

# City of Charleston Watershed Master Planning

## *Standardizing the Process*

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SESWA Conference  
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**AECOM**

# OVERVIEW

Purpose

Background

Planning

Field Investigation

Condition Assessment

Path Forward



# PURPOSE



# PURPOSE – Citywide Identified Issues

## – Flooding

- Nuisance Flooding
- Major Events

## – Infrastructure

- Age
- Location
- Maintenance

## – Development / Redevelopment

- City Design Standards
- Smart Growth



Citadel Mall parking lot during Hurricane Irma, 2017

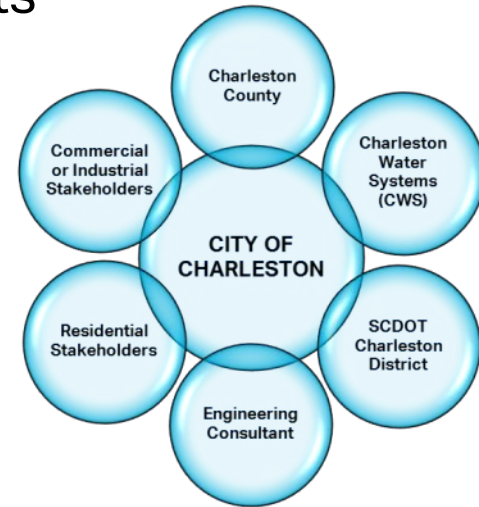
# PURPOSE – Standardize the process of watershed management

- Identify Pilot Project – Dupont-Wappoo Watershed
- Identify the Process
  - Data Collection/Management
  - Asset Management
  - Condition Assessment
  - Maintenance
- Implementation



# PURPOSE – Coordination and Public Outreach

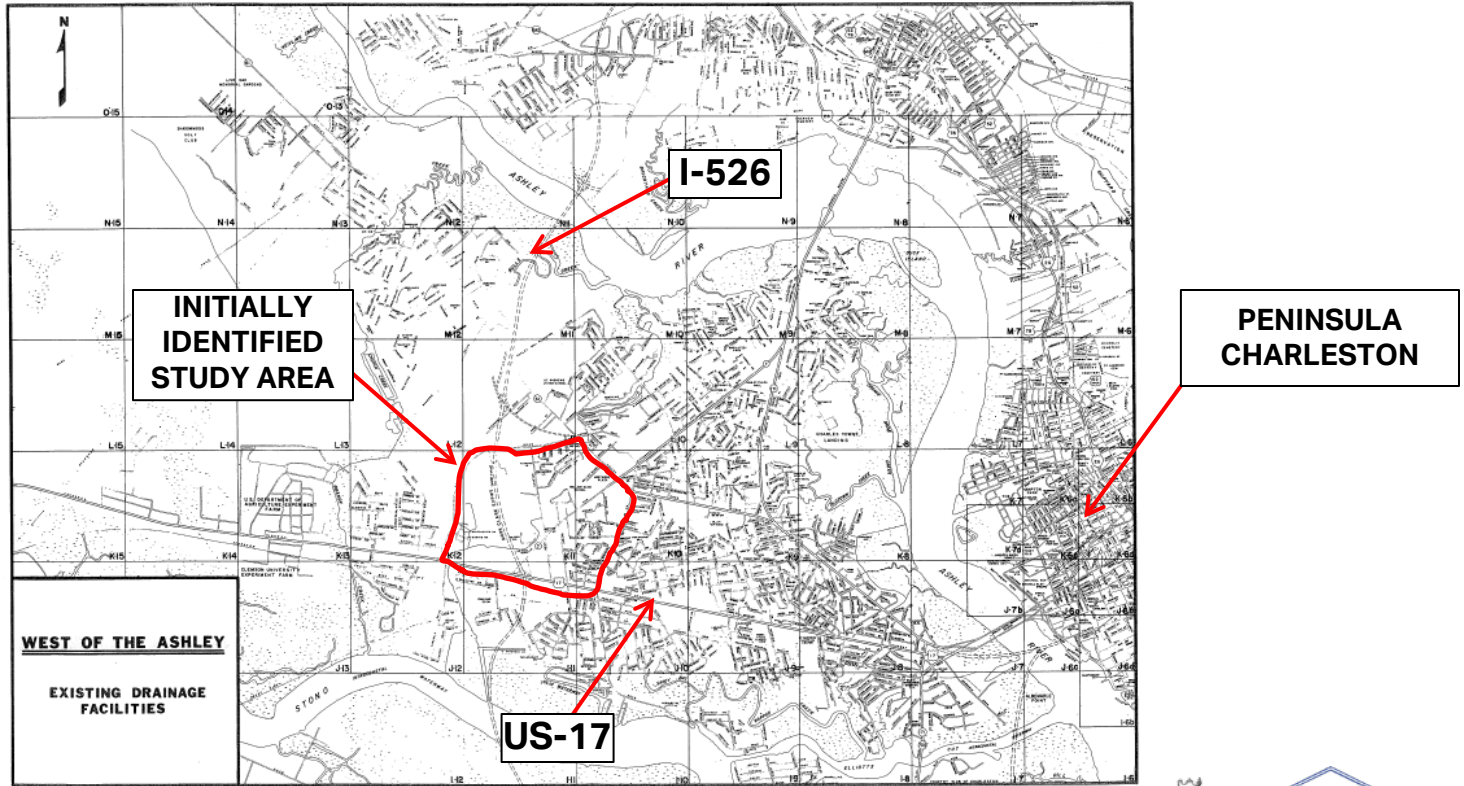
- City / County Memorandum of Understanding
- SCDOT Coordination for survey encroachments
- Stakeholder Identification and Involvement
  - Public Meetings
  - [StoryMap project website](#)
  - [SurveyMonkey community survey](#)



# BACKGROUND

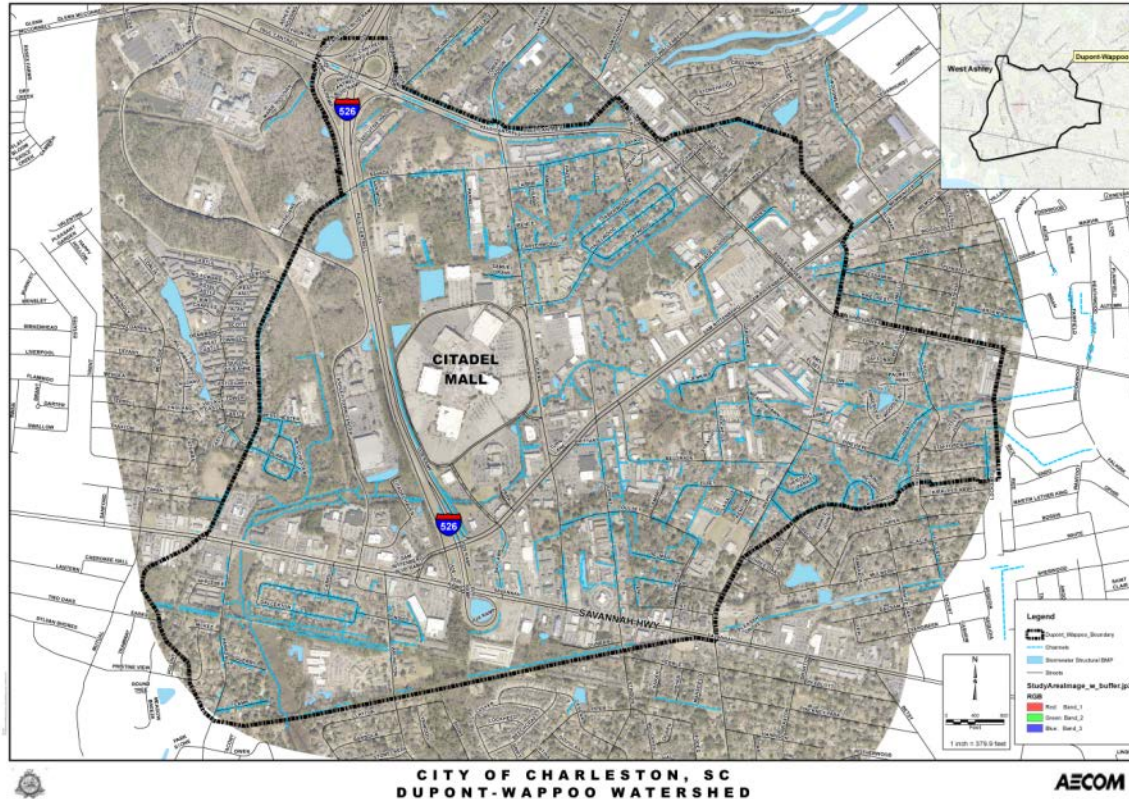


# BACKGROUND – 1984 Master Drainage Plan – West Ashley





# BACKGROUND – Defining the Watershed

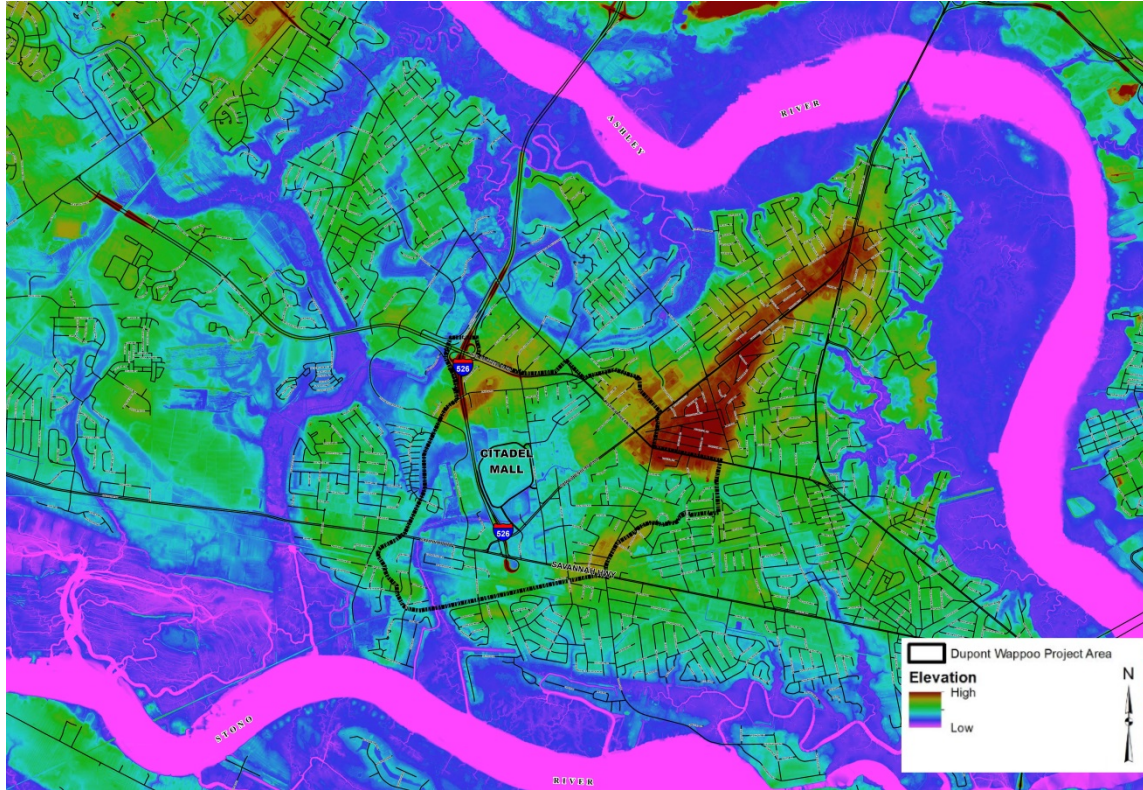


## DuWap Characteristics:

- 1500 ac
- Mixed land uses residential, schools, commercial, some light industrial
- Citadel Mall and major shopping corridors
- High traffic area
- Mostly older development but starting to redevelop
- West Ashley Greenway



# BACKGROUND – Historical Watershed Perspective



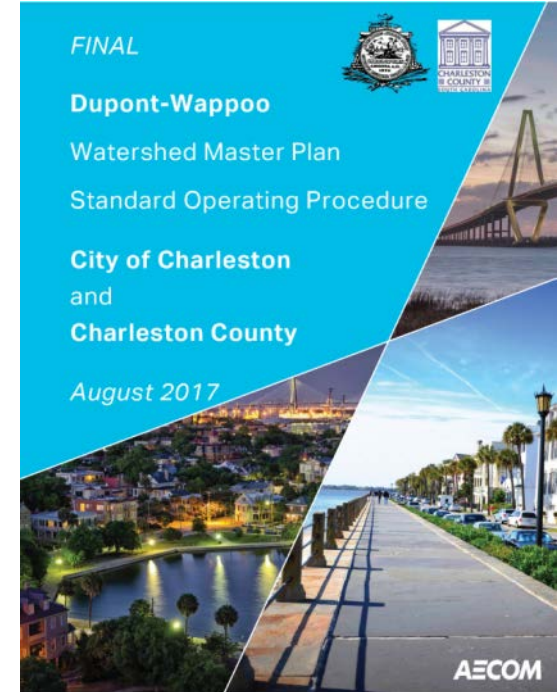


# PLANNING



# PLANNING – Defining the SOP

- Infrastructure Mapping/Asset Inventory
- Condition Assessment
- Stream and Wetland Assessment
- Hydraulic and Hydrologic Modeling
- Prioritization of Proposed Projects



# PLANNING – Infrastructure Mapping/Asset Inventory

- GIS Database Planning and Setup
- Base Data Digitizing
- Standardizing Feature Classes and Domain Lists
- Illustrated Guidance for Stormwater asset inventory

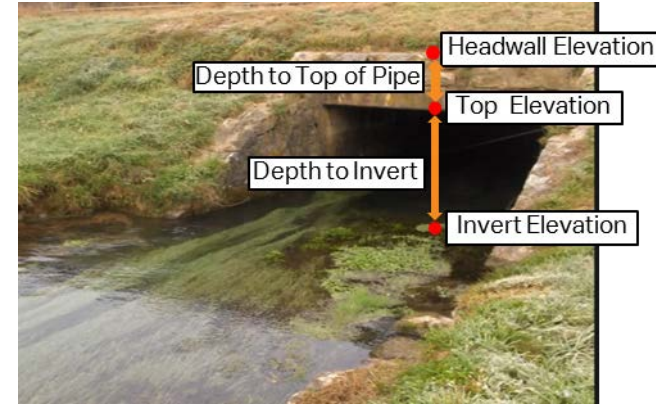
## DATA REVIEWED:

- 1984 Master Drainage Plan
- SCDOT drainage maps
- As-built drawings
- LiDAR data
- USGS topographic quadrangle map(s)
- Aerial imagery
- Tidal data
- Easement records
- Maintenance records
- Storm high water records



# PLANNING – Infrastructure Mapping/Asset Inventory

- Two Pass Process
- Survey Grade Data
- Measurement Consistency



# PLANNING – Condition Assessment

## – NASSCO® Standards as basis

- Standard enables consistent assessment and communication between field and office
- Scoring system



Condition Assessment Grading System

Grade	Description
5	Failed or failure is imminent - requires immediate attention
4	Severe defects - risk of future failure
3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
1	Minor defects - failure unlikely in the foreseeable future

PART 1 - STRUCTURAL DEFECTS	
Brick/Block/Rock: Used to describe defects in brick sewers, brick or block structures or pipes.	
<b>Descriptor:</b> <ul style="list-style-type: none"> <li>• Displaced – Bricks have shifted position</li> <li>• Missing – One or more bricks missing</li> <li>• Missing Mortar – Mortar between brickwork has receded; bricks are still in place.</li> </ul>	<b>Modifier:</b> N/A
<p>Displaced</p>	<p>Missing Mortar</p>

## – Illustrated Guidance

- Structural Defects
- Operational and Maintenance Defects
- Supplemental Defects (Open Channels, BMPs)

Defect Categories	Defects	Descriptors	Modifiers	Condition Grade				
				No Modifier	Minor	Moderate	Severe	
Structural Defects	Crack		Minor, Moderate, Severe		2	3	4	
	Fracture		Minor, Moderate, Severe		3	4	5	
	Broken		Minor, Moderate, Severe		3	4	5	
	Hole		Minor, Moderate, Severe		3	4	5	
	Deformed (≤ 40%)			4				
	Collapse (> 40%)			5				
	Joint	Offset		Minor, Moderate, Severe		2	3	4
		Separated		Minor, Moderate, Severe		3	4	5
	Surface Damage	Spalling			2			
		Aggregate Visible			3			
		Rebar Exposed			4			
		Corrosion			5			
		Lining Failure			3			
	Brick/Block/Rock	Other		Minor, Moderate, Severe		1	3	5
		Displaced			3			
Missing				4				
Decayed	Missing Mortar			2				
			Minor, Moderate, Severe		2	3	4	
Sag		< 30%, (30-50%), (> 50%)		No Mod.	< 30%	30-50%	> 50%	



# PLANNING – Stream and Wetland Assessment

- 10 stream and wetland candidate locations
- Evaluate natural resources and identify potential for enhancement projects

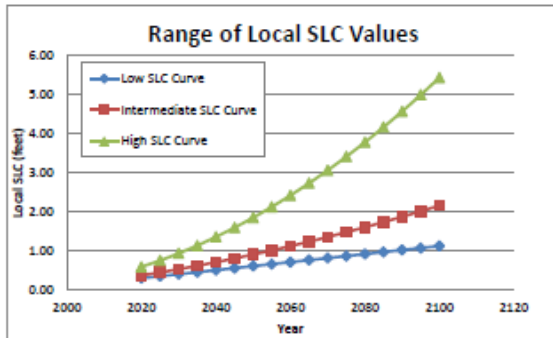
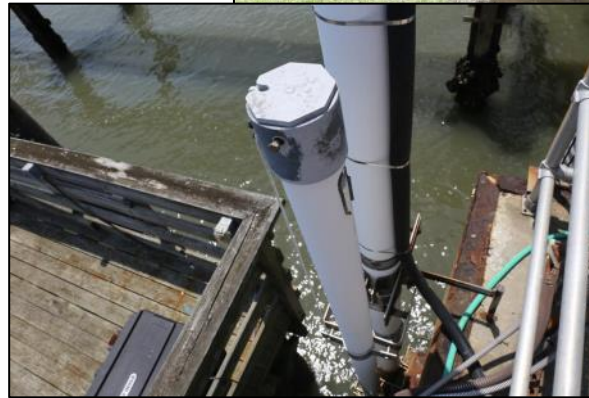
FEATURE CLASS	CATEGORY
Stream Reach	Channel Stability
	Channel Sediment
	Physical Instream Habitat
	Water Quality
	Riparian Habitat
Wetland Site	Hydrology
	Vegetation
	Water Quality





# PLANNING – Hydraulic and Hydrologic Modeling

- ICPR 4 – GIS Capabilities
- Field Validation from Gauge and Observed High Water Marks
- Incorporate Sea Level Change



# PLANNING – Prioritization of Proposed Projects

- Develop Priority Matrix
- Maintenance and Repairs
- CIP Identification
- Rankings

The following factors will be used in order to prioritize maintenance and repair projects:

- Location – proximity to major roadways and population density (residential and commercial land uses)
- Capacity – loss due to obstructions
- Severity of defect
- Frequency of defect
- Category of defect (structural, O&M or supplemental)
- Potential impact in event of failure

Condition Grade (CG)	Number of Defects			Feature Grade (FG <sub>n</sub> )		
	Structural	O&M	SW	Structural	O&M	SW
5				FG <sub>5</sub>	FG <sub>5</sub>	FG <sub>5</sub>
4				FG <sub>4</sub>	FG <sub>4</sub>	FG <sub>4</sub>
3				FG <sub>3</sub>	FG <sub>3</sub>	FG <sub>3</sub>
2				FG <sub>2</sub>	FG <sub>2</sub>	FG <sub>2</sub>
1				FG <sub>1</sub>	FG <sub>1</sub>	FG <sub>1</sub>
Total # Defects						
	Overall Feature Rating (OR)					(Sum)
	Feature Rating Index (RI)					(Average)



# FIELD INVESTIGATION



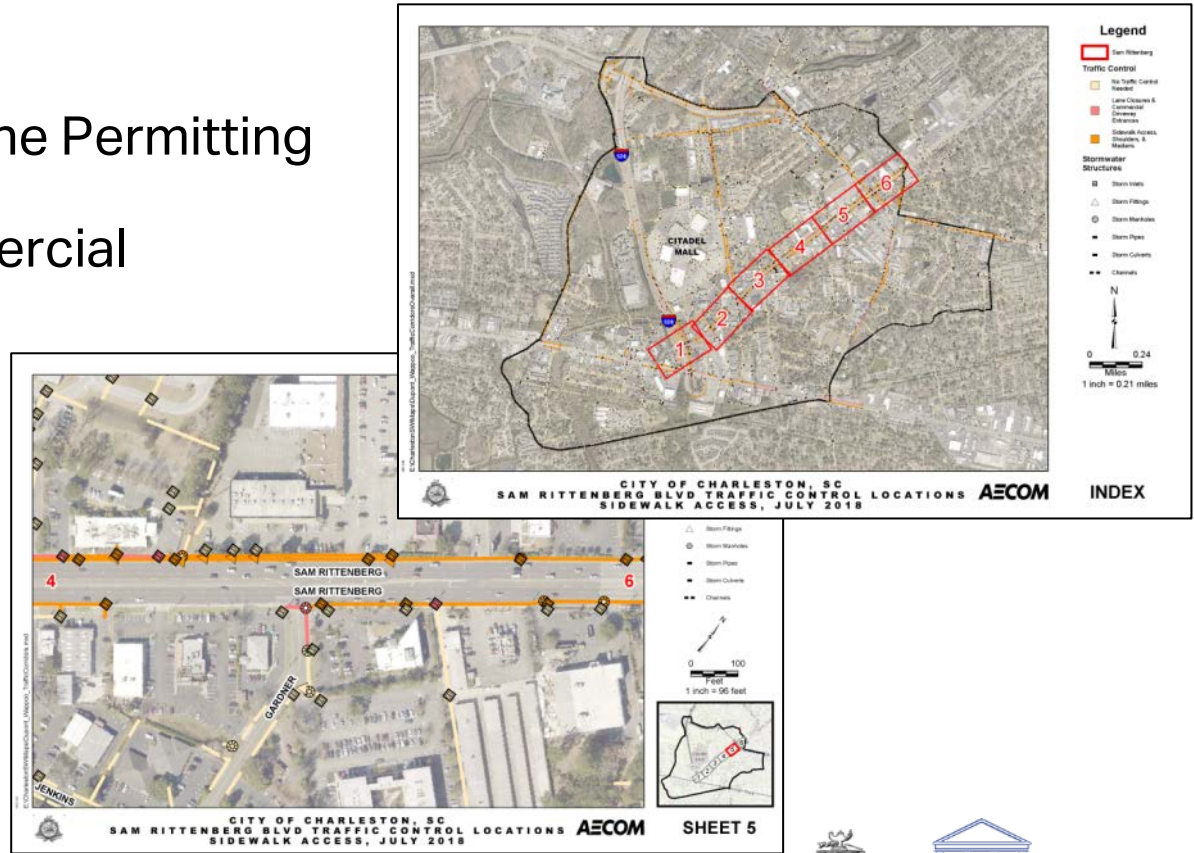
# FIELD INVESTIGATION – Safety First

- Safety Plan Critical for Successful Project
- Daily Tailgate Meetings
- SCDOT Coordination
- Hazards include:
  - **Traffic**
  - Snakes, bugs and gators
  - Slips, trips and falls
  - Weather extremes



# FIELD INVESTIGATION – SCDOT Encroachment Permitting

- Sidewalk and Travel Lane Permitting
- Travel Lane and Commercial Driveway Closures
- SCDOT Assistance
- Maintenance during traffic control activities



# FIELD INVESTIGATION – Maintenance and Access Issues

- Maintenance and Access Needed for Data Collection
- Standardized Maintenance/ Access Request Reports
- Coordination with Eadie’s Industrial for Maintenance and Access



## MAINTENANCE ISSUES

- Accumulated sediment or debris in structures
- Standing water or sludge in structures
- Heavy overgrowth of vegetation



## ACCESS ISSUES

- Fencing or locked gate
- Manhole cover or inlet grate paved over or stuck
- Concrete box-top inlets or oversized manhole or inlet covers requiring heavy equipment to lift
- Owner denies entry
- Safety constraints, aggressive dogs

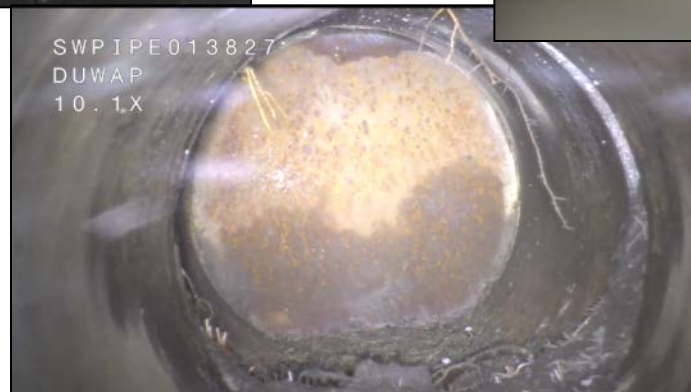


# FIELD INVESTIGATION – Maintenance and Access Issues

Batch #	Begin Date	End Date	Date Requested from Columbia (Target-Monday)	Maintenance Request Count	Access Request Count	Total Requests
1	8/14/2017	10/3/2017	8/30/2017	11	5	16
2	10/4/2017	10/20/2017	10/23/2017	2	9	11
3	10/21/2017	11/3/2017	11/6/2017	4	1	5
4	11/4/2017	11/17/2017	11/20/2017	3	12	15
N/A 1	11/18/2017	12/1/2017	12/4/2017	0	0	0
N/A 2	12/2/2017	12/15/2017	12/18/2017	0	0	0
N/A 3	12/16/2017	12/29/2017	1/2/2018	0	0	0
N/A 4	12/30/2017	1/12/2018	1/15/2018	0	0	0
5	1/13/2018	1/26/2018	1/29/2018	2	4	6
6	1/27/2018	2/9/2018	2/12/2018	1	0	1
7	2/10/2018	2/23/2018	N/A	3	5	8
8	2/24/2018	3/9/2018	N/A	0	4	4
9	3/10/2018	3/23/2018	N/A	0	1	1
10	3/24/2018	4/6/2018	N/A	2	16	18
11	4/7/2018	4/20/2018	N/A	3	0	3
N/A 5	4/21/2018	5/4/2018	N/A	0	0	0
12	5/5/2018	5/18/2018	N/A	2	1	3
13	5/19/2018	6/1/2018	N/A	14	4	18
14	6/2/2018	6/15/2018	N/A	0	2	2
15	6/16/2018	6/29/2018	N/A	17	3	20
N/A 6	6/30/2018	7/13/2018	N/A	0	0	0
N/A 7	7/14/2018	7/27/2018	N/A	0	0	0
16	7/28/2018	8/10/2018	N/A			
	8/11/2018	8/24/2018				
	8/25/2018	9/7/2018				
	9/8/2018	9/21/2018				
	9/22/2018	10/5/2018				
	10/6/2018	10/19/2018				
	10/20/2018	11/2/2018				
<b>Total</b>				<b>64</b>	<b>67</b>	<b>131</b>



# FIELD INVESTIGATION – Maintenance during Data Collection

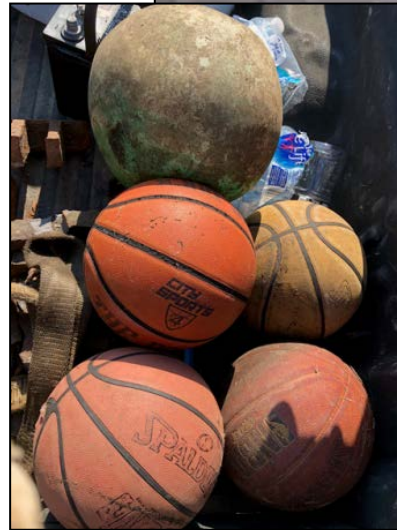




# FIELD INVESTIGATION – Unique Finds



# FIELD INVESTIGATION – Unique Finds

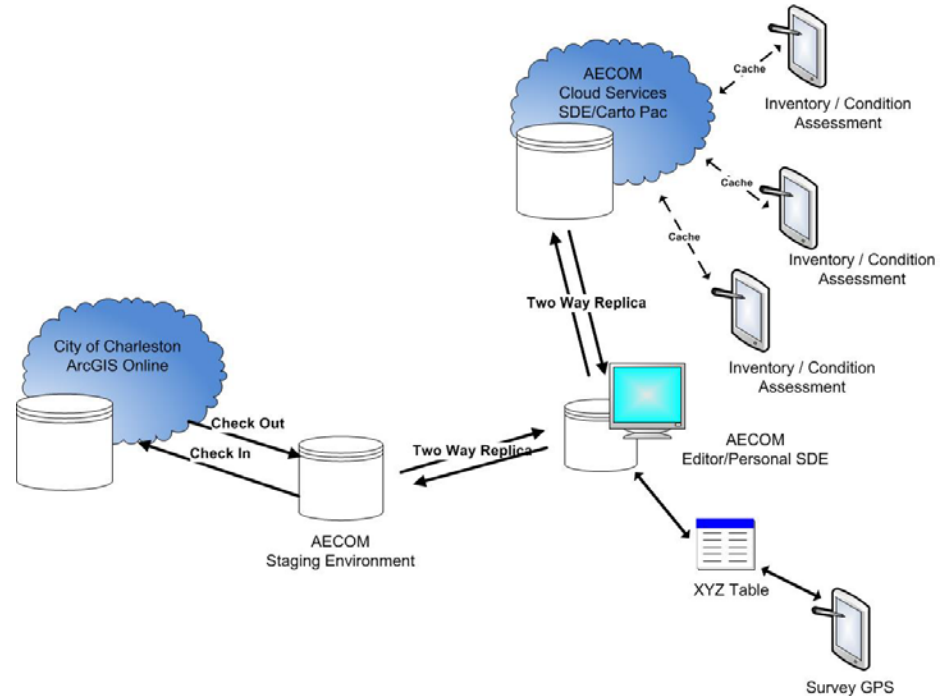


# ASSET INVENTORY



# ASSET INVENTORY – GIS Data Collection and Management

FEATURES (ASSETS)	FEATURE CLASS CATEGORY
Inlets Manholes/Junctions Outlets	Point Features
Discharge Points Fittings	
Pipes Culverts Channels	Linear Features
BMPs	Polygon Features
COMPONENTS	FEATURE CLASS CATEGORY
End Structures	Associated with Point and Linear Features





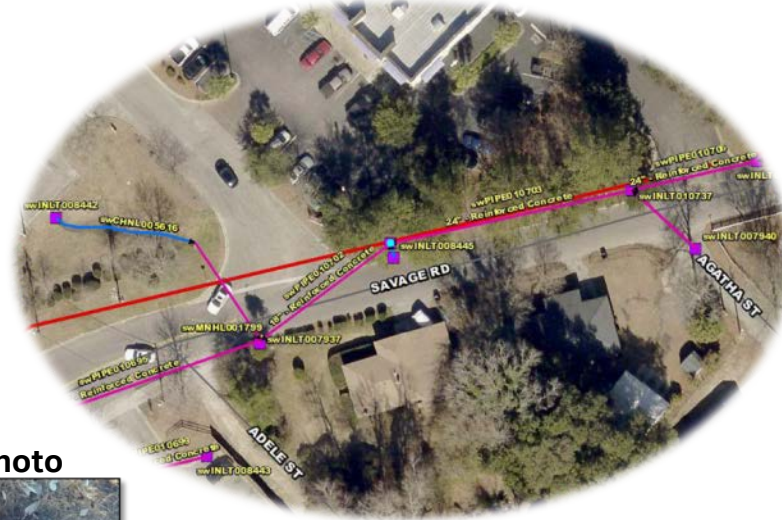
# ASSET INVENTORY – Data Collection

**SURVEY GRADE DATA  
COLLECTION**

South Carolina State Plane Coordinates  
 X: 2,300,539.477  
 Y: 355,819.318  
 Z: 14.90314 (NAVD 88)

**ASSET INVENTORY DATA  
COLLECTION**

## INLETS



FIELD NAME	FIELD DESCRIPTION
ASSETID	swINLT007938
BASINID	1000
LegacyID	15030
GlobalID	{08FBBD4B-5FD9-42AA-BBE9-83C0B5F08334}
INLETYPE	Grate Inlet
HEIGHT	N/A
WIDTH	2 ft.
LENGTH	3 ft.
TOPELEV	14.90314
DEPTHORIM	N/A
RIMELEV	14.90314
INVERTDEPTH	2.34 ft.
INVERTELEV	12.56314
ACCESSMAT	Cast Iron
ACCESSTYPE	Rectangular Grate
ACCESSMARK	Generic no mark on cover
ACCESSDIAM	N/A
ACCESSLENGTH	3 ft.
ACCESSWIDTH	2 ft.
WALLMAT	Concrete
STENCIL	No
BMP	No
COMMENTS	#SEDIMENTLINER IN INLET
ACTIVEFLAG	True
LIFECYCLESTATUS	Active
LASTUPDATE	4/21/2017 8:49:53 AM
LASTEDITOR	LYNN SHELLEY
SOURCE	DGPS
SOURCEACC	N/A
SOURCEDATE	4/5/2018 9:02:56 AM
SOURCEDATUM	Unknown
DimUOMElev	Feet
DimUOMLength	Tenths of foot
DimUOMWidth	Tenths of foot
DimUOMDepth	Tenths of foot
DimUOMHeight	N/A
DimUOMDiameter	N/A
XCORD	2,300,541.777
YCORD	355,818.277
ZCORD	14.90314
NeedsMaintenance	No Maintenance Issues
Accessible	Accessible

Area Photo



Closeup Photo



# ASSET INVENTORY – Data Collection

## SURVEY GRADE DATA COLLECTION

South Carolina State Plane Coordinates

Upstream End

X: 2,299,225.21299  
Y: 354,024.62552  
Z: 4.51 (NAVD 88)

Downstream End

X: 2,299,183.65294  
Y: 354,039.33471  
Z: 4.46 (NAVD 88)

## ASSET INVENTORY DATA COLLECTION

Area Photo



Internal Photo



## PIPES

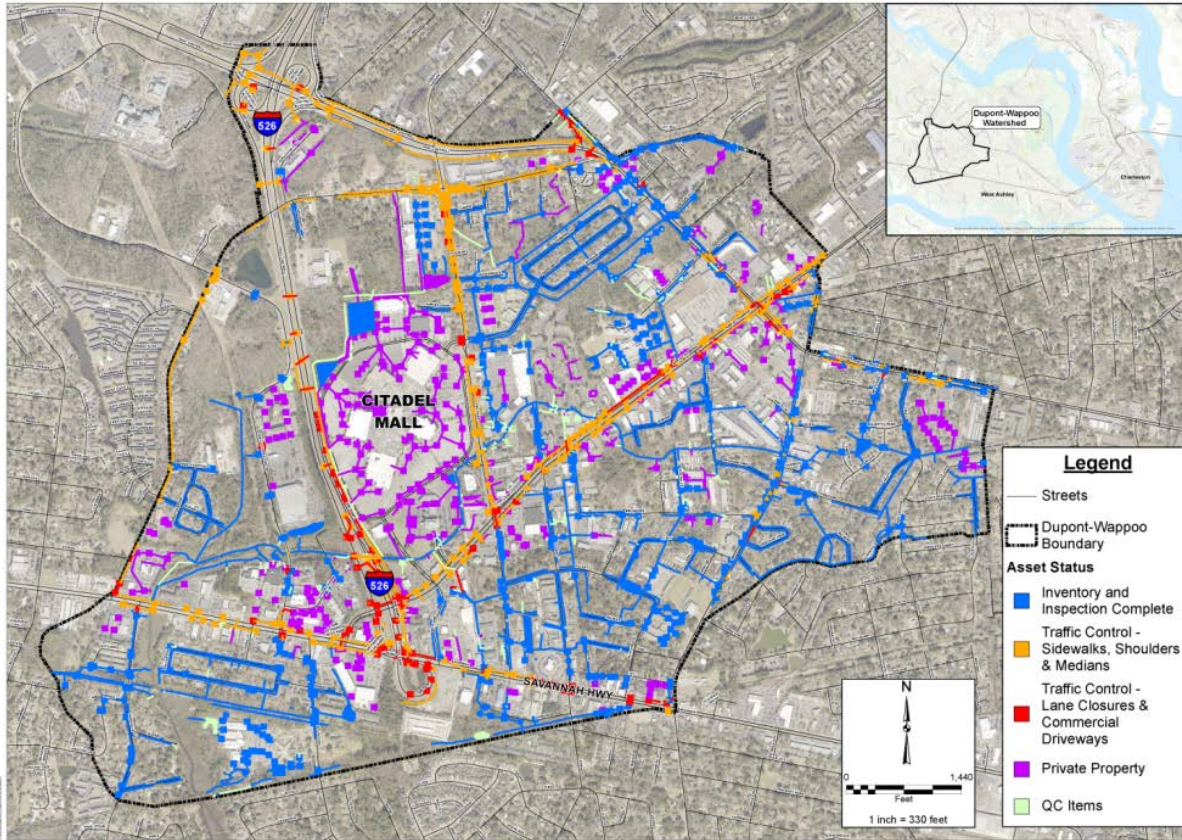


FIELD NAME	FIELD DESCRIPTION
ASSETID	swPIPE011269
BASINID	N/A
LegacyID	N/A
GlobalID	N/A
MATERIAL	Reinforced Concrete
DIAMETER	36"
HEIGHT	N/A
WIDTH	N/A
LENGTH	44.086366
MAINSHAPE	Circular
PIPETYPE	Gravity Main
LININGMAT	N/A
DNELEV_HW	N/A
DNDEPTH_TOP	N/A
DNELEV_TOP	8.55
DNELEV_INV	4.46
DNDEPTH_INV	4.09
UPELEV_HW	N/A
UPDEPTH_TOP	N/A
UPELEV_TOP	7.71
UPELEV_INV	4.51
UPDEPTH_INV	3.20
SLOPE	0.11
AVGCOVERDEPTH	N/A
FROM ASSET	N/A
TO ASSET	swINLT008053
STRUCT_TYP_UP	Projected from Fill
STRUCT_TYP_DN	N/A
STENCIL	No
COMMENTS	Data Source: 1984 Master Drainage and Floodplain Management Plan
ACTIVEFLAG	True
LIFECYCLESTATUS	Active
LASTUPDATE	4/21/2017 8:30:08AM
LASTEDITOR	LYNN SHELLEY
SOURCE	Other (See Comments)
SOURCEACC	Best Fit
SOURCEDATE	3/8/2018 12:37:05PM
SOURCE DATUM	Unknown
DimUOMlev	N/A
DimUOMLength	N/A
DimUOMWidth	N/A
DimUOMDepth	Tenths of Foot
DimUOMHeight	N/A
DimUOMSlope	Percent
DimUOMDiameter	Inch
NeedsMaintenance	No Maintenance Issues
Accessible	Accessible





# ASSET INVENTORY – System Mapping



# ASSET INVENTORY – Asset Counts

– As of 9/1/18

## Asset Counts for Field Data Collection

Feature Type	# of Assets Inventoried	# Assets Inventoried - Private Property	# Assets Remaining - Traffic Control	Total # Assets for field collection
<b>Inlets</b>	352	147	365	864
<b>Manholes/Junctions</b>	102	9	96	207
<b>Pipes</b>	751	216	578	1545
<b>Culverts</b>	686	0	71	757
<b>Channels</b>	1042	10	215	1267
<b>Fittings</b>	12	0	46	58
<b>TOTAL</b>	<b>2945</b>	<b>382</b>	<b>1371</b>	<b>4698</b>

## City of Charleston Digitized Asset Counts - Entire City

Feature Type	# of Assets Digitized (June 13, 2017)
<b>Inlets</b>	10,805
<b>Manholes/Junctions</b>	2078
<b>Pipes</b>	13,930
<b>Culverts</b>	1245
<b>Channels</b>	7214
<b>Fittings</b>	52
<b>BMPs</b>	429
<b>TOTAL</b>	<b>35,753</b>





# CONDITION ASSESSMENT



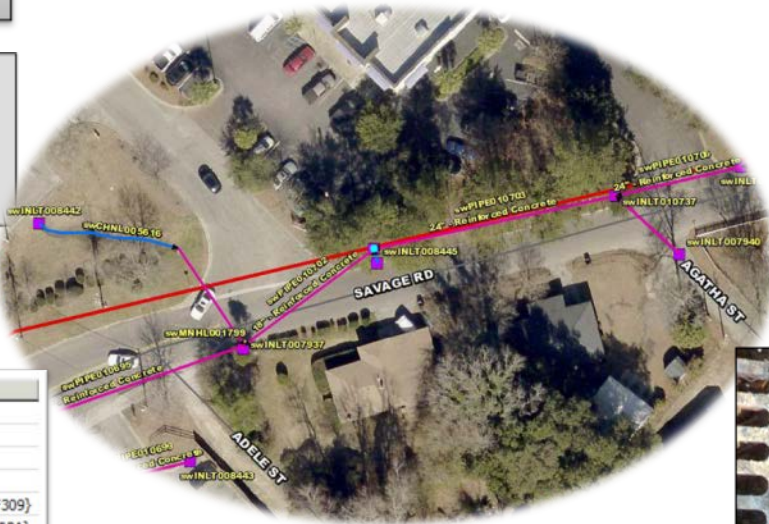
# CONDITION ASSESSMENT– Data Collection

## SURVEY GRADE DATA COLLECTION

South Carolina State Plane Coordinates

X: 2,300,539.477  
 Y: 355,819.318  
 Z: 14.90314 (NAVD 88)

## INLETS



Field	Value
Asset ID	swINLT007938
Comments	#Sediment liner partially blocking flow.
Component	Not applicable
Component Condition	<null>
CP_FC_GUID	{EDA88C48-C88A-4FC7-9A92-5FE23AC9F309}
CP_INSP_GUID	{498AA188-1857-483D-ABD8-3950D538A93A}
Defect	Obstruction (> 25%)
Descriptor	Sediment
GlobalID	{391D8CC7-2746-4BA7-A5EF-1D779EB65E0D}
Inspection Date	4/5/2018 9:05:10 AM
Inspector	MR
Modifier	50% - 75%
OBJECTID	5753
Upstream or Downstream	NA

## CONDITION ASSESSMENT



# CONDITION ASSESSMENT- Data Collection

## SURVEY GRADE DATA COLLECTION

South Carolina State Plane Coordinates

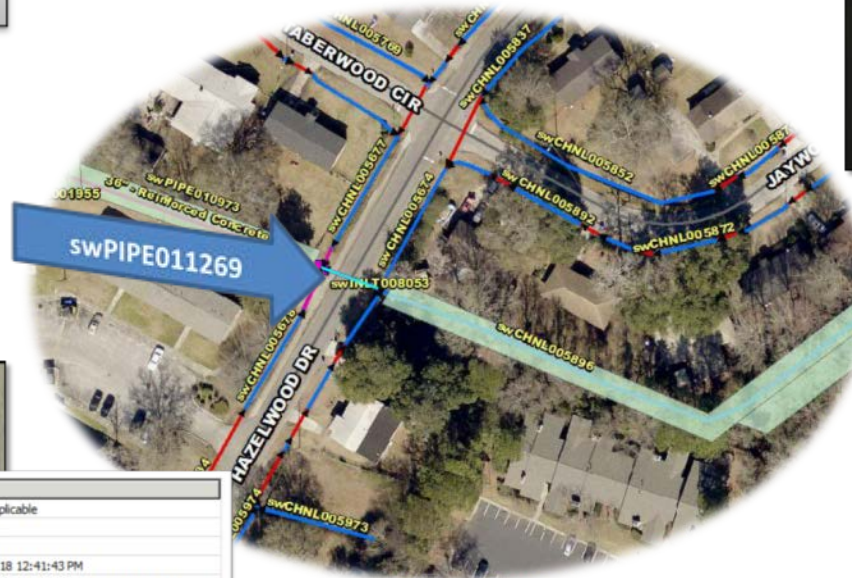
Upstream End

X: 2,299,225.21299  
Y: 354,024.62552  
Z: 4.51 (NAVD 88)

Downstream End

X: 2,299,183.65294  
Y: 354,039.33471  
Z: 4.46 (NAVD 88)

## PIPES



Field	Value
Upstream or Downstream	Not applicable
Modifier	<null>
Inspector	CH
Inspection Date	3/8/2018 12:41:43 PM
GlobalID	(7D35886C-F405-4966-9C6F-EB1E638138E7)
Descriptor	Deposit Sediment (no mod)
Defect	Deposits (LTEQ 25%)
CP_INSP_GUID	(27908B52-8CA9-464E-AE1B-56DDC0F6C350)
CP_FC_GUID	(F4074F1A-6996-40E2-A457-F297AE042528)
Component Condition	<null>
Component	Not applicable
Comments	<null>
Asset ID	swPIPE011269

Field	Value
Upstream or Downstream	Upstream
Modifier	Moderate
Inspector	CH
Inspection Date	3/8/2018 12:42:11 PM
GlobalID	(77D12DAE-9695-45F6-A1DA-EBC586FC0860)
Descriptor	<null>
Defect	Crack
CP_INSP_GUID	(1DC470A9-2F4B-427B-B1F5-163C88E42C32)
CP_FC_GUID	(F4074F1A-6996-40E2-A457-F297AE042528)
Component Condition	<null>
Component	Not applicable
Comments	<null>
Asset ID	swPIPE011269

## CONDITION ASSESSMENT



# CONDITION ASSESSMENT - Findings

## DUPONT-WAPPOO WATERSHED MASTER CONDITION ASSESSMENT

### STRUCTURAL DEFECTS Corrosion & Joint Separation



Defect Category	Defects	Descriptors	Modifiers	Condition Grade				
				No Modifier	Minor	Moderate	Severe	
Structural Defects	Crack		Minor, Moderate, Severe	2	3	4		
	Fracture		Minor, Moderate, Severe	3	4	5		
	Broken		Minor, Moderate, Severe	3	4	5		
	Hole		Minor, Moderate, Severe	3	4	5		
	Deformed (< 40%)			1				
	Collapse (> 40%)			5				
	Joint	Offset		Minor, Moderate, Severe	2	3	4	
		Separated		Minor, Moderate, Severe	3	4	5	
		Spalling		Minor, Moderate, Severe	2	3	4	5
	Surface Damage	Aggregate Visible			2			
		Rebar Exposed			4			
		Corrosion			5			
		Lining Issue			3			
	Back/Block/Rock	Other		Minor, Moderate, Severe	3	1	3	5
		Displaced			3			
Missing Mortar				4				
Decayed	Missing Mortar			2				
	Missing Mortar		Minor, Moderate, Severe	2	2	3	4	
Sag			< 30% (30-50%) (> 50%)	No Mod.	< 30%	30-50%	> 50%	

#### Condition Grade Scoring

Grade	Condition Description
5	Failed or failure is imminent - requires immediate attention
4	Severe defects - risk of future failure
3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
1	Minor defects - failure unlikely in the foreseeable future

#### Modifier Descriptions:

Defect Category	Modifier	Description
Structural (except Sag)	Minor	Few defects visible
	Moderate/Severe	Multiple defects visible; deterioration may continue
Structural - Sag	< 30%	None of section oval to circular
	30-50%	< 30% cross-sectional area affected

Defect Category	Defects	Descriptors	Modifiers	Condition Grade				
				No Modifier	Minor	Moderate	Severe	
Structural Defects	Crack		Minor, Moderate, Severe	2	3	4		
	Fracture		Minor, Moderate, Severe	3	4	5		
	Broken		Minor, Moderate, Severe	3	4	5		
	Hole		Minor, Moderate, Severe	3	4	5		
	Deformed (< 40%)			4				
	Collapse (> 40%)			5				
	Joint	Offset		Minor, Moderate, Severe	2	3	4	
		Separated		Minor, Moderate, Severe	3	4	5	
		Spalling		Minor, Moderate, Severe	2	3	4	5
	Surface Damage	Aggregate Visible			2			
		Rebar Exposed			4			
		Corrosion			5			
		Lining Failure			3			
	Back/Block/Rock	Other		Minor, Moderate, Severe	3	1	3	5
		Displaced			3			
Missing Mortar				4				
Decayed	Missing Mortar			2				
	Missing Mortar		Minor, Moderate, Severe	2	2	3	4	
Sag			< 30% (30-50%) (> 50%)	No Mod.	< 30%	30-50%	> 50%	





# CONDITION ASSESSMENT - Findings

## DUPONT-WAPPOO WATERSHED MASTER PLAN CONDITION ASSESSMENT

### STRUCTURAL DEFECTS Joint Offsets



#### Modifier Descriptions:

Defect Category	Modifier	Description
Structural (except Sag)	Minor	Few defects visible
	Moderate	Multiple defects visible, deterioration may continue
	Severe	Risk of failure due to defects
Structural - Sag	< 30%	< 30% cross-sectional area affected
	30-50%	30-50% cross-sectional area affected



Defect Categories	Defects	Descriptors	Modifiers	Condition Grade				
				No Modifier	Minor	Moderate	Severe	
Structural Defects	Crack		Minor, Moderate, Severe	2	3	4	5	
	Fracture		Minor, Moderate, Severe	3	4	5		
	Broken		Minor, Moderate, Severe	3	4	5		
	Hole		Minor, Moderate, Severe	3	4	5		
	Deformed (< 40%)			4				
	Collapse (> 40%)			5				
	Joint	Offset		Minor, Moderate, Severe	2	3	4	5
		Separated		Minor, Moderate, Severe	3	4	5	
		Spalling			2			
		Aggregate Visible			3			
	Surface Damage	Rebar Exposed			4			
		Corrosion			5			
		Linting, Flaking, Other		Minor, Moderate, Severe	3	1	3	5
	Brick/Block/Block	Reinforcement Missing			3			
		Missing Mortar			4			
		Missing Mortar			2			
	Decayed			Minor, Moderate, Severe	No Mod.	2	3	4
					No Mod.	< 30%	30-50%	> 50%
Reg.					2	3	4	

#### Condition Grade Scoring

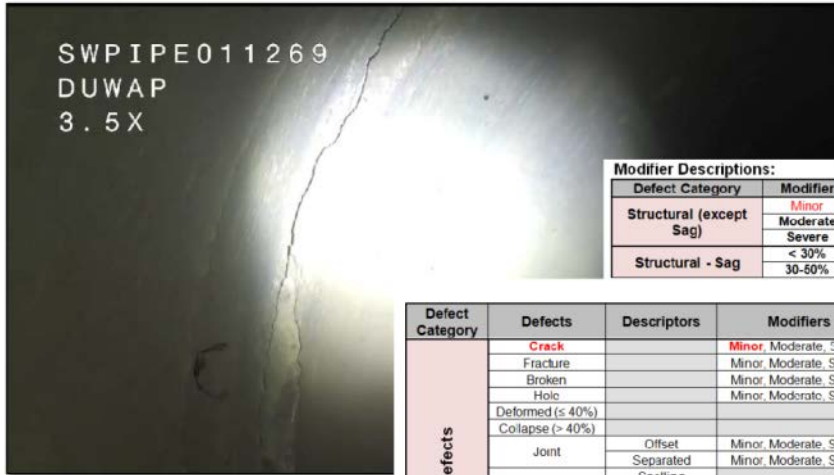
Grade	Condition Description
5	Failed or failure is imminent - requires immediate attention
4	Severe defects - risk of future failure
3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
1	Minor defects - failure unlikely in the foreseeable future



# CONDITION ASSESSMENT - Findings

## DUPONT-WAPPOO WATERSHED MASTER PLAN CONDITION ASSESSMENT

### STRUCTURAL DEFECTS Crack



SWPIPE011269  
DUWAP  
3.5X

#### Modifier Descriptions:

Defect Category	Modifier	Description
Structural (except Sag)	Minor	Few defects visible
	Moderate	Multiple defects visible; deterioration may continue
	Severe	Risk of failure due to defects
Structural - Sag	< 30%	< 30% cross-sectional area affected
	30-50%	30-50% cross-sectional area affected

Defect Category	Defects	Descriptors	Modifiers	Condition Grade				
				No Modifier	Minor	Moderate	Severe	
Structural Defects	Crack		Minor, Moderate, Severe		2	3	4	
	Fracture		Minor, Moderate, Severe		3	4	5	
	Broken		Minor, Moderate, Severe		3	4	5	
	Hole		Minor, Moderate, Severe		3	4	5	
	Deformed (≤ 40%)			4				
	Collapse (> 40%)			5				
	Joint	Offset	Minor, Moderate, Severe		2	3	4	
		Separated	Minor, Moderate, Severe		3	4	5	
	Surface Damage	Spalling			2			
		Aggregate Visible			3			
		Rebar Exposed			4			
		Corrosion			5			
		Lining Failure			3			
		Other	Minor, Moderate, Severe		1	3	5	
	Brick/Block/Rock	Displaced			3			
		Missing			4			
		Missing Mortar			2			
	Decayed		Minor, Moderate, Severe		2	3	4	
	Sag		(< 30%), (30-50%), (> 50%)	No Mod.	< 30%	30-50%	> 50%	

#### Condition Grade Scoring

Grade	Condition Description
5	Failed or failure is imminent - requires immediate attention
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3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
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# CONDITION ASSESSMENT - Findings

## DUPONT-WAPPOO WATERSHED MASTER PLAN

### OPERATIONAL & MAINTENANCE DEFECTS

#### Obstructions

Defect Categories	Defects	Descriptors	Modifiers	Condition Grade			
				No Modifier	Minor	Moderate	Severe
Operational & Maintenance (O&M) Defects	Deposits (< 25%)	Deposit Sediment		2			
		Deposit Gravel		2			
		Deposit Woody Debris		2			
		Deposit Concrete		2			
		Deposit Garbage		2			
		Deposit Other		2			
					No Mod.	< 30%	50-75%
Obstruction (> 25%)	Obstruction (> 25%)	Sediment (< 50%, 50-75%, > 75%)		3	4	5	
		Gravel/Rocks (< 50%, 50-75%, > 75%)		3	4	5	
		Woody Debris (< 50%, 50-75%, > 75%)		3	4	5	
		Construction Debris (< 50%, 50-75%, > 75%)		3	4	5	
		Garbage (< 50%, 50-75%, > 75%)		3	4	5	
		Burned (< 50%, 50-75%, > 75%)		5	3	4	5
		Object Intruding Through Wall (< 50%, 50-75%, > 75%)		3	4	5	
Roots	Roots	External Pipe/Utility (< 50%, 50-75%, > 75%)		3	4	5	
		Other (< 50%, 50-75%, > 75%)		3	4	5	
		Fine		2	3	4	5
Infiltration	Infiltration	Tap		3			
		Medium (< 50%)		4			
		Ball (> 50%)		5			
		Wrecker/Crusher Runner		2			
		Runner		4			



Defect Categories	Defects	Descriptors	Modifiers	Condition Grade			
				No Modifier	Minor	Moderate	Severe
Operational & Maintenance (O&M) Defects	Deposits (< 25%)	Deposit Sediment		2			
		Deposit Gravel		2			
		Deposit Woody Debris		2			
		Deposit Concrete		2			
		Deposit Garbage		2			
		Deposit Other		2			
					No Mod.	< 50%	50-75%
Obstruction (> 25%)	Obstruction (> 25%)	Sediment (< 50%, 50-75%, > 75%)		3	4	5	
		Gravel/Rocks (< 50%, 50-75%, > 75%)		3	4	5	
		Woody Debris (< 50%, 50-75%, > 75%)		3	4	5	
		Construction Debris (< 50%, 50-75%, > 75%)		3	4	5	
		Garbage (< 50%, 50-75%, > 75%)		3	4	5	
		Burned (< 50%, 50-75%, > 75%)		5	3	4	5
		Object Intruding Through Wall (< 50%, 50-75%, > 75%)		3	4	5	
Roots	Roots	External Pipe/Utility (< 50%, 50-75%, > 75%)		3	4	5	
		Other (< 50%, 50-75%, > 75%)		3	4	5	
		Fine		2	3	4	5
Infiltration	Infiltration	Tap		3			
		Medium (< 50%)		4			
		Ball (> 50%)		5			
		Wrecker/Crusher Runner		2			
		Runner		4			

#### Modifier Descriptions:

Defect Category	Modifier	Description
O&M - Obstruction	< 50%	< 50% cross-sectional area affected
	50-75%	50-75% cross-sectional area affected
	> 75%	> 75% cross-sectional area affected

#### Grade Condition Description

5	Failed or failure is imminent - requires immediate attention
4	Severe defects - risk of future failure
3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
1	Minor defects - failure unlikely in the foreseeable future



# CONDITION ASSESSMENT - Findings

## DUPONT-WAPPOO WATERSHED MASTER PLAN CONDITION ASSESSMENT

### OPERATIONAL & MAINTENANCE DEFECTS

#### Obstructions



#### Condition Grade Scoring

Grade	Condition Description
5	Failed or failure is imminent - requires immediate attention
4	Severe defects - risk of future failure
3	Moderate defects - deterioration may continue
2	Minor to Moderate defects - low risk of failure
1	Minor defects - failure unlikely in the foreseeable future

Defect Categories	Defects	Descriptors	Modifiers	Condition Grade					
				No Modifier	Minor	Moderate	Severe		
Operational & Maintenance (O&M) Defects	Deposits (≤ 25%)	Deposit Sediment		2					
		Deposit Gravel		2					
		Deposit Woody Debris		2					
		Deposit Concrete		2					
		Deposit Garbage		2					
	Deposit Other		2						
	Obstruction (> 25%)		Sediment (< 50%) (S1-75%) (> 75%)			3	4	5	
			Gravel/Rocks (< 25%) (21-75%) (> 75%)			3	4	5	
			Woody Debris (< 50%) (51-75%) (> 75%)			3	4	5	
			Construction Debris (< 50%) (51-75%) (> 75%)			3	4	5	
			Garbage (< 50%) (51-75%) (> 75%)			3	4	5	
			Dried			5			
			Object Intruding Through Wall (< 50%) (51-75%) (> 75%)			3	4	5	
			External Flow Cable (< 50%) (51-75%) (> 75%)			3	4	5	
			Other (< 50%) (51-75%) (> 75%)			3	4	5	
Fine					2				
Roots	Tap			3					
	Medium (≤ 50%)			4					
	Ball (> 50%)			5					
Infiltration	Washer/Drinker			2					
	Runner			4					

#### Modifier Descriptions:

Defect Category	Modifier	Description
O&M - Obstruction	< 50%	< 50% cross-sectional area affected
	50-75%	50-75% cross-sectional area affected
	> 75%	> 75% cross-sectional area affected





# PATH FORWARD



# PATH FORWARD

- Modeling – ICPR4 and Validation
- Priority Matrix
- Final Report
  - Maintenance and Repair projects
  - CIP Identification
  - Design Standards
- Lessons Learned



# THANKS

City of Charleston Mayor

Charleston County

City Council

County Council

Plan West Ashley

SCDOT

Wildlands Engineering

Eadie's Industrial



# Questions and Comments

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