EVALUATION OF THE PERFORMANCE EFFICIENCY OF THE NEW YORK AVENUE EXFILTRATION FACILITY

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION 1

INTRODUCTION

This document provides a summary of work efforts conducted by the City of Winter Park (City) and its consultants, Reiss Engineering, Inc. and Environmental Research & Design, Inc. (ERD) to construct and evaluate the pollution reduction benefits of the New York Avenue Exfiltration Stormwater Treatment Facility. This project was constructed as a retrofit to reduce pollutant loadings discharging to Lake Maitland. Lake Maitland is a 470-acre lake which is the terminal waterbody in the Winter Park Chain-of-Lakes. Watershed areas surrounding Lake Maitland are highly urbanized, and much of the existing development was constructed prior to regulations requiring treatment of stormwater discharges. As a result, many watershed areas discharge untreated stormwater directly into the lake. The Winter Park Chain-of-Lakes are a significant recreational resource that provide opportunities for boating, fishing, swimming, and other aquatic activities, as well as providing scenic settings for lakeside homes and the surrounding communities. A general location map for the New York Avenue project is given on Figure 1-1.

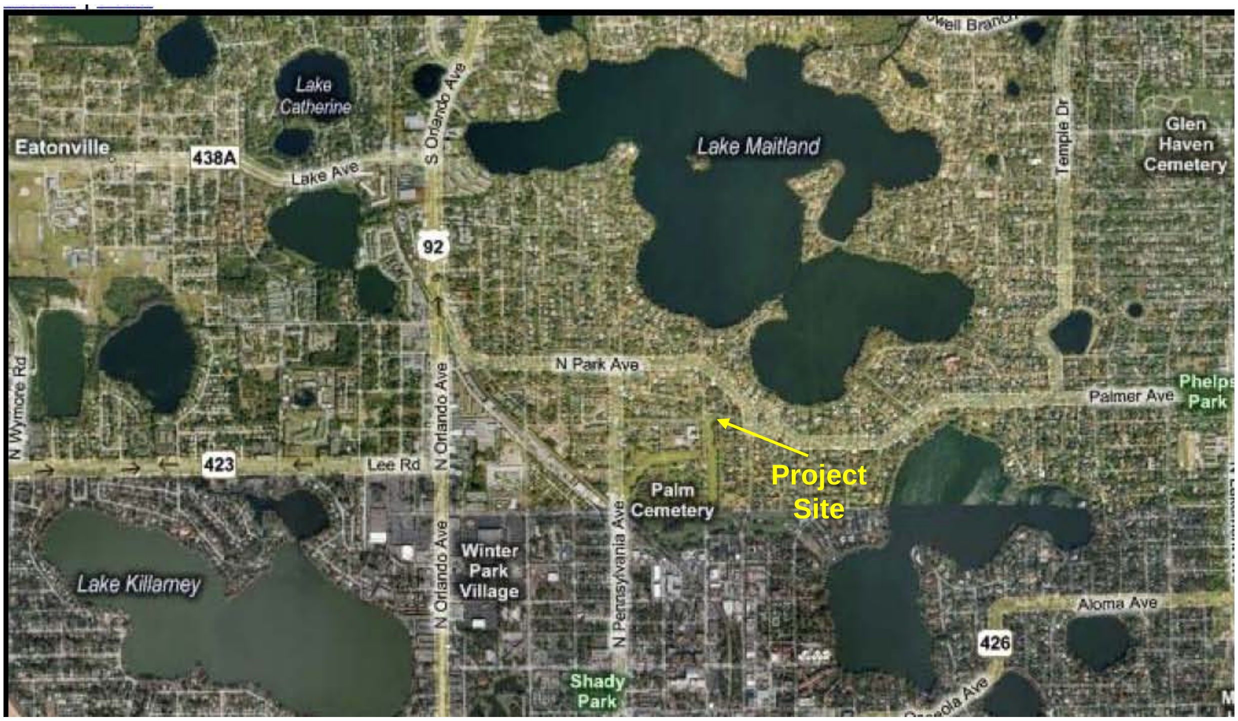


Figure 1-1. Location Map for the New York Avenue Project.

1.1 Project Description

The New York Avenue exfiltration facility provides dry retention treatment for 61.78 acres of a 95-acre drainage basin located adjacent to New York Avenue in the City of Winter Park. Land use in the contributing drainage basin includes open space, golf course, single-family residential, low-intensity commercial, and low-density residential uses.

The exfiltration facility is constructed on a municipal golf course which is owned by the City of Winter Park. The project site is located along New York Avenue, north of Webster Avenue and south of Lake Maitland. An overview of the project site for the New York Avenue exfiltration system is given on Figure 1-2. The exfiltration facility consists of approximately 1071 ft of three-barrel 30-inch perforated HDPE pipe inside a 6-ft thick layer of No. 4 coarse gravel. The bottom of the exfiltration pipe is located approximately 3 ft above the seasonal high groundwater level at the project site. Engineering design for the exfiltration system was performed by the City of Winter Park. A set of construction plans for the exfiltration system is given in Appendix A. A schematic of the exfiltration facility is given on Figure 1-3.

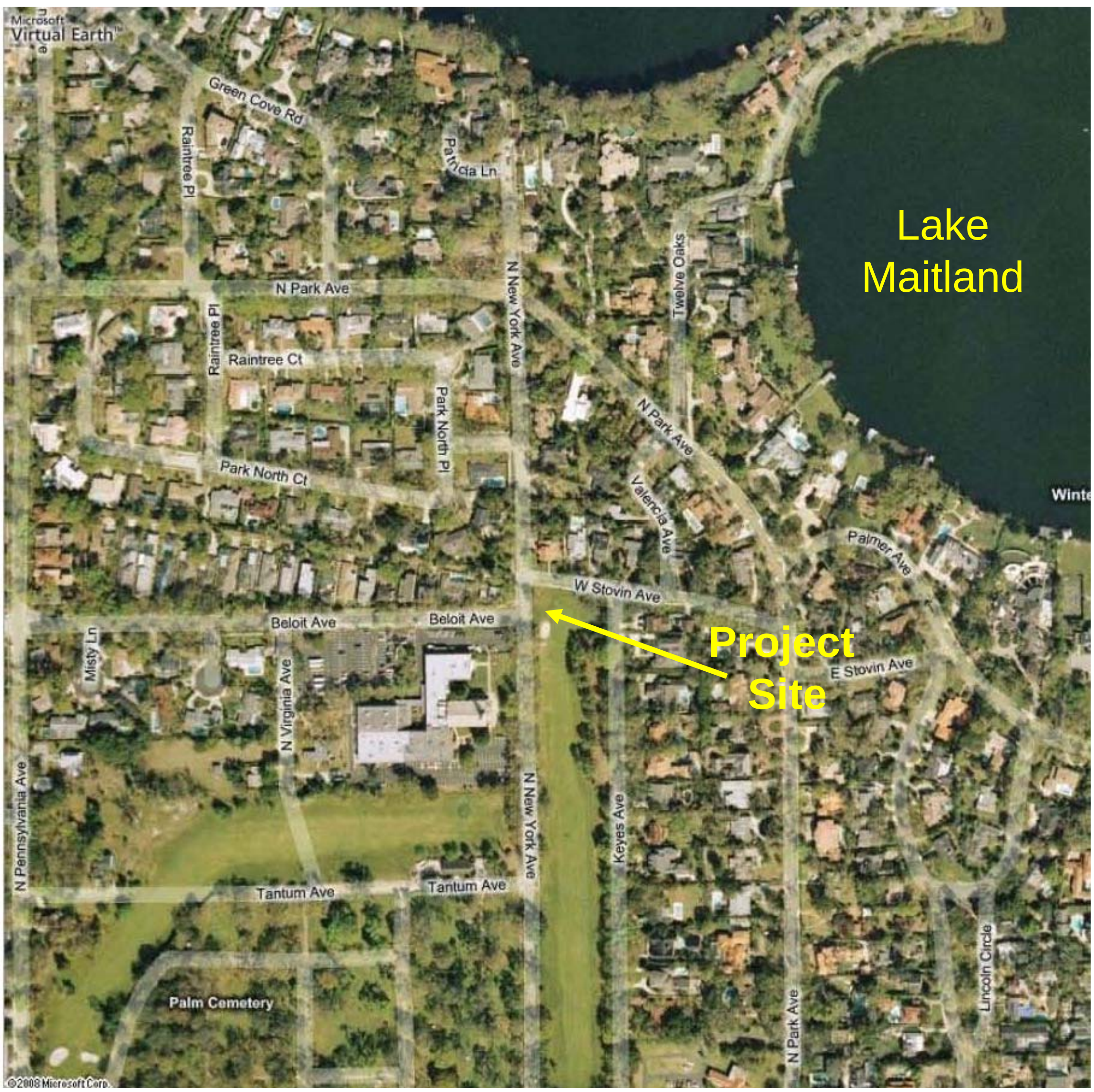


Figure 1-2. Overview of Project Site for the New York Avenue Exfiltration System.

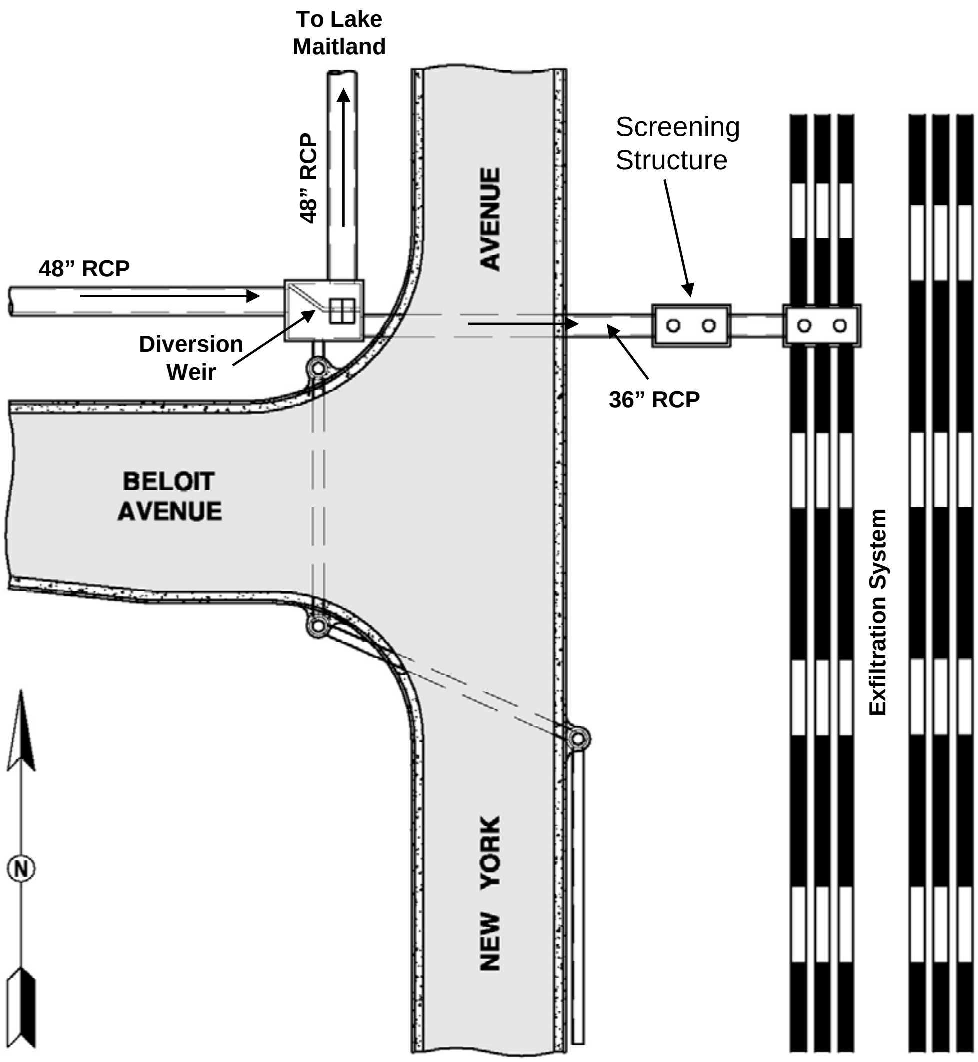


Figure 1-3. Schematic of the New York Avenue Exfiltration System.

The exfiltration system is designed to provide dry retention treatment for 0.5-inch of runoff over the 61.78-acre contributing basin area. The treatment volume is diverted into the exfiltration system by a newly constructed weir structure. This structure diverts runoff discharging along Beloit Avenue as well as New York Avenue into the exfiltration system. When the exfiltration system becomes full, the excess water flows over the weir and into the existing downstream stormsewer system. A detailed schematic of the diversion weir structure is given on Figure 1-4. The design also incorporates a screening structure upstream from the exfiltration system to remove leaves and other debris which could potentially lead to clogging in the exfiltration system. According to calculations conducted by the City of Winter Park, it is estimated that this system will reduce existing loadings to Lake Maitland by 26.4 kg/yr for total phosphorus, 260.8 kg/yr for total nitrogen, 1008 kg/yr for BOD, and 5984 kg/yr for TSS.

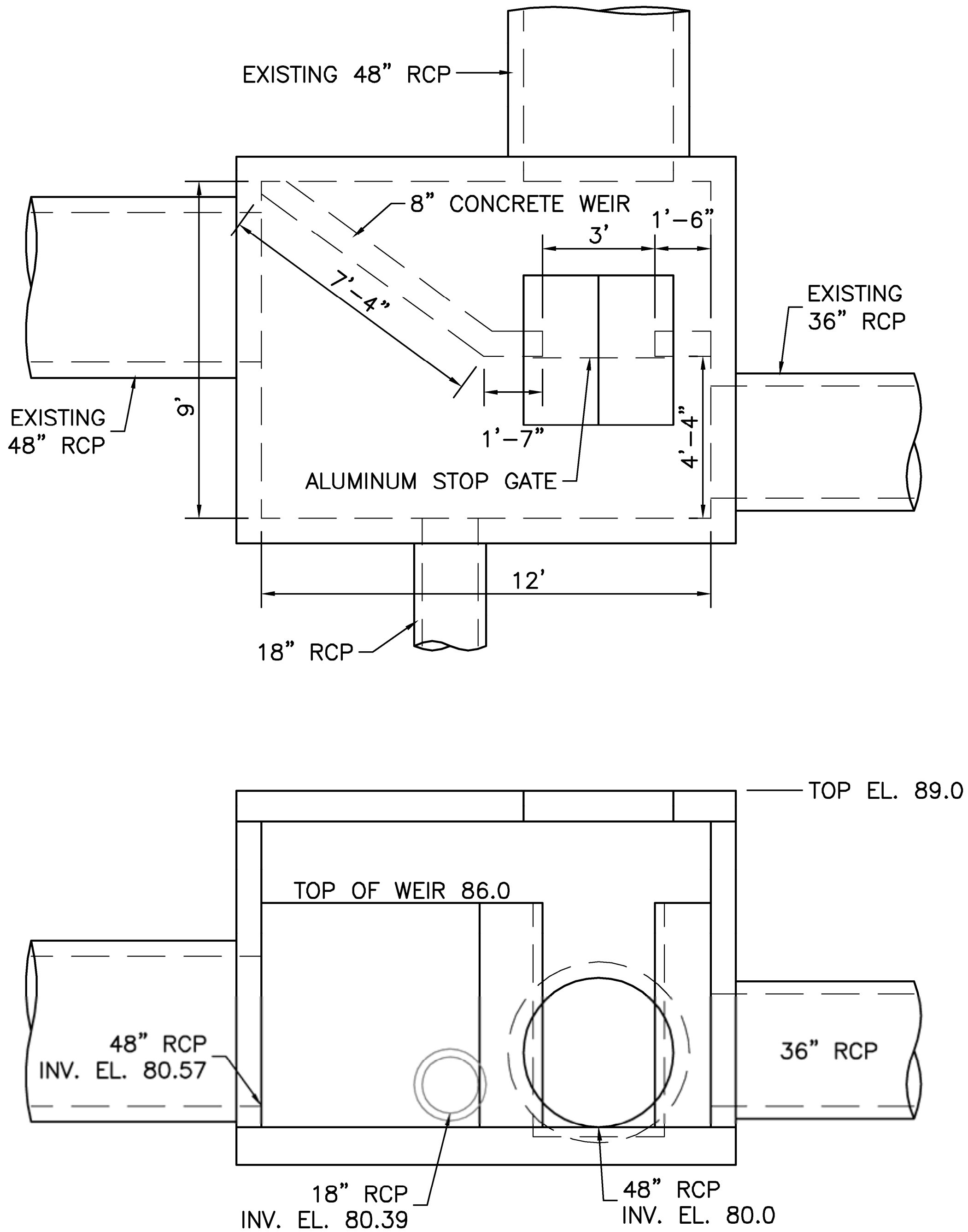


Figure 1-4. Schematic Details of the Diversion Structure.

Construction for the exfiltration facility was completed and the system was placed in service on June 15, 2007. Restoration of the disturbed golf course areas was completed on September 15, 2007. Primary funding for construction of the New York Avenue exfiltration facility was provided by the Florida Department of Environmental Protection (FDEP) under Agreement No. S0238 in the amount of $682,000 through a TMDL Water Quality Restoration Grant.

1.2 Work Efforts Performed by ERD

A Quality Assurance Project Plan (QAPP) was developed by ERD during December 2007 which provided details concerning the proposed field monitoring and laboratory analyses. Monitoring equipment was installed at the exfiltration site by ERD during early-January 2008. Field monitoring was initiated on January 15, 2008 and was conducted over a three-month period until April 15, 2008.

This report has been divided into four separate sections for presentation of results. Section 1 contains an introduction to the report, a description of the exfiltration system, and a summary of work efforts performed by ERD. Section 2 provides a detailed discussion of the methodologies used for field and laboratory evaluations. Section 3 provides a discussion of the hydrologic and water quality results, and a summary is provided in Section 4.

SECTION 2

FIELD AND LABORATORY ACTIVITIES

Field and laboratory investigations were conducted by ERD from January-April 2008 to evaluate the effectiveness of the recently constructed New York Avenue exfiltration system. Performance efficiency monitoring was conducted in the field inside the diversion manhole upstream from the exfiltration unit. The field monitoring included a continuous record of inflows into the exfiltration system and overflow, as well as collection of flow-weighted composite inflow and overflow samples. Laboratory analyses were conducted on collected samples for general parameters and nutrients to assist in quantifying mass removal efficiencies. Specific details of monitoring efforts performed at the New York Avenue exfiltration system site are given in the following sections.

2.1 Drainage Basin Characteristics

An overview of the New York Avenue exfiltration system site is given on Figure 2-1. The exfiltration system was constructed east of the intersection of New York Avenue and Beloit Avenue in Winter Park. The approximate location of the underground exfiltration system is indicated on Figure 2-1.

Figure 2-1. Overview of the New York Avenue Exfiltration System Site.

A delineation of the contributing watershed area for the New York Avenue exfiltration system is given on Figure 2-2. This delineation was generated by ERD based on a combination of aerial photography, 1-ft contour Lidar data, field reconnaissance, and observations of flow patterns during rain events. Based on this delineation, the overall basin area discharging to the New York Avenue exfiltration site is estimated to be approximately 61.78 acres.

Figure 2-2. Drainage Basin Delineation for the New York Avenue Exfiltration System.

The drainage basin for the New York Avenue exfiltration system was divided into three sub-basin areas based upon similarities in estimated runoff generation and discharge. The area identified as Sub-basin 1 consists primarily of a cemetery and adjacent golf course. Based upon the available contour data, it appears that this area retains much of the generated runoff except during relatively large rain events. The area identified as Sub-basin 3 is a new residential area which provides stormwater treatment in an on-site dry retention facility along the southern side of the sub-basin boundary. Since much of the runoff generated in this basin is infiltrated into the ground, it is thought that this sub-basin area also discharges stormwater runoff only during significant rain events. The remaining area, identified as Sub-basin 2, is thought to contribute runoff regularly to the exfiltration site. A summary of current land use in the New York Avenue exfiltration system drainage basin is given on Figure 2-3. Land use within the basin consists of low-density residential, medium-density residential, buildings, a church site, cemetery, open space, and significant roadways.

Soils within the drainage basin for the New York Avenue exfiltration system are well-drained sandy soils which are classified in Hydrologic Soil Group (HSG) A. Soils classified in this group have a high infiltration rate and a relatively low runoff potential for pervious areas. Wet season water table elevations in these soils are typically 6 ft or more below the ground surface.

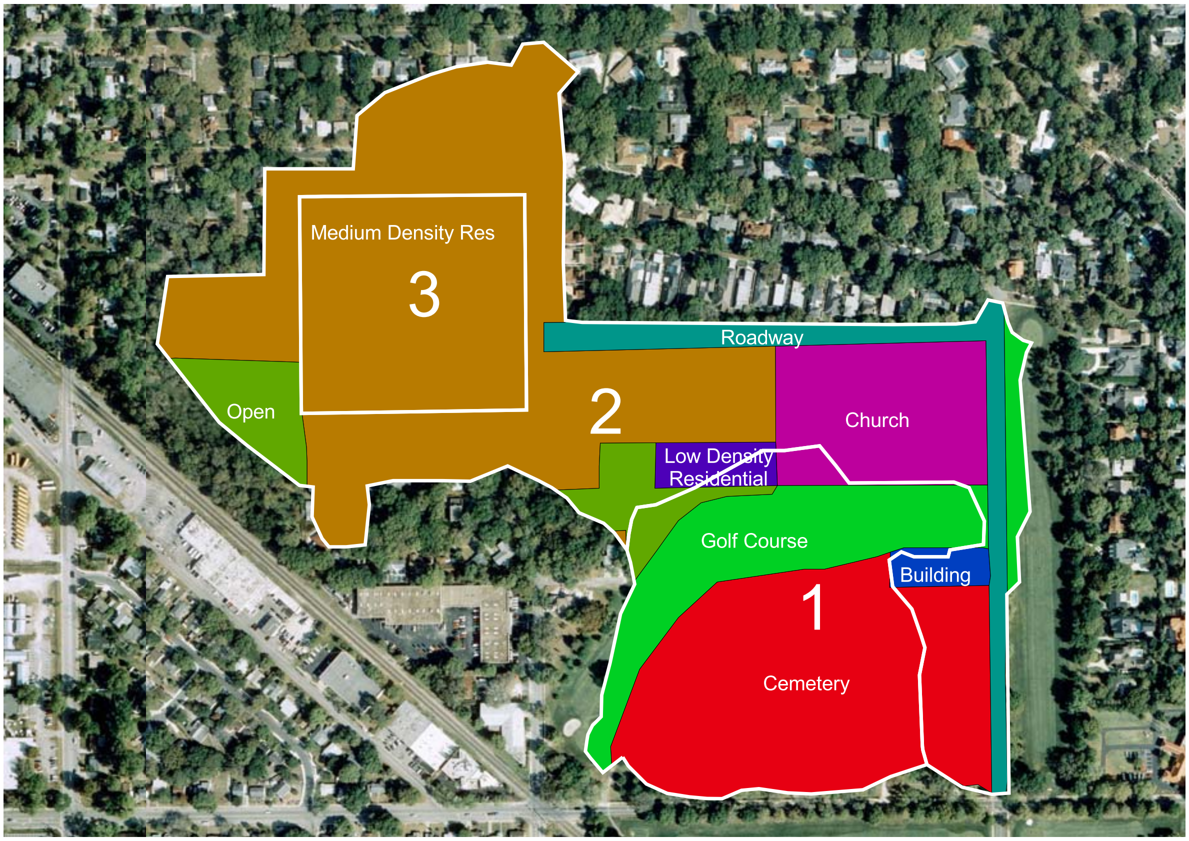


Figure 2-3. Current Land Use in the New York Avenue Exfiltration System Drainage Basin.

2.2 Field Instrumentation and Monitoring

A schematic of the monitoring locations used to evaluate the performance efficiency of the exfiltration system is given on Figure 2-4. The incoming stormsewer lines, consisting of a 48-inch RCP and 18-inch RCP, converge into an underground concrete structure. A 6-ft tall concrete diversion weir is used to divert these incoming flows into the exfiltration system located east of the diversion structure. When the exfiltration system becomes full, excess water can discharge over the diversion weir into the existing 48-inch RCP downstream stormsewer which ultimately discharges to Lake Maitland.

Stormwater samplers with integral flow meters were installed at each of the two monitoring sites indicated on Figure 2-4. The inflow monitoring site was located inside the 36-inch RCP which discharges from the diversion structure into the exfiltration system. This autosampler was used to provide a continuous measurement of discharges into the exfiltration system, under both storm event and baseflow conditions, as well as to collect flow-weighted samples from the inflow to the unit over a wide range of flow conditions. Monitoring Site 2 is located on the downstream site of the overflow of the diversion weir to provide a measurement of overflow which bypasses the exfiltration system. In addition, a recording rain gauge was installed adjacent to the monitoring site approximately mid-way between New York Avenue and the exfiltration system.

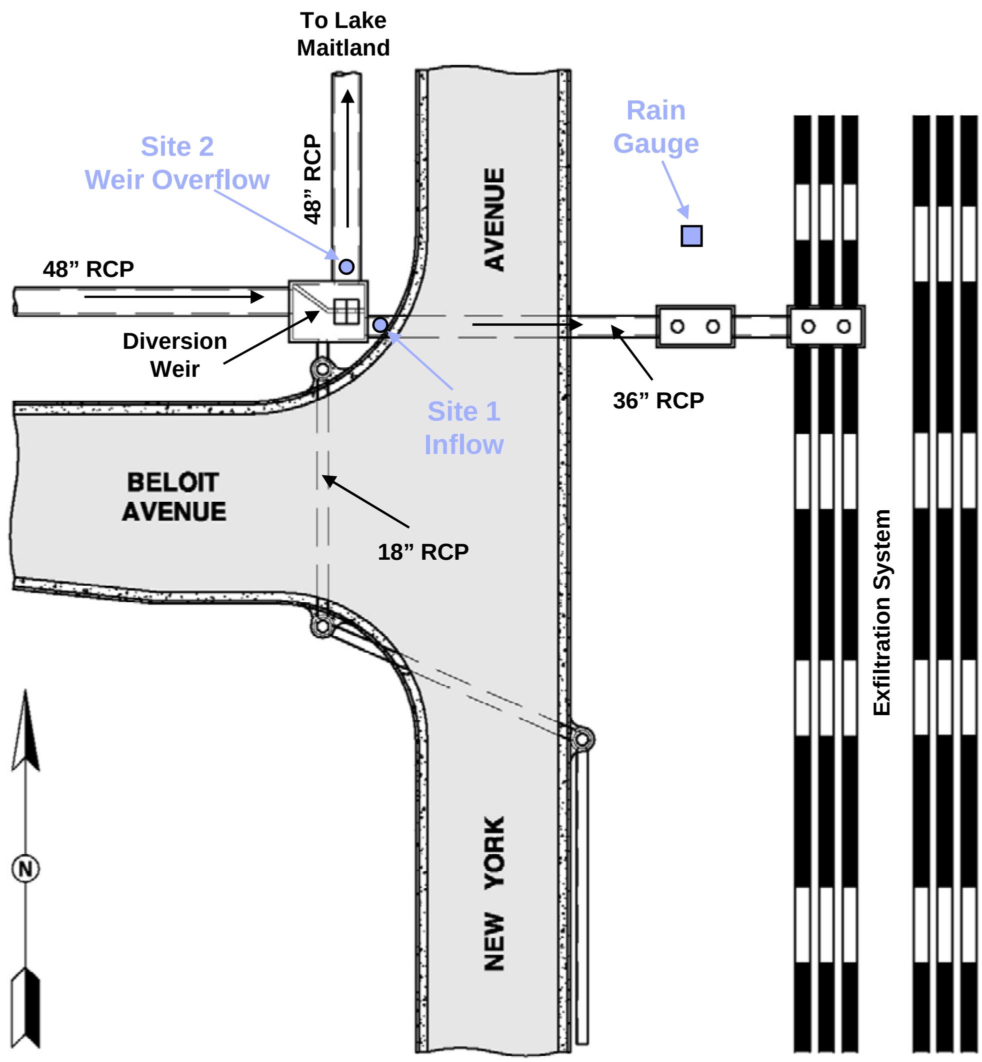


Figure 2-4. Locations for Monitoring Equipment at the New York Avenue Site.

A photograph of the automatic sampling equipment used at the New York Avenue monitoring site is given in Figure 2-5. Automatic sequential stormwater samplers with integral flow meters, manufactured by Sigma (Model 900MAX), were installed on top of the diversion structure at the corner of New York Avenue and Beloit Avenue. The automatic samplers were housed inside insulated aluminum shelters which were installed on top of a manhole cover for the underground structure. The manhole cover was removed during the monitoring program to allow access for the sample collection tubing and flow probes to the specific monitoring locations. Sensor cables and sample tubing were extended from each of the two samplers to the appropriate inflow and outflow monitoring sites. The integral flow meter was programmed to provide a continuous record of hydraulic inputs into the exfiltration system, as well as discharges over the diversion weir, with measurements stored into internal memory at 10-minute intervals.

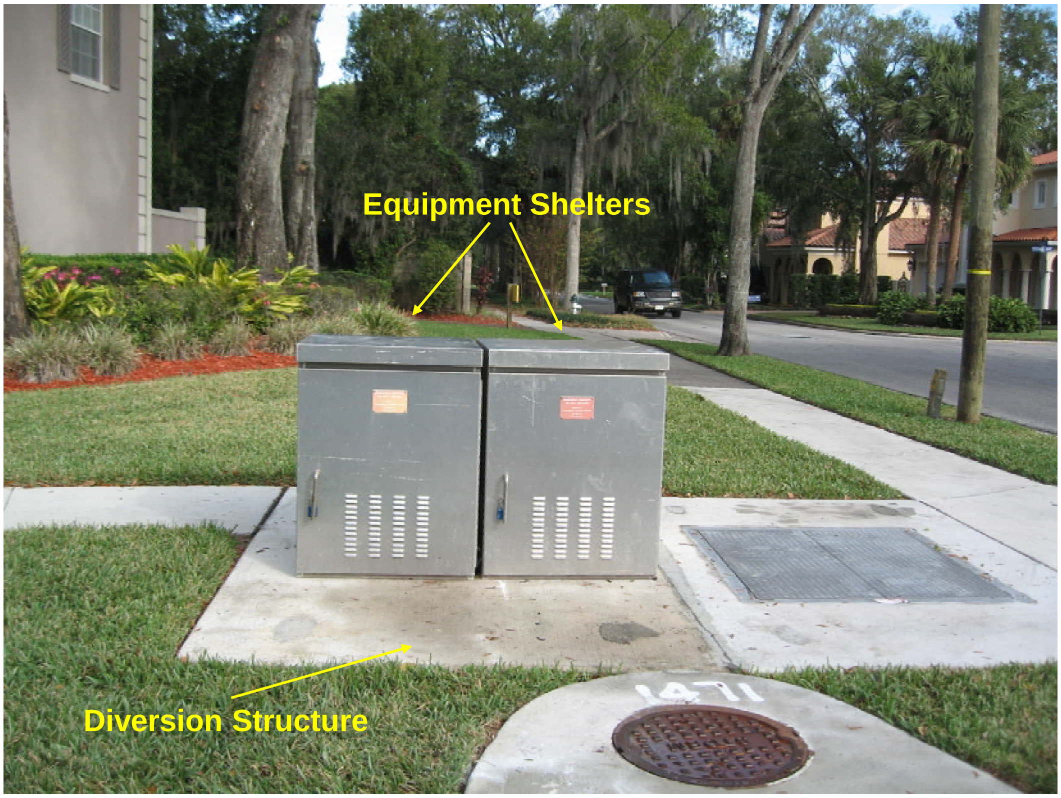


Figure 2-5. Automatic Sampling Equipment.

Flow measurements at the inflow monitoring site (Site 1) were performed using the area/velocity method. The flow probe utilized at this monitoring site provides simultaneous measurements of water depth and flow velocity. The depth measurements are converted into a cross-sectional area based upon the geometry of the pipe, and the velocity of flow is measured directly by the probe. Discharge is then calculated by the flow meter using the Continuity Equation (Q = A x V) in cubic feet per second (cfs). Flow measurements at the weir overflow monitoring site (Site 2) were performed using a pressure transducer sensor which transforms sensitive measurements of water depth into a flow rate using the Manning Equation and pipe geometry. A pressure transducer depth probe was inserted approximately 15 ft into the 48-inch RCP downstream from the diversion weir structure. This probe provided continuous measurements of water depth and converted measured water depths into an approximate flow rate.

A photograph of the interior of the diversion structure is given on Figure 2-6. The 6-ft tall concrete diversion weir is shown near the center of the picture. A removable aluminum weir plate was constructed within the weir structure to restore normal stormsewer hydraulics within the system in the event that the exfiltration system would become clogged. The sample and flow probe tubing can be seen extending downstream into the 48-inch RCP.

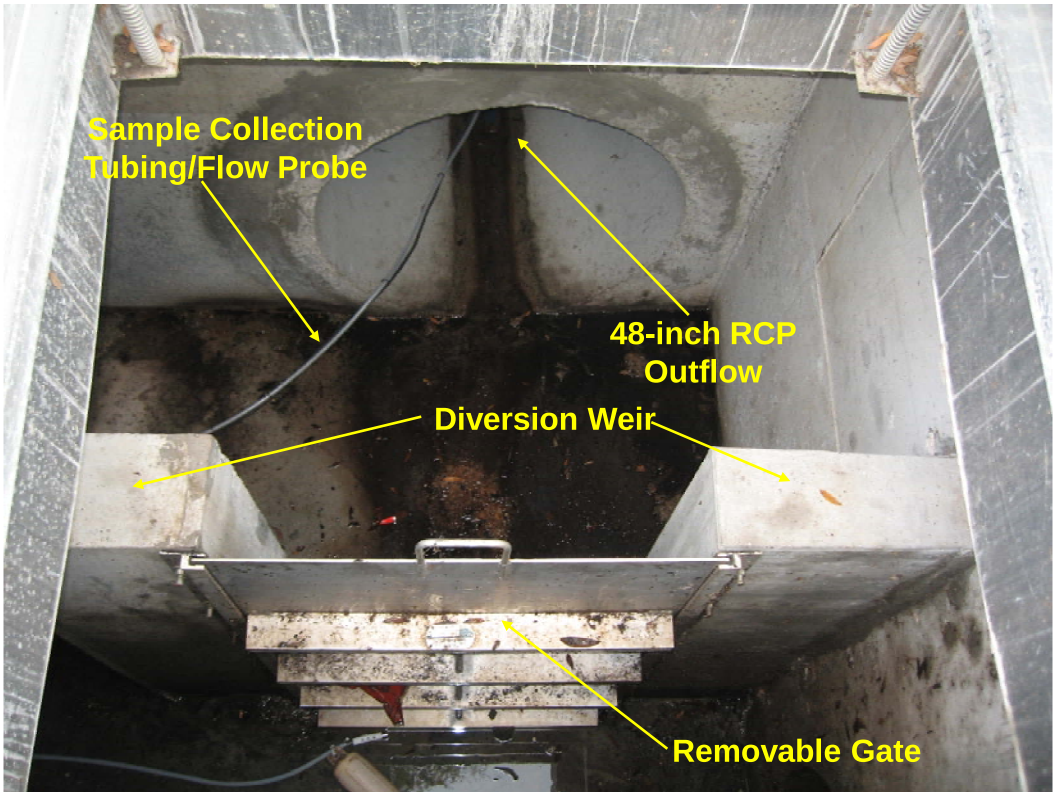


Figure 2-6. Interior of Diversion Structure.

Each of the two automatic stormwater samplers contained 24 individual one-liter polyethylene bottles. The two samplers were programmed to collect samples in a flow-weighted mode, with collected samples placed into the collection bottles in a sequential order. Since 120 VAC power was not available at the site, the automatic samplers were operated on gel cell batteries which were replaced on a weekly basis. Ten separate flow-weighted composite samples of inflow were collected at the inflow site during the monitoring program. No significant overflow of the diversion weir structure occurred during the monitoring program, and as a result, no samples were collected at the downstream overflow monitoring site. All collected inflow samples were analyzed in the ERD Laboratory for general parameters, nutrients, and BOD.

The field monitoring program at the New York Avenue exfiltration site was conducted during a period of heavy leaf fall within the drainage basin. A photograph of accumulated leaves inside the diversion structure is given in Figure 2-7. Although the leaves are seen floating in this figure, much of the leaf matter would become water logged in 2-3 days and sink to the bottom of the diversion structure and 30-inch RCP inflow into the exfiltration system. Initially, the sample intake strainer for the autosampler was mounted onto the bottom at the 30-inch RCP. However, the accumulated leaves on the bottom quickly clogged the Teflon strainer, causing missed samples for several storm events. Therefore, a modification to the sampling protocol was made to minimize accumulation of leaves onto the intake strainer. A photograph of this modification is given on Figure 2-8. The intake strainer was attached to a large float so that the strainer would hang down from the float into the water column during inflow events. The float positioned the strainer near the center of the water column and prevented it from being impacted by either floating or settling leaf material. Leaf material which settled onto the probe between storm events would be washed off the strainer as the level began to rise and the strainer lifted off the bottom of the structure.

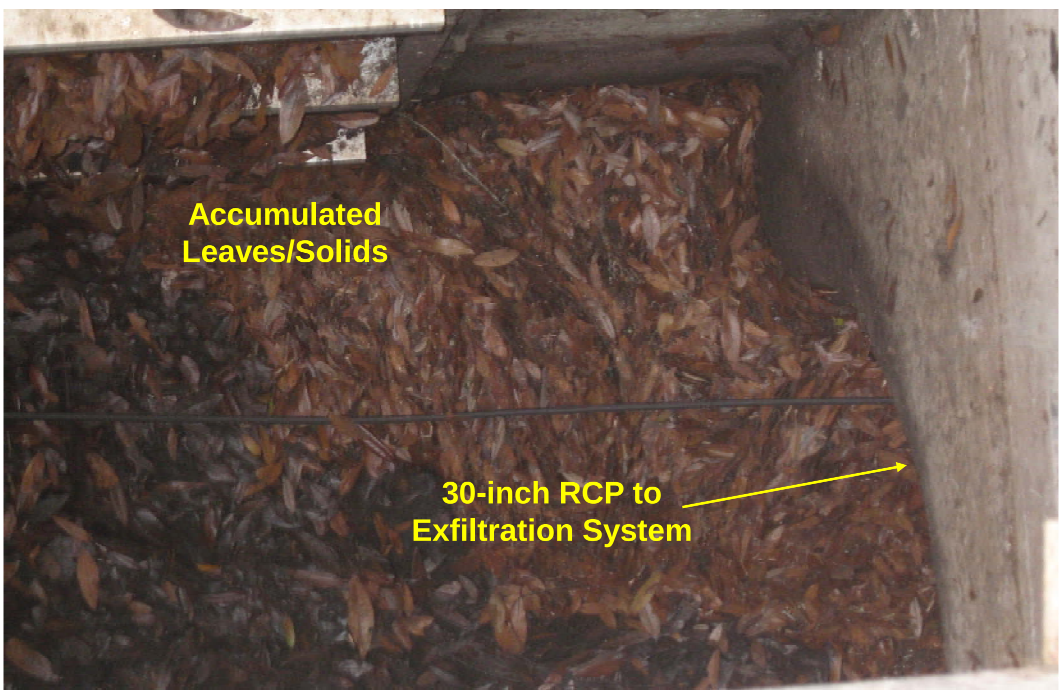


Figure 2-7. Accumulation of Leaves Inside the Diversion Structure.

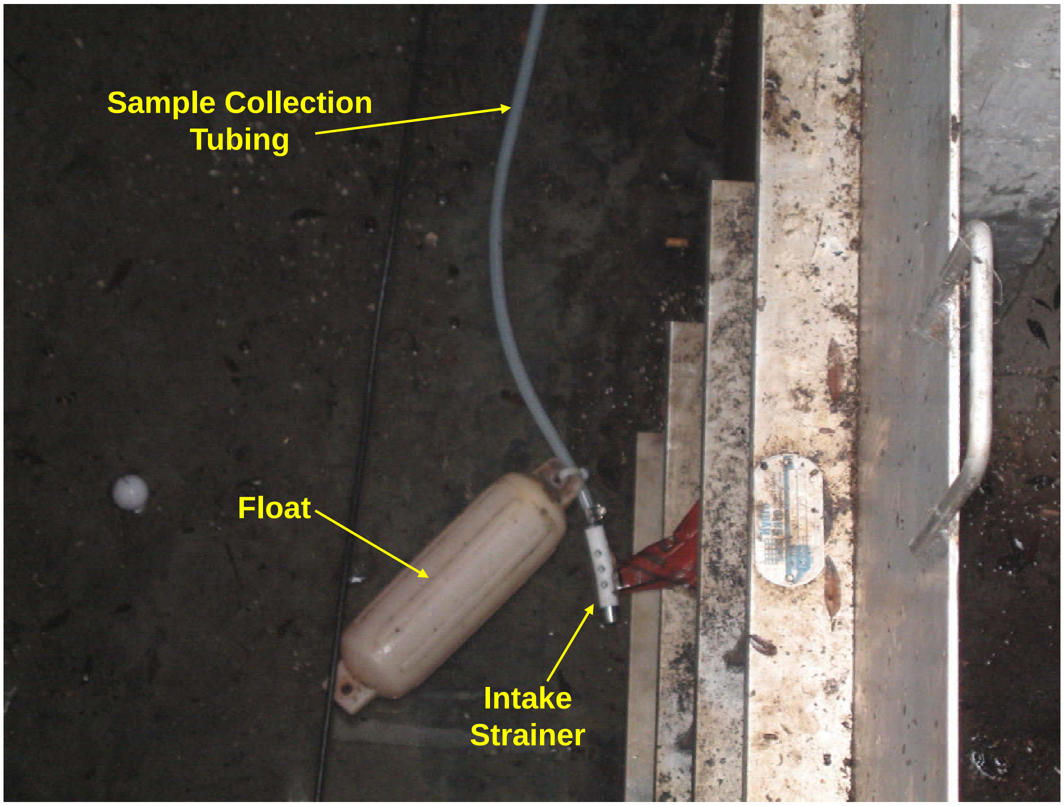


Figure 2-8. Modified Intake Strainer Attachment.

Rainfall at the monitoring site was documented using a continuous rainfall recorder attached to a 4-inch x 4-inch wooden post adjacent to the underground exfiltration pipes. The rainfall recorder (Texas Electronics Model 1014-C) produced a continuous record of all rainfall which occurred at the site. A photograph of the rainfall collector is given on Figure 2-9. The rainfall record is used to provide information on general rainfall characteristics in the vicinity of the monitoring site and to assist in evaluation of hydrologic inputs from the watershed area.

Prior to initiation of the field monitoring program, the screening structure (located between the diversion structure and exfiltration pipes) was cleaned by the City of Winter Park to remove existing debris and leaves. A photograph of cleaning operations for the screening structure is given in Figure 2-10. The cleaning process was performed using a vacuum truck which vacuumed material within the system. Cleaning operations for the screening structure were also conducted on approximately a monthly basis during the monitoring program due to the high level of leaf fall associated with the late winter and early spring months.

Figure 2-9. Recording Rainfall Collector.

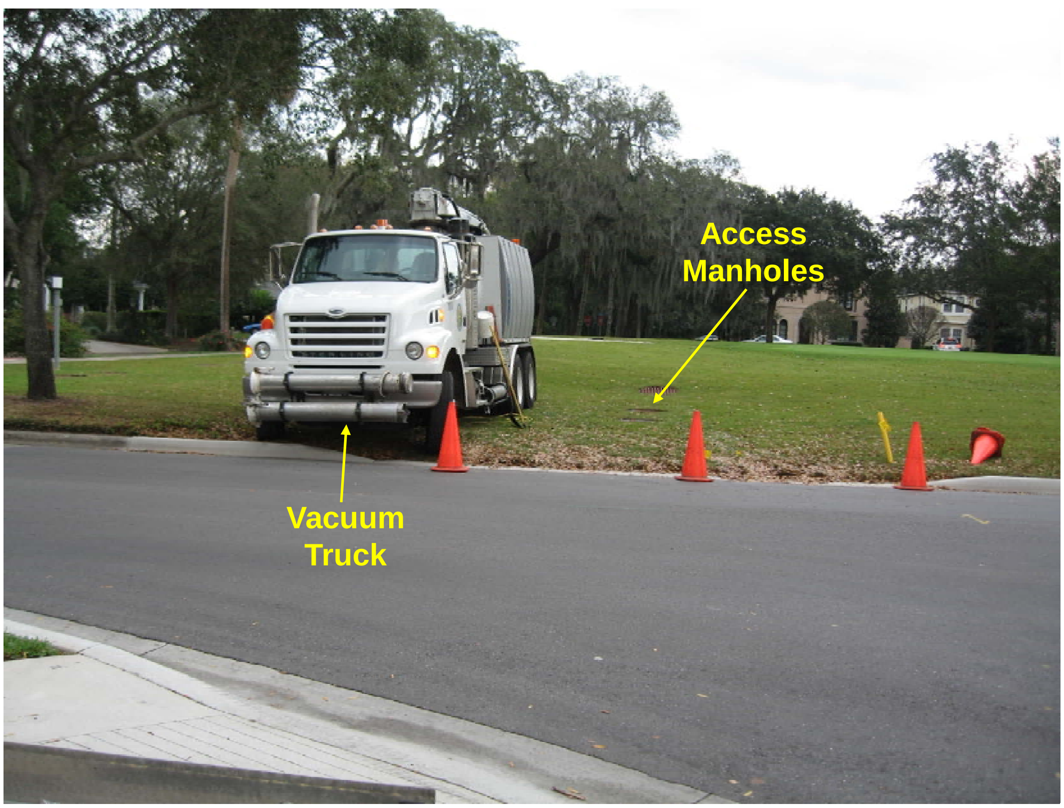


Figure 2-10. Cleaning Operations for the Screening Structure.

2.3 Laboratory Analyses

A summary of laboratory methods and MDLs for analyses conducted on water samples collected during this project is given in Table 2-1. All laboratory analyses were conducted in the ERD Laboratory. The ERD Laboratory is NELAC-certified (No. 1031026). Details on field operations, laboratory procedures, and quality assurance methodologies are provided in the FDEP-approved Comprehensive Quality Assurance Plan No. 870322G for Environmental Research & Design, Inc. In addition, a Quality Assurance Project Plan (QAPP), outlining the specific field and laboratory procedures to be conducted for this project, was submitted to and approved by FDEP prior to initiation of any field and laboratory activities.

TABLE 2-1

ANALYTICAL METHODS AND DETECTION LIMITS FOR LABORATORY ANALYSES

PARAMETER	METHOD OF ANALYSIS	METHOD DETECTION LIMITS (MDLs)[1]
pH	EPA-83, Sec. 150.1[2]	N/A
Conductivity	EPA-83, Sec. 120.1[2]	0.3 μmho/cm
Alkalinity	EPA-83, Sec. 310.1[2]	0.5 mg/l
Ammonia	EPA-83, Sec. 350.1[2]	0.005 mg/l
NO_x	EPA-83, Sec. 353.2[2]	0.005 mg/l
TKN	Alkaline Persulfate Digestion[3]	0.01 mg/l
Ortho-P	EPA-83, Sec. 365.1[2]	0.001 mg/l
Total Phosphorus	Alkaline Persulfate Digestion[3]	0.001 mg/l
Turbidity	EPA-83, Sec. 180.1[2]	0.1 NTU
Color	EPA-83, Sec. 110.3[2]	1 Pt-Co Unit
TSS	EPA-83, Sec. 160.2[2]	0.7 mg/l
BOD	SM-19, Sec. 5210B[4]	2 mg/l

1. MDLs are calculated based on the EPA method of determining detection limits
2. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Revised March 1983.
3. FDEP-approved alternate method
4. Standard Methods for the Examination of Water and Wastewater, 19th Ed., 1995.

SECTION 3

RESULTS

Field monitoring, sample collection, and laboratory analyses were conducted by ERD from January 15-April 15, 2008 to evaluate the hydraulic and pollutant removal efficiencies of the New York Avenue exfiltration system in the City of Winter Park. A discussion of the results of these efforts is given in the following sections.

3.1 Site Hydrology

3.1.1 Rainfall Characteristics

A continuous record of rainfall characteristics was collected at the exfiltration system monitoring site from January 15-April 15, 2008 using a tipping bucket rainfall collector with a resolution of 0.01 inch and a digital data logging recorder. However, due to an initial programming error, information on the starting and ending time for rain events was not collected during the initial four weeks of the monitoring program, although total rainfall depth was still recorded for individual rain events. Beginning on February 15, 2008, the programming was modified to log all available data.

The characteristics of individual rain events measured at the New York Avenue exfiltration system site from January 15-April 15, 2008 are given in Table 3-1. During the initial four weeks of the monitoring program, information is provided only for total rainfall associated with each rain event. However, beginning on February 13th, information is also provided on event start time, event end time, event duration, average rainfall intensity, and antecedent dry period for each individual rain event measured at the monitoring site. For purposes of this analysis, average rainfall intensity is calculated as the total rainfall divided by the total event duration.

A total of 12.95 inches of rainfall fell in the vicinity of the exfiltration system over the 91-day monitoring period from a total of 43 separate storm events. A summary of rainfall event characteristics measured at the exfiltration system rain gauge site from January 15-April 15, 2008 is given in Table 3-2. Individual rainfall amounts measured at the exfiltration system site range from 0.01-2.11 inches, with an average of 0.30 inches/event. Durations for events measured at the site range from 0.01-12.8 hours, with antecedent dry periods ranging from 0.13-9.96 days.

A comparison of measured and typical "average" rainfall in the vicinity of the New York Avenue exfiltration system is given in Figure 3-1. Measured rainfall presented in this figure is based upon the field-measured rain events at the exfiltration system monitoring site presented in Table 3-1, summarized on a monthly basis. "Average" rainfall conditions are based upon historical monthly rainfall averages recorded at the Orlando International Airport (OIA) over the 64-year period from 1942-2005. Comparisons between measured and average rainfall are provided for the months of January-April 2008 even though measurements performed at the exfiltration system site during January and April 2008 represent only partial months. Historical average rainfall during the months of January-April in Central Florida is approximately 11.04 inches.

TABLE 3-1

SUMMARY OF RAINFALL MEASURED AT THE NEW YORK AVENUE MONITORING SITE FROM JANUARY 15-APRIL 15, 2008

EVENT START		EVENT END		TOTAL RAINFALL (inches)	DURATION (hours)	ANTECEDENT DRY PERIOD (days)	AVERAGE INTENSITY (inches/hour)
DATE	TIME	DATE	TIME				
1/16/08	--	--	--	0.01	--	--	--
1/17/08	--	--	--	1.03	--	--	--
1/18/08	--	--	--	0.01	--	--	--
1/19/08	--	--	--	0.94	--	--	--
1/22/08	--	--	--	0.10	--	--	--
1/23/08	--	--	--	1.43	--	--	--
1/26/08	--	--	--	0.14	--	--	--
1/27/08	--	--	--	0.14	--	--	--
2/6/08	--	--	--	0.01	--	--	--
2/7/08	--	--	--	0.40	--	--	--
2/8/08	--	--	--	0.01	--	--	--
2/12/08	--	--	--	0.39	--	--	--
2/13/08	14:47	2/13/08	14:47	0.01	--	--	--
2/18/08	14:46	2/18/08	14:46	0.03	0.01	5.0	2.35
2/19/08	9:53	2/19/08	10:01	0.11	0.14	0.8	0.81
2/21/08	8:46	2/21/08	10:03	0.12	1.30	1.9	0.09
2/21/08	17:17	2/21/08	18:00	0.30	0.72	0.3	0.42
2/23/08	10:45	2/23/08	12:38	0.43	1.88	1.7	0.23
2/26/08	18:09	2/26/08	20:13	0.26	2.07	3.2	0.13
2/26/08	23:25	2/27/08	4:59	0.55	5.56	0.1	0.10
2/29/08	7:35	2/29/08	7:35	0.01	--	2.1	--
3/4/08	16:53	3/4/08	16:54	0.02	0.02	4.4	1.20
3/5/08	6:01	3/5/08	6:01	0.01	--	0.5	--
3/6/08	16:38	3/7/08	4:02	1.17	11.40	1.4	0.10
3/7/08	15:15	3/7/08	15:15	0.01	--	0.5	--
3/7/08	20:22	3/8/08	2:59	0.21	6.62	0.2	0.03
3/13/08	11:27	3/13/08	11:28	0.02	0.02	5.4	1.20
3/14/08	18:02	3/14/08	20:30	0.07	2.46	1.3	0.03
3/17/08	10:02	3/17/08	10:02	0.01	--	2.6	--
3/20/08	6:08	3/20/08	7:31	0.25	1.38	2.8	0.18
3/30/08	6:39	3/30/08	7:08	0.28	0.49	10.0	0.57
3/31/08	6:57	3/31/08	7:22	0.23	0.41	1.0	0.57
3/31/08	16:33	3/31/08	16:33	0.01	--	0.4	--
4/1/08	16:21	4/1/08	17:41	0.86	1.33	1.0	0.64
4/1/08	22:11	4/1/08	22:11	0.01	--	0.2	--
4/2/08	13:06	4/2/08	13:07	0.02	0.02	0.6	1.18
4/2/08	17:37	4/2/08	18:08	0.07	0.51	0.2	0.14
4/3/08	7:26	4/3/08	7:26	0.01	--	0.6	--
4/3/08	17:05	4/3/08	17:05	0.01	--	0.4	--
4/4/08	19:27	4/4/08	19:27	0.01	--	1.1	--
4/5/08	14:47	4/6/08	3:35	2.11	12.79	0.8	0.16
4/6/08	13:01	4/7/08	0:23	1.05	11.36	0.4	0.09
4/13/08	12:48	4/13/08	15:19	0.08	2.53	6.5	0.03
			TOTAL:	**12.95**			

TABLE 3-2

SUMMARY OF RAINFALL CHARACTERISTICS IN THE VICINITY OF THE NEW YORK AVENUE EXFILTRATION SYSTEM FROM JANUARY – APRIL 2008

PARAMETER	UNITS	MINIMUM VALUE	MAXIMUM VALUE	MEAN EVENT VALUE
Event Rainfall	inches	0.01	2.11	0.30
Event Duration	hours	0.01	12.8	3.00
Average Intensity	inches/hour	0.03	2.35	0.49
Antecedent Dry Period	days	0.13	9.96	1.91

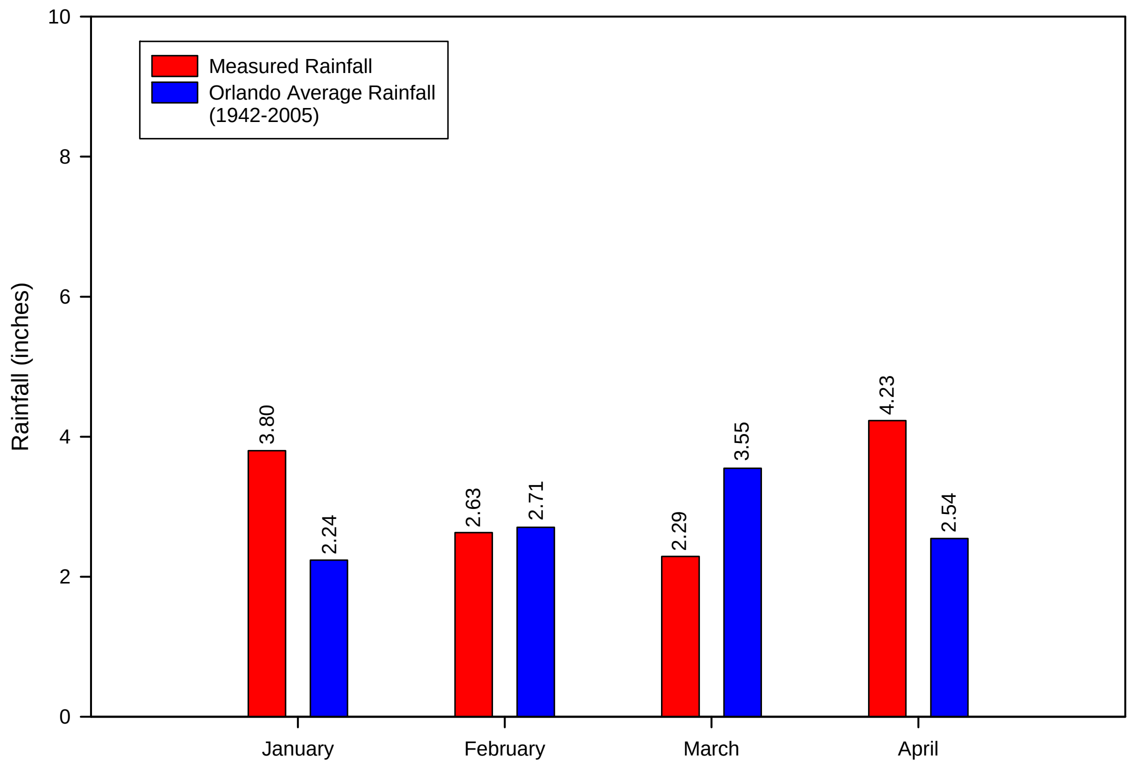


Figure 3-1. Comparison of Average and Measured Rainfall in the Vicinity of the New York Avenue Exfiltration System Site.

As seen in Figure 3-1, measured rainfall in the vicinity of the exfiltration system site was greater than "normal" during January and April, even though the field monitored rainfall included only half of each month. Measured rainfall during February and March was slightly less than "normal". Overall, the field measured rainfall of 12.95 inches from January-April 2008 is approximately 17% greater than the "average" rainfall of 11.04 inches which typically occurs during the period from January-April in the Central Florida area.

3.1.2 Hydrologic Inputs

The autosampler installed by ERD at the inflow to the exfiltration system contained an internal flow meter which provided measurements of stormwater discharge based upon water depth, geometric characteristics of the stormsewer, and measured water velocity. However, as discussed in Section 2, leaves and other debris frequently accumulated within the diversion structure, interfering with the accuracy of the velocity measurements. Although the operation of the flow sensor was sufficient to pace the autosampler for collection of stormwater inflow, the measured discharge rates are not considered to be accurate enough to provide estimates of hydrologic inputs associated with monitored storm events. Therefore, it was decided to hydrologically model the estimated runoff volume associated with each of the individual monitored rainfall events summarized in Table 3-1. The results of this modeling exercise would then be used to represent the total runoff volume which discharged into the exfiltration system during the monitoring program.

The SCS curve number methodology was used to generate estimates of the runoff volumes produced within the drainage sub-basin area for each of the monitored rainfall events listed in Table 3-1. The SCS methodology utilizes the hydrologic characteristics of the drainage basin, including impervious area, directly connected impervious area (DCIA), and soil curve numbers to estimate runoff volumes for modeled storm events. Hydrologic characteristics were developed by ERD for each of the three sub-basin areas, identified in Figure 2-2, which discharge to the exfiltration system. Individual hydrologic characteristics were developed for each land use category within each of the three sub-basins for use in hydrologic modeling. A summary of this information is provided in Appendix B. Hydrologic characteristics of the sub-basin areas were determined by ERD based upon a review of available aerial photography and a field reconnaissance of the sub-basin areas.

A summary of general hydrologic characteristics for each of the three sub-basin areas is given in Table 3-3. The total basin area discharging to the exfiltration system is approximately 61.78 acres which includes 27.5 acres of impervious area. Approximately 14.89 acres of the impervious area are considered to be DCIA for modeling purposes. As discussed previously, soils within the drainage basin are well-drained and are classified in HSG A which is reflected in the selected pervious CN values listed in Table 3-3.

TABLE 3-3

CHARACTERISTICS OF THE NEW YORK AVENUE EXFILTRATION SYSTEM DRAINAGE BASIN AREA

PARAMETER	SUB-BASIN 1	SUB-BASIN 2	SUB-BASIN 3	TOTALS
Total Area (acres)	18.47	34.14	9.17	61.78
Impervious Area (acres)	0.27	23.11	4.13	27.51
DCIA (acres)	0.00	12.87	2.02	14.89
DCIA (%)	0.00	37.7	22.0	24.1
Pervious CN	39	39	39	39
Non-DCIA CN	39.9	67.4	56.4	54.9
S (inches)	15.1	6.74	7.73	9.39

After estimating the hydrologic characteristics of the basin area, the runoff volume for each rainfall event is calculated by adding the rainfall excess from the non-directly connected impervious area (non-DCIA) portion to the rainfall excess created from the DCIA portion for the basin. Rainfall excess from the non-DCIA areas is calculated using the following set of equations:

$$Soil\ \ Storage,\ S\ =\ \left(\frac{1000}{nDCIA\ \ CN}\ -\ 10\right)$$

$$nDCIA\ \ CN\ =\ \frac{[CN\ *\ (100\ -\ IMP)]\ +\ [98\ (IMP\ -\ DCIA)]}{(100\ -\ DCIA)}$$

$$Q_{nDCIA_i}\ =\ \frac{(P_i\ -\ 0.2S)^2}{(P_i\ +\ 0.8S)}$$

where:

CN	=	curve number for pervious area
IMP	=	percent impervious area
DCIA	=	percent directly connected impervious area
nDCIA CN	=	curve number for non-DCIA area
P_i	=	rainfall event depth (inches)
Q_{nDCIAi}	=	rainfall excess for non-DCIA for rainfall event (inches)

For the DCIA portion, rainfall excess is calculated using the following equation:

$$Q_{DCIA_i}\ =\ (P_i\ -\ 0.1)$$

When P_i is less than 0.1, Q_{DCIAi} is equal to zero. This methodology was used to estimate the generated runoff volume within each of the delineated sub-basin areas for each of the rainfall events listed in Table 3-1.

The methodology outlined above provides an estimate of the "generated" runoff volume for each sub-basin area. However, significant portions of the generated runoff volume may be attenuated during migration through stormwater management systems or in depressional areas within individual sub-basin areas. If the stormwater management system provides dry retention treatment, a large portion of the runoff volume may be infiltrating into the ground and not reach the receiving water as a surface flow. If the area contains depressional areas, then much of the generated runoff volume may simply infiltrate into the ground or evaporate, and relatively large rain events may be required to actually result in transport of runoff from the sub-basin area. The watershed model used for estimation of runoff volumes includes estimates of the types of stormwater management systems utilized within each sub-basin area, the amount of developed area treated by each stormwater management type, and volume reductions for depressional areas. Estimates of the amount of generated runoff volume which is attenuated in stormwater management systems or in depressional areas are included in the model, and the attenuated volume is subtracted from the generated volume within each sub-basin. The result is an estimate of the runoff volume which actually discharges into the stormsewer system from each sub-basin area as a surface inflow.

A summary of estimated volumetric removal efficiencies for stormwater management systems and depressional areas in the exfiltration system drainage basin is given in Table 3-4. These volumetric removals are based on previous research performed by ERD on the performance efficiencies of stormwater management systems used in the State of Florida. Developed areas treated by dry retention are assumed to have a volumetric loss of approximately 80% for runoff inputs due to infiltration and evaporation within the pond. The information summarized in Table 3-4 is used to assist in calculation of estimated runoff inflow from sub-basin areas into the exfiltration system.

TABLE 3-4

ESTIMATED VOLUMETRIC REMOVAL EFFICIENCIES FOR STORMWATER MANAGEMENT SYSTEMS AND DEPRESSIONAL AREAS IN THE EXFILTRATION SYSTEM DRAINAGE BASIN

SUB-BASIN	SYSTEM TYPE	VOLUME REDUCTION (%)
1	Depressional Area	95
3	Dry Retention	80

The 9.17-acre medium-density residential area which forms Sub-basin 3 discharges to a dry retention facility. A volumetric loss of 80% is assumed for this sub-basin. No significant stormwater treatment for depressional areas are thought to exist in Sub-basin 2, and no volumetric reductions are assumed for this sub-basin. Sub-basin 1 appears to consist of a relatively low-lying area which must accumulate standing water before significant discharges can occur into downstream portions of the drainage basin. It is thought that this sub-basin contributes stormwater runoff into the stormsewer system only during significant rain events. As a result, a volumetric removal efficiency of approximately 95% is assumed for runoff generated within this sub-basin. However, due to the lack of impervious areas in this sub-basin, the predicted runoff generation rate is low, even if the depressional attenuation is not considered. Additional details concerning hydrologic modeling for estimation of runoff volumes discharging to the New York Avenue exfiltration system is given in Appendix B.

A summary of modeled runoff inputs to the New York Avenue exfiltration system from January 15-April 15, 2008 is given in Table 3-5 using the methodology outlined previously. Due to the anticipated depressional storage and dry retention stormwater treatment system, little generated runoff is predicted to occur in Sub-basins 1 or 3. A substantially larger runoff volume is predicted for Sub-basin 2 which has no significant stormwater treatment or depressional storage attenuation mechanisms.

TABLE 3-5

MODELED RUNOFF INPUTS TO THE NEW YORK AVENUE EXFILTRATION SYSTEM FROM JANUARY 15-APRIL 15, 2008

PARAMETER	SUB-BASIN			TOTALS
	1	2	3	
Area (acres)	18.47	34.14	9.17	61.78
Runoff Volume (ac-ft)	0.00	13.37	0.35	13.72
Runoff C Value	0.000	0.363	0.035	0.240

Based upon the hydrologic modeling, the runoff volume reaching the exfiltration system during the period from January 15-April 15, 2008 is approximately 13.72 ac-ft. Using the recorded rainfall depth of 12.95 inches during this period, the calculated watershed runoff coefficient for the 61.78-acre drainage basin area is approximately 0.240. This value suggests that approximately 24.0% of the rainfall volume within the drainage basin becomes stormwater runoff.

As discussed in Section 2, flow monitoring was also conducted in the 48-inch RCP located downstream from the diversion weir structure to document the quantity of runoff discharges which discharge over the diversion weir and bypass the exfiltration system. No significant flows were recorded through the downstream 48-inch RCP during the 91-day monitoring program. However, water levels ranging from 0.02-0.42 inches were recorded in the 48-inch RCP following several significant storm events. These flows are thought to be insignificant with respect to the overall runoff volume and appear to reflect low level water leakage through the aluminum gate installed in the diversion weir structure. Therefore, for purposes of this analysis, the overflow volume for stormwater runoff is assumed to be zero.

3.2 Chemical Characteristics of Monitoring Inflow and Outflow

ERD collected ten flow-weighted composite inflow samples to the New York Avenue exfiltration system during the period from January 15-April 15, 2008. Each inflow sample was collected as a flow-weighted composite between the beginning and ending period for each rain event. A complete listing of the chemical characteristics of individual composite inflow samples collected during the monitoring program is given in Table 3-6. Monitored rain events range from 0.21-2.11 inches, with an overall mean of 0.86 inches per monitored event.

In general, runoff collected at the inflow monitoring site was found to be approximately neutral in pH, with measured pH values ranging from 6.32-7.40. The runoff inflow was found to be poorly to moderately buffered, with alkalinity values ranging from 17.4-83.0 mg/l. The runoff samples were characterized by relatively low conductivity levels, with measured values ranging from 43-183 μmho/cm. The observed conductivity values at this site are somewhat less than values commonly observed in urban runoff.

In general, a relatively high degree of variability was observed in measured concentrations for the evaluated nitrogen species. Variability in measured nitrogen concentrations is common in urban runoff samples. Measured concentrations for the individual nitrogen species are typical of values commonly observed in urban runoff. The average total nitrogen concentration measured at the site is 1386 μg/l. Approximately 61% of the total nitrogen measured at the inflow monitoring site was contributed by particulate nitrogen, with 22% by dissolved organic nitrogen, 11% by ammonia, and 6% by NO_x.

Relatively elevated concentrations of phosphorus species were observed at the inflow monitoring site, with measured total phosphorus concentrations ranging from 113-1136 μg/l, with an overall mean of 356 μg/l. This mean total phosphorus value is somewhat higher than concentrations commonly observed in urban runoff. A relatively wide range of concentrations was observed for soluble reactive phosphorus (SRP), dissolved organic phosphorus, and particulate phosphorus measured at the site. Of the total phosphorus measured at the inflow monitoring site, approximately 47% is contributed by particulate phosphorus, 44% by SRP, and 9% by dissolved organic phosphorus. Relatively elevated levels of SRP, with concentrations in excess of 150 μg/l, were observed during four of the 10 monitoring events at this site.

Stormwater runoff collected at the inflow monitoring site was found to have highly variable concentrations for both turbidity and TSS, with approximately a 25-fold difference between minimum and maximum values measured for each of these parameters. Highly variable values of BOD were also observed at the monitoring site, with measured concentrations ranging from 2.3-17.9 mg/l. However, measured BOD concentrations at the inflow monitoring site are typical of values commonly observed in urban runoff.

A graphical statistical comparison of the chemical characteristics of inflow samples collected at the exfiltration monitoring site was developed for general parameters, nitrogen species, and phosphorus species. A graphical summary of data for each parameter is presented in the form of Tukey box plots, also often called "box and whisker plots". The bottom line of the box portion of each plot represents the lower quartile, with 25% of the data points lying below this value. The upper line of the box represents the 75% upper quartile, with 25% of the data lying above this value. The **blue** horizontal line within the box represents the median value, with 50% of the data lying both above and below this value. The **red** horizontal line within the box represents the mean of the data points. The vertical lines, also known as "whiskers", represent the 5 and 95 percentiles for the data sets. Individual values which lie outside of the 5-95 percentile range, sometimes referred to as “outliers”, are indicated as **red dots**.

TABLE 3-6

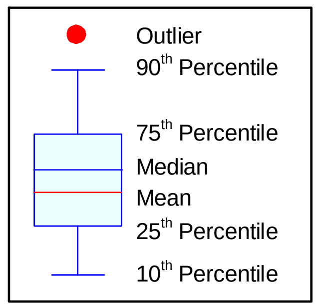
CHEMICAL CHARACTERISTICS OF RUNOFF SAMPLES COLLECTED AT THE INFLOW TO THE NEW YORK AVENUE EXFILTRATION SYSTEM FROM JANUARY 15-APRIL 15, 2008

DATE	PARAMETER															RAINFALL (inches)
	pH (s.u.)	Alk. (mg/l)	Cond. (µmho/cm)	NH_3 (µg/l)	NO_x (µg/l)	Diss. Org. N (µg/l)	Part. N (µg/l)	Total N (µg/l)	SRP (µg/l)	Diss. Org. P (µg/l)	Part. P (µg/l)	Total P (µg/l)	Turb. (NTU)	TSS (mg/l)	BOD (mg/l)	
1/23/08	6.75	20.4	43	10	27	128	429	594	31	14	71	116	8.6	41.5	7.0	1.43
2/21/08	6.81	83.0	183	86	109	1003	329	1527	183	45	89	317	3.4	19.4	9.4	0.30
2/23/08	6.69	29.8	84	102	86	180	1698	2066	49	4	280	333	13.6	67.6	5.7	0.43
2/26/08	6.79	44.6	144	61	83	472	2109	2725	57	30	421	508	56.8	131	17.9	0.81
3/6/08	6.65	32.2	69	58	84	158	148	448	78	7	28	113	3.7	10.0	8.1	1.17
3/7/08	6.46	20.8	56	196	61	151	451	859	57	5	93	155	12.4	33.4	3.9	0.21
3/20/08	6.70	44.2	122	451	9	793	1979	3232	630	114	392	1136	14.9	43.5	15.6	0.25
4/1/08	6.40	27.6	76	185	156	96	623	1060	219	54	164	437	7.6	48.0	5.6	0.86
4/5/08	6.32	17.4	45	101	139	33	534	807	54	19	84	157	7.5	27.0	2.9	2.11
4/6/08	7.40	74.2	133	286	<5	65	185	539	229	14	49	292	1.8	5.6	2.3	1.05
Average	**6.70**	**39.4**	**96**	**154**	**84**	**308**	**849**	**1386**	**159**	**31**	**167**	**356**	**13.0**	**42.7**	**7.8**	**0.86**
Minimum	**6.32**	**17.4**	**43**	**10**	**9**	**33**	**148**	**448**	**31**	**4**	**28**	**113**	**1.8**	**5.6**	**2.3**	**0.21**
Maximum	**7.40**	**83.0**	**183**	**451**	**156**	**1003**	**2109**	**3232**	**630**	**114**	**421**	**1136**	**56.8**	**131.0**	**17.9**	**2.11**

A summary of statistical variability in general parameters measured at the inflow monitoring site is given on Figure 3-2. A relatively low degree of variability was observed in measured pH values at the inflow monitoring site. However, a substantially larger degree of variability was observed in measured concentrations for the remaining parameters. Each of the remaining parameters had at least one “outlier” value which lies outside of the 95 percentile “whisker”. A comparison of variability in measured nitrogen species at the inflow monitoring site is given on Figure 3-3. A relatively high degree of variability was observed for each of the measured nitrogen species, although variability in nitrogen species is commonly observed in urban runoff.

A comparison of variability in measured concentrations for phosphorus species is given on Figure 3-4. A particularly large range of degree of variability was observed for measured concentrations of SRP, dissolved organic phosphorus, and total phosphorus. The variability observed for the measured phosphorus species appears to be well outside of the range of variability commonly observed for phosphorus species in urban runoff.

Legend for Figures 3-2, 3-3, and 3-4:



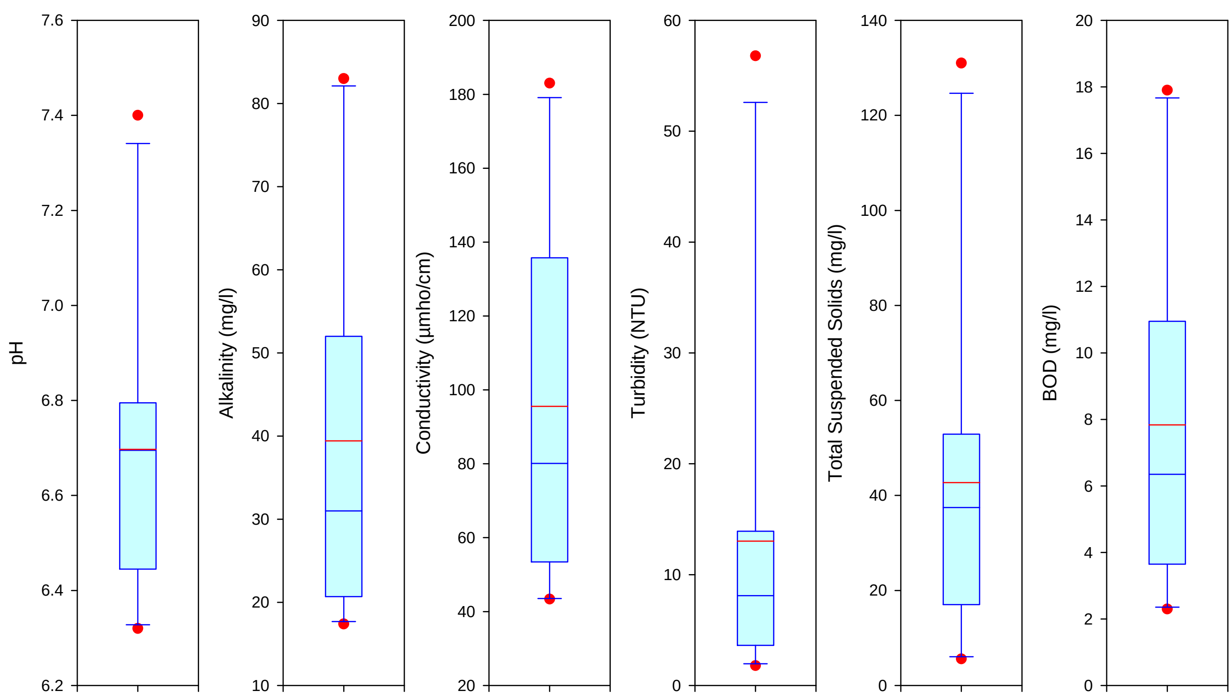


Figure 3-2. Summary of Statistical Variability in General Parameters Measured at the New York Avenue Exfiltration System Inflow Monitoring Site.

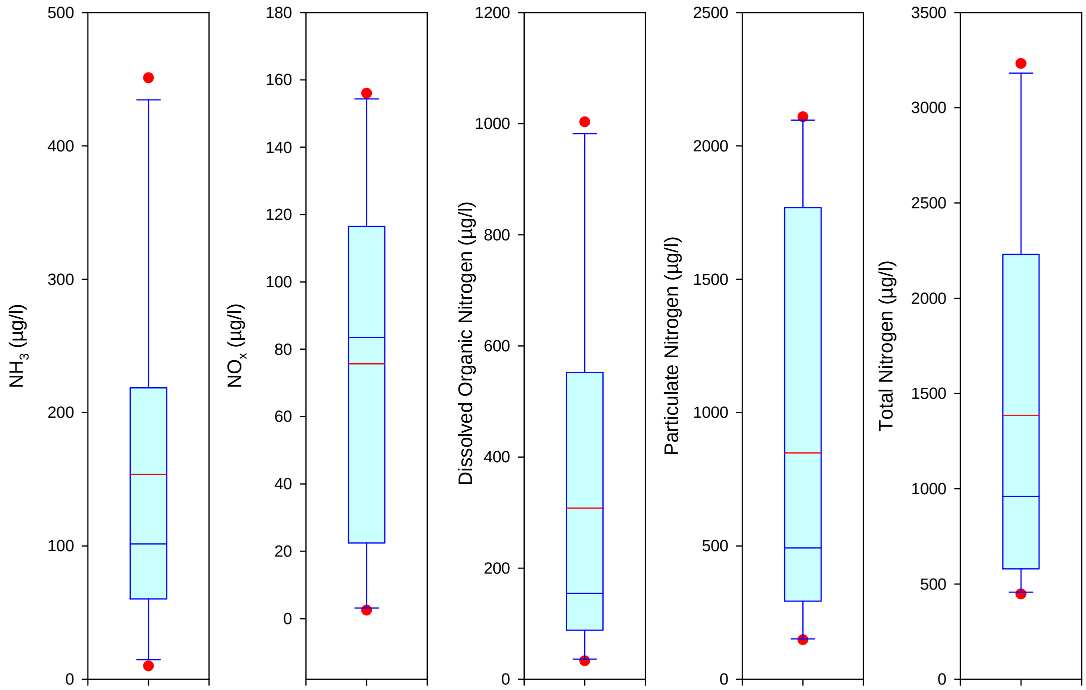


Figure 3-3. Summary of Statistical Variability in Nitrogen Species Measured at the New York Avenue Exfiltration System Inflow Monitoring Site.

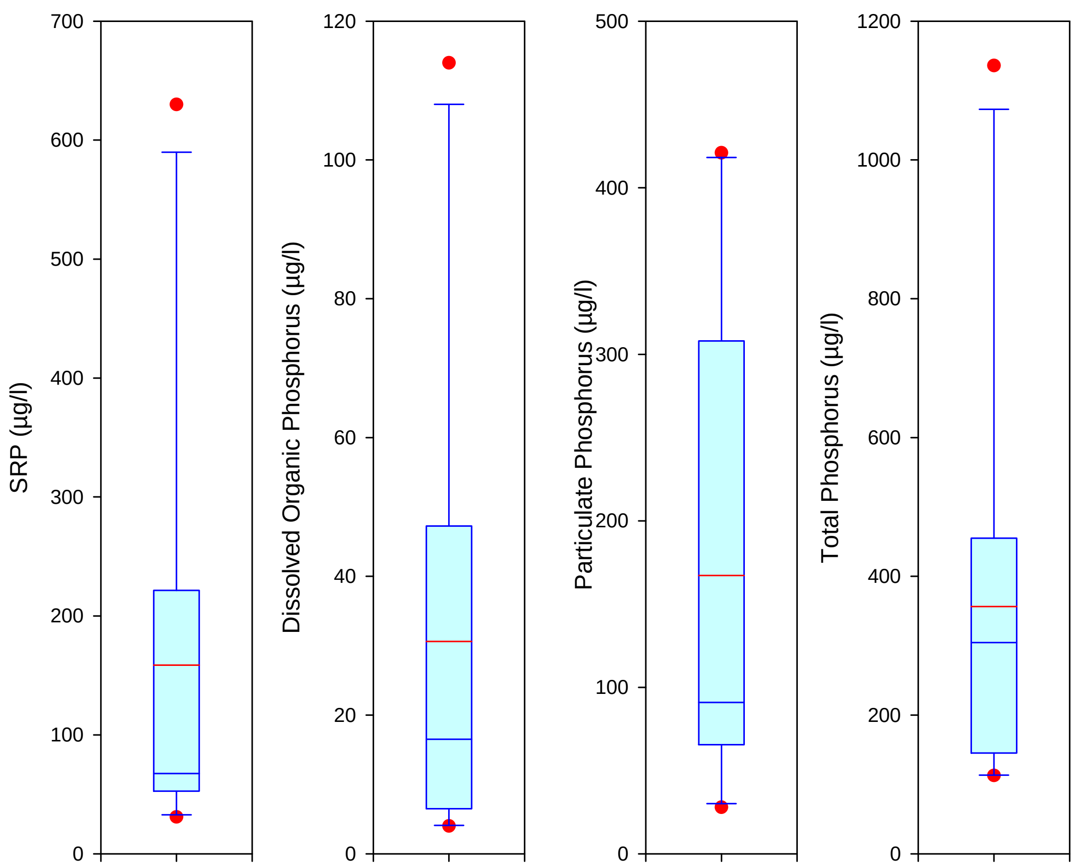


Figure 3-4. Summary of Statistical Variability in Phosphorus Species Measured at the New York Avenue Exfiltration System Inflow Monitoring Site.

3.3 Estimated System Removal Efficiency

The primary objective of the monitoring efforts discussed in this report is to estimate the mass removal efficiency of the exfiltration system by comparing calculated mass loadings in the inflow and outflow to the unit over the 91-day monitoring period. However, as discussed in Section 2, no significant discharge was observed over the diversion weir structure during the monitoring program, indicating that virtually all generated runoff within the drainage basin entered the exfiltration system. This implies a removal efficiency of 100% since none of the generated runoff volume was discharged to the downstream waterbody. The field monitoring program included rain events as large as 2.11 inches which did not result in discharges over the diversion weir. This finding is significant since rain events in excess of 2.1 inches rarely occur during an annual rainfall cycle.

Although an apparent removal efficiency of 100% was observed during the monitoring program, it is unlikely that the system would achieve a removal efficiency of 100% on an annual basis. Based upon the design retention volume of 0.5-inch of runoff over the watershed area and the modeled drainage basin runoff coefficient of 0.240, the theoretical capacity of the exfiltration system is equal to approximately 2.08 inches of rainfall (0.5 inches divided by 0.240). However, there are several factors which suggest that the observed removal efficiency of 100% is not likely to be achieved over an annual cycle. First, rain events in excess of approximately 2.1 inches, although rare, will cause over-topping of the diversion weir structure and discharges to the downstream conveyance system. In addition, most of the observed significant rain events during the monitoring program were separated by several or more days of either low or no measured rainfall. This allowed the exfiltration system to recover virtually completely between the observed significant events. However, complete recovery of the exfiltration system may not be possible during the summer months when rainfall events may be more frequent.

An evaluation of estimated mean annual mass removal efficiencies for dry retention systems was conducted by ERD (2007) as part of an evaluation for the Florida Department of Environmental Protection. This evaluation was summarized in a document titled "Evaluation of Current Stormwater Design Criteria within the State of Florida – Final Report". Appendix D of this document titled "Calculated Performance Efficiency of Dry Retention as a Function of DCIA and Non-DCIA Curve Number" contains a series of tables for five meteorological zones within the State of Florida for retention depths ranging from 0.25-4.00 inches in 0.25-inch increments. These tables reflect a continuous simulation of the performance of a dry retention system over a period of record of more than 50 years.

A summary of the estimated performance efficiency for the New York Avenue exfiltration system is given in Table 3-7. Central Florida is located in meteorological zone 2 based upon the 2007 ERD report. As indicated in Table 3-2, the drainage basin area for the New York Avenue exfiltration system has a DCIA percentage of 24.1% and a non-DCIA curve number of 54.9. When these input data are iterated in the tables provided in Appendix D of the ERD report, the estimated annual performance efficiency is approximately 83%. This value indicates that approximately 83% of the annual runoff volume will be removed by the dry retention system as a result of infiltration into the soil. Therefore, for purposes of this analysis, it is assumed that the New York Avenue exfiltration system will have an annual removal efficiency of approximately 83%.

TABLE 3-7

ESTIMATED PERFORMANCE EFFICIENCY FOR THE NEW YORK AVENUE EXFILTRATION SYSTEM

PARAMETER	VALUE
Meteorological Zone	2
Percent DCIA (%)	24.1
Non-DCIA CN	54.9
Retention Depth (inches)	0.5
Annual Removal (%)	83.0

A summary of calculated annual mass removals for the New York Avenue exfiltration system is given in Table 3-8. The generated runoff volume is calculated based upon a watershed area of 61.78 acres, an annual C value of 0.240, and annual rainfall of 50 inches for the Central Florida area. Based upon these assumptions, the generated annual runoff volume within the drainage basin area is approximately 61.75 ac-ft. It is assumed that 83% of this volume will be removed by the exfiltration system, with the remaining volume (approximately 10.50 ac-ft) discharging to Lake Maitland. Estimates of annual mass loadings for total nitrogen, total phosphorus, TSS, and BOD were calculated by multiplying the mean runoff concentrations summarized in Table 3-6 times the generated runoff volume of 61.75 ac-ft/yr. These values are summarized in Table 3-8 as the generated pollutant mass for each parameter. The annual mass loading removed by the exfiltration system is calculated assuming that approximately 83% of the mass loading will be retained within the system, with 17% of the mass loading discharging to downstream waterbodies. Based upon this analysis, the New York Avenue exfiltration system is expected to remove approximately 87.6 kg/yr of total nitrogen, 22.5 kg/yr of total phosphorus, 2699 kg/yr of TSS, and 493 kg/yr of BOD.

TABLE 3-8

SUMMARY OF ANNUAL MASS REMOVALS FOR THE NEW YORK AVENUE EXFILTRATION SYSTEM

PARAMETER	UNITS	GENERATED VOLUME/MASS	REMOVED IN EXFILTRATION SYSTEM	DISCHARGE TO LAKE MAITLAND
Runoff Volume	ac-ft/yr	61.75	51.25	10.50
Total Nitrogen Load	kg/yr	105.5	87.6	17.9
Total Phosphorus Load	kg/yr	27.1	22.5	4.6
TSS Load	kg/yr	3252	2699	553
BOD Load	kg/yr	594	493	101

An evaluation of estimated present worth costs for the New York Avenue exfiltration system is given in Table 3-9. This analysis assumes a construction cost of $1,154,441.32 and an annual maintenance cost of approximately $20,000 per year for 20 years. This equates to an estimated present worth cost of approximately $1,554,441.32.

TABLE 3-9

EVALUATION OF PRESENT WORTH COST FOR THE NEW YORK AVENUE EXFILTRATION SYSTEM

PARAMETER	VALUE
Basin Area (acres)	61.78
Design Retention Treatment Provided (inches)	0.5
BMP Construction Costs ($) (Land: $0 + Construction: $1,154,441.32)	$1,154,441.32
Annual Maintenance Cost ($)	20,000
Present Worth Cost (20-year) ($)	$1,554,441.32

An evaluation of load reduction costs for the New York Avenue exfiltration system is given in Table 3-10. The estimated annual mass removal for total nitrogen, total phosphorus, TSS, and BOD is divided by the 20-year present worth cost of $1,554,441.32. The resulting present worth costs per kg of pollutant removed are summarized in the last row of Table 3-10.

TABLE 3-10

EVALUATION OF LOAD REDUCTION COSTS FOR THE NEW YORK AVENUE EXFILTRATION SYSTEM

PARAMETER	TOTAL NITROGEN	TOTAL PHOSPHORUS	TSS	BOD
Annual Mass Removed (kg/yr)	87.6	22.5	2699	493
Present Worth Cost per kg Removed ($)	887	3454	28.8	158

3.4 Quality Assurance

Supplemental samples were collected during the field monitoring program for quality assurance purposes. These supplemental samples include equipment blanks and duplicate samples, along with supplemental laboratory analyses to evaluate precision and accuracy of the collected data. A summary of QA data collected as part of this project is given in Appendix C.

SECTION 4

SUMMARY

A field monitoring program was conducted by ERD from January-April 2008 to evaluate the performance efficiency of the New York Avenue exfiltration system. The exfiltration system is designed to provide dry retention treatment for 0.5-inch of runoff for 61.78 acres of a 95-acre contributing basin area. Automatic samplers with integral flow meters were used to provide a continuous record of hydrologic discharges through the basin area, as well as collect runoff samples on a flow-weighted basis. A recording rain gauge was also installed adjacent to the monitoring site.

Composite runoff samples were collected during a total of 10 storm events at the monitoring site. The collected runoff samples were found to be highly variable with respect to chemical characteristics, with relatively elevated concentrations for most phosphorus species. No significant discharges were observed over the diversion weir structure during the 91-day monitoring program, which included measured rain events as great as 2.11 inches, suggesting that virtually 100% of the generated runoff volume was retained by the exfiltration system.

A supplemental analysis was conducted which estimated that the long-term annual removal efficiency of the exfiltration system will be approximately 83%. Based upon this estimated performance efficiency and the chemical characteristics of runoff collected at the site, it is estimated that the New York Avenue exfiltration system will provide removal for approximately 87.6 kg/yr of total nitrogen, 22.5 kg/yr of total phosphorus, 26.99 kg/yr of TSS, and 493 kg/yr of BOD.

A summary of total project costs is given in Table 4-1. FDEP and the City of Winter Park each contributed 50% ($ 609,434.15) of the total project cost.

TABLE 4-1

SUMMARY OF TOTAL PROJECT COSTS AND FUNDING SOURCES

PROJECT FUNDING ACTIVITY	TOTAL PROJECT COSTS ($)	DEP GRANT FUNDS ($)	CITY OF WINTER PARK FUNDS ($)
Staff	32,033.08	--	32,033.08
Travel	--	--	--
Equipment	--	--	--
Supplies	--	--	--
Contractual	--	--	--
BMP Implementation	1,154,441.32	609,434.15	545,007.17
Monitoring	32,393.90	--	32,393.90
Public Education	--	--	--
Other	--	--	--
TOTAL:	**$ 1,218,868.30**	**$ 609,434.15**	**$ 609,434.15**
PERCENTAGE MATCH:		**50**	**50**

APPENDICES

APPENDIX A

CONSTRUCTION PLANS FOR THE NEW YORK AVENUE EXFILTRATION SYSTEM

CONSTRUCTION PLANS

FOR

NEW YORK AVE EXFILTRATION SYSTEM

FLORIDA FOREVER AND THE CITY OF WINTER PARK

City Of Winter Park

WP - 4 - 2007

DAVID C. STRONG
MAYOR

DOUGLAS R. STORER
COMMISSIONER

DOUGLAS METCALF
COMMISSIONER

BARBARA DEVANE
COMMISSIONER

JOHN ECKBERT
COMMISSIONER

JAMES S. WILLIAMS, P.E.
CITY MANAGER

TROY R. ATTAWAY, P.E.
DIRECTOR of PUBLIC WORKS

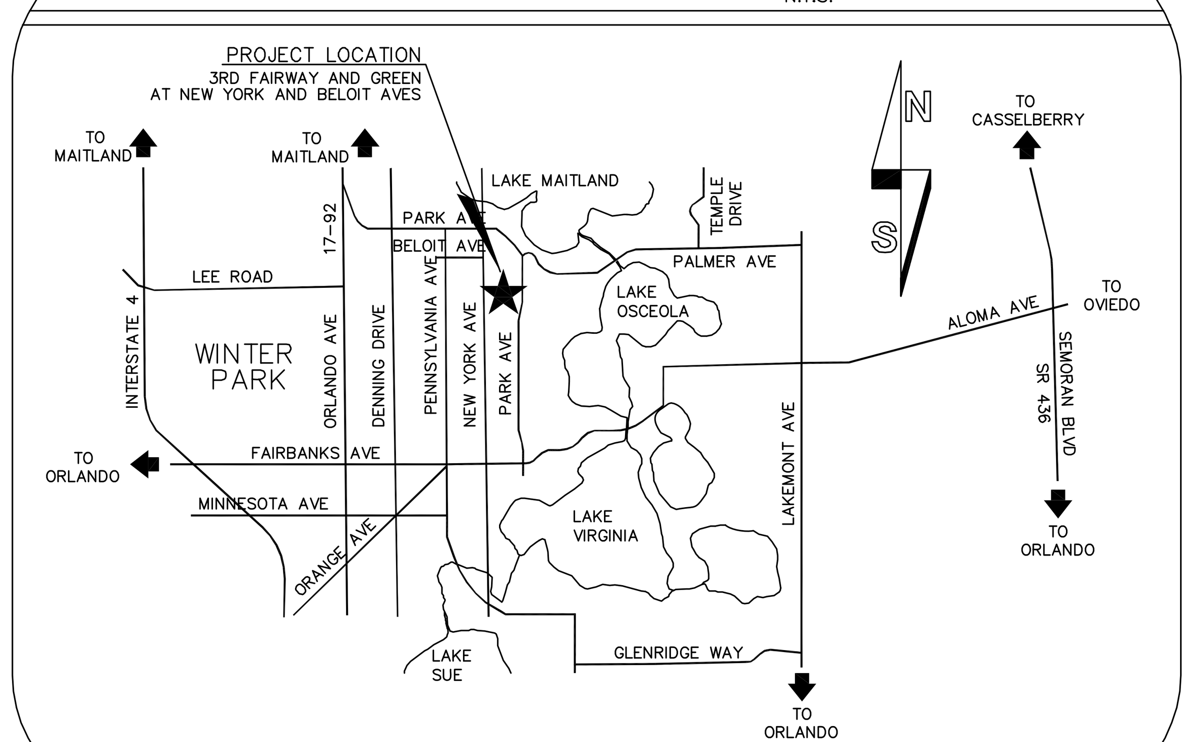
DONALD J. MARCOTTE, P.E.
CITY ENGINEER, ASSISTANT PW DIRECTOR

JOSEPH SERRANO
PROJECT MANAGER, ASSISTANT PW DIRECTOR

UTILITIES ENCOUNTERED

CALL SUNSHINE 48 HOURS BEFORE YOU DIG 1-800-432-4770
TECO PEOPLES GAS 407-420-2678
CITY OF WINTER PARK WATER AND WASTEWATER 407-599-3458
BRIGHTHOUSE NETWORKS 407-532-8520
CITY OF WINTER PARK STREETS AND DRAINAGE 407-599-3233
SPRINT (TELEPHONE) 407-830-3428
CITY OF WINTER PARK (ELECTRIC) 407-599-3491

LOCATION MAP N.T.S.



WINTER
PARK
LOCATION MAP
N.T.S.

INDEX OF SHEETS

GRAPHIC SYMBOLOGY LEGEND

SECTION LINE
CITY LINE
BASE OR SURVEY LINE
RIGHT OF WAY
LIMITED ACCESS LINE
FENCE LINE
BOX CULVERT
BRIDGE
STORM SEWER INLET
MANHOLE
SURVEY REFERENCE POINT
BENCH MARK — B.M. NO. 112
POINT OF INTERSECTION
NORTH POINT
BASE LINE
CENTERLINE
PROPERTY LINE
DELTA ANGLE — Δ
APPROXIMATE — $\pm$
ROUND — Ø
CURB
CURB AND GUTTER

HEDGE
TREES
EDGE OF WOODED AREA
CONCRETE
RATE OF SUPERELEVATION — e
POWER POLE
OVERHEAD POWER CABLE — OE (7.5KV)
TELEPHONE POLE
OVERHEAD TELEPHONE POLE — OT (100 PR)
GUY WIRE AND ANCHOR PIN
BURIED POWER CABLE — BE (7.5KV)
ELECTRIC DUCT — BE 4MTD (7.5KV)
BURIED TELEPHONE CABLE — BT (200PR)
TELEPHONE DUCT — BT 6MTD
LIGHT POLE
GAS MAIN — 6" GM
WATER MAIN — 6" WM
SANITARY SEWER — 8" SAN
MANHOLE
VALVE
FIRE HYDRANT
UNDERGROUND CABLE TELEVISION — UG (CATV)
OVERHEAD CABLE TELEVISION — OH (CATV)

1. All construction is to conform with City of Winter Park standards and specifications, unless otherwise waived by the City Engineer.

2. The Engineer certifies that all roadways were designed to the applicable standards, as set forth by The City of Winter Park and the latest edition of the Florida Department of Transportation Manual of Uniform Standards for Design, Construction, and Maintenance for Streets and Highways.

3. The Contractor shall coordinate all work within existing road right–of–ways with The City of Winter Park and the Florida Department of Transportation.

4. It will be the responsibility of the Contractor to get the necessary Right–of–Way Permit(s) and provide for the safety and control of local traffic during construction.

5. The Contractor shall be extremely cautious when working near trees that are to be saved, whether shown in the plans or designated in the field.

6. The Contractor shall be responsible for locating and verifying (horizontally and vertically) all existing utilities before construction, and for notifying the various utility companies to arrange for any relocation, temporary disruption of service, or clarification of activity regarding said utility. The contractor shall exercise caution when crossing an underground utility, whether shown in these plans or field located. All utilities which interfere with the proposed construction shall be relocated by the respective utility companies and the Contractor shall cooperate with them during relocation operations. Any delay or inconvenience of the various utilities shall be incidental to the contract and no extra compensation will be allowed.

7. The locations of all existing utilities, facilities, and any other features shown on these plans have been determined from the best available information and are provided for the convenience of the Contractor. The Engineer does not guarantee the accuracy or the completeness of the location information provided. Any inaccuracy or omission in such information shall not relieve the Contractor of his responsibility to protect such existing features from damage or unscheduled interruption of service. Should a discrepancy arise between these plans and actual field conditions which would appreciably affect the execution of these plans, the Contractor will halt construction and notify the Engineer immediately.

8. The Contractor shall be responsible for meeting all inspection criteria and schedules, and for signing for said inspections.

9. The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades or grading sections established for this project, except where such excavation or removal is provided for in the contract, plans or specifications.

10. All work and materials furnished shall conform with the lines,grades, grading sections, cross sections, dimensions, material requirement, and testing requirements specified in the contract, plans or specifications.

11. Prior to commencing work, the Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards and the control of traffic, in conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways or as directed by the City of Winter Park Traffic Engineer, to effectively prevent accidents in all places where the work causes obstruction to traffic or constitutes in any way a hazard to the public.

12. Compact all utility trenches within the top two (2) feet of the roadways to 98% of the Modified Proctor Maximum Density, and to 95% within other areas.

13. The Contractor shall be responsible for the maintenance of all landscape buffers, retention and detention facilities until the work has been accepted by the Owner. All disturbed areas shall be returned to their original condition.

14. The Contractor shall comply with all legal load restrictions in the hauling of materials in public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for the damage that may result from the moving of material and equipment.

15. The Contractor shall familiarize himself with the policies and guidelines established by The City of Winter Park, Florida for the preservation of all public and private property. The Contractor shall be responsible for all damage or injury to property of any character during the execution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at anytime due to defective work or materials.

16. Fire protection shall be provided according to Winter Park Fire Department Regulations.

17. The Contractor shall ensure that proper soil densities are achieved for placement of all drainage improvememts and roadway restoration . It will also be the responsibility of the Contractor to ensure that sufficient geotechnical testing has been performed prior to construction. City EOS consultants are to perform geotechnical testing.

18. The Contractor shall be responsible for obtaining area(s) for staging equipment and materials.

19. Area(s) for staging equipment and materials must be reviewed and approved by the City prior to use.

20. The Contractor shall include dewatering and shoring costs in the cost of storm sewer improvement installations. Silent Pack dewatering pumps are required. Contractor is responsible for reviewing the soils information provided with the plans and specifications and conforming to to the recommendations made within.

21. The City of Winter Park will provide and pay for necessary M.O.T. devices. The Contractor is responsible for developing the M.O.T. plan to be approved by the City, and daily inspection and maintainence of M.O.T. devices and placement.

22. The Contractor is responsible for the restoration of any and all components of private and / or public property that are removed, disturbed, and or damaged due to construction. Items included but not limited to landscaping, irrigation systems, curb, sidewalk, driveway approaches, mail boxes, walls, fences, lighting, columns, sod, ect. Contractor will be responsible for reported damage due to excessive vibration resulting from construction activities.

23. The F.D.O.T. Roadway and Traffic Design Standards (booklet dated January 1994) is to be used for drainage structures and pavement markings.

24. All Reinforced Concrete Pipe (RCP) shall be minimum Class III.

25. The Contractor shall schedule the City's EOS Geotechnical Consultant for all testing to certify all site , utility , and roadway compaction, underdrain and pavement construction to plan specifications. Geotechnical recommendations are not the responsibility of City Engineering Staff. The City of Winter Park has relied on the geotechnical report in the preparation of the plans. Any conflict between information within the report and these plans shall be reported to the Engineer and/or Owner. The City of Winter Park assumes no responsibility for the correctness, completeness. or accuracy of the geotechnical Information.

26. During construction, no direct discharge of water will be allowed to downstream receiving waters. The Contractor is responsible for water quality and shall route discharges in such a manner to adequately remove silt before runoff from the site.

27. Erosion Control Notes

a. Provide effective temporary and permanent erosion control following the requirements in Section 104 of the State of Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 1992 Edition (FDOT Section 104).

b. Control features, methods and conditions included in this contract include the following as indicated by X in blank:

_X_ (1) Coordinate construction of temporary erosion control features with permanent erosion control features.

_X_ (2) Control operation which result in water pollution (FDOT Section 104–3).

_X_ (3) Provide schedule for clearing and grubbing, earthwork operations and construction of permanent erosion control features and proposed use of temporary erosion control features (FDOT Section 104–5).

_X_ (4) Temporary grassing (FDOT Section 104–6.4.2).

_X_ (5) Temporary sod (FDOT Section 104–6.4.3).

_X_ (6) Temporary mulching (FDOT Section 104–6.4.4).

_X_ (7) Sandbagging (FDOT Section 104–6.4.5).

_X_ (8) Baled hay or straw (FDOT Section 104–6.4.10).

_X_ (9) Temporary silt fences and staked silt barriers (FDOT Section 104–6.4.11).

_X_ (10) Remove temporary erosion control features (FDOT Section 104–6.5).

_X_ (11) Maintain permanent and temporary erosion control features (FDOT Section 104.7).

_X_ (12) This contract design has been approved by the City and regulatory agencies having an interest in erosion control abatement. The design in its final form meets or exceeds minimum standards. All temporary erosion control features required during construction shall be constructed by the Contractor, and the cost thereof included in the Contract Sum as a regular obligation incidental to the work.

c. The Contractor is to submit an erosion control plan to the City of Winter Park Engineer for approval prior to the preconstruction meeting for this project.

d. The Contractor is responsible for maintaining all erosion protection, especially along and within Conservation/Environmental areas where applicable during the entire construction process, including repairs, etc., to prevent any siltation from entering these areas, as well as any unsuitable discharges offsite or into applicable Conservation/Environmental areas.

28. Miscellaneous Engineer Notifications

a. The Contractor shall provide the Engineer 24 – hour advance notification for the following construction and inspection activities:
(1) Connections to existing systems.
(2) Storm drain lamping.
(3) Inlet top pours (reinforcing steel check).
(4) Base observation and sounding.
(5) Pre–final inspection.
(6) Final inspection.

b. The Contractor shall keep DAILY "As–built" drawings employing the criteria shown on the Paving and Drainage, Sanitary and Water Detail sheets. Record all As–builts in RED ink.

c. Before the start of construction, the Contractor shall prepare and submit to the Engineer a project construction schedule (Bar Graph) and update the schedule monthly.

d. Any fuel storage areas shall have owner's prior approval and appropriate measures shall be taken to ensure protection of groundwater and soil resources.

e. The Contractor shall coordinate all backfill operations with the Resident Geotechnical Engineer and submit test reports to the Engineer prior to beginning work on the next item of work.

f. The Engineer reserves the right to require the Contractor to perform any action necessary to ensure that the improvements have been constructed in accordance with the plans and specifications.

29. The Contractor shall field verify horizontal and vertical information for all connection points to existing utility systems, as well as the location and depth of all clusters of fittings and valves, before submittal of shop drawings.

30. The Contractor is bound to the contract specifications in addition to these general notes and is expected to have copies of both the construction drawings and contract specifications on the job–site during construction activities.

31. Any discrepancy between the dimensions and measurements shown on the plans and the actual field conditions shall immediately be brought to the Engineer's attention. Failure to do so shall make the Contractor completely liable for whatever errors and/or problems that may subsequently arise.

32. It will be the responsibility of the Contractor(s) to ensure that all required permits are obtained and are in hand at the job site prior to the commencement of construction. Contractor shall abide by all conditions contained therein. Permits included (but not necessarily limited to) are:
a. Local right–of–way use.
b. Local underground utilities.

33. The Contractor shall stake all improvements using the plan. Contractor shall confirm with the Engineer that the plat is current prior to construction. It is the Contractor's sole responsibility to completely stake and check all improvements to ensure adequate positioning, both horizontal and vertical, including minimum building setbacks, before the installation of any improvement.

34. The Contractor shall be responsible for protecting all existing survey monumentation. Disturbed monumentation shall be restored by a Florida–licensed land surveyor selected by the Owner at the Contractor's expense.

35. The Contractor is responsible for grading all pavement areas to drain positively. Intersections shall be transitioned to provide smooth driving surfaces while maintaining positive drainage. Should areas of poor drainage be observed, the Contractor shall notify the Engineer prior to paving so that recommendations for correction may be made.

36. The quantities and lengths of materials shown on plans should be verified by the Contractor. Any discrepancy between callouts and actual shown in plan view is to be brought to the Engineer's attention by the Contractor prior to bidding. It is the Engineer's intention to build what is shown on the construction plans.

37. Record Drawing: At the end of construction, the Contractor shall provide one (1) set of drawings showing ALL CHANGES marked in waterproof red with the following Contractor Certification executed on EACH SHEET:

The Contractor ____
hereby certifies to the OWNER that improvements covered by this drawing and the related details have been constructed as indicated or as modified by the notes and graphics shown. Absent a note or graphic to the contrary, the improvements have been constructed meeting industry standard tolerances.

Signed: ________________________________ Date: ________________
Authorized Contractor's Representative

GENERAL NOTES

NEW YORK AVENUE EXFILTRATION SYSTEM
City of Winter Park
Winter Park, Florida

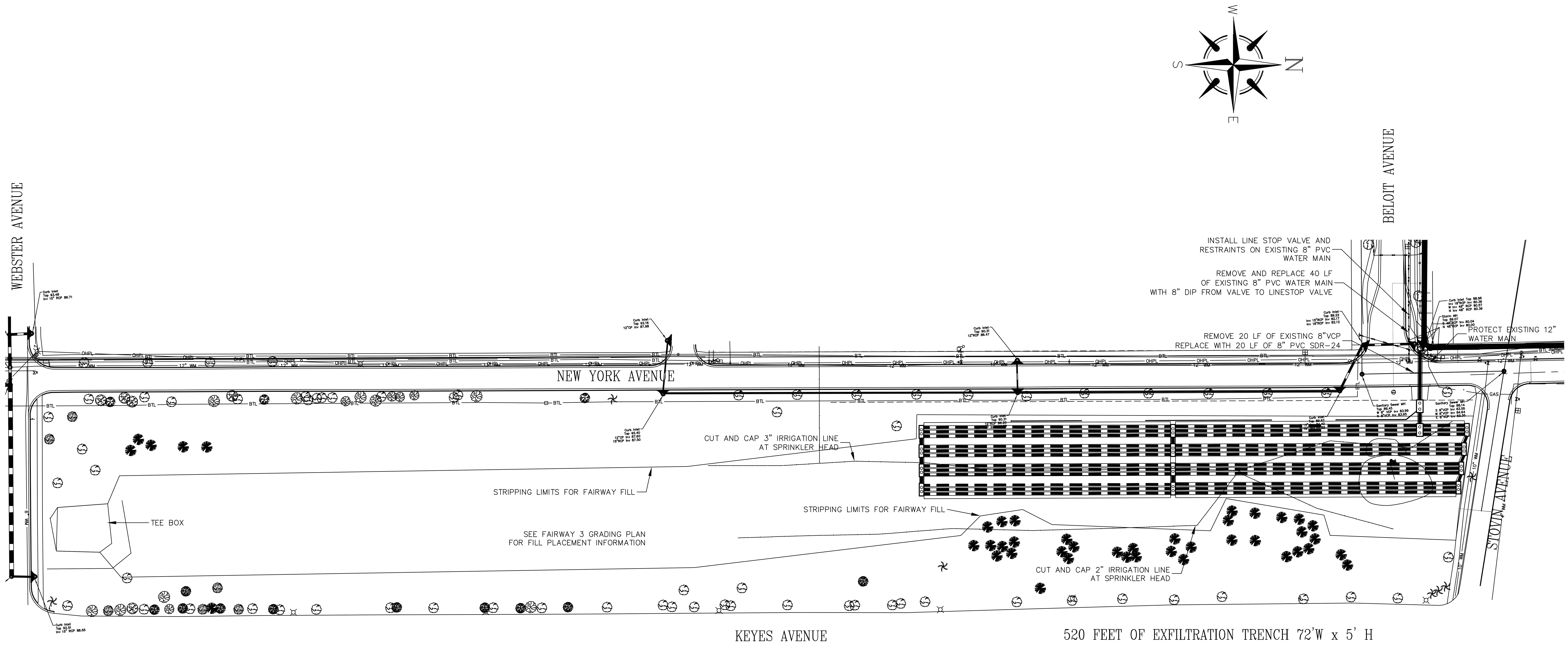
PROJECT NUMBER
DATE 06–15–04
SCALE NTS
SHEET NO. 2 of 7

City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

DESIGNED BY: BEL
DRAWN BY: BEL
CHECKED BY:
APPROVED BY:

DATE	REVISIONS	REVISED BY	CHKD. BY

FILE NAME LANDER.DWG
PLOT CODE BEL.PLT



PROJECT NUMBER

NEW YORK AVENUE EXFILTRATION SYSTEM

NEW YORK AVENUE AND BELOIT AVENUE
City of Winter Park
Winter Park, Florida

DATE 06/15/06

SCALE 1" = 50'

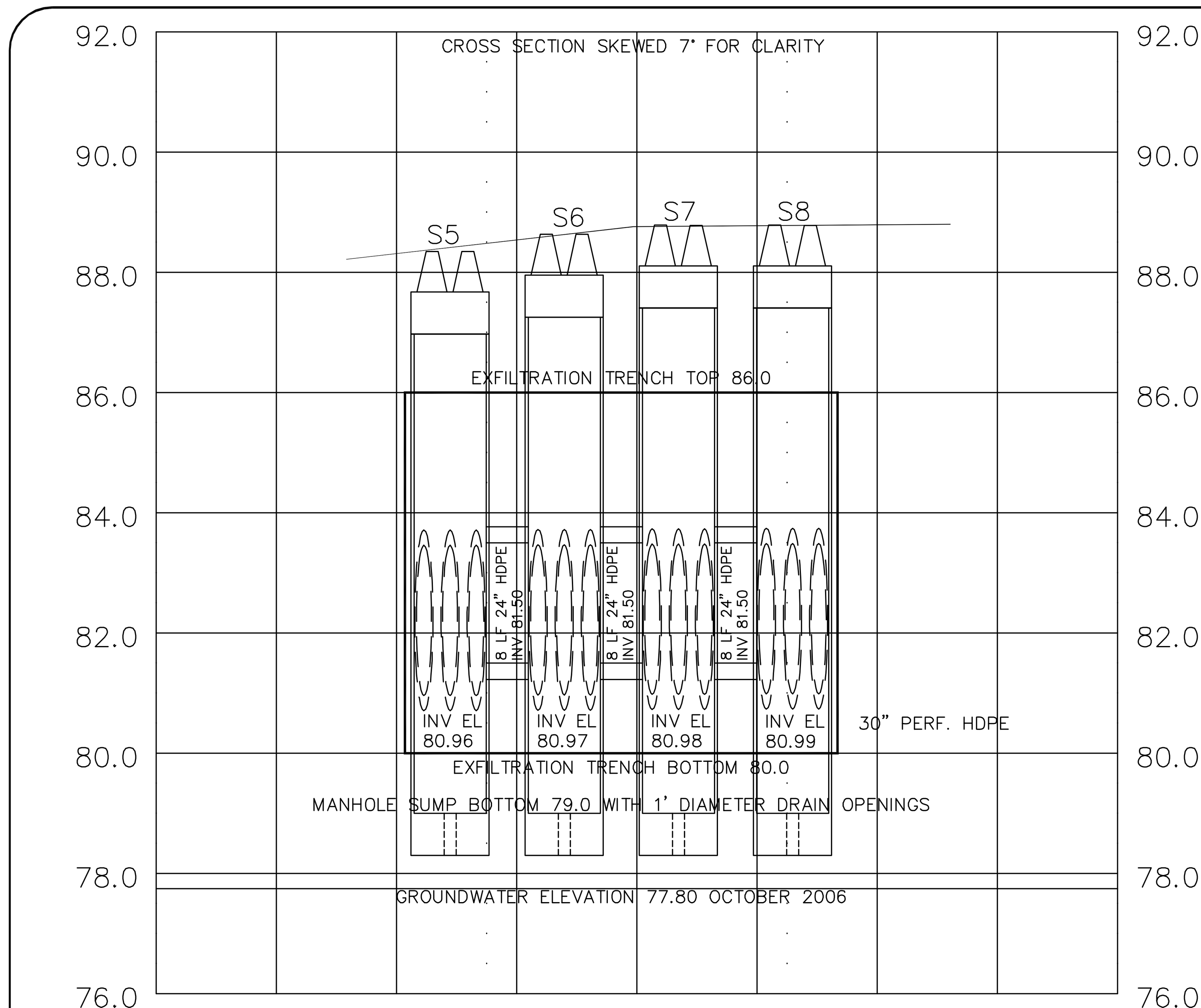
SHEET NO. 3 of 7

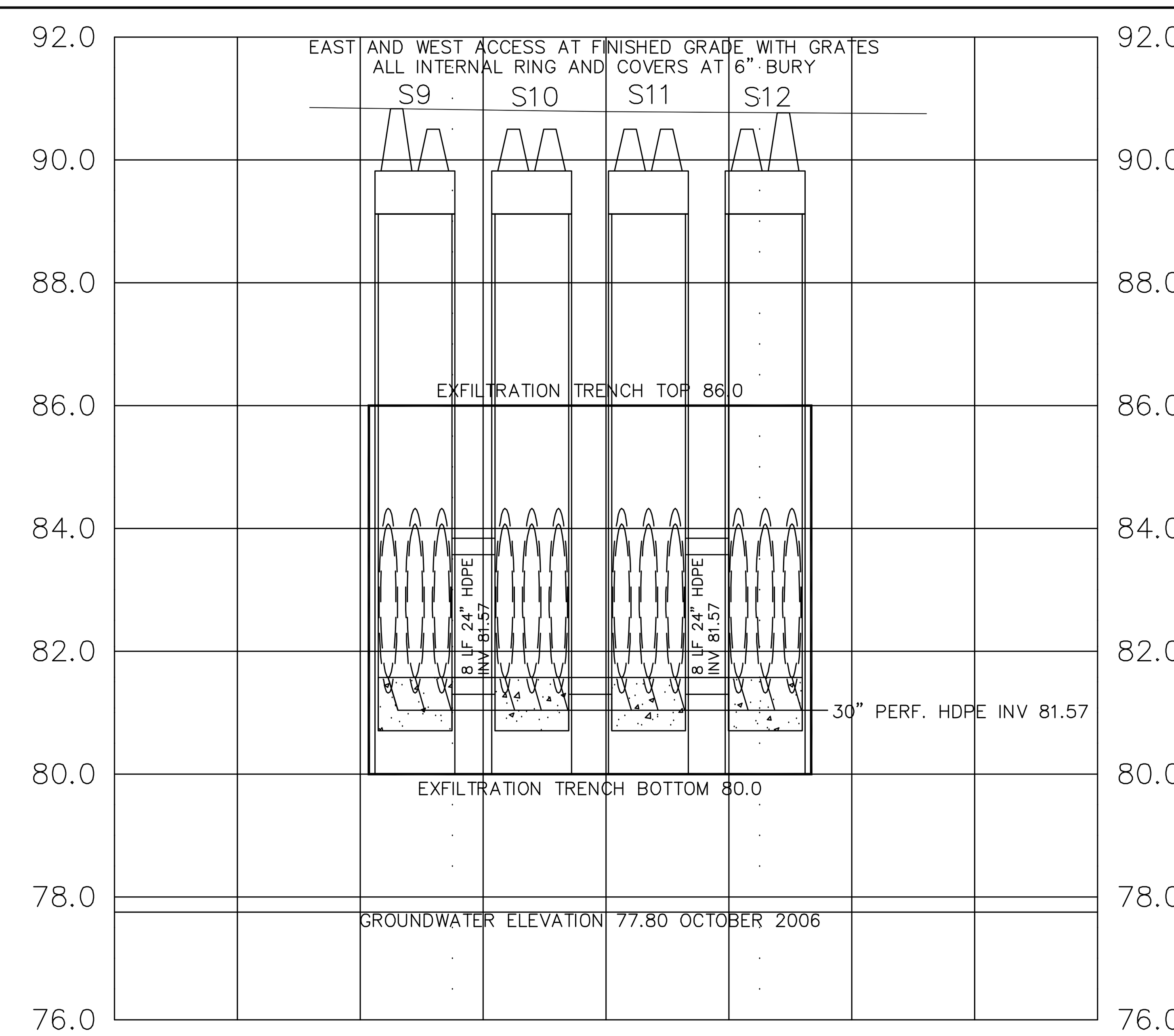
City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

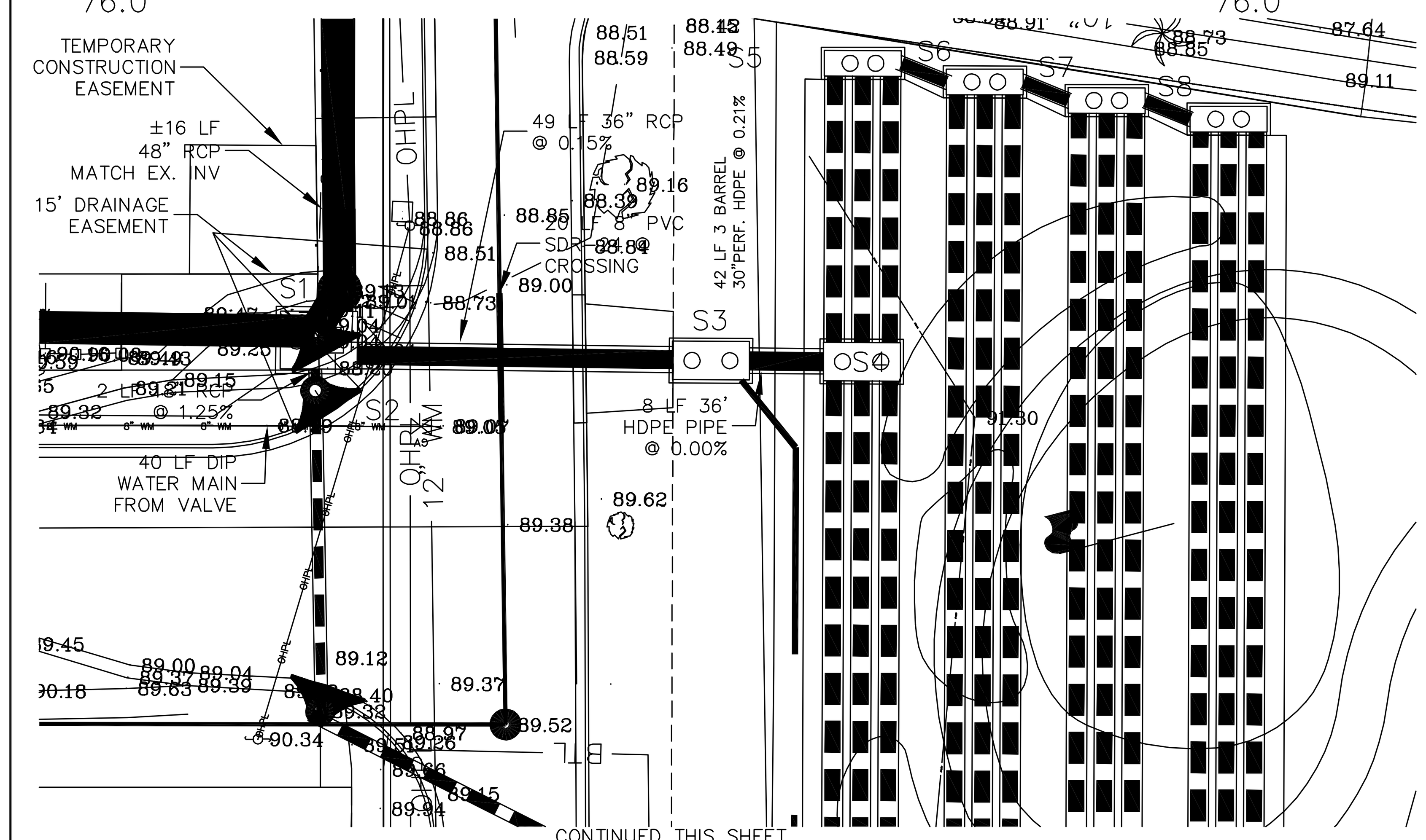
DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:

DATE	REVISIONS	REVISED BY	CHKD. BY

FILE NAME FILE.DWG
PLOT CODE FILE.CTB







S1
9' x 12' (INTERNAL DIMENSIONS)
DIVERSION STRUCTURE WITH 12' WEIR
TOP EL 89.0
W 48" RCP INV 80.57 (EXISTING)
S 18" RCP INV 80.39
E 36" RCP INV 80.14
N 48" RCP INV 80.00
12.7 L' WEIR EL 86.0
(SEE DETAIL SHEET 6)

S2
P-4 INLET
TOP EL 89.0
N 18" RCP INV 80.60
S 18" RCP INV 80.70 (EXISTING)

S3
5' x 12' (INTERNAL DIMENSIONS)
DEBRIS SCREEN STRUCTURE
TOP EL 88.75
W 36" RCP INV 80.09
E 36" HDPE INV 80.00
SCREEN TOP EL 84.0
S 12" UNDERDRAIN INV EL 80.15
(SEE DETAIL SHEET 6)

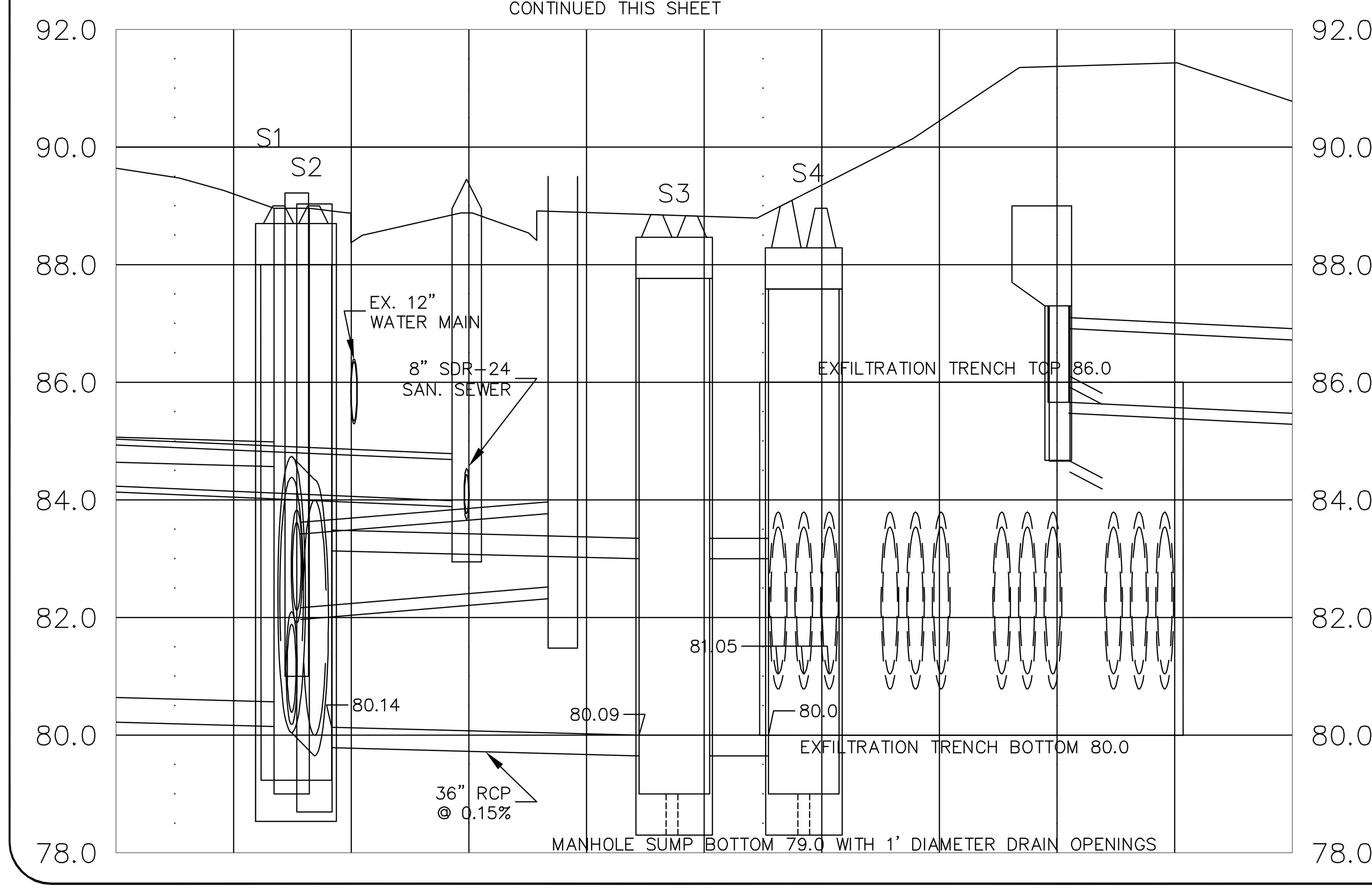
S4
5' x 12' (INTERNAL DIMENSIONS)
JUNCTION MH W/ SECONDARY SCREEN
TOP EL 88.70
W 36" HDPE INV 80.00
S 3 ~30' HDPE PERF. PIPE INV 81.05
N 3 ~30' HDPE PERF. PIPE INV 81.05
(SEE DETAIL SHEET 6)

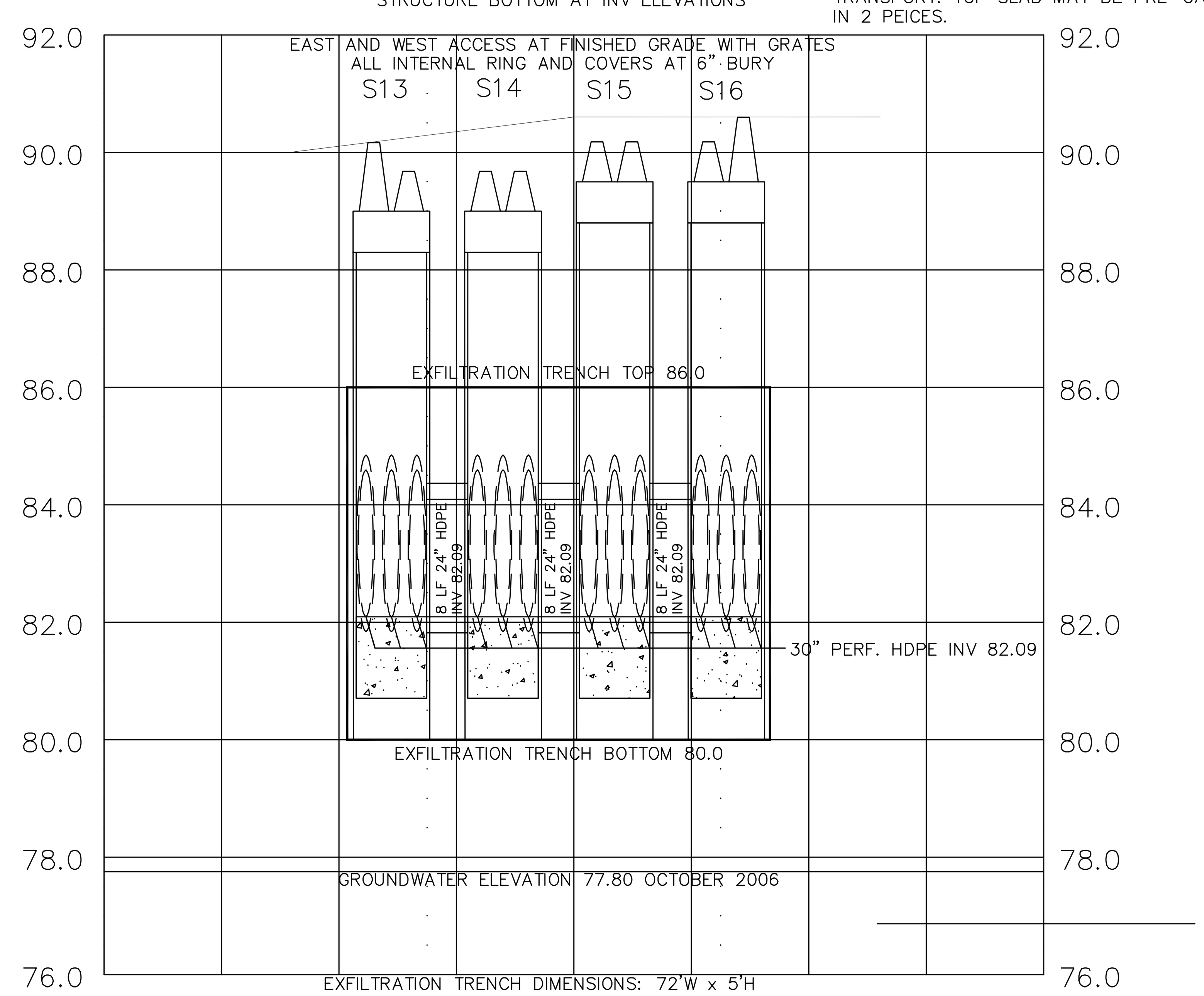
S5, S6, S7, S8,
4' x 12' (INTERNAL DIMENSIONS)
JUNCTION MANHOLE
TOPS AT FG S5 88.70, S6 89.0, S7 89.2,
S8 89.2
S 3 ~30' HDPE PERF. PIPE INV ±81.00
SUMP BOTTOM EL 79.0
24" HDPE CONNECTIONS BETWEEN S5 S6
S7 S8 INV 81.00

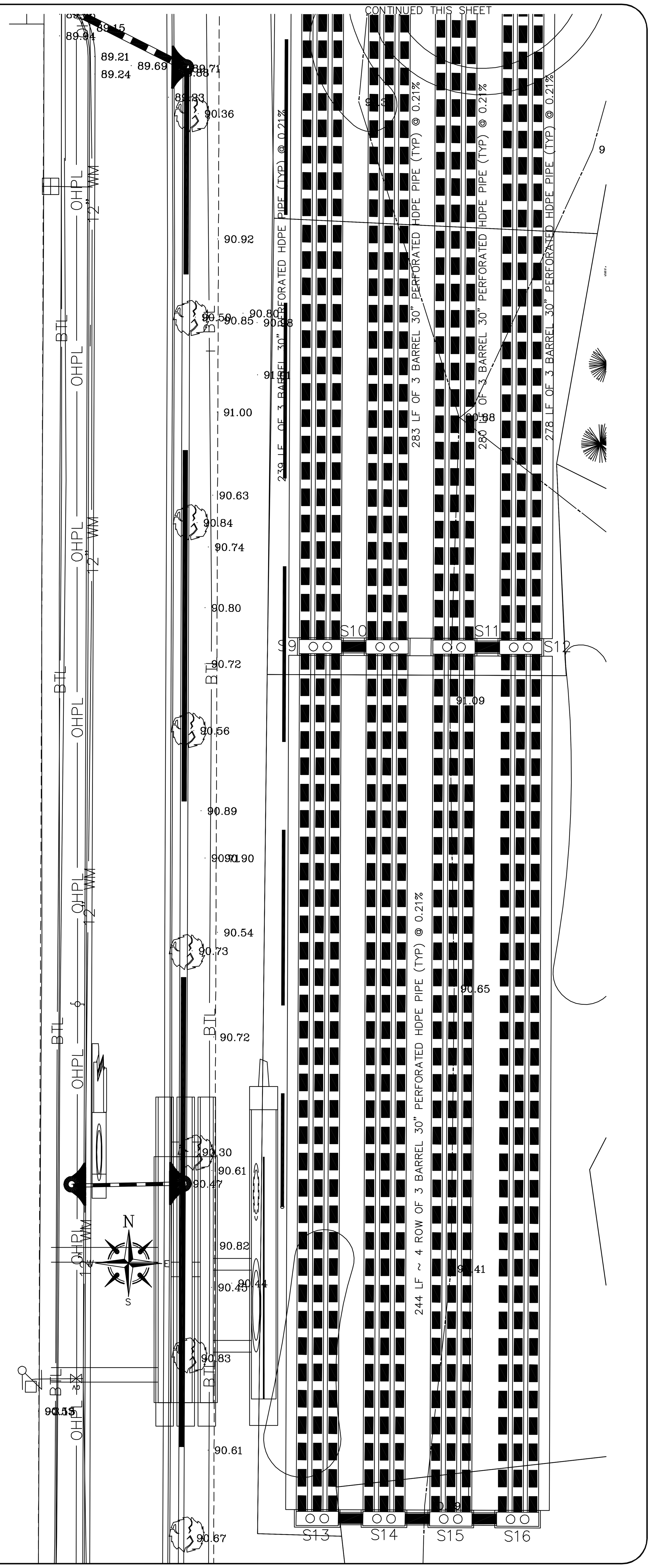
S9, S10, S11, S12,
4' x 12' (INTERNAL DIMENSIONS)
JUNCTION MANHOLE
TOPS AT FG S9 W 90.70 S12 E 90.60
ALL OTHER TOPS 6" BELOW FG ±90.0'
N 3 ~30" HDPE PERF. PIPE INV 81.57
S 3 ~30' HDPE PERF. PIPE INV 81.58
24" HDPE CONNECTIONS BETWEEN S9 S10
AND S11 S12 INV 81.54
STRUCTURE BOTTOM AT INV ELEVATIONS

S13, S14, S15, S16,
4' x 12' (INTERNAL DIMENSIONS)
JUNCTION MANHOLE
TOPS AT FG S13 W 90.70 S16 E 90.60
ALL OTHER TOPS 6" BELOW FG ±90.0'
N 3 ~30" HDPE PERF. PIPE INV 82.09
24" HDPE CONNECTIONS BETWEEN S9 S10
S11 S12 INV 82.09
STRUCTURE BOTTOM AT INV ELEVATIONS

STRUCTURE NOTES:
STRUCTURES WITHIN PUBLIC RIGHTS OF WAY MUST MEET FDOT SPECIFICATIONS. RING AND COVERS AT GRADE ARE TO BE TRAFFIC BEARING USF 230 GRATE 3220. RING AND COVERS FOR 6" BURY SHALL BE USF 230 AA WITH FILTER FABRIC TAPED IN PLACE PRIOR TO BACFILL PLACEMENT 3 ~ 30" HDPE PERFORATED PIPE IS DESIGNED AT 1' 2" OUTER WALL SPACING TO FIT THE INSIDE 12' WIDE WALL. ADJUSTMENTS MADE TO THIS WALL WIDTH ARE AT THE PRE-CASTER'S DISCRETION. THE CITY OF WINTER PARK WILL PROVIDE ALL PRE CAST STRUCTURES FOR THIS PROJECT. STRUCTURE S1 MAY BE CAST IN PLACE IF STRUCTURAL REQUIREMENTS WILL NOT PERMIT PRE-CASTING AND OR TRANSPORT. TOP SLAB MAY BE PRE-CAST IN 2 PEICES.







City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

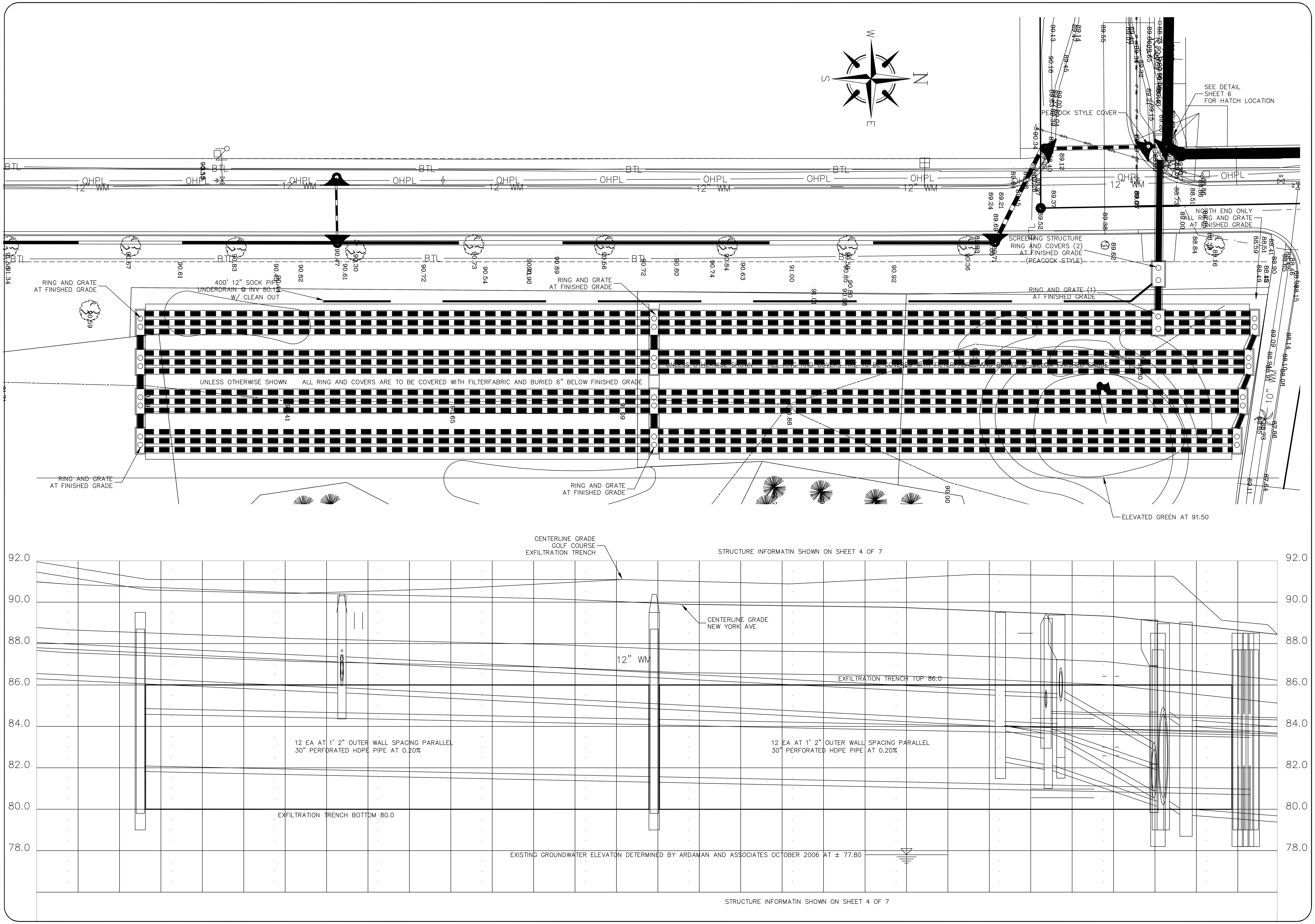
DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
___	___	___	

NEW YORK AVENUE EXFILTRATION SYSTEM
BELOIT AVE. @ NEW YORK AVE.
City of Winter Park
Winter Park, Florida

PROJECT NUMBER
DATE 06-22-06
SCALE 1" = 20'
SHEET NO. 4 of 7

DATE	REVISIONS	REVISED BY	CHKD. BY
03/26/07	Moved Exfiltration Trench 8' East	Rayken/CWP	JLS

FILE NAME FILE.DWG
PLOT CODE FILE.CTB



NEW YORK AVENUE EXFILTRATION SYSTEM

NEW YORK AVENUE @ BELOIT AVENUE
City of Winter Park
Winter Park, Florida

PROJECT NUMBER

DATE 06-22-06

SCALE 1" = 20'

SHEET NO. 5 of 7

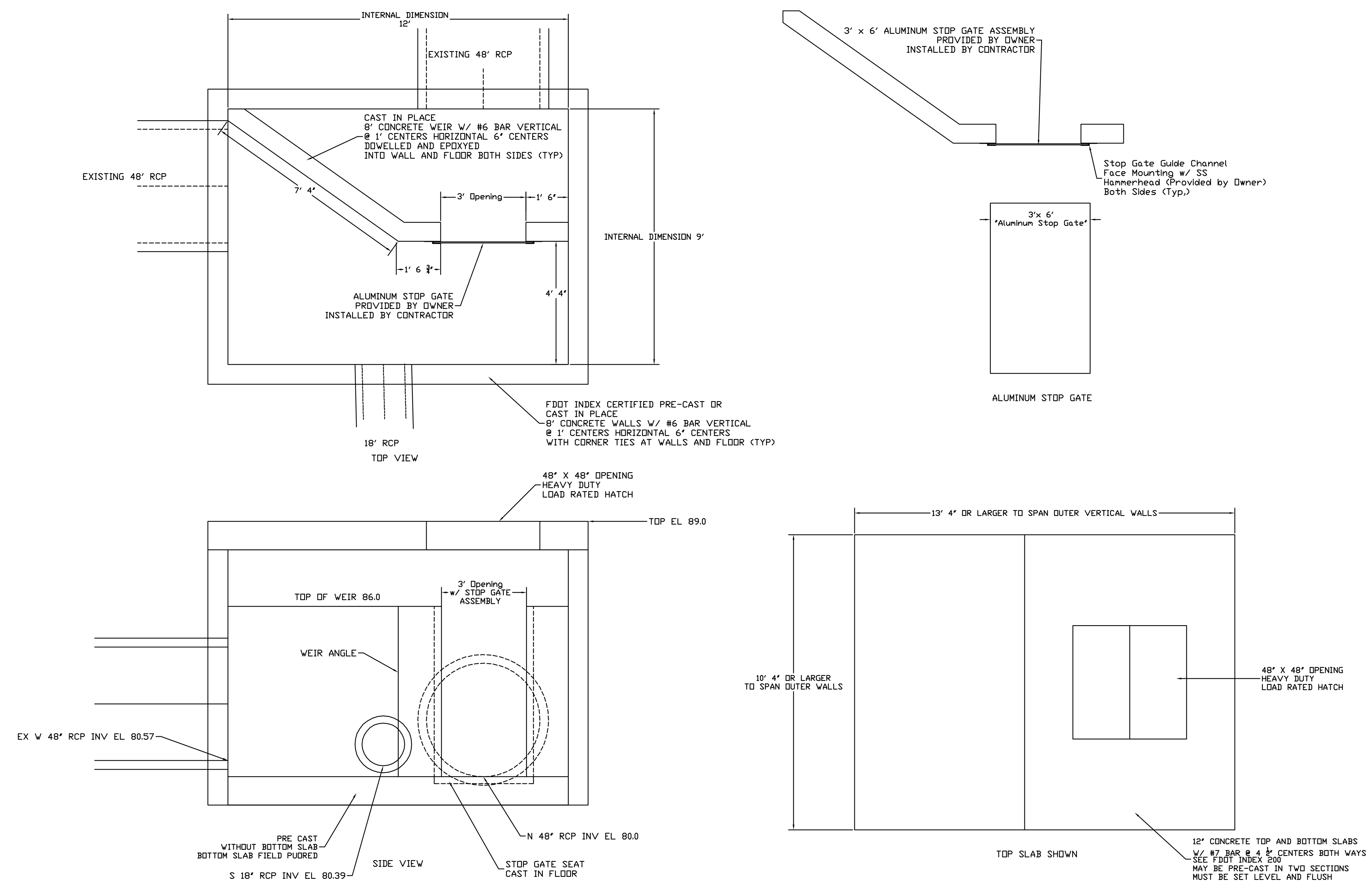
City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

DESIGNED BY: | DRAWN BY: | CHECKED BY: | APPROVED BY:

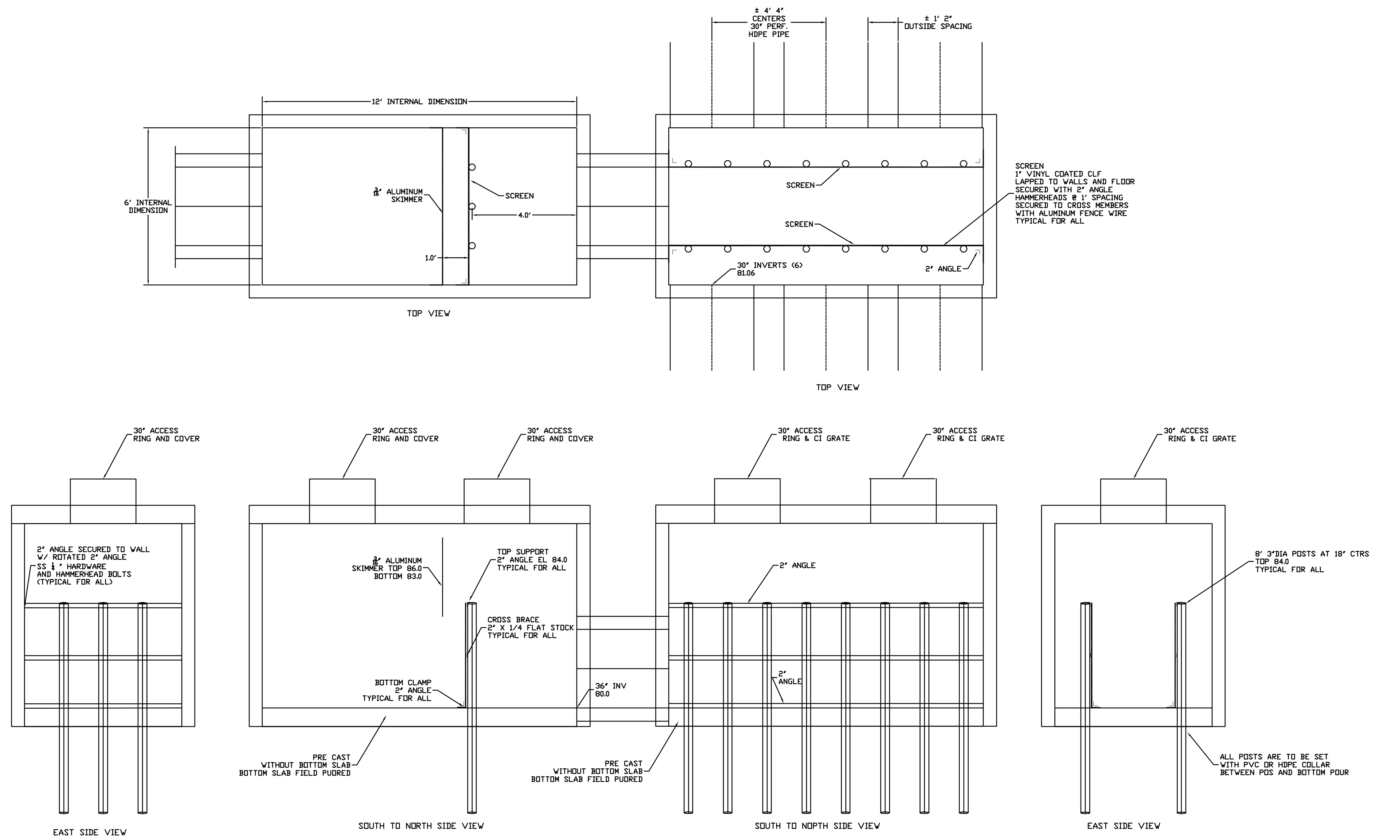
DATE | REVISIONS | REVISED BY | CHKD. BY

FILE NAME FILE.DWG
PLOT CODE FILE.CTB

GENERAL NOTES
1. CONSTRUCTION WILL BE CONDUCTED IN TWO PHASES WITH THE FIRST PHASE COMPLETED PRIOR TO DEMOLITION OR CONSTRUCTION ACTIVITIES WITHIN THE CITY OF WAINTER PARK RIGHT OF WAY. tHE FIRST PHASE INCLUDES ALL PROPOSED IMPROVEMENTS BENEATH THE THIRD FAIRWAY OF THE MUNICIPLE GOLF COURSE, INCLUDING AND UP TO THE SEPARATOR SCREEN. THE GOLF COURSE FAIRWAY SHALL BE COMPACTED AND GRADED BACK TO THE ORIGINAL ELEVATIONS PRIOR TO CONSTRUCTION. IRRIGATION SYSTEM SHALL BE RESTORED AND TESTED. uTILITY COORDINATION FOR PHASE TWO CONSTRUCTION MAY BE ADDRESSES DURING PHASE ONE ACTIVITIES, PROVIDED ROAD CLOSURES ARE NOT REQUIRED. ALL NECESSARY UTILITY COORDINATION BETWEEN THE CONTRACTOR AND SERVICING UTILITY WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. CITY OF WINTER PARK ELECTRIC, WATER AND SEWER, TECO GAS, AND EMBARQ COMMUNICATIONS ALL HAVE FACILITIES WITHIN THE CONSTRUCTION LIMITS. THESE COMPANIES HAVE BEEN NOTIFIED OF PROPOSED ACTIVITIES BY THE CITY OF WINTER PARK, BUT IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE NECESSARY ACTIVITIES FOR AND DURING CONSTRUCTION.
PHASE TWO SHALL INCLUDE ALL PHYSICAL UTILITY RELOCATION, PROTECTION, AND COORDINATION1. TOP SOIL TURF AND SURFACE STRIPPINGS ARE TO BE STOCKPILED SEPARATELY FROM SUITABLE GRANULAR BACKFILL. PRIOR TO STRIPPING ACTIVITIES EXISTING SURFACE IRRIGATION HEADS, CONTROLLERS AND PEDASTALS WITHIN CONSTRUCTION AND STAGING AREAS ARE EITHER REMOVED AND STORED , OR REPLACED AT THE CONTRACTOR'S EXPENSE. EXISTING IRRIGATION MAINS ARE TO BE CAPPED AT LOCATIONS SHOWN IN THESE DRAWINGS. IRRIGATION SYSTEM VALVES ARE TO BE OPERATED TO ISOLATE THE THIRD FAIRWAY AND GREEN FROM THE REMAINDER OF THE GOLF COURSE IRRIGATION SYSTEM.
2. A 20 FOOT SEPARATION FROM THE EXISTING TREE TRUNKS TO THE EDGE OF THE PROPOSED EXFILTRATION SYSTEM IS REQUIRED. THE TOP OF EXCAVATED SIDE SLOPES MUST MAINTAIN A 10 SEPARATION FROM EXISTING TREE TRUNKS. ALL APPLICIBLE TRENCH SAFETY REQUIREMENTS APPLY.
3. THE EXFILTRATION SYSTEM SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE LINE AND GRADES SHOWN ON THE PLAN. CONNECTIONS TO ALL STRUCTURES ARE TO BE ACCOMPLISHED BY MEANS OF CONSTRUCTION BRICK AND NON-SHRINK GROUT. ALL SURFACES ARE TO BE SMOOTH TROWEL FINISHED WITH A SMOOTHE APPEARANCE, BOT INSIDE AND OUTSIDE OF THE PRECAST TO PIPE CONNECTIION. ALL STRUCTURES ARE TO BE SET UPON COMPACTED, OR UNEXCAVATED SOIL WITH 12" OF CRUSHED GRAVEL BENEATH EACH STRUCTURE. STRUCTURES CONSTRUCTED WITH BOTTOM DRAINS SHALL BE SET IN SIMILAR FASHION WITH SCREEN MATERIAL BENEATH THE BOTTOM OPENING, AND ABOVE THE AGGREGATE. FILTER FABRIC SHALL BE OVERLAPPED FROM ALL DIRECTIONS AS SHOWN IN DETAILS. FILTER FABRIC SHALL PROVIDE A DIRT TIGHT BARRIER BETWEEN ADJACENT SOIL AND BACKFILL, AND THE EXFILTRATION AGGREGATE. AGGREGATE SHALL BE PLACED IN SUCH A MANNER TO ENSUER THE INTEGGRITY AND ALIGNMENT OF THE PERFORATED PIPE AND UNDERLYING FILTER FABRIC. MANHOLE RING AND COVERS WILL BE OVERLAPPED WITH A SEPARATE PIECE OF FILTER FABRIC AND COVERED WITH 6" OF SOIL. MANHOLE RING AND GRATES WILL BE CONSTRUCTED AT FINISHED GRADE. SEE SHEET 5 OF 6.
4. CONTRACTOR IS RESPONSIBLE FOR ALL UTILITY LOCATION COORDINATION. 48 HOURS PRIOR TO DIGGING. 1-800-432-4770. CONTRACTOR IS REQUIRED TO NOTIFY THE CITY ENGINEER OR HIS DESIGNATED REPRESENTATIVE OF ANY UTILITY CONFLICT NOT ANTICIPATED FROM THE PLAN DRAWINGS, WHICH SIGNIFICANTLY ALTERS THE SCOPE OF WORK DESCRIBED WITHIN THESE PLANS. FAILURE TO DO SO WILL RESULT IN FORFIETURE OF PAYMENT FOR ADDITIONAL RESULTING COSTS. SUBCONTRACTORS WILL BE RESPONSIBLE FOR COORDINATION WITH ALL EXISTING UTILITY COMPANIES FOR ANY RELOCATION OF EXISTING UTILITIES IN CONFLICT WITH THE PROPOSED IMPROVEMENTS.
4. CONTRACTOR WILL BE RESPONSIBLE FOR REVIEWING, AMMENDING, CORRECTING, AND RETURNING PROPOSED MATERIAL ORDERS FOR COMPLETENESS AND SUITABILITY WITHIN 48 HOURS OF RECIEPT FROM THE CITY. FAILURE TO REVIEW AND COMMENT WILL RESULT IN FORFIETURE OF DOWN TIME COMPENSATION DUE TO MATERIAL OMMISSION OR ERROR.
5. ALL INLETS, STRUCTURES, PIPES, CURBS, GRATES, AND COVERS SHOWN ON THESE PLANS FOR CONSTRUCTION WITHIN THE PUBLIC RIGHT OF WAY ARE IN ACCORDANCE WITH CURRENT FDOT ROADWAY AND TRAFFIC DESIGN STANDARDS. ALL CONSTRUCTION WILL BE IN ACCORDANCE WITH THESE SPECIFICATIONS UNLESS OTHERWISE DIRECTED BY THE CITY ENGINEER, OR HIS DESIGNATED REPRESENTATIVE, IN WRITING.
6. CONTRACTOR WILL BE RESPONSIBLE FOR TREE PROTECTION, NOISE, DUST AND EROSION CONTROL RELATED TO SITE WORK BEING PERFORMED.
7. CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING A CLEAN, SAFE SITE. CONTRACTOR IS RESPONSIBLE FOR PEDESTRIAN SAFETY WITHIN THE WORK AREA AND WILL PROVIDE REASONABLE WARNING AND OR BARRICADE PLACEMENT. CONTRACTOR WILL POLICE ALL LOOSE DEBRIS, AND ARRANGE MATERIALS IN A NEAT AND ORDERLY FASHION PRIOR TO LEAVING THE WORK SITE EACH WORK DAY.
8. CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING EROSION CONTROL. CONTRACTOR WILL BE RESPONSIBLE FOR KEEPING SEDIMENT OUT OF NEW AND EXISTING STORMWATER SYSTEMS BY MAINTAINING SILT BARRIERS AND PROTECTION MEASURES AT ENTRY POINTS ALONG, AND OR INSIDE SYSTEMS FOR THE DURATION OF THE OF THE WORK DESCRIBED IN THIS SCOPE. SEDIMENT BUILDUP WHICH OCCURS AS A RESULT OF CONTRACTOR'S FAILURE TO PROVIDE AND MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROLWILL BE REMOVED BY THE CONTRACTOR, OR REMOVED BY CITY AND BACKCHARGED TO CONTRACTOR. FAILURE TO PROTECT NEW EXFILTRATION TRENCH INSTALLATION FROM SEDIMENT INTRUSION WILL RESULT IN NON-PAYMENT FOR AFFECTED LENGTHS. FILTER FABRIC SECURED TO THE INSIDE OF THE PROPOSED PERFORATED PIPE IS RECOMMENDED, AND MAY BE LEFT IN PLACE FOLLOWING CONSTRUCTION IF DETERMINED TO BE SUFFICIENTLY CLEAN AND SECURED.
9. THE CONTRACTOR WILL PROVIDE: ON-SITE RESTROOM FACILITIES, ON SITE ROLL OFF WASTE RECEPTACLE, MAINTENANCE OF TRAFFIC SET UP, CAST IN PLACE ASSOCIATED MATERIALS, AND CONSTRUCTION LAY-OUT SERVICES. CITY PROVIDED SERVICES WILL INCLUDE TREE TRIMMING/REMOVAL, GEOTECHNICAL TESTING, PERMITS, MATERIAL ACQUISITION (AS DESCRIBED), GREENSCAPE RESTORATION, AND INSPECTION.
10. A SUBSURFACE SOIL EXPLORATION HAS BEEN PERFORMED BY ARDAMAN AND ASSOCIATES, INC. FOR THIS PROJECT AND IS AVAILABLE UPON REQUEST. CONTACT CHARLES H. CUNNINGHAM P.E. AT 407-855-3860 FILE NO. 06-6444 PROPOSED EXFILTRATION SITE WINTER PARK, ORANGE COUNTY, FLORIDA, JUNE 16, 2006, AND SUBSEQUENT REVISIONS.

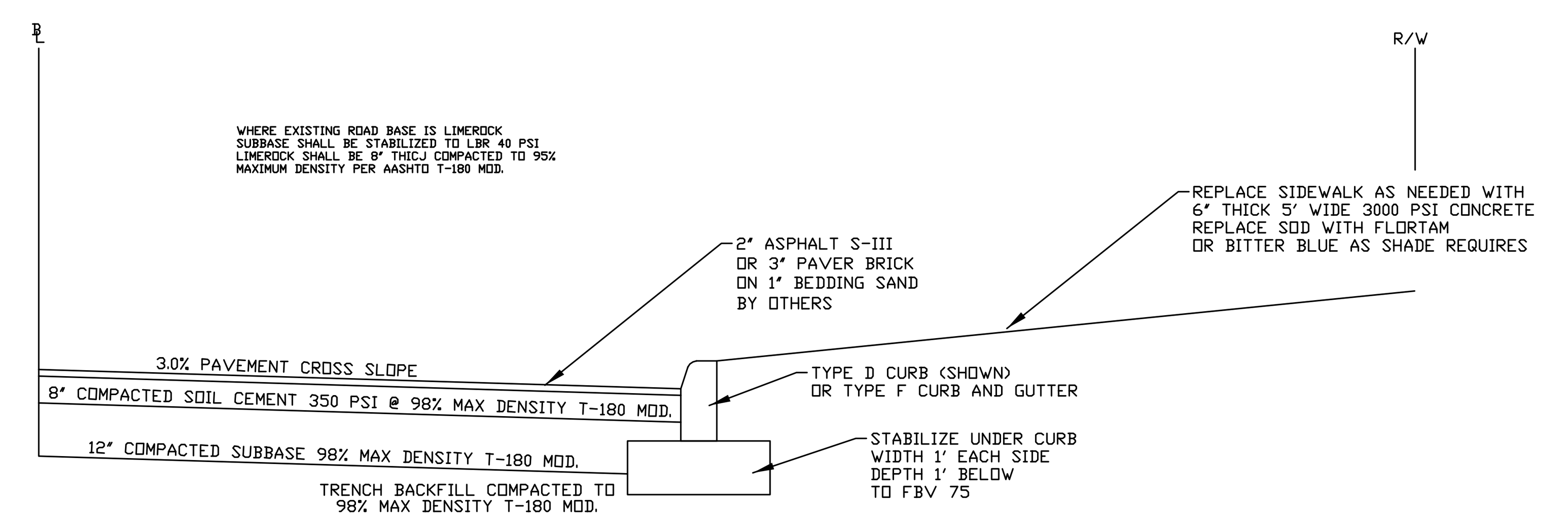


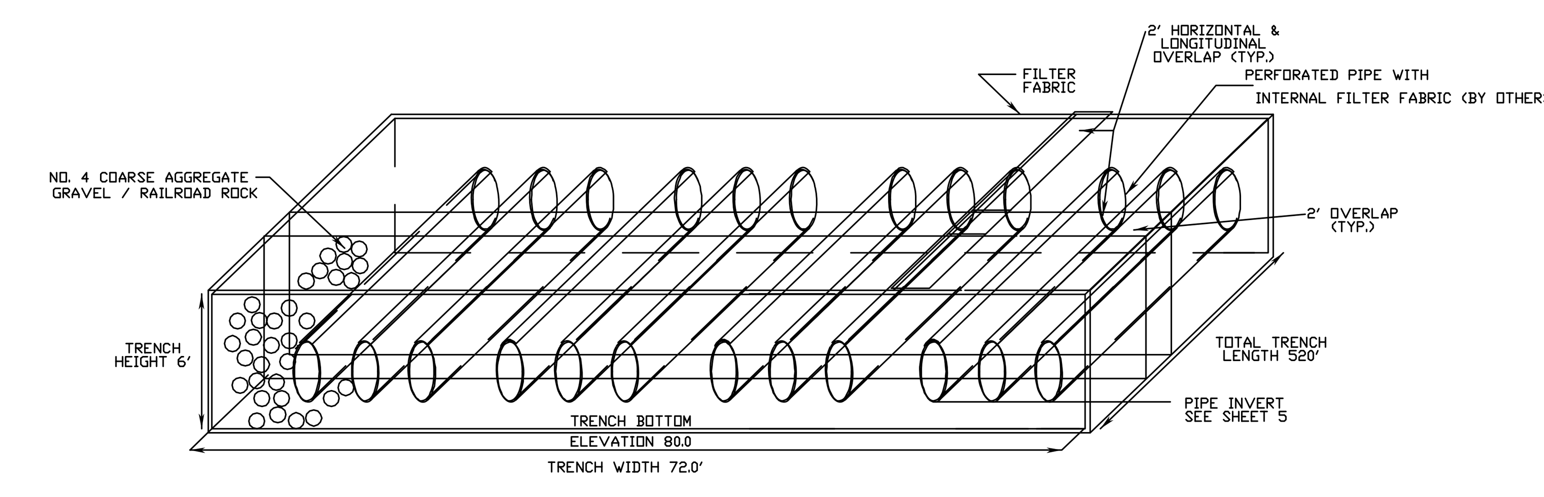
S1 DIVERSION STRUCTURE DETAIL



S3 DEBRIS SCREEN
STRUCTURE DETAIL
NTS

S4 JUNCTION MANHOLE
SECONDARY SCREEN DETAIL
NTS





EXFILTRATION TRENCH DETAIL VIEW
N.T.S.

NOTE:
ALL MATERIALS DESCRIBED IN THIS DETAIL WILL BE PROVIDED BY THE CITY OF WINTER PARK
FILTER FABRIC SHALL BE
NICOLAN, MIRAFI 160N
OR APPROVED EQUAL.
CRUSHED CONCRETE AND LIMEROCK
ARE NOT SUITABLE COARSE AGGREGATE
METHODS
EXTERNAL FILTER FABRIC SHALL BE DOUBLED @ ENDS
ENSURING SOIL TIGHT PERIMETER ON ALL SIDES OF
THE TRENCH AND AROUND STRUCTURES AND PIPES.
CONTRACTOR MAY, AT HIS DISCRETION, WRAP STRUCTURES
AND DRAINFIELD TOGETHER PROVIDED CLOTH
CONTOURS TO THE TOP AND SIDES OF STRUCTURES

TYPICAL EXFILTRATION TRENCH DETAIL
N.T.S.

GENERAL NOTES AND DETAILS
NEW YORK AVENUE EXFILTRATION SYSTEM
City of Winter Park
Winter Park, Florida

PROJECT NUMBER
DATE 12-12-06
SCALE N.T.S.
SHEET NO. 6 of 7

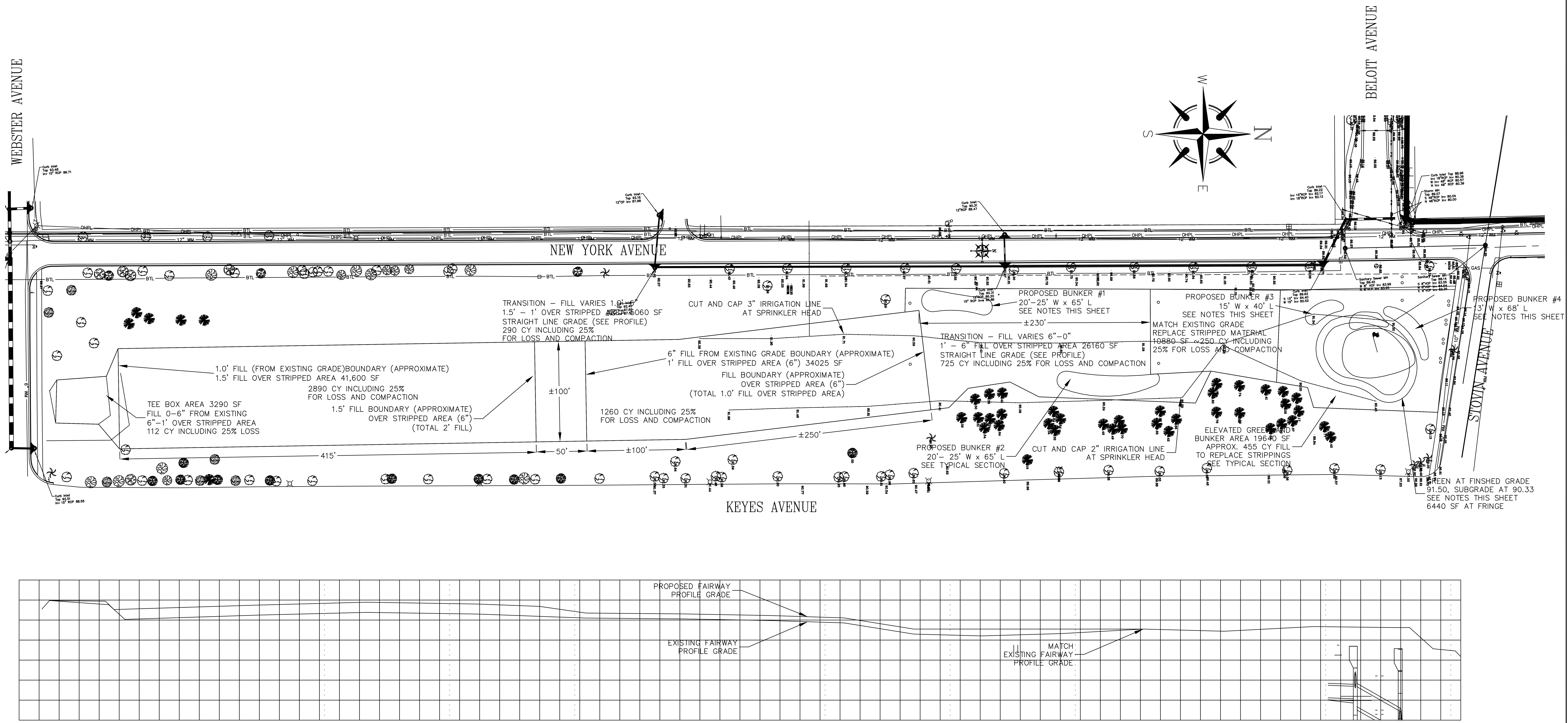
City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

DESIGNED BY: BEL | DRAWN BY: BEL | CHECKED BY: — — — | APPROVED BY: — — —

DATE	REVISIONS	REVISED BY	CHKD. BY

FILE NAME NPARKBRK.DWG
PLOT CODE BEL.PLT

GRADING PLAN NOTES:
THE INFORMATION CONTAINED ON THIS PLAN SHEET IS INTENDED TO BALANCE 6300 CY OF CLEAN FILL DISPLACED BY THE EXFILTRATION CONSTRUCTION AND REMOVAL OF 2100 CY OF TOPSOIL STRIPPINGS. A 25% LOSS FACTOR IS EMPLOYED IN THESE CALCULATIONS, ACTUAL LOSSES WILL VARY.
THE FILL ZONES ARE TO BE SLOPED FROM THE LIMITS SHOWN AT NO GREATER THAN A 10:1 SLOPE TO MATCH THE EXISTING GROUND.
BUNKER LOCATIONS SHOWN ARE TO BE CUT 1' DEEP FROM FINISHED GRADED AREAS READY FOR PLACEMENT OF 12" OF BUNKER SAND. FOR FAIRWAY BUNKERS #1 AND #2, THE REMOVED MATERIAL IS TO BE DEPOSITED AT THE BUNKER EDGE FARTHESY AWAY FROM THE FAIRWAY TAPERING FLUSH TO THE FAIRWAY WHERE ADJACENT. THE RAISED PORTION OF THE FAIRWAY BUNKERS ARE TO BE SHAPED TO A HEIGHT OF 1.0' AND SLOPED TO MATCH EXISTING GRADE AT A SLOPE NO GREATER THAN 8'H TO 1'V.
GREEN BUNKERS ARE TO BE CUT 1' FROM FINISHED GRADING, READY FOR FILL WITH 12" OF BUNKER SAND. rEMOVED MATERIAL FROM THESE BUNKERS WILL BE SPREAD ALONG DESIGNATED AREAS ALONG THE PREIMETER OF THE GREEN.
THE GREEN WILL BE GRADED TO SUB GRADE FOR GREEN CONSTRUCTION. SUBGRADE IS 14" BELOW FINISHED GRADE.
CONTRACTOR WILL BE RESPONSIBLE FOR FOR VERIFYING SITE BALANCE OR TRANSPORT OF ADDITIONAL CLEAN FILL TO AN APPROVED LOCATION WITHIN THE CITY. ALL PLACED FILL SHALL BE COMPACTED TO 95% MAX. DENSITY PER AASHTO T-180 MODIFIED.



HOLE 3 GRADING
NEW YORK AVENUE AND BELOIT AVENUE
City of Winter Park
Winter Park, Florida

PROJECT NUMBER
DATE 06/15/06
SCALE 1" = 50'
SHEET NO. 1 of 1

City Of Winter Park
401 Park Avenue South
Winter Park, Florida 32789
Telephone (407) 623-3242

DESIGNED BY: | DRAWN BY: | CHECKED BY: | APPROVED BY:

DATE | REVISIONS | REVISED BY | CHKD. BY

FILE NAME FILE.DWG
PLOT CODE FILE.CTB

APPENDIX B

HYDROLOGIC MODELING FOR ESTIMATION OF RUNOFF VOLUMES DISCHARGING TO THE NEW YORK AVENUE EXFILTRATION SYSTEM

New York Avenue
Appendix B

Parameter	Basin 1					
	Building	Cemetery	Church	Golf Course	Low Density Res	Open
Total Area (ac)	0.107	11.029	0.472	5.863	0.316	0.684
DCIA (%)	0.0	0.0	0.0	0.0	0.0	0.0
non DCIA CN	65.6	40.2	39.0	39.0	39.0	39.0
S (in)	5.26	14.89	15.64	15.64	15.64	15.64

Rainfall Event Range (in)	Mean Rainfall Depth (in)	Basin 1					
		Building	Cemetery	Church	Golf Course	Low Density Res	Open
1/16/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1/17/08 0:00	1.03	0.00	0.00	0.00	0.00	0.00	0.00
1/18/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1/19/08 0:00	0.94	0.00	0.00	0.00	0.00	0.00	0.00
1/22/08 0:00	0.1	0.00	0.00	0.00	0.00	0.00	0.00
1/23/08 0:00	1.43	0.00	0.00	0.00	0.00	0.00	0.00
1/26/08 0:00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
1/27/08 0:00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
2/6/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2/7/08 0:00	0.4	0.00	0.00	0.00	0.00	0.00	0.00
2/8/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2/12/08 0:00	0.39	0.00	0.00	0.00	0.00	0.00	0.00
2/13/08 14:47	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2/18/08 14:46	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2/19/08 9:53	0.11	0.00	0.00	0.00	0.00	0.00	0.00
2/21/08 8:46	0.12	0.00	0.00	0.00	0.00	0.00	0.00
2/21/08 17:17	0.3	0.00	0.00	0.00	0.00	0.00	0.00
2/23/08 10:45	0.43	0.00	0.00	0.00	0.00	0.00	0.00
2/26/08 18:09	0.26	0.00	0.00	0.00	0.00	0.00	0.00
2/26/08 23:25	0.55	0.00	0.00	0.00	0.00	0.00	0.00
2/29/08 7:35	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3/4/08 16:53	0.02	0.00	0.00	0.00	0.00	0.00	0.00
3/5/08 6:01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3/6/08 16:38	1.17	0.00	0.00	0.00	0.00	0.00	0.00
3/7/08 15:15	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3/7/08 20:22	0.21	0.00	0.00	0.00	0.00	0.00	0.00
3/13/08 11:27	0.02	0.00	0.00	0.00	0.00	0.00	0.00
3/14/08 18:02	0.07	0.00	0.00	0.00	0.00	0.00	0.00
3/17/08 10:02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3/20/08 6:08	0.25	0.00	0.00	0.00	0.00	0.00	0.00
3/30/08 6:39	0.28	0.00	0.00	0.00	0.00	0.00	0.00
3/31/08 6:57	0.23	0.00	0.00	0.00	0.00	0.00	0.00
3/31/08 16:33	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4/1/08 16:21	0.86	0.00	0.00	0.00	0.00	0.00	0.00
4/1/08 22:11	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4/2/08 13:06	0.02	0.00	0.00	0.00	0.00	0.00	0.00
4/2/08 17:37	0.07	0.00	0.00	0.00	0.00	0.00	0.00
4/3/08 7:26	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4/3/08 17:05	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4/4/08 19:27	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4/5/08 14:47	2.11	0.00	0.00	0.00	0.00	0.00	0.00
4/6/08 13:01	1.05	0.00	0.00	0.00	0.00	0.00	0.00
4/13/08 12:48	0.08	0.00	0.00	0.00	0.00	0.00	0.00

Generated Volume (ac-ft/yr)	0.00	0.00	0.00	0.00	0.00	0.00
Weighted Basin "C" Value	0.016	0.000	0.000	0.000	0.000	0.000

Dry	0.107	11.029	0.472	5.863	0.316	0.684
Percent Removal	0.95	0.95	0.95	0.95	0.95	0.95
Weighted Percent Removal	0.95	0.95	0.95	0.95	0.95	0.95
Volume Removed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Wet	0	0	0	0	0	0
Percent Removal	0.2	0.2	0.2	0.2	0.2	0.2
Weighted Percent Removal	0.0	0.0	0.0	0.0	0.0	0.0
Volume Removed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

New York Avenue
Appendix B

Parameter	Basin 2								Basin 3
	Building	Cemetery	Church	Golf Course	Low Density Res	Medium Density Res	Open	Road	Medium Density Res
Total Area (ac)	0.615	2.709	5.175	0.976	0.703	17.600	2.850	3.511	9.171
DCIA (%)	32.0	0.0	62.0	0.0	0.0	44.0	0.0	49.0	22.0
non DCIA CN	52.0	40.2	57.6	39.0	44.3	87.5	39.0	40.2	56.4
S (in)	9.23	14.89	7.35	15.64	12.57	1.43	15.64	14.90	7.73

Rainfall Event Range (in)	Mean Rainfall Depth (in)	Basin 2								Basin 3
		Building	Cemetery	Church	Golf Course	Low Density Res	Medium Density Res	Open	Road	Medium Density Res
1/16/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/17/08 0:00	1.03	0.02	0.00	0.25	0.00	0.00	0.81	0.00	0.13	0.16
1/18/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/19/08 0:00	0.94	0.01	0.00	0.22	0.00	0.00	0.71	0.00	0.12	0.14
1/22/08 0:00	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/23/08 0:00	1.43	0.02	0.00	0.36	0.00	0.00	1.28	0.00	0.19	0.22
1/26/08 0:00	0.14	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.01	0.01
1/27/08 0:00	0.14	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.01	0.01
2/6/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/7/08 0:00	0.4	0.00	0.00	0.08	0.00	0.00	0.20	0.00	0.04	0.05
2/8/08 0:00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/12/08 0:00	0.39	0.00	0.00	0.08	0.00	0.00	0.19	0.00	0.04	0.05
2/13/08 14:47	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/18/08 14:46	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/19/08 9:53	0.11	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2/21/08 8:46	0.12	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
2/21/08 17:17	0.3	0.00	0.00	0.05	0.00	0.00	0.13	0.00	0.03	0.03
2/23/08 10:45	0.43	0.01	0.00	0.09	0.00	0.00	0.22	0.00	0.05	0.06
2/26/08 18:09	0.26	0.00	0.00	0.04	0.00	0.00	0.10	0.00	0.02	0.03
2/26/08 23:25	0.55	0.01	0.00	0.12	0.00	0.00	0.32	0.00	0.06	0.08
2/29/08 7:35	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/4/08 16:53	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/5/08 6:01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/6/08 16:38	1.17	0.02	0.00	0.29	0.00	0.00	0.97	0.00	0.15	0.18
3/7/08 15:15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/7/08 20:22	0.21	0.00	0.00	0.03	0.00	0.00	0.07	0.00	0.02	0.02
3/13/08 11:27	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/14/08 18:02	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/17/08 10:02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/20/08 6:08	0.25	0.00	0.00	0.04	0.00	0.00	0.10	0.00	0.02	0.03
3/30/08 6:39	0.28	0.00	0.00	0.05	0.00	0.00	0.12	0.00	0.03	0.03
3/31/08 6:57	0.23	0.00	0.00	0.03	0.00	0.00	0.08	0.00	0.02	0.02
3/31/08 16:33	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/1/08 16:21	0.86	0.01	0.00	0.20	0.00	0.00	0.63	0.00	0.11	0.13
4/1/08 22:11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/2/08 13:06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/2/08 17:37	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/3/08 7:26	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/3/08 17:05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/4/08 19:27	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4/5/08 14:47	2.11	0.03	0.00	0.55	0.00	0.00	2.14	0.00	0.29	0.36
4/6/08 13:01	1.05	0.02	0.00	0.25	0.00	0.00	0.83	0.00	0.14	0.16
4/13/08 12:48	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Generated Volume (ac-ft/yr)	0.17	0.00	2.76	0.00	0.00	8.96	0.00	1.48	1.75
Weighted Basin "C" Value	0.255	0.000	0.495	0.000	0.000	0.472	0.000	0.390	0.177

Dry	0	0	0	0	0	0	0	0	9.171
Percent Removal	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Weighted Percent Removal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80
Volume Removed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.40**
Wet	0	0	0	0	0	0	0	0	0
Percent Removal	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Weighted Percent Removal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume Removed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

0.17	**0.00**	**2.76**	**0.00**	**0.00**	**8.96**	**0.00**	**1.48**	**0.35**

Total	**13.72**
Area (ac)	**61.781**

APPENDIX C

QA DATA

SAMPLE DUPLICATE RECOVERY
(5% of all samples)

PARAMETERS	UNITS	SAMPLE ID	DATE ANALYZED	REPEAT 1	REPEAT 2	MEAN	s	% RELATIVE STD. DEVIATION (RSD)	RELATIVE % DEVIATION (RPD)	ACCEPTANCE RANGE (% RSD)	FLAG
pH	s.u.	08-0372	02/28/08	6.79	6.82	6.81	0.021	0.312	0.441	0-2	
pH	s.u.	08-0732	04/16/08	7.4	7.41	7.41	0.007	0.095	0.135	0-2	
Alkalinity	mg/l	08-0732	04/16/08	74.2	73.8	74.0	0.283	0.382	0.541	0-4	
Alkalinity	mg/l	08-0372	02/28/08	44.6	45	44.8	0.283	0.631	0.893	0-4	
Specific Conductivity	µmho/cm	08-0539	03/25/08	122	123	123	0.707	0.577	0.816	0-8	
Turbidity	mg/l	08-0372	02/28/08	56.8	56.4	56.6	0.283	0.500	0.707	0-2	
Turbidity	mg/l	08-0732	04/16/08	1.8	1.8	1.80	0.00	0.00	0.00	0-2	
TSS	mg/l	08-0372	02/28/08	131	133	132	1.41	1.07	1.52	0-5	
BOD_5	mg/l	08-0458	03/13/08	0	0	0.00	0.00	0.00	0.00	0-20	
SRP	µg/l	08-0458	03/11/08	0	0	0	0.00	0.00	0.00	0-5	
NOX-N	µg/l	08-0458	03/11/08	0	0	0	0.00	0.00	0.00	0-4	
Ammonia	µg/l	08-0185	02/10/08	0	0	0	0.00	0.00	0.00	0-10	
Total N	µg/l	08-0658	04/14/08	807	804	806	2.12	0.263	0.372	0-10	
Total P	µg/l	08-0658	04/14/08	157	155	156	1.41	0.907	1.28	0-5	

BLANK SPIKE RECOVERY STUDY
(5% of all samples)

PARAMETERS	UNITS	DATE ANALYZED	INITIAL CONC.	INITIAL VOLUME (ml)	SPIKE CONC.	SPIKE VOLUME ADDED (ml)	FINAL CONC.	MEASURED CONC.	PERCENT RECOVERY	ACCEPTANCE RANGE	FLAG
TSS	mg/l	02/25/08	0	500	28.7	500	28.7	29.6	103%	91-105	
BOD_5	mg/l	01/24/08	0.2	300	10000	6	200	198	98.9%	85-115	
SRP	µg/l	02/22/08	0	10	10000	0.250	250	248	99.2%	90-110	
NOX-N	µg/l	02/22/08	0	10	10000	0.250	250	260	104%	95-105	
Ammonia	µg/l	02/10/08	0	10	10000	0.400	400	438	110%	80-120	
Total N	µg/l	04/14/08	0	5	22600	0.500	2260	2277	101%	90-110	
Total P	µg/l	04/14/08	0	5	10000	0.500	1000	1005	101%	94-106	

MATRIX SPIKE RECOVERY STUDY
(5% of all Samples)

PARAMETERS	UNITS	SAMPLE ID	DATE ANALYZED	INITIAL CONC.	INITIAL VOLUME (ml)	SPIKE CONC.	SPIKE VOLUME ADDED (ml)	FINAL CONC.	MEASURED CONC.	PERCENT RECOVERY	ACCEPTANCE RANGE	FLAG
TSS	mg/l	08-0359	02/25/08	19.4	500	28.7	500	48.1	48.7	101%	91-105	
BOD_5	mg/l	08-0185	01/24/08	7.0	300	10000	6	207	203	98.1%	85-115	
SRP	µg/l	08-0359	02/22/08	183	10	10000	0.150	333	330	99.1%	90-110	
NOX-N	µg/l	08-0359	02/22/08	109	10	100000	0.150	1609	1600	99.4%	95-105	
Ammonia	µg/l	08-0185	02/10/08	10	10	100000	0.200	2010	2030	101%	80-120	
Total N	µg/l	08-0658	04/14/08	807	5	100000	0.200	4807	4554	94.7%	90-110	
Total P	µg/l	08-0658	04/14/08	157	5	10000	0.200	557	560	101%	94-106	

RESULTS OF LABORATORY TESTS CONDUCTED ON FIELD CLEANED EQUIPMENT BLANKS COLLECTED FROM NEW YORK AVE

Sample ID Number	Sample Description	Matrix	Site Location	Date Collected	Date Received	pH s.u.	Alkalinity mg/l	Conductivity mmho/cm	BOD_5 mg/l	Turbidity NTU	TSS mg/L	NOX-N µg/l	SRP µg/l	Ammonia mg/l	Total N mg/l	Total P mg/l
184	New York Ave	BF	Inflow PCEB	01/23/08	01/23/08	5.71	1.0	2.1	<2.0	<0.1	<0.7	<5	<1	<5	<25	<1
458	New York Ave	BF	PCEB	03/10/08	03/10/08	5.15	0.6	2.1	<2.0	<0.1	<0.7	<5	<1	<5	<25	<1
657	New York Ave	BF	Site 1 PCEB	04/03/08	04/07/08	5.25	0.6	2.0	<2.0	<0.1	<0.7	<5	<1	<5	<25	<1