

# Stormwater Management Plan

## Appendix A

### Water Quality Modeling

City of Stoughton

Revisions to meet DNR revised standards and  
the City's plan to meet the 40% TSS reduction requirement

*Prepared For:*  
City of Stoughton  
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Stoughton, WI 53589

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*January 2010*  
*October 2010*  
*Updated December 2010*

## APPENDIX A

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### SECTIONS

- A1. BMP Preliminary Drawings
- A2. BMP Cost Estimate

## APPENDIX A WATER QUALITY MODELING

### 1.0 Introduction

#### A. General

This report evaluates stormwater discharges from the City of Stoughton against the requirements of Chapters 151 and 216 of the Wisconsin Administrative Code. These chapters of the Code establish the permitting requirements and treatment standards enforced by the Wisconsin Department of Natural Resources for municipalities requiring a Stormwater (MS4) Permit. The WDNR rules are staggered to require a 20% reduction in total suspended solids (TSS) discharged in stormwater runoff by March 10, 2008 and a 40% reduction in TSS discharged by March 10, 2013. Compliance with the MS4 permit is determined by comparing the TSS discharged from the municipality without any Best Management Practices (BMP's) against the BMP's maintained by the City.

#### B. Watershed Modeling

WinSLAMM 9.0 (SLAMM) was used to create a watershed model for the City in order to evaluate the TSS loading discharged by the City's storm sewer system. This model was presented in the Stoughton 2006 Stormwater Master Plan. WinSLAMM 9.3 was released in late 2009 and used to re-evaluate the City's stormwater discharges in January of 2010. The DNR reviewed the January 2010 analysis and provided comments and additional revisions to the SLAMM modeling. Some of the comments from the DNR include:

- Combine the SLAMM files for each device (street sweeping, grass swale, or stormwater facility).
- Take credit for one device per SLAMM file. Using more than one device results in double crediting the area and is not a true representation. At this time SLAMM does not take into account treatment in series and that is why this is required.
- Use ½ of the DNR's design infiltration rate for grass swales (0.065in/hr for silt loam soils). The DNR's design rates can be found in technical standard "Site Evaluation for Stormwater Infiltration (1002)", Table 2: Design Infiltration Rates for Soil Textures Receiving Stormwater.
- The upgrade to WinSLAMM 9.3 skewed the modeling of dry detention basins. These devices had to be revised to be modeled accurately.

WinSLAMM 9.4.0 was released in 2010 and the City's watershed model has been updated again in September 2010 to work with the most recent SLAMM model and to comply with the January 2010 comments received from the DNR.

Modeling the City's watersheds using SLAMM modeling requires all lands within the watershed to be assigned a land usage. Land usage data was determined from aerial photography, aerial topography, NRCS's Soil Survey of Dane County, zoning maps, record drawings, site visits and engineering plans. Standard Land Use (SLU) files (available from the USGS) were used to model TSS runoff for the varying land uses. The following SLU files were used to aid in evaluating the City of Stoughton watershed model. All the SLAMM SLU files were obtained from the USGS and Vierbicher calculated the Land Use areas.



**Tale 1 - Stoughton Land Usages for the 2010 SLAMM Watershed Model**

<b>Standard Land Use</b>	<b>Acres</b>	<b>Percentage %</b>
Cemetery (CEMM)	10.3	0.45
Institutional (INST)	21.6	0.93
School (SCH)	161.1	6.97
Medium Density Res. (MDRNA)	1117.8	48.38
High Density Residential (HDRNA)	80.1	3.47
Multi-Family Residential (MFRNA)	175.1	7.58
Duplex (DUP)	74.7	3.23
Strip Commercial (STCOMM)	30.7	1.33
Commercial Downtown (CDT)	62.7	2.71
Commercial (COMM)	123.4	5.34
Hospital (HOSP)	5.3	0.23
Light Industrial (LI)	27.4	1.19
Heavy Industrial (HI)	271.8	11.76
Office Park (OFPK)	0.6	0.03
Park (PARK)	112.1	4.85
Undeveloped (<5 Acres) (OSUD)	36.1	1.56

As required by the Administrative Code, lands zoned and used for agricultural purposes are not included in the SLAMM models. Further, undeveloped land over 5 acres and internally drained areas with natural infiltration are not included in the modeling. Developments that were issued an NOI after October 1, 2004 have already met NR216 requirements and therefore are not included.

Precipitation events were simulated using the Madison 1981 5-year rain table assuming a winter season beginning December 2<sup>nd</sup> and ending March 12<sup>th</sup>. The NURP soil particle size distribution was used as required by the DNR.

## **B. Best Management Practices**

The DNR defines "Best Management Practices (BMP)" as "structural or nonstructural measures, practices, techniques, or devices employed to avoid or minimize soil, sediment, or pollutants carried in runoff to waters of the state". A BMP may include any program, technology, process, siting criteria, operational method, measure, or device that controls, prevents, removes, or reduces pollution. BMP's can consist of structural or nonstructural measures. Nonstructural measures may include public information and education to reduce public impacts on nonpoint source pollution and "source controls," such as street sweeping and leaf collection. Structural BMPs may include construction of detention basins, infiltration basins, vegetated swales, and similar measures.

An effective stormwater management program will include a mixture of structural and nonstructural BMPs as well as effective source controls to reduce nonpoint source runoff to receiving waterways.

## **2.0 "No Controls" Analysis**

"No Control" conditions are estimated by evaluating the watershed without considering the installation of any BMPs. As part of this analysis, the drainage system is assumed to contain full curb and gutter street sections in fair condition even if the existing drainage system is a swale. WinSLAMM 9.0 was used to model the City's outfall watersheds with no controls in 2006. The no controls model has been updated with WinSLAMM 9.4 and includes DNR comments as discussed in section 1.0.

Watershed annual loadings of TSS and phosphorus levels in Stoughton have been





estimated using the SLAMM models. Currently there are no regulatory requirements for phosphorus discharged by municipal storm water drainage systems. The DNR has requested that the phosphorous levels be reported as part of the annual MS4 permitting process. The DNR is in the process of developing a Total Maximum Daily Load (TMDL) for the Upper and Lower Rock River Basins in south-central Wisconsin. The TMDL will focus only on the water bodies that are impaired by excessive sediment and phosphorus. The TMDL will provide a quantitative analysis of the amount of sediment and/or phosphorus that the water bodies can receive from both point and nonpoint sources and still meet water quality standards. If the DNR were to require the Yahara River to be considered part of the TMDL for the Rock River Basins, the City of Stoughton would then have to meet additional TSS and phosphorous removal requirements. The DNR had anticipated implementing the TMDL requirements by the beginning of 2011; however this action has been delayed. See Table 2 for a summary of the SLAMM modeling of the Stoughton watershed with no controls, and Section A1 for detailed modeling data.

Table 2 – SLAMM Modeling Results with “No Controls “

<b>Watershed</b>	<b>TSS (lbs)</b>	<b>Phosphorus(lbs)</b>	<b>Area (ac.)</b>
West	373,217	1,264	301
Central	1,919,364	6,062	1,250
North	174,660	606	124
East	1,259,518	3,069	635
<b>Total</b>	<b>3,693,260</b>	<b>11,000</b>	<b>2,311</b>

### 3.0 Existing Conditions Analysis

WinSLAMM 9.4 was used to model the City watersheds with existing controls in 2006. The existing conditions model has been updated with version 9.4. BMPs evaluated in this model include street sweeping, wet detention basins, bio-filtration and vegetated swales. Following is a brief description of the existing BMPs.

#### A. Street Sweeping

The public works department has an aggressive street sweeping policy for the City of Stoughton. The city is swept once a week. This information was incorporated into the WinSLAMM models.

#### B. Wet Detention Basins

The City has several wet detention basin located throughout Stoughton.

#### C. Biofiltration (SLAMM Definition)

There are several dry detention and infiltration basins scattered throughout the city. Many of the dry detention basins have outlets which allow settlement and infiltration. None are located near the Yahara River.

#### D. Vegetated Swales

There are several outfall watersheds which convey runoff by vegetated swales. The swales vary from well maintained grass to woody vegetation with under growth.

See Table 3 for summary of the SLAMM modeling for Stoughton with existing controls, and Section A1 for detailed modeling data.



Table3 – SLAMM Results with Existing Controls

<b>Watershed</b>	<b>TSS (lbs)</b>	<b>Phosphorus(lbs)</b>	<b>Area (ac.)</b>
West	253,632	1,048	301
Central	1,318,100	4,681	1,250
North	104,754	438	124
East	804,878	2,525	635
<b>Total</b>	<b>2,481,364</b>	<b>8,691</b>	<b>2,311</b>

#### 4.0 Water Quality Modeling Summary

WinSLAMM modeling shows that the existing controls reduce the TSS in runoff appreciably. The reduction in TSS with existing controls is 33.4%. The model that was completed in 2006 had a 31.2% reduction in TSS. This increase in TSS reduction is due to DNR requirements that have been put in place since 2006 and changes within the newer version of WinSLAMM that increased the amount of TSS removal estimated for street sweeping. See Tables 4 and 5 for a comparison of the WinSLAMM modeling for Stoughton with “No Controls: and Existing Controls.

Table 4 – SLAMM TSS Summary

<b>Watershed</b>	<b>No Controls TSS (lbs.)</b>	<b>Exist Controls TSS (lbs.)</b>	<b>TSS Reduction</b>
West	373,217	253,632	32.0%
Central	1,919,364	1,318,100	31.3%
North	174,660	104,754	40.0%
East	1,259,518	804,878	36.1%
<b>Total</b>	<b>3,693,260</b>	<b>2,481,364</b>	<b>33.4%</b>

Table 5 – SLAMM Phosphorus Summary

<b>Watershed</b>	<b>No Controls Phosphorus (lbs.)</b>	<b>Exist Controls Phosphorus (lbs.)</b>
West	1,264	1,048
Central	6,062	4,681
North	606	438
East	3,069	2,525
<b>Total</b>	<b>11,000</b>	<b>8,691</b>

The watershed model shows that the City meets the March 10, 2008 deadline for a 20% reduction in TSS with the existing controls. However, there will need to be additional BMPs in place to meet the 40% TSS reduction required by March 10, 2013. Evaluations of additional BMPs that can be installed to meet this deadline are covered in the following section.

#### 5.0 Proposed Improvements

In order for the City to comply with the 40% reduction in TSS by March 10, 2013 additional BMP improvements will need to be implemented. The City is required to submit a plan to the DNR by March 10, 2011 stating how they will achieve the mandated 40% TSS reduction. This section presents ten (10) potential improvements that have been modeled in SLAMM. The location of these proposed BMP's are shown on Exhibit 1. The conclusion to this report presents our recommendations for installing BMP's needed to meet the 40% requirement.

The following should be noted:

- BMPs 1 through 4a were initially presented in the 2006 report and are included here.



- We recommend BMP 2 be revised to function as a wet detention basin due to the amount of stormwater directed to this area.
- BMP's #4b, 5 and 8 were constructed in the 2010 construction season.

**BMP 1** is on the west side of the City, north of Buckingham Road in Virgin Lake Park. This improvement entails installing a treated lumber weir to an existing concrete stormwater control structure (Exhibit 2). This will reduce the peak runoff rate from the facility and allow runoff to slow and deposit sediment in an existing detention area.

In addition to the improvements to the storm water management structure described above, there will be enhancements made to the area upstream and downstream of the structure.

**BMP 2a** is in the center of the City at Bjoin Park. The design has a 5' deep wet detention area and a small treated lumber weir that would be constructed across an existing box culvert. The channel to the north of the detention area would be forced to back up runoff into the proposed detention area where sediment will be deposited (Exhibit 3a). This project would also address drainage issues adjacent to the park at Grant Street and Harding Street. Approximately 1.1 acres of the park would be utilized for this detention area and would require clearing and grubbing a significant number of trees in the park.

**BMP2b** is similar to BMP2a except that it is scaled back in size to avoid the trees in Bjoin Park. (Exhibit 3b). Approximately 0.6 acres of the park would be utilized for this detention area. This design would reduce the number of trees that are removed from the park.

**BMP 3** is on the northern side of the City in a privately owned field. The proposed design uses a bioretention facility for sediment removal (Exhibit 4). This area has been proposed for development in the near future by private parties.

**BMP 4b** is on the eastern side of the City within a publicly owned lot on Franklin Street. The design has a wet detention facility for sediment to be deposited (Exhibit 6). This will allow runoff to slow and deposit sediment in the new detention area. Approximately 1 acre will be used for the detention facility. *This BMP was constructed in the summer of 2010.*

**BMP 5** is on the southeastern side of the City on a publicly owned lot on East Street. The design has a bioretention facility for sediment to be deposited (Exhibit 7). This will allow runoff to slow and deposit sediment in the new detention area. *This BMP was constructed in the summer of 2010.*

**BMP 6** is in the center of the City on Lincoln Avenue School property. The design has a wet detention facility for sediment to be deposited (Exhibit 8). This will allow runoff to pond and deposit sediment in the new detention area. *A modified design was selected at this BMP location that resulted in no increase TSS removal.*

**BMP 7** is on the southwest side of the City in a public outlot near Hamilton Street. Currently the area is a dry detention area. The design would involve adding a wet detention area. This will allow runoff to pond and deposit sediment before moving on downstream (Exhibit 9). Approximately 0.9 acres of the outlot will be used for the detention facility.

**BMP 8** is on the west side of the City (Paradise Pond). Currently the area is a "wet" detention area. This will allow sediment to drop out and slow down runoff. *Construction was completed in the summer of 2010.*

**Infiltration Testing** is another option for the City. Currently the DNR requires grassed swales and infiltration areas to be modeled with ½ of the DNR's design infiltration rates (0.065 in/hr for silt loam which was assumed in SLAMM based on countywide soils maps).



Initial testing has been completed and follow up testing will be completed in the spring of 2011.

## 6.0 Opinion of Cost's For Improvements

A comparison of opinion of costs and TSS reduction for the entire City was done for each of the BMPs. See Table 6 for a summary.

Table 6: BMP Opinion of Cost from January 2010 Report

BMP Name	Location	No-Controls Particulate Solids Yield (tons)	Controls Particulate Solids Yield (tons)	% TSS Removal <sup>1</sup>	% TSS Removal Increase	Cost Estimate <sup>2</sup>	Cost per % Removal
Infiltration Testing	Grass Swales	322.54	212.66	34.07%	4.46%	\$6,000	\$1,345
BMP 1	Virgin Lake	322.54	223.29	30.77%	1.17%	\$142,000	\$121,594
BMP 2	Bjoin Park	322.54	208.10	35.48%	5.88%	\$450,000	\$76,530
BMP 3	Private Property	322.54	225.22	30.17%	0.57%	\$87,500	\$153,901
BMP 4b	Public Lot (Franklin)	322.54	217.89	32.45%	2.84%	\$192,000	\$67,595
BMP 5	Public Lot (East St.)	322.54	225.34	30.14%	0.53%	\$135,000	\$253,735
BMP 6	Lincoln Ave. School	322.54	220.59	31.61%	2.01%	\$240,000	\$119,692
BMP 7a	Hamilton Street	322.54	222.23	31.10%	1.49%	\$161,500	\$108,094
BMP 8	Paradise Pond	322.54	220.26	31.71%	2.10%	\$0	\$0

<sup>1</sup> % TSS Removal is the increase from the base removal of 29.6%

<sup>2</sup> Does not include cost of property which may be necessary for some BMPs

\*\*Note that Paradise Pond was budgeted in 2009's budget

## 7.0 Improvement Evaluation

Since January 2010 the City of Stoughton has completed and/or started four of the BMP projects. The four projects are infiltration testing (BMP 1), construction of a wet detention pond at Franklin Street (BMP 4b), a bio-retention at East Street (BMP 5), and improvements to Paradise Pond (BMP8).

The infiltration testing has produced unfavorable results initially but will be reevaluated in the spring of 2011. The wet detention pond at Franklin was modified after discovering during the project design phase that sanitary sewer and 3-phase electrical lines run through the site. The bio-retention basin on East Street also was modified to reduce the amount of engineered soil and increase storage volume.

WinSLAMM 9.4.0 was after the January 2010 report. One of the major differences in the newest WinSLAMM version is that more credit is given for aggressive street sweeping. This pairs well with the added emphasis the City has placed on this activity. The revised modeling indicates that this will boost the overall sediment reduction credit in the City's base existing model from 29.6% to 33.42%.



The City constructed three BMPs in 2010. We have revised the modeling for the installed improvements and further reviewed the City's overall modeling and BMP cost effectiveness. The City currently is reducing TSS from the baseline condition by 37.53%. See Table 7 for a summary.

Table 7: September 2010 BMP Opinion of Cost

BMP Name	Location	No-Controls Particulate Solids Yield (tons)	Controls Particulate Solids Yield (tons)	% TSS Removal for BMP	% TSS Removal Increase <sup>4</sup>	Cost Estimate <sup>5</sup>	Cost per % Removal
Infiltration Testing <sup>3</sup>	Grass Swales	372.7					
BMP 1	Virgin Lake	372.7	244	34.59%	1.17%	\$142,000	\$121,594
BMP 2a	Bjoin Park	372.7	239	35.83%	2.41%	\$387,000 <sup>1</sup>	\$160,183
BMP 2b	Bjoin Park	372.7	245	34.39%	0.97%	\$216,000 <sup>1</sup>	\$221,556
BMP 3	Private Property	372.7	246	33.89%	0.47%	\$87,500	\$153,901
BMP 4a	Public Lot (Franklin)	372.7	248	33.64%	0.22%	\$79,034 <sup>1</sup>	\$359,245
BMP 5	Public Lot (East St.)	372.7	241	35.46%	2.04%	\$86,222 <sup>1</sup>	\$42,266
BMP 6	Lincoln Ave. School	372.7	224	39.86%	6.45%	\$240,000	\$119,692
BMP 7a	Hamilton Street	372.7	243	34.86%	1.45%	\$195,200 <sup>1</sup>	\$111,714
BMP 8	Paradise Pond	372.7	241	35.27%	1.85%	\$0 <sup>2</sup>	\$0
BMP 9	Elven Sted	372.7	247	33.63%	0.22%	n/a	n/a
<b>TOTAL 2010 Projects</b>	<b>City Wide</b>	<b>372.7</b>	<b>233</b>	<b>37.53%</b>	<b>4.12%</b>	<b>\$165,256</b>	<b>\$38,254</b>

<sup>1</sup>Cost Estimate is actual construction bids that were received in August 2010.

<sup>2</sup>Paradise Pond was budgeted in 2009's budget.

<sup>3</sup>Partial infiltration testing has been completed. The results have not been favorable but will be re-evaluated in the spring of 2011.

<sup>4</sup>% TSS Removal is the increase from the base removal of 33.42%

<sup>5</sup>The BMPs will need to be maintained as sediment will accumulate over time. Maintenance costs have not been included in the cost opinion. Also, not included in the opinion of cost are any permitting fees that may be required or the potential cost of property easements or acquisitions.

## 8.0 Conclusion

With the construction of the three BMPs in the summer of 2010 the City has an overall TSS removal of 37.53%. In order to meet the required 40% TSS removal by March 2013 the City will need to install additional BMPs. The Elven Sted Project is moving forward and will be constructed in 2011. While helpful, this project alone will not allow the City to meet the 40% requirement.

The table below presents two options that will allow the City to meet the TSS reduction



requirement. The anticipated TSS reduction, estimated project cost and cost per percent of TSS removed are shown.

Table 8: Proposed 2011 BMP Opinion of Costs

BMP Name	Location	No-Controls Particulate Solids Yield (tons)	Controls Particulate Solids Yield (tons)	% TSS Removal for BMP	% TSS Removal Increase <sup>2</sup>	Cost Estimate	Cost per % Removal
BMP 2a	Bjoin Park	372.7	239	35.83%	2.42%	\$387,000 <sup>1</sup>	\$160,183
BMP 9	Elven Sted	372.7	247	33.63%	0.22%	n/a	n/a
2011 Projects	BMP 2a and 9	372.7	223	40.17%	2.64%	\$387,000	\$146,590
BMP 2b	Bjoin Park	372.7	245	34.39%	0.97%	\$216,000 <sup>1</sup>	\$221,556
BMP 7a	Hamilton Street <sup>3</sup>	372.7	243	34.86%	1.45%	\$195,200 <sup>1</sup>	\$108,094
BMP 9	Elven Sted	372.7	247	33.63%	0.22%	n/a	n/a
2011 Projects	BMP 2b, 7a and 9	372.7	223	40.17%	2.64%	\$411,200	\$155,757

<sup>1</sup>Cost Estimate is based off of actual construction bids that were received in August 2010.

<sup>2</sup>%TSS Increase from 2010 baseline of 37.53%

<sup>3</sup>This project may be completed in 2012

**Option “A”** (shown in green) includes BMPs at Bjoin Park and the Elven Sted project. These projects would both be completed in 2011. The City would only undertake the improvements at Bjoin Park (Elven Sted would be completed by the developer). The BMP at Bjoin Park (presented graphically in Exhibit 3A) would require approximately 1.1 acres of Bjoin Park to be used for stormwater management.

Option A would require removing a significant amount of woodland on north side of the park. In addition, the existence and extent of wetlands and groundwater elevations are not known and could impact the final design. Revisions to the design required by wetland or groundwater limitations could negatively impact the amount TSS removed and lower the attractiveness of the project. However, if these issues can be eliminated or overcome, option A could be more cost effective and efficient because the City would only have to construct one project.

**Option “B”**, (shown in blue) includes BMPs at Bjoin Park, Elven Sted and a project on Hamilton Street. The BMP in Bjoin Park (shown graphically in Exhibit 3B) would require approximately 0.6 acres of the Park to be used for stormwater management and would reduce the number of trees removed from the park. The smaller basin footprint would reduce the likelihood of wetland and groundwater elevation issues impacting the final design. However, this would also require constructing the Hamilton Street BMP in 2011 or 2012 to meet the 40% TSS reduction requirement. Although it is slightly more costly and involves two City projects, reducing the number of trees removed may be better received by the public as a whole.

We recommend the City move forward with option B and budget for stormwater management improvements in 2011 and 2012. In our opinion the reduced risk of



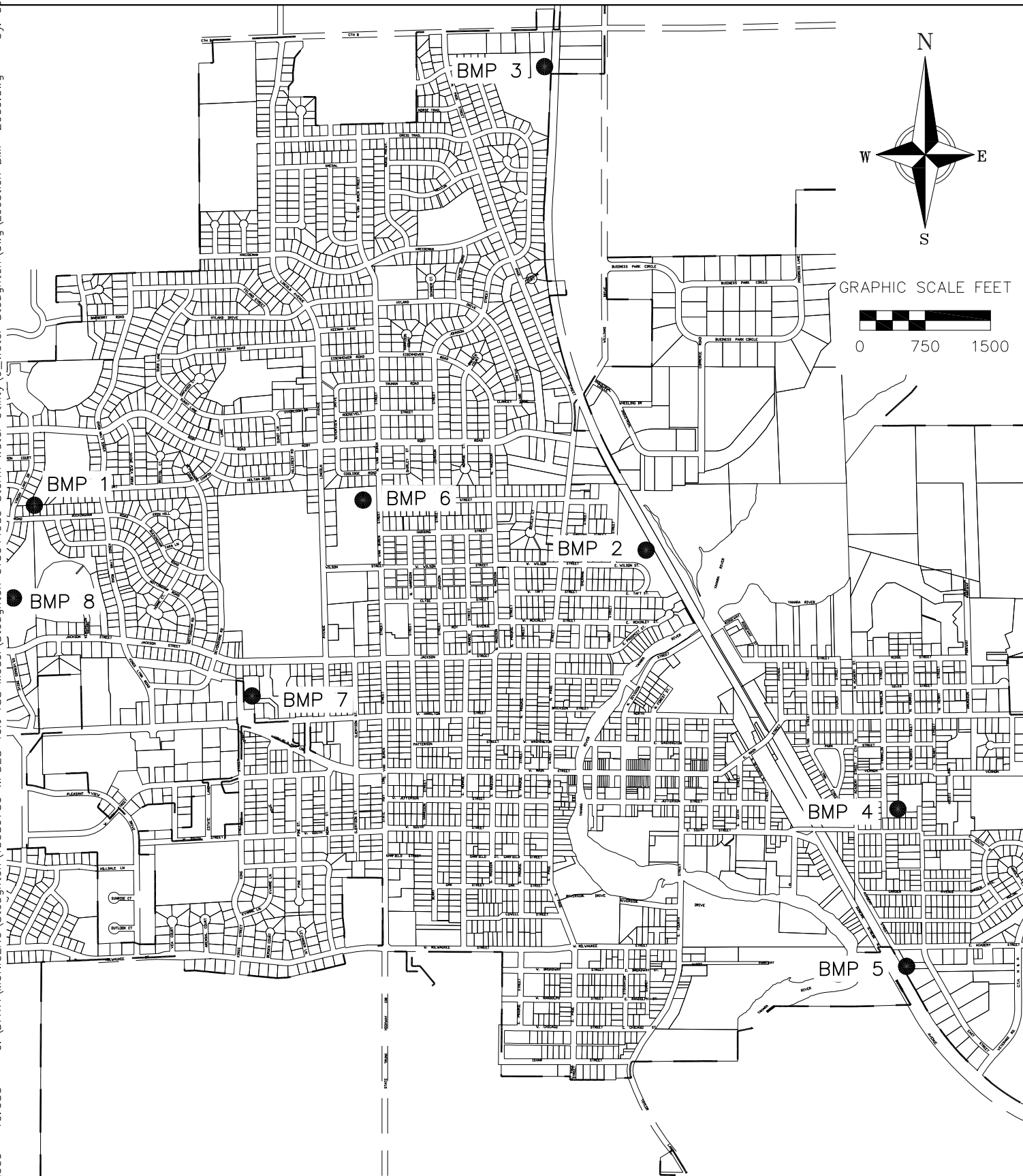
regulatory and construction issues and a more favorable public presentation outweighs the potential cost savings presented in option A. This approach also allows the City to continue pursuing favorable infiltration testing and potentially eliminate the Hamilton Street project altogether.

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08 Oct 2009 - 10:08a G:\DATA\MUNICIPAL\Stoughton\13086780 WPDES 40% TSS Model\Stoughton 013044989 Storm Water Utility\6\_Water Stoughton\dwg\Location BMP-2009.dwg by: schu



LOCATION MAP FOR PROPOSED BMPs

**vierbicher**  
planners | engineers | advisors



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REVISIONS

10/01/2009

JOB NO.

013044989

SCALE

AS SHOWN

CHECKED

DRAFTER

SRC/SVC

FILE

DATE

5/18/06

SHEET

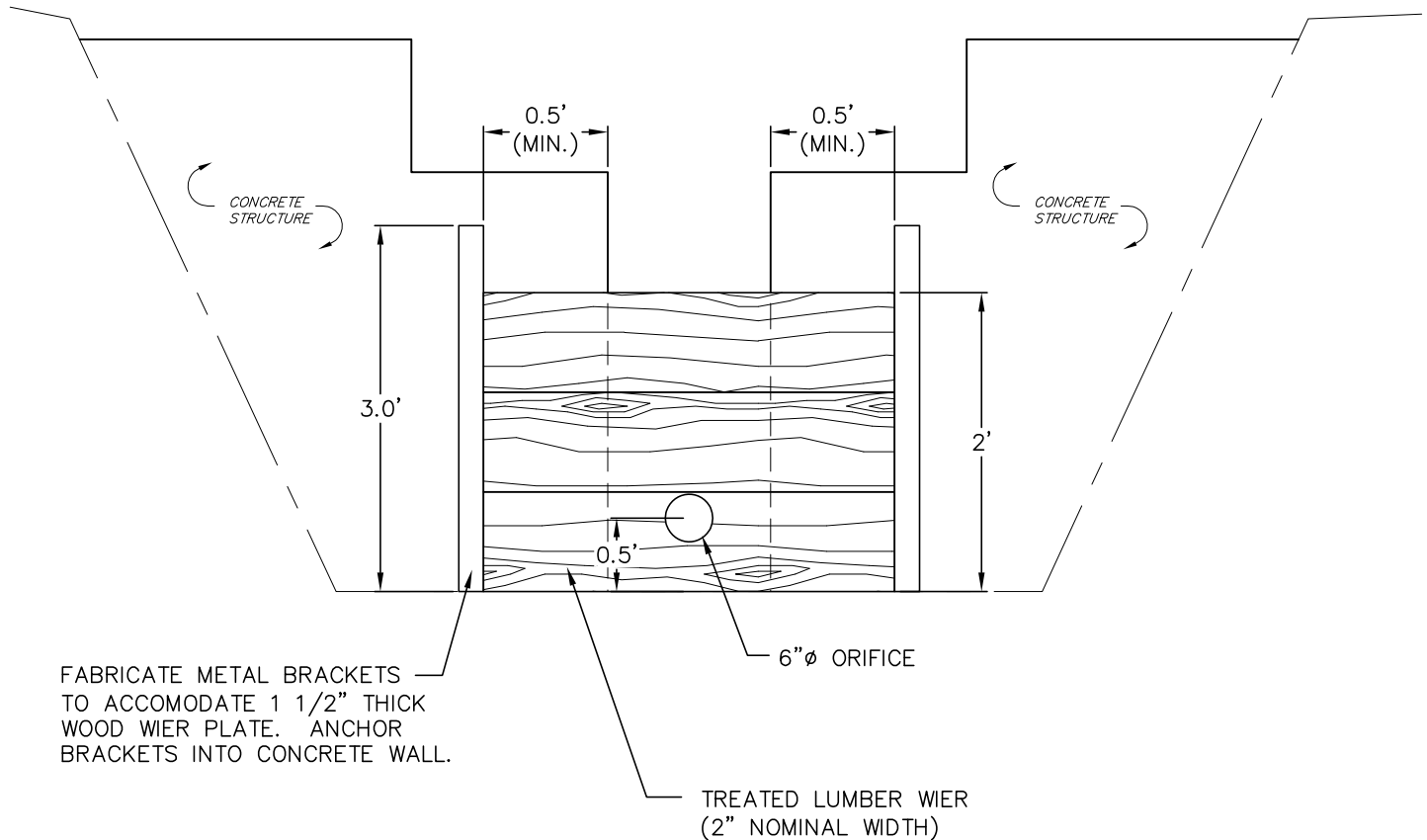
EXHIBIT 1



08 Oct 2009 — 9:43a G:\DATA\MUNICIPAL\Stoughton\13086780 WPDES 40% TSS Model\Stoughton\6\_Water Stoughton\dwg\Rough Detail BMP 1.dwg by: schu

VIRGIN LAKE PARK'S  
STORMWATER CONTROL STRUCTURE MODIFICATION  
BMP #1 (AREA WW-01)  
(NOT TO SCALE)

FRONT VIEW



NOTE:

1. STRUCTURE LOCATED NORTH OF BUCKINGHAM ROAD, ON THE WEST SIDE OF THE VIRGIN LAKE TRAIL.

**vierbicher**  
planners | engineers | advisors



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REVISIONS	SCALE	AS SHOWN	SHEET
10/01/2009	CHECKED		EXHIBIT 2
	DRAFTER	SRC/SVC	
	FILE		
JOB NO. 013044989	DATE	5/18/06	



EXHIBIT 3A





EXHIBIT 3B



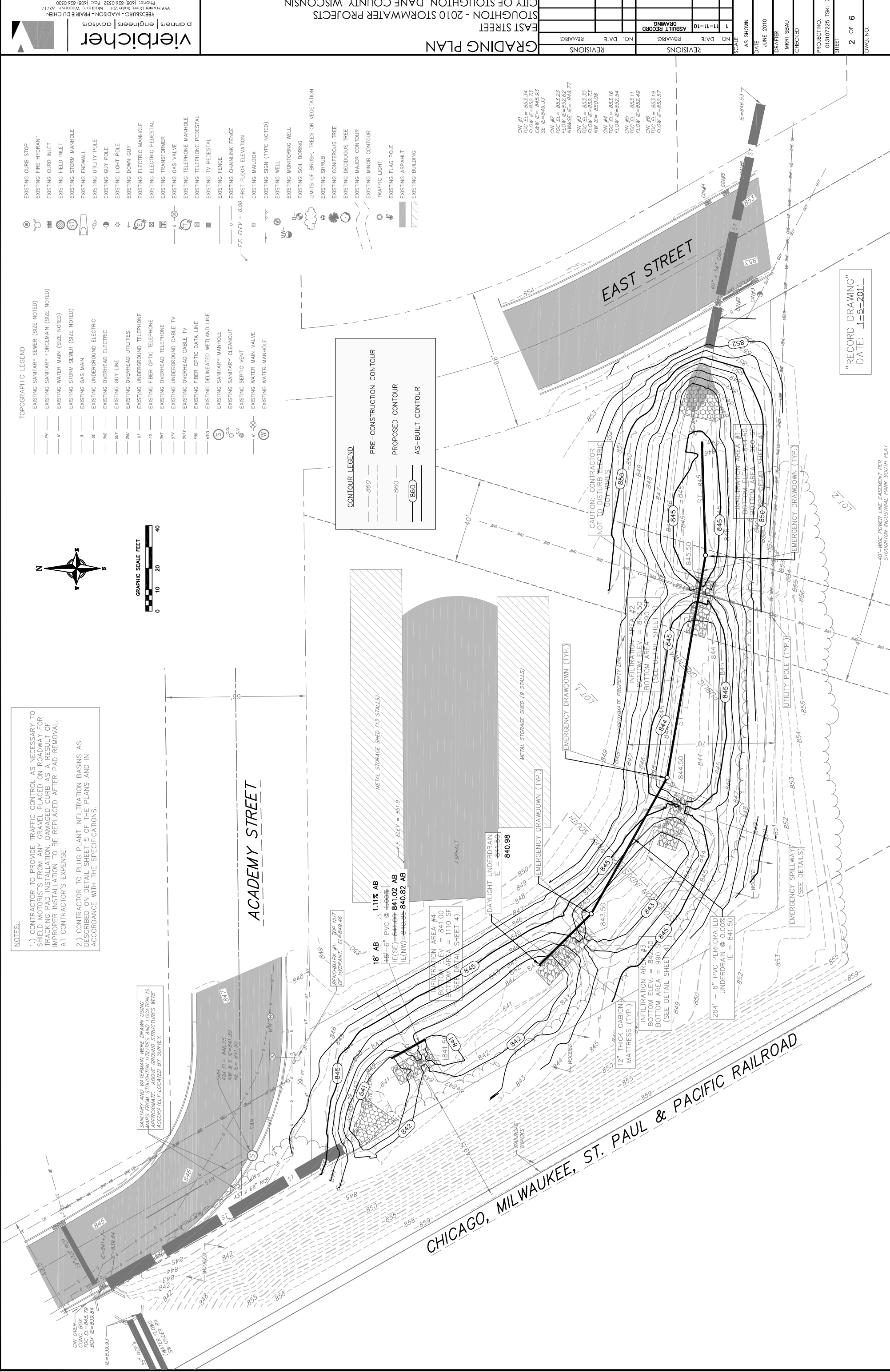


- 1.) CONTRACTOR TO PROVIDE TRAFFIC CONTROL AS NECESSARY TO SHIELD MOTORISTS FROM ANY GRAVEL PLACED ON ROADWAY FOR TRACKING PAD INSTALLATION. DAMAGED CURB AS A RESULT OF IMPROPER INSTALLATION TO BE REPLACED AFTER PAD REMOVAL, AT CONTRACTOR'S EXPENSE.
- 2.) CONTRACTOR TO PLUG PLANT INFILTRATION BASINS AS DESCRIBED ON DETAIL SHEET 5 OF THE PLANS AND IN

SANITARY AND WATERMAIN WERE DRAWN USING MAPS FROM STOUGHTON UTILITIES AND LOCATION IS APPROXIMATE. ABOVE GROUND STRUCTURES WERE ACCURATELY LOCATED BY SURVEY.

ACADEMY STREET

"RECORD DRAWING"  
DATE: 1-5-2011



SCALE		AS SHOWN		
DATE		JUNE 2010		
DRAWER		MBRI		
CHECKED		SBAD		
PROJECT NO.		01307225	TSK: 7	
SHEET				
2 OF 6				
DWG. NO.				

## GRADING PLAN

STOUGHTON - 2010 STORMWATER PROJECTS  
CITY OF STOUGHTON, DANE COUNTY, WISCONSIN

viereblicher

999 Fourth Drive, Suite 201 Madison, Wisconsin 53717  
Phone: (608) 826-0532 Fax: (608) 826-0530

NOTES:

- 1) ELEVATIONS ARE BASED UPON NAVD 88 DATUM.
- 2) THIS TOPOGRAPHIC MAP WAS PREPARED AT THE REQUEST OF THE CITY OF STOUTENHOPE, AND IS NOT INTENDED TO BE USED AS A PROPERTY SURVEY AS DEFINED BY A-E 7 OF THE WISCONSIN ADMINISTRATIVE CODE.
- 3) THE DATA USED TO CREATE THIS MAP WAS COMPILED USING ROBOTIC TOTAL STATION, AND GPS OBSERVATIONS REFERENCED TO THE DANE COUNTY COORDINATE SYSTEM.
- 4) ALL UNDERGROUND UTILITIES HAVE BEEN LOCATED PER MARKINGS PLACED ON THE GROUND BY THE UTILITIES AND OR THEIR AUTHORIZED REPRESENTATIVES AS PER DIGGER'S HOTLINE TICKET NO. 20101702717, UNLESS OTHERWISE NOTED ON THIS MAP. VERBOSCHER DOES NOT WARRANT THESE LOCATIONS MARKED BY OTHERS.
- 5) ROAD RIGHT-OF-WAY AND PARCEL LINES ARE BASED ON RECORD INFORMATION AND ARE APPROXIMATE.

BEARINGS ARE REFERENCED TO  
THE DANE COUNTY COORDINATE  
SYSTEM NAD 83/07



<i>STNH</i> #1 RM E = 856.52	<i>STNH</i> #2 RM E = 856.89 NW & E = 851.89	<i>STNH</i> #3 RM E = 857.69 W & NE = 853.22	<i>STNH</i> #4 RM E = 859.29 SW & E = 854.44 N E = 855.19	<i>STNH</i> #5 RM E = 863.69 SW & NE = 859.39	<i>STNH</i> #6 RM E = 864.40 S E = 879.10
<i>SMH</i> #1 RM E = 857.54	<i>SMH</i> #2 RM E = 857.48 W & E = 849.19 S E = 849.73	<i>SMH</i> #3 RM E = 859.77 E = 850.87 W E = 850.97	<i>SMH</i> #4 RM E = 858.63 W E = 850.38 NE E = 850.68	<i>SMH</i> #5 RM E = 863.57 SW & NE = 855.42	<i>SMH</i> #6 RM E = 875.39 S E = 896.10

**BENCHMARK #1:**  
**TOP NUT OF**

NELSON STREET

FRANKLIN STREET

GAS MARKINGS END HERE.  
IT IS ASSUMED GAS  
EXTENDS NORTH.

BENCHMARK #2:  
TOP NUT OF  
HYDRANT EL-860 8A

5th Ave

6th Ave

WATERMAIN MARKINGS (END HERE.)

CITY WM MAPS SHOW WATERMAIN EXTENDING NORTH AND SOUTH.

S

NO TELEPHONE MARKINGS  
FOUND BETWEEN PEDESTALS.

LOT 9,             
6.5' HIGH BOARD  
PRIVACY FENCE

JOHN NELSON ADDITION

SURVEY REQUESTED BY:  
CITY OF STOUGHTON  
381 EAST MAIN ST.  
STOUGHTON, WI 53589

SURVEY COMPLETED BY:  
VERBICHER  
999 FOURIER DR, STE 201  
MADISON, WI 53717

"RECORD DRAWING"

DATE: 1-5-2011

SCALE		AS SHOWN	
DATE		JUNE 2010	
DRAFTER		MKRI SBAU	
CHECKED			
PROJECT NO.		013107225 TSK: 2	
SHEET			
2 OF 4			
DWG. NO.			

## The Plan

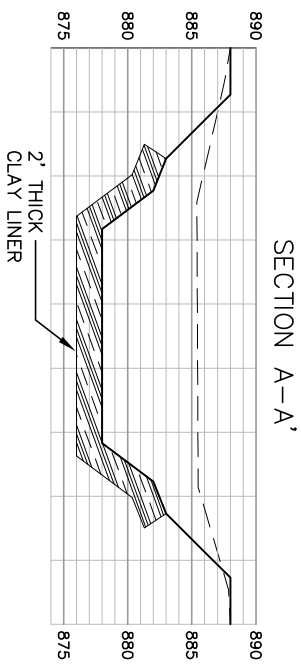
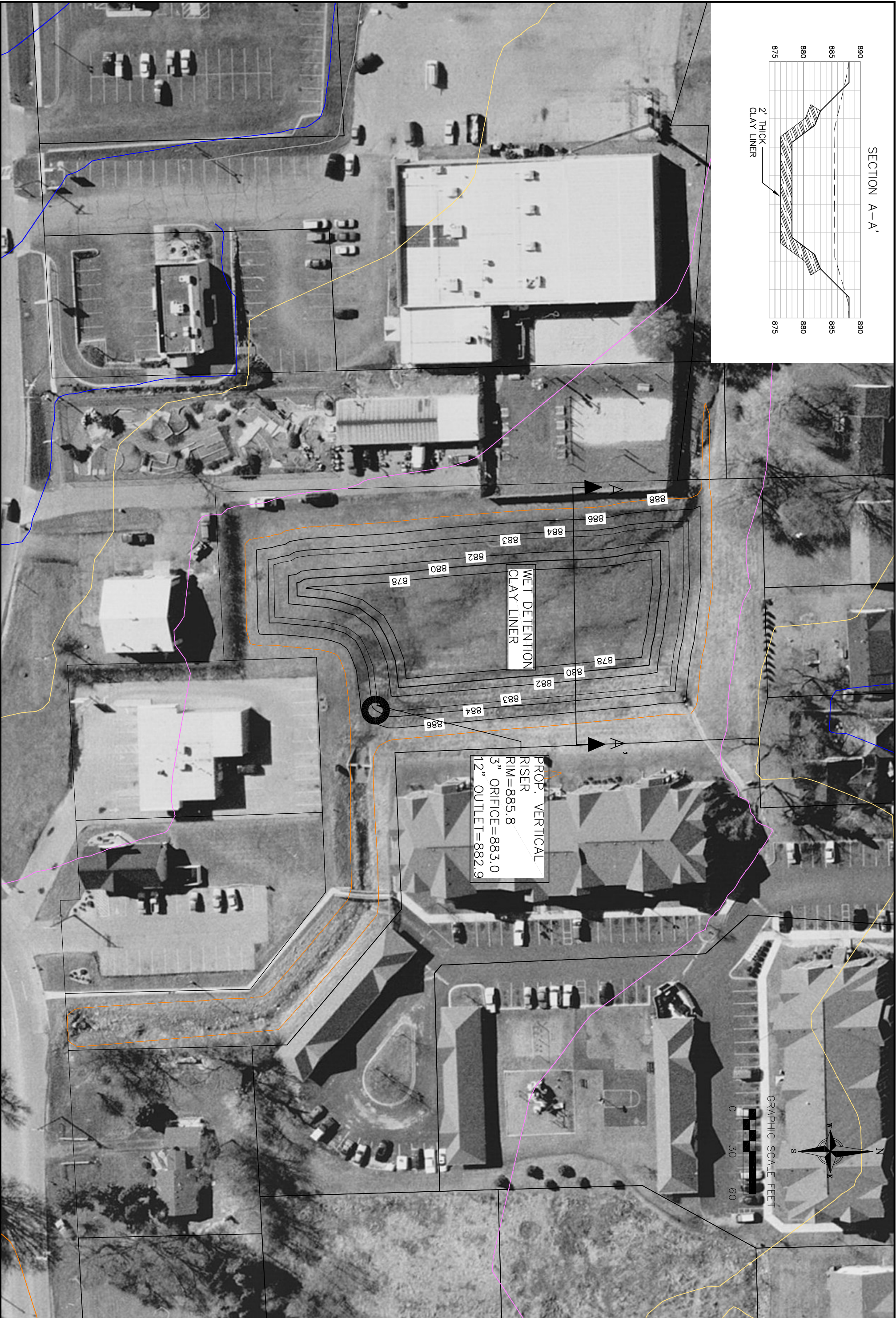
Stoughton 2010 Stormwater Projects  
City Of Stoughton, Dane County, Wisconsin

viërbichër | planners | engineers | advisors

Phone: (608) 826-0532 Fax: (608) 826-0530  
9 Fourier Drive, Suite 201 Madison, Wisconsin 53717







PROP. VERTICAL  
RISER  
RIM=885.8  
3" ORIFICE=883.0  
12" OUTLET=882.9

WET DETENTION  
CLAY LINER



GRAPHIC SCALE FEET



## Engineer's Opinion of Cost-Stoughton Stormwater Project

Bjoin

Park (B - 0.6 acres top area)

29-Dec-10

Item #	Description	Measure	Quantity	Unit Price	Item Total
1	Mobilization	LS	1	\$2,500.00	\$2,500
2	Tracking Pad	TON	100	\$10.00	\$1,000
3	Select Tree Removal	LS	1	\$500.00	\$500
4	Strip and Stockpile Topsoil	SY	3,400	\$0.75	\$2,550
5	Respread Topsoil	SY	1,060	\$0.75	\$795
6	Restoration - (Seed, Fertilize, & Mulch)	SY	1,060	\$0.75	\$795
7	Restoration - Detention Basin	SY	1,890	\$0.75	\$1,418
8	Clay Liner - 12" Thickness	CY	1,890	\$20.00	\$37,800
9	Unclassified Excavation	LS	1	\$15,000.00	\$15,000
10	Haul-off Cut	CY	8,570	\$10.00	\$85,700
11	Silt Fence	LF	850	\$1.75	\$1,488
12	Erosion Matting - Class I Type A	SY	1,060	\$1.50	\$1,590
13	Erosion Matting - Class III Type C	SY	50	\$5.50	\$275
14	24" RCP - Salvaged & Replaced	LF	86	\$30.00	\$2,580
15	24" RCP - Endwall	EA	4	\$1,000.00	\$4,000
16	48" Manhole	EA	1	\$2,000.00	\$2,000
17	Medium Riprap w/ Fabric	TON	25	\$50.00	\$1,250
18	Inlet Protection - Type D	EA	1	\$150.00	\$150
19	Traffic Control	LS	1	\$500.00	\$500
Grant/Harding Street Repair					
20	Remove Flume & Asphalt (w/ saw cut)	SY	185	\$2.00	\$370
21	Storm Inlets w/ grate	EA	2	\$850.00	\$1,700
22	Storm Sewer	LF	80	\$34.00	\$2,720
23	Endwall	EA	1	\$1,500.00	\$1,500
24	Asphalt Patch	SY	185	\$70.00	\$12,950
25	Concrete Curb and Gutter	LF	70	\$16.50	\$1,155
26	Bid Bond	LS	1	\$500.00	\$500
27	Payment & Performance Bond	LS	1	\$5,000.00	\$5,000
SUBTOTAL:					\$187,826
CONTINGENCIES (15%):					\$28,174
TOTAL:					\$216,000

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## Engineer's Opinion of Cost-Stoughton Stormwater Project

Bjoin

Park (A- 1.1 acres top area)

29-Dec-10

Item #	Description	Measure	Quantity	Unit Price	Item Total
1	Mobilization	LS	1	\$2,500.00	\$2,500
2	Tracking Pad	TON	100	\$10.00	\$1,000
3	Clear and Grub	AC	1	\$8,000.00	\$4,000
4	Strip and Stockpile Topsoil	SY	7,260	\$0.75	\$5,445
5	Respread Topsoil	SY	3,630	\$0.75	\$2,723
6	Restoration - (Seed, Fertilize, & Mulch)	SY	3,630	\$0.75	\$2,723
7	Restoration - Detention Basin	SY	3,780	\$0.75	\$2,835
8	Clay Liner - 12" Thickness	CY	3,780	\$20.00	\$75,600
9	Unclassified Excavation	LS	1	\$15,000.00	\$15,000
10	Haul-off Cut	CY	18,100	\$10.00	\$181,000
11	Silt Fence	LF	850	\$1.75	\$1,488
12	Erosion Matting - Class I Type A	SY	3,650	\$1.50	\$5,475
13	Erosion Matting - Class III Type C	SY	50	\$5.50	\$275
14	24" RCP - Salvaged & Replaced	LF	86	\$30.00	\$2,580
15	24" RCP - Endwall	EA	4	\$1,000.00	\$4,000
16	48" Manhole	EA	1	\$2,000.00	\$2,000
17	Medium Riprap w/ Fabric	TON	25	\$50.00	\$1,250
18	Inlet Protection - Type D	EA	1	\$150.00	\$150
19	Traffic Control	LS	1	\$500.00	\$500
Grant/Harding Street Repair					
20	Remove Flume & Asphalt (w/ saw cut)	SY	185	\$1.95	\$361
21	Storm Inlets w/ grate	EA	2	\$850.00	\$1,700
22	Storm Sewer	LF	80	\$34.00	\$2,720
23	Endwall	EA	1	\$1,500.00	\$1,500
24	Asphalt Patch	SY	185	\$70.00	\$12,950
25	Concrete Curb and Gutter	LF	70	\$16.50	\$1,155
26	Bid Bond	LS	1	\$500.00	\$500
27	Performance Bond	LS	1	\$5,000.00	\$5,000
SUBTOTAL:					\$336,522
CONTINGENCIES (15%):					\$50,478
TOTAL:					\$387,000

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Engineer's Opinion of Cost-Stoughton Stormwater Project  
Hamilton Street

29-Dec-10

Item #	Description	Measure	Quantity	Unit Price	Item Total
1	Mobilization	LS	1	\$2,500.00	\$2,500
2	Tracking Pad	TON	100	\$10.00	\$1,000
3	Strip and Stockpile Topsoil	SY	4,100	\$0.75	\$3,075
4	Respread Topsoil	SY	1,100	\$0.75	\$825
5	Restoration - (Seed, Fertilize, & Mulch)	SY	1,100	\$0.75	\$825
6	Restoration - Detention Basin	SY	1,400	\$0.75	\$1,050
7	Clay Liner - 12" Thickness	CY	1,400	\$20.00	\$28,000
8	Unclassified Excavation	LS	1	\$15,000.00	\$15,000
9	Haul-off Cut	CY	10,750	\$10.00	\$107,500
10	Silt Fence	LF	200	\$1.75	\$350
11	Erosion Matting - Class I Type A	SY	400	\$1.50	\$600
12	Erosion Matting - Class III Type C	SY	50	\$5.50	\$275
13	48" Manhole	EA	1	\$2,000.00	\$2,000
14	Medium Riprap w/ Fabric	TON	25	\$50.00	\$1,250
15	Bid Bond	LS	1	\$500.00	\$500
16	Performance Bond	LS	1	\$5,000.00	\$5,000
	<b>SUBTOTAL:</b>				<b>\$169,750</b>
	CONTINGENCIES (15%):				\$25,463
	<b>TOTAL:</b>				<b>\$195,213</b>

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