

Using Mobile GIS for Storm Water Infrastructure Inventories and Inspections



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Abstract - The City of Redding, CA, faced the challenge of visiting and inspecting every Storm Water inlet and outfall in the city. No small feat considering there were more than 6,000 inlets and 1,400 outfalls, and no budget existed to support this task. The city took the challenge in stride and used Mobile GIS technology to get the job done. The city wanted out-of-the-box technology to keep costs to a minimum and prepare the way for an eventual Enterprise GIS implementation, still a few years off. The GIS staff created personal geodatabases, used ArcGIS functionality for daily check-in/check-out of data, ArcPad software in the field for inspection data collection, and checked data back in using ArcGIS at the end of each day. With help from the GIS staff, the field crews, who were barely proficient with email, were able to accomplish the tasks under budget and before the expected completion date.

Background

- Redding is a full-service city of 87,000
- GIS began as an informal division of Public Works Engineering in 1989 (staff of 2)
- GIS began spreading to Planning in 1994
- In 1995, GIS became a division of the Development Services Dept. (Planning, Building, Community Development, and Airports)
- Planning drafting staff merged w/GIS for a total of 6 FT and 1 PT

CAD/GIS History

- Purchased Autocad in 1984, in Engineering
- Obtained Office of Traffic Safety grant in 1989 to build TCDI
- Built the first City Autocad basemap in 1990
- Used GeoSQL for 5 years as Autocad-based GIS product
- Purchased first Arcview license, along with ArcCAD, in 1996
- Purchased Autocad Map 1997

Transition

- Prior to '99, used ArcCAD and GeoSQL Spatial Analyst for conversion/sharing
- Data conversion not smooth or seamless until Map 2000 and Arcview 3.2
- Complex analysis and thematic maps fueled the transition from CAD to ESRI
- Today's tools require less "conversion" making transition easier, plus there are better tools for handling conversions (FME or DIE)

Why Mobile GIS?

- GIS considered Mobile GIS to reduce paper maps for field personnel
- GIS used remaining funds of '02-'03 budget to purchase 2 Arcpad licenses
- The plan was to develop mobile GIS for the Water Division Valve Turning program

Why Arcpad?

- Comparatively inexpensive
- Requires only a personal Geodatabase for check-in/check-out
- Allowed “out-of-the-box” implementation – additional programming is not necessarily required

Why Storm Drain Inlets?

- The Storm Drain Division (SDD) expressed a need for "route maps" in October '03
- SDD also asked about linking form-based data collection to Inlet ID's for results-based maps
- Inspection of 6,250 inlets and 1,480 outfalls was slated to begin mid-January of 2004
- SDD had no \$\$ for technology

Mobile GIS Pilot Project

- GIS proposed the possibility of true field data capture to SDD
- SDD agreed to a pilot project with hardware/ software reimbursement if successful
- GIS met with Vestra to discuss Arcpad basics and implementation
- GIS prepared an implementation plan and schedule and SDD bought off on it
- GIS began implementation

Mobile GIS Implementation

- GIS met with staff hydrologist in charge of NPDES compliance
- GIS met with SDD management staff
- GIS met with SDD field crews
- Mapped out rough data schema
- Built 2 geodatabases
- Mapped network drives and permissions
- Installed new iPaq's and Arcpad
- Began pilot field work

Mobile GIS Implementation

- GIS made additions/corrections for field data capture
- GIS assisted for the first week in file transfers to mobile device
- Pilot lasted 5 days +/-
- GIS continues to respond to SDD field personnel
- Mobile data is deemed success by all involved

Keys to Success

- All parties are involved, from top manager to field crews
- Listening to each party's needs and making sure there is "something of value" for each party
- Simplicity!... and ease of use
- Spend time training, especially field personnel
- Give immediate feedback

The Problems

- Limited font support on mobile devices
- Limited linetypes/styles supported on mobile devices
- Can be slow (does Cray make PDA's??)
- Accidental redraws
- Problem data (stacked points)
- 2 Personal Geodatabases required
- The field crews love it...

The Cost

- 2 iPaq's at \$550 each
- 2 Ruggedized cases at \$120 each
- 2 Arcpads at \$500 each
- 2 Auto-chargers at \$30 each
- 12 hrs consultant time/training \$1,100
- Additional custom programming \$3,200

- Total cost - \$6,700, or...
- Less than \$0.75 per inlet/outfall/channel inspected!

The ROI

- A 2-man crew costs at least \$50/hr
- \$50/hr equates to \$0.83 per minute
- Soooo... If you save 1 minute per location visited, you have more than paid for cost in the 1st year
- Added benefits:
 - Error free data entry
 - No lost, smudged, stained or ink-run sheets
 - Immediate reporting after upload



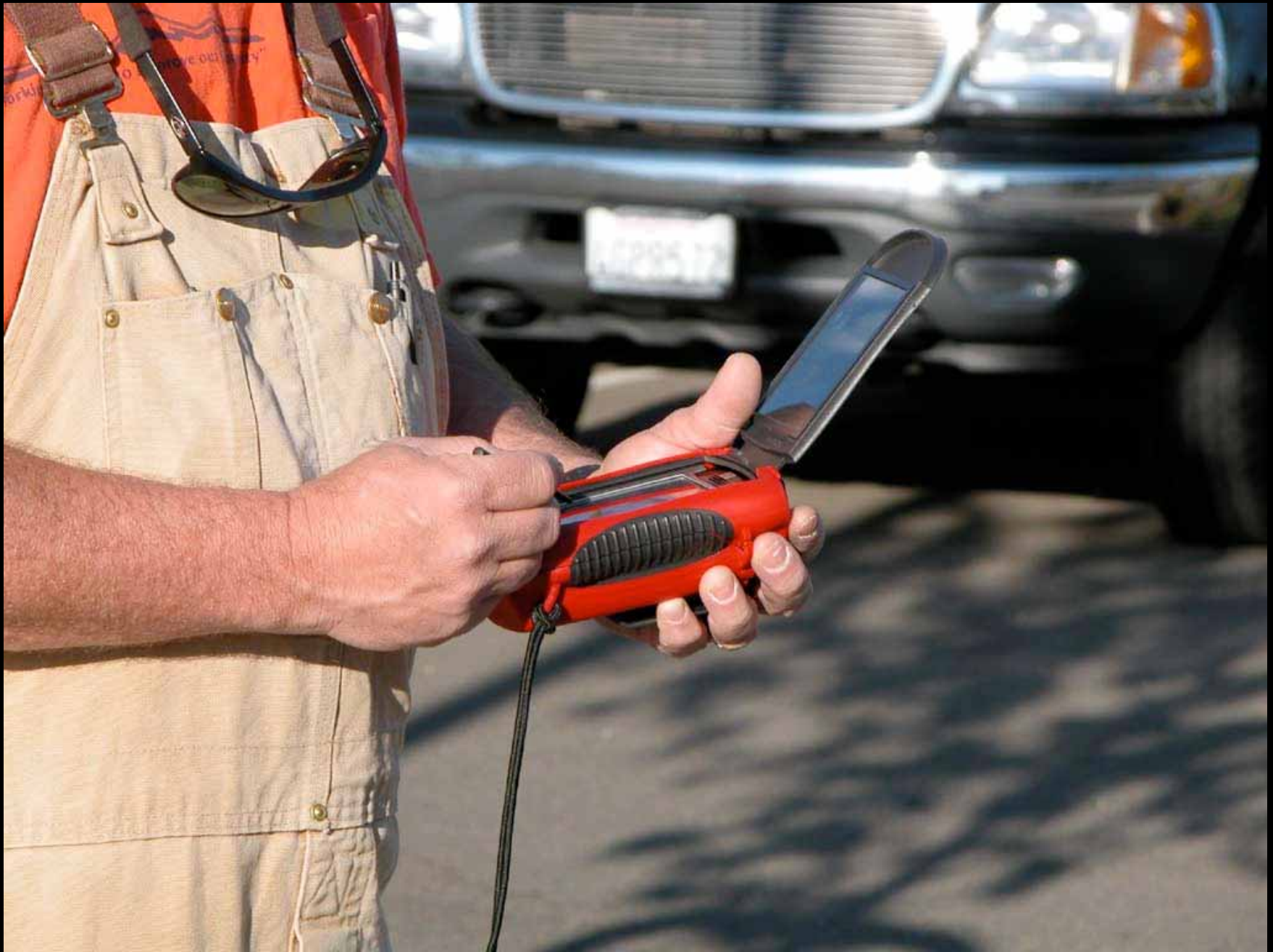
Matt Cervenka locates an Inlet



John Stacher inspects inlet & Matt Cervenka edits data



Inlet with organic material



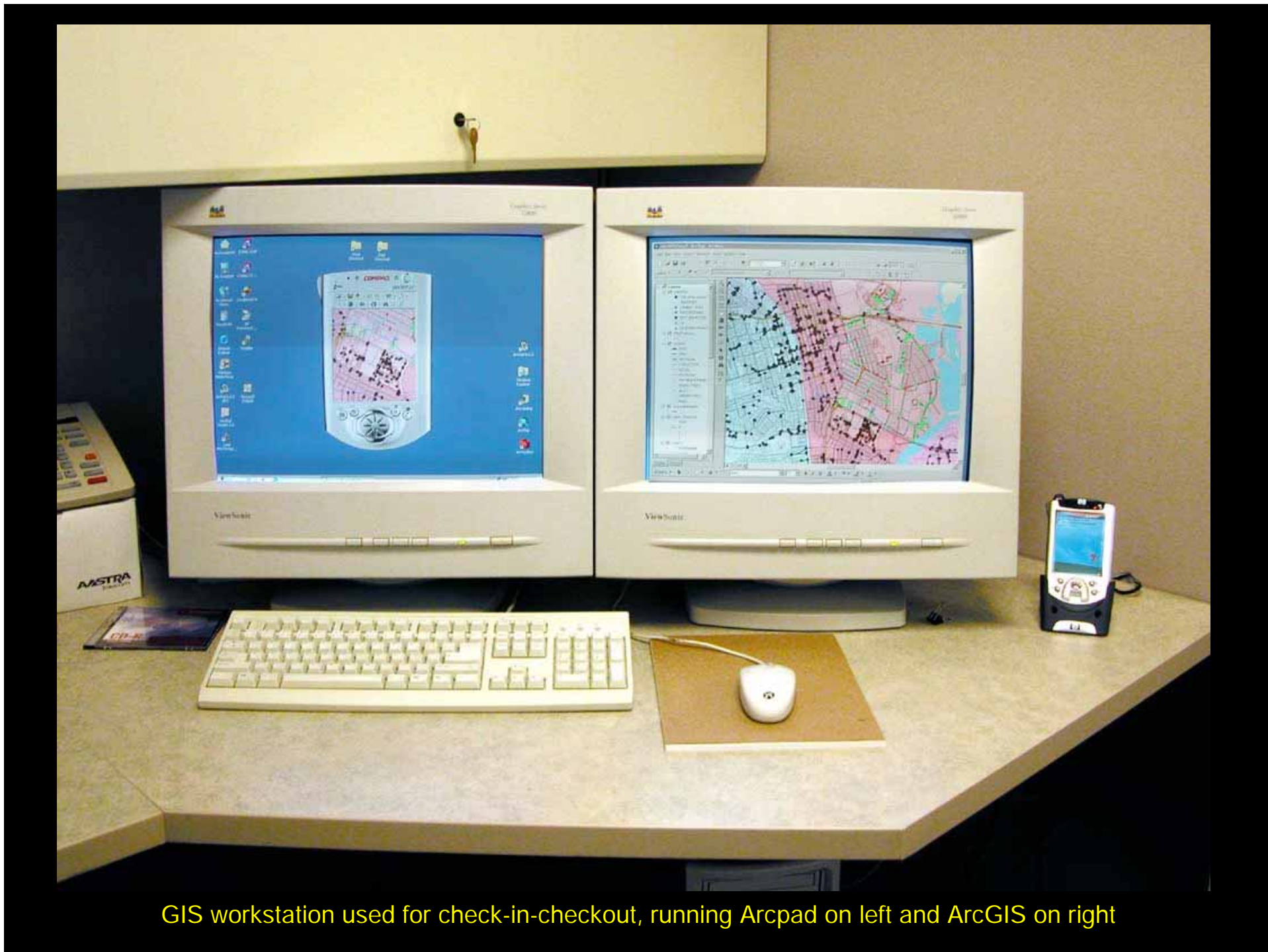
Close-up of data entry on iPaq with ruggedized case



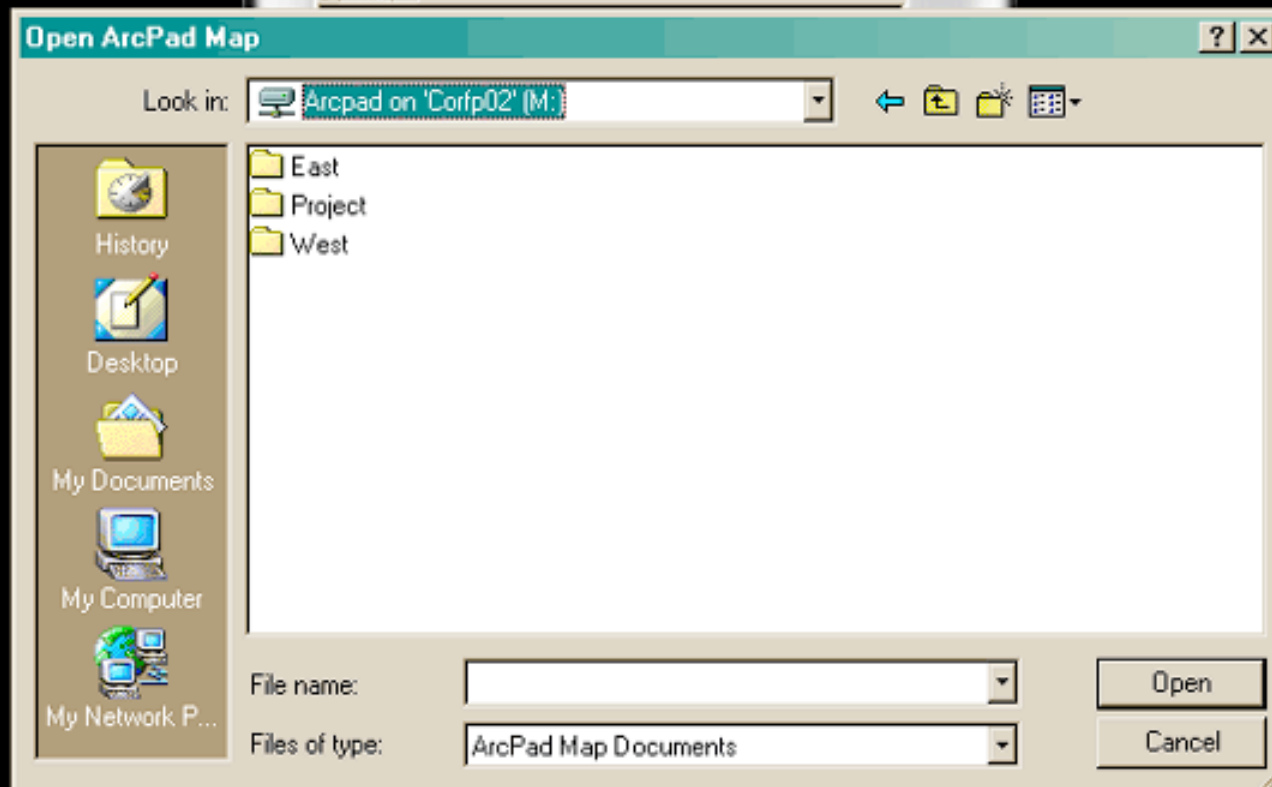
Close-up of iPaq with ruggedized case



Inspection and data entry for a different type of inlet



GIS workstation used for check-in-checkout, running Arcpad on left and ArcGIS on right



Opening the Arcpad project file (as shown on a desktop PC)



Initial view of checked-out work area



Zoomed view of work area where crews left off from day before



Start editing by "checking" the Inlets layer for edits



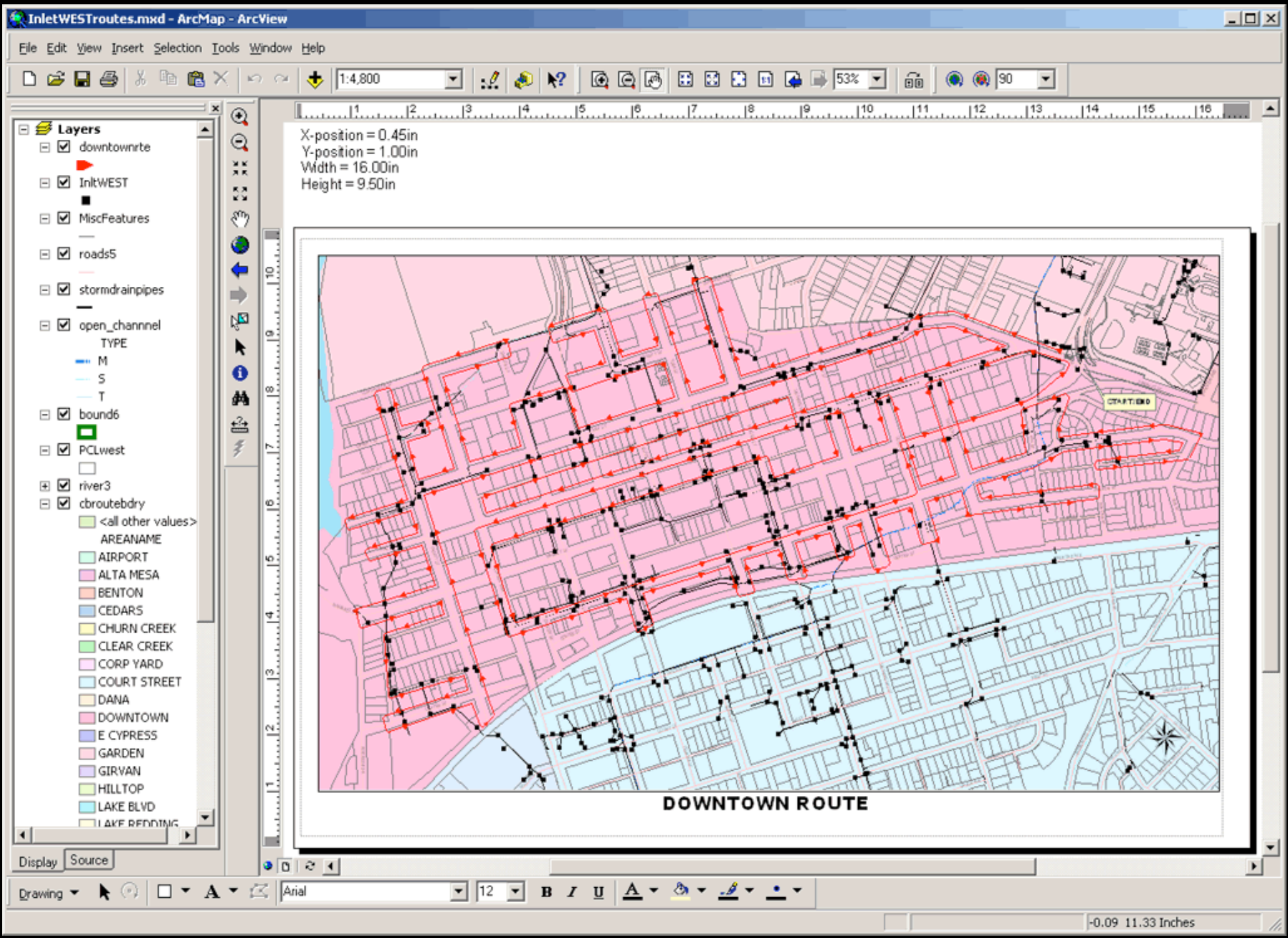
Clicking on the down arrow of INSPSTAT (Inspection Status) reveals pick list items



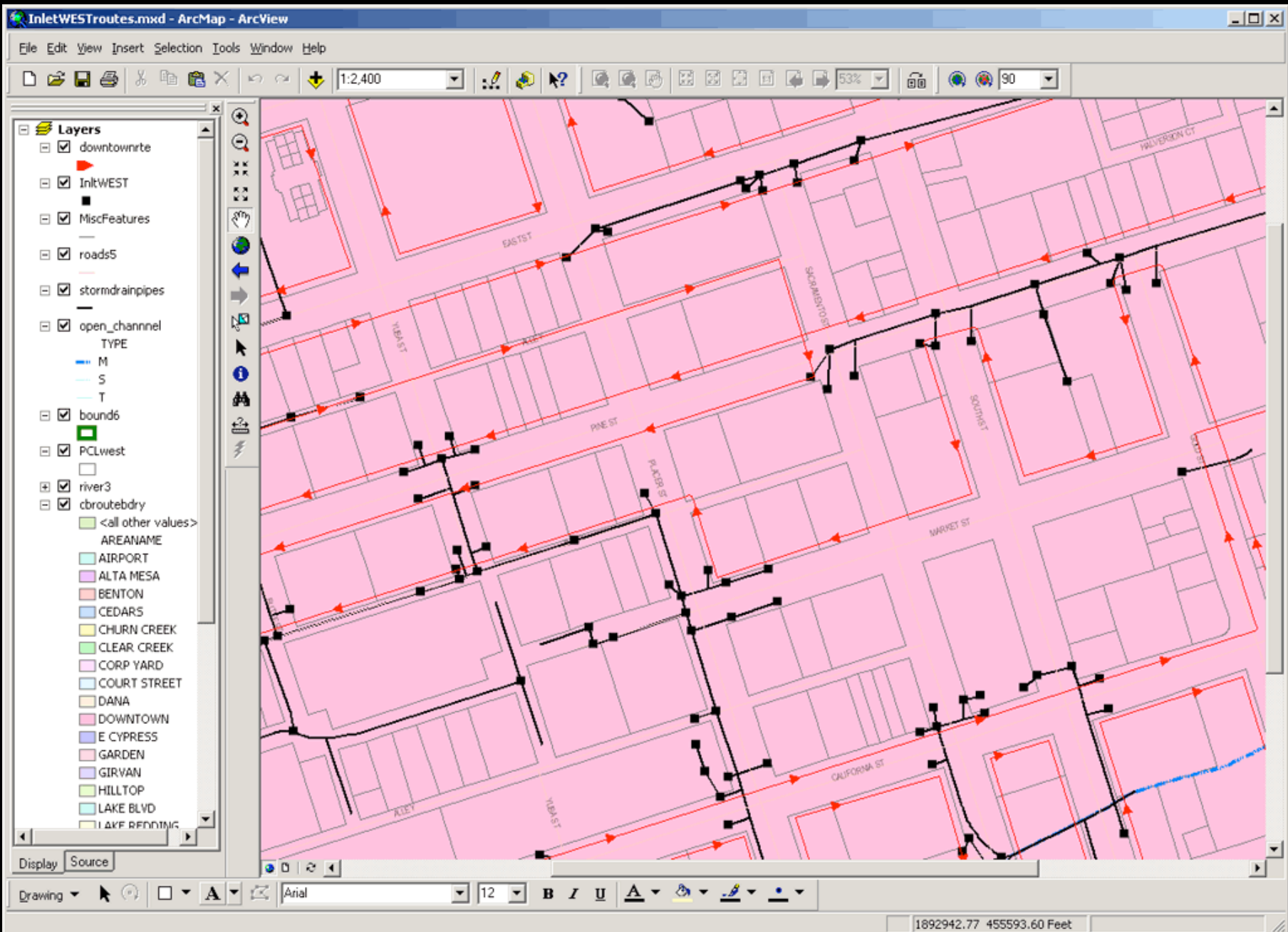
Page 2 of the form showing the visual inspection pick list



Once the form is completed, immediate feedback on the Inlet status shows on-screen



Screenshot of Route Map on ArcGIS



Screenshot of Data Frame for Route Map

Additional Mobile GIS projects at the City of Redding



Additional Mobile GIS Projects

- Completed:
 - Traffic Control Device (Sign) Inventory (using GPS)
- Currently In-place:
 - Channel Inspection
 - Outfall Inspection
 - Roadside Ditch Inventory
 - Backflow Prevention Device Collection
- Roll-out this spring/summer:
 - Pavement Marking Collection
 - Valve Turning/Inspection
 - Hydrant Flushing/Inspection
 - Commercial Meters Collection
 - Street Tree Inventory

Questions?

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