AbTech

A Discussion with Anna Grigg's of Apex Companies, LLC

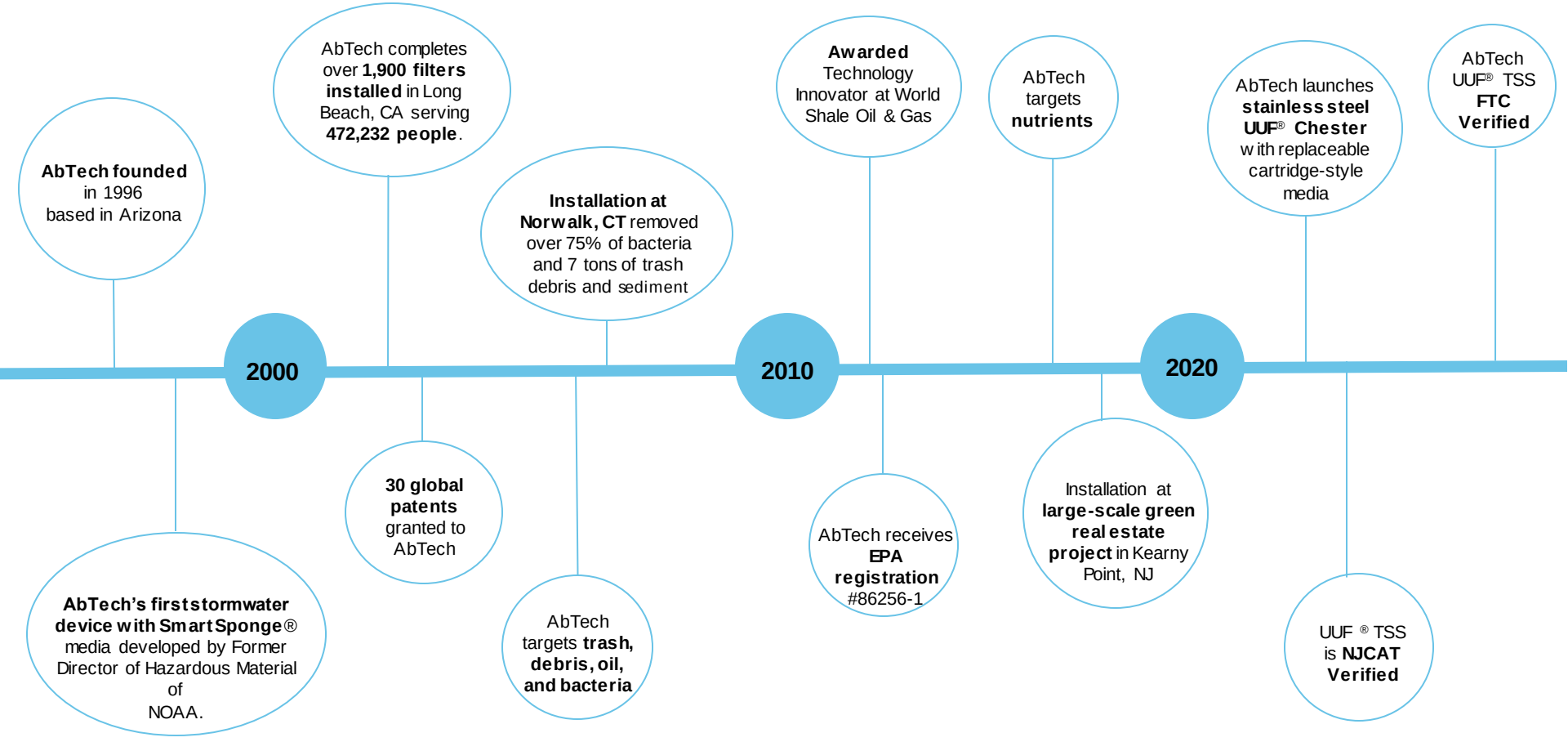
Observations From Stormwater Asset Maintenance to Drive Sustainable Performance

October 1, 2020

Today's Presenters:

About AbTech

- Headquarters in AZ
- Representatives nationally and internationally
- Innovative solutions to address water pollution
- 30,000+ installations in 45 states and 15 countries
- Provide Stormwater, SPCC and Industrial solutions


AbTech founded in 1996 based in Arizona
AbTech's first stormwater device with SmartSponge® media developed by Former Director of Hazardous Material of NOAA.
2000
AbTech completes over 1,900 filters installed in Long Beach, CA serving 472,232 people.
30 global patents granted to AbTech
Installation at Norwalk, CT removed over 75% of bacteria and 7 tons of trash debris and sediment
AbTech targets trash, debris, oil, and bacteria
2010
Awarded Technology Innovator at World Shale Oil & Gas
AbTech receives EPA registration #86256-1
AbTech targets nutrients
Installation at large-scale green real estate project in Kearny Point, NJ
2020
AbTech launches stainless steel UUF® Chester with replaceable cartridge-style media
UUF ® TSS is NJCAT Verified
AbTech UUF® TSS FTC Verified

Observations From Stormwater Asset Maintenance to Drive Sustainable Performance

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APEX

Apex Quick Facts

- Privately-held company with 30-year history of customer satisfaction
- 700+ employees in nearly 60 offices nationwide
- Full suite of professional and field environmental services serving over 2,000 clients across the US each year

APEX

Why Apex?

- Technical expertise and very high rate of repeat clients
- Demonstrated responsiveness to meet client needs (24/7 if needed)
- Proven relationships with state/federal regulators to provide a clear path to regulatory closure
- Industry specific expertise
- Partnerships with our clients
- Solid health & safety culture and performance metrics (our WorkSafe program is committed to zero incidents)

APEX

Learn more at: www.apexcos.com

Opening Remarks

- Why is stormwater so important?
  - First step to drinking water
    - Which leads to… beer
- Who should care?
  - Anyone who drinks water (beer)
  - Anyone who showers regularl
  - All the critters on the plane

Poll:

- How often do you Inspect or Maintain your stormwater infrastructure?
  - Monthly
  - Quarterly
  - Annually
  - When not performing (clogged or flooded)
  - Never or Do not know

Stormwater Planned Maintenance Program

Awareness

- Regulatory
- Property Damage
- Public Perception

Identification

- Types of Systems
  - Above Ground
  - Below Ground
  - Retention
  - Detention

Agenda: 5 Steps to Stormwater Planned Maintenance Program

Inventory

- Structures
- Attributes

Assessment

- Condition of Systems
  - Neglected
  - Improper installation

Implementation

- Analyze
  - Data
  - Budget
    - Repairs or remediation
    - Maintenance - Frequency

Awareness

- Regulatory – Local Enforcement Efforts
  Kent Conservation District DE

To Whom It May Concern:

Kent Conservation District recently performed our annual inspection of the storm water facility at the above referenced address. During our inspection, the following items were noted and our office request the following items be performed:

1. On the south end of the building there is a stormwater facility. Very near to this facility, there is a garbage dumpster. This dumpster is leaking and trash is finding its way into the stormdrain. There are collected sediments on the pavement in the area of this stormdrain. This matter needs to be resolved and the sediment removed from the pavement. Any collected sediments in the pipe system also need to be removed.

The approved plan for this location was approved on July 10, 2002, by Kent Conservation District. The approved plan requires that the facility by maintained per the DE Sediment and Stormwater Regulations. We will be performing a follow up inspection to ensure compliance within 60 days.

Please call my office upon receiving this correspondence, to schedule a meeting so that I may provide you with technical assistance and a better understanding of that work that needs to be completed.

Awareness

- Regulatory – Local Enforcement Efforts Tampa FL

Dear Permittee,

By letter dated 07/07/2010 you were advised that a condition of the permit for the above referenced project requires that you submit an inspection report to the District in accordance with a specific schedule. To date, this information has not been provided. Failure to submit the required documents is a violation of your permit and District rules.

To bring this matter into compliance, you must submit a certified "Statement of Inspection for Proper Operation and Maintenance" form within 14 days. Your response should be directed to me at the Tampa Service office.

If this matter is not brought into compliance in a timely manner at the staff level, the case may be referred to the District's Legal Department for further enforcement action.

If you have any questions, please contact TAMPA Service Office.

Awareness

- Regulatory – Local Enforcement Efforts Bee Cave TX

To Whom It May Concern:

The addressee above is listed as the owner of a non-point source water quality facility located in the City of Bee Cave city limits or ETJ, and you are responsible for maintenance of the facility in accordance with the City's Code of Ordinances, associated environmental and drainage criteria manuals, and approved development plans. This location was recently inspected, and a copy of the inspection report is enclosed with this letter. This water quality facility requires an annual operating permit, and any maintenance required per the inspection report attached shall be performed within 30 days of the date of this letter. Please review the permitting procedures below and submit all required information along with applicable permit fees to the City of Bee Cave's Community Services Department within 30 days of the date of this letter.

Sec. 20.01.104 Annual Operating Permit

(a) General Requirements. The owners or operators of all new water quality controls for multi-family residential development, for single-family subdivision development, and for non-residential development must obtain an annual operating permit. The owner or operator is responsible for the proper operation and maintenance of the control and for annual permit renewal. The initial operating permit will be issued by the city upon:

(1) The completion of construction, if applicable;

(2) Inspection of the control by the city after review of the maintenance plan accompanying the design engineer's concurrence letter of the completion of construction;

(3) Final inspection approval by the city;

Awareness

- Regulatory – Local Enforcement Efforts Thousand Oaks CA

Subject: **Report on required maintenance for permanent storm water quality facilities**
Due June 30, 2018

BY:

To the Owner(s) of 512 N Ventu Park Rd **(PCID 139)**: 3179

The developer of the subject property was required to install a permanent storm water treatment system as a condition of developing the property. This system removes pollutants from the property's storm water runoff to protect the downstream natural receiving waters. The installed system is referenced in a Covenant and Deed Restriction upon the subject property, recorded by the County of Ventura as document number 20130917-00159196-0 1/8.

Frequent maintenance of these facilities is necessary for them to operate effectively. Neglecting maintenance could result in an illegal discharge of pollution subject to fines and/or flooding due to blocked storm drains. Maintenance procedures are required by City Municipal Code Section 7-8.201(e) as a preventative measure. Please review the Deed Restriction for the site (typically found among property title documents) and follow the prescribed maintenance including equipment manufacturer's recommendations.

Awareness

- Public Perception
- The social phenomenon known as **public perception** can be seen as the difference between an absolute truth based on facts and a virtual truth shaped by popular opinion, media coverage and/or reputation

Awareness

- Public Perception

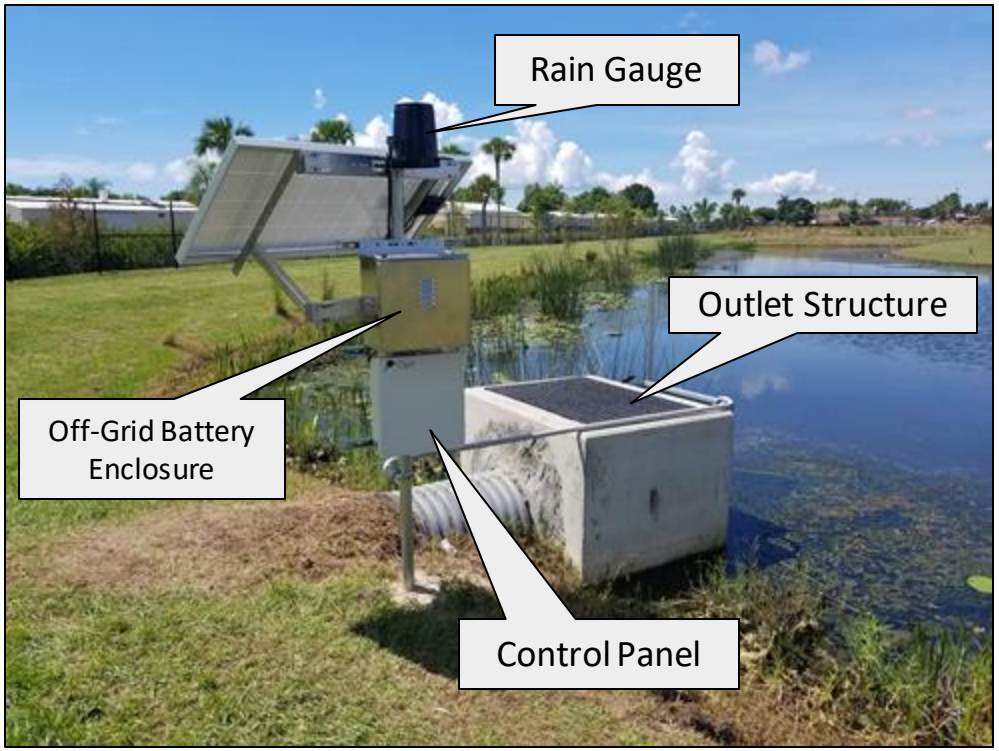
Creating a Win-Win for Public & Private

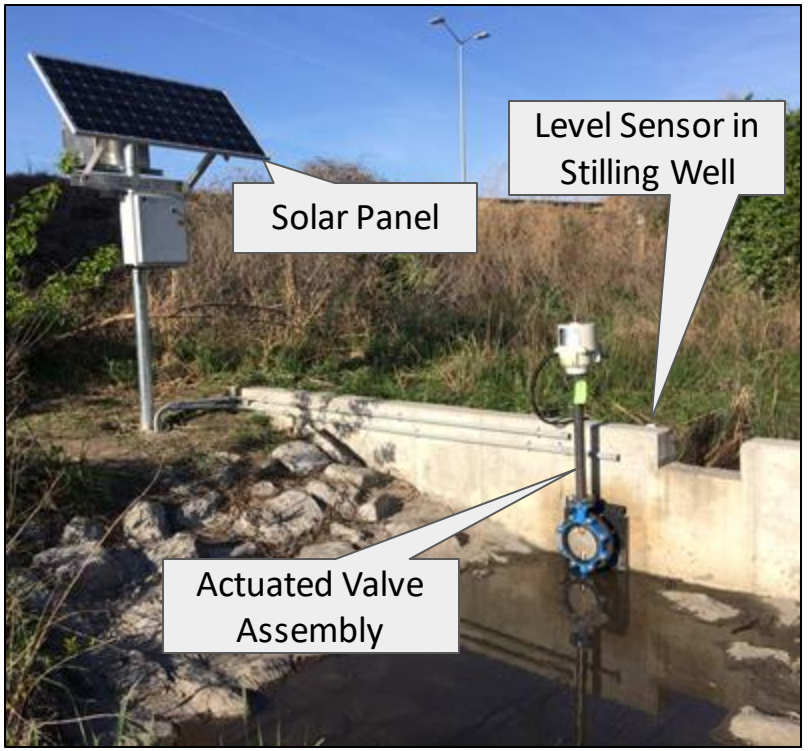
- Converted 3.2 ac-ft from passive to active storage at 90% savings compared to new storage
- Generated 12.1 water quality credits at 86% capital savings for Howard County
- Saved private landowner $14,000/year

Metric	Passive	Active	Improvement
Wet Weather Flow Reduction	5%	70%	13X
Average Retention Time	12hr	60hr	4X
Peak Flow Reduction	33%	91%	1.8X

*8/1/2018-8/1/2019

Public/Private Integrated Solutions





Identification of Stormwater Systems

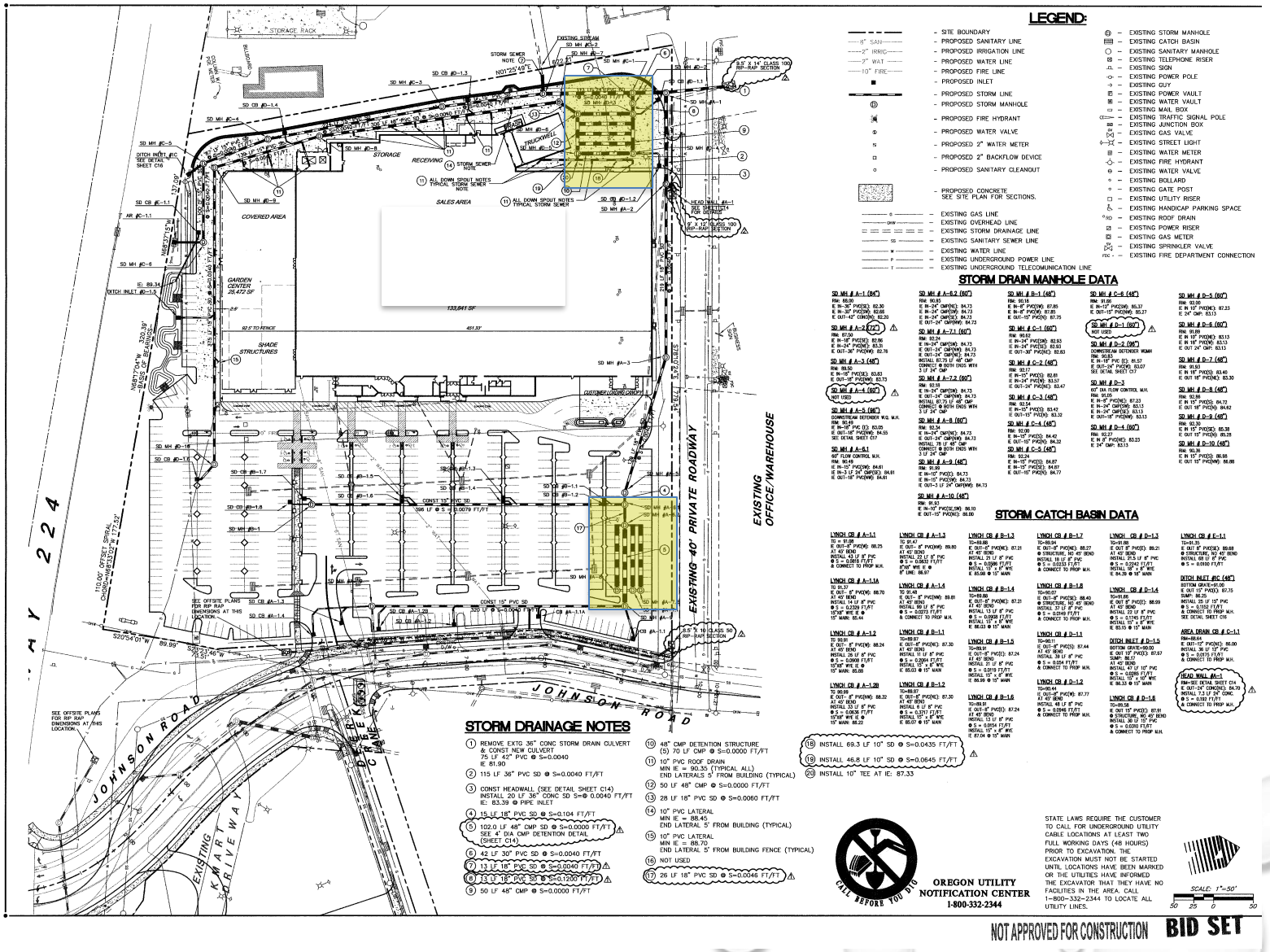
What is a stormwater system?

It's a network of structures, channels, and underground pipes that carry stormwater away from buildings to ponds, lakes, streams, and rivers.

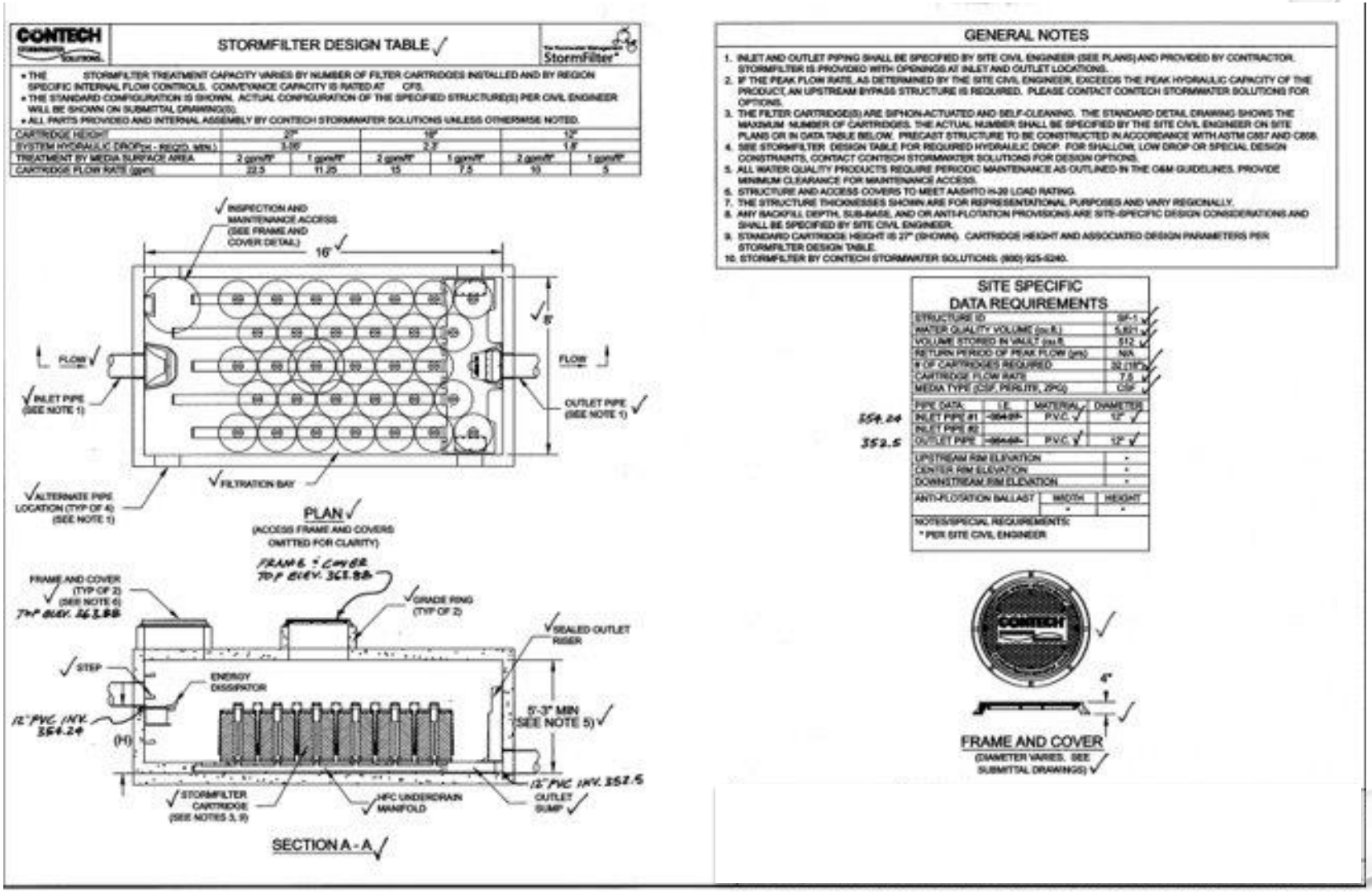
Identification of Stormwater Systems

- Diversion
  - Retention
  - Detention
- Above Ground
- Below Ground
- Ponds vs. Bioretention
- Inlet
- Outlet
- Flow Control
- Box Filter
- Treatment Devices
  - Filters
  - Sand

Identification of Stormwater Systems



Identification of Stormwater Systems



CONTECH STORMWATER SOLUTIONS

STORMFILTER DESIGN TABLE ✓

StormFilter®

- THE STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED AND BY REGION SPECIFIC INTERNAL FLOW CONTROLS. CONVEYANCE CAPACITY IS RATED AT CFS.
- THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CIVIL ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).
- ALL PARTS PROVIDED AND INTERNAL ASSEMBLY BY CONTECH STORMWATER SOLUTIONS UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	27"		18"		12"	
SYSTEM HYDRAULIC DROP(Hd - REQ'D. MIN.)	3.16'		2.3'		1.8'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5

GENERAL NOTES

1. INLET AND OUTLET PIPING SHALL BE SPECIFIED BY SITE CIVIL ENGINEER (SEE PLANS) AND PROVIDED BY CONTRACTOR. STORMFILTER IS PROVIDED WITH OPENINGS AT INLET AND OUTLET LOCATIONS.
2. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE PEAK HYDRAULIC CAPACITY OF THE PRODUCT, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED. PLEASE CONTACT CONTECH STORMWATER SOLUTIONS FOR OPTIONS.
3. THE FILTER CARTRIDGE(S) ARE SIPHON-ACTUATED AND SELF-CLEANING. THE STANDARD DETAIL DRAWING SHOWS THE MAXIMUM NUMBER OF CARTRIDGES. THE ACTUAL NUMBER SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER ON SITE PLANS OR IN DATA TABLE BELOW. PRECAST STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C857 AND C858.
4. SEE STORMFILTER DESIGN TABLE FOR REQUIRED HYDRAULIC DROP. FOR SHALLOW, LOW DROP OR SPECIAL DESIGN CONSTRAINTS, CONTACT CONTECH STORMWATER SOLUTIONS FOR DESIGN OPTIONS.
5. ALL WATER QUALITY PRODUCTS REQUIRE PERIODIC MAINTENANCE AS OUTLINED IN THE O&M GUIDELINES. PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS.
6. STRUCTURE AND ACCESS COVERS TO MEET AASHTO H-20 LOAD RATING.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES AND VARY REGIONALLY.
8. ANY BACKFILL DEPTH, SUB-BASE, AND OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY SITE CIVIL ENGINEER.
9. STANDARD CARTRIDGE HEIGHT IS 27" (SHOWN). CARTRIDGE HEIGHT AND ASSOCIATED DESIGN PARAMETERS PER STORMFILTER DESIGN TABLE.
10. STORMFILTER BY CONTECH STORMWATER SOLUTIONS: (800) 925-5240.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	SF-1 ✓
WATER QUALITY VOLUME (cu.ft.)	5,851 ✓
VOLUME STORED IN VAULT (cu.ft.)	512 ✓
RETURN PERIOD OF PEAK FLOW (yrs)	N/A
# OF CARTRIDGES REQUIRED	32 (18") ✓
CARTRIDGE FLOW RATE	7.5 ✓
MEDIA TYPE (CSF, PERLITE, ZPG)	CSF ✓

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	354.24	P.V.C. ✓	12" ✓
INLET PIPE #2			
OUTLET PIPE	352.5	P.V.C. ✓	12" ✓
UPSTREAM RIM ELEVATION			*
CENTER RIM ELEVATION			*
DOWNSTREAM RIM ELEVATION			*
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT	
	*	*	

NOTES/SPECIAL REQUIREMENTS:
* PER SITE CIVIL ENGINEER

INSPECTION AND MAINTENANCE ACCESS (SEE FRAME AND COVER DETAIL) ✓
16' ✓
8' ✓
FLOW ✓
INLET PIPE (SEE NOTE 1) ✓
FLOW
OUTLET PIPE (SEE NOTE 1) ✓
ALTERNATE PIPE LOCATION (TYP OF 4) (SEE NOTE 1) ✓
FILTRATION BAY ✓

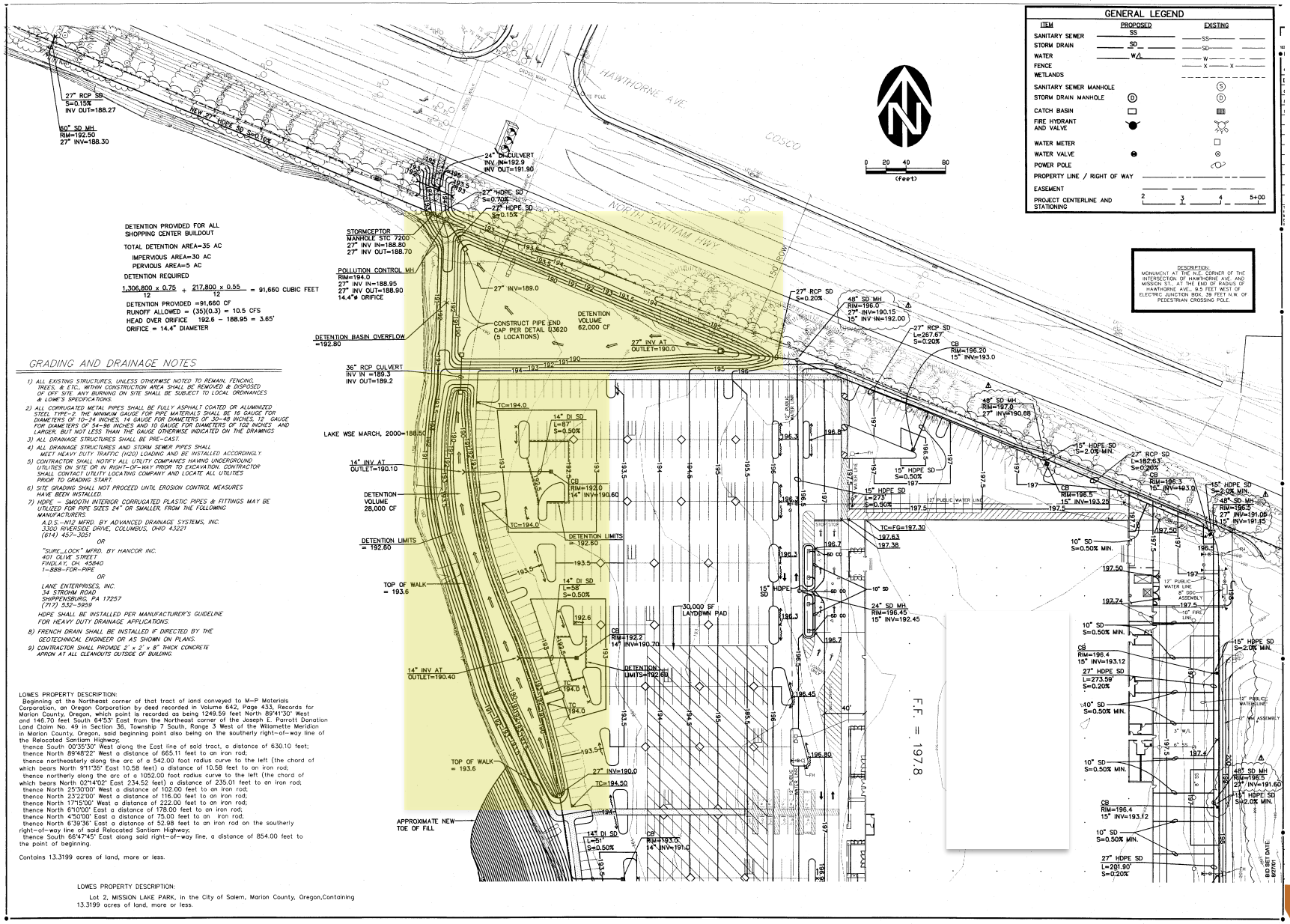
PLAN ✓
(ACCESS FRAME AND COVERS OMITTED FOR CLARITY)

FRAME AND COVER (TYP OF 2) (SEE NOTE 6)
FRAME & COVER TOP ELEV. 362.88
TOP ELEV. 362.88
GRADE RING (TYP OF 2) ✓
SEALED OUTLET RISER ✓
STEP ✓
ENERGY DISSIPATOR
12" PVC INV. 354.24
(H)
5'-3" MIN (SEE NOTE 5) ✓
12" PVC INV. 352.5
STORMFILTER CARTRIDGE (SEE NOTES 3, 9) ✓
HFC UNDERDRAIN MANIFOLD ✓
OUTLET SUMP ✓

SECTION A - A ✓

CONTECH
6" ✓
FRAME AND COVER
(DIAMETER VARIES, SEE SUBMITTAL DRAWINGS) ✓

Identification of Stormwater Systems



Identification of Stormwater Systems

Diversion & Detention

Structural or Manufactured BMPs

Green Infrastructure

Inventory – Stormwater Assets/Structures

Diversion & Detention

Definition: an artificial pond or other structure that is designed to collect and retain or detain urban stormwater.

Inventory – Stormwater Assets/Structures

Structural or Manufactured BMPs

Definition: Proprietary or manufactured structures, catch basins, filtered devices, formed inlets/outlets, etc.

Inventory – Stormwater Assets/Structures

"Green Infrastructure"

Definition: The process in which contaminants and sedimentation are removed from stormwater runoff through a system utilizing vegetation, various soil media for infiltration, and temporary retention.

LID – Effective Construction Installation

Poll

- Who does your maintenance and inspection?
  - You
  - Third-party
  - Unsure

Assessing Systems

Has the system received routine maintenance?

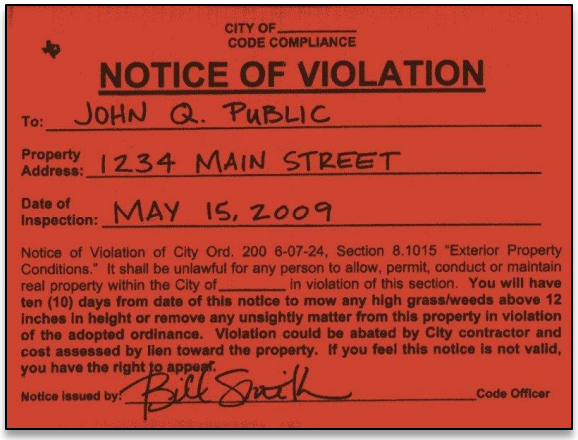
- Is it neglected?

Are repairs required?

- Major or minor?

Is the system out of regulatory compliance?

- Has a notice of violation been received?
- Are fines being assessed?



CITY OF_____
CODE COMPLIANCE

NOTICE OF VIOLATION

To: JOHN Q. PUBLIC

Property Address: 1234 MAIN STREET

Date of Inspection: MAY 15, 2009

Notice of Violation of City Ord. 200 6-07-24, Section 8.1015 "Exterior Property Conditions." It shall be unlawful for any person to allow, permit, conduct or maintain real property within the City of_____ in violation of this section. **You will have ten (10) days from date of this notice to mow any high grass/weeds above 12 inches in height or remove any unsightly matter from this property in violation of the adopted ordinance. Violation could be abated by City contractor and cost assessed by lien toward the property. If you feel this notice is not valid, you have the right to appeal.**

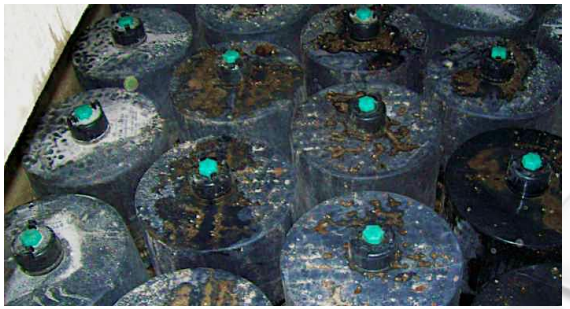
Notice issued by: Bill Smith Code Officer

Assessing Systems

Above/Below Ground Detention Systems Common Issues

Underground Detention/Retention

- Inconsistent Maintenance
- Improper Installation
- Location of Access
- Paved-Over Lids
- Locked or Specialized Tool Required for Entry
- Broken Structures
- Dumping Regulations
- End of Pipe (where is it going?)
- MS4
  - Pond
  - Vault



Assessing Systems – Example Issues

Underground Detention/Retention

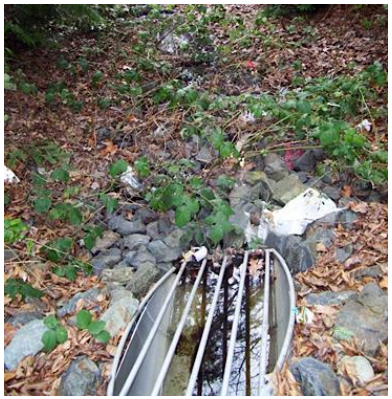
- Inconsistent Maintenance
- Location of Access

Assessing Systems

Other System Attributes Common Issues

Inlets/Outlets

- Inconsistent Maintenance
- Improper Installation
- Location of Access
- Broken Structures
- Dumping Regulations
- End of Pipe (where is it going?)
  - MS4
  - Stream/Creek
  - Lake
  - Ocean



Assessing Systems – Example Issues

- **Inlets/Outlets**
  - Inconsistent Maintenance
  - Broken Structures
    - Liability

Assessing Systems

Above Ground Systems Common Issues

Above Ground Detention/Retention

- Inconsistent Maintenance
- Improper Installation of Inlet/Outlet
- Location of Access (if any)
- Irregular and Incorrect Herbicide Use (erosion)
- Locked Entry (gates locked)
- Broken Structures
- Regulatory Requirements
- Illegal Dumping (landscape debris, trash, transients)
- End of Pipe (where is it going & where did it come from?)
  - MS4
  - Vault
  - Receiving Waters

Assessing Systems – Example Issues

- **Above Ground**
  - Inconsistent Maintenance
  - Broken Structures
  - Dumping Regulations

Assessing Systems – Example Failures

Property development stopped due to economy. No inspections, no maintenance.

Marietta, GA

Assessing Systems - the cost of neglect

Outlet to System: $45,000 Rehab • Lafayette, LA

Assessing Systems – the cost of neglect

Overgrown Vegetation. No Inspections. No Prior Maintenance.

Lafayette, LA

Assessing Systems – the cost of neglect

Above Ground Detention/Retention

- Inconsistent Maintenance
- Regulatory Requirements
- Illegal Dumping (landscape debris, trash, transients)

Flow Control Weir – impacted by vegetation and trash

Assessing Systems – the cost of neglect

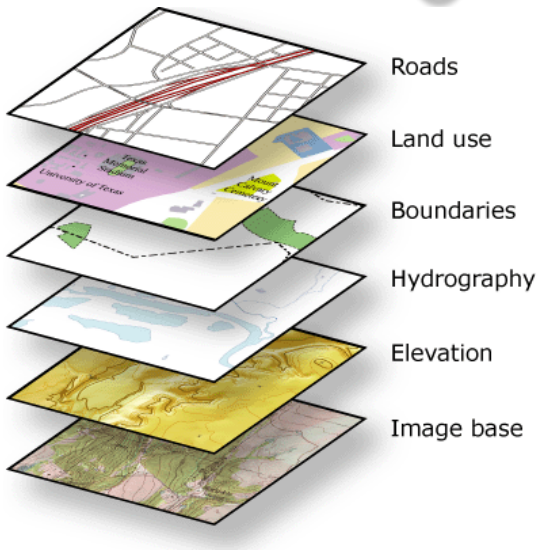
Flow Control Weir – impacted by vegetation and trash - 45’ swale rebuild and dumping restrictions $25,000 repair – Gaithersburg, MD – no ongoing maintenance

Poll

- Does your organization consider your Stormwater Program…
  - Necessary requirement
  - Asset and a value to our core mission
  - Someone else's problem

Implementing a Program

How to manage all that information!



Data

- Where Does it Go?
- Ease of Access

Requirements (Inspection, etc.)

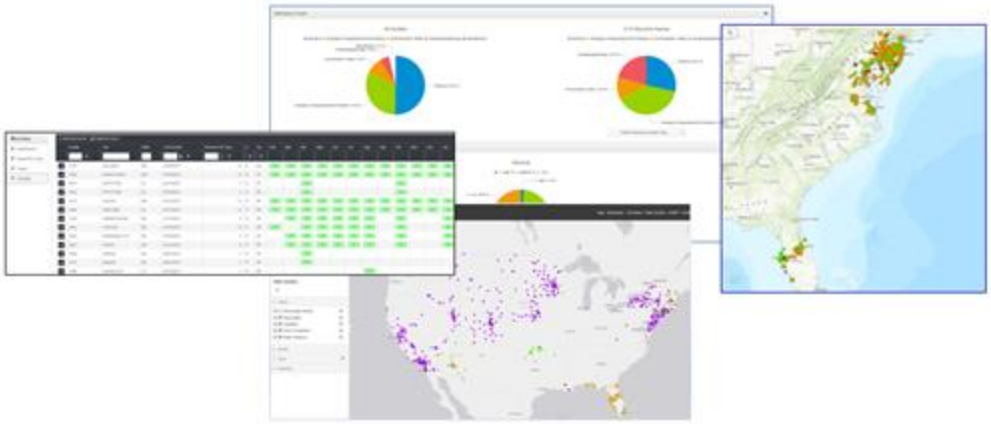
- When, Where, Who?

Repair/Remediation

- How Much?
  - Time for Budget
  - Immediate Repair?

Maintenance

- How much?
- How often?



Information Management System (ARTEMIS[SM])

Automated Workflows

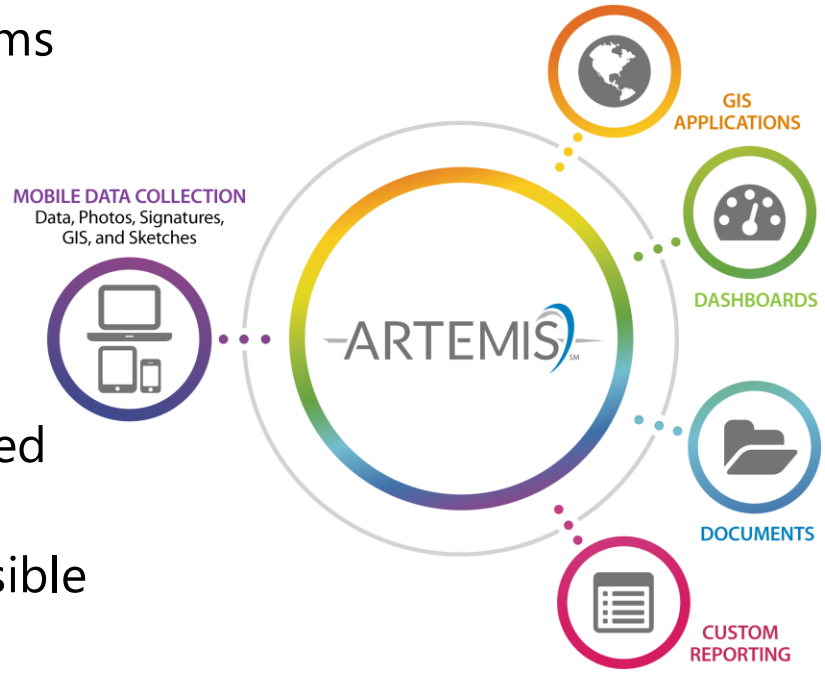
- Use of electronic field inspection forms
- Capture inspection and repair data, including photos and signatures
- Ensure quality of data collection and reporting

Centralized Data

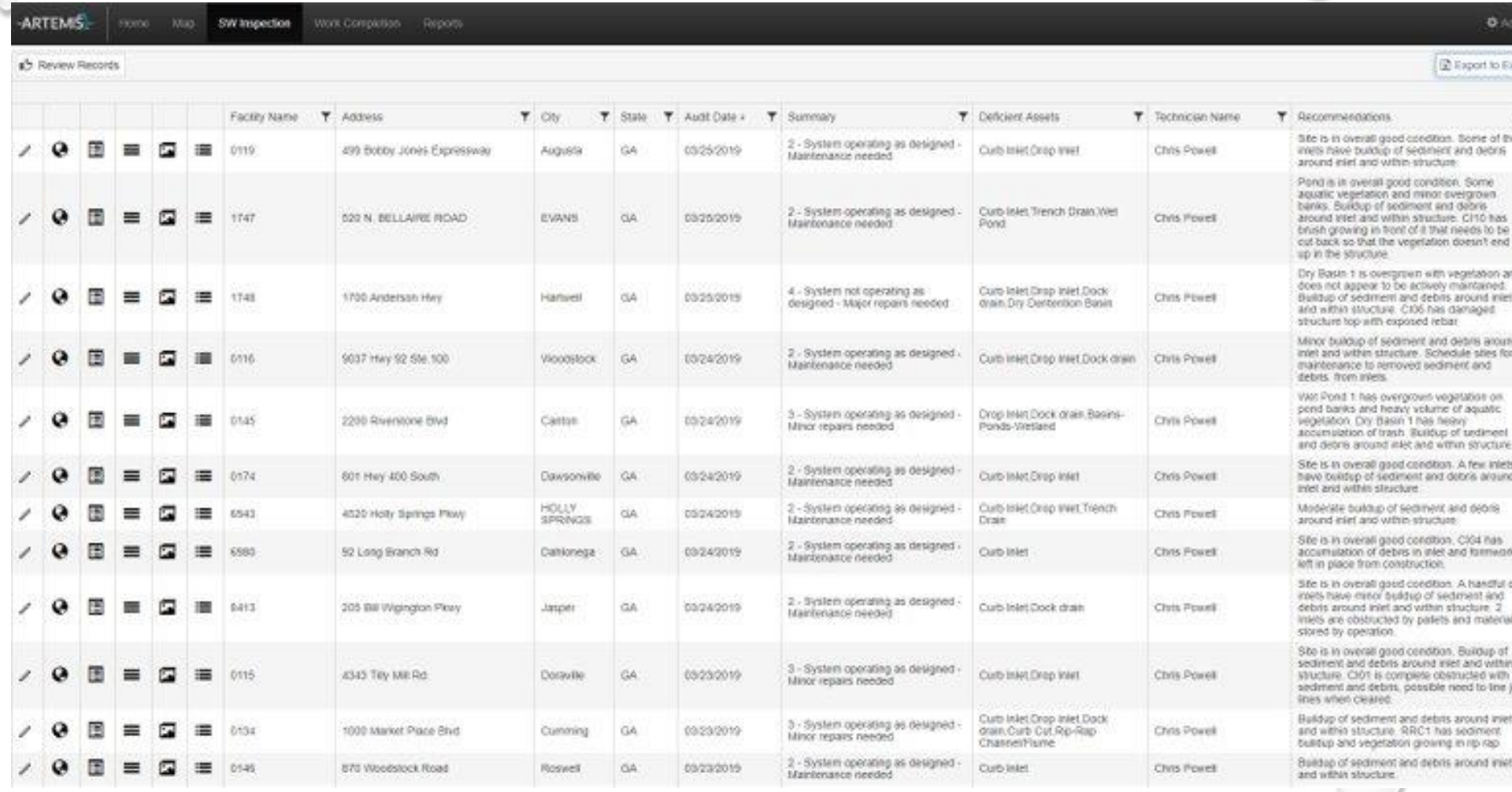
- Data is synchronized with a centralized data management system
- Data and Information is easily accessible through an easy to use interface
- Review, analysis and workflow

Centralized Document Management

- Implementation of client-facing sites
- Provides one location for all pertinent documents with enhanced search capability



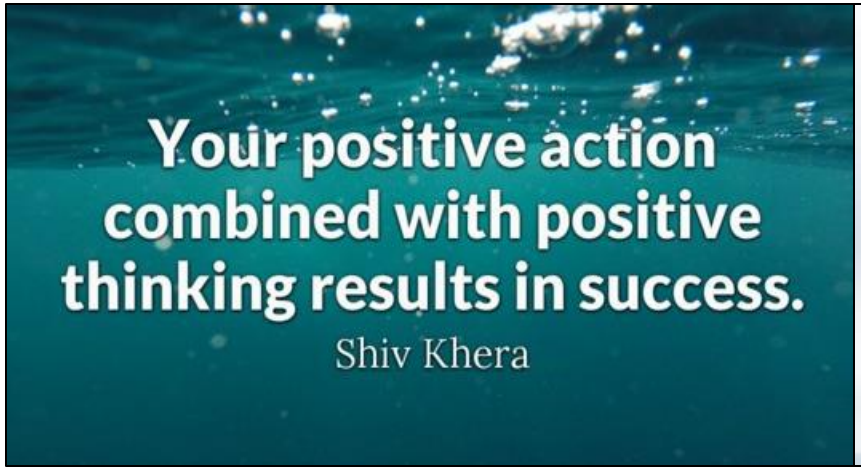
Implementing A Program



Facility Name	Address	City	State	Audit Date	Summary	Deficient Assets	Technician Name	Recommendations
0119	499 Bobby Jones Expressway	Augusta	GA	03/25/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Drop Inlet	Chris Powell	Site is in overall good condition. Some of th inlets have buildup of sediment and debris around inlet and within structure.
1747	520 N. BELLAIRE ROAD	EVANS	GA	03/25/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Trench Drain,Wet Pond	Chris Powell	Pond is in overall good condition. Some aquatic vegetation and minor overgrown banks. Buildup of sediment and debris around inlet and within structure. CI10 has brush growing in front of it that needs to be cut back so that the vegetation doesn't end up in the structure.
1748	1700 Anderson Hwy	Hartwell	GA	03/25/2019	4 - System not operating as designed - Major repairs needed	Curb Inlet,Drop Inlet,Dock drain,Dry Dentention Basin	Chris Powell	Dry Basin 1 is overgrown with vegetation ar does not appear to be actively maintained. Buildup of sediment and debris around inlet and within structure. CI06 has damaged structure top with exposed rebar.
0116	9037 Hwy 92 Ste 100	Woodstock	GA	03/24/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Drop Inlet,Dock drain	Chris Powell	Minor buildup of sediment and debris aroun inlet and within structure. Schedule sites fo maintenance to removed sediment and debris from inlets.
0145	2200 Riverstone Blvd	Canton	GA	03/24/2019	3 - System operating as designed - Minor repairs needed	Drop Inlet,Dock drain,Basins-Ponds-Wetland	Chris Powell	Wet Pond 1 has overgrown vegetation on pond banks and heavy volume of aquatic vegetation. Dry Basin 1 has heavy accumulation of trash. Buildup of sediment and debris around inlet and within structure
0174	601 Hwy 400 South	Dawsonville	GA	03/24/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Drop Inlet	Chris Powell	Site is in overall good condition. A few inlets have buildup of sediment and debris aroun inlet and within structure.
6543	4520 Holly Springs Pkwy	HOLLY SPRINGS	GA	03/24/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Drop Inlet,Trench Drain	Chris Powell	Moderate buildup of sediment and debris around inlet and within structure.
6580	92 Long Branch Rd	Dahlonega	GA	03/24/2019	2 - System operating as designed - Maintenance needed	Curb Inlet	Chris Powell	Site is in overall good condition. CI04 has accumulation of debris in inlet and formwor left in place from construction.
6413	205 Bill Wigington Pkwy	Jasper	GA	03/24/2019	2 - System operating as designed - Maintenance needed	Curb Inlet,Dock drain	Chris Powell	Site is in overall good condition. A handful inlets have minor buildup of sediment and debris around inlet and within structure. 2 inlets are obstructed by pallets and materia stored by operation.
0115	4343 Tilly Mill Rd	Doraville	GA	03/23/2019	3 - System operating as designed - Minor repairs needed	Curb Inlet,Drop Inlet	Chris Powell	Site is in overall good condition. Buildup of sediment and debris around inlet and within structure. CI01 is complete obstructed with sediment and debris, possible need to line lines when cleaned.
0134	1000 Market Place Blvd	Cumming	GA	03/23/2019	3 - System operating as designed - Minor repairs needed	Curb Inlet,Drop Inlet,Dock drain,Curb Cut,Rip-Rap Channel/Flume	Chris Powell	Buildup of sediment and debris around inlet and within structure. RRC1 has sediment buildup and vegetation growing in rip rap.
0146	870 Woodstock Road	Roswell	GA	03/23/2019	2 - System operating as designed - Maintenance needed	Curb Inlet	Chris Powell	Buildup of sediment and debris around inlet and within structure.

Summary – 5 Keys to Success

1. Awareness
2. Identification
3. Inventory
4. Assessment
5. Implementation – Data



Interesting Findings…

Thank you!

Questions?

Anna Griggs

Business Development Manager

Apex Companies, LLC

704-589-5088

Anna.Griggs@apexcos.com

APEX