



Automating Manhole Inspections Using Cloud and Mobile Technology

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Rob Michaels
IT Supervisor

Orange County Sanitation District

Rami Naber
Product Manager
Trimble Water

Orange County Sanitation District

(OCSD) Service Area

463 Square Miles

2.6 Million Population

21 Cities, 2 Special Districts

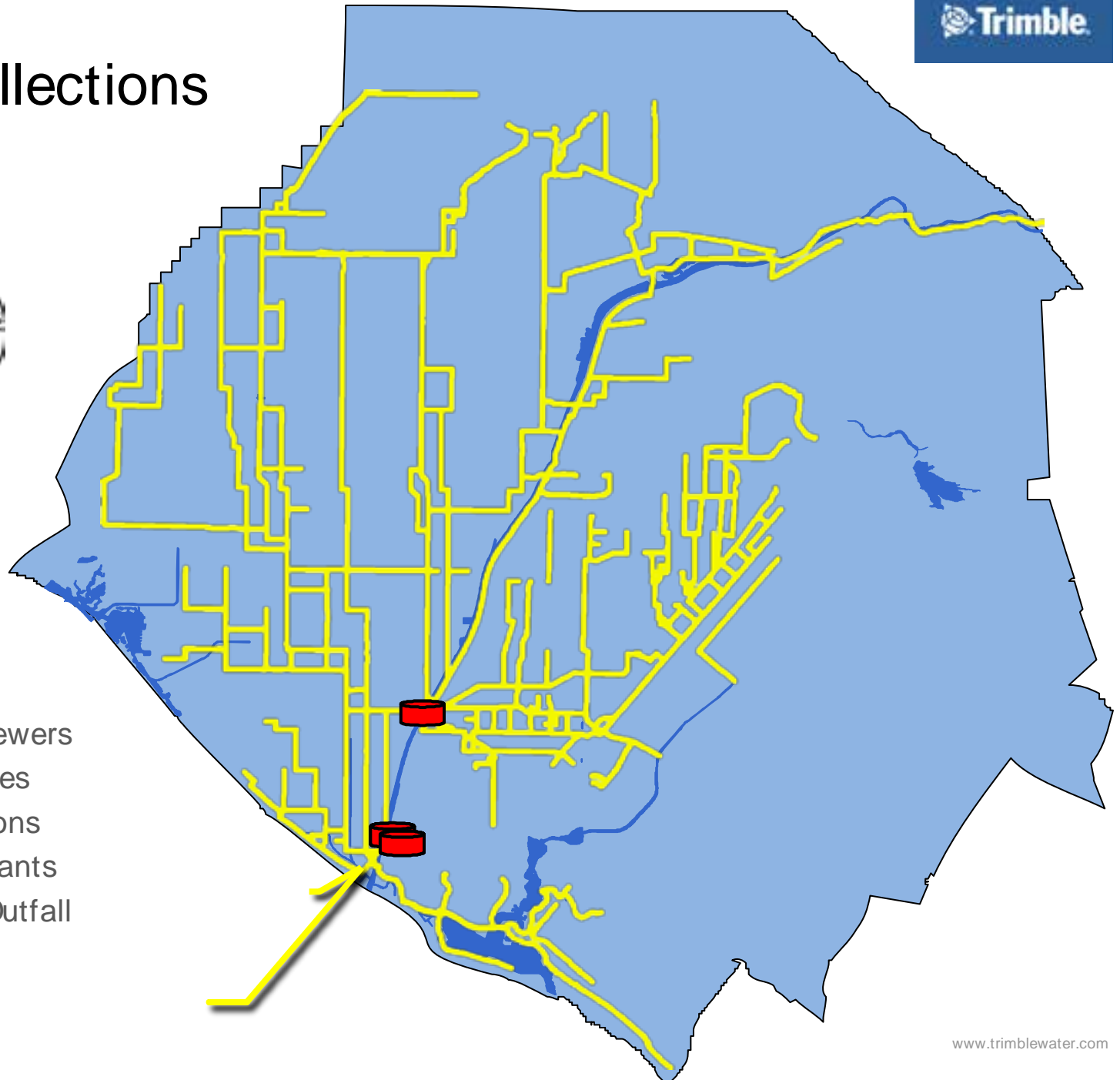
207 Million Gallons per day



**Orange County,
California**



OCSD Collections System



- 579 Miles of Sewers
- 8,000+ Manholes
- 15 Pump Stations
- 2 Treatment Plants
- 5 Mile Ocean Outfall

OCSD's Manhole Inspection Program

Paper Inspections



MANHOLE & CONNECTION DATA COLLECTION

MANHOLE CONDITION

1. Inlet/Outlet	2. Flow Direction	3. Structural	4. Material
5. Access	6. Surround	7. Inlet/Outlet	8. Flow Direction
9. Structural	10. Material	11. Access	12. Surround

CONNECTION CONDITION

1. Inlet/Outlet	2. Flow Direction	3. Structural	4. Material
5. Access	6. Surround	7. Inlet/Outlet	8. Flow Direction
9. Structural	10. Material	11. Access	12. Surround



Automating OCSD's Manhole Inspection Program

Goals and Objectives

- Eliminate paper inspection process and forms
- Eliminate hand entry of inspection data
- Use mobile computing to enter inspection data
- Centralized database repository
- Eliminate delay of accessing current and historical inspection data
- Accurate, reliable and easy to use
- Create reports or dashboards



Selecting Trimble Navigation

Trimble Connect™

- Long relationship with Trimble
- Contacted by Trimble Water
- Initiated Proof of Concept
 - Adopted existing paper inspection form
 - Test Run including onsite training
 - Used variety of hardware and platforms
 - Gathered feedback to “fine tune”
- Created Manhole Inspection Application
- Included as part of the Trimble Connect Wastewater offering



Trimble Connect™

What is it?

- A powerful, integrated software platform for visualizing and managing your utility network maintenance and data collection activities.
- Leverages the power of Trimble GPS, Cloud and Esri's mapping technologies.
- Offers core apps focused on Water, Wastewater and Stormwater specific workflow.
- Allows office users to log in from anywhere using a web browser to view latest GIS maps, dispatch work and manage field operations.
- Allows field users to leverage Trimble's ruggedized high accuracy GPS handheld devices OR use their own devices.



Manhole Inspector



Hydrant Inspector



Valve Inspector



Water Mapper



Wastewater Mapper



Stormwater Mapper



Leak Repair



Incident Repair



Meter Change-out

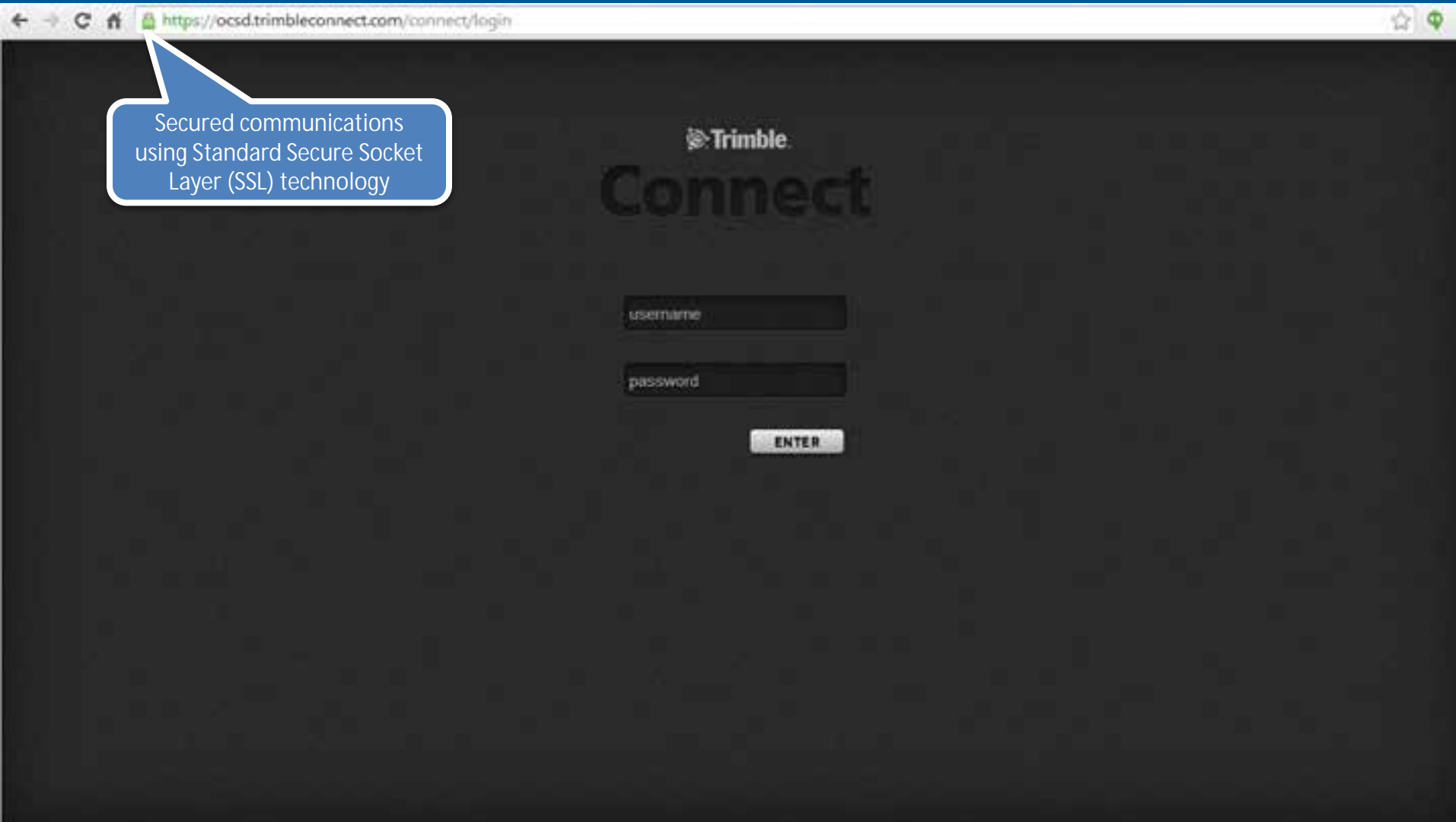
For more information visit us at booth #1715

Trimble Connect™ - Manhole Inspector app

Key Features and Benefits



Log In



Trimble Connect™ Manhole Inspector App

 RAMI NABER

 logout



Interact with Map

The screenshot displays the Trimble Connect mobile application interface. On the left is a dark sidebar with navigation options: TA CONNECT, search, address, MAP, OPEN WORK ORDERS, CLOSED WORK ORDERS, EXPORT, and DASHBOARD. The main area shows an aerial map with yellow lines representing sewer lines and a red dot indicating a manhole location. A central pop-up window titled "DETAILS OF MANHOLE SUN0470-0000" displays the following data:

OBJECTID : 7013	MANHOLE_DEPTH : 12
STRUCT_1 : SUN0470-0000	REHAB_CONTRACT :
NUM_W_FLOS : 124+00.00	REHAB_SHEET :
STATUS : In Service	DOCID : 003709057
PROJ_NO : 7-11-3	TYPE_COOT : STD
INSTALL_DATE : 03/01/1975	DivNum : NA
RECON_DATE :	REHAB_DESC :

Buttons for "CREATE WORKORDER", "BACK", and "CLOSE" are visible on the right side of the pop-up. On the right side of the map, an "AVAILABLE LAYERS" panel lists various map layers and assets, including ESRI Topo, ESRI Aerial, ESRI World Street, Work Order, Crew, Wastewater, Forms, Network Assets, Manhole Inspection, Manhole, Barriers, Sewer, Force Main, Vaults, Valve, Fittings, Pumping Station, and Casings. Three callout boxes highlight key features: "Identify GIS Features" points to a green circle on the map; "View Crew Location" points to a red dot on the map; and "Toggle Layer Visibility" points to the "AVAILABLE LAYERS" panel.

Create Work Orders - Select Manholes



Various selection tools

Plan for inspections
Select multiple assets and group them in a work order.

CREATE WORK ORDER
SEARCH

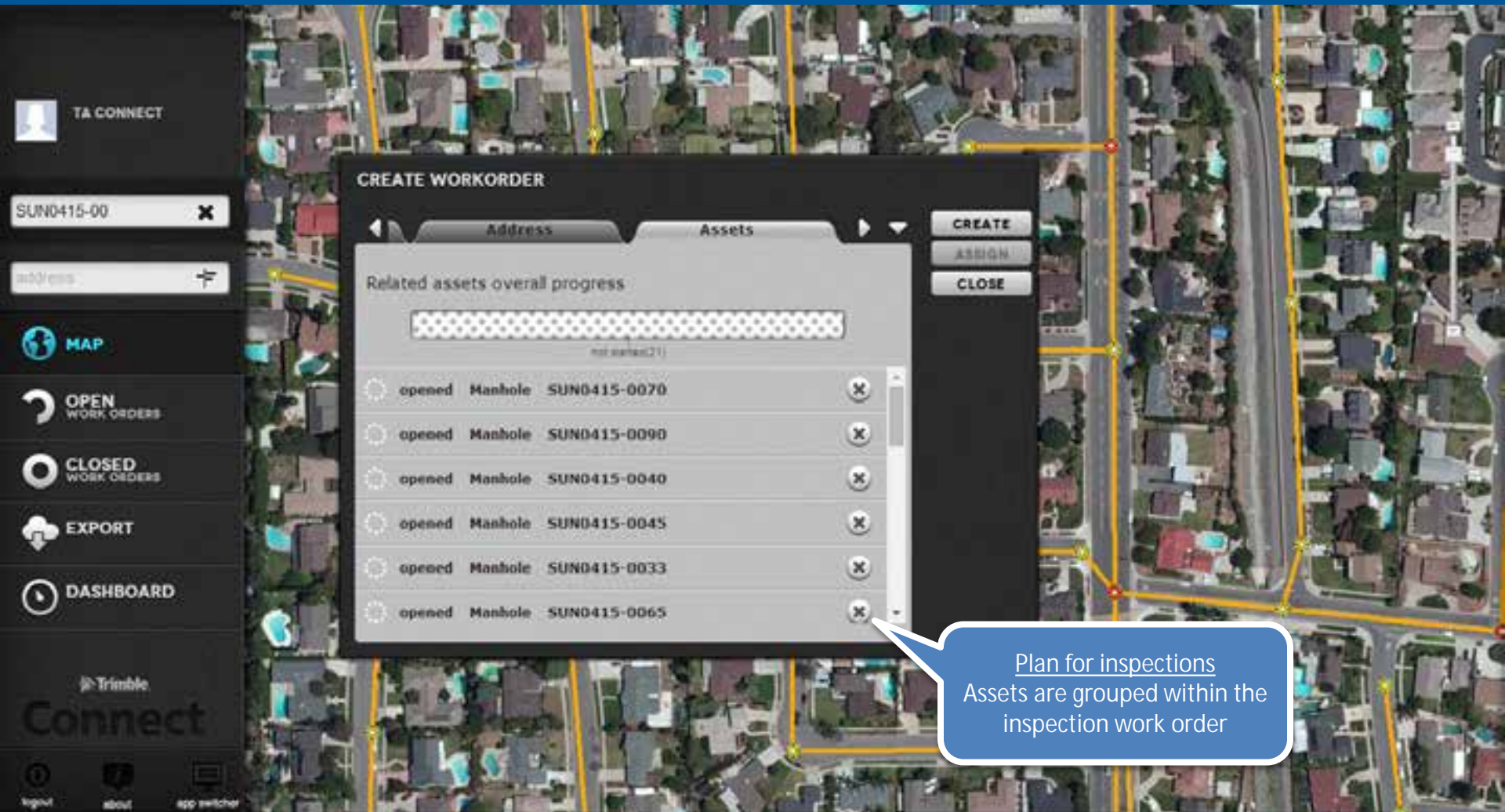
Create Work Orders - Search for Manholes

The screenshot shows the Trimble Connect mobile application interface. On the left is a dark sidebar with navigation options: TA CONNECT, a search bar containing 'SUN0415-00', an address field, MAP, OPEN WORK ORDERS, CLOSED WORK ORDERS, EXPORT, DASHBOARD, and the Trimble Connect logo. The main area displays a map with a green circle marker at the intersection of Weston Pl and Hill Ave. A modal window is open over the map, showing a list of manhole assets under the heading 'MANHOLE'. Each asset is represented by its ID, a green checkmark, and a 'WO' icon. To the right of the list are 'REFINE' and 'ACTIONS' tabs, and a section titled 'WITH SELECTED' containing '+ CREATE' and '+ ADD ASSET' buttons.

MANHOLE	Asset ID	Status	WO
	SUN0415-0070	✓	WO
	SUN0415-0090	✓	WO
	SUN0415-0040	✓	WO
	SUN0415-0045	✓	WO
	SUN0415-0033	✓	WO
	SUN0415-0065	✓	WO
	SUN0415-0055	✓	WO
	SUN0415-0015	✓	WO
	SUN0415-0025	✓	WO
	SUN0415-0000	✓	WO
	SUN0415-0060	✓	WO
	SUN0415-0080	✓	WO
	SUN0415-0050	✓	WO
	SUN0415-0075	✓	WO
	SUN0415-0095	✓	WO
	SUN0415-0085	✓	WO
	SUN0415-0020	✓	WO
	SUN0415-0030	✓	WO
	SUN0415-0005	✓	WO
	SUN0415-0010	✓	WO
	SUN0415-0035	✓	WO

Plan for inspections
Search for and navigate to assets. Create Work Order from selected asset

Group Manholes into Work Orders

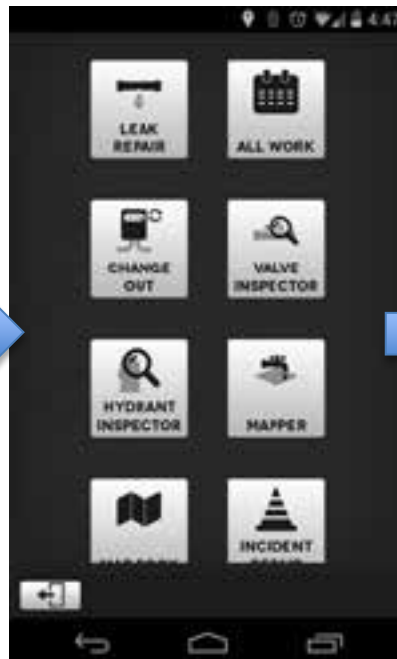


Login and View Work Orders

User Based Log-In



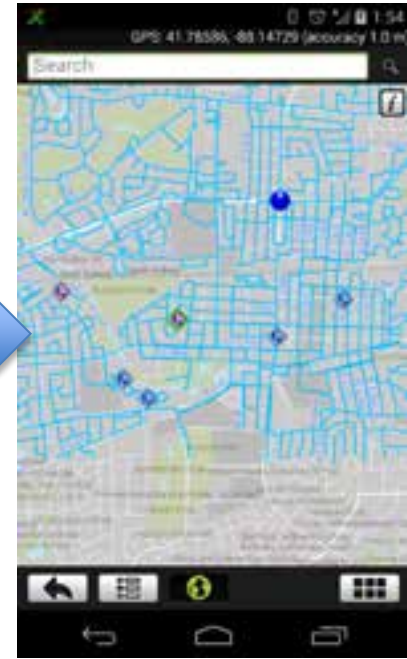
View List of Apps



View Work Order List



View Work Orders on Map



Mobile Workflows – Navigate to Work Order

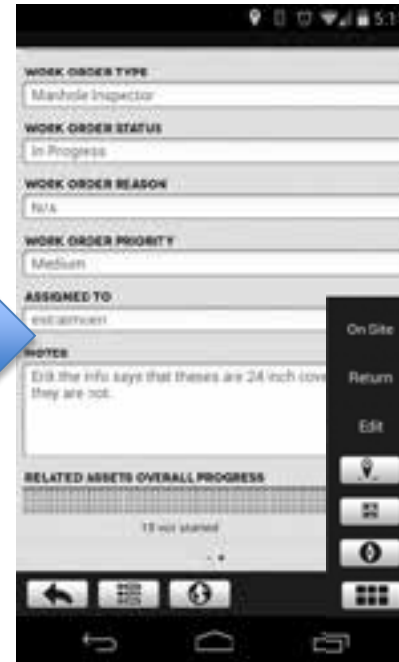
Locate Work Order
Interact with Assets



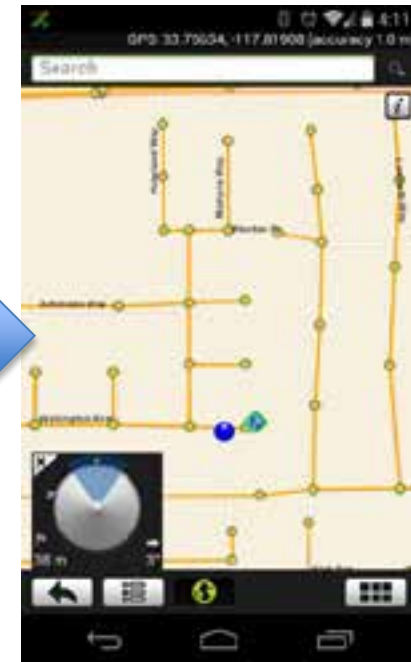
Get Driving
Directions



Progress Work Order
Through Workflow



Locate Asset



Mobile Workflow – Manhole Inspection

View List of Assets with Progress



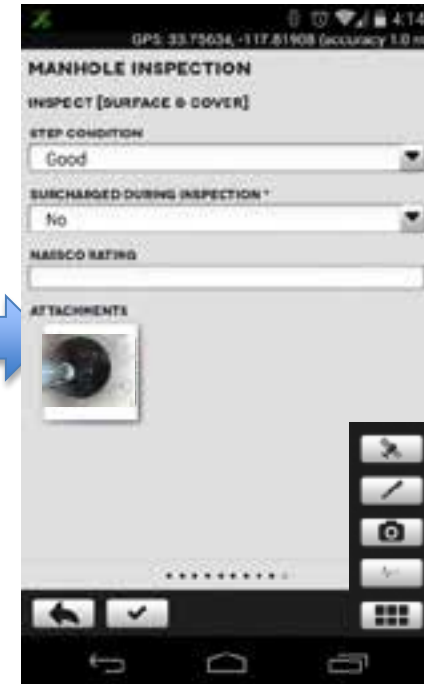
Perform Inspection



Take Pictures



Capture GPS



Supervisors Monitor Manhole Inspections Progress

The screenshot displays the 'DETAILS OF WORK ORDER : 21260187' interface. The left sidebar contains navigation options: TA CONNECT, MAP, OPEN WORK ORDERS, CLOSED WORK ORDERS, EXPORT, and DASHBOARD. The main content area is divided into 'General' and 'Address' tabs. The 'General' tab shows fields for: Potential ID (21260187), Organizational Unit (DC60), Work Order Type (Manhole Inspector), Work Order Status (Completed), Work Order Reason (N/A), Work Order Priority (Medium), Assigned To (schells), and a Notes section. The 'Address' tab is currently selected. To the right, a 'Related assets overall progress' section features a green progress bar with a checkmark and a table of inspected manholes. The table lists eight manholes, all with a green checkmark indicating they have been inspected. On the far right, there are buttons for BACK, ASSIGN CREW, LOCATE ON MAP, LOCATE FORMS ON MAP, SAVE, and CLOSE.

Status	Asset Type	Asset ID	Action
✓	Inspected Manhole	NHP0275-0000	✕
✓	Inspected Manhole	NHP0280-0000	✕
✓	Inspected Manhole	NHP0290-0000	✕
✓	Inspected Manhole	NHP0295-0000	✕
✓	Inspected Manhole	NHP0260-0000	✕
✓	Inspected Manhole	NHP0270-0000	✕
✓	Inspected Manhole	NHP0265-0000	✕
✓	Inspected Manhole	NHP0285-0000	✕

Monitor asset maintenance and inspection progress

View Manhole Inspections Spatially

The screenshot displays the Trimble Connect mobile application interface. On the left is a dark sidebar menu with the following items: TA CONNECT (with a profile icon), a search bar, a barcode scanner, MAP (with a globe icon), OPEN WORK ORDERS, CLOSED WORK ORDERS, EXPORT, DASHBOARD, and the Trimble Connect logo at the bottom. Below the logo are icons for input, about, and app switcher. The main area is a map showing a residential street grid with several red circular markers representing manhole inspection locations. A specific marker is highlighted with a green circle. A detailed inspection report overlay is open, titled "DETAILS OF MANHOLE INSPECTION NHPO310-0020". The report contains the following information:

- Chimney Concrete Problem:
- Chimney Liner Coatings: Good
- Chimney Liner Coatings Problem:
- Chimney Liner T-Lock/PVC:
- Chimney Liner T-Lock/PVC Problem:
- Cone Condition Brick/Block:
- Cone Condition Brick/Block Problem:
- Manhole Depth RIM to Water:
- Signature:
- Photo:

On the right side of the report overlay are two buttons: "BACK" and "CLOSE". The map background shows streets such as E Windsor Rd, E Winston Rd, E Cerritos Ave, and W K Delta Ave, along with a river and various buildings.

View Manhole Inspections Spatially



Measure Performance & Asset Condition

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search

address

MAP

OPEN WORK ORDERS

CLOSED WORK ORDERS

EXPORT

DASHBOARD

Trimble Connect

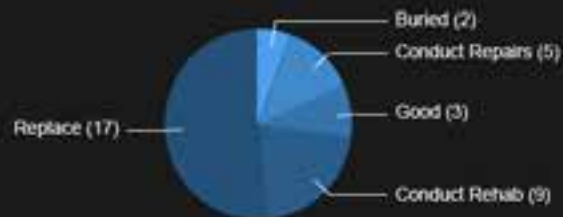
Logout about app switcher

Inspections Completed



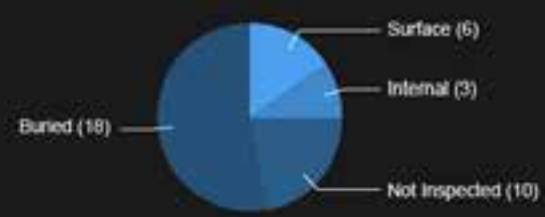
Manholes Overall Condition

The last 7 days



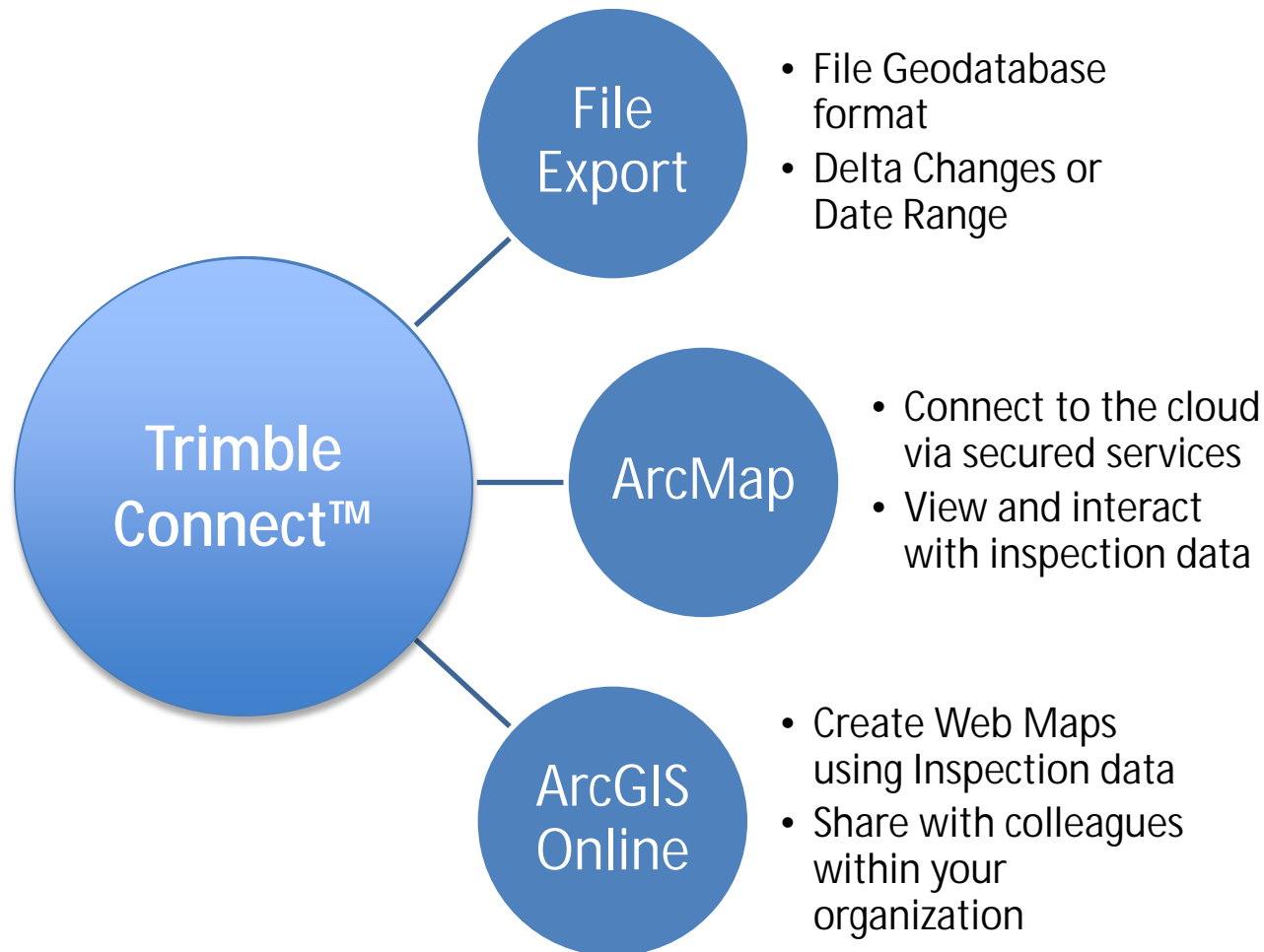
Manholes Inspection Type

The last 7 days



Working With Inspection Data

Leveraging ArcGIS Technology



Benefits

Trimble Connect™ Manhole Inspector

- Streamlined inspection process
- Capture photos and GPS position
- Immediate access to the data
- Fewer Errors
- View sewer network and inspections spatially
- Better manage of inspection program
- Easier to manage updates to devices
- Staff by in
- Cost effective solution



Trimble Water



Rob Michaels
IT Supervisor
Orange County Sanitation District
rmichaels@ocsd.com

Rami Naber
Product Manager
Trimble Water
rami_naber@trimble.com



water@trimble.com
www.trimblewater.com
www.ocsewers.com

Please visit our booth for more information
Booth #1715

