



Green Infrastructure Maintenance Management at MSDGC

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Presentation Overview

- Background
- Asset List
- SCM and the Asset Management Lifecycle
- Accomplishments
- To Do List
- Lessons Learned

Metropolitan Sewer District of Greater Cincinnati

- Serves Cincinnati and most of Hamilton County as well as parts of adjacent counties of Butler, Warren, and Clermont
 - Population of more than 800,000
 - 230K accounts
- Treats more than 70B gallons per year
- Seven major treatment plants



Our Challenge

MSD is under a federal mandate (Consent Decree) to reduce sewer overflows into local streams and rivers.



Combined sewers carry both sewage and stormwater in the same pipe.

Consent Decree

- Federally Mandated by USEPA
 - Capture, treat, or remove 85% of 11BG of CSO
 - Eliminate all SSOs
- Final WWIP (2010)
 - Storage and Conveyance
 - Product Control
 - **Source Control**
- Bioretention, detention, vegetated swales, stream restoration, etc.

Phase 1 Assets



Map Layers

500 ft
Scale: 1:2,400

3 km

Rapid Run

2 mi

Scale: 1:48,000



Rapid Run Bioswale





Map Layers

Scale: 1:48,000
1:1,200
Rapid Run
St. Francis

3 km

2 mi

Scale: 1:48,000

St. Francis





Map Layers

Rapid Run
Harrison SP

0m
2mi
3km

Scale: 1:48,000

Harrison Street Planter





Map Layers

Map Layers

Base

Denham St

40m

100ft

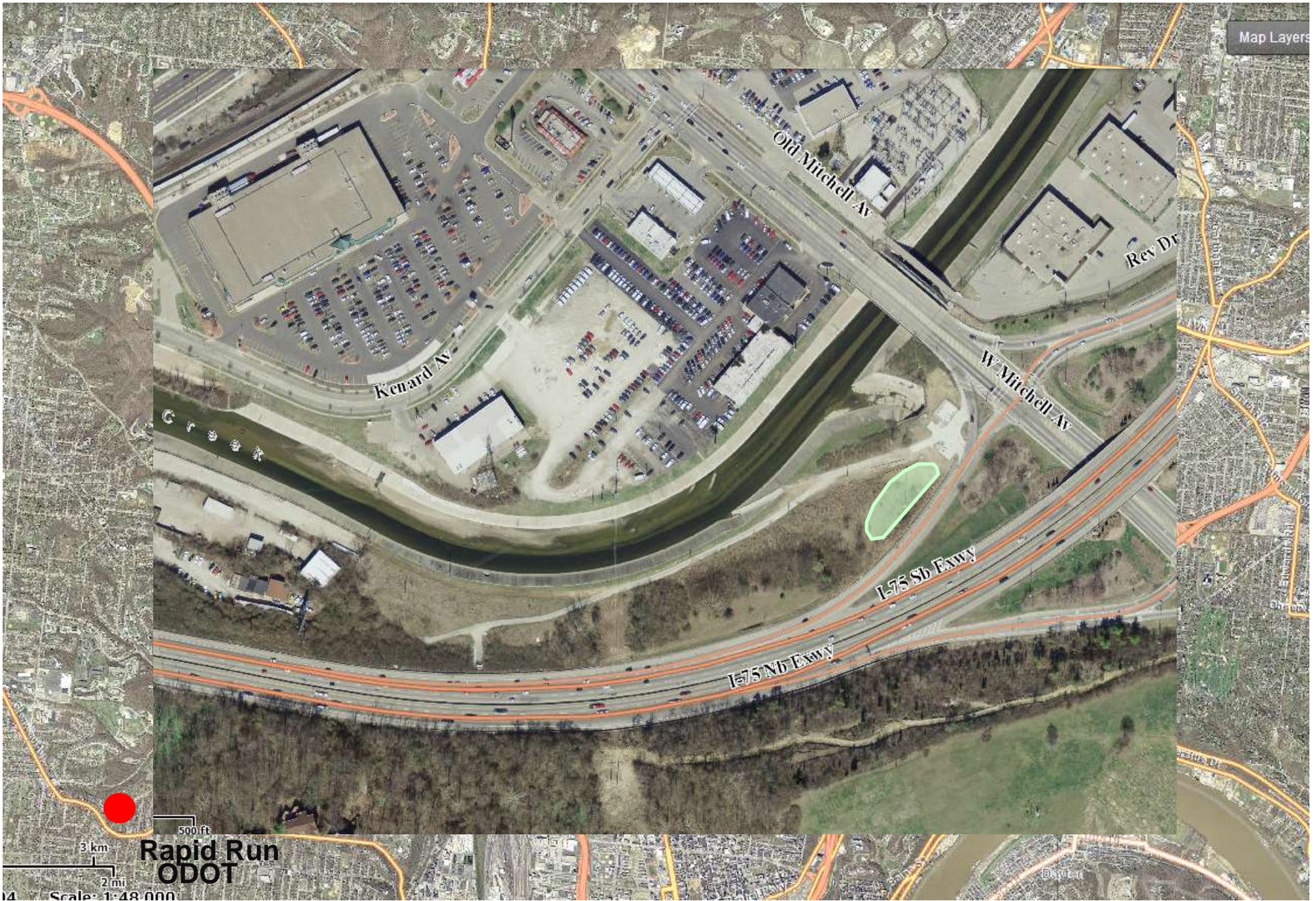
3 km

Rapid Run
North Fairmount

Scale: 1:48,000

North Fairmount





Map Layers

Old Mitchell Av

Kenard Av

Rev Dr

W Mitchell Av

I-75 Sb Exwy

I-75 Nb Exwy

Creek



500 ft

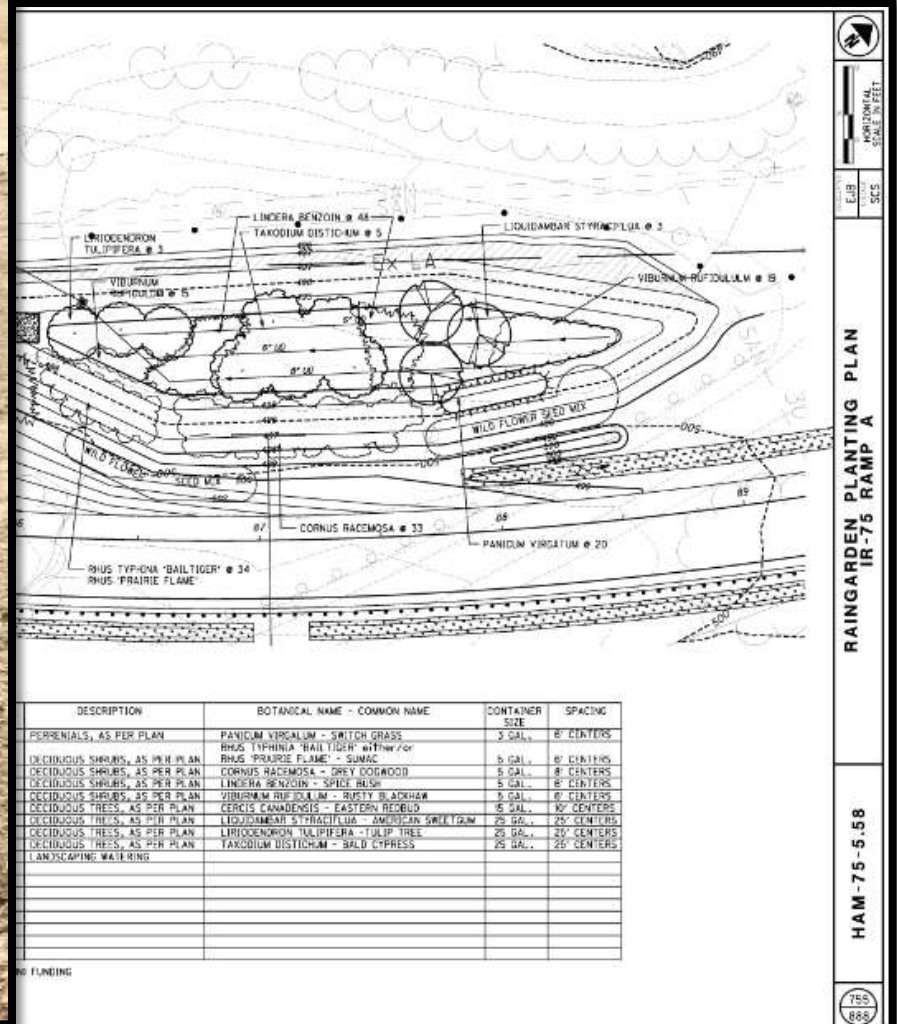
3 km

2 mi

Rapid Run
ODOT

Scale: 1:48,000

ODOT Basin





Roselawn

3 km 2 mi
Scale: 1:48,000

Map Layers

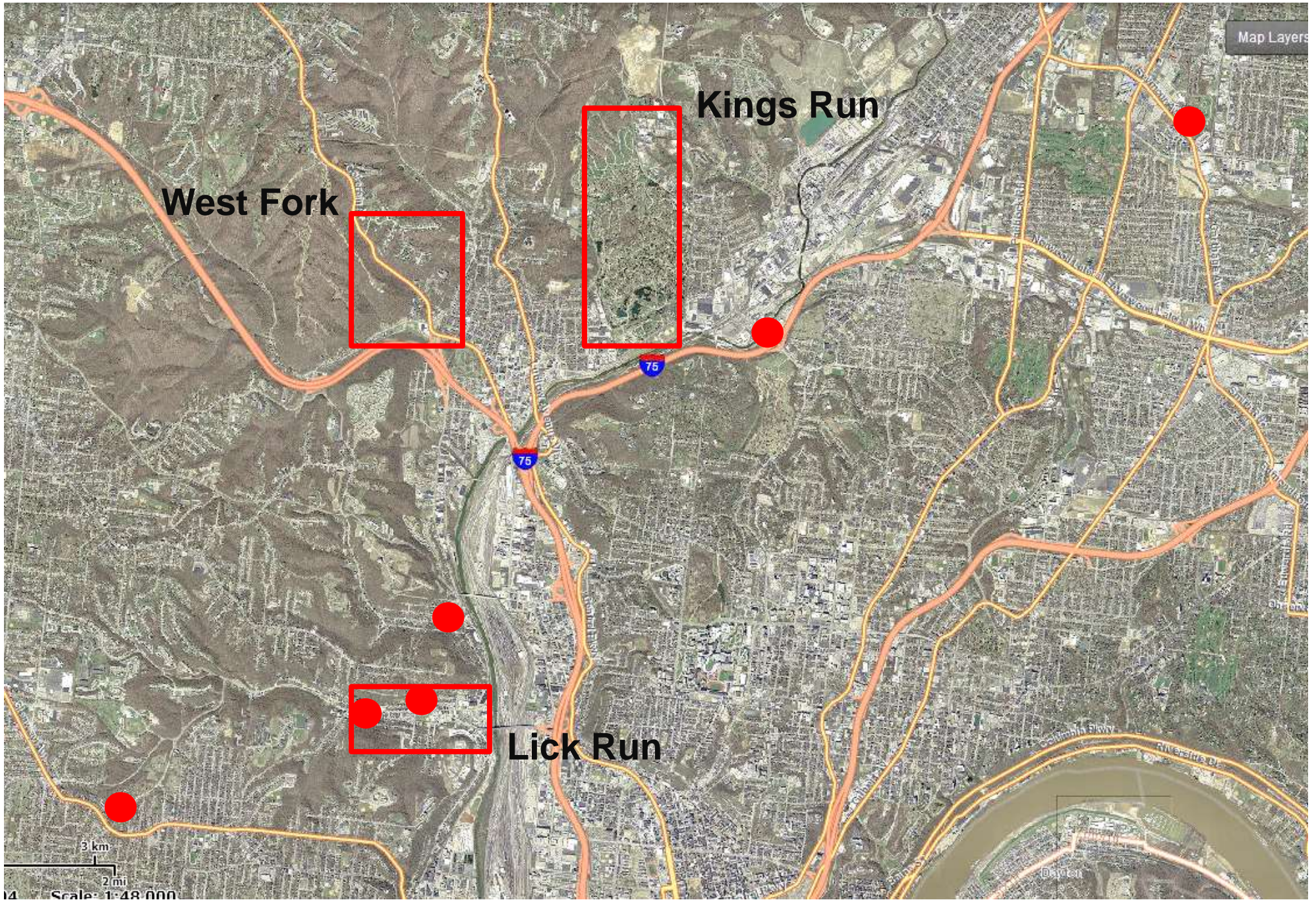


CINCINNATI URBAN YOUTH ACADEMY

Roselawn Park



P&G Cincinnati Reds
With a 33 baseball field and too many hitting clinics requested



Map Layers

Kings Run

West Fork

Lick Run

3 km

2 mi

Scale: 1:48,000

Valley Conveyance System



METROPOLITAN
SEWER DISTRICT
of greater
CINCINNATI



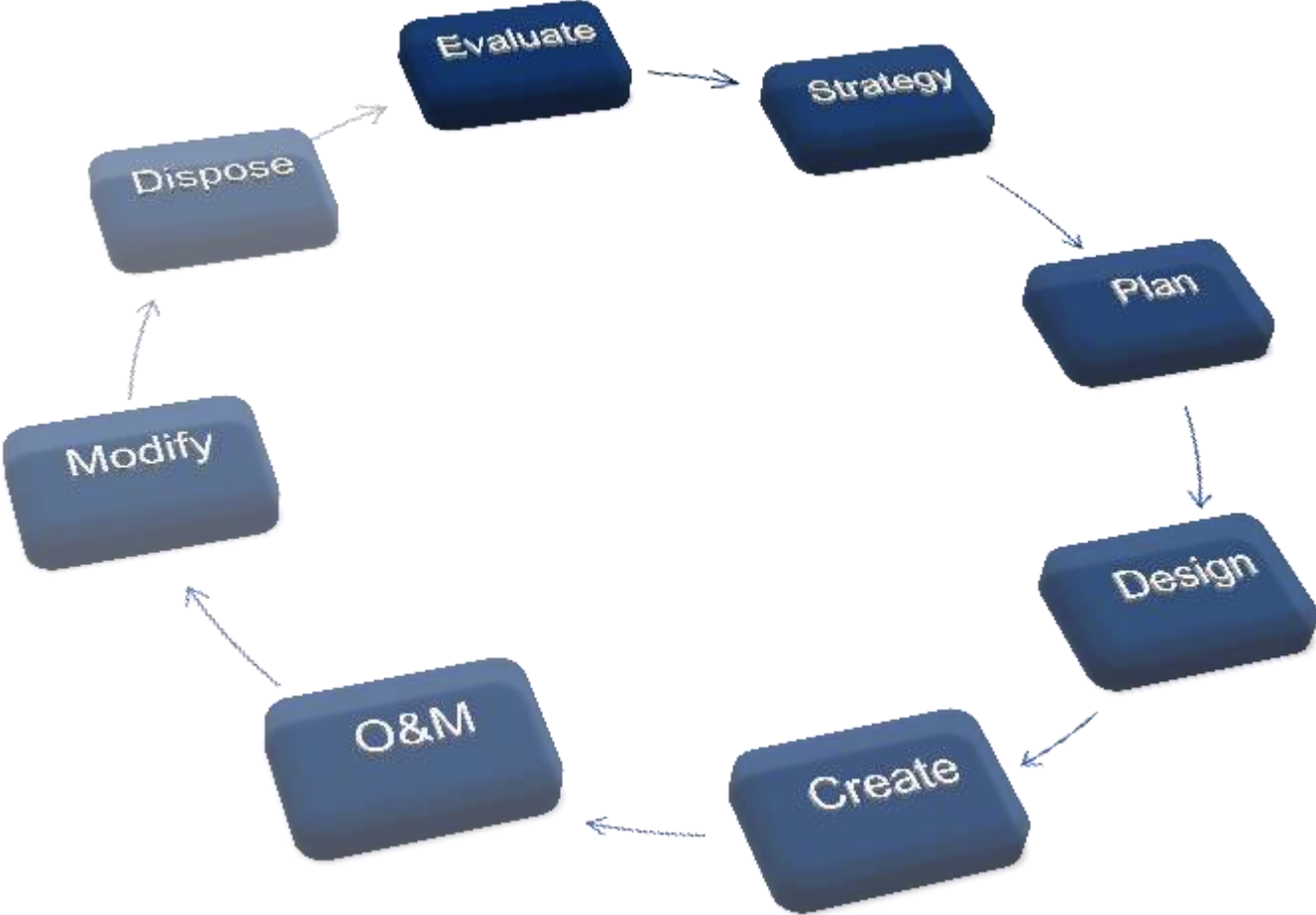
PROJECT GROUNDWORK
your pipeline to clean water

Watershed Operations

- Division dedicated to the operations, maintenance, and performance of wet weather facilities
 - Real Time Control facilities
 - Enhanced High Rate Treatment facilities
 - Storage facilities
 - Stormwater Control Measures

SCM in the Asset Management Lifecycle

Asset Management Lifecycle



AM Advantages



Minimize cost of ownership

Focus on customer satisfaction



Performance metric into the program

Eliminates or mitigates funding issues



Knowledge retention

Organizational buy-in



- Consulted for O&M perspective
- Review BCE as owner
 - O&M considered in plan
 - O&M costs included in budget



It starts with the meeting



- 30, 60, 90 technical review
- Input on maintenance MOUs
- Input on SCM specs
 - Incorporate mandatory establishment periods

Dispose
Dispose

Qualify
Qualify

O&M
O&M

Create
Create

Design
Design

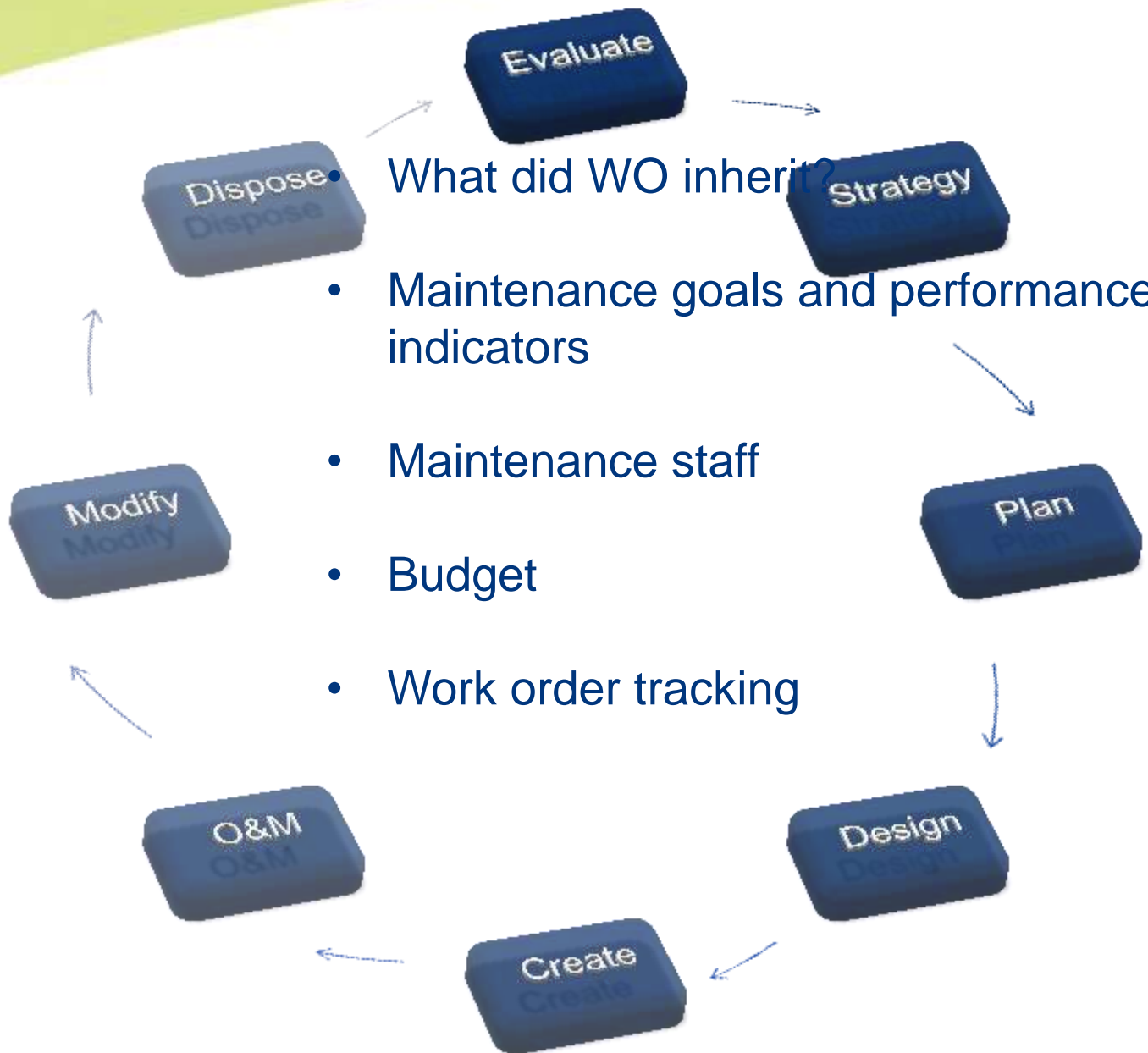


- Be copied on all change management documents

- Keep up to date with establishment period maintenance activities

- Don't accept a dead system

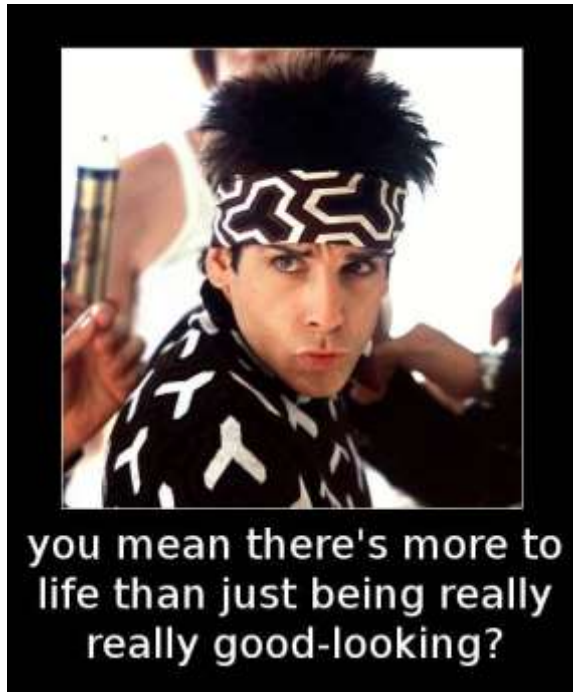
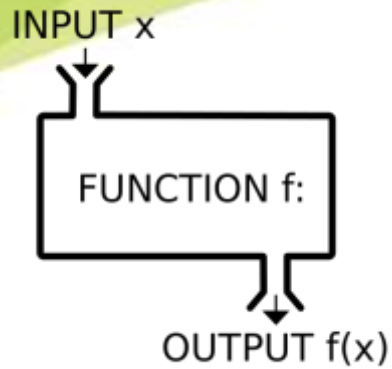




SCM Maintenance Then & Now

	Then	Now
Management	Environmental Programs Management (Engineering Division)	Watershed Operations (Operating Division)
Labor	Cincinnati Park Board	Landscape Contractors (RFQ Process)
Where	Early Success Projects	MSD Assets
What	Inspections and limited maintenance	Inspections and all maintenance
Data Tracking	Inspection Database	CMMS

Maintenance Goals



- **Function**
- **Aesthetics**
- **Safety**



Performance Indicators

Vegetated systems

- Structure and soil clogging
- Plant viability
- Erosion
- Sediment
- Trash
- Infestation

Non-vegetated systems

- Structure clogging
- Structure failure



Budget Based On...

- Maintenance activities
- Level of Service
- Size
- Hourly rate of a Parks Dept. employee

Item	MSD Basin	Anticipated MSD Acceptance Date	Year 1	2014	2015	2016	2017	2018	2019	2020
Subtotal Carl Denham/North Fairmount										
SO 30 ODOT (Mitchell Interchange) PID 11143100										
New storm and combined pipes (621 LF 72"; 37 LF 12" Type C Conduit)	Mill Creek	08/31/2015	2015	\$0	\$983	\$1,012	\$1,043	\$1,074	\$1,106	\$1,139
Bioretention	Mill Creek	12/31/2015	2015	\$0	\$5,708	\$5,879	\$6,055	\$6,237	\$6,424	\$6,617
Subtotal CSO 30 ODOT (Mitchell Interchange)										
SO 33 ODOT PID 11143120										
New storm and combined pipes (16 LF 12"; 69 LF 24"; 12 LF 30" Type C Conduit)	Mill Creek	04/04/2023	2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0
North Bioretention	Mill Creek	04/04/2023	2024	\$0	\$0	\$0	\$0	\$0	\$0	\$0
South Bioretention	Mill Creek	04/04/2023	2024	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Subtotal CSO 33 ODOT										
SO 12 A4a (Stock Street) PID 11242843										
New storm and combined pipes (859 LF 12" x 10' Conduit; 277 LF 36"; 96 LF 30"; 209 LF 24"; 136 LF 15"; 872 LF 12")	Mill Creek	12/10/2015	2015	\$0	\$3,659	\$3,769	\$3,882	\$3,998	\$4,118	\$4,242
New sanitary pipes (175 LF 24"; 990 LF 8")	Mill Creek	12/10/2015	2015	\$0	\$1,740	\$1,792	\$1,846	\$1,901	\$1,958	\$2,017

CMMS...but why???

Benefits of CMMS

- Incorporate real O&M data into the cost of ownership
- Improves preservation of the asset
- Helps meet the performance standards of the asset in a cost-effective manner
- Decisions made about the future of the asset are economically based

CMMS Implementation

1. Choose the software
2. Form the team
3. Workflow and process development
4. Configuration
5. Data
6. Training
7. Go Live
8. Continuous Improvement

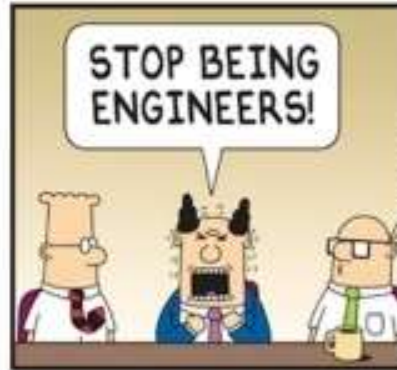
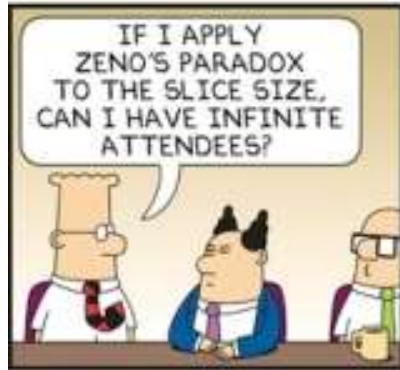
1. Choose a Software

- Maximo vs. Cityworks
- Discrete vs. Linear
- GIS based or not
- Mobile capabilities



2. Form the Team

DILBERT

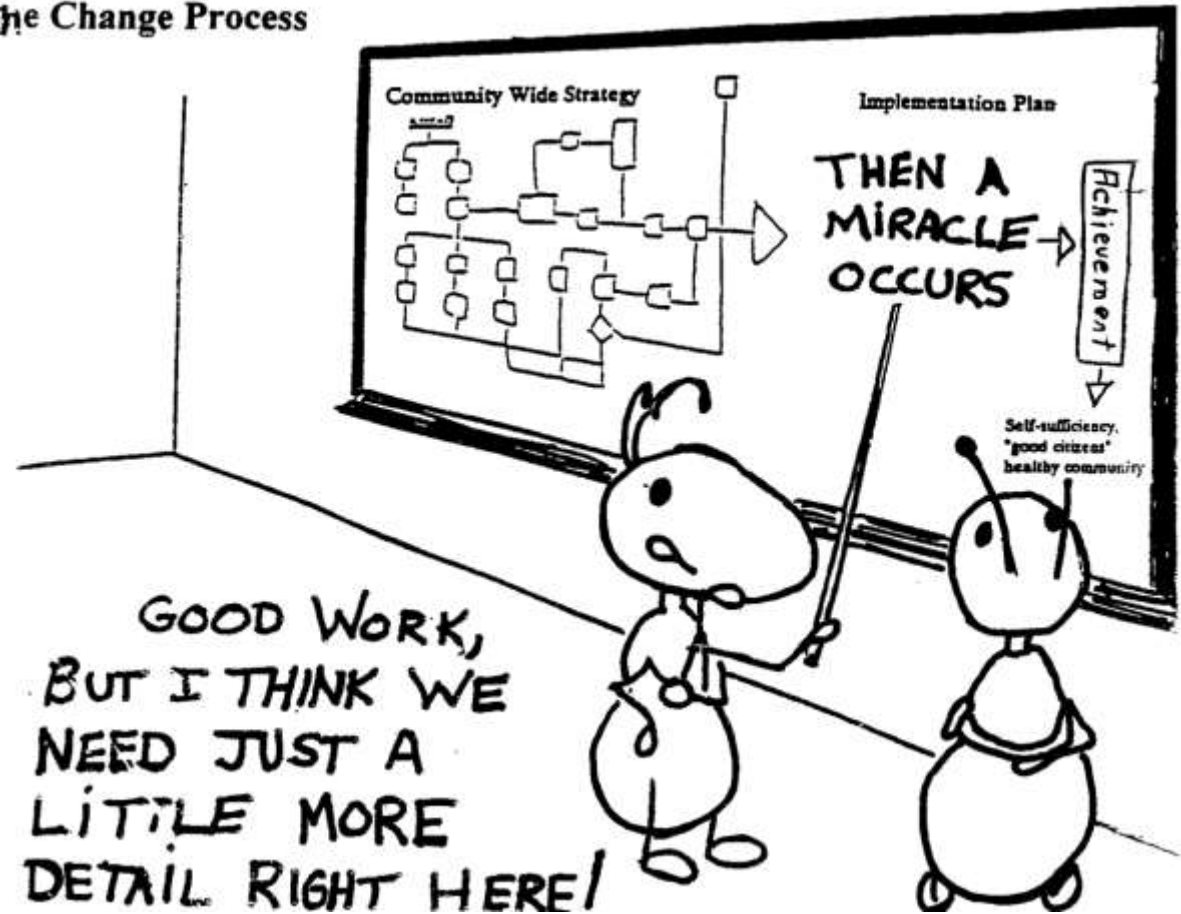


BY SCOTT ADAMS

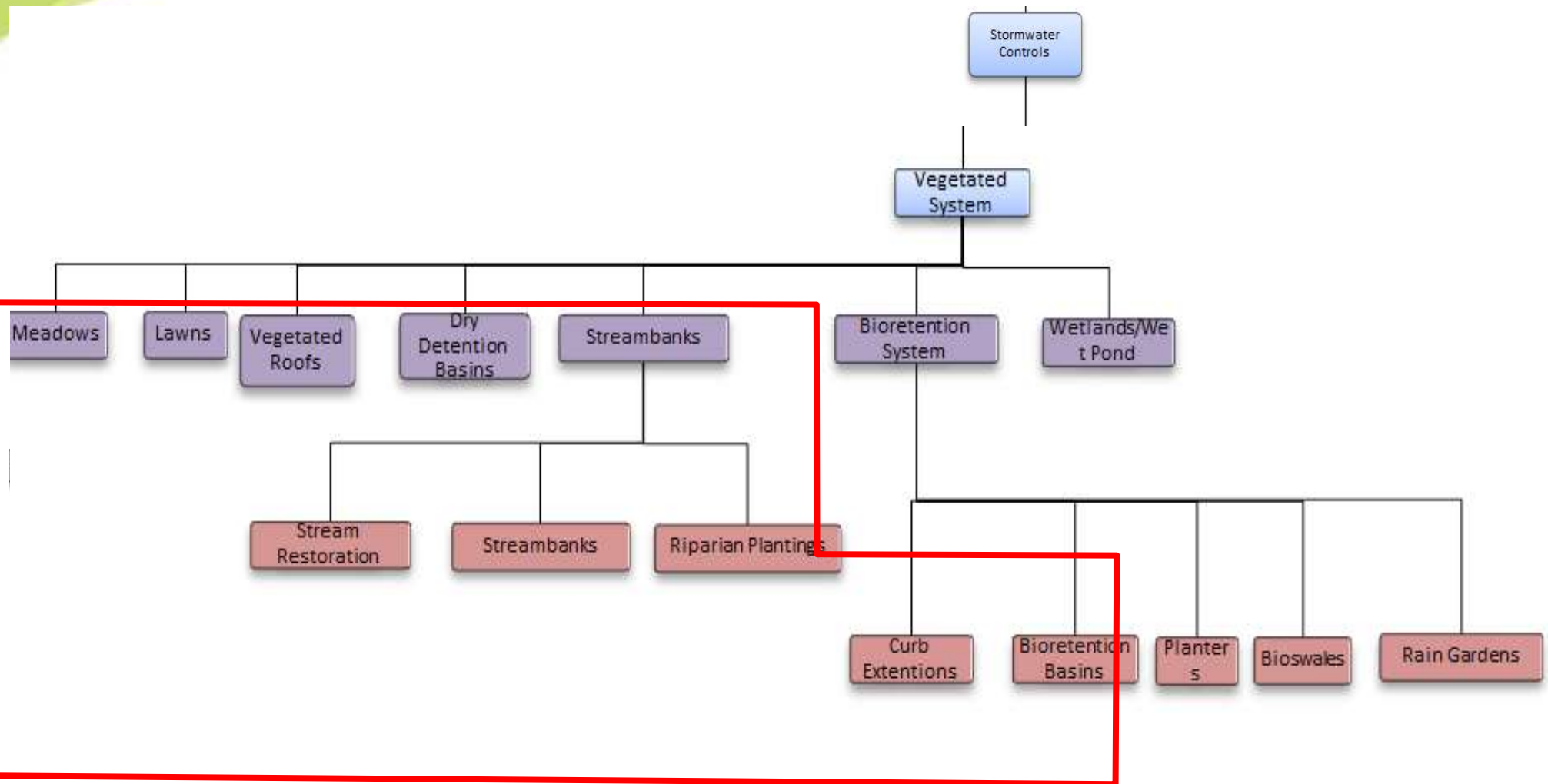
3. Workflow and Process Development

- Hierarchy
- Maintenance Manual
- Resources
- Workflow diagrams

The Change Process



Hierarchy



Maintenance Manual

- Description of SCM
- Maintenance tasks
- Frequencies
- SOPs
- Forms and Logs



MSD STORMWATER CONTROL MEASURES OPERATIONS AND MAINTENANCE MANUAL
Appendix D

MSD STORMWATER CONTROL MEASURES OPERATIONS AND MAINTENANCE MANUAL
Appendix D

T.2: BIORETENTION SYSTEM INSPECTION FORM * Check box before proceeding with inspection
** Document conditions to assist maintenance personnel

STEP	STEP DESCRIPTION	INSPECTION RESULTS (IF)	CHECK *	INSPECTOR ACTION (TREN)	INSPECTION NOTES**
8	Vegetation diseased, dead, or dying?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Indication of vegetative disease impacting the health of live vegetation and/or presence of dead plant material	Yes	<input type="checkbox"/>	Document number, location, and species in poor health or dead, then proceed with inspection	
9	Pipes/structures in poor condition?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Pipes/structures cracked, deformed, leaking, corroded, misplaced, etc.	Yes	<input type="checkbox"/>	Document location and severity of damage, then proceed with inspection	
10	Slopes/benches in poor condition?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Slopes/benches unstable due to erosion or other factors.	Yes	<input type="checkbox"/>	Document location and severity of damage, then proceed with inspection	
11	Evidence of contamination?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Visible sheen, stains, or odors of oil, gasoline, or other pollutants	Yes	<input type="checkbox"/>	Document location, severity, nature, and potential source of contamination, then proceed with inspection.	
12	Foul odors present?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Unidentified unpleasant odors within or coming from the basin.	Yes	<input type="checkbox"/>	Document conditions, then proceed with inspection	
13	Harmful insects present?	No	<input type="checkbox"/>	Proceed with inspection	
	EX - Wasps, hornets, etc. creating nuisance or hazard for inspectors or others	Yes	<input type="checkbox"/>	Document location, severity of problem and insect species (if known), then proceed with inspection	
14	Damage from rodents or other animals?	No	<input type="checkbox"/>	Proceed to inspection completion	
	EX - Normal flow is restricted, burrowing holes are present, plants are damaged or missing, etc.	Yes	<input type="checkbox"/>	Document location, severity of problem and species of rodent or animal (if known), then proceed with inspection.	
15	Take at least one photograph of the asset to best document conditions and assist maintenance.	NA	<input type="checkbox"/>		

7.6

Rel

1.1

1.2

M.1

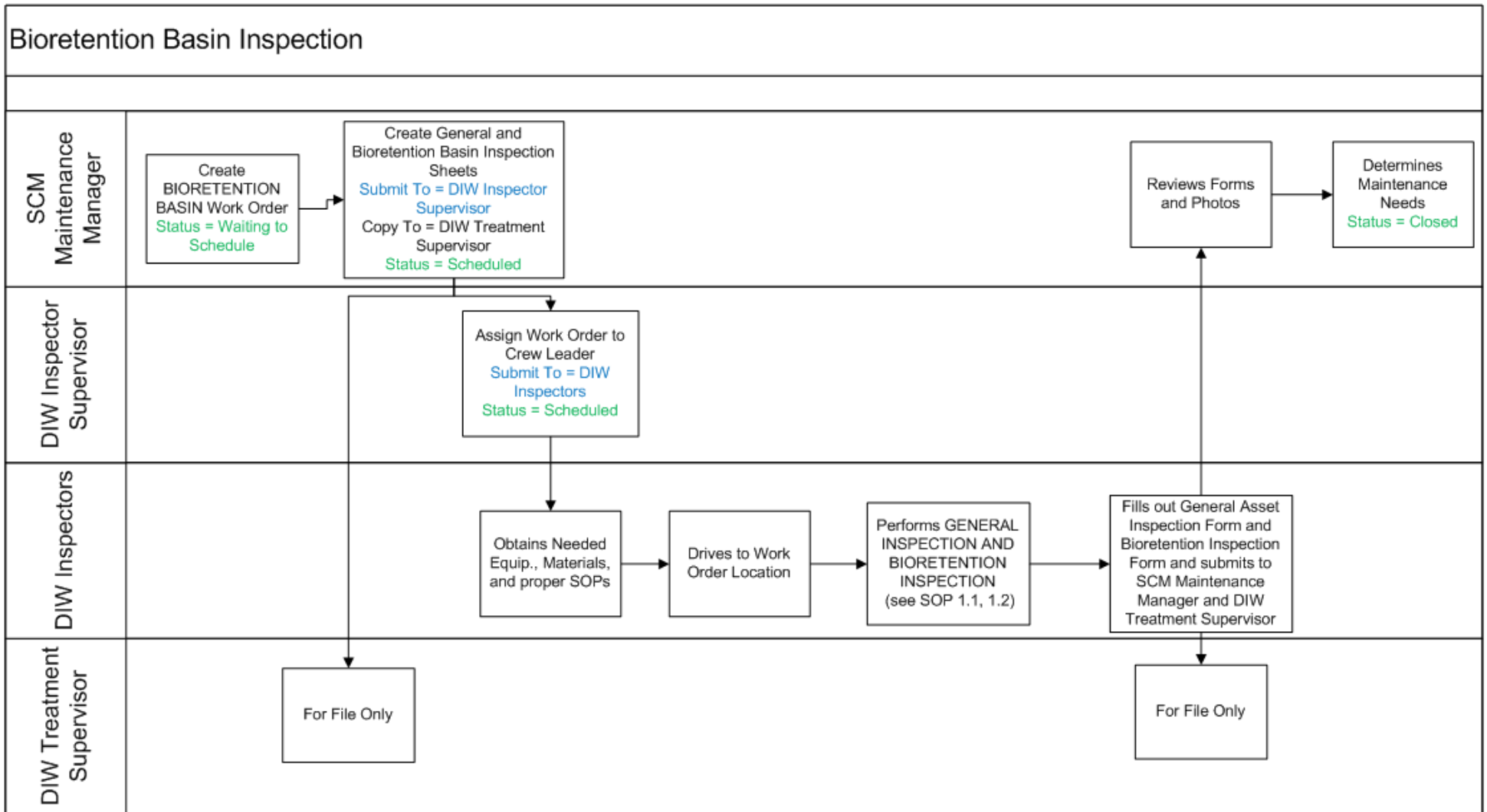
ANSI Z133.1 Safety Standards

ISA Best Management Practices: Tree Pruning

To ensure that pruning is appropriate for the species and tree/site conditions, it is important to have a clear understanding of the specific needs of the tree and the objectives for pruning. Pruning objectives for shade trees include the following:

- Improve structural strength and reduce failure potential (including dead branch removal)
- Prevent or mitigate a pest problem

Workflow



4. Configuration



5. Data

6. Training

7. Go Live

Cityworks DOMAIN INBOX New Work Order New Inspection Charts/KPI's Asset Search Search...

Inspection View Close

Inspection Details

Type: Bioretention Basin Inspection

Submit To: SCHEHL, LESLIE Date: 5/15/2015 9:59 AM

Priority: 1 Routine No Risk

Initiated By: SCHEHL, LESLIE Initiated Date: 5/15/2015 9:57 AM

Projected Start: 5/15/2015 9:57 AM Projected Finish: 5/15/2015 9:59 AM

Actual Finish: 5/15/2015 9:59 AM

Closed By: Date Closed:

Location

District: Cincinnati

Assets & Associated Work Activities

Highlight Get from Map History Remove Asset Costs

Editable Fields All Fields

BIOINFILTRATION_SYSTEMS

Editable Fields All Fields

BIOINFILTRATION_BASIN

Request:

Work Order:

Create Work

Order:

Create

Attachments

+ Add attachments... Remove all attachments

Drag and drop files here to attach them.

Observations

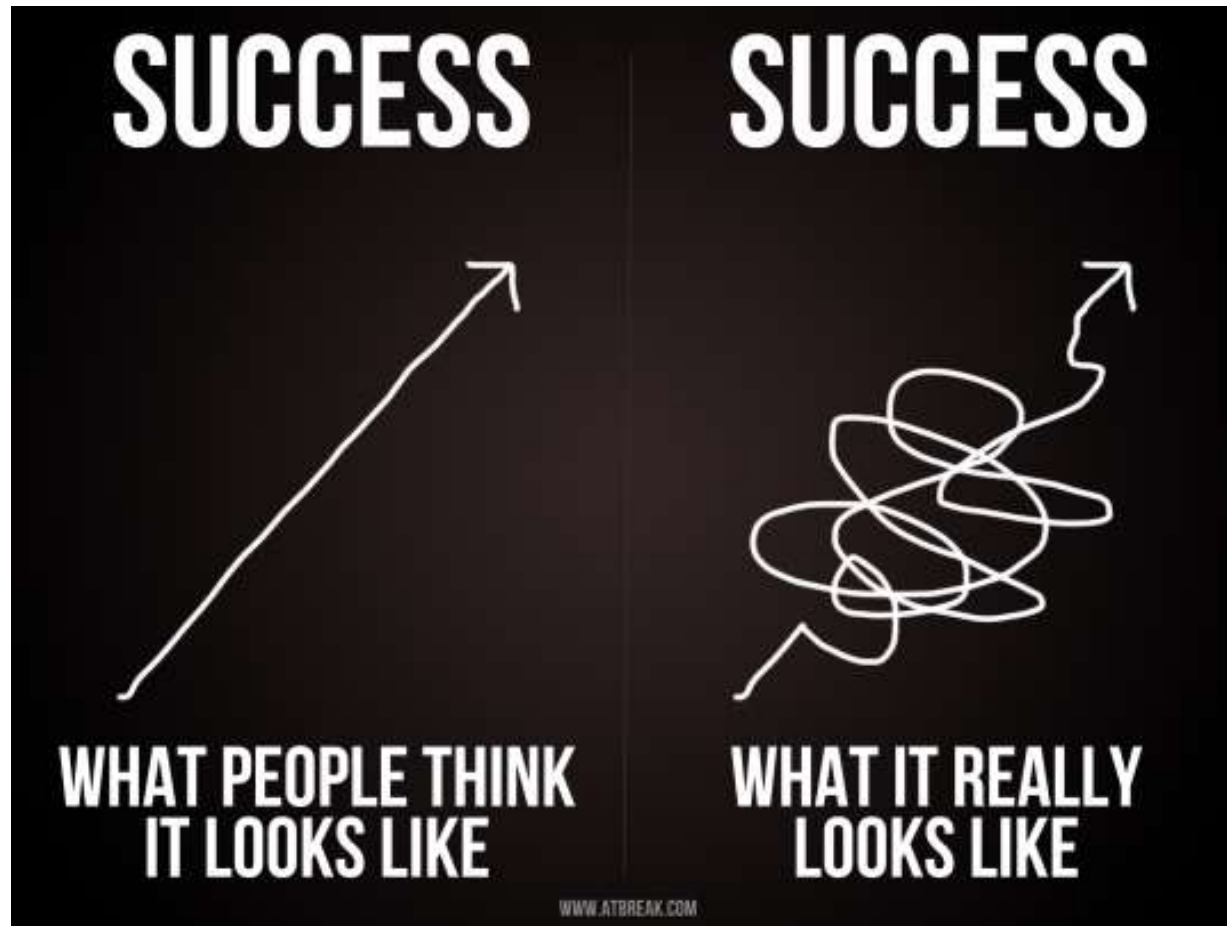
Results Route Search Smart Search

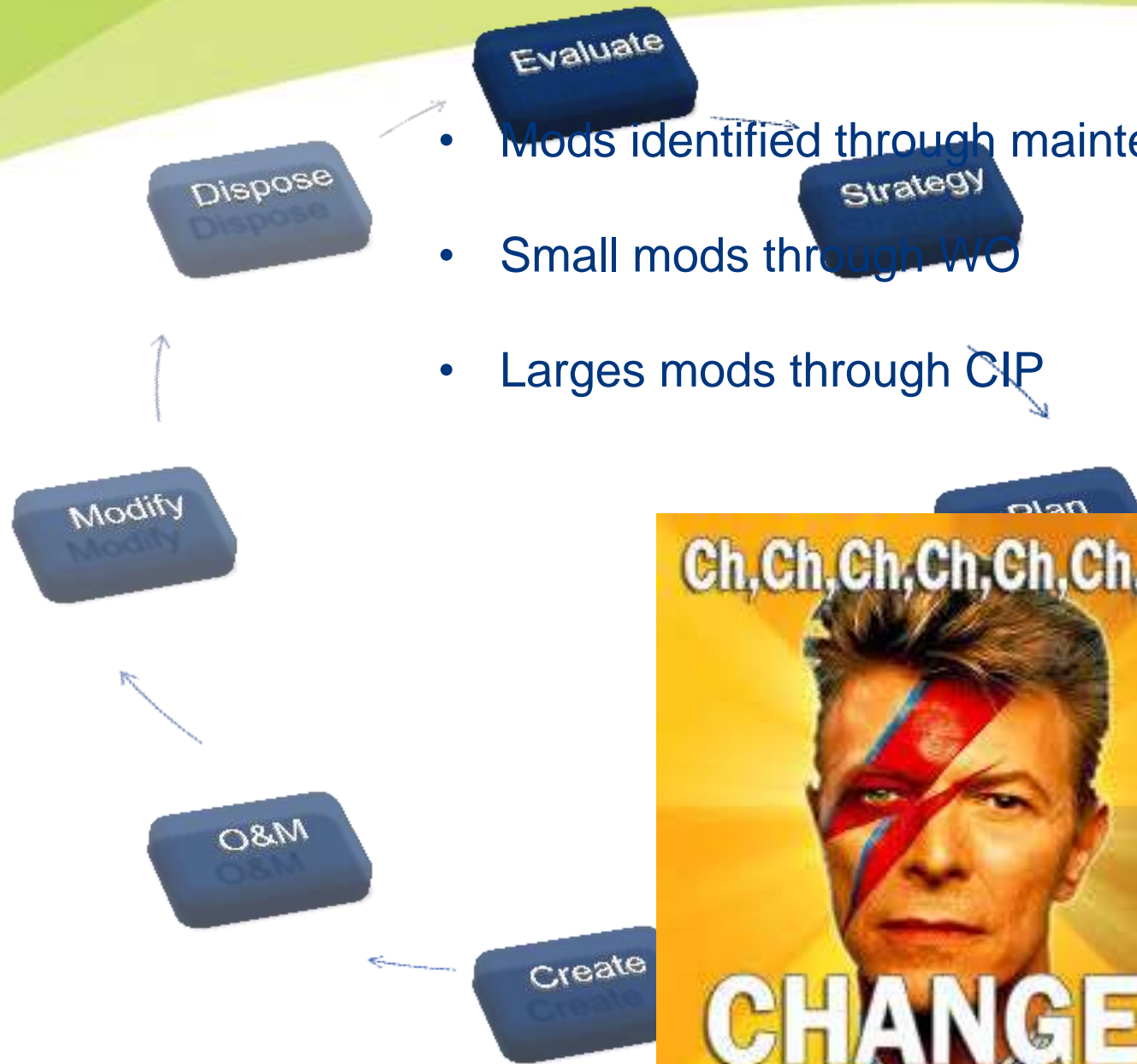
Bioinfiltration Basin (1)

OBJECTID	ASSETID	PROJECT	BASINID
3	1421372	VCS1	VCS1

X: 1382366.24109 Y: 417982.49191

8. Continuous Improvement





- Mods identified through maintenance history
- Small mods through WO
- Large mods through CIP





- Replaced or eliminated?
- Manage decommissioning
- Update databases and budgets

Accomplishments

- ✓ Maintenance Manual
- ✓ Inspection Forms
- ✓ Standard Operating Procedures
- ✓ Inspector Training
- ✓ Bioretention Basin Go-Live in Cityworks
- ✓ Technical Review Team for source control projects
- ✓ Contractors completing maintenance activities



THE LIST

- Continue “soft” go-lives for other assets
- Contractor Certification Program
- Contractors/Inspectors training in CMMS
- Going mobile
- Public Education/Outreach
- Enforcement Plans

Lessons Learned

- Be involved in all phases of the asset lifecycle
- Secure resources early and have a backup plan
- Define performance criteria
- Don't bite off more than you can chew
- Don't reinvent the wheel



Questions?

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