

NUTRIENT SEPARATING BAFFLE BOX: LEAF AND NUTRIENT REMOVAL SYNOPSIS

Prepared By:

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Prepared For:

**Suntree Technologies Inc.
798 Clearlake Road
Cocoa, FL 32922**

April 10, 2007

The logo for Applied Environmental Technology (AET) features the letters 'AET' in a bold, blue, sans-serif font. The letters are slightly shadowed, giving them a three-dimensional appearance as if they are floating above a surface.

Applied Environmental Technology

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EXECUTIVE SUMMARY

The Nutrient Separating Baffle Box (NSBB) is a stormwater treatment technology that removes leaves and their associated content of nitrogen and phosphorus from receiving waters. A full scale NSBB in Rockledge, Florida was monitored over a 167 day period to estimate the quantity of leaves captured, the capture efficiency, and the mass of nitrogen and phosphorus in the captured leaves. It was found that:

- The total volume of stormwater treated by the NSBB during the study was 54,042 gallons.
- The total volume of leaves removed from the NSBB during the study period was 63 cubic feet.
- The total mass of leaves captured by the NSBB during the study period was 944 lbs. wet weight.
- Average daily leaf capture was 5.65 lbs per day.
- A whole effluent collection basket was installed on the NSBB outfall in order to estimate the leaf removal efficiency. Only a small quantity of leaves accumulated in the effluent basket, indicating a leaf capture efficiency of greater than 99%.
- To estimate the mass of nutrients removed by the NSBB, samples of captured leaves were taken to an analytical laboratory for analysis of Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP). The nutrient concentration equivalents removed from stormwater were 0.355 mg/L TKN and 0.214 mg/L TP.

BACKGROUND

The Nutrient Separating Baffle Box (NSBB) is a structural Best Management Practice (BMP) used for stormwater quality treatment. The NSBB, or “Type II” baffle box, is an evolution from the “Type I” baffle box that has been used primarily for removal of sediment and suspended solids from stormwater. The “Type I” baffle boxes consist of an in-line chamber with two to three vertical baffles which extend from the bottom of the baffle box tank to an elevation below the invert of the stormwater pipe. The function of a “Type I” baffle box is primarily to decrease the stormwater flow velocity and allow time for the settling of particles in the chambers. In addition, the baffles impede the horizontal movement of particles and enhancing settling. A description of the “Type I” baffle box can be found in *Storm Water Technology Fact Sheet Baffle Boxes*, EPA Office of Water, EPA 832-F-01-004, which is available at www.epa.gov/OW-OWM.html/mtb/baffle_boxes.pdf.

The NSBB manufactured by Suntree Technologies Inc. of Cocoa, Florida is a “Type II” design that incorporates an aluminum screen basket with a horizontal bottom at an elevation below the invert of the influent pipe but above the top of the baffles. In the “Type II” design, incoming flow passes through the screen basket, which captures leaves, trash, and other large materials. In addition to capturing the large sized materials and preventing their passage into the baffle box effluent, the material captured in the screen basket is held above and out of the water column. The purported effect is to reduce or eliminate the leaching that would occur if the captured material were submerged. Since leaching of leaves would release biochemical oxygen demand, nitrogen and phosphorus, removing leaves from the stormwater and holding the captured leaves out of the water column results in a reduction of nutrient loading to the receiving water body. The twin functions of capture and non-submergence are the basis for describing the baffle box/screen basket system as the *Nutrient Separating Baffle Box*. A description of the Suntree Technologies Inc. “Type II” baffle box can be found on the Suntree technologies website at www.suntreetech.com/baffle_box/.

OBJECTIVES

The objectives of this study were:

- Compile daily precipitation, daily volume of stormwater treated, and cumulative volume of stormwater treated at a full scale Nutrient Separating Baffle Box located in Rockledge, Florida over a specified period of operation;
- Quantify total volume and wet mass of leaves collected by the NSBB screen basket over the same time period;
- Perform Total Kjeldahl Nitrogen and Total Phosphorus analyses on representative samples of materials collected from the NSBB screen basket;
- Estimate the total cumulative mass of leaf wet weight, Total Kjeldahl Nitrogen and Total Phosphorus removed by the NSBB and their equivalent stormwater concentrations; and
- Monitor the mass of leaves in the baffle box effluent to evaluate the efficiency of NSBB treatment.

It must be recognized that this report is a synopsis of monitoring, measurements, analyses and observations made at a particular NSBB installation over a limited period of operation. This report is not, nor is it intended to be, a definitive performance evaluation of NSBB technology.

SITE DESCRIPTION

The Suntime Nutrient Separating Baffle Box is located in Rockledge, Florida, at the intersection of Little John Dr. and Rockledge Dr. (Figure 1). Discharge is directly to the Indian River Lagoon (Figure 2). The Rockledge baffle box is a Suntime Model NSBB 5-10, with inside width and length of 5 and 10.5 ft, respectively, a baffle height of 3.0 ft, and a total height of 7 ft. The screen basket within the NSBB is 3 ft wide and 8 ft long, and is roughly centered within the baffle box walls (Figure 3). The basket has three sidewalls of 36 inch height and a top that extends 24 inches from the downstream sidewall. The basket bottom, sidewalls, and top are all fabricated from expanded aluminum diamond pattern screen having opening lengths of 1.75 and 0.625 inch on the long and short axes, respectively.

The contributing watershed has an area of 10.6 acres, and is primarily single family residential (Figure 4). A single 14 x 23 inch elliptical pipe enters the Rockledge baffle box. The baffle box received no drainage directly through the top; all inflow was through the single influent pipe.

Rainfall and flow through the Rockledge baffle box were monitored through continuous monitoring equipment that was installed at the site as a part of an ongoing monitoring project. Rainfall was monitored using an ISCO 674 tipping bucket rain, and flowrate was monitored using an ISCO 750 Area-Velocity (Doppler) Flowmeter that directly measured average water velocity and flow depth in the baffle box effluent pipe. Data were downloaded at monthly or more frequent intervals, and integrated to produce daily cumulative values of rainfall and volume treated.

A custom effluent collection basket was designed and installed at the Rockledge site to collect leaves and other large materials passing through the Rockledge NSBB (Figure 5). The effluent collection basket was connected to the NSBB by a covered flume (Figure 6). The effluent basket was 4 ft wide, 4 ft. long, and 18 in tall, and was fabricated from expanded aluminum diamond pattern screen having the same opening lengths as the NSBB basket.

The Rockledge Nutrient Separating Baffle Box was cleaned on November 12, 2006 by City of Rockledge personnel, who removed 100% of the sediment from the bottom chambers and all of the leaves from the basket. This date marked the start of the NSBB evaluation period. After that date, all leaves in the baffle box basket and effluent basket were due to stormwater entering the influent pipe. It is noted that the Rockledge baffle box was designed with top grates that permitted flow of water directly into the baffle box. These grates were covered during the evaluation period to prevent direct water ingress from above.

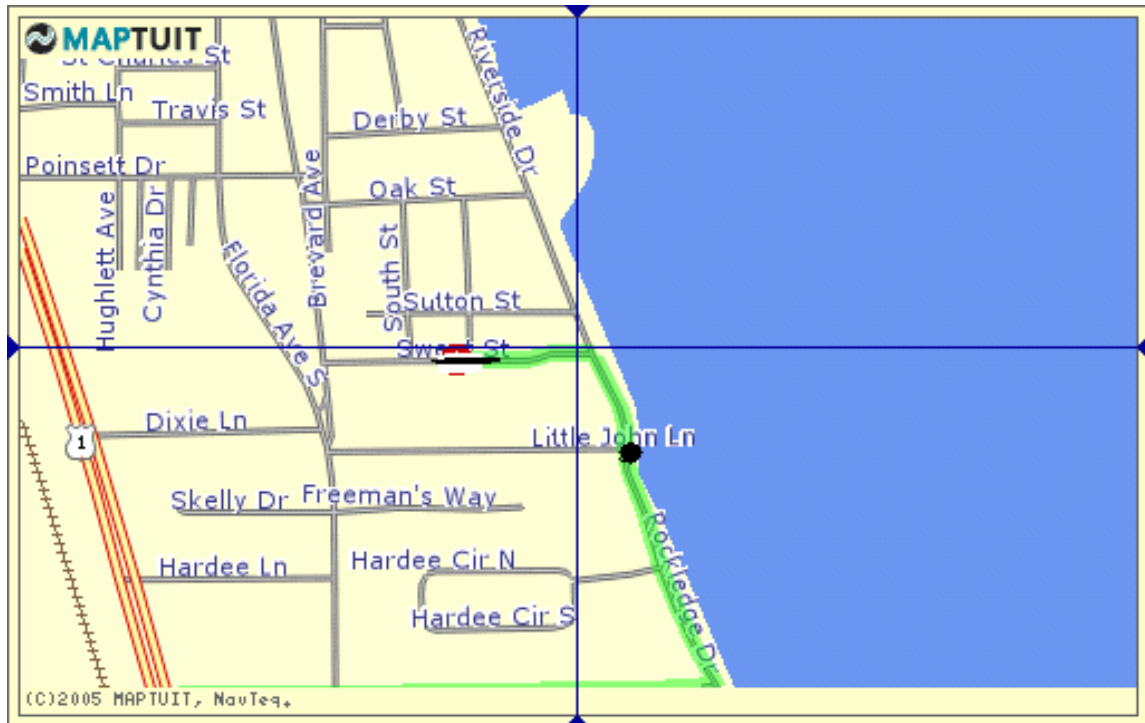


Figure 1 Rockledge Nutrient Separating Baffle Box location (north is up).



Figure 2. Rockledge baffle box on Indian River Lagoon.



Figure 3. NSBB screen basket.

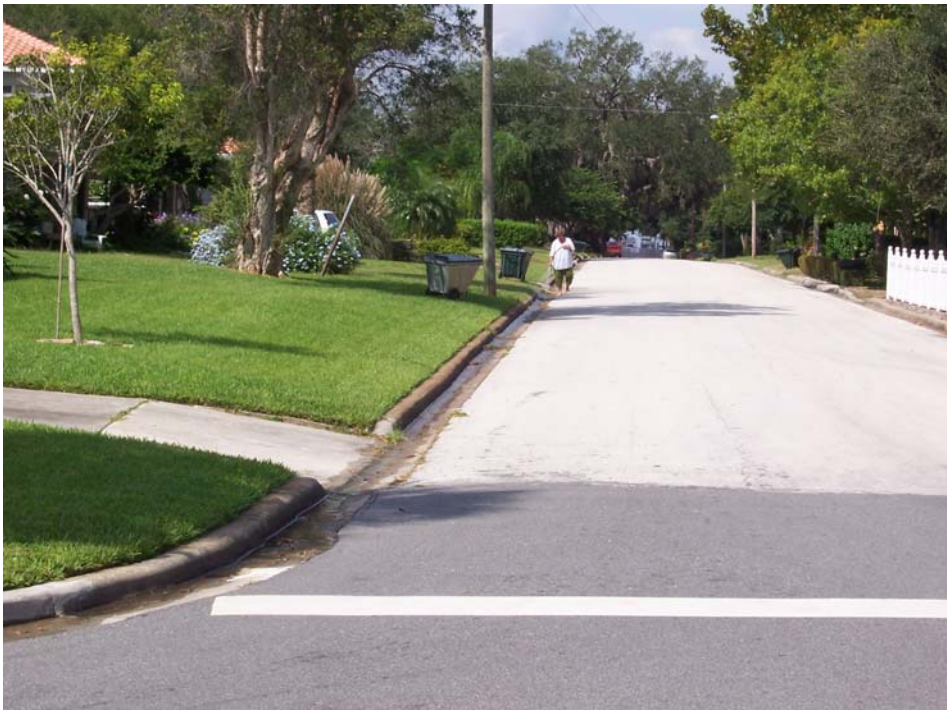


Figure 4. Little John Lane, looking west from baffle box location.



Figure 5. Effluent screen basket.



Figure 6. Flume connecting baffle box to effluent basket.

PRECIPITATION AND TREATED VOLUMES

Precipitation Daily precipitation over the 167 day period is shown in Figure 7. This record is composed primarily of on-site precipitation monitoring, augmented data from local rain gage stations when the on-site gage was not operating. Thirty one days had a daily precipitation greater than zero, with 17 days having greater than 0.1 inch. The total precipitation over the 167 day period was 6.87 inch.

Treated Volume The volume treated through the Rockledge NSBB is shown in Figure 8. The highest daily volume treated was 20,284 gallons on 10/1/2006, which corresponded to a daily precipitation of 1.05 inch, the highest recorded during the study period. Five storm events accounted for 91.6% of the total volume treated in the Rockledge NSBB over the monitored period. Stormwater runoff entered the Rockledge NSBB on only 13 days during the study period.

Volume Precipitation Relationship The daily volume treated in the Rockledge NSBB is plotted versus daily precipitation in Figure 9. The volume treated by the Rockledge NSBB was generally zero for daily precipitation of less than 0.1 inch. For daily precipitation greater than 0.1 inch, treated volume increased and accounted for a greater fraction of precipitation incident on the drainage basin. This result is expected, as higher precipitation events results in saturation of storage in surface depressions and subsurface porous media. An exponential fit to the data resulted in an R^2 of 0.89, which is reasonable for the purposes of this synopsis. It is noted that treatment volume monitoring data for the Rockledge NSBB were not available for three times within the 167 day observation period; 12/4/2006 to 12/7/2006, 12/20/2006 to 1/10/2007, and 2/24/2007 to 3/28/2007. The treatment volume/precipitation regression did not use data for these periods. During these times, only five non-zero precipitation days occurred, and three of these were less than 0.1 inch (i.e., zero treatment volume). There were two days for which the regression equation shown in Figure 9 was used to estimate daily treatment volume for the Rockledge NSBB: 12/23/2006 and 12/25/2006.

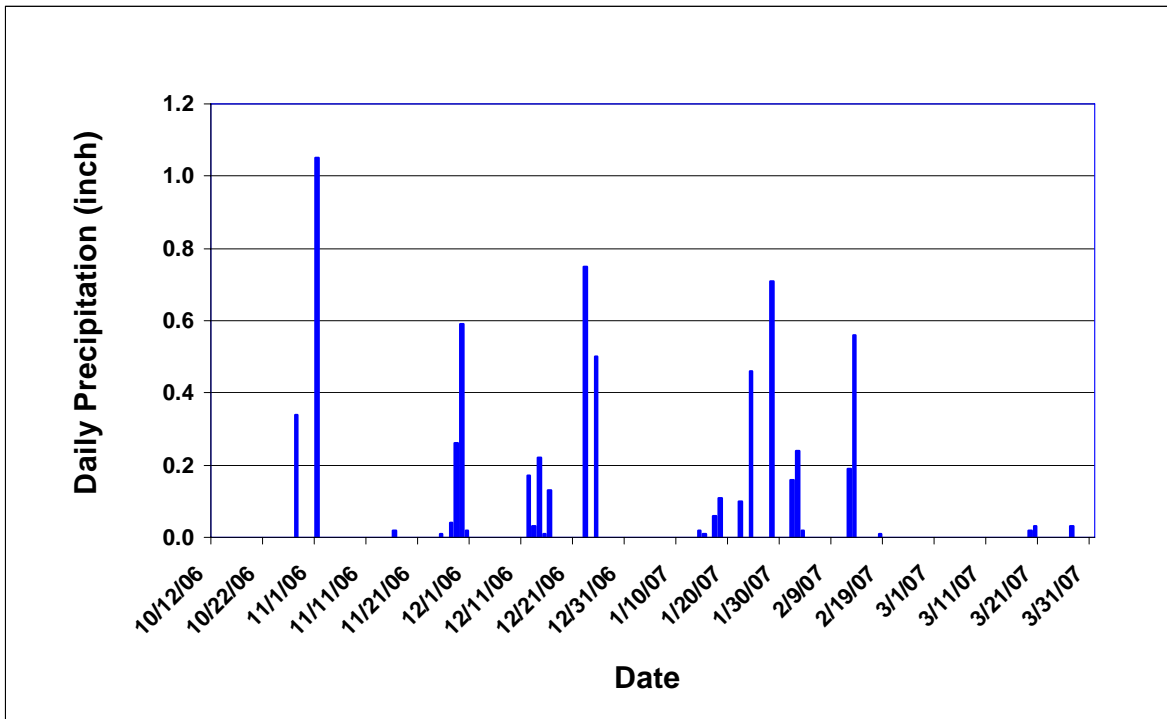


Figure 7. Daily precipitation at Rockledge NSBB.

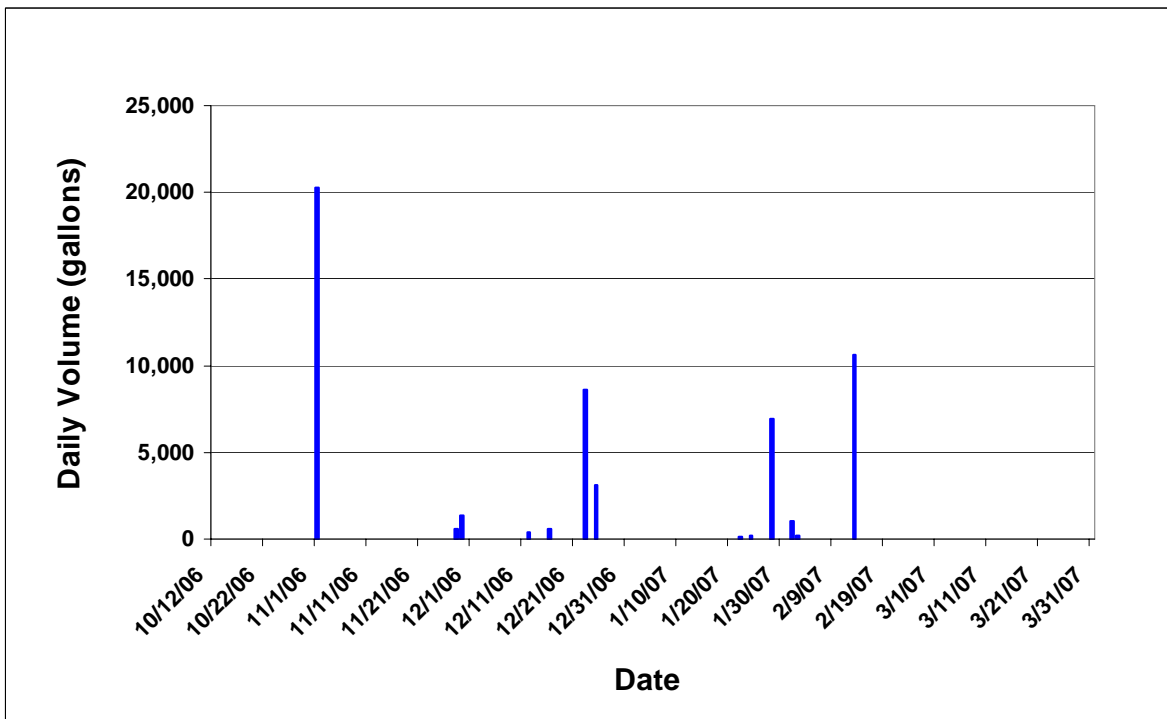


Figure 8. Daily volume treated by Rockledge NSBB.

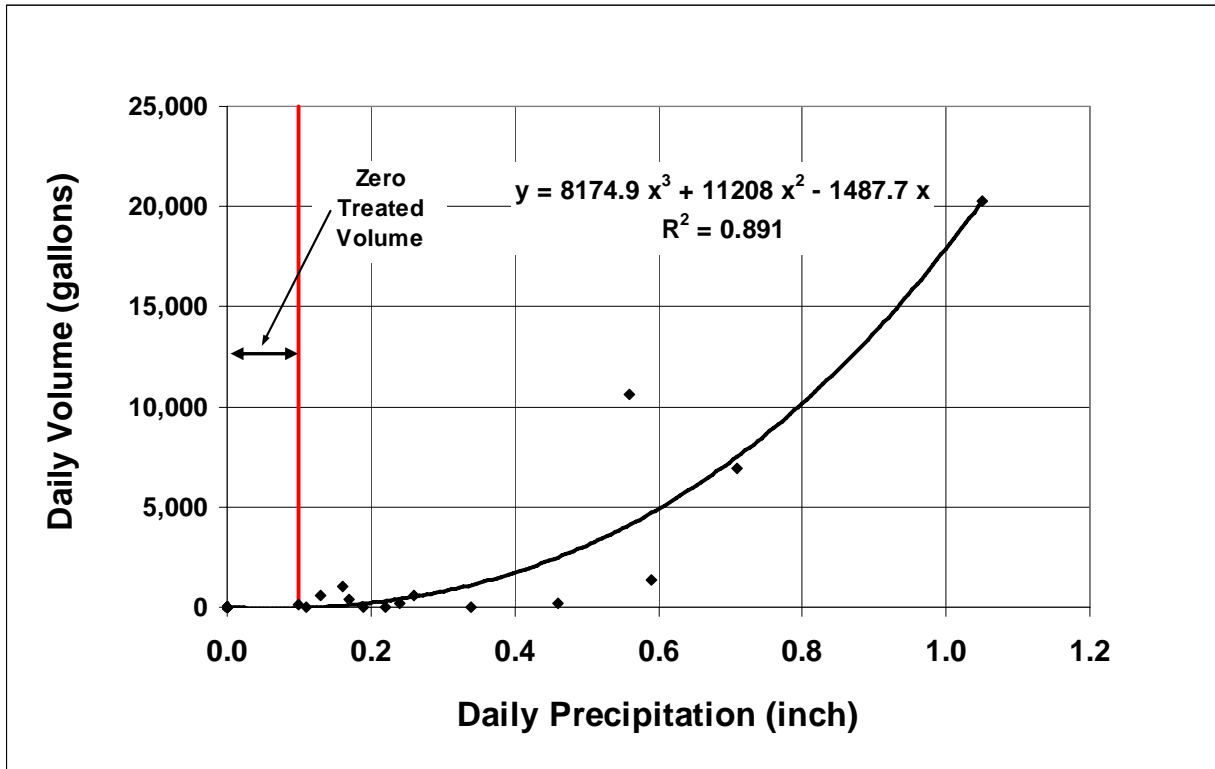


Figure 9. Rockledge NSBB treated volume versus precipitation.

LEAF REMOVAL AND NUTRIENT ANALYSIS

Leaf Removal Material collected in the Rockledge NSBB was removed twice during the 167 day study period. Material was collected in plastic bags and subsequently weighed within 2 hours of collection. The majority of material was leaves, with other materials present to a minor degree. The mass of material removed is shown in Table 1. Only a portion of the leaves were removed on 3/14/2007, but 100% of the leaves were removed on 3/28/2007. The sum of leaves removed on the two dates represents the total leaf material accumulated in the screen basket of the Rockledge NSBB during the 167 day period. Since the leaves were weighted without drying, the reported weight is a wet weight and includes moisture. The moisture content of the leaves was not measured. Field service reports are included in Appendix A.

Leaf material at the Rockledge NSBB influent pipe on 2/12/2007 is shown in Figure 10. The presence of some non-leaf material can be seen. Accumulation of leaves in the Rockledge NSBB is readily seen in Figure 11, which represents a top view with the top bar racks in open position. It is clearly seen that a great amount of leaves were retained on the screen basket in the Rockledge NSBB. A photograph of the effluent basket, taken at the same date and time, is shown in Figure 12. The amount of leaves in the effluent basket was quite limited. Although the leaves in the effluent basket were not quantified, the total mass would be expected to be not more than 100 grams. Considering that 944 lbs. of leaves were removed from the screen basket, the percentage of leaf removal by the Rockledge NSBB was greater than 99% over the 167 day period. It is noted that material smaller than the openings on the screen could pass through the NSBB or the effluent basket. High leaf accumulation in the NSBB basket could form a leaf bed on the bottom and a leaf wall on the basket periphery; this could perhaps increase the retention of materials, but the available monitoring data does not permit further analyses of this effect.

Analyses of Nutrient Content On 2/12/2007, leaf samples from the Rockledge NSBB were collected by Universal Engineering Sciences and submitted for analyses of Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP). Analyses were conducted for each of two composite samples. Each composite sample was assembled from an equal volume of leaves collected at five locations along a transect in the screen basket. One transect ran along the south side of the basket, and the second was at centerline. The results of analyses of each composite sample are shown in Table 2. The two TKN values differed by over 300%, with an average of 169.8 mg/kg, while the two TP analyses were within 6% with an average TP of 102.1 mg/kg. The complete Universal Engineering

Sciences Report is included in Appendix B. The reason for the relatively high discrepancy in TKN results is unknown.

Table 1 Material removal from screen basket

Date	Mass Removed (lbs)
3/14/2007	460
3/28/2007	484
Total	944

Table 2 Nutrient analyses of material removed from screen basket

Date	Total Kjeldahl Nitrogen (mg/kg)	Total Phosphorus (mg/kg)
Composite 1 (sideline)	77.6	99.1
Composite 2 (centerline)	262	105
Average	169.8	102.1



Figure 10. Influent pipe (2/12/2007).



Figure 11. View from top showing leaf accumulation (2/12/2007).



Figure 12. Effluent basket showing flume (2/12/2007).

MASS OF NUTRIENTS REMOVED

Total Nutrient Mass The nutrient content of the leaves removed by the Rockledge NSBB during the 167 day period was estimated using the total mass of leaves removed and the TKN and TP analyses of the composite samples. The resulting estimates of TKN and TP removal are shown in Table 3. These estimates assume that nutrient levels in composite samples are representative of all of the leaf material removed. The nutrient mass estimates are directly affected by the chemical analyses of the two composite samples. For TKN, there is a high degree of uncertainty in the mass estimate because the significant relative difference between the two TKN values (Table 2). Further methods development and analyses are needed to improve the reliability of the estimates nutrient reductions.

Equivalent Concentration Reduction The estimated mass removals of TKN and TP were used to calculate equivalent concentration reductions by the Rockledge NSBB. The total mass removed over the 167 day period was divided by the cumulative volume treated during the same period. Results are shown in Table 3. The calculated equivalent concentrations are directly dependent on the chemical analyses and share the uncertainty inherent in the chemical analysis results.

Table 3 Nutrient removal by Rockledge NSBB

Date	Total Kjeldahl Nitrogen	Total Phosphorus
Mass removed (lbs)	0.160	0.0964
Equivalent concentration (mg/L)	0.355	0.214

SUMMARY

A Nutrient Separating Baffle Box of 52.5 ft² plan area was monitored over a 167 day period from 10/12/2006 to 3/28/2007, during which time:

- The total cumulative stormwater volume treated was 54,042 gallons (205,550 L), with five storm events accounting for 91.6% of the total volume treated.
- The cumulative mass of leaves removed was 944 lbs wet weight (429 kg), for an average removal of 5.65 lbs. per day (2.57 kg/day).
- The Total Kjeldahl Nitrogen (TKN) of two composite samples of leaves collected from the NSBB basket screen were 77.6 and 262 mg TKN / kg wet weight.
- Total Phosphorus (TP) of the same samples used for TKN analyses were 99.2 and 105 mg TP/kg wet weight.
- The total estimated mass removed by the NSBB were 0.160 lbs. (72.8 gram) of Total Kjeldahl Nitrogen and 0.0964 lbs. (43.8 gram) of Total Phosphorus.
- The estimated equivalent water volume concentration reductions by the Rockledge NSBB were 2,090, 0.36, and 0.21 mg/L of leaves (wet weight), TKN, and TP, respectively.
- The capture efficiency of leaves and other material greater in size than the screen openings was greater than 99%.

In this study, precipitation was recorded on only 18.6% of the days throughout the study period. Stormwater runoff entered the Rockledge NSBB on only 13 days (7.8%) of the 167 days study period. In higher precipitation seasons, the average daily mass removals of leaves and associated nutrients would be greater than those observed in this report, provided that the removal efficiency of leaves was maintained.

The conclusions of this report properly apply only to the Nutrient Separating Baffle Box that was monitored at Rockledge. Caution should be used when extrapolating the results of this synopsis to other NSBB installations. The removal of leaves and their associated nutrient content by NSBB technology is affected by numerous factors, including NSBB unit size, watershed area, land use, precipitation patterns, runoff hydrographs, pipe flow velocities, characteristics of vegetation, and NSBB maintenance. More detailed monitoring evaluations are required to further define NSBB performance. The extent to which the nutrient content of captured leaves and other organic material is eliminated from discharge should be further elucidated.

Appendix A
Field Service Reports



Appendix B
Universal Engineering Sciences Report



UNIVERSAL ENGINEERING SCIENCES

Consultants In: Geotechnical Engineering • Environmental Sciences
Construction Material Testing • Threshold Inspection

820 Brevard Avenue • Rockledge, Florida 32955
(321) 638-0808 Fax (321) 638-0978

March 7, 2007

Henry Happel
President
Suntree Technologies, Inc.
798 Clearlake Road
Cocoa, Florida 32922

Reference: Baffle Box Sampling
Little John Lane
Rockledge, Florida 32955
Universal Project No. 34184-003-01

Dear Mr. Happel:

Universal Engineering Sciences, Inc. (Universal) is pleased to submit this letter report to Suntree Technologies, Inc. including laboratory analysis and volume measurement of leaf material collected from the baffle box at the above-referenced property (hereinafter "site"). Conclusions and recommendations are not a part of this report as per Universal Proposal No. P07-4800REV, dated February 12, 2007.

SCOPE OF WORK

Two composite samples were collected from a baffle box located at the site and submitted to a state certified laboratory for analyses of *total phosphorus* and *total kjeldahl nitrogen*. Measurements were taken of the approximate bulk volume of leaf material in the baffle box screen (length x width x average depth) at the time of the sampling event. Refer to **Figure 1 (Property Location Map)** in **Attachment A** for the site location.

LEAF SAMPLING

On February 12, 2007 Universal collected five samples of leaf material along the southern edge of the baffle box from the entrance (influent) to exit (effluent). Each sample point was of approximate equal spacing from the next sample point and had an approximate equal quantity of material. The five samples were combined together to form one composite sample (Composite No. 1). Universal also collected five samples of leaf material along the center line of the baffle box from the entrance (influent) to exit (effluent). Each sample point was of approximate equal spacing from the next sample point and had an approximate equal quantity of material. The five samples were

combined together to form one composite sample (Composite No 2). The two composite samples were submitted to a state certified laboratory for analyses by Environmental Protection Agency (EPA) Method 365.4 (*total phosphorus*), and EPA Method 351.2 (*total kjeldahl nitrogen*). Refer to **Figure 2 (Sampling Location Map)** in **Attachment A** for sampling locations within the baffle box.

Universal estimates the approximate bulk volume of leaf material accumulated in baffle box screen to be approximately ([96 in.] length x [34 in.] width x [12 in.] average depth) or 22.67 cubic feet (ft³) at the time of the sampling event.

The laboratory analytical report performed by PEL Laboratories, Inc. (PEL) in Tampa, Florida along with the Chain-of-Custody is located in **Attachment B**.

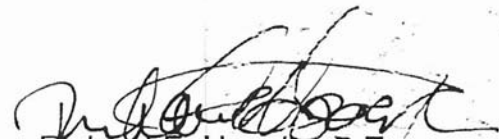
Universal appreciates this opportunity to provide environmental services to you, and looks forward to working with you on this project. Please do not hesitate to contact us if you have questions or require any additional information.

Sincerely,

UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No. 549



Doug Sterling
Senior Project Manager



Richard E. Hcaglin, P.E.
Branch Manager 3/7/07
Florida Registration No. 48796

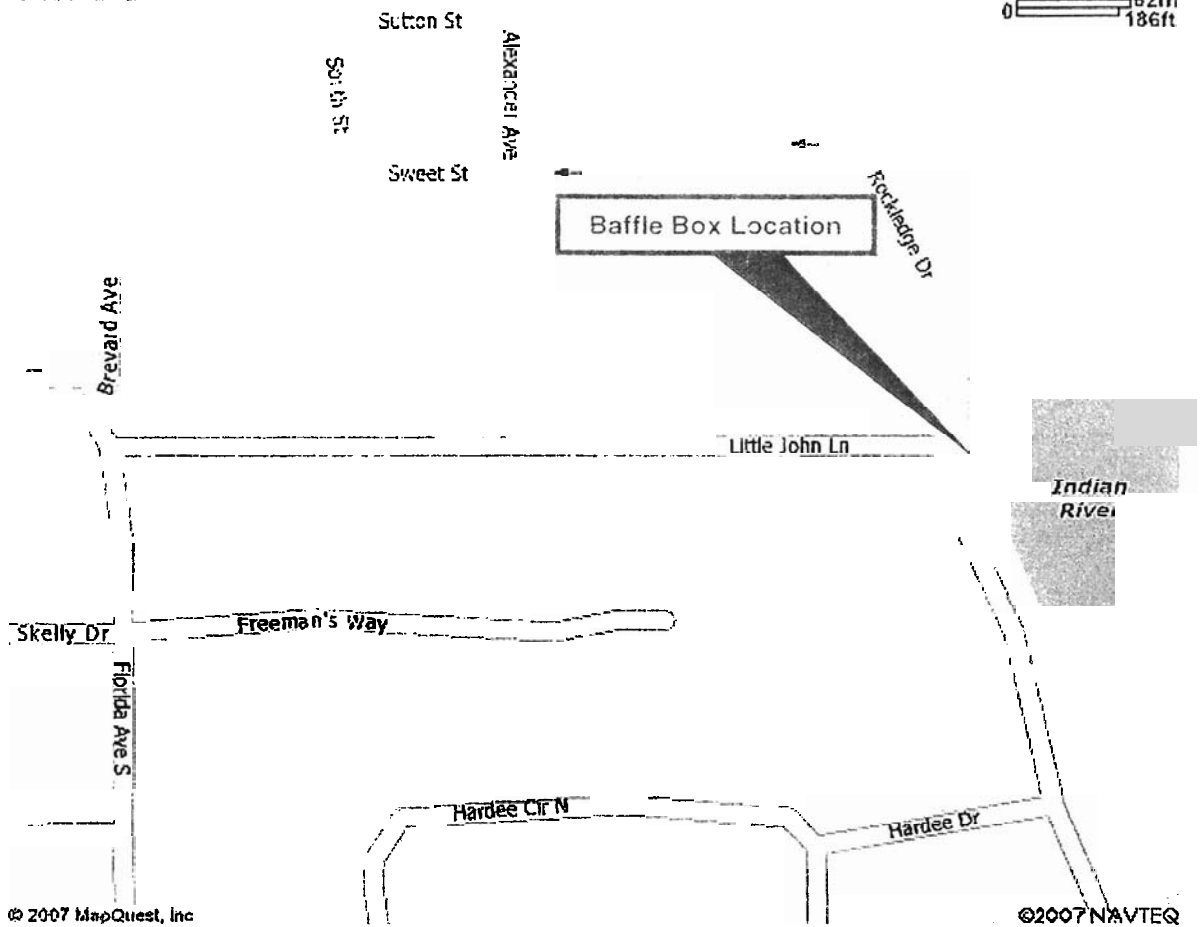
2-Addressee



ATTACHMENT A

MAPQUEST

0 62m
186ft

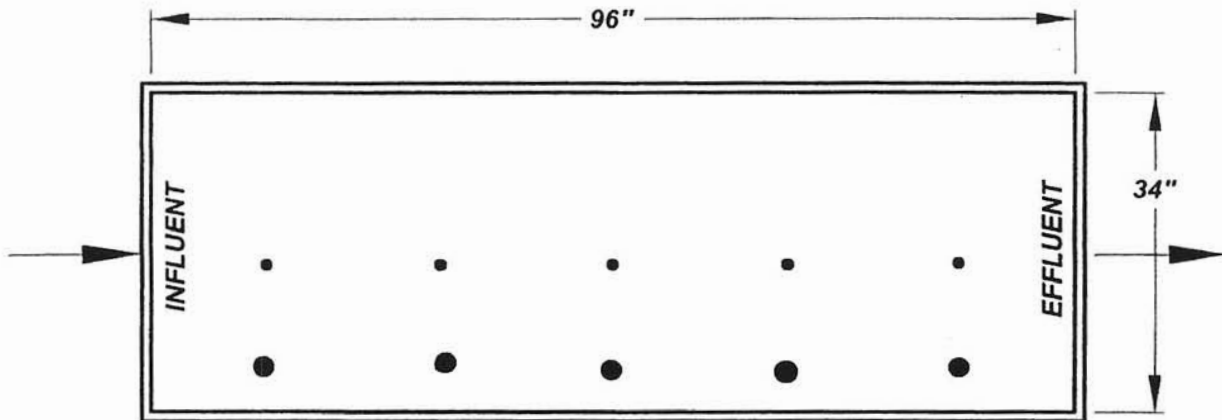


Baffle Box
Little John Lane and Rockledge Drive
Rockledge, Brevard County, Florida

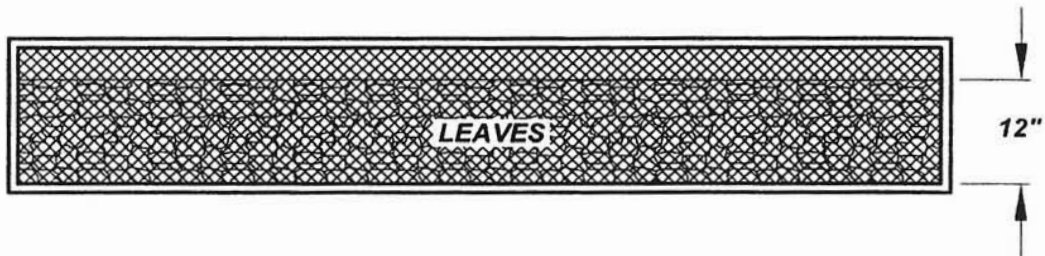
PROPERTY LOCATION MAP

DRAWN BY	D.S.	DATE	February 14, 2007	CHECKED BY	D.S.	DATE	February 14, 2007
SCALE	N.T.S.	PROJECT NO	34184-003-01	REPORT NO		PAGE NO	FIGURE 1

PLAN VIEW



SIDE VIEW



LEGEND

- COMPOSITE SAMPLE #1 LOCATIONS
- COMPOSITE SAMPLE #2 LOCATIONS

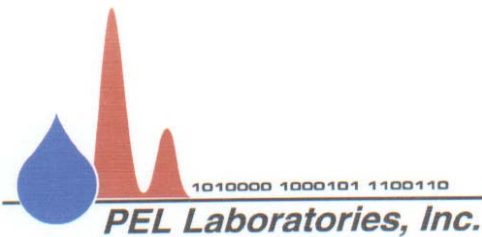


BAFFLE BOX
LITTLE JOHN LANE AND ROCKLEDGE AVE.
ROCKLEDGE, FLORIDA

SAMPLING LOCATION MAP

DRAWN BY: G.W.V.	DATE: 6 MAR 07	CHECKED BY: D.S.	DATE: 6 MAR 07
SCALE: N.T.S.	ORDER NO: 34184-003-01	REPORT NO:	PAGE NO: FIGURE 2

ATTACHMENT B



Florida Department of Health #E84207

July 1, 2007

CWA - Extractable Organics, General Chemistry, Metals,
Pesticides-herbicides-PCB's, Volatile Organics

RCRA/CERCLS - Extractable Organics, General Chemistry, Metals
Pesticides-Herbicides-PCB's, Volatile Organics

- CERTIFICATE OF ANALYSIS -

Report Date: 02/22/2007

To: Doug Sterling
Universal Engineering Sciences
820 Brevard Avenue
Rockledge, FL 32955

W 321-638-0808
F 321-638-0978

PROJECT ID: Baffle Box / 34184-003-01
WORK ORDER: 2505941
DATE RECEIVED: Wednesday, February 14, 2007

Project Notes:

@@@@@ Subcontracted to lab certification # 87600/E87936

(t): Short Hold Time Analysis Date

Samples reported on dry weight basis

All test results in this report pertain only to the samples as submitted.

PEL Contact: Mark Gudnason / extension: 242

4420 Pendola Point Road • Tampa, Florida 33619
(813)247-2805 • FAX: (813)248-1537
Website: www.pelab.com

PEL Laboratories, Inc.

DATA QUALIFIER CODES

State of Florida, Department of Environmental Protection and
Department of Health Rehabilitative Services / NELAC

- I** The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
- J** Estimated value; value not accurate. This code shall be used in the following instances:
 - 1. Surrogate recovery limits have been exceeded.
 - 2. No known quality control criteria exists for the component.
 - 3. The reported value did not meet the established quality control criteria for either precision or accuracy but falls within the NELAC marginal exceedance range
 - 3M. The reported value did not meet the established quality control criteria for either precision or accuracy and falls beyond the NELAC range for marginal exceedances.
 - 4. The sample matrix interfered with the ability to make an accurate determination.
 - 5. The data is questionable because of improper laboratory or field protocols (e.g. composite sample was collected instead of a grab sample).
- L** Off-scale high. Actual value is known to be greater than the value given. To be used when the concentration of the analyte is above the acceptable limit for quantitation (exceeds the linear range of the highest calibration standard) and the calibration curve is known to exhibit a negative deflection.
- Q** Sample held beyond acceptable holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for the sample preparation or analysis.
- U** Indicates that the compound was analyzed for but not detected above the method detection limit (MDL).
- V** Indicates that the analyte was detected in both the sample and the associated method blank. Note: The value in the blank shall not be subtracted from associated samples.
- Y** The laboratory analysis was from an unpreserved or improperly preserved sample. The data may not be accurate.

Note: There was not sufficient sample volume to perform a matrix spike/duplicate for the following method(s). : 351.1_OL, 365.2_OL
PEL did analyze a Blank and Laboratory Control sample to ensure the method performed within acceptable guidelines.

- CERTIFICATE OF ANALYSIS -



FLDOH #E84207

To: Doug Sterling
Universal Engineering Sciences

WORK ORDER: 2505941

PROJECT ID: Baffle Box / 34184-003-01

PEL Lab# : 250594101
Client ID : Composite #1
Matrix : S

Collection Information:
Sample Date: 2/12/2007 2:00:00 PM
ND = Non Detect

Parameter	Method	Results	Analysis Date	Prep Date	Units	MDL	RL	Dilution Factor
Total Kjeldahl Nitrogen	351.1	@@@@@ 77.6	02/21/2007 11:53	02/20/2007 12:00	MG/KG	0.185	37	1
Total Phosphorus	365.2	@@@@@ 99.2	02/21/2007 11:28	02/20/2007 11:30	MG/KG	4.96	4.96	50

- CERTIFICATE OF ANALYSIS -



FLDOH #E84207

To: Doug Sterling
Universal Engineering Sciences

WORK ORDER: 2505941

PROJECT ID: Baffle Box / 34184-003-01

PEL Lab# : 250594102
Client ID : Composite #2
Matrix : S

Collection Information:
Sample Date: 2/12/2007 2:15:00 PM
ND = Non Detect

Parameter	Method	Results	Analysis Date	Prep Date	Units	MDL	RL	Dilution Factor
Total Kjeldahl Nitrogen	351.1	@@@@@ 262	02/21/2007 11:53	02/20/2007 12:00	MG/KG	0.187	37.5	1
Total Phosphorus	365.2	@@@@@ 105	02/21/2007 11:28	02/20/2007 11:30	MG/KG	4.93	4.93	50

- CERTIFICATE OF ANALYSIS -



FLDOH #E84207

To: Doug Sterling
Universal Engineering Sciences

WORK ORDER: 2505941
PROJECT ID: Baffle Box / 34184-003-01

QC SUMMARY

METHOD: 351.1

Method Blank 7021125-BLK1 Matrix : SOIL

Associated Lab Samples : 250594101 250594102 7021125-BLK1 7021125-BS1

Parameter	Results	Analysis Date	Prep Date	Units	RL	Dilution Factor
Total Kjeldahl Nitrogen	ND	2/21/2007	2/20/2007	MG/KG	4	1

LABORATORY CONTROL SAMPLE 7021125-BS1 Matrix : SOIL

PARAMETER	UNITS	SPIKE CONC	LCS RESULT	SPIKE % REC	% REC LIMITS	RPD	RPD LIMIT
Total Kjeldahl Nitrogen	MG/KG	50	53.2	106	(90-110)	20	

- CERTIFICATE OF ANALYSIS -



FLDOH #E84207

To: Doug Sterling
Universal Engineering Sciences

WORK ORDER: 2505941

PROJECT ID: Baffle Box / 34184-003-01

METHOD: 365.2

Method Blank 7021136-BLK1

Matrix : SOIL

Associated Lab Samples : 250594101 250594102 7021136-BLK1 7021136-BS1

Parameter	Results	Analysis Date	Prep Date	Units	RL	Dilution Factor
Total Phosphorus	U	2/21/2007	2/20/2007	MG/KG	0.005	1

LABORATORY CONTROL SAMPLE 7021136-BS1 Matrix : SOIL

PARAMETER	UNITS	SPIKE CONC	LCS RESULT	SPIKE % REC	% REC LIMITS	RPD	RPD LIMIT
Total Phosphorus	MG/KG	0.25	0.256	102	(90-110)	20	

- CERTIFICATE OF ANALYSIS -



FLDOH #E84207

To: Doug Sterling
Universal Engineering Sciences

WORK ORDER: 2505941

PROJECT ID: Baffle Box / 34184-003-01

Brian C. Spann Laboratory Manager
David Cantillo Quality Assurance
Mark Gudnason Senior Project Manager

EPA Method 351.2 (Total Kjeldahl Nitrogen)

Report Preparation

Professional Engineer/Geologist PE/PG (report review, sign & seal)

Project Engineer/Geologist (report preparation)

CADD/Drafting

Clerical

FedEx | Ship Manager | Label 7912 3091 3349

From: Origin ID: COJA (321)638-0808
Michele Brandell,
Universal Engineering Sciences
820 Brevard Avenue
Rockledge, FL 32955



CL5012472805

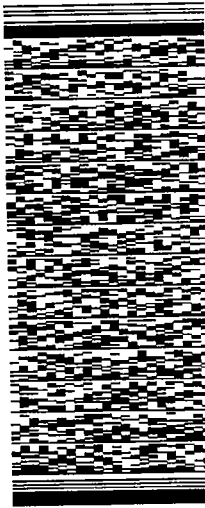
SHIP TO: (813)247-2805 BILL RECIPIENT

PEL Labs Sample Custody

PEL Labs

4420 PENDOLA POINT RD

TAMPA, FL 336199689



Ship Date: 13FEB07
ActWgt: 20 LB
System#: 1281798/NET2600
Account#: S *****

Delivery Address Bar Code



Ref # Baffle Box
Invoice #
PO #
Dept #

PRIORITY OVERNIGHT

WED

Deliver By:
14FEB07

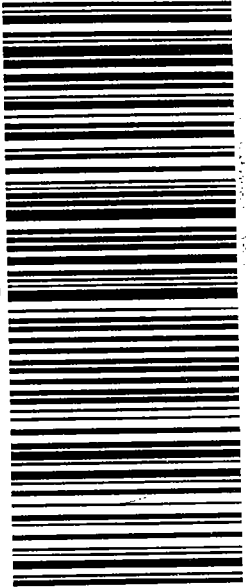
FORM
0201

TRK# 7912 3091 3349

TPA A1

33619 -FL-US

34 MCFA



SAMPLE RECEIPT CONFIRMATION SHEET

Client Information			
SDG:	2505941	Req:	78011
Client:	Universal	Project:	Generic - Rockledge
Level:	1	Date Rec'd:	2/14/07 11:45:00 AM
Rec'd via:	Fed-Ex	Due Date:	02/21/07

Sample Verification			
Samples/Cooler Secure?	<input type="text" value="Yes"/>	All Samples on COC accounted For?	<input type="text" value="Yes"/>
Temperature of Samples(Celsius)	<input type="text" value="5.0 C"/>	All Samples Rec'd Intact?	<input type="text" value="Yes"/>
pH Verified?	<input type="text" value="No"/>	Sample Vol. Stuff. For Analysis?	<input type="text" value="Yes"/>
pH WNL?	<input type="text" value="No"/>	Samples Rec'd W/I Hold Time?	<input type="text" value="Yes"/>
Soil Origin (Domestic/Foreign):	<input type="text"/>	Are All Samples to be Analyzed?	<input type="text" value="Yes"/>
Site Location/Project on COC?	<input type="text" value="No"/>	Correct Sample Containers?	<input type="text" value="Yes"/>
Client Project # on COC?	<input type="text" value="No"/>	COC Comments written on COC?	<input type="text" value="Yes"/>
Project Mgr. Indicated on COC?	<input type="text" value="Yes"/>	Samplers Initials on COC?	<input type="text" value="Yes"/>
COC relinquished/Dated by Client?	<input type="text" value="Yes"/>	Sample Date/Time Indicated?	<input type="text" value="Yes"/>
COC Received/Dated by PEL?	<input type="text" value="Yes"/>	TAT Requested:	<input type="text" value="STD"/>
Specific Subcontract Indicated?	<input type="text" value="No"/>	Client Requests Verbal Results?	<input type="text" value="No"/>
Samples Received By	<input type="text" value="Fed-Ex"/>	Client Requests Faxed Results?	<input type="text" value="No"/>
PEL to Conduct ALL Analyses?	<input type="text" value="No"/>		

Subcontract Analysis

Parameter	Due Date	Via	Lab Name	Comments
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PEER REVIEW

