



Pierce County

Public Works and Utilities

Using ArcGIS Online to Meet NPDES Compliance





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Using ArcGIS Online to Meet NPDES Compliance



Mike Johnson

Asset Management Specialist 3

Pierce County Public Works and
Utilities Road Operations
Division

Pierce County Road Operations Drainage Programs

Drainage Features

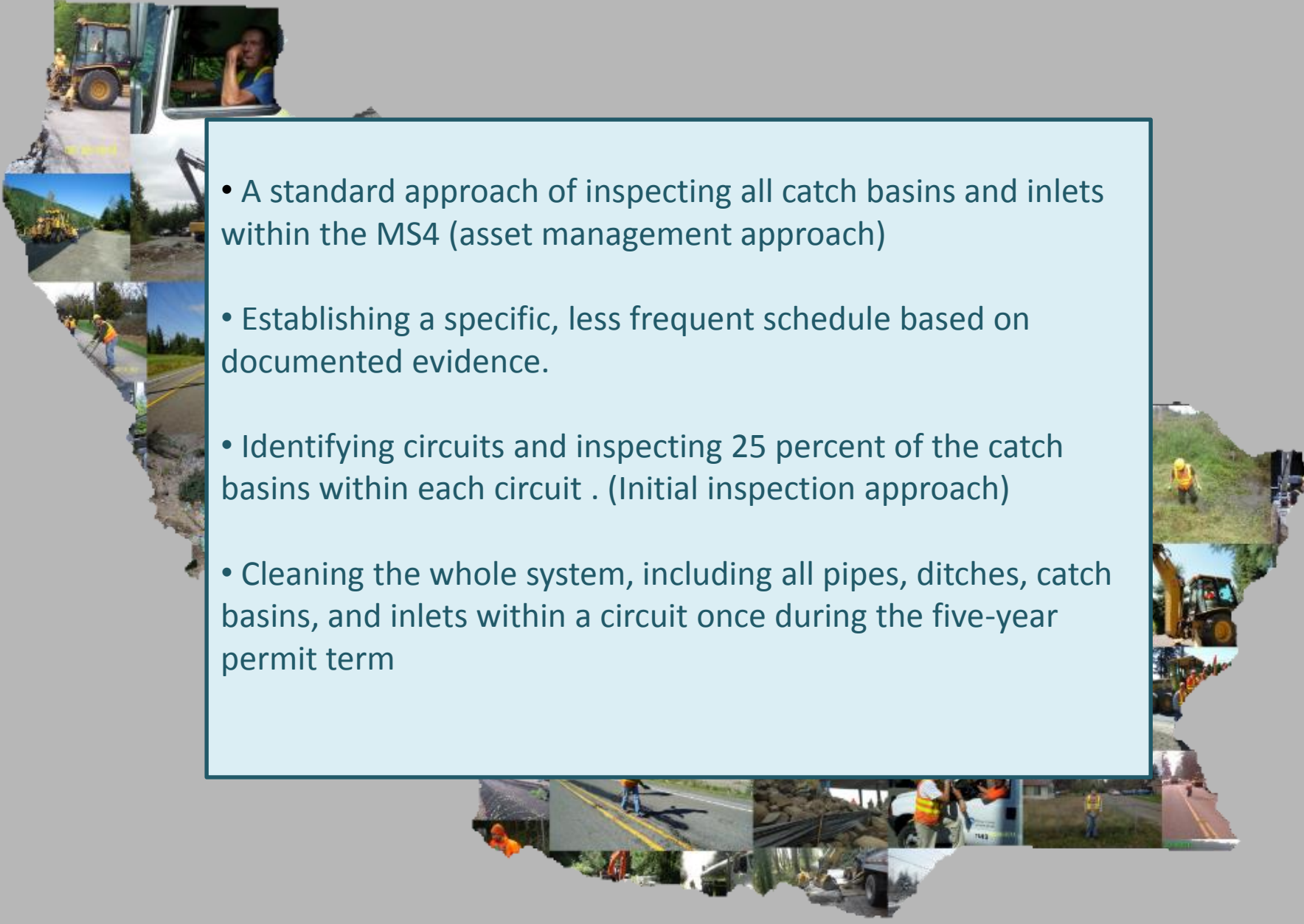
- 22,239 – Catch Basins
- 44 – Vault Structures
- 1530 Miles – Open Channels (Ditch)
- 552 Miles – Pipe

Drainage Inspection Programs

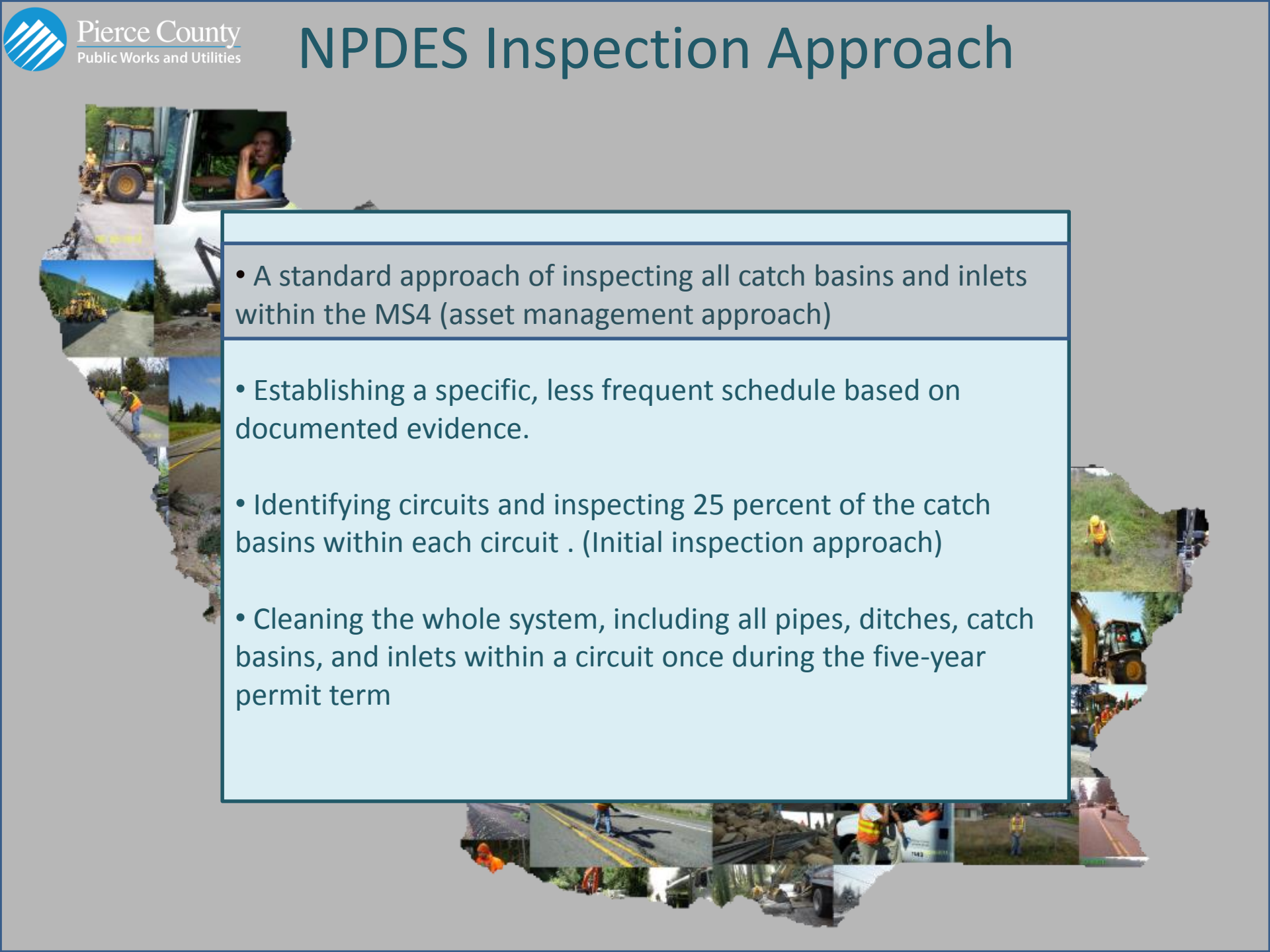
- Catch Basin Inspection and Cleaning
- WQFC (Water Quality Flow Control) Inspection
- Ditch and Culvert Inspection
- Bioswale & Rain Garden Inspection



NPDES Inspection Approach

- 
- A standard approach of inspecting all catch basins and inlets within the MS4 (asset management approach)
 - Establishing a specific, less frequent schedule based on documented evidence.
 - Identifying circuits and inspecting 25 percent of the catch basins within each circuit . (Initial inspection approach)
 - Cleaning the whole system, including all pipes, ditches, catch basins, and inlets within a circuit once during the five-year permit term

NPDES Inspection Approach

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Inspection Approach - Teams



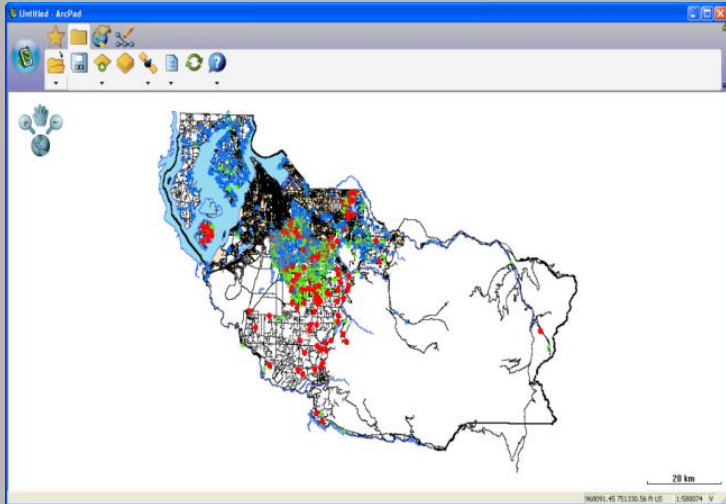
- 5 teams of two are dispatched to separate areas to inspect catch basins.
- 2 assessment teams report to satellite shops (ECMF, WCMF)
- Each team inspects all catch basins in their assigned areas.
- Assessment teams start 2 weeks prior to vector crews
- 4 Vector crews perform the cleaning of marked structures 2 vectors report out of satellite shops

What is ArcPad?

- *ArcPad* is mobile field mapping and data collection software designed for GIS professionals. It includes advanced GIS and GPS capabilities for capturing, editing, and displaying geographic information quickly and efficiently. Critical data can be checked in and out of a multi-user or personal geo-database and shared across your organization.

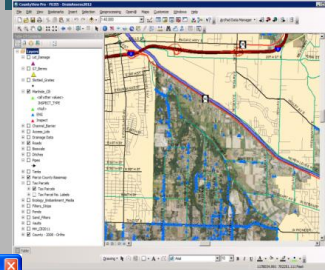


ArcPad at work

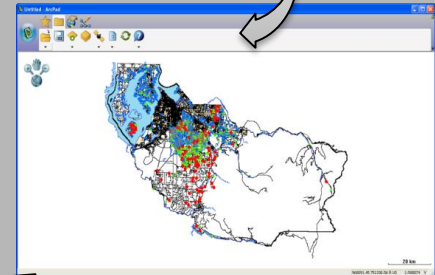


ArcPad provides a simple and fast way to input any asset information that is required for your inspections on the fly in the field

4. Check the edits and asset info back into GIS



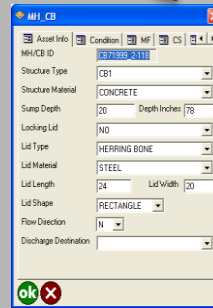
1. Take data from GIS and export it to ArcPad



2. Display and query your data in the field



3. Edit inspection data and asset information





FEATURED CONTENT



Drainage Assessment 2014



PAVEMENT RATING 2014 - DISCONNECTED



Bioswale Inspection



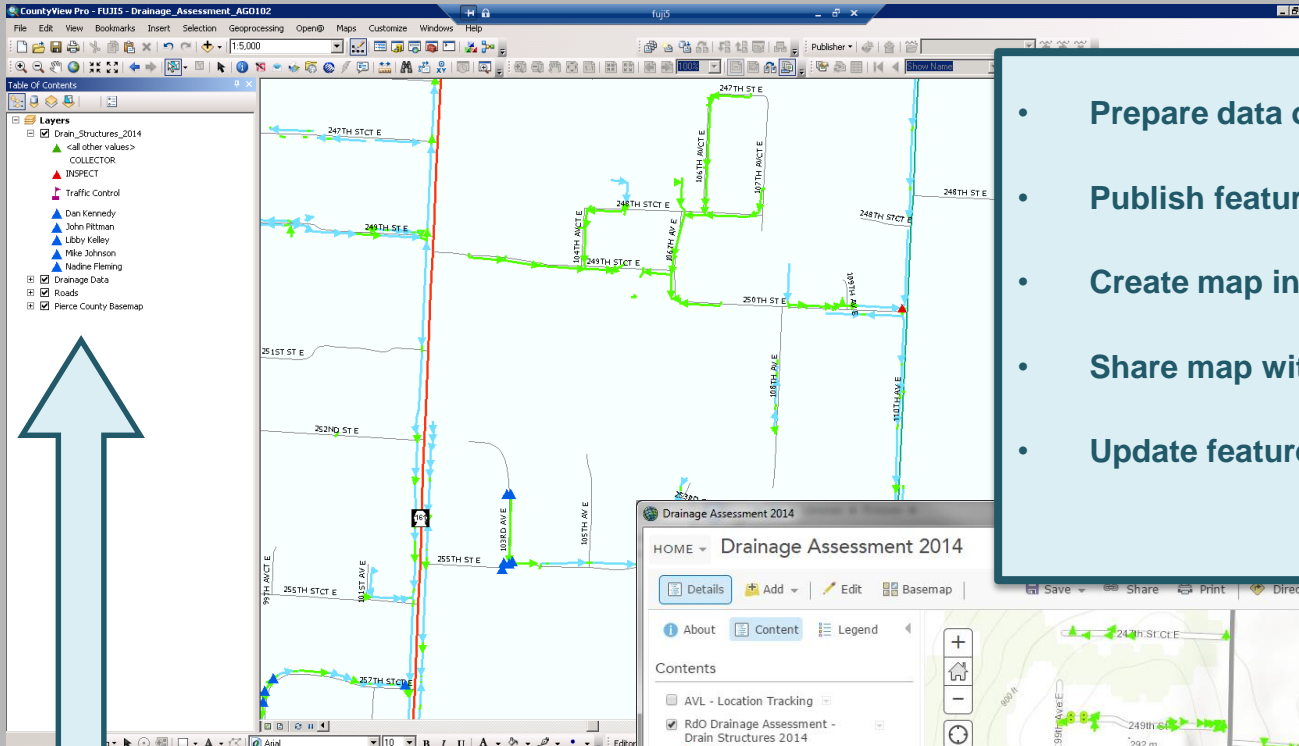
2014 CHIPSEALS

Welcome to the Pierce County ArcGIS Online homepage on ESRI's ArcGIS Online platform. A wide variety of Pierce County-specific web maps, applications, and services can be viewed using this cloud-based technology.

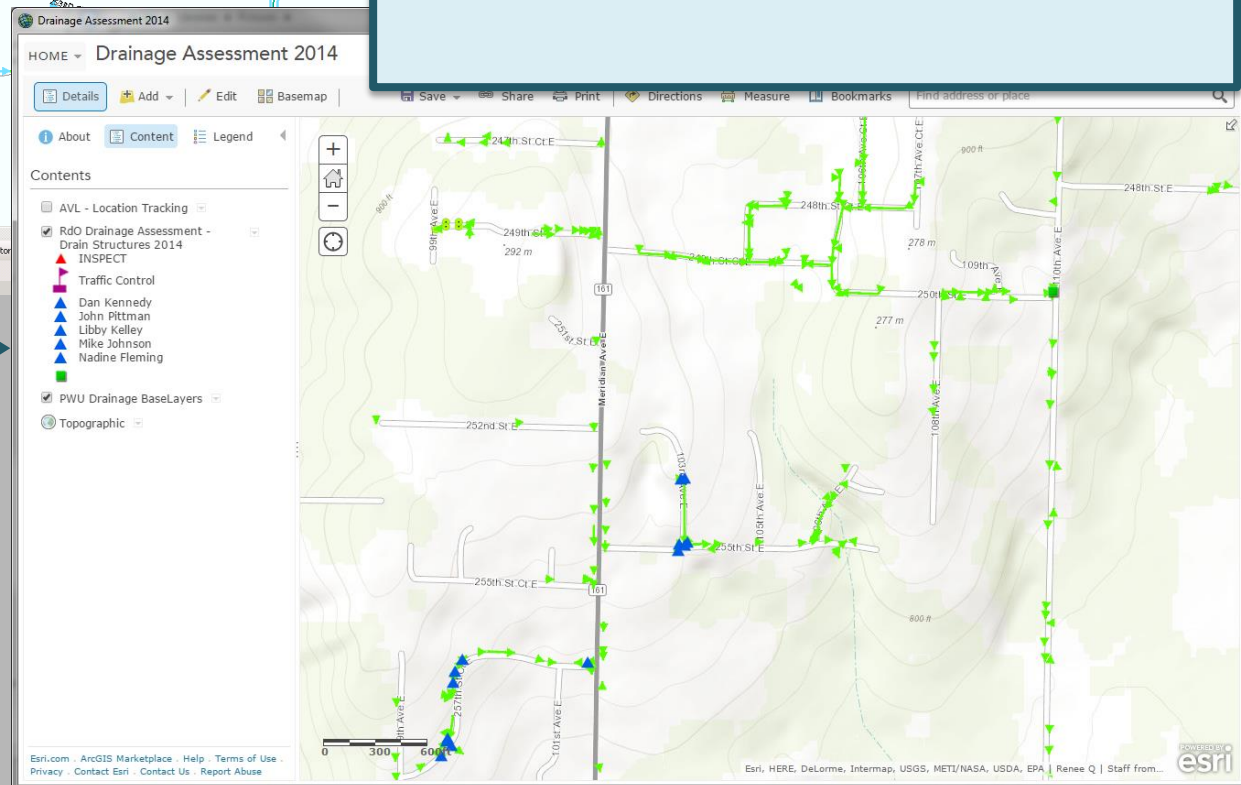
Maps are currently produced by several Pierce County departments including: **Pierce County IT GIS Applications, Surface Water Management, and Road Operations Division**. Look for more maps in the coming months to view useful information on up coming projects throughout Pierce County.

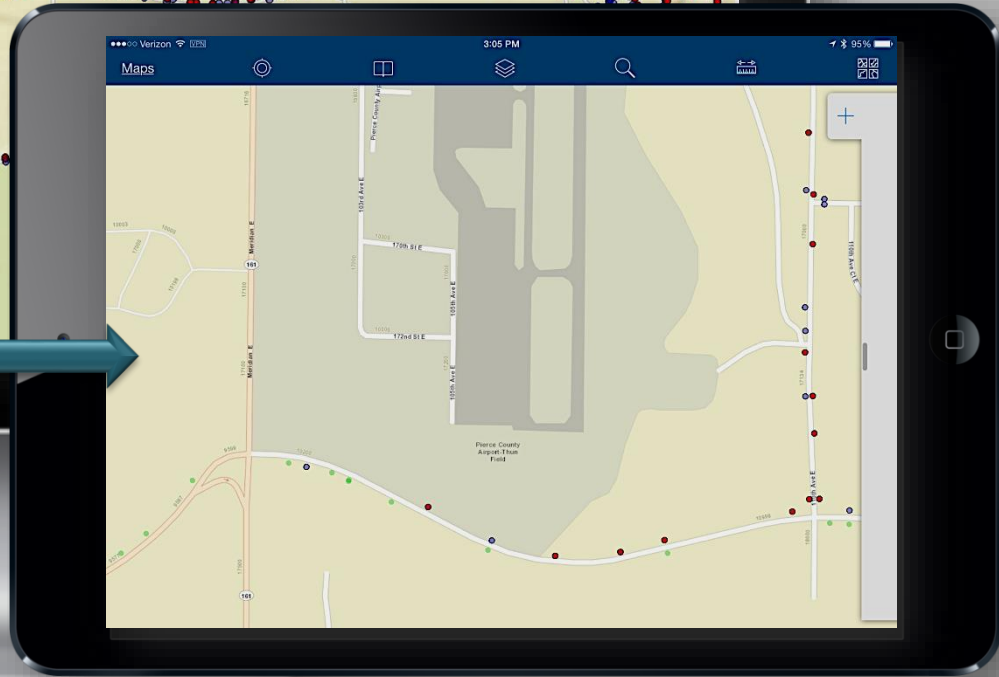
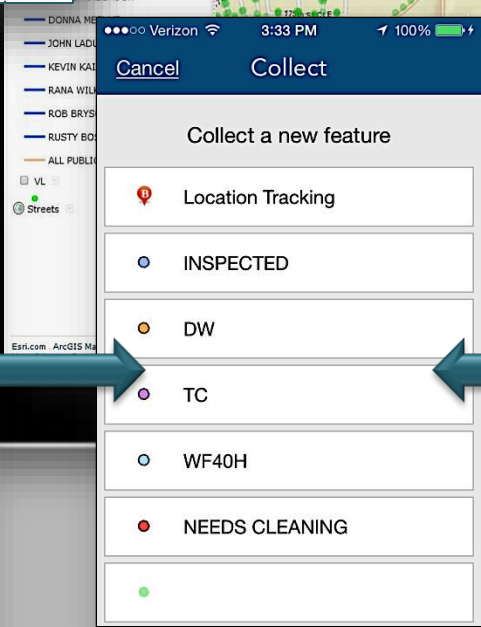
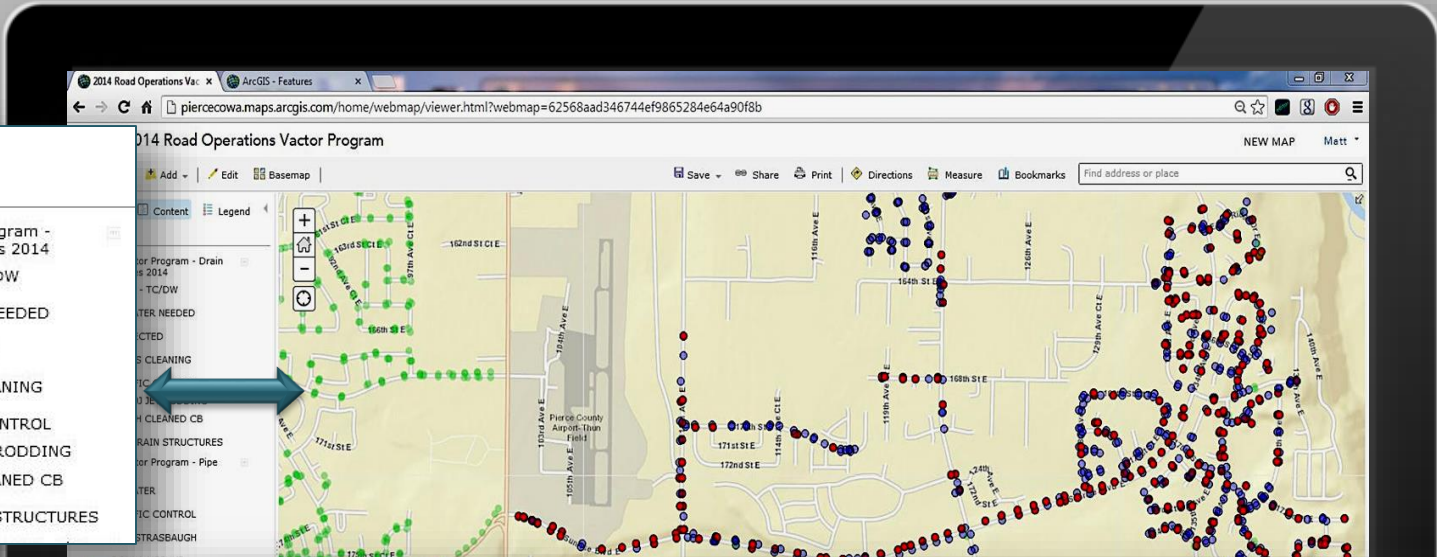
[Pierce County Official Site](#)

Desktop to ArcGIS Online



- Prepare data on Desktop
- Publish feature service
- Create map in ArcGIS online
- Share map with organizational groups
- Update features in the web or on mobile





Feature Access – Mobile Applications

EXPLORER



SHARE MAPS
SKETCH MAPS
HIGHLIGHT TARGETS
CREATE MAP
PRESENTATIONS
LEVERAGE PORTAL
FOR ARCGIS

ARCGIS



DISCOVER
SHARE MAPS
CONTENT
EDIT
UPDATE ATTRIBUTES
IDENTIFY
MEASURE
QUERY TOOLS

COLLECTOR



COLLECT DATA
EDIT
OFFLINE EDITING
SYNC
PLAN ROUTES
GET DIRECTIONS
MEDIA
ATTACHMENTS
OPERATIONS
DASHBOARD

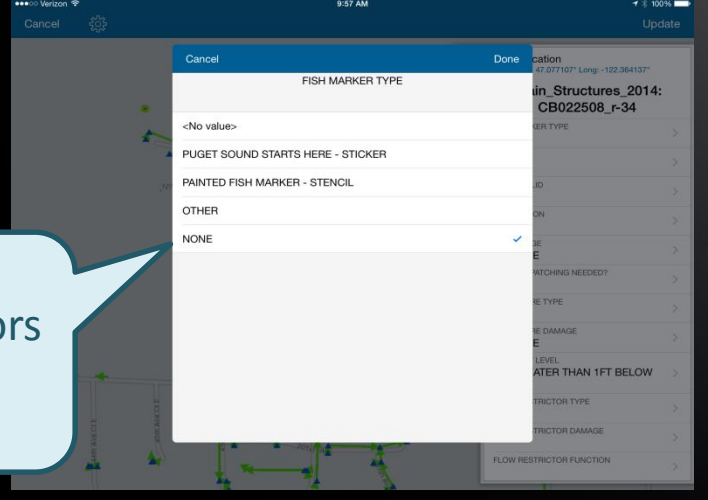
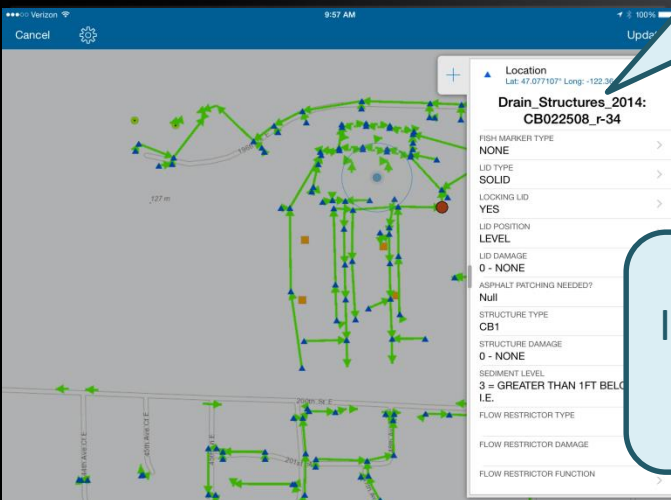
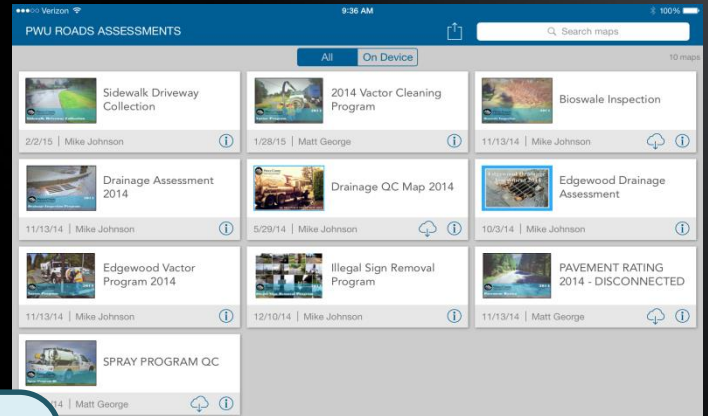


Collector Application

Access to editable
feature services
published to ArcGIS
Online

Select and edit
features from your
mobile device

Input data in collectors
pop up forms



Make Your Maps Talk

Assessment MXD

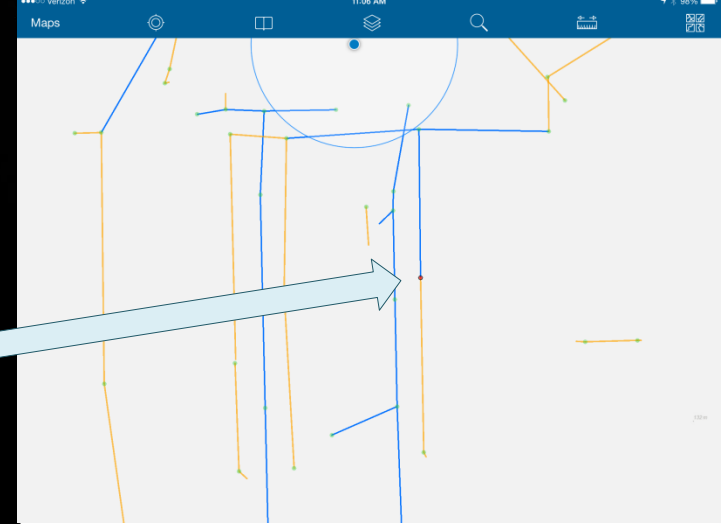
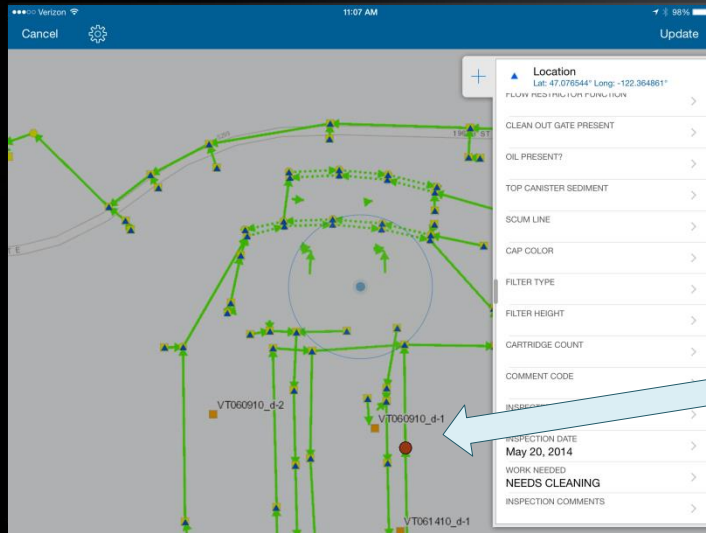
Vector MXD

- Create 2 MXD's from one feature class
- Manage drainage inspection and cleaning separately
- Publish 2 feature services from one database

Make your Maps Talk

Drainage Assessment

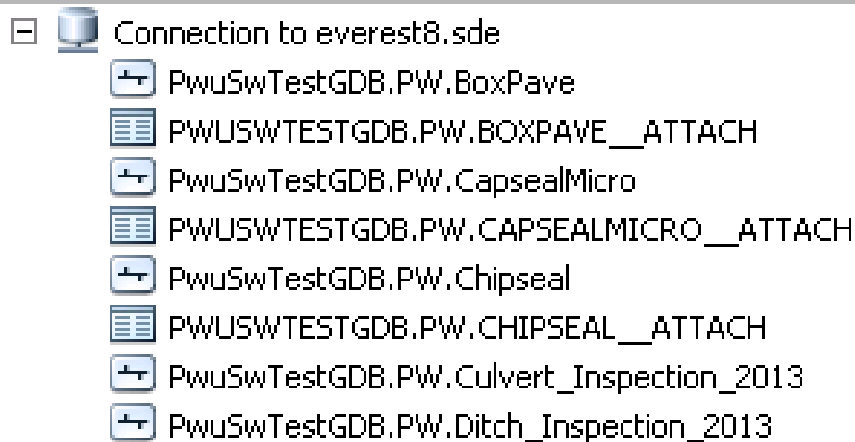
Vector Program



- 2 maps published from one database
- Field created to initiate symbology change
- Attachments and comments from assessment carried over to vector program
- Real time symbology change on both maps to show inspected catch basins (assessment) and catch basins that require cleaning (Vector)

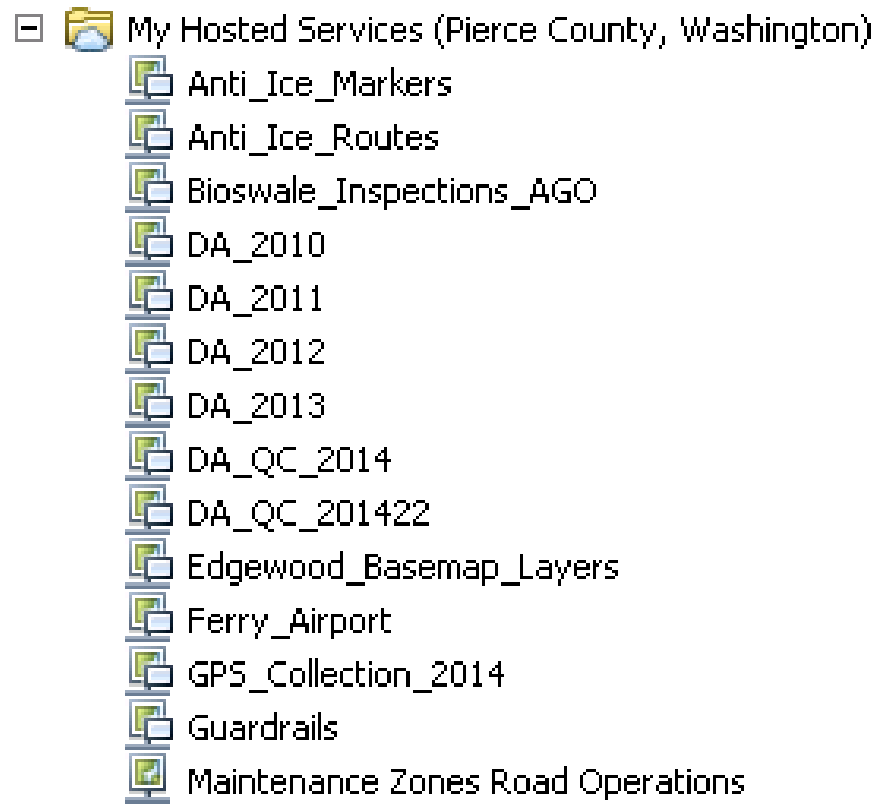
Internal network SDE feature service

- Stored on local secure server (access via VPN)
- Provides Arc Desktop users to view live data
- Make edits to data from desktop
- Enables unique symbology for each service



Amazon cloud feature service

- Stored on the Amazon cloud server
- Feature service access on web and Desktop



Internal Network Data

Create Database

Create MXD

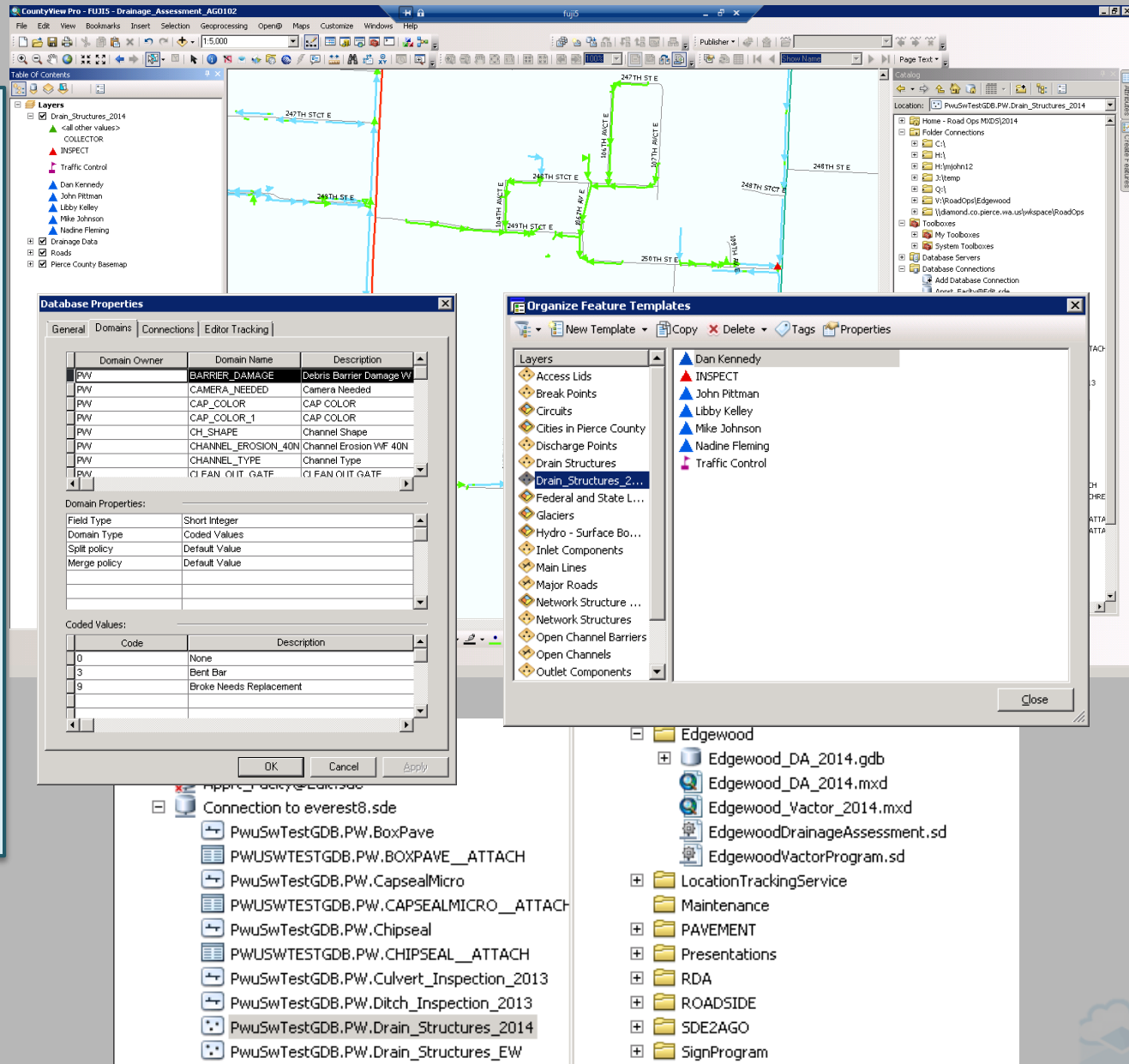
Build coded domain values

Create feature template

(symbology control)

Create a service definition file

Publish SD file to server



The screenshot displays the ArcGIS Desktop interface. The main map shows a network of drainage structures with various features highlighted in green and blue. The 'Table of Contents' on the left lists layers including 'Drain_Structures_2014' and 'Pierce County Basemap'. The 'Database Properties' dialog box is open, showing the 'Domains' tab with a table of domain values:

Domain Owner	Domain Name	Description
PW	BARRIER_DAMAGE	Debris Barrier Damage Wf
PW	CAMERA_NEEDED	Camera Needed
PW	CAP_COLOR	CAP COLOR
PW	CAP_COLOR_1	CAP COLOR
PW	CH_SHAPE	Channel Shape
PW	CHANNEL_EROSION_40N	Channel Erosion WF 40N
PW	CHANNEL_TYPE	Channel Type
PW	FAN_OILT_GATE	FAN OILT GATF

The 'Organize Feature Templates' dialog box is also open, showing a list of feature templates such as 'Access Lids', 'Break Points', 'Circuits', 'Discharge Points', 'Drain Structures', 'Federal and State L...', 'Glaciers', 'Hydro - Surface Bo...', 'Inlet Components', 'Main Lines', 'Major Roads', 'Network Structure ...', 'Network Structures', 'Open Channel Barriers', 'Open Channels', and 'Outlet Components'. The 'Layers' list on the left includes 'Dan Kennedy', 'INSPECT', 'John Plttman', 'Libby Kelley', 'Mike Johnson', 'Nadine Fleming', and 'Traffic Control'. The file explorer at the bottom shows a folder structure for 'Edgewood' containing files like 'Edgewood_DA_2014.gdb', 'Edgewood_DA_2014.mxd', 'Edgewood_Vactor_2014.mxd', 'EdgewoodDrainageAssessment.sd', and 'EdgewoodVactorProgram.sd'. It also shows a 'Connection to everest8.sde' with various database connections like 'PwuSwTestGDB.PW.BoxPave', 'PwuSwTestGDB.PW.BoxPave__ATTACH', 'PwuSwTestGDB.PW.CapsealMicro', 'PwuSwTestGDB.PW.CapsealMicro__ATTACH', 'PwuSwTestGDB.PW.Chipseal', 'PwuSwTestGDB.PW.Chipseal__ATTACH', 'PwuSwTestGDB.PW.Culvert_Inspection_2013', 'PwuSwTestGDB.PW.Ditch_Inspection_2013', 'PwuSwTestGDB.PW.Drain_Structures_2014', and 'PwuSwTestGDB.PW.Drain_Structures_EW'.

Add Data Published to ArcServer

Login to ArcGIS.com

Create New Map

Add server URL

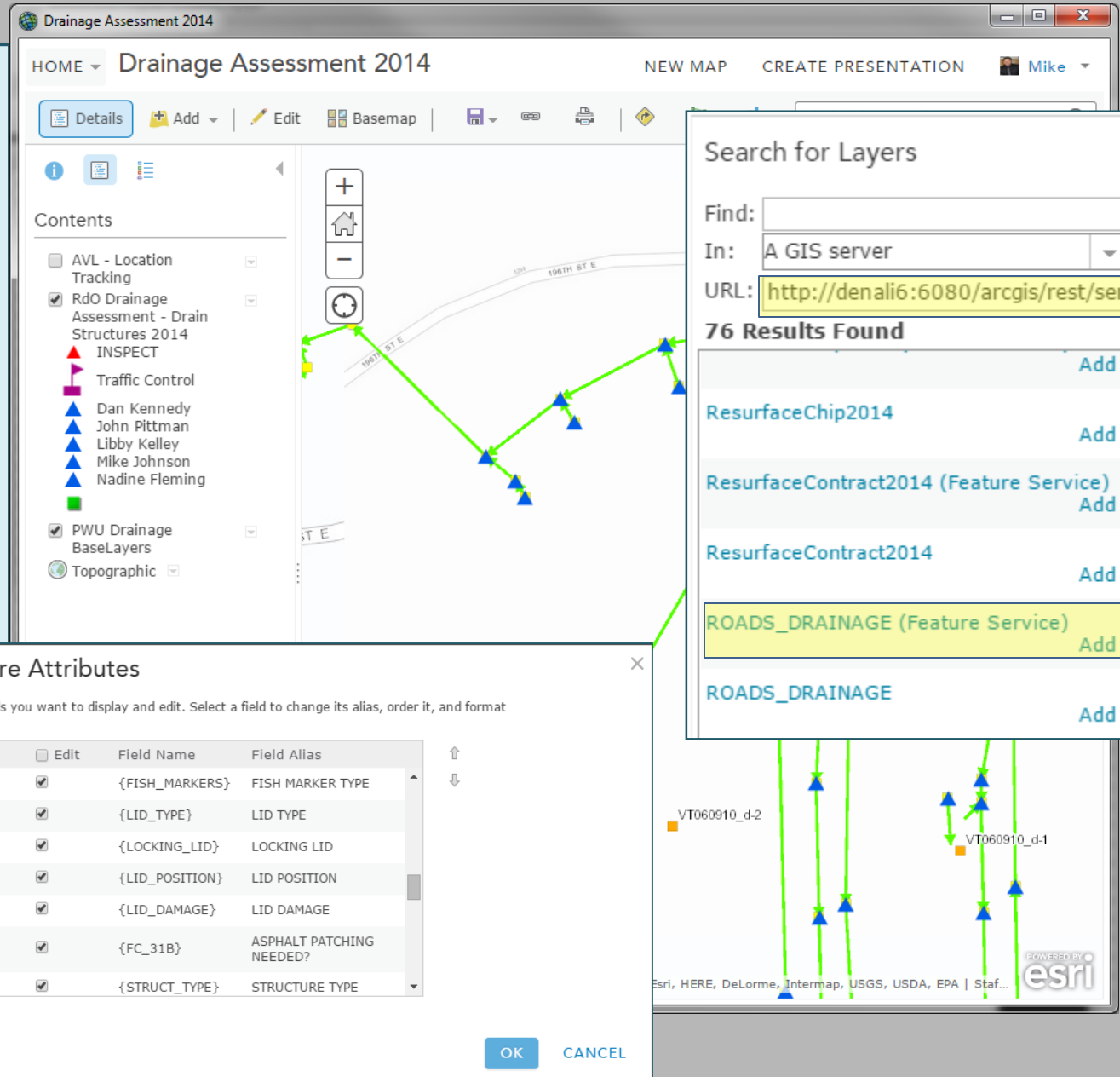
Add Data from Server

Style Map

Configure Pop-ups (Attributes)

Adjust Alias Names

Check your Domains



Drainage Assessment 2014

HOME | Drainage Assessment 2014 | NEW MAP | CREATE PRESENTATION | Mike

Details | Add | Edit | Basemap | Save | Print | Help

Contents

- AVL - Location Tracking
- RdO Drainage Assessment - Drain Structures 2014
 - INSPECT
 - Traffic Control
 - Dan Kennedy
 - John Pittman
 - Libby Kelley
 - Mike Johnson
 - Nadine Fleming
- PWU Drainage BaseLayers
- Topographic

Search for Layers

Find: **GO**

In: A GIS server

URL:

76 Results Found

- ResurfaceChip2014 **Add**
- ResurfaceContract2014 (Feature Service) **Add**
- ResurfaceContract2014 **Add**
- ROADS_DRAINAGE (Feature Service)** **Add**
- ROADS_DRAINAGE** **Add**

Configure Attributes

Check the fields you want to display and edit. Select a field to change its alias, order it, and format it.

Display	Edit	Field Name	Field Alias
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{FISH_MARKERS}	FISH MARKER TYPE
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{LID_TYPE}	LID TYPE
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{LOCKING_LID}	LOCKING LID
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{LID_POSITION}	LID POSITION
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{LID_DAMAGE}	LID DAMAGE
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{FC_31B}	ASPHALT PATCHING NEEDED?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	{STRUCTURE_TYPE}	STRUCTURE TYPE

OK **CANCEL**

VT060910_d-2 | VT060910_d-1

POWERED BY **esri**

Esri, HERE, DeLorme, Intermap, USGS, USDA, EPA | Staf...

Data Driven Forms

Database Properties

General Domains

Domain Name	Description
V_OPERATOR	VEHICLE OPERATOR
WF_40D	MANUALLY CLEAN DRAINAGE INLET
WF_40F	DO NOT USE
WF_40H	MECHANICALLY CLEANING DRAIN STRUCTURE
WF_40I	INSPECTED
WF_40J	JET RODDING PIPE
WORK_1	WORK PERFORMED
WORK_2	ADDITIONAL WORK

Domain Properties:

Field Type	Short Integer
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
0	None
1	Source
2	Sink

OK Cancel Apply

Verizon 2:54 PM 88%

Cancel Update

WORK PERF/NEEDED

BOTH - TC/DW

INSPECTED

DEWATER NEEDED

TRAFFIC CONTROL

WF40H CLEANED CB

NEEDS CLEANING ✓

WF 40J JET RODDING

Location
lat: 47.037868° Long: -122.266431°

rain_Structures_2014:
CB100300_I-74

Damage

Structure Damage

Element level

Code

Comments

Date
er 31, 1969

er 31, 1969

WF/NEEDED
CLEANING

AL WORK

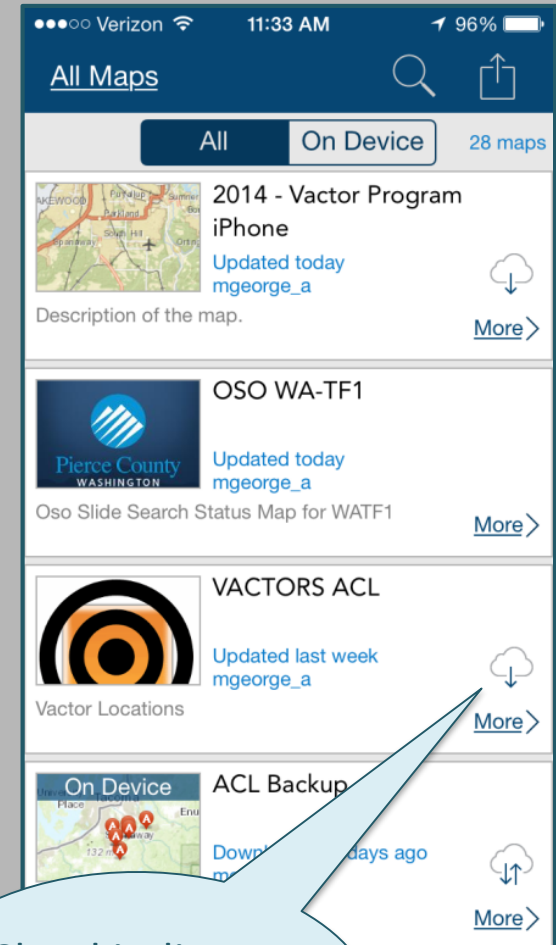
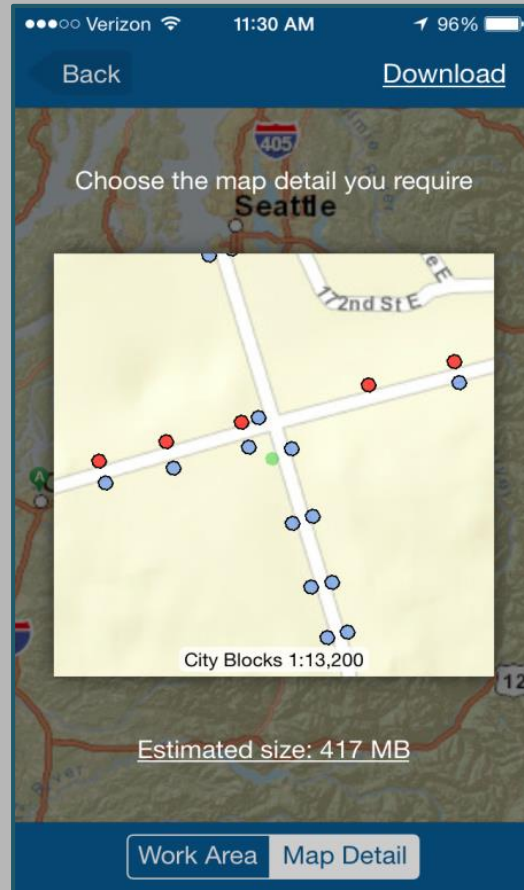
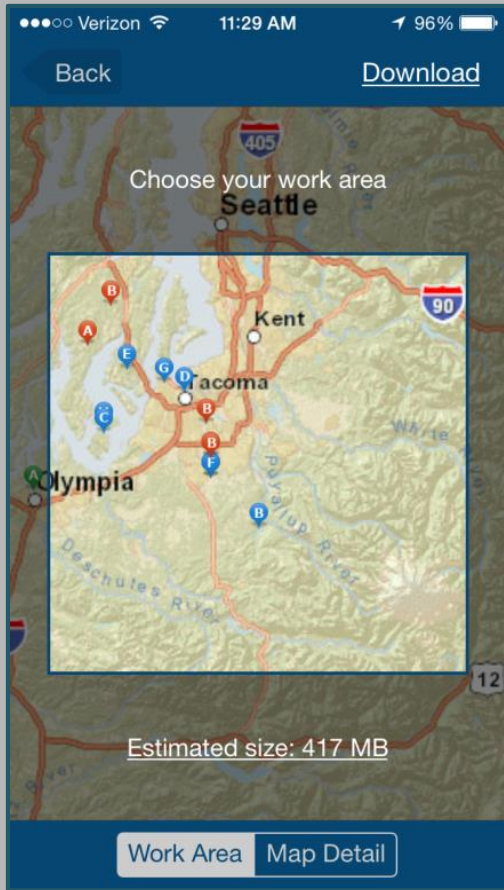
Coded Values:

Code	Description
TC	TRAFFIC CONTROL
DW	DEWATER NEEDED
BOTH	BOTH - TC/DW
NEEDS CLEANING	NEEDS CLEANING
WF40H	WF40H CLEANED CB

OK Cancel Apply

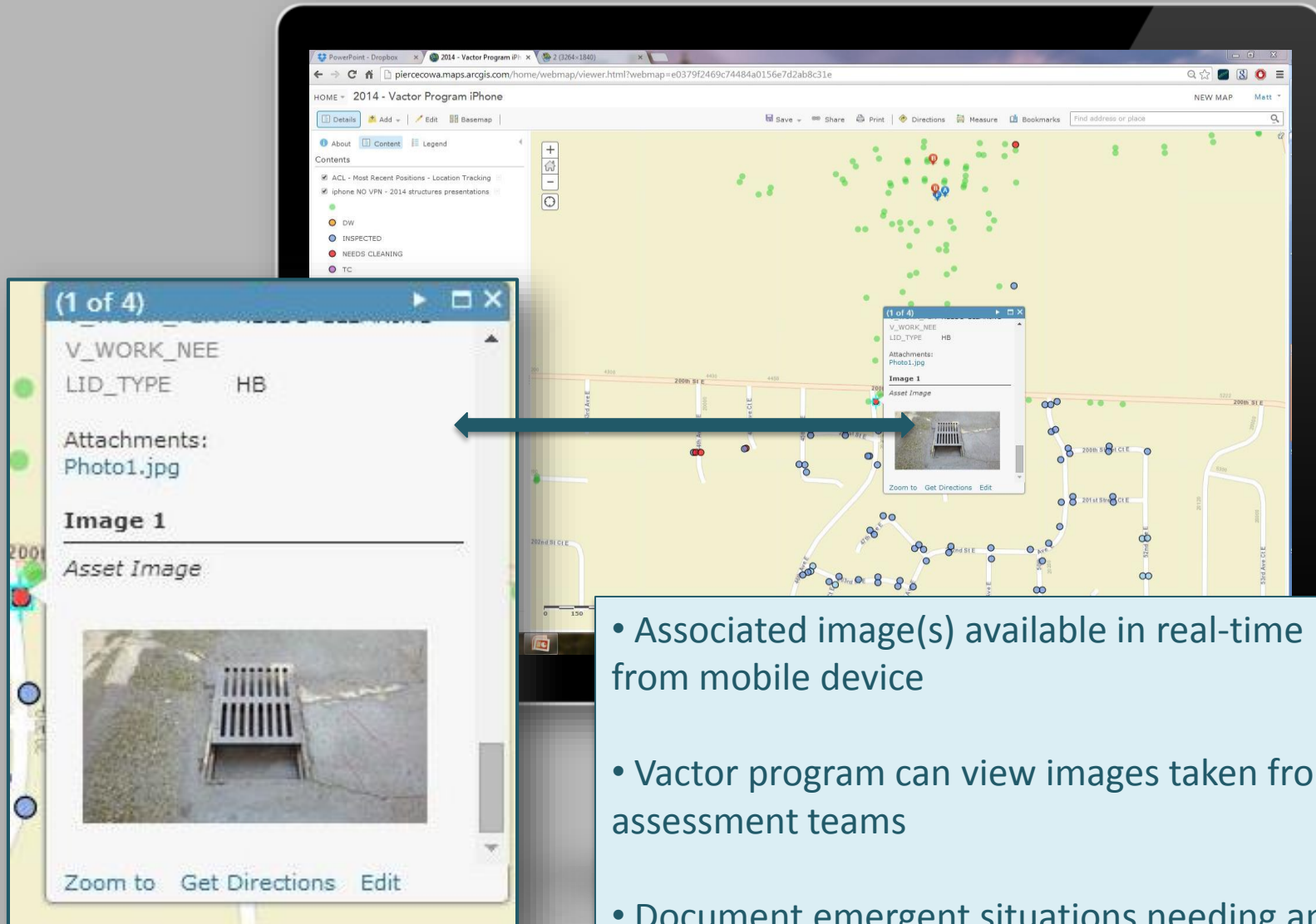
- Create Data Driven Forms
- Speed up data collection
- Eliminate data entry errors

Additional Options with Collector



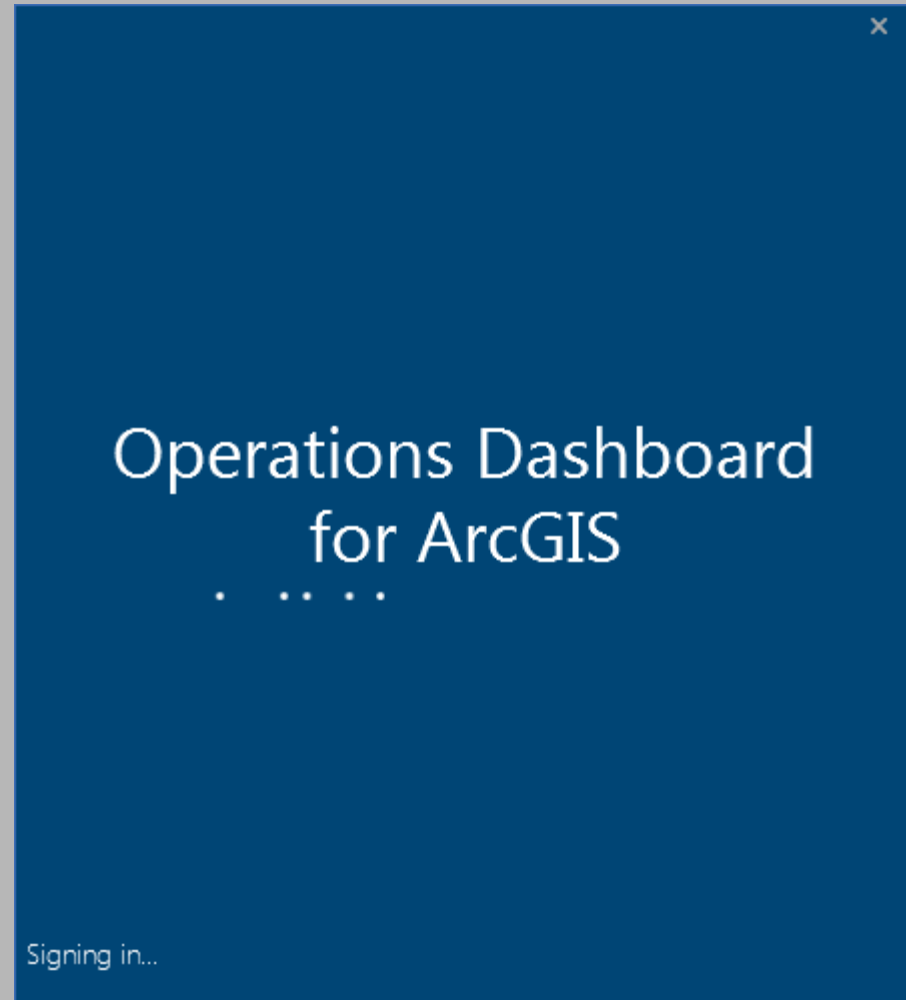
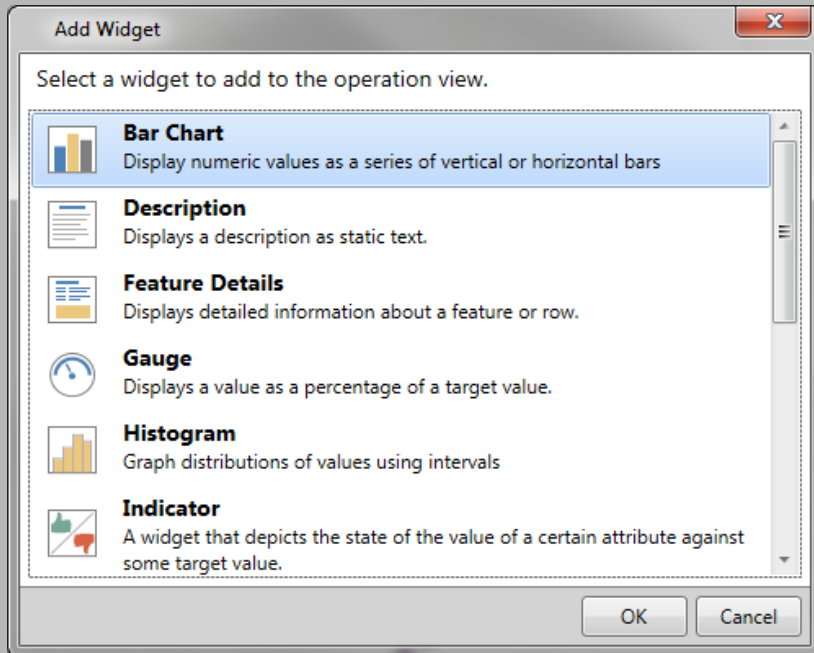
Take your map offline for disconnected editing for areas with little or no service.

Cloud indicates which maps are offline.



- Associated image(s) available in real-time from mobile device
- Vactor program can view images taken from assessment teams
- Document emergent situations needing an immediate response

- View data dynamically
- Create graphic reporting tools
- Create filters to narrow your area of focus
- Connect to outside data sources
- Customizable Widgets

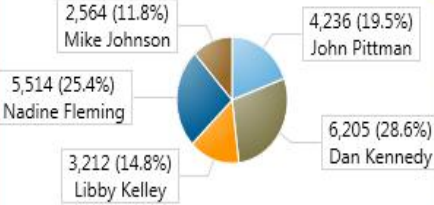


FILE TOOLS VIEW

Drainage Assessment 2014 Operations View

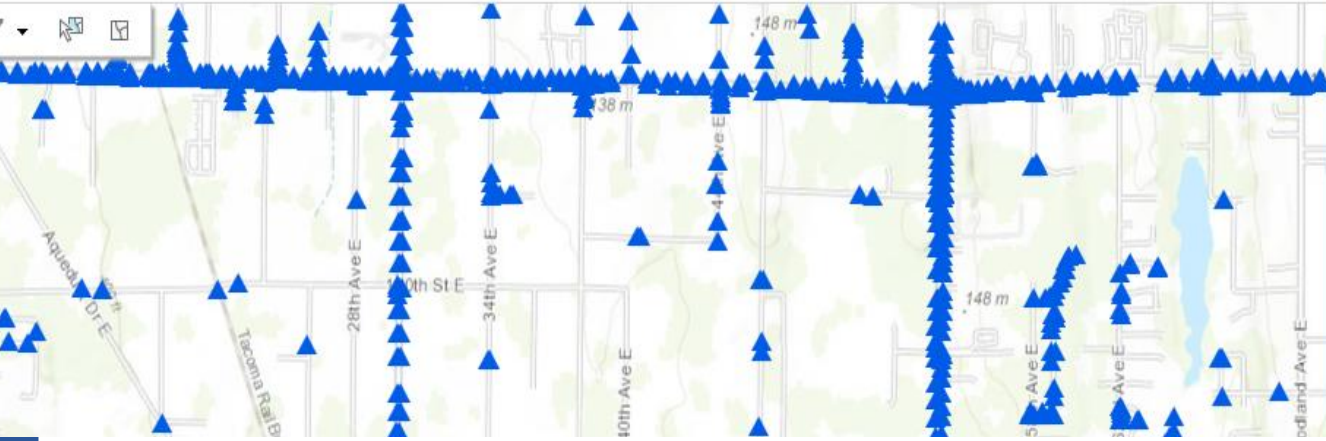
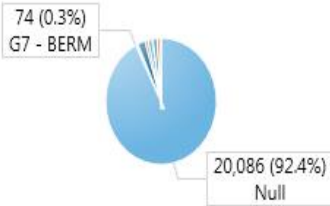
? [Icons] - [Icons] X

Inspection Team Count



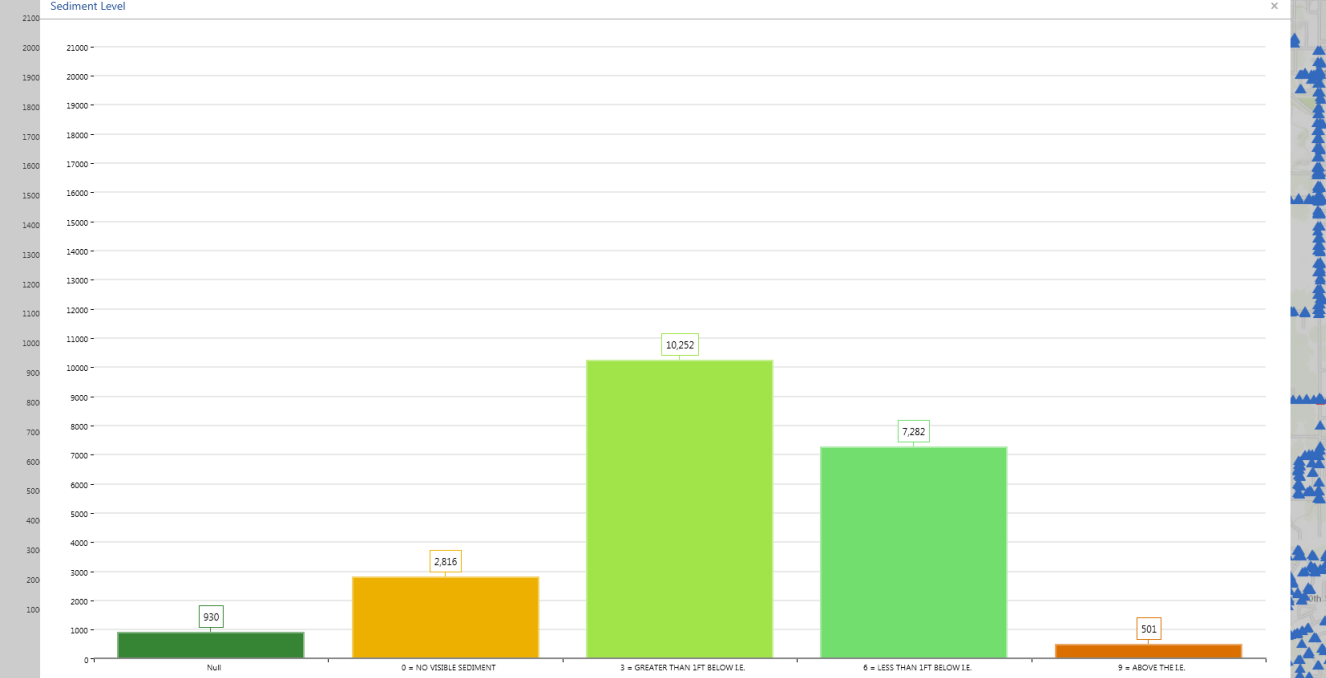
This pie chart displays the number of catch basins inspected by each team

Comment Code



FILE TOOLS VIEW Drainage Assessment 2014 Operations View

Sediment Level



This bar chart displays the sum per sediment score

This pie chart displays the number of catch basins inspected by each team

Drainage Inspection and Cleaning

Pierce County Road Operations performs an annual drainage inspection and Vector Cleaning Program. We inspect every catch basin that Road Operations is responsible for inside the right of way.

These inspections were initiated by the **NPDES** permitting requirements. We have been able to meet the requirements since we started in 2010. Since 2010 we have seen a **24% drop** in overall cost for the inspection and cleaning of our stormwater drainage infrastructure.

Catch Basin Asset Management

2003-2009: Catch basin cleaning - **\$70.17**
2010: Catch basin cleaning & Inspections - **\$119.00**
2011: Catch basin cleaning & Inspections - **\$97.65**
2012: Catch basin cleaning & Inspections - **\$70.34**
2013: Catch basin cleaning & Inspections - **\$60.05**



Improved Efficiency with AGO

2013 – Satellite Shops (using ArcPad on laptops)	2014 – Satellite Shops (using iPad with Collector)
<ul style="list-style-type: none"> 40I (Inspection) 52 Days <ul style="list-style-type: none"> 5504 Catch Basin's Inspected (106 per Day) 	<ul style="list-style-type: none"> 40I (Inspection) 42 Days <ul style="list-style-type: none"> 5673 Catch Basin's Inspected (135 per Day)
<ul style="list-style-type: none"> 40H (Mechanical Cleaning) 149 Days <ul style="list-style-type: none"> 2,685 Catch Basin's Cleaned (18 per Day) 	<ul style="list-style-type: none"> 40H (Mechanical Cleaning) 61 Days <ul style="list-style-type: none"> 1,199 Catch Basin's Cleaned (20 per Day)
<p>Totals 201 Days</p>	<p>Totals 103 Days</p>

Delta – Satellite Shops	
<ul style="list-style-type: none"> 40I (Inspection) 	29 Additional Inspections per Team per Day
<ul style="list-style-type: none"> 40H (Mechanical Cleaning) 	2 Additional Cleaning per Team per Day



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Using ArcGIS Online to Meet NPDES Compliance

