Drainage Dedication

RH-35 Zoning

UNPLATTED LANDS

RH-35 Zoning

UNPLATTED LANDS

Stormwater Detention

Stormwater Detention

LOT 1
CSM 9245

LOT 2
CSM 9245

LOT 3
CSM 9245

LOT 2
CSM 9549

East 1/4 Corner
Sec. 34, T8 N, R 7 E

LOT 1 CSM 11202

UNPLATTED LANDS

CSM 3705

LOT 1
CSM 9549

FIRST ADDITION TO ST. FRANCIS ADDITION

LAUFENBERG BLVRD

UNPLATTED LANDS

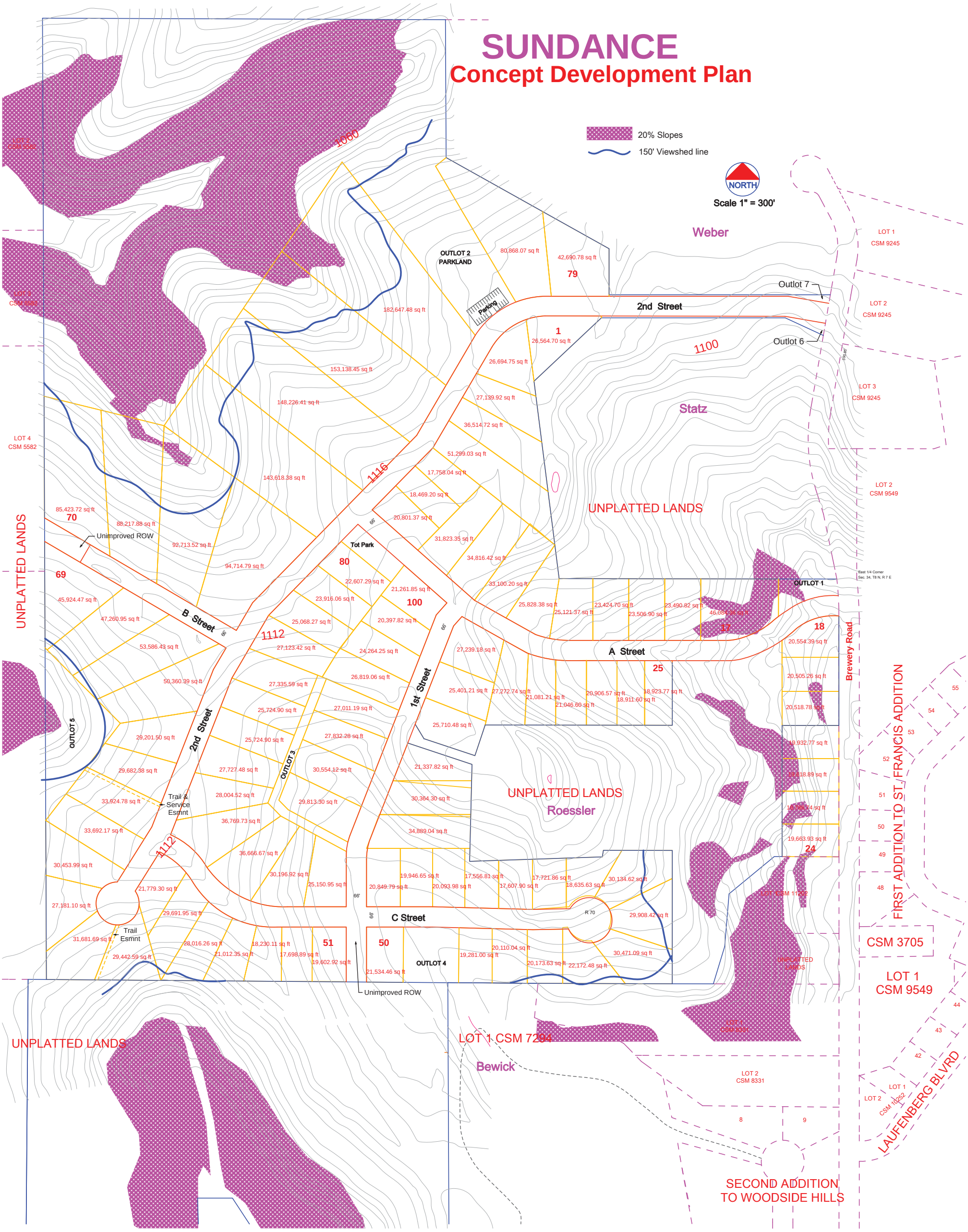
LOT 1 CSM 7294

LOT 1
CSM 8331

LOT 2
CSM 8331

SECOND ADDITION
TO WOODSIDE HILLS

SUNDANCE
Concept Development Plan



Phasing

Phase1

Phase2

Phase3

Municipal

NORTH

Scale 1" = 300'

LOT 2
CSM 5582

LOT 3
CSM 5582

LOT 4
CSM 5582

UNPLATTED LANDS

Stormwater Detention

Stormwater Detention

Drainage Dedication

UNPLATTED LANDS

Stormwater Detention

LOT 1
CSM 9245

LOT 2
CSM 9245

LOT 3
CSM 9245

LOT 2
CSM 9549

UNPLATTED LANDS

East 1/4 Corner
Sec. 34, T8 N, R 7 E

Stormwater Detention

LOT 1 CSM 11202

FIRST ADDITION TO ST. FRANCIS ADDITION

55
54
53
52
51
50
49
48

CSM 3705

UNPLATTED LANDS

LOT 1
CSM 9549

44
43
42

LOT 1
CSM 8331

LOT 2
CSM 8331

LOT 1
LOT 2
CSM 1052

8
9

LAUFENBERG BLVRD

UNPLATTED LANDS

LOT 1 CSM 7294

SECOND ADDITION
TO WOODSIDE HILLS

SUNDANCE DEVELOPMENT TRAFFIC STUDY

simulation by
Professor A. Skabardonis
Institute of Traffic Studies
UC Berkeley

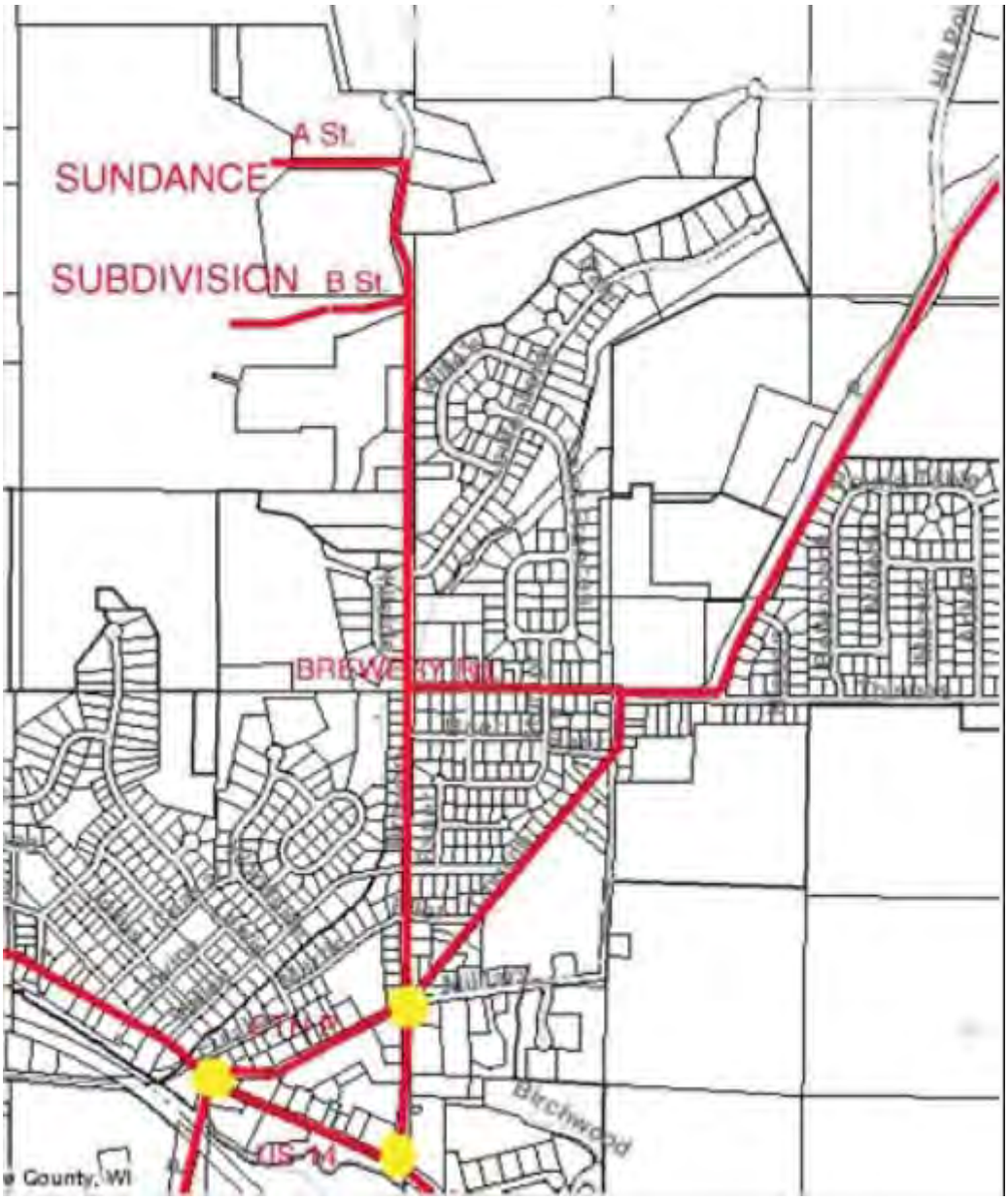
SUMMARY:

A traffic study and computer simulation were prepared for the proposed Sundance Neighborhood by Professor A. Skabardonis of the Berkeley Institute of Transportation Studies. The original study was performed in 2008 and has been updated for the current proposal. The study indicates that the traffic added by the Sundance subdivision will not require additional road improvements. All major roads and intersections of concern will still have adequate capacity upon completion of the subdivision and traffic flows will not be substantially altered.

DESCRIPTION:

The following areas and intersections were included in the study:

1. Brewery Rd., Church St. (CTH P), & Military Rd.
2. Brewery Rd. & US HWY 14.
3. Church St. (CTH P) & US HWY 14.
4. Sundance outlets (Streets “A” and “B”) and Brewery Rd.



METHODOLOGY:

The study and associated simulation was conducted using Highway Capacity Manual 2000 standards, the SYNCHRO software application (see appendix), and ITE 7th Edition trip generation rates (See Table 1).

PROPOSED PROJECT: TRIP GENERATION & DISTRIBUTION

Table 1. Trip Generation

Trip Generation Rates *(Source: ITE Trip Generation)*								
Development Type	Trip Rate		Peak Period Rate		AM Distribution		PM Distribution	
	Trips (#/day/unit)	…unit	AM	PM	In	Out	In	Out

Single Family	9.57	trips/dwelling unit	0.77	1.02	25%	75%	64%	36%

"In": Vehicle Trips into the development

"Out": Vehicle Trips out of the development

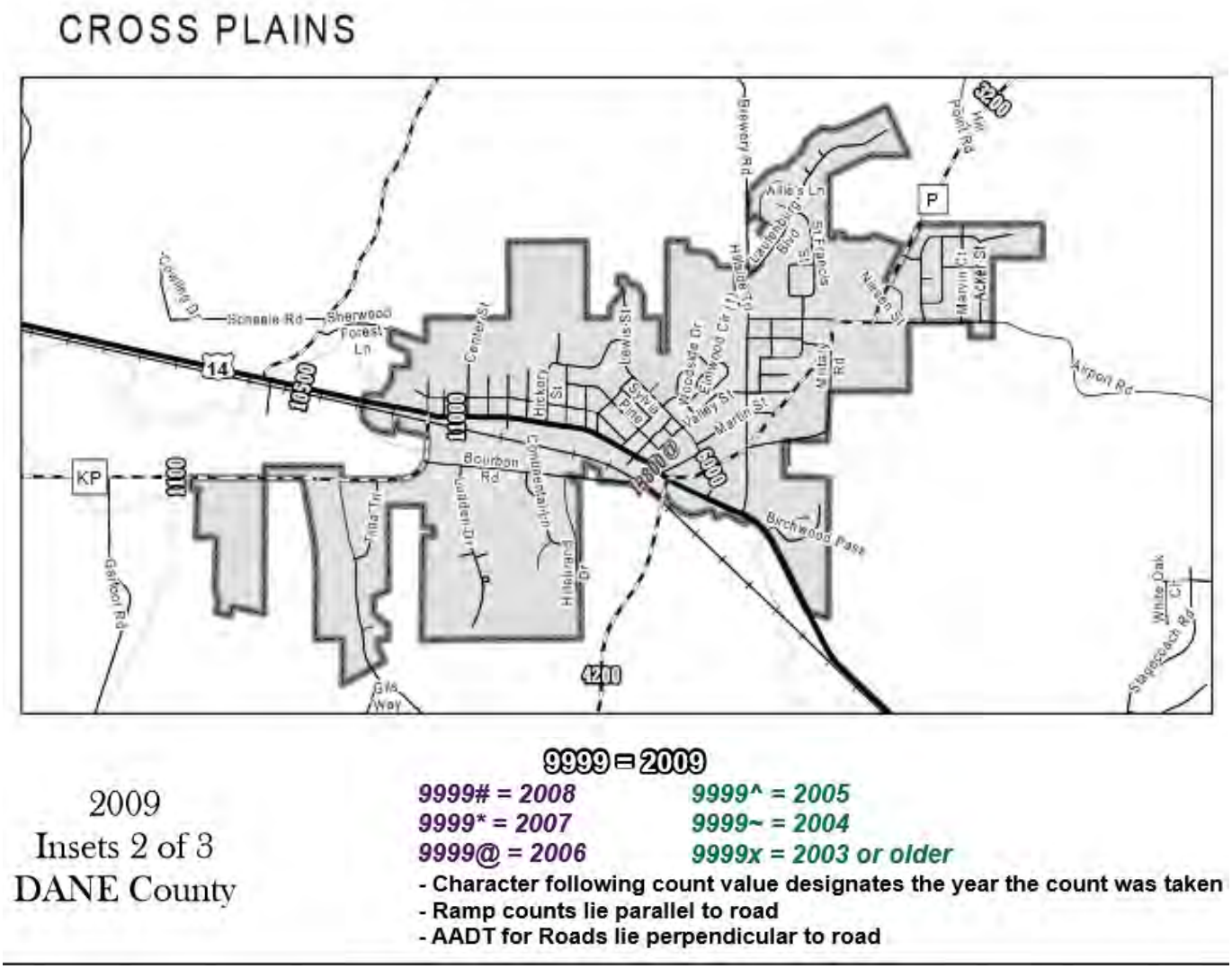
Traffic Volume Analysis								
Subject: **Sundance**								
Development Type	Single Family Dwelling Units	Daily Vehicle Trips	Peak Period Trips		AM Peak Trip Distribution		PM Peak Trip Distribution	
			AM	PM	In	Out	In	Out
Current Proposal	**101**	**967**	**76**	**102**	**19**	**57**	**65**	**37**
Original Proposal (2008)	186	1781	140	188	35	105	121	68
Original Proposal (Southbound trips only)	140	1340	105	142	27	79	91	52

ASSUMPTIONS:

The bulk of neighborhood traffic is expected to travel south to Main St./14. For study purposes, all of the traffic is assumed to exit south along Brewery Rd. and to US14 through existing roads. Because access to northern and eastern portions of the Madison area is faster via a northern route, some of the traffic is likely to divert through Thinnes St. to County P and to Airport Road. This pattern will make for a smaller traffic impact than the study shows. The original study assumed a 75%/25% split of southern to northern routes—the current proposed traffic total is significantly lower than the originally proposed southern route traffic.

The initial project build-out date was estimated for the year 2011 with a total 3.6% net background traffic growth. The new build-out date is 2020. However, annual growth in traffic counts from 2005-2009 in this area of Dane Country suggest a much slower rate of growth than the initial assumption—on the order of 0.2-0.3% at most, rather than the originally assumed value of over 0.7%. As such, the simulation results should hold quite closely for the new timeframe at 140 dwellings, and will still be significantly eased by the reduced number of dwellings in the current proposal (101).

EXISTING TRAFFIC



2009
Insets 2 of 3
DANE County

9999 = 2009

9999# = 2008 ***9999^ = 2005***
9999* = 2007 ***9999~ = 2004***
9999@ = 2006 ***9999x = 2003 or older***

- Character following count value designates the year the count was taken
- Ramp counts lie parallel to road
- AADT for Roads lie perpendicular to road

Wisconsin DOT Traffic Counts

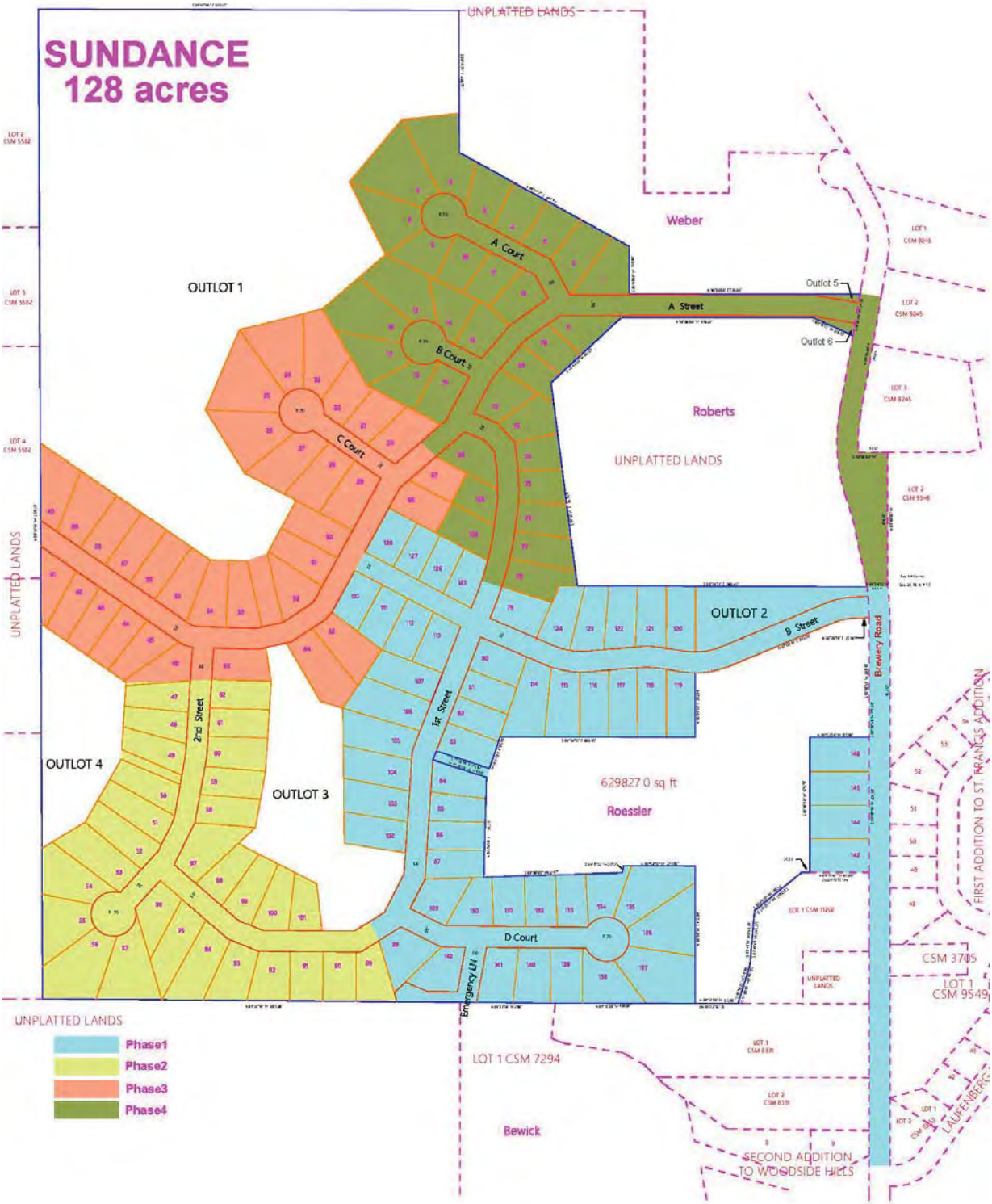
Location	Daily Traffic (Avg. Annual)	Peak Traffic AM	Peak Traffic PM
Brewery Rd.	900**	90	100
Hwy 14 (@ Brewery)	13690*	1369	1363
Hwy 14 (@ Church)	13800***	1723	1982
Hwy P (@ Brewery)	5500***	833	777
Military Rd.	200*	20*	20*

* HNTB estimated value
** HNTB counts
*** WisDOT counts

Military Road traffic was estimated based on an assessment of surrounding development, the rest are counts. Peak hour traffic estimates use the standard default value of 10% of AADT.

SITE DESCRIPTION

The Sundance Neighborhood will consist of approximately 145 single-family homes developed in 4 phases as shown.



PROJECTED TRAFFIC

The projected traffic impact on all key intersections is modest. None of the projected traffic increases exceed any of the intersection capacities. Average wait time (Control Delay) increases are small and Level of Service (LOS) categories remain unchanged at all intersections except PM Peak westbound left turns from P onto Brewery. At this intersection during the PM peak hour, the LOS changes from B to C, with an average increased delay of less than 7 seconds (i.e. from the high end of LOS B to the low end of LOS C). (See SYNCHRO maps and tables in Appendix.)

Below are listed the traffic changes for each studied intersection.

AM PEAK		
	AVG. DELAY / LEVEL OF SERVICE	
INTERSECTION	BASELINE (2011)	WITH PROJECT
Brewery/P	16.8 sec (C)	21.1 sec (C)
Brewery/US14	21.1 sec (C)	24.7 sec (C)
US14/P	18.1 sec (B)	18.3 sec (B)

PM PEAK		
	AVG. DELAY / LEVEL OF SERVICE	
INTERSECTION	BASELINE (2011)	WITH PROJECT
Brewery/P	14.9 sec (B)	21.8 sec (C)
Brewery/US14	21.6 sec (C)	24.4 sec (C)
US14/P	18.8 sec (B)	19.6 sec (B)

APPENDIX:

Level of Service (LOS) Table

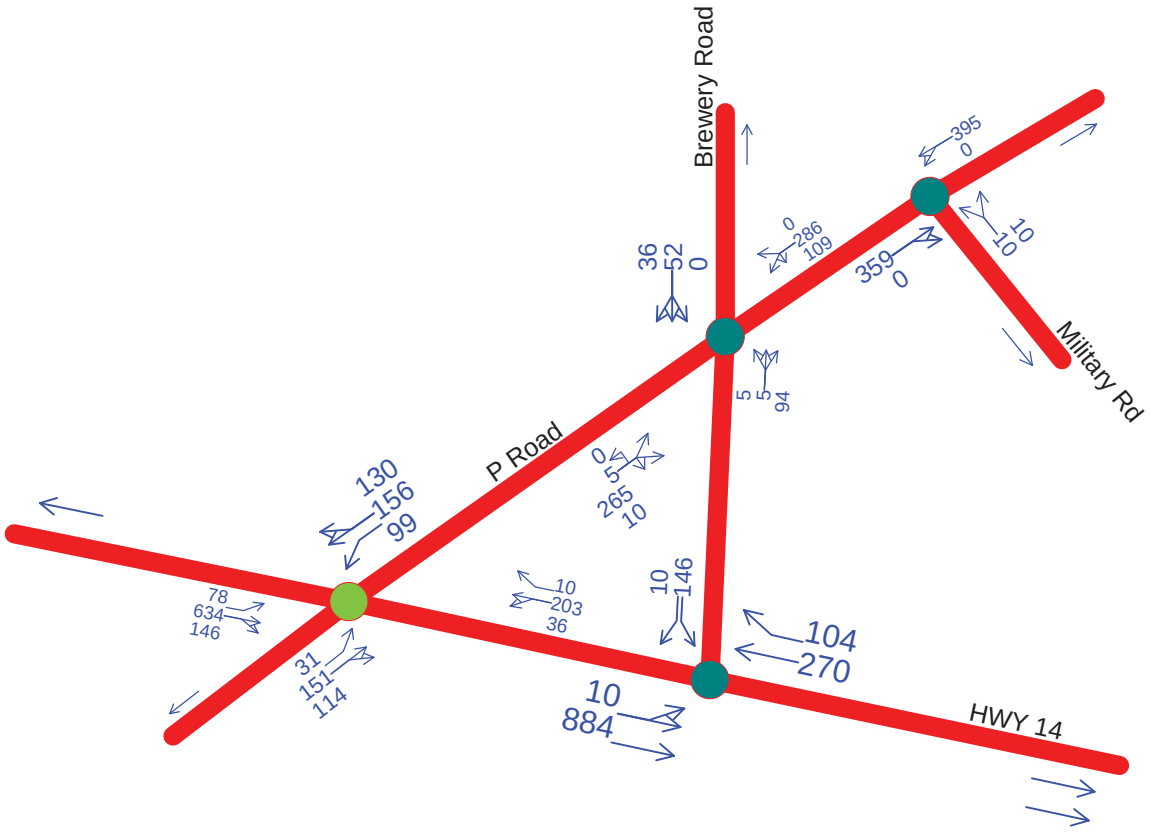
* “Average” wait times
** Intersection capacity exceeded

Unsignalized Intersection	
Level of Service	Average Control Delay (seconds)
A	<10
B	>10-15
C*	>15-25
D	>25-35
E	>35-50
F**	>50
Signalized Intersection	
Level of Service	Average Control Delay (seconds)
A	<10
B	>10-20
C*	>20-35
D	>35-55
E	>55-80
F**	>80

SYNCHRO Maps & Tables

BASELINE 2011 CONDITIONS
Traffic Volumes

GROWTH FACTOR: 3.6%
AM PEAK

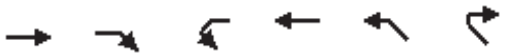


HCM Unsignalized Intersection Capacity Analysis
2: P Road & Brewery Road

AM PEAK

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Sign Control		Free			Stop			Stop		Free		
Grade		0%			0%			0%		0%		
Volume (veh/h)	105	275	0	5	5	90	0	50	35	5	255	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	109	286	0	5	5	94	0	52	36	5	265	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type					None			None				
Median storage veh)												
vC, conflicting volume	276			848	785	270	881	790	286	286		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
tC, single (s)	4.2			7.2	6.6	6.2	7.1	6.5	6.2	4.2		
tC, 2 stage (s)												
tF (s)	2.3			3.5	4.0	3.3	3.5	4.0	3.3	2.3		
p0 queue free %	91			98	98	88	100	82	95	100		
cM capacity (veh/h)	1254			213	292	761	217	295	758	1242		

Direction, Lane #	WB 1	NB 1	SB 1	NE 1
Volume Total	395	104	88	281
Volume Left	109	5	0	5
Volume Right	0	94	36	10
cSH	1254	630	394	1242
Volume to Capacity	0.09	0.17	0.22	0.00
Queue Length (ft)	7	15	21	0
Control Delay (s)	2.9	11.8	16.8	0.2
Lane LOS	A	B	C	A
Approach Delay (s)	2.9	11.8	16.8	0.2
Approach LOS		B	C	



Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	345	0	0	380	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	359	0	0	395	10	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume			359		754	359
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			100		97	98
cM capacity (veh/h)			1167		380	690

Direction, Lane #	EB 1	WB 1	NW 1
Volume Total	359	395	21
Volume Left	0	0	10
Volume Right	0	0	10
cSH	1700	1167	490
Volume to Capacity	0.21	0.00	0.04
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	12.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.7
Approach LOS			B

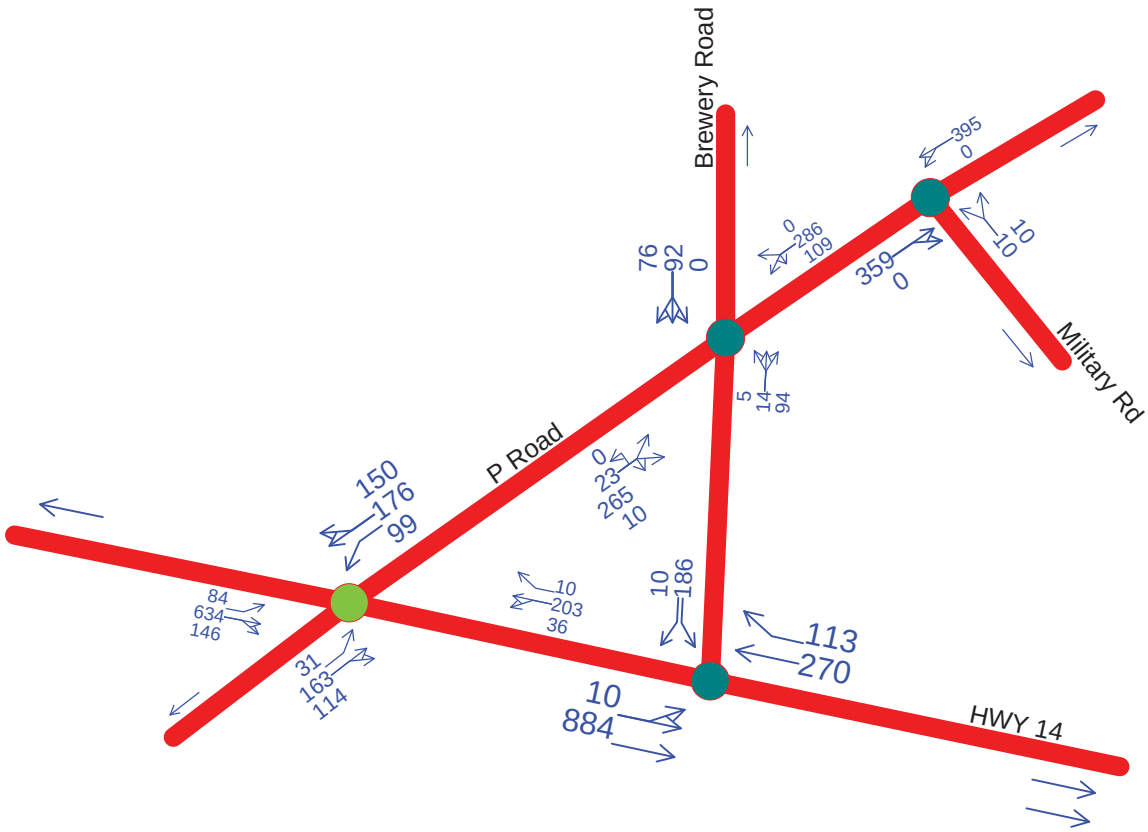
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	850	260	100	140	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	10	884	270	104	146	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	374				733	270
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				59	99
cM capacity (veh/h)	1181				357	734

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	305	589	270	104	146	10
Volume Left	10	0	0	0	146	0
Volume Right	0	0	0	104	0	10
cSH	1181	1700	1700	1700	357	734
Volume to Capacity	0.01	0.35	0.16	0.06	0.41	0.01
Queue Length (ft)	1	0	0	0	48	1
Control Delay (s)	0.4	0.0	0.0	0.0	21.9	10.0
Lane LOS	A				C	A
Approach Delay (s)	0.1		0.0		21.1	
Approach LOS					C	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97			1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1793			1684	1442	1641	1616		1719	1686	
Flt Permitted	0.58	1.00			0.71	1.00	0.47	1.00		0.50	1.00	
Satd. Flow (perm)	1063	1793			1212	1442	818	1616		901	1686	
Volume (vph)	75	610	140	35	195	10	30	145	110	95	150	125
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	78	634	146	36	203	10	31	151	114	99	156	130
Lane Group Flow (vph)	78	780	0	0	239	10	31	265	0	99	286	0
Heavy Vehicles (%)	3%	3%	3%	12%	12%	12%	10%	10%	10%	5%	5%	5%
Turn Type	Perm			Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	36.0	36.0			36.0	70.0	26.0	26.0		26.0	26.0	
Effective Green, g (s)	37.0	37.0			37.0	70.0	27.0	27.0		27.0	27.0	
Actuated g/C Ratio	0.53	0.53			0.53	1.00	0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	562	948			641	1442	316	623		348	650	
v/s Ratio Prot		c0.44						0.16			c0.17	
v/s Ratio Perm	0.07				0.20	0.01	0.04			0.11		
v/c Ratio	0.14	0.82			0.37	0.01	0.10	0.43		0.28	0.44	
Uniform Delay, d1	8.4	13.8			9.7	0.0	13.7	15.8		14.8	15.9	
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	8.0			1.7	0.0	0.6	2.1		2.0	2.2	
Delay (s)	8.9	21.8			11.3	0.0	14.3	17.9		16.9	18.1	
Level of Service	A	C			B	A	B	B		B	B	
Approach Delay (s)		20.6			10.9			17.5			17.8	
Approach LOS		C			B			B			B	

PROJECT 2011 CONDITIONS

Traffic Volumes **AM PEAK**

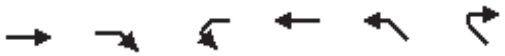


HCM Unsignalized Intersection Capacity Analysis
2: P Road & Brewery Road

AM PEAK

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Sign Control		Free			Stop			Stop		Free		
Grade		0%			0%			0%		0%		
Volume (veh/h)	109	286	0	5	14	94	0	92	76	23	265	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	109	286	0	5	14	94	0	92	76	23	265	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type					None			None				
Median storage veh)												
vC, conflicting volume	275			942	820	270	921	825	286	286		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
tC, single (s)	4.2			7.2	6.6	6.2	7.1	6.5	6.2	4.2		
tC, 2 stage (s)												
tF (s)	2.3			3.5	4.0	3.3	3.5	4.0	3.3	2.3		
p0 queue free %	91			97	95	88	100	67	90	98		
cM capacity (veh/h)	1254			148	275	761	196	278	758	1242		

Direction, Lane #	WB 1	NB 1	SB 1	NE 1
Volume Total	395	113	168	298
Volume Left	109	5	0	23
Volume Right	0	94	76	10
cSH	1254	543	389	1242
Volume to Capacity	0.09	0.21	0.43	0.02
Queue Length (ft)	7	19	53	1
Control Delay (s)	2.9	13.4	21.1	0.8
Lane LOS	A	B	C	A
Approach Delay (s)	2.9	13.4	21.1	0.8
Approach LOS		B	C	



Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	359	0	0	395	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	359	0	0	395	10	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume			359		754	359
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1167		380	690

Direction, Lane #	EB 1	WB 1	NW 1
Volume Total	359	395	20
Volume Left	0	0	10
Volume Right	0	0	10
cSH	1700	1167	490
Volume to Capacity	0.21	0.00	0.04
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	12.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.7
Approach LOS			B

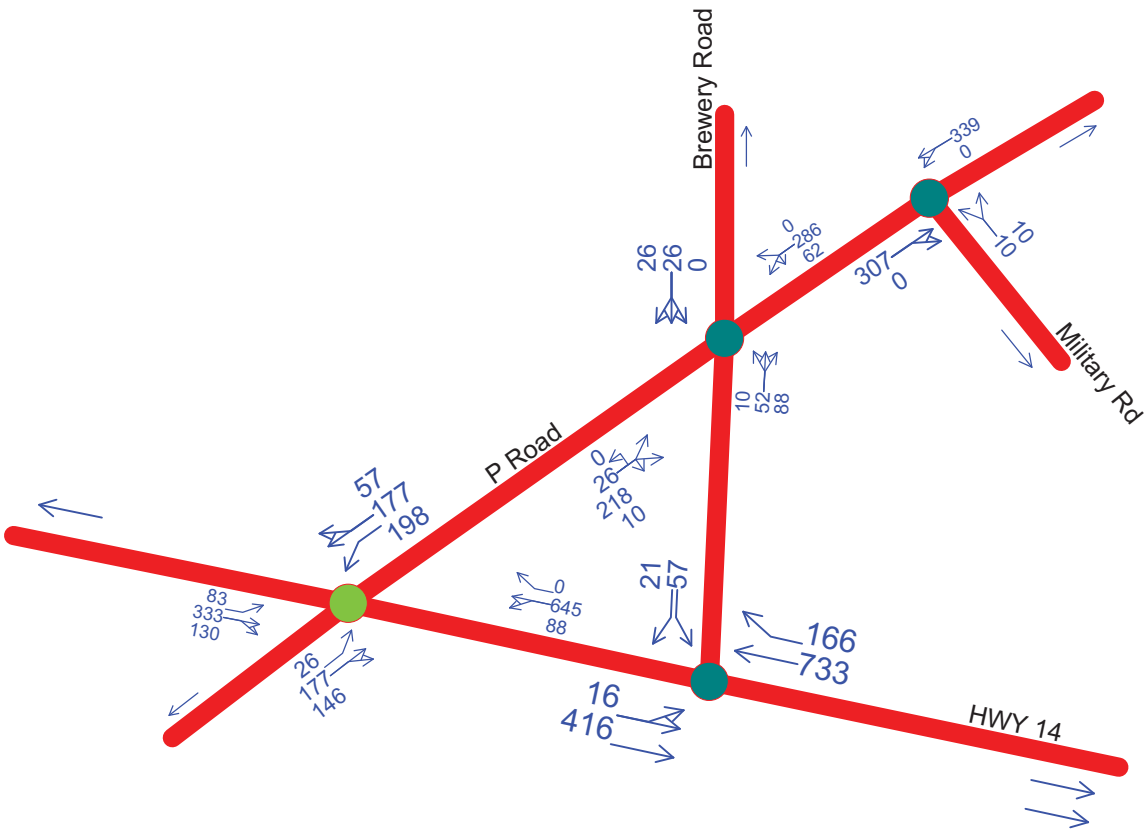
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	884	270	113	186	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	10	884	270	113	186	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	383				732	270
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				48	99
cM capacity (veh/h)	1172				358	734

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	305	589	270	113	186	10
Volume Left	10	0	0	0	186	0
Volume Right	0	0	0	113	0	10
cSH	1172	1700	1700	1700	358	734
Volume to Capacity	0.01	0.35	0.16	0.07	0.52	0.01
Queue Length (ft)	1	0	0	0	72	1
Control Delay (s)	0.3	0.0	0.0	0.0	25.5	10.0
Lane LOS	A				D	A
Approach Delay (s)	0.1		0.0		24.7	
Approach LOS					C	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97			1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1793			1684	1442	1641	1621		1719	1685	
Flt Permitted	0.58	1.00			0.71	1.00	0.43	1.00		0.48	1.00	
Satd. Flow (perm)	1063	1793			1212	1442	739	1621		876	1685	
Volume (vph)	84	634	146	36	203	10	31	163	114	99	176	150
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	84	634	146	36	203	10	31	163	114	99	176	150
Lane Group Flow (vph)	84	780	0	0	239	10	31	277	0	99	326	0
Heavy Vehicles (%)	3%	3%	3%	12%	12%	12%	10%	10%	10%	5%	5%	5%
Turn Type	Perm			Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	36.0	36.0			36.0	70.0	26.0	26.0		26.0	26.0	
Effective Green, g (s)	37.0	37.0			37.0	70.0	27.0	27.0		27.0	27.0	
Actuated g/C Ratio	0.53	0.53			0.53	1.00	0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	562	948			641	1442	285	625		338	650	
v/s Ratio Prot		c0.44						0.17			c0.19	
v/s Ratio Perm	0.08				0.20	0.01	0.04			0.11		
v/c Ratio	0.15	0.82			0.37	0.01	0.11	0.44		0.29	0.50	
Uniform Delay, d1	8.4	13.8			9.7	0.0	13.8	15.9		14.9	16.4	
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	8.0			1.7	0.0	0.8	2.3		2.2	2.8	
Delay (s)	9.0	21.8			11.3	0.0	14.6	18.2		17.1	19.1	
Level of Service	A	C			B	A	B	B		B	B	
Approach Delay (s)		20.5			10.9			17.8			18.7	
Approach LOS		C			B			B			B	

BASELINE 2011 CONDITIONS

Traffic Volumes **PM PEAK**



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Sign Control		Free			Stop			Stop		Free		
Grade		0%			0%			0%		0%		
Volume (veh/h)	60	275	0	10	50	85	0	25	25	25	210	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	62	286	0	10	52	88	0	26	26	26	218	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type					None			None				
Median storage veh)												
vC, conflicting volume	229			725	686	224	801	692	286	286		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
tC, single (s)	4.1			7.1	6.5	6.2	7.1	6.5	6.2	4.1		
tC, 2 stage (s)												
tF (s)	2.2			3.5	4.0	3.3	3.5	4.0	3.3	2.2		
p0 queue free %	95			96	85	89	100	92	97	98		
cM capacity (veh/h)	1328			294	345	816	227	343	753	1270		

Direction, Lane #	WB 1	NB 1	SB 1	NE 1
Volume Total	348	151	52	255
Volume Left	62	10	0	26
Volume Right	0	88	26	10
cSH	1328	512	471	1270
Volume to Capacity	0.05	0.29	0.11	0.02
Queue Length (ft)	4	30	9	2
Control Delay (s)	1.8	14.9	13.6	1.0
Lane LOS	A	B	B	A
Approach Delay (s)	1.8	14.9	13.6	1.0
Approach LOS		B	B	

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	295	0	0	326	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	307	0	0	339	10	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume			307		646	307
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1221		439	738

Direction, Lane #	EB 1	WB 1	NW 1
Volume Total	307	339	21
Volume Left	0	0	10
Volume Right	0	0	10
cSH	1700	1221	551
Volume to Capacity	0.18	0.00	0.04
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	11.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.8
Approach LOS			B

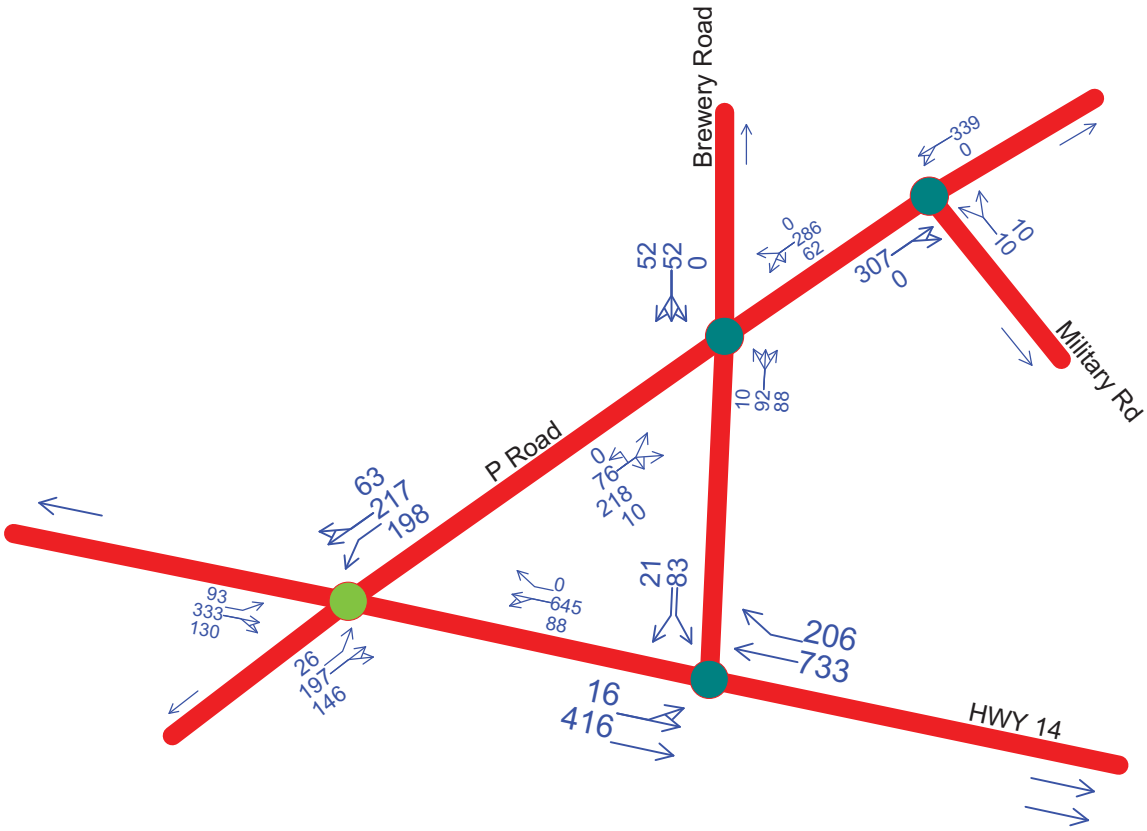
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	400	705	160	55	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	16	416	733	166	57	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	900				972	733
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.3				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	98				77	94
cM capacity (veh/h)	714				248	368

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	154	277	733	166	57	21
Volume Left	16	0	0	0	57	0
Volume Right	0	0	0	166	0	21
cSH	714	1700	1700	1700	248	368
Volume to Capacity	0.02	0.16	0.43	0.10	0.23	0.06
Queue Length (ft)	2	0	0	0	22	4
Control Delay (s)	1.2	0.0	0.0	0.0	23.8	15.4
Lane LOS	A				C	C
Approach Delay (s)	0.4		0.0		21.6	
Approach LOS					C	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96			1.00		1.00	0.93		1.00	0.96	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1733			1852		1703	1671		1752	1777	
Flt Permitted	0.21	1.00			0.90		0.52	1.00		0.41	1.00	
Satd. Flow (perm)	372	1733			1676		935	1671		757	1777	
Volume (vph)	80	320	125	85	620	0	25	170	140	190	170	55
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor (vph)	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%	104%
Adj. Flow (vph)	83	333	130	88	645	0	26	177	146	198	177	57
Lane Group Flow (vph)	83	463	0	0	733	0	26	323	0	198	234	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	6%	6%	6%	3%	3%	3%
Turn Type	Perm			Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	38.0	38.0			38.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	39.0	39.0			39.0		25.0	25.0		25.0	25.0	
Actuated g/C Ratio	0.56	0.56			0.56		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	207	966			934		334	597		270	635	
v/s Ratio Prot		0.27						0.19			0.13	
v/s Ratio Perm	0.22				c0.44		0.03			c0.26		
v/c Ratio	0.40	0.48			0.78		0.08	0.54		0.73	0.37	
Uniform Delay, d1	8.8	9.4			12.2		14.9	17.9		19.6	16.7	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.7	1.7			6.6		0.5	3.5		16.2	1.6	
Delay (s)	14.5	11.1			18.8		15.3	21.4		35.8	18.3	
Level of Service	B	B			B		B	C		D	B	
Approach Delay (s)		11.6			18.8			21.0			26.3	
Approach LOS		B			B			C			C	

PROJECT 2011 CONDITIONS

Traffic Volumes **PM PEAK**



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Sign Control		Free			Stop			Stop		Free		
Grade		0%			0%			0%		0%		
Volume (veh/h)	62	286	0	10	92	88	0	52	52	76	218	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	62	286	0	10	92	88	0	52	52	76	218	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type					None			None				
Median storage veh)												
vC, conflicting volume	228			863	785	223	919	790	286	286		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
tC, single (s)	4.1			7.1	6.5	6.2	7.1	6.5	6.2	4.1		
tC, 2 stage (s)												
tF (s)	2.2			3.5	4.0	3.3	3.5	4.0	3.3	2.2		
p0 queue free %	95			95	68	89	100	82	93	94		
cM capacity (veh/h)	1328			204	291	817	157	289	753	1270		

Direction, Lane #	WB 1	NB 1	SB 1	NE 1
Volume Total	348	190	104	304
Volume Left	62	10	0	76
Volume Right	0	88	52	10
cSH	1328	402	418	1270
Volume to Capacity	0.05	0.47	0.25	0.06
Queue Length (ft)	4	62	24	5
Control Delay (s)	1.8	21.8	16.5	2.4
Lane LOS	A	C	C	A
Approach Delay (s)	1.8	21.8	16.5	2.4
Approach LOS		C	C	

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	307	0	0	339	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	307	0	0	339	10	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume			307		646	307
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1220		439	738

Direction, Lane #	EB 1	WB 1	NW 1
Volume Total	307	339	20
Volume Left	0	0	10
Volume Right	0	0	10
cSH	1700	1220	551
Volume to Capacity	0.18	0.00	0.04
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	11.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.8
Approach LOS			B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	416	733	206	83	21
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	16	416	733	206	83	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	939				973	733
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.3				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	98				66	94
cM capacity (veh/h)	690				247	368

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	155	277	733	206	83	21
Volume Left	16	0	0	0	83	0
Volume Right	0	0	0	206	0	21
cSH	690	1700	1700	1700	247	368
Volume to Capacity	0.02	0.16	0.43	0.12	0.34	0.06
Queue Length (ft)	2	0	0	0	35	5
Control Delay (s)	1.3	0.0	0.0	0.0	26.7	15.4
Lane LOS	A				D	C
Approach Delay (s)	0.5		0.0		24.4	
Approach LOS					C	

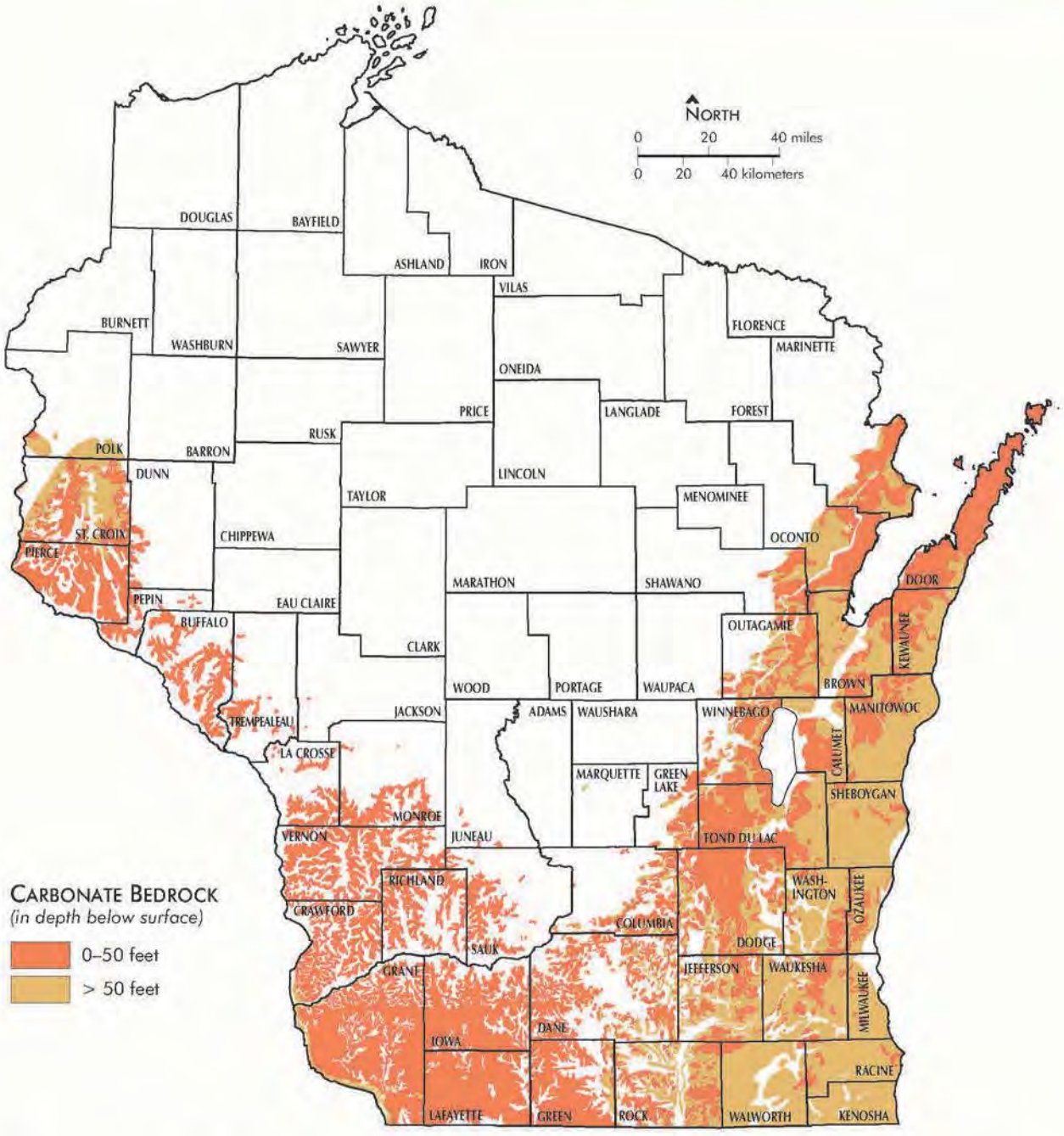
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96			1.00		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1733			1852		1703	1678		1752	1782	
Flt Permitted	0.21	1.00			0.90		0.46	1.00		0.39	1.00	
Satd. Flow (perm)	372	1733			1676		831	1678		713	1782	
Volume (vph)	93	333	130	88	645	0	26	197	146	198	217	63
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	93	333	130	88	645	0	26	197	146	198	217	63
Lane Group Flow (vph)	93	463	0	0	733	0	26	343	0	198	280	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	6%	6%	6%	3%	3%	3%
Turn Type	Perm			Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	38.0	38.0			38.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	39.0	39.0			39.0		25.0	25.0		25.0	25.0	
Actuated g/C Ratio	0.56	0.56			0.56		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	207	966			934		297	599		255	636	
v/s Ratio Prot		0.27						0.20			0.16	
v/s Ratio Perm	0.25				c0.44		0.03			c0.28		
v/c Ratio	0.45	0.48			0.78		0.09	0.57		0.78	0.44	
Uniform Delay, d1	9.2	9.4			12.2		14.9	18.2		20.0	17.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.9	1.7			6.6		0.6	3.9		20.4	2.2	
Delay (s)	16.1	11.1			18.8		15.5	22.1		40.4	19.4	
Level of Service	B	B			B		B	C		D	B	
Approach Delay (s)		11.9			18.8			21.7			28.1	
Approach LOS		B			B			C			C	

Karst and shallow carbonate bedrock in Wisconsin

Wisconsin Geological and Natural History Survey

Factsheet 02 | 2009

Areas with carbonate bedrock within 50 feet of the land surface are particularly vulnerable to groundwater contamination.



UW Extension
University of Wisconsin-Extension

Wisconsin Geological and Natural History Survey 3817 Mineral Point Road • Madison, Wisconsin 53705-5100
Tel 608.263.7389 • Fax 608.262.8086 • WisconsinGeologicalSurvey.org
Director and State Geologist: James M. Robertson

as daily minimum, maximum, and average temperatures and daily precipitation observations. The model was used to simulate two years of recharge, with the first year used to develop antecedent conditions for the second year. Output was reported as total annual recharge in inches per year. Unrealistic high values (specifically, recharge greater than 50 inches, or 127 cm, per year) were converted to 50 inches, with the remainder likely representing additional runoff to surface water features. Extractive (such as quarries), wetland, and water land-use categories were removed from further processing and labeled as undefined. These land-use types are hydrologically complex and cannot be accurately represented in the SWB recharge model. The model output was then smoothed using a focal median method with a 19-cell area (approximately 80 acres).

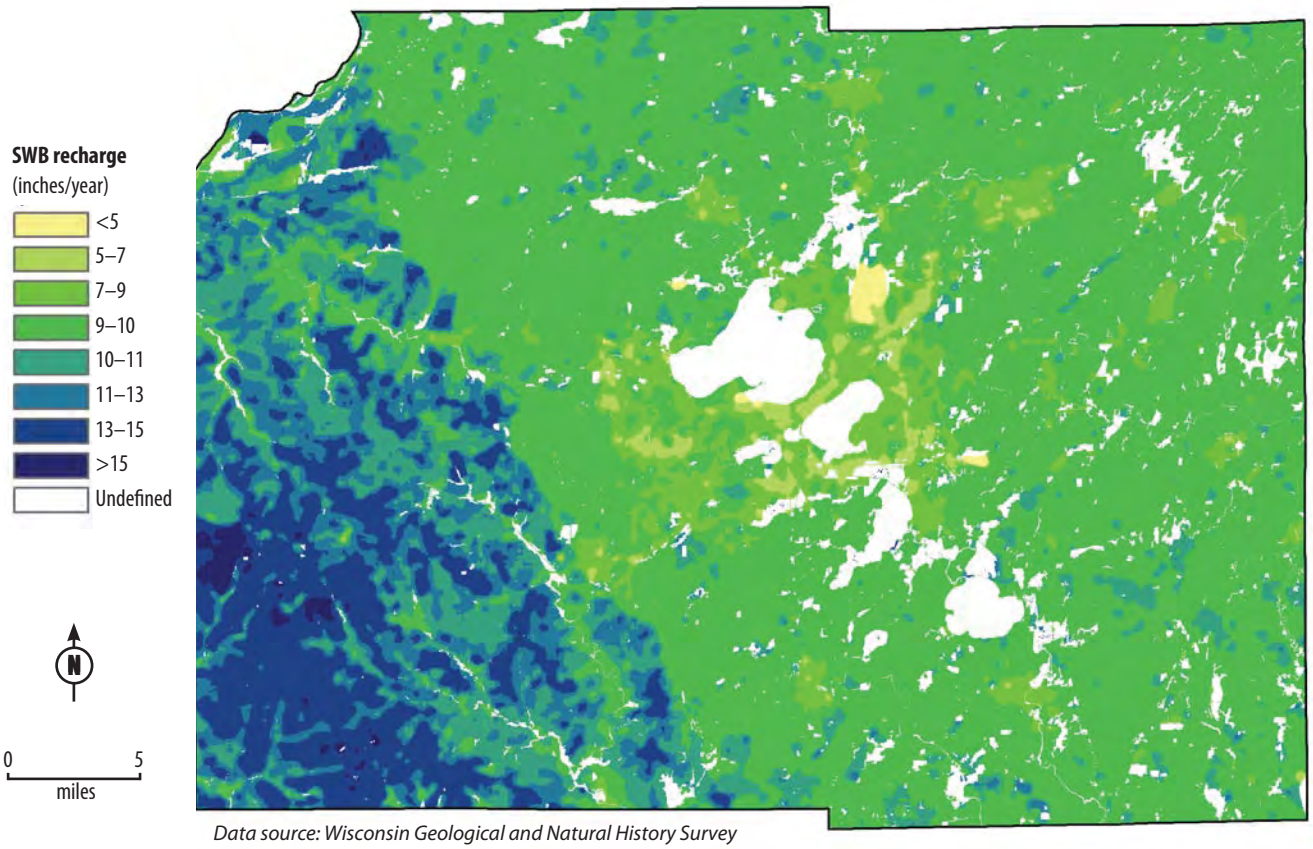
Results and applications

Regional recharge

The recharge map (shown categorized at a reduced scale in figure 5) was prepared as a raster data set in Environmental Systems Research Institute grid format, suitable for overlay and analysis with other GIS data layers. The map was prepared using existing land use as of 2005 and a typical climate year, 1981. For this model year, recharge varies by more than 10 inches (25 cm) per year across the county. Using other years with different precipitation patterns and antecedent moisture conditions will result in different recharge estimates. In general, the pattern of recharge will remain constant, but the overall average will vary with the precipitation and antecedent soil moisture.

Some general trends, correlating with surficial geology and land-use patterns, are evident in the recharge map. The greatest spatial control on recharge in Dane County is surficial geology. The unglaciated western and southwestern part of the county (Clayton and Attig, 1997) has the highest recharge, shown in dark green and blue. Recharge is high here because thin soils with low storage capacity occur over carbonate and sandstone bedrock. In contrast, the eastern two-thirds of the county, the glaciated area, has moderate recharge with little variation. In this area, the moderate hydraulic conductivity and higher storage capacity of the glacial tills reduce recharge rates. The lower recharge values in the central part of the county are due primarily to urban development in the Madison

Figure 5. Recharge map for Dane County.



Data source: Wisconsin Geological and Natural History Survey

FINAL REPORT FOR THE SANITARY SEWER COLLECTION SYSTEM

LONG RANGE UTILITY PLAN

Village of Cross Plains, Wisconsin

January 2001

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I. INTRODUCTION

The Village of Cross Plains Board of Trustees has authorized preparation of a long range plan for the Village's sanitary sewer collection system and the Village's water distribution system. The purpose of this study is to provide the basis for making decisions regarding the slope and size of sanitary sewer replacements which will eventually be required on Main Street, Valley Street and Brewery Road and to provide the basis for selection of the site for a new water storage tank and primary transmission mains. Establishment of existing loadings on the utility systems and definition of the limitations of the existing systems will allow the Village Planning Commission and the Village Board of Trustees to make rational decisions regarding the extent of additional development which can be allowed north and east of the Village without overloading these utility systems. This plan will also establish the limits of gravity sewer service north and east of the Village and the limits to which the water system will provide the static and residual dynamic pressures required by the Department of Natural Resources and the Public Services Commission. Specifically, this plan will establish the depth, diameter and slope at which sanitary sewer replacements on Main Street, Valley Street and Brewery Road will be made in order to service the potential growth areas north and east of the Village and the location and elevation of a new water storage tank.

It should be clearly understood that the analysis of wastewater treatment plant capacity is not a part of this study. Rather, this study assumes that wastewater treatment plant capacity can somehow be made available if the flows generated by new development can be conveyed to the wastewater treatment plant at the west end of the Village.

It should also be clearly understood that the determination of whether it is desirable from a Master Planning or a land use planning point of view for the development to actually occur in the locations assumed is not a consideration in this study. This study simply recognizes that the terrain north and east of the Village is physically suitable for development and that, if such development occurs, the sewage generated in the newly developed areas must be conveyed to the wastewater treatment plant at the west end of the Village.

A separate report has been prepared on the development of a computer water model for the Village water distribution system and to evaluate the service limits in the north and east parts of the Village. That report and the model itself establishes the capabilities and limitations of the existing Village water storage and distribution system. That report should be consulted for water distribution system information. This report will not address any water distribution system issues.

II. EXISTING SANITARY SEWER COLLECTION SYSTEM

A map of the Village's sanitary sewer collection system is folded into a map envelope following this page of the report. Because of the configuration of the system and the goals of the study it is not necessary to establish the capacities of every pipe in the sanitary sewer system. The following four larger "interceptor" sewers, which are highlighted on the sanitary sewer system map, were determined to be critical to the goals of this study:

- The Main Street Interceptor Sewer, extending from the wastewater treatment plant at the west end of the Village to the intersection of Main Street and Valley Street,

- The Valley Street/Brewery Road Interceptor Sewer, extending from the intersection of Main Street and Valley Street to the intersection of Valley Street and Brewery Road, then extending up Brewery Road to the Brewery Creek crossing,

- The Enchanted Valley Interceptor, extending from the intersection of Main Street and Valley Street east down Main Street to a point between Church Street and Brewery Road, then extending northerly up the Enchanted Valley Drainageway to the northeasterly boundary of Baer Park,

- The Bourbon Road Interceptor Sewer, extending from the wastewater treatment plant, following Bourbon Road to the east to the railroad crossing, then cutting north across Black Earth Creek to the intersection of Main Street and Valley Street.

The Main Street Interceptor now receives flow from sewers tributary to Main Street, but receives no flow from the Valley Street/Brewery Road Interceptor. Rather, the flow from the Valley Street/Brewery Road Interceptor joins with the flow from the Enchanted Valley Interceptor and enters the Bourbon Road Interceptor. Therefore, under the existing system configuration, all of the flow from the potential development areas to the north and east of the Village must be carried by the Bourbon Road interceptor. Obviously, the capacity of the Bourbon Road Interceptor is limited. If this interceptor cannot receive all of the increased sewage flows from potential developing areas north and east of the Village an alternate flow path for some of that future flow must be found. One possible future scenario would have the Main Street Interceptor, which, because of its age and physical condition, will require replacement the next time that Main Street (U.S. Highway 14) is reconstructed, being constructed to receive the flow from the Valley Street/Brewery Road Interceptor, thereby relieving the Bourbon Road Interceptor.

The Cross Plains sanitary sewer collection system has five inverted siphons. An inverted siphon is a section of sewer constructed lower than adjacent sections, to pass

VILLAGE OF CROSS PLAINS

DANE COUNTY, WISCONSIN

MAP PREPARED USING BASE MAPS PREPARED BY THE DANE COUNTY SURVEYORS OFFICE COURT HOUSE MADISON, WIS. 53709

0 150 300 450 600 750 900 1050 1200 1350 1500

SCALE 1"=300'

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MADISON, WI 53744-4451

SEWER SYSTEM LEGEND

8" SEWER	
10" SEWER	
12" SEWER	
MANHOLE	MANHOLE NUMBER

beneath an obstacle or obstruction. It runs full at all times under the force of gravity and at greater than atmospheric pressure, the sewage entering and leaving under atmospheric pressure. An inverted siphon usually consist of two or more pipes, with the second functioning if the first is plugged or if the flow is too great for the first to handle alone. The pipe diameters are lesser than normal sewers in an attempt to keep the velocity of flow high enough to minimize deposition of solids, which tend to cause plugging. A velocity of 3 feet per second at average flow is the goal, with the upstream manhole being sufficiently higher than the downstream manhole to overcome friction losses at peak flows due to entrance loss, exit loss, loss in the straight sections of pipe and loss in the angled fittings. However, in order to facilitate cleaning, in no case is a siphon pipe smaller than six inches in diameter permitted. The velocities at low flows are often far less than desirable, and may not be sufficient to carry solids through the pipe. Therefore, inverted siphons often require frequent clean-out or flushing. This high maintenance makes them undesirable unless there is no other alternative.

III. STUDY METHODS

Sewer Loadings

The first part of the equation in analyzing the state of the sanitary interceptor sewers being studied is to determine the existing loadings on those sewers. Then sewer capacities can be determined and those loadings can be compared with the capacities and conclusions can be reached regarding whether those sewers are overloaded or how much new development can be accommodated. The scope of work for this study did not allow the establishment of in-pipe flow monitoring stations to measure the actual flow being received. Even if such stations were to be used, it would be impractical to establish a station in every manhole, and the data recorded by such stations would reflect only the set of weather conditions and season during which the measurements were made. It is unlikely that the true peak flow condition upon which capacity decisions must be made would be recorded.

Instead, a study method was chosen in which the number of structures which discharge to all of the sewers tributary to the interceptors being studied were counted by a "windshield" survey. The nature of these structures was noted, and the persons residing in these structures or using these structures and the loadings emitted from these structures were then approximated by using standard unit factors. The following factors were used:

- Persons per single family or duplex dwelling unit:	2.5
- Persons per apartment dwelling unit:	2.25
- Sewage generation rate per person per day:	65 gallons
- Commercial area sewage generation rate per acre per day:	1,000 gallons
-Sewage generated from restaurants, industries and special users, such as car washes:	Actual water use from Village meter records

For example, a single family residential dwelling unit, either a house or a duplex, would be expected to discharge 1 x 2.5 persons x 65 gallons per person per day = 162.5 gallons per day. For schools a factor of 1/3 population equivalent per student and per employee was used to compute the flow contribution. For certain commercial structures, such as gas stations and stores, where water use was not expected to be significant assumptions were made regarding the number of equivalent dwelling units these structures represented. In the case of a gas station, for example, a factor of 1/3 of a single family dwelling unit was used.

This sanitary sewer study uses the figure of 65 gallons per capita per day (gpcd) for sanitary sewer contribution for the population of the Village. Although this figure is relatively low compared to other communities, it reflects the flows measured at the wastewater treatment facility. The possibility exists that the flows measured at the treatment plant in 1997 reflect an abnormally dry period. If this is the case typical per capita flows would be higher. The figure of 65 gpcd could be raised to 75 or 85 gpcd, which are more typical figures for similar sized communities. Appendix A includes tables for both 75 gpcd and 85 gpcd. These tables simply show that if higher per capita flows are experienced, capacity in the interceptors will be used up sooner and fewer new development units can be added before an upgrade is required.

Sites within the Village which had potential for the construction of new single family residences were noted during the windshield survey. A total of such sites were counted. Because these sites represent potential additional loadings without the addition of new developments, these sites were added to the contributing structures as single family dwelling units.

After compilation of all the dwelling units and sewage contributors throughout the Village was completed the total assumed population was compared against the estimated Village population for 1997 as provided by the State Department of Administration. The State Department of Administration estimate was 2955 persons. The total from the study projections was 3011 persons, of which 52.5 persons were the results of vacant building sites. Also, after calculation of the average sewage generated by the structures counted during the windshield survey, the total sewage generated in the Village was measured against the recorded average daily sewage flow received at the Village wastewater treatment plant in 1996 and 1997. (This part of the study work was conducted in early 1999, accounting for the fact that 1998, 1999 and 2000 data were not used, despite the nominal report date of January 2001.) The calculated average day sewage flow was 267,500 gallons, of which 3,413 gallons per day were the result of vacant building sites. The actual recorded average day sewage flow in 1996 was 263,000 gallons. In 1997 flow at the treatment plant averaged 238,000 gallons per day. These comparisons indicate that the study methods reflect the actual existing conditions with a reasonable degree of accuracy.

Sanitary sewers must be designed, not for average loadings, but for peak loadings. Therefore, it is necessary to adjust the average flows calculated using the unit estimating factors to peak flows which the sewers must convey. There must be a reasonable factor of safety in choice of a peaking factor because the ramifications of not being able to handle the actual peak flow are unacceptable (i.e., basement back-ups with resulting property damage and threat to public health). For smaller service areas a peaking factor of 4 is normally used. For wastewater treatment plants peaking factors of 2.5 to 4 are often used. For purposes of this study a peaking factor of 4 was chosen. Please recognize that the farther downstream in the sewer system one considers, the more conservative this peaking factor is. This is because, under typical

dry weather conditions, it is less and less likely the farther downstream one considers that all of the upstream tributary sewers are flowing at their peak rated capacity. However, one must also recognize that this peaking factor must include allowance for normal infiltration of clearwater into the sanitary sewer system. Peak infiltration events in a community the size of Cross Plains are usually system-wide, and such system-wide events will tend to cause the peak flows for all sewers to be encountered close to the same time.

Sewer Capacities

In order to determine the capacity of the existing sanitary sewers and to establish whether those sewers are overloaded or can accept additional loadings it is necessary to establish the diameter and slope of those sewers. The diameters could be established by reference to the Village's sanitary sewer collection system map. However, only limited reliable records exist of the elevations of the pipes at the manholes in the system or of the slopes of the pipes themselves.

It was determined by a review of available records and spot measurements that the as-built plans for the Enchanted Valley Interceptor could be used for the purposes of this study without additional field measurements. It was also determined that sufficient information existed in the form of the original construction plans and in manhole locations determined during the Bourbon Road reconstruction in 1996 to allow the characterization of the Bourbon Road Interceptor. However, insufficient information was available for the characterization of the Main Street Interceptor and for the characterization of the Valley Street/Brewery Road Interceptor.

Therefore, because records were lacking for these two interceptors, it was necessary to take field measurements to establish their characteristics. Field measurements were performed with "total station" field surveying equipment. These measurements established coordinates and elevations for each manhole cover on the sewers in question. The manhole covers were then removed and measurements were taken of the depth from the cover to the bottom (invert) of each sewer entering the manhole. The data from the total station measurements were then entered into an AUTOCAD computer file, and distances between manholes were established using AUTOCAD technology. The elevations of the sewer inverts were established by subtracting the depth measurements from the elevations determined by the total station measurements. Slopes of each sewer were then determined by dividing the difference in elevation of the inverts of the pipe at each end by the distance between the ends of the pipe. The centers of the manholes were used in the distance measurements.

Capacities of the sewers were then established by using Manning's formula for flows in open channels on a computer spreadsheet. A Manning's friction factor, n, of) 0.015 was used for clay and concrete pipe. A Manning's friction factor of n = 0.013

was used for PVC pipe. This friction factor will vary somewhat with the type and condition of the pipe, and represents one possible source of error in the calculations. The "head" loss which may take place through manholes was ignored for purposes of these calculations. In some cases the inflowing sewer pipe is higher than the outflowing sewer pipe. This difference in elevation may be sufficient to overcome the slight exit and entrance losses which occur as flow proceeds through a manhole. In some cases the pipe was laid straight through the manholes, which should minimize exit and entrance losses. In some cases the outflowing sewer is actually slightly higher than the inflowing sewer. In these latter cases some back-up will clearly occur. In these cases it assumed herein that the 4x peaking factor is sufficiently high to compensate for the small back-ups which will occur in such manholes.

Inverted Siphons

The Village of Cross Plains sanitary sewer system contains five inverted siphons. Four of those are pertinent to this analysis. Calculations were completed to determine the capacities of the inverted siphons, assuming gravity PVC pipe dimensions and a Hazen-Williams friction factor, C, of 120. The difference in elevation between the invert of the siphon pipes (barrels) exiting the upstream siphon manhole and the invert elevation of the inverts of the siphon pipes entering the downstream siphon manhole were used to determine available headloss. The assumption was made that no back-up above the top of the upstream pipes would be permissible.

IV. EXISTING LOADINGS & CAPACITIES

Using the methods described above, several tables were created to analyze the collection system. Each page in each table represents one of the four interceptors being studied. The first set of four pages is entitled "EXISTING SANITARY SEWER LOADING SUMMARY". The second set of four pages, which utilizes the input from the first table, is called "EXISTING SANITARY SEWER CAPACITY SUMMARY".

In the existing sanitary sewer LOADING tables the number of additional dwelling units of each category and the average flow from commercial and special contributors are shown for each manhole. Any contributors the sewage from which would be directly entering the pipe between two manholes are shown as being tributary to the upstream manhole of that section of pipe. This was done to reflect the fact that the pipe between two manholes must, at some point before it reaches the next manhole, be large enough to handle all the flow entering the upstream manhole, plus all the flow entering the pipe between manholes. The LOADING table is important because it generates data for use in the following CAPACITY table.

Three important conclusions can be drawn from the EXISTING SANITARY SEWER CAPACITY SUMMARY table. First, any sewers which are already overloaded or nearly overloaded can be determined from this table. Second, this table can be used to determine how much development can be added before a particular interceptor will be overloaded. Third, a judgment can be made regarding whether it is likely to be necessary or desirable to reconstruct the Main Street Interceptor to handle the flow from the Valley Street/Brewery Road Interceptor, in order to relieve the loading on the Bourbon Road Interceptor.

The CAPACITY table shows that no sanitary sewer segments can potentially be considered overloaded at the present time. The greatest capacity limitation is on Valley Street in the sewer segment between Elmwood Circle and Lewis Street. This sewer, which has a substandard slope of 0.207%, can accept an additional 0.24 cfs, which represents an additional 241 single family residential dwelling units.

All the interceptors studied have excess capacity. Therefore, additional development can be accommodated. Of the interceptors other than the Valley Street/Brewery Road Interceptor the Bourbon Road interceptor is most limited in capacity. At its most restrictive point, near the Village wastewater treatment plant, this interceptor can accept about an additional 0.45 cubic feet per second of flow, or the equivalent of the peak flow from about another 447 single family dwelling units. (A population of about 1119 persons). Because this is the point at which the 4x peaking factor is most conservative and because no basements exist in this area a greater number could probably be accepted without property damage occurring. It could be conservatively said that at a density of 3 single family dwelling units per acre, approximately another 149 acres of development could take place upstream of this interceptor

without exceeding the peak flow capacity of this sewer. Because there is far greater than 149 potentially developable acres which would be tributary to this sewer, the data in the CAPACITY table indicates that it will be desirable at some time in the future to divert the Valley Street/Brewery Road Interceptor to flow down the Main Street Interceptor instead of the present configuration in which it discharges to the Bourbon Road Interceptor.

EXISTING SANITARY SEWER LOADING SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	RESIDENTIAL DWELLING UNITS IN INCREMENTAL AREA	APARTMENT DWELLING UNITS IN INCREMENTAL AREA	FLOW FROM OTHER CONTRIBUTORS (COMMERCIAL/ INDUSTRIAL) IN INCREMENTAL AREA	CUMULATIVE TOTAL RESIDENTIAL DWELLING UNITS	CUMULATIVE TOTAL APARTMENT DWELLING UNITS	CUMULATIVE TOTAL FLOW FROM OTHER CONTRIBUTORS (GPD)	CUMULATIVE TOTAL FLOW (GPD)	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)
MAIN STREET									
36	Jovina St.	9			9	0	0	1,483	5,850
35	Caesar St.	15		500	24	0	500	4,400	17,600
34		4			28	0	500	5,050	20,200
15			3		28	3	500	5,489	21,955
14	Mill St., American Legion Dr.	18			46	3	500	8,414	33,655
13		3			49	3	500	8,901	35,605
12		4			53	3	500	9,551	38,205
11		4			57	3	500	10,201	40,805
10		4			61	3	500	10,851	43,405
9		4			65	3	500	11,501	46,005
8					65	3	500	11,501	46,005
7	Park St. West, Lagoon St.	138	21	25,857	203	24	26,357	62,855	251,418
6					203	24	26,357	62,855	251,418
5	Market St.	4		300	207	24	26,657	63,805	255,218
4					207	24	26,657	63,805	255,218
3	Plastic Ingenuity			6,877	207	24	33,534	70,682	282,726
2									

EXISTING SANITARY SEWER LOADING SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	RESID. DWELLING UNITS IN INCREMENTAL AREA	APT. DWELLING UNITS IN INCREMENTAL AREA	FLOW FROM OTHER CONTRIBUTORS (COMMERCIAL/ INDUSTRIAL) IN INCREMENTAL AREA	CUMULATIVE TOTAL RESIDIAL DWELLING UNITS	CUMULATIVE TOTAL APARTMENT DWELLING UNITS	CUMULATIVE TOTAL FLOW FROM OTHER CONTRIBUTORS (GPD)	CUMULATIVE TOTAL FLOW (GPD)	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)
BREWERY ROAD									
262					0	0	0	0	0
90	Thinnes St., Hillside Trail	40			40	0	0	6,500	26,000
89		4			44	0	0	7,150	28,600
106	Baer St.	24		300	68	0	300	11,350	45,400
88		3			71	0	300	11,838	47,350
87		4			75	0	300	12,488	49,950
129	Upper Valley St., Esser St.	54			129	0	300	21,263	85,050
84	Eller St.	15	24		144	24	300	27,210	108,840
VALLEY STREET									
82					144	24	300	27,210	108,840
81		2			146	24	300	27,535	110,140
80	Elmwood Circle	64			210	24	300	37,935	151,740
52	Lewis St.	10			220	24	300	39,560	158,240
51	Grand St.	10	4		230	28	300	41,770	167,080
50		1			231	28	300	41,933	167,730
37					231	28	300	41,933	167,730
233									

EXISTING SANITARY SEWER LOADING SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	RESID. DWELLING UNITS IN INCREMENTAL AREA	APT. DWELLING UNITS IN INCREMENTAL AREA	FLOW FROM OTHER CONTRIBUTORS (COMMERCIAL/ INDUSTRIAL) IN INCREMENTAL AREA	CUMULATIVE TOTAL RESIDIAL DWELLING UNITS	CUMULATIVE TOTAL APARTMENT DWELLING UNITS	CUMULATIVE TOTAL FLOW FROM OTHER CONTRIBUTORS (GPD)	CUMULATIVE TOTAL FLOW (GPD)	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)
ENCHANTED VALLEY INTERCEPTOR									
249	Melody Acres	228		29,167	228	0	29,167	66,217	264,868
248					228	0	29,167	66,217	264,868
247					228	0	29,167	66,217	264,868
246					228	0	29,167	66,217	264,868
245		1			229	0	29,167	66,380	265,518
244					229	0	29,167	66,380	265,518
243			7		229	7	29,167	67,403	269,613
242					229	7	29,167	67,403	269,613
241			12		229	19	29,167	69,158	276,633
240					229	19	29,167	69,158	276,633
238			10		229	29	29,167	70,621	282,483
237			20		229	49	29,167	73,546	294,183
236			6		229	55	29,167	74,423	297,693
235					229	55	29,167	74,423	297,693
234	Westview Ct.		97	3,228	229	152	32,395	91,838	367,350
68			20		229	172	32,395	94,763	379,050
67	Church St.	22	17	1,079	251	189	33,474	101,903	407,611
144	Eulalia St., Martin St.	33		300	284	189	33,774	107,565	430,261
66			20		284	209	33,774	110,490	441,961
SIPHON EAST			6		284	215	33,774	111,368	445,471
SIPHON WEST					284	215	33,774	111,368	445,471
233									

EXISTING SANITARY SEWER LOADING SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	RESID. DWELLING UNITS IN INCREMENTAL AREA	APT. DWELLING UNITS IN INCREMENTAL AREA	FLOW FROM OTHER CONTRIBUTORS (COMMERCIAL/ INDUSTRIAL) IN INCREMENTAL AREA	CUMULATIVE TOTAL RESIDIAL DWELLING UNITS	CUMULATIVE TOTAL APARTMENT DWELLING UNITS	CUMULATIVE TOTAL FLOW FROM OTHER CONTRIBUTORS (GPD)	CUMULATIVE TOTAL FLOW (GPD)	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)
BOURBON ROAD INTERCEPTOR									
233					515	243	34,074	153,300	613,201
232			5		515	248	34,074	154,032	616,126
SIPHON N.					515	248	34,074	154,032	616,126
SIPHON S.					515	248	34,074	154,032	616,126
231					515	248	34,074	154,032	616,126
230					515	248	34,074	154,032	616,126
229		1			516	248	34,074	154,194	616,776
228		1			517	248	34,074	154,357	617,426
227					517	248	34,074	154,357	617,426
226	Hillebrand Dr.	41			558	248	34,074	161,019	644,076
225					558	248	34,074	161,019	644,076
276	Continental Dr.	43	16		601	264	34,074	170,347	681,386
224					601	264	34,074	170,347	681,386
223					601	264	34,074	170,347	681,386
222					601	264	34,074	170,347	681,386
221	Ludden Dr.	39	109	4,196	640	373	38,270	196,821	787,285
208					640	373	38,270	196,821	787,285
207					640	373	38,270	196,821	787,285
206					640	373	38,270	196,821	787,285
205					640	373	38,270	196,821	787,285
SIPHON S.					640	373	38,270	196,821	787,285
SIPHON N.					640	373	38,270	196,821	787,285
204					640	373	38,270	196,821	787,285
203					640	373	38,270	196,821	787,285
202					640	373	38,270	196,821	787,285
201					640	373	38,270	196,821	787,285
1									
		847	397	71804					

RESIDENTIAL USE = 65 gpcd

SINGLE FAMILY = 2.50 persons per unit

APARTMENT = 2.25 persons per unit

POPULATION = 3,011

TOTAL AVE. DAILY FLOW = 267,503

PEAK DAILY FLOW = 1,070,011

EXISTING SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	PIPE CROSS-SECTIONAL AREA, SQ. FT.	HYDRAULIC RADIUS	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	VELOCITY (fps)	GRAVITY SEWER CAPACITY (cfs)	OVER-LOADED	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
MAIN STREET																		
36	Jovina St.			CLAY				876.79	8.75	8.81	868.04	867.98						
		0.00905	8	0.015	0.34907	0.16667	293						0.0029	1.62033	0.56560	NO	0.56	553
35	Caesar St.			CLAY				879.64	12.51	12.52	867.13	867.12						
		0.02723	8	0.015	0.34907	0.16667	219						0.00315	1.68861	0.58944	NO	0.56	559
34				CLAY				879.03	12.60	12.56	866.43	866.47						
		0.03126	8	0.015	0.34907	0.16667	200						0.0038	1.85447	0.64733	NO	0.62	613
15				CLAY				877.91	12.20	12.13	865.71	865.78						
		0.03397	8	0.015	0.34907	0.16667	204						0.00304	1.65847	0.57892	NO	0.54	542
14	Mill St. Amerlan			CLAY				876.16	11.00	11.08	865.16	865.08						
	Legin Dr.	0.05208	8	0.015	0.34907	0.16667	344						0.00256	1.52156	0.53113	NO	0.48	476
13				CLAY				874.04	9.84	9.86	864.20	864.18						
		0.05509	8	0.015	0.34907	0.16667	320						0.00325	1.71502	0.59865	NO	0.54	540
12				CLAY				872.17	9.03	9.00	863.14	863.17						
		0.05912	8	0.015	0.34907	0.16667	322						0.00289	1.61674	0.56435	NO	0.51	502
11				CLAY				869.91	7.67	7.80	862.24	862.11						
		0.06314	8	0.015	0.34907	0.16667	323						0.01096	3.14940	1.09935	NO	1.04	1030
10				CLAY				865.42	6.85	6.89	858.57	858.53						
		0.06716	8	0.015	0.34907	0.16667	324						0.00265	1.54990	0.54102	NO	0.47	471
9				CLAY				866.07	8.40	8.36	857.67	857.71						
		0.07119	8	0.015	0.34907	0.16667	339						0.00316	1.69013	0.58997	NO	0.52	516
8				CLAY				864.90	8.26	8.33	856.64	856.57						
		0.07119	8	0.015	0.34907	0.16667	335						0.00319	1.70019	0.59348	NO	0.52	519
7	Park St. West			CLAY				863.63	8.13	8.22	855.50	855.41						
	Lagoon St.	0.38903	10	0.015	0.54542	0.20833	171						0.00263	1.79078	0.97672	NO	0.59	584
6				CLAY				862.68	7.72	7.70	854.96	854.98						
		0.38903	10	0.015	0.54542	0.20833	143						0.00336	2.02249	1.10310	NO	0.71	710
5	Market St.			CLAY				862.17	7.67	7.79	854.50	854.38						
		0.39491	10	0.015	0.54542	0.20833	295						0.00149	1.34819	0.73532	NO	0.34	338
4				CLAY				861.69	7.75	7.75	853.94	853.94						
		0.39491	10	0.015	0.54542	0.20833	296						0.00247	1.73360	0.94553	NO	0.55	548
3	Plastic Ingenuity			CLAY				862.58	9.37	9.30	853.21	853.28						
		0.43747	10	0.015	0.54542	0.20833	275						0.00211	1.60318	0.87440	NO	0.44	434
2								863.01	10.31	10.38	852.70	852.63						

EXISTING SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	PIPE CROSS-SECTIONAL AREA, SQ. FT.	HYDRAULIC RADIUS	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	VELOCITY (fps)	GRAVITY SEWER CAPACITY (cfs)	OVER-LOADED	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
BREWERY ROAD																		
202				PVC				903.07	6.02	6.10	897.05	896.97						
		0.00000	8	0.013	0.34907	0.16667	25						0.00280	1.83677	0.64115	NO	0.64	638
90	Thinnes St., Hillside Tr.			ABS TRUSS				902.79	5.89	5.91	896.90	896.88						
		0.04023	8	0.013	0.34907	0.16667	284						0.00345	2.03906	0.71177	NO	0.67	668
89				ABS TRUSS				902.26	6.36	6.42	895.90	895.84						
		0.04425	8	0.015	0.34907	0.16667	54						0.00759	2.62134	0.91502	NO	0.87	866
106	Baer St.			CLAY				902.62	7.19	7.22	895.43	895.40						
		0.07025	8	0.015	0.34907	0.16667	244						0.00561	2.25420	0.78687	NO	0.72	713
88				ORANGEBURG				899.07	5.04	5.00	894.03	894.07						
		0.07327	8	0.015	0.34907	0.16667	299						0.01739	3.96729	1.38484	NO	1.31	1304
87				CLAY				896.24	7.37	7.42	888.87	888.82						
		0.07729	8	0.015	0.34907	0.16667	346						0.00321	1.70393	0.59478	NO	0.52	515
129	Uppery Valley St.			CLAY				894.66	6.95	6.97	887.71	887.69						
	Esser St.	0.13160	8	0.015	0.34907	0.16667	21						0.07952	8.48352	2.96131	NO	2.83	2814
84	Eller St.							893.90	7.88	8.05	886.02	885.85						
VALLEY STREET		0.16841	8	0.015	0.34907	0.16667	407						0.02098	4.35772	1.52113	NO	1.35	1345
82				CONC				886.78	9.47	9.44	877.31	877.34						
		0.16841	8	0.015	0.34907	0.16667	390						0.00318	1.69631	0.59213	NO	0.42	421
81				CONC				884.40	8.30	8.33	876.10	876.07						
		0.17042	8	0.015	0.34907	0.16667	110						0.00373	1.83664	0.64111	NO	0.47	468
80	Elmwood Circle			CLAY				883.93	8.27	8.31	875.66	875.62						
		0.23479	8	0.015	0.34907	0.16667	290						0.00207	1.36837	0.47765	NO	0.24	241
52	Lewis St.			CLAY				881.89	6.87	6.93	875.02	874.96						
		0.24485	8	0.015	0.34907	0.16667	242						0.00364	1.81410	0.63324	NO	0.39	386
51	Grand St.			CLAY				882.90	8.82	8.87	874.08	874.03						
		0.25853	8	0.015	0.34907	0.16667	295						0.00675	2.47083	0.86248	NO	0.60	601
50				PVC/CLAY				880.75	8.71	8.78	872.04	871.97						
		0.25953	8	0.015	0.34907	0.16667	273						0.01092	3.14307	1.09714	NO	0.84	833
37				PVC/CLAY				875.37	6.38	6.63	868.99	868.74						
		0.25953	8	0.015	0.34907	0.16667	15						0.09600	9.32101	3.25365	NO	2.99	2977
233								875.24	7.94	8.06	867.30	867.18						

EXISTING SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	PIPE CROSS-SECTIONAL AREA, SQ. FT.	HYDRAULIC RADIUS	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	VELOCITY (fps)	GRAVITY SEWER CAPACITY (cfs)	OVER-LOADED	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
ENCHANTED VALLEY INTERCEPTOR																		
249	Melody Acres		PVC					910.02			900.02	897.80						
		0.40984	10	0.013	0.54542	0.20833	396						0.00530	2.93322	1.59982	NO	1.19	1183
248			PVC					905.28			895.70	895.63						
		0.40984	10	0.013	0.54542	0.20833	199						0.00814	3.63424	1.98217	NO	1.57	1563
247			PVC					903.86			894.01	893.96						
		0.40984	10	0.013	0.54542	0.20833	308						0.00698	3.36532	1.83550	NO	1.43	1418
246			PVC					906.83			891.81	891.73						
		0.40984	10	0.013	0.54542	0.20833	170						0.00635	3.21048	1.75104	NO	1.34	1334
245			PVC					904.25			890.85	890.53						
		0.41085	10	0.013	0.54542	0.20833	235						0.00464	2.74322	1.49620	NO	1.09	1079
244			PVC					901.57			889.44	889.40						
		0.41085	10	0.013	0.54542	0.20833	287						0.00488	2.81323	1.53438	NO	1.12	1117
243			PVC					902.85			888.00	887.95						
		0.41718	10	0.013	0.54542	0.20833	215						0.00460	2.73326	1.49076	NO	1.07	1067
242			PVC					901.17			886.96	886.89						
		0.41718	10	0.013	0.54542	0.20833	260						0.00612	3.14988	1.71799	NO	1.30	1293
241			PVC					899.60			886.30	886.25						
		0.42804	10	0.013	0.54542	0.20833	224						0.02027	5.73437	3.12762	NO	2.70	2684
240			PVC					893.76			880.71	880.64						
		0.42804	10	0.013	0.54542	0.20833	204						0.00505	2.86211	1.56104	NO	1.13	1127
239			PVC					893.50			879.61	879.48						
		0.43710	10	0.013	0.54542	0.20833	220						0.01777	5.36981	2.92878	NO	2.49	2478
237			PVC					885.50			876.57	875.50						
		0.45520	10	0.013	0.54542	0.20833	301						0.00751	3.49022	1.90362	NO	1.45	1440
236			PVC					881.64			873.24	873.19						
		0.46063	10	0.013	0.54542	0.20833	222						0.00730	3.44083	1.87668	NO	1.42	1408
235			PVC					881.97			871.57	871.55						
		0.46063	10	0.013	0.54542	0.20833	181						0.00271	2.09576	1.14306	NO	0.68	679
234	Westview St							877.63			871.06	871.05						
		0.56841	12	0.013	0.78540	0.25000	274						0.00438	3.01013	2.36415	NO	1.80	1786
68								875.55			869.85	869.85						
		0.58652	12	0.013	0.78540	0.25000	238						0.00202	2.04269	1.60432	NO	1.02	1012
67	Church St							874.90			869.37	869.37						
		0.63071	12	0.013	0.78540	0.25000	139						0.00331	2.61662	2.05509	NO	1.42	1416
144	Eulalia St, Martin St							874.80			868.91	868.91						
		0.66576	12	0.013	0.78540	0.25000	48						0.00229	2.17744	1.71015	NO	1.04	1038
66								874.95			868.80	868.80						
		0.68386	12	0.013	0.78540	0.25000	33						0.00212	2.09489	1.64532	NO	0.96	956
SIPHON EAST								873.59			868.73	868.73						
		0.68929	2@6				87								1.47	NO	0.7861	782
SIPHON WEST								879.81			866.97	866.97						
		0.68929	12	0.013	0.78540	0.25000	91						0.00374	2.78028	2.18363	NO	1.49	1486
239								874.13			868.63	868.63						

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	PIPE CROSS-SECTIONAL AREA, SQ. FT.	HYDRAULIC RADIUS	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	VELOCITY (fps)	GRAVITY SEWER CAPACITY (cfs)	OVER-LOADED	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
BOURBON ROAD INTERCEPTOR																		
233			PVC					874.30			867.05	867.05						
		0.94883	12	0.013	0.78540	0.25000	58						0.00224	2.15341	1.69129	NO	0.74	738
232			PVC					873.00			866.92	866.92						
		0.95335	12	0.013	0.78540	0.25000	175						0.00251	2.28075	1.79129	NO	0.84	833
SIPHON N.			PVC					872.00			866.48	866.48						
		0.95335					85								1.25455	NO	0.29	291
SIPHON S.			PVC					872.70			866.21	866.21						
		0.95335	12	0.013	0.78540	0.25000	142						0.00250	2.27426	1.78620	NO	0.83	828
231			PVC					874.10			865.86	865.86						
		0.95335	12	0.013	0.78540	0.25000	156						0.00250	2.27426	1.78620	NO	0.83	828
230			PVC					875.90			865.47	865.47						
		0.95335	12	0.013	0.78540	0.25000	394						0.00250	2.27426	1.78620	NO	0.83	828
229			PVC					880.90			864.48	864.48						
		0.95436	12	0.013	0.78540	0.25000	291						0.00250	2.27426	1.78620	NO	0.83	827
228			PVC					881.00			863.75	863.75						
		0.95537	12	0.013	0.78540	0.25000	266						0.00250	2.27426	1.78620	NO	0.83	826
227			PVC					878.80			863.09	863.09						
		0.95537	12	0.013	0.78540	0.25000	289						0.00250	2.27426	1.78620	NO	0.83	826
226	Hillebrand Dr.		PVC					870.40			862.37	862.37						
		0.99660	12	0.013	0.78540	0.25000	256						0.00250	2.27426	1.78620	NO	0.79	785
225			PVC					871.40			861.73	861.73						
		0.99660	12	0.013	0.78540	0.25000	48						0.00250	2.27426	1.78620	NO	0.79	785
276	Continental Dr.		PVC					870.60			861.61	861.61						
		1.05433	12	0.013	0.78540	0.25000	347						0.00250	2.27426	1.78620	NO	0.73	728
224			PVC					870.40			860.74	860.74						
		1.05433	12	0.013	0.78540	0.25000	270						0.00250	2.27426	1.78620	NO	0.73	728
223			PVC								860.06	860.06						
		1.05433	12	0.013	0.78540	0.25000	125						0.00250	2.27426	1.78620	NO	0.73	728
222			PVC					872.00			859.75	859.75						
		1.05433	12	0.013	0.78540	0.25000	357						0.00320	2.57303	2.02085	NO	0.97	961
221	Ludden Dr.		PVC					872.79			858.61	858.61						
		1.21819	12	0.013	0.78540	0.25000	47						0.00320	2.57303	2.02085	NO	0.80	798
208			PVC					872.50			858.46	858.46						
		1.21819	12	0.013	0.78540	0.25000	296						0.00320	2.57303	2.02085	NO	0.80	798
207			PVC					870.50			857.51	857.51						
		1.21819	12	0.013	0.78540	0.25000	170						0.00320	2.57303	2.02085	NO	0.80	798
206			PVC					869.80			856.97	856.97						
		1.21819	12	0.013	0.78540	0.25000	64						0.01180	4.94095	3.88061	NO	2.66	2647
205			PVC					863.60			856.21	856.21						
		1.21819	12	0.013	0.78540	0.25000	100						0.00911	4.34091	3.40935	NO	2.19	2179
SIPHON S.			PVC					860.00			855.30	855.30						
		1.21819					100								0.87591	YES	--	--
SIPHON N.			PVC					860.00			855.12	855.12						
		1.21819	12	0.013	0.78540	0.25000	298						0.00218	2.12431	1.66843	NO	0.45	448
204			PVC					860.00			854.47	854.47						
		1.21819	12	0.013	0.78540	0.25000	227						0.00220	2.13472	1.67661	NO	0.46	456
203			PVC					860.00			853.97	853.97						
		1.21819	12	0.013	0.78540	0.25000	382						0.00220	2.13293	1.67520	NO	0.46	454
202			PVC					860.00			853.13	853.13						
		1.21819	12	0.013	0.78540	0.25000	200						0.00220	2.13344	1.67560	NO	0.46	455
201			PVC					860.00			852.69	852.69						
		1.21819	12	0.013	0.78540	0.25000	225						0.00218	2.12264	1.66712	NO	0.45	446
1			PVC					862.30			852.20	852.20						

V. FUTURE LOADINGS, CAPACITY LIMITATIONS AND OVERALL INTERCEPTOR PLAN

To analyze the effects of future loadings on the existing collection system, the "EXISTING SANITARY SEWER CAPACITY SUMMARY" table was modified to reflect future extensions to the collection system. This table is on the following pages as the "FUTURE SANITARY SEWER CAPACITY SUMMARY" table.

During the field investigations done as a part of this study measurements were taken of culvert elevations in the following four locations:

1) Airport Road, where the Enchanted Valley Drainageway crosses,

2) Enchanted Valley Road, where the Enchanted Valley Drainageway crosses,

3) C.T.H. P, where Brewery Creek crosses,

4) Enchanted Valley Road, where Brewery Creek crosses.

These are four low points in areas of potential development. If interceptor sewers can reach these points while still having at least seven feet of depth from the ground surface to the invert of the sewer, gravity sanitary sewer service can be provided to all probable development areas for the foreseeable future. The primary purpose of these measurements was to determine if the lowering of any of the existing interceptors would be desirable to extend the gravity sanitary sewer service areas, if those interceptors should require replacement for other reasons. The map following the future sanitary sewer capacity summary tables shows these low points and the ends of the existing interceptors which are nearest to those low points. The table following the map demonstrates the results of calculations to determine the feasibility of extending the existing sanitary interceptor sewers to those low points. From an inspection of this table it can be seen that the first two low points can be serviced by extending the existing 10 inch diameter Enchanted Valley Interceptor, although extension of an 8 inch diameter sewer would also work. In the second two cases it can be seen that extension of the existing 8 inch diameter Valley Street/Brewery Road Interceptor at the minimum allowable slope of 0.40% will not allow gravity sewer to reach these low points with sufficient cover. By replacing the existing 8 inch diameter Valley Street/Brewery Road Interceptor with 10 inch diameter sanitary sewer these points may be serviceable with a 10 inch sewer extension. However, the sewers would be very deep. A preliminary design to establish alternatives is the subject of the next phase of study.

FUTURE SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	GRAVITY SEWER CAPACITY (cfs)	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
ENCHANTED VALLEY INTERCEPTOR															
				PVC			910.02			900.02	897.80				
249	Melody Acres	264,868	0.40984	10	0.013	396						0.00530	1.59982	1.19	1183
				PVC			905.28			895.70	895.53				
248		264,868	0.40984	10	0.013	199						0.00814	1.98217	1.57	1563
				PVC			903.86			894.01	893.96				
247		264,868	0.40984	10	0.013	308						0.00698	1.83550	1.43	1418
				PVC			906.63			891.81	891.73				
246		264,868	0.40984	10	0.013	170						0.00635	1.75104	1.34	1334
				PVC			904.25			890.65	890.53				
245		265,518	0.41085	10	0.013	235						0.00464	1.49620	1.09	1079
				PVC			901.57			889.44	889.40				
244		265,518	0.41085	10	0.013	287						0.00488	1.53438	1.12	1117
				PVC			902.65			888.00	887.86				
243		269,613	0.41718	10	0.013	215						0.00460	1.49076	1.07	1067
				PVC			901.17			886.96	886.89				
242		269,613	0.41718	10	0.013	260						0.00612	1.71799	1.30	1293
				PVC			899.50			885.30	885.25				
241		276,633	0.42804	10	0.013	224						0.02027	3.12762	2.70	2684
				PVC			893.76			880.71	880.64				
240		276,633	0.42804	10	0.013	204						0.00505	1.56104	1.13	1127
				PVC			893.50			879.61	879.46				
238		282,483	0.43710	10	0.013	220						0.01777	2.92878	2.49	2478
				PVC			885.50			875.57	875.50				
237		294,183	0.45520	10	0.013	301						0.00751	1.90362	1.45	1440
				PVC			881.84			873.24	873.19				
236		297,693	0.46063	10	0.013	222						0.00730	1.87668	1.42	1408
				PVC			881.97			871.57	871.55				
235		297,693	0.46063	12	0.013	181						0.00271	1.85874	1.40	1390
							877.63			871.06	871.05				
234	U.S.H. 14	367,350	0.56841	12	0.013	274						0.00438	2.36415	1.80	1786
							875.55			869.85	869.85				
68		379,050	0.58652	12	0.013	238						0.00202	1.60432	1.02	1012
							874.90			869.37	869.37				
67	Church St.	407,611	0.63071	12	0.013	139						0.00331	2.05509	1.42	1416
							874.80			868.91	868.91				
144	Eulalia St., Marlin St.	430,261	0.66576	12	0.013	48						0.00229	1.71015	1.04	1038
							874.95			868.80	868.80				
66		441,961	0.68386	12	0.013	33						0.00212	1.64532	0.96	956
							873.53			868.72	868.73				
SIPHON EAST		445,471	0.68929	2@6		87							1.47	0.7861	782
							873.81			866.97	866.97				
SIPHON WEST		445,471	0.68929	12	0.013	91						0.00374	2.18363	1.49	1486
							874.13			866.63	866.63				
233															

FUTURE SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	GRAVITY SEWER CAPACITY (cfs)	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
BREWERY ROAD															
					PVC		903.07	6.02	6.10	897.05	896.97				
262		8,450	0.01307	8	0.013	25						0.00280	0.64115	0.63	625
					ABS TRUSS		902.79	5.89	5.91	896.90	896.88				
90	Thinnes St.,	34,450	0.05331	8	0.013	284						0.00345	0.71177	0.66	655
	Hillside Trail				ABS TRUSS		902.26	6.36	6.42	895.90	895.84				
89		37,050	0.05733	8	0.015	54						0.00759	0.91502	0.86	853
					CLAY		902.62	7.19	7.22	895.43	895.40				
106	Baer St.	53,850	0.08332	8	0.015	244						0.00561	0.78687	0.70	700
					ORANGEBURG		899.07	5.04	5.00	894.03	894.07				
88		55,800	0.08634	8	0.015	299						0.01739	1.38484	1.30	1291
					CLAY		896.24	7.37	7.42	888.87	888.82				
87		58,400	0.09036	8	0.015	346						0.00321	0.59478	0.50	502
					CLAY		894.66	6.95	6.97	887.71	887.69				
129	Upper Valley St.,	93,500	0.14468	8	0.015	21						0.07952	2.96131	2.82	2801
	Esser St.						893.90	7.86	8.05	886.02	885.85				
84	Eller St.	117,290	0.18149	8	0.015	407						0.02098	1.52113	1.34	1332
VALLEY STREET					CONC		886.78	9.47	9.44	877.31	877.34				
82		117,290	0.18149	8	0.015	390						0.00318	0.59213	0.41	408
					CONC		884.40	8.30	8.33	876.10	876.07				
81		118,590	0.18350	8	0.015	110						0.00373	0.64111	0.46	455
					CLAY		883.93	8.27	8.31	875.66	875.62				
80	Elmwood Circle	160,190	0.24787	8	0.015	290						0.00207	0.47765	0.23	228
					CLAY		881.89	6.87	6.93	875.02	874.96				
52	Lewis St.	166,690	0.25793	8	0.015	242						0.00364	0.63324	0.38	373
					CLAY		882.90	8.82	8.87	874.08	874.03				
51	Grand St.	175,530	0.27160	8	0.015	295						0.00675	0.86248	0.59	588
					PVC/CLAY		880.75	8.71	8.78	872.04	871.97				
50		176,180	0.27261	8	0.015	273						0.01092	1.09714	0.82	820
					PVC/CLAY		876.37	6.38	6.63	868.99	868.74				
37		176,180	0.27261	8	0.015	15						0.09600	3.25365	2.98	2964
							875.24	7.94	8.06	867.30	867.18				
233															

FUTURE SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	GRAVITY SEWER CAPACITY (cfs)	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
BOURBON ROAD INTERCEPTOR															
				PVC			874.30			867.05	867.05				
233		621,651	0.96190	12	0.013	58						0.00224	1.69129	0.73	725
				PVC			873.00			866.92	866.92				
232		624,576	0.96643	12	0.013	175						0.00251	1.79129	0.82	820
				PVC			872.00			866.48	866.48				
SIPHON N.		624,576	0.96643			85							1.25455	0.29	286
				PVC			872.70			866.21	866.21				
SIPHON S.		624,576	0.96643	12	0.013	142						0.00250	1.78620	0.82	815
				PVC			874.10			865.86	865.86				
231		624,576	0.96643	12	0.013	156						0.00250	1.78620	0.82	815
				PVC			875.90			865.47	865.47				
230		624,576	0.96643	12	0.013	394						0.00250	1.78620	0.82	815
				PVC			880.90			864.48	864.48				
229		625,226	0.96743	12	0.013	291						0.00250	1.78620	0.82	814
				PVC			881.00			863.75	863.75				
228		625,876	0.96844	12	0.013	266						0.00250	1.78620	0.82	813
				PVC			878.80			863.09	863.09				
227		625,876	0.96844	12	0.013	289						0.00250	1.78620	0.82	813
				PVC			870.40			862.37	862.37				
226	Hillebrand Dr.	652,526	1.00968	12	0.013	256						0.00250	1.78620	0.78	772
				PVC			871.40			861.73	861.73				
225		652,526	1.00968	12	0.013	48						0.00250	1.78620	0.78	772
				PVC			870.60			861.61	861.61				
276	Continental Dr.	689,836	1.06741	12	0.013	347						0.00250	1.78620	0.72	715
				PVC			870.40			860.74	860.74				
224		689,836	1.06741	12	0.013	270						0.00250	1.78620	0.72	715
				PVC						860.06	860.06				
223		689,836	1.06741	12	0.013	125						0.00250	1.78620	0.72	715
				PVC			872.00			859.75	859.75				
222		689,836	1.06741	12	0.013	357						0.00320	2.02085	0.95	948
				PVC			872.79			858.61	858.61				
221	Ludden Dr.	795,735	1.23127	12	0.013	47						0.00320	2.02085	0.79	785
				PVC			872.50			858.48	858.48				
208		795,735	1.23127	12	0.013	296						0.00320	2.02085	0.79	785
				PVC			870.50			857.51	857.51				
207		795,735	1.23127	12	0.013	170						0.00320	2.02085	0.79	785
				PVC			869.80			856.97	856.97				
206		795,735	1.23127	12	0.013	64						0.01180	3.88061	2.65	2634
				PVC			863.80			856.21	856.21				
205		795,735	1.23127	12	0.013	100						0.00911	3.40935	2.18	2166
				PVC			860.00			855.30	855.30				
SIPHON S.		795,735	1.23127			100							0.87591	–	–
				PVC			860.00			855.12	855.12				
SIPHON N.		795,735	1.23127	12	0.013	298						0.00218	1.66843	0.44	435
				PVC			860.00			854.47	854.47				
204		795,735	1.23127	12	0.013	227						0.00220	1.67661	0.45	443
				PVC			860.00			853.97	853.97				
203		795,735	1.23127	12	0.013	382						0.00220	1.67520	0.44	441
				PVC			860.00			853.13	853.13				
202		795,735	1.23127	12	0.013	200						0.00220	1.67560	0.44	442
				PVC			860.00			852.69	852.69				
201		795,735													

FUTURE SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION	INCREMENTAL AREA DRAINED	RESIDENTIAL DWELLING UNITS IN INCREMENTAL AREA	TOTAL PEAK INCREMENTAL SEWAGE FLOW, using peaking factor of 4 (GPD)	PEAK FLOW REQUIRED FROM EXISTING LOADING TABLE,cfs	EXISTING SEWER DIA-METER, inches	ASSUMED MANNING'S FRICTION FACTOR	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEV-ATION	OUTFLOW INVERT ELEV-ATION	SEWER SLOPE, feet/ foot	GRAVITY SEWER CAPACITY (cfs)	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
MAIN STREET																
						CLAY		876.79	8.75	8.81	868.04	867.98				
36	Jovina St.	9	5,850	0.00905	8	0.015	293						0.0029	0.56560	0.56	553
						CLAY		879.64	12.51	12.52	867.13	867.12				
35	Caesar St.	15	17,600	0.02723	8	0.015	219						0.00315	0.58944	0.56	559
						CLAY		879.03	12.60	12.56	866.43	866.47				
34		4	20,200	0.03126	8	0.015	200						0.0038	0.64733	0.62	613
						CLAY		877.91	12.20	12.13	865.71	865.78				
15			21,955	0.03397	8	0.015	204						0.00304	0.57892	0.54	542
						CLAY		876.16	11.00	11.08	865.16	865.08				
14	Mill St., American Legion Dr.	18	33,655	0.05208	8	0.015	344						0.00256	0.53113	0.48	476
						CLAY		874.04	9.84	9.86	864.20	864.18				
13		3	35,605	0.05509	8	0.015	320						0.00325	0.59865	0.54	540
						CLAY		872.17	9.03	9.00	863.14	863.17				
12		4	38,205	0.05912	8	0.015	322						0.00289	0.56435	0.51	502
						CLAY		869.91	7.87	7.80	862.24	862.11				
11		4	40,805	0.06314	8	0.015	323						0.01096	1.09935	1.04	1030
						CLAY		865.42	6.85	6.89	858.57	858.53				
10		4	43,405	0.06716	8	0.015	324						0.00265	0.54102	0.47	471
						CLAY		866.07	8.40	8.36	857.67	857.71				
9		4	46,005	0.07119	8	0.015	339						0.00316	0.58997	0.52	516
						CLAY		864.90	8.26	8.33	856.64	856.57				
8			46,005	0.07119	8	0.015	335						0.00319	0.59348	0.52	519
						CLAY		863.63	8.13	8.22	855.50	855.41				
7	Park St. West, Lagoon St.	138	251,418	0.38903	10	0.015	171						0.00263	0.97672	0.59	584
						CLAY		862.68	7.72	7.70	854.96	854.98				
6			251,418	0.38903	10	0.015	143						0.00336	1.10310	0.71	710
						CLAY		862.17	7.67	7.79	854.50	854.38				
5	Market St.	4	255,218	0.39491	10	0.015	295						0.00149	0.73532	0.34	338
						CLAY		861.69	7.75	7.75	853.94	853.94				
4			255,218	0.39491	10	0.015	296						0.00247	0.94553	0.55	548
						CLAY		862.58	9.37	9.30	853.21	853.28				
3	Plastic Ingenuity		282,726	0.43747	10	0.015	275						0.00211	0.87440	0.44	434
								863.01	10.31	10.38	852.70	852.63				
2																

FUTURE SANITARY SEWER CAPACITY SUMMARY

MUNICIPALITY: *VILLAGE OF CROSS PLAINS, WISCONSIN*

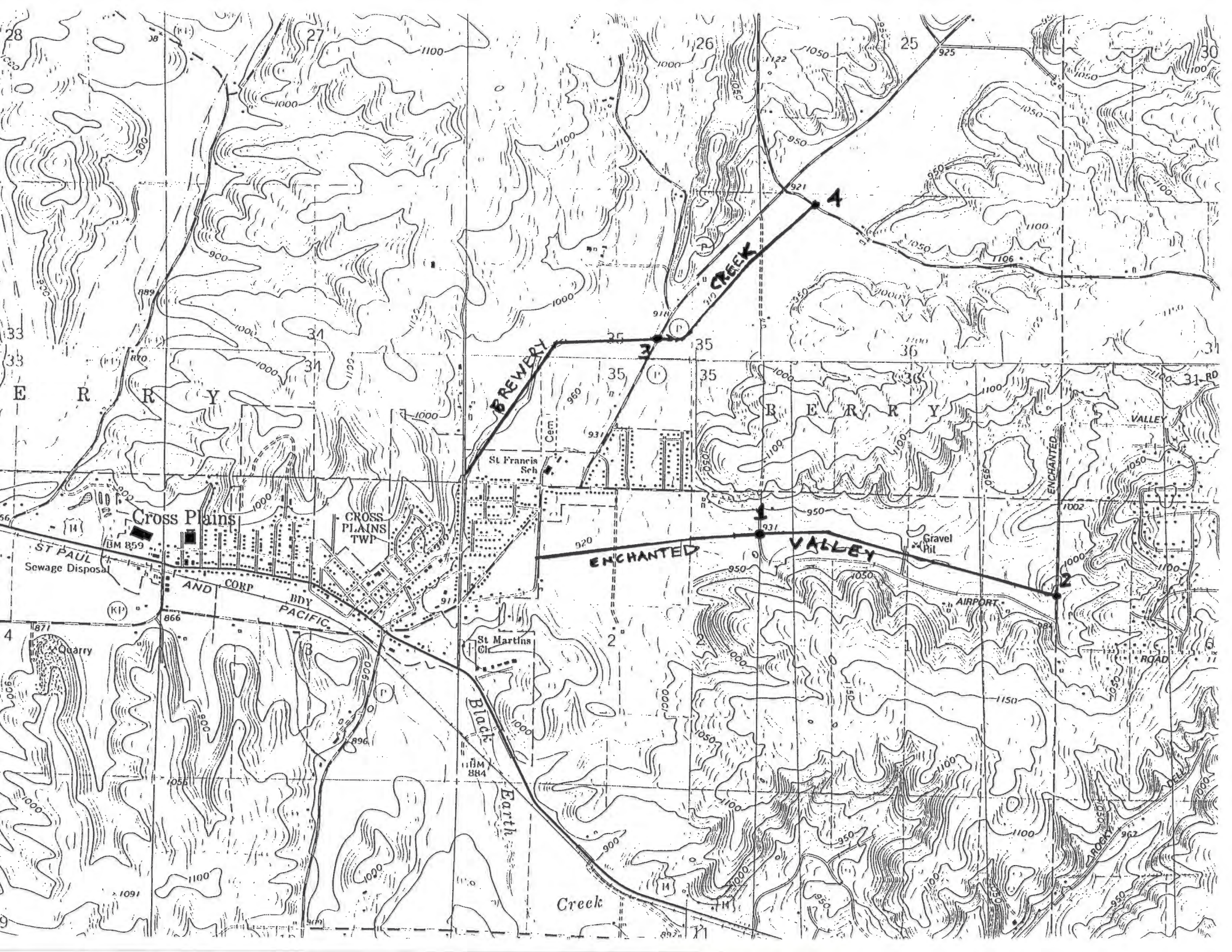
PROJECT: **LONG RANGE SANITARY SEWER SYSTEM PLAN**

MANHOLE LOCATION OR DESIGNATION	INCREMENTAL AREA DRAINED	PEAK FLOW REQUIRED ,cfs	ASSUMED SEWER DIAMETER, inches	ASSUMED MANNING'S FRICTION FACTOR	PIPE CROSS SECTIONAL AREA, SQ. FT.	HYDRAULIC RADIUS	SEGMENT LENGTH (feet)	MANHOLE RIM ELEVATION	DEPTH TO INFLOW INVERT (feet)	DEPTH TO OUTFLOW INVERT (feet)	INFLOW INVERT ELEVATION	OUTFLOW INVERT ELEVATION	SEWER SLOPE, feet/ foot	VELOCITY (fps)	GRAVITY SEWER CAPACITY (cfs)	REMAINING CAPACITY, cfs	SINGLE FAMILY DWELLING UNITS WHICH COULD BE ADDED
FUTURE DEVELOPMENT AREAS		0.60106															
1ST ADD. TO ST. FRANCIS COLLECTION SITE		0.75889															
NEW INTERCEPTOR																	
02	ZIEGLER FARM CULVERT			pvc				907.94	3.81	3.81	904.13	904.03					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
01				pvc				907.94	5.03	5.13	902.91	902.81					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
O	ZIEGLER PROPERTY			pvc				907.94	6.85	6.85	901.09	901.09					
		0.75889	12	0.013	0.78540	0.25000	325						0.00280	2.40685	1.89033	1.13	1125
P				pvc				907.00	6.32	6.41	900.68	900.58					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
O	CTH "B"			pvc				906.61	4.55	4.65	902.46	902.36					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
N				pvc				907.00	6.76	6.86	900.24	900.14					
		0.75889	12	0.013	0.78540	0.25000	250						0.00280	2.40685	1.89033	1.13	1125
M				pvc				907.90	9.56	9.66	897.44	897.34					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
L	(SPLIT FROM BELOW)			pvc				907.00	10.78	10.88	896.22	896.12					
		0.75889	12	0.013	0.78540	0.25000	200						0.00280	2.40685	1.89033	1.13	1125
K				pvc				907.00	11.44	11.54	895.56	895.46					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
J				pvc				907.00	12.66	12.76	894.34	894.24					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
I				pvc				907.00	13.88	13.98	893.12	893.02					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
H				pvc				907.00	15.10	15.20	891.90	891.80					
		0.75889	12	0.013	0.78540	0.25000	320						0.00280	2.40685	1.89033	1.13	1125
G				pvc				907.00	16.10	16.20	890.90	890.80					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
F				pvc				907.00	17.32	17.42	889.68	889.58					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
E				pvc				907.00	18.54	18.64	888.46	888.36					
		0.75889	12	0.013	0.78540	0.25000	350						0.00280	2.40685	1.89033	1.13	1125
D				pvc				907.00	19.62	19.72	887.38	887.28					
		0.75889	12	0.013	0.78540	0.25000	370						0.00280	2.40685	1.89033	1.13	1125
C				pvc				907.00	20.75	20.85	886.25	886.15					
		0.75889	12	0.013	0.78540	0.25000	220						0.00280	2.40685	1.89033	1.13	1125
B				pvc				906.00	19.47	19.47	886.53	886.53					
		0.75889	12	0.013	0.78540	0.25000	400						0.00280	2.40685	1.89033	1.13	1125
A				pvc				906.00	21.79	21.99	884.21	884.01					
		0.77297	12	0.013	0.78540	0.25000	280						0.00280	2.40685	1.89033	1.12	1111
26A	Hillside Trail			pvc				903.90	20.67	20.67	883.23	883.13					
		0.79912	12	0.013	0.78540	0.25000	220						0.00280	2.40685	1.89033	1.09	1085
90	Thomas St.			pvc				902.79	20.28	20.38	882.51	882.41					
		0.82914	12	0.013	0.78540	0.25000	338						0.00280	2.40685	1.89033	1.06	1055
106	Deer Trl.			pvc				902.62	21.16	21.26	881.46	881.36					
		0.83216	12	0.013	0.78540	0.25000	244						0.00280	2.40685	1.89033	1.06	1052
88				pvc				899.07	16.79	16.89	882.28	882.18					
		0.83618	12	0.013	0.78540	0.25000	299						0.00280	2.40685	1.89033	1.05	1048
87				pvc				895.24	15.50	15.60	879.74	879.64					
		0.92730	12	0.013	0.78540	0.25000	346						0.00280	2.40685	1.89033	0.96	958
179	Upper Valley St., Esser Court, Eller Street			pvc				895.90	15.53	15.63	874.48	874.38					
VALLEY STREET		0.92730	12	0.013	0.78540	0.25000	210						0.00280	2.40685	1.89033	0.96	958
83				pvc				885.37	7.94	7.48	877.89	877.89					
		0.92730	12	0.013	0.78540	0.25000	203	M.H. 83 EXISTING INVERT ELEVATION =				877.89	0.00540	3.34246	2.62516	1.70	1688
82				pvc				886.79	8.99	10.19	878.70	878.60					
		0.92931	12	0.013	0.78540	0.25000	380						0.00540	3.34246	2.62516	1.70	1688
81				pvc				884.40	9.90	10.00	874.50	874.40					
		0.99368	12	0.013	0.78540	0.25000	110						0.00540	3.34246	2.62516	1.63	1622
80	Elmwood Circle			pvc				883.83	10.13	10.23	873.70	873.60					
		1.00374	12	0.013	0.78540	0.25000	290						0.00540	3.34246	2.62516	1.62	1612
92	Lewis St.			pvc				881.80	9.76	9.86	872.14	872.04					
		1.01742	12	0.013	0.78540	0.25000	242						0.00540	3.34246	2.62516	1.61	1599
91	Grant St.			pvc				882.80	12.17	12.27	870.73	870.63					
		1.01843	12	0.013	0.78540	0.25000	295						0.00540	3.34246	2.62516	1.61	1598
90				pvc				880.26	11.71	11.81	868.64	868.54					
		1.01843	12	0.013	0.78540	0.25000	273						0.00540	3.34246	2.62516	1.61	1598
87				pvc				878.57	7.91	8.01	867.46	867.36					
		0.78869	12	0.013	0.78540	0.25000	15						0.00540	3.34246	2.62516	1.87	1856
311				pvc				878.24	7.96	8.06	867.28	867.18					

3/19/01

FUTURE65GPCDSUMMARY - SEWERCAP

Approximate Fixed Elevation in 1ST Addition to St. Francis Addition = 909


BREWERY CREEK
ENCHANTED VALLEY
Cross Plains
CROSS PLAINS TWP
ST PAUL AND PACIFIC CORP BDY
Sewage Disposal
Quarry
St Francis Sch
St Martins Ch
Cem
Gravel Pit
AIRPORT
ROAD
Black Earth Creek
BM 859
BM 884
1
2
3
4

EXTENSION OF GRAVITY SEWER SERVICE TO OUTLYING AREAS

NUMBER	LOW POINT LOCATION	LIKELY INTERCEPTOR EXTENSION TO ALLOW CONNECTION TO EXISTING SYSTEM	ELEVATION OF END OF EXISTING INTERCEPTOR	ELEVATION OF CULVERT AT LOW POINT	DISTANCE FROM END OF EXISTING INTERCEPTER TO CULVERT @ LOW POINT, FEET	AVAILABLE SLOPE TO MAKE CONNECTION	GREATER THAN 0.40% MINIMUM ALLOWABLE 8 INCH SEWER SLOPE	GREATER THAN 0.28% MINIMUM ALLOWABLE 10 INCH SEWER SLOPE
1	AIRPORT ROAD @ ENCHANTED VALLEY DRAINAGEWAY CROSSING	ENCHANTED VALLEY INTERCEPTOR	900.02	925.04	4000	0.006255	YES	YES
2	ENCHANTED VALLEY ROAD @ ENCHANTED VALLEY DRAINAGEWAY CROSSING	ENCHANTED VALLEY INTERCEPTOR	900.02	971.64	9400	0.007619149	YES	YES
3	C.T.H. P @ BREWERY CREEK CROSSING	VALLEY STREET/ BREWERY ROAD INTERCEPTOR*	897.15	904.01	4700	0.001459574	NO	NO
4	ENCHANTED VALLEY ROAD @ BREWERY CREEK CROSSING	VALLEY STREET/ BREWERY ROAD INTERCEPTOR*	897.15	906.79	8400	0.001147619	NO	NO

* ELEVATION GIVEN IS AT MANHOLE ON NORTH SIDE OF SIPHON

VI. MAIN STREET INTERCEPTOR DETAILED RECOMMENDATIONS

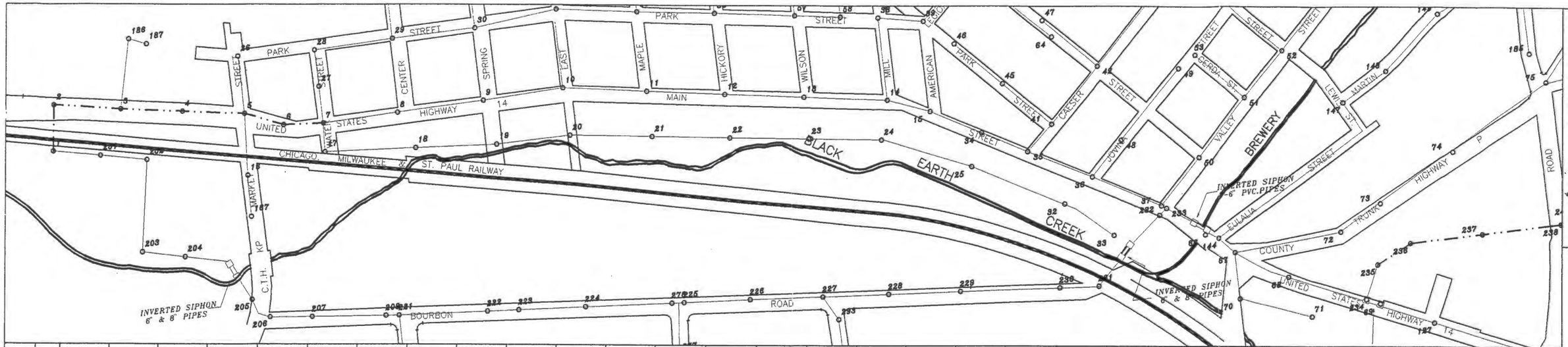
Lagoon Street Sewer

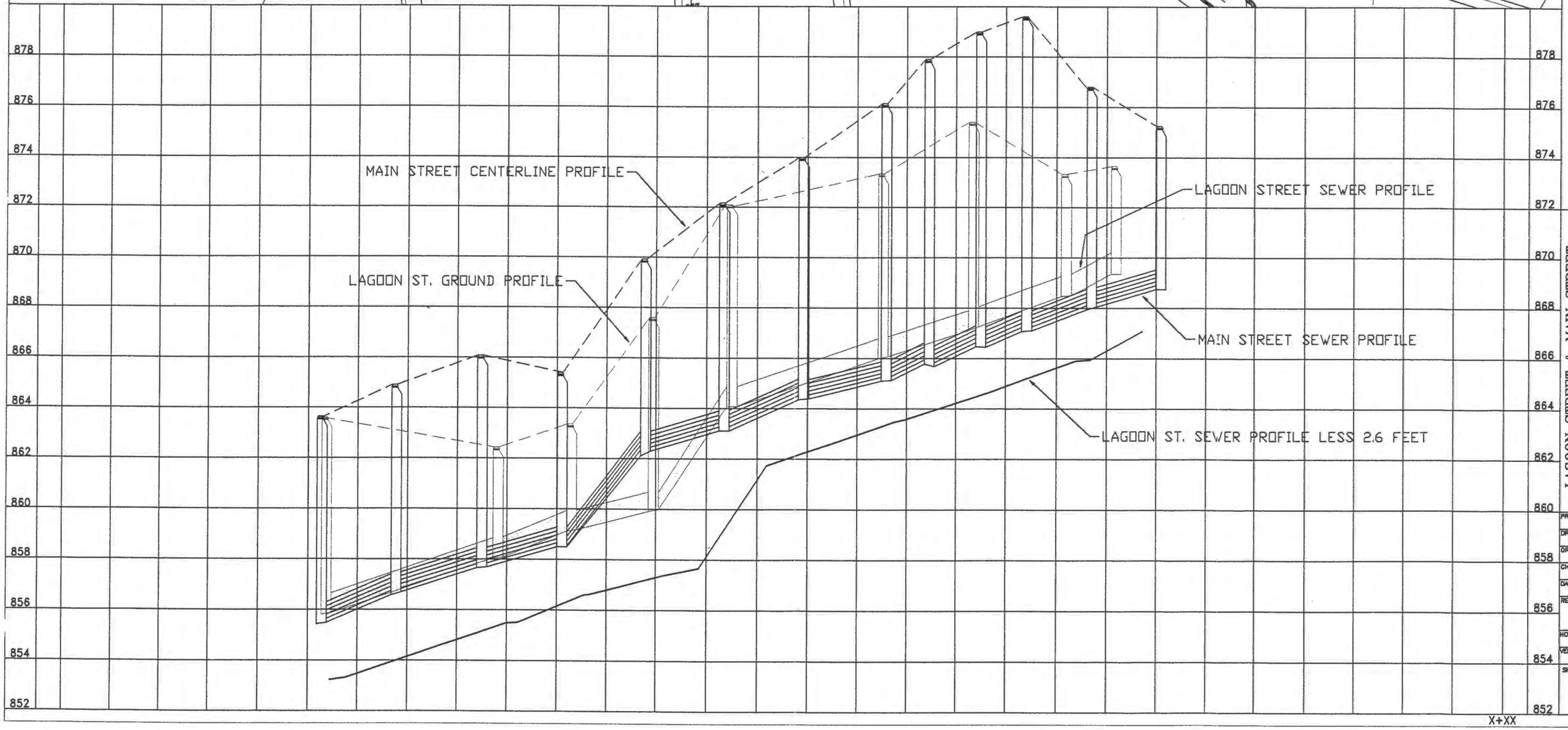
Another mission of this study was to determine how the Lagoon Street sewer could be abandoned, with the flow entering that sewer being assumed by the Main Street Interceptor. (The Lagoon Street sewer is the title used to refer to the sewer which runs parallel to Main Street and which receives the sewage discharges from the buildings on the south side of Main Street. There is no actual street titled "Lagoon Street". This is just the common term used for the access drive on the north bank of Black Earth Creek which services the back side of several commercial buildings located there.) The Lagoon Street sewer is old, is believed to be subject to excessive infiltration, and runs beneath several buildings as it proceeds west from the Valley Street intersection area to Water Street, at which point it turns north and empties into the Main Street Interceptor.

Field surveying measurements were also taken of the existing Lagoon Street sewer to determine how much lower the Main Street Interceptor must be constructed to allow the buildings along the south frontage of Main Street to be directly connected. The drawing on the following page shows the profiles of the existing Lagoon Street sewer and the existing Main Street Interceptor. Another line is shown on this drawing which is 2.6 feet lower than the Lagoon Street sewer. This 2.6 feet is an allowance for 250 feet of building lateral pipe at 1/8 inch per foot slope which may be necessary to connect the building drains at the south side of the buildings and bring those building drains around the side of the buildings and to Main Street. (A more detailed analysis which would involve field surveying measurements of basement elevations and calculation of exact connection distances for each building is beyond the scope of this study.) From a comparison of these profile lines it is apparent that the Main Street interceptor must be lowered by as much as five feet in order to abandon the Lagoon Street sewer. This would result in this interceptor being as deep as 16 feet from the ground surface on Main Street. This is not an unreasonable depth. Therefore, it is recommended that when the Main Street sewer is reconstructed in be built deep enough to accept the sewage now being discharged into the Lagoon Street sewer, and that the Lagoon Street sewer be abandoned.

Brewery Creek Interceptor Detailed Recommendations

The siphon at the north end of Brewery Road, where that road crosses Brewery Creek was analyzed during this study. This siphon is not shown on the loading or capacity tables, which begin at the next manhole downstream. However, calculations were completed on the capacity of this siphon. Only a few homes discharge to this siphon at the present time. It has a required peak flow capacity of 0.01308 cubic feet per second. The calculated capacity is 0.3379 cubic feet per second, providing capacity for an additional 323 dwelling units.





TOWN & COUNTRY ENGINEERING, INC.
5225 VERONA ROAD, BUILDING NO. 4
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PH: (608) 273-3350
FAX: (608) 273-3391

PLAN & PROFILE
LAGOON STREET SANITARY SEWER
MH 33 TO MH 7

LAGOON STREET & MAIN STREET
SANITARY SEWER PROFILES

Village of Cross Plains, Wisconsin

PROJECT NO.:	CP 86 13
DRAWING FILE:	CPPROF.DWG
DRAWN BY:	JLJ
CHECKED BY:	WDM
DATE:	02/16/98
REVISIONS:	
HORIZONTAL SCALE:	1" = 400'
VERTICAL SCALE:	1" = 4'
SHEET	1 OF 1