





Redefining Construction “As-Built” Plans to Meet Current KYTC Needs

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Kentucky Transportation Center



Make “As-Builts” Great Again!!



Roy E. Sturgill, Jr. P.E., Ph.D. – KTC
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Victoria Lasley – COE
Steve Waddle, P.E. – KTC



We started by asking a few questions.

- Does anyone really use as-builts?
- What information is actually wanted and needed?
- What are the benefits of as-builts for KYTC?
- What are other states doing?
- Is there FHWA requirements/guidance?

Unfortunately, we didn't like some of the answers!!



No one actually
uses as-builts!

Fake News!!!





**As-Builts are time
consuming and we
have limited
resources**

Not Fake News!!!



**College of
Engineering**
Department of Civil Engineering

The *WORST* answer of all!!

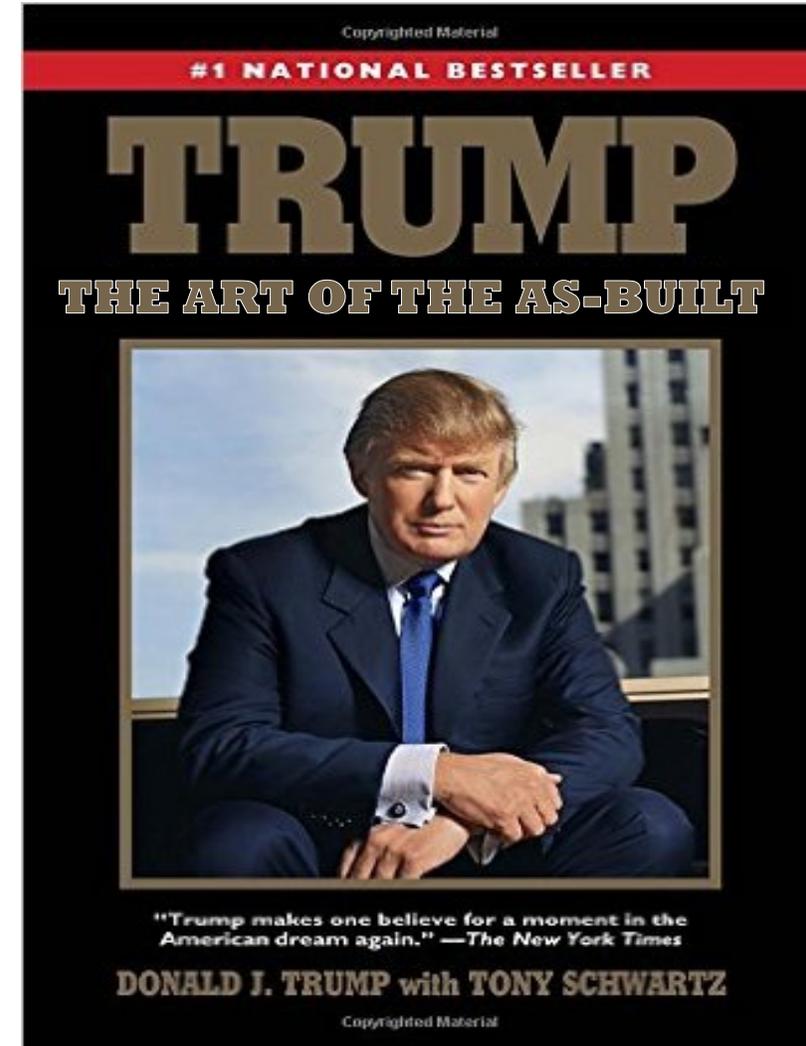
Maybe as-builts are just not needed anymore!

Result of these questions and answers:

A two year study on how best to produce as-built plans became a one year study to determine if as-builts are even needed



New best-seller everyone needs to read. Go buy it now! [#TheArtoftheAsBuilt](#)



We put together a group of as-built end users, developers, and researchers to go forth and do good!

Study Advisory Committee

Jason Siwula (KYTC)-Chair

Tim Taylor (KTC)-Principal Investigator

Erin Van Zee (KYTC)

Joe Tucker (KYTC)

Matt Looney (KYTC)

Joe Gossage (KYTC)

Jeremy Brickey (KYTC)

Michael Loyselle (FHWA)

Anthony Scaramucci

Roy Sturgill (parts unknown)

Victoria Lasley (KTC)



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With guidance from the SAC we established primary project objectives

- Synthesize Current As-Built Practice at Other DOTs
- Determine KYTC's As-Built Needs
- Present Results to KYTC Leadership



Contrary to the fake news haters no Russian involvement is needed! [#NoAsBuiltCollusion](#)



Step 1: We Conducted KYTC End User Interviews

Main Purpose:

To determine what information they needed and how it was used

To determine preferred format of as built information

- Structural Design
- Geotechnical Branch
- Bridge Maintenance
- Pavement Design
- Highway Design
- Utilities
- Permits



Step 2: We Conducted KYTC “As-Built Developer” Interviews

Main Purpose:

To determine how As-Built Information is currently being collected and recorded as

To understand the difficulties and obstacles Section Office crews must deal with when developing As-Built Plans



Requested As-Built Information

End User	As-Built Information Requested	Current Method to Collect and Record Data	New Method to Collect and Record Data
Structural Design/Geotechnical	Footing Information	Measured	
	Pile Lengths	Pile Logs	
	X-Dimensions	Surveyed	
	Bearing Details	Surveyed	
Bridge Maintenance	Pile tip elevations	Pile logs	
	Concrete cylinder breaks	Cylinder break log	
	Beam seat information	Surveyed	
	X-Dimensions	Surveyed	
	Culvert fill heights	Measured	
	Foundation layouts	Surveyed	



Requested As-Built Information

End User	As-Built Information Requested	Current Method to Collect and Record Data	New Method to Collect and Record Data
Pavement Design	Actual courses placed	Measured	
	Typical sections	Measured	
	Substructure details	Measured	
	ADA tamps	Measured	Mobile Carts and Phone Application
	Intersection grades	Measured	Lidar and/or Photographs
	Maintenance history	Maintenance Database	
	As-Built for proposal only projects	Measured	Lidar and/or Photographs
Highway Design	Right-of-Way Plans	Survyed	Google Earth
	Picture and Lidar Scan of Completed Project	Pictures and GPS Rover	Google Earth
	Basic Project Information	Pictures	Google Earth
	Scaled Drawings of Permitted Facilities	Hand-Drawn Red-Lined Plans	Red-Lined Plans Using PDF Editor



Requested As-Built Information

End User	As-Built Information Requested	Current Method to Collect and Record Data	New Method to Collect and Record Data
Utilities	Subsurface Utility Information	Measured or Surveyed	Use of ASCE 38-02
	Utility Conflict Information	Maintenance Database	Use of SHRP2 R01A
	Alignments, Depths, and Clearances	Measured and Surveyed	GPS/Asset Management Devices/Other Location Devices
Permits	Permitted Facilities shown on As-Built	Visual Inspection	GPS/GIS Asset Management System
	Scaled Drawings of Permitted Facilities	Hand-Drawn Red-Lined Plans	Red-Lined Plans Using PDF Editor

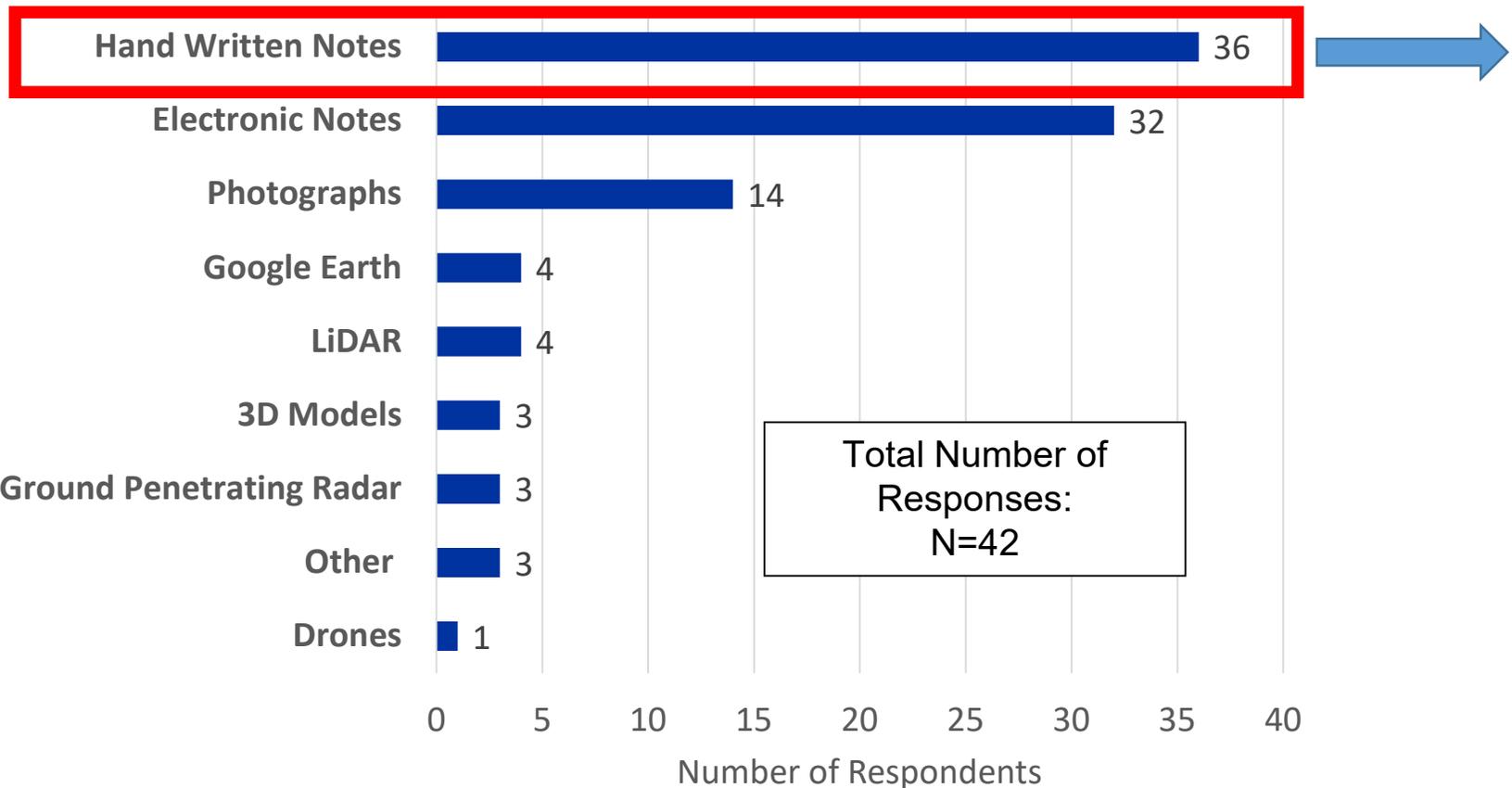


DOT Synthesis Results

- KYTC is doing as well as most DOTs
- Multiple Approaches to As-Built Development
 - In-house
 - Design Consultant Developed
 - Contractor Developed
 - 3rd Party Developed
 - Various Combinations
- Multiple Delivery Formats
 - From very detailed to just the facts.



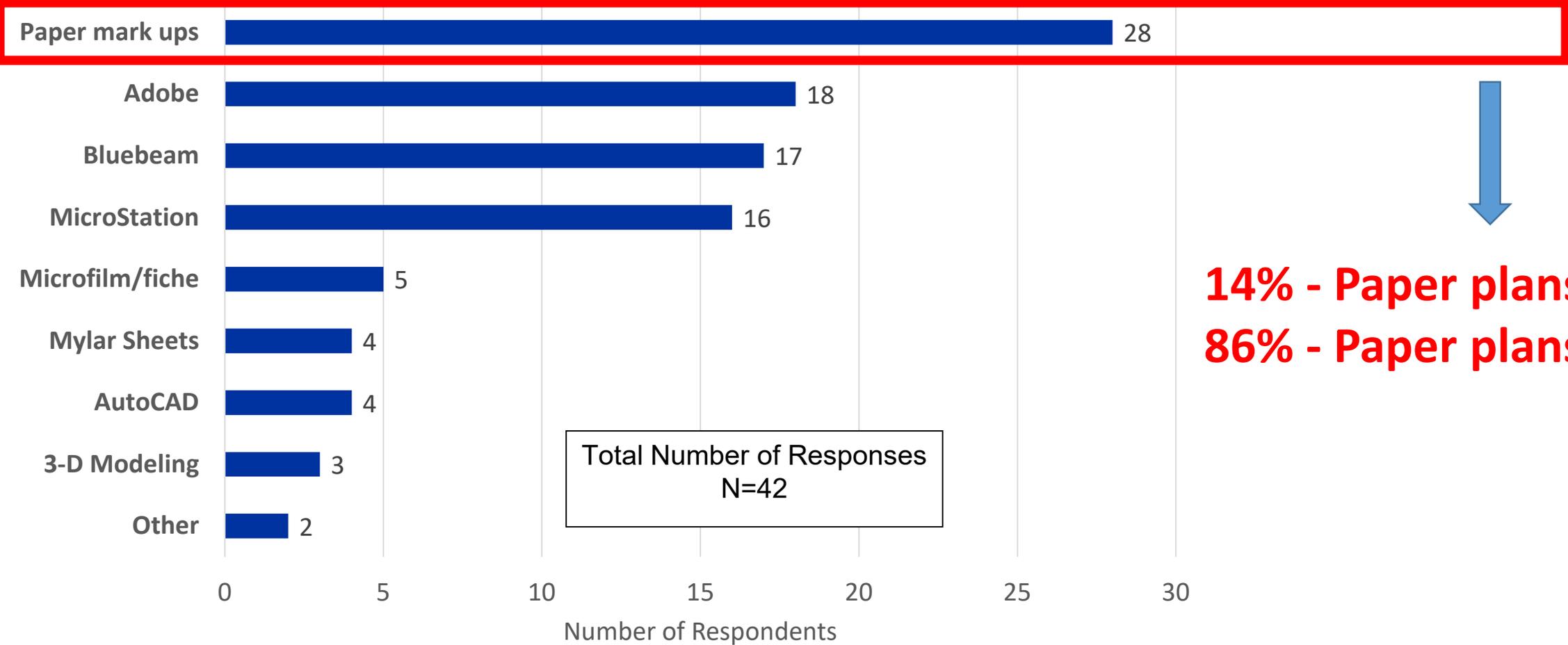
Methods Used to Capture and Document As-Built Data



11% - Hand written only
89% - Hand written +



Platforms Used to Establish As-Built Plans

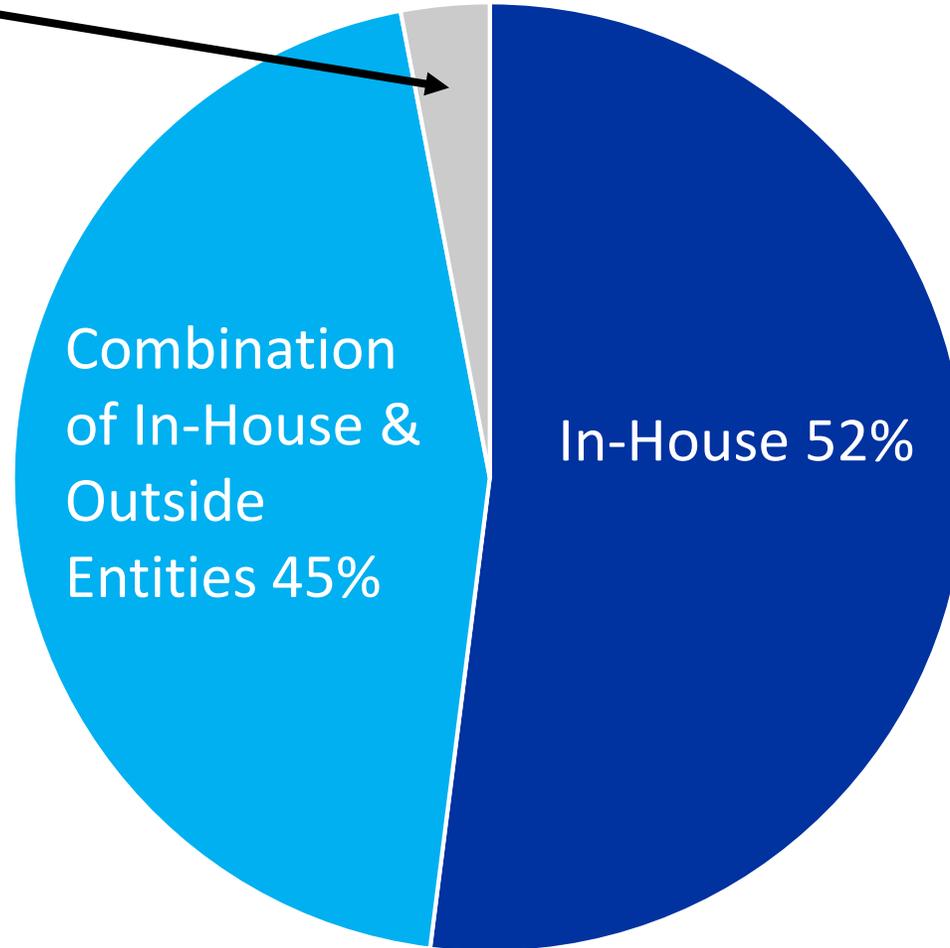


14% - Paper plans only
86% - Paper plans +

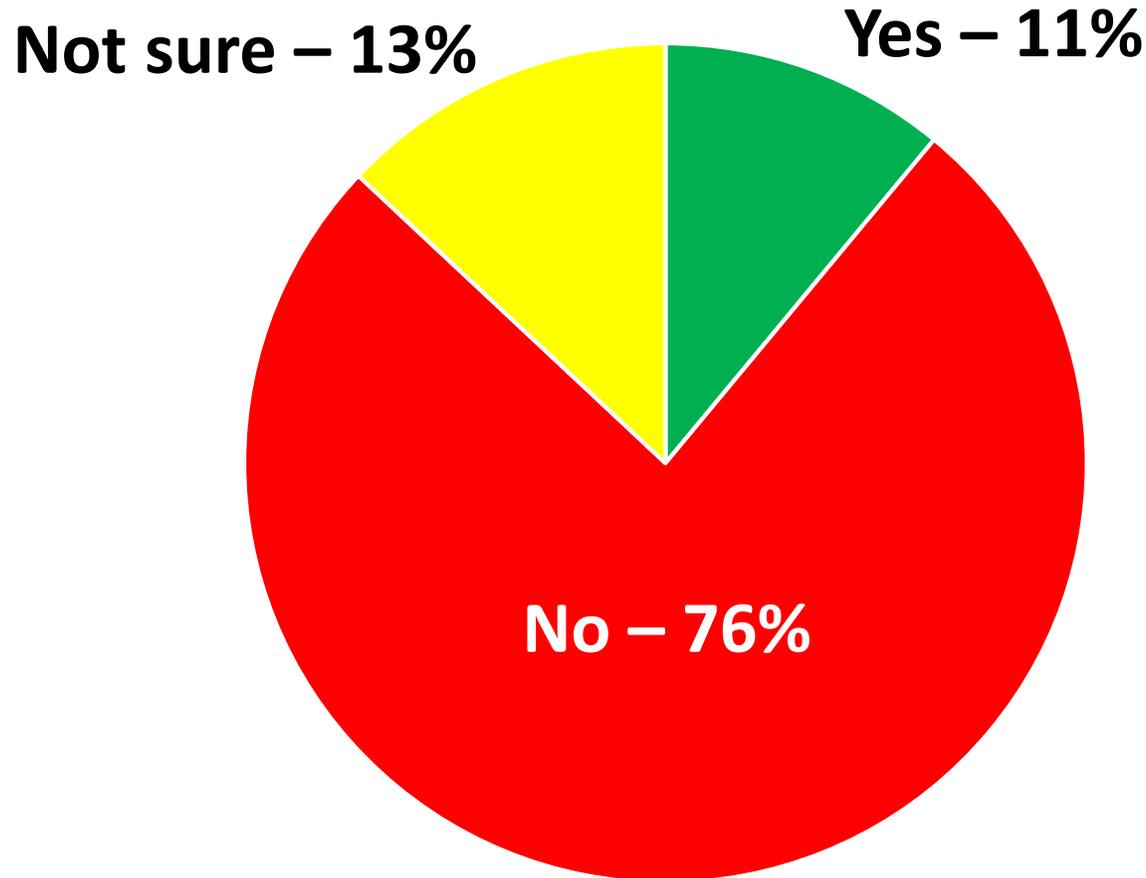


Who Is Responsible for Developing As-Built Plans?

Outside Entities 3%



Are Completed (Existing) As-Built Plans Updated?



“Big Picture” Conclusions!

- Construction Crews are stretched thin and winter is no longer downtime
- The belief that As Built Information is not used and not needed by KYTC end users is **#FAKE NEWS!!!**
- The majority of those interviewed felt very strongly that As-Built **Information** is very much needed
- Emphasis on “**As-Built Information**” instead of **As-Built Plans**



Presented Results to KYTC Leadership



What's Next?

**Keep
“As-Builts”
Great!**



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Department of Civil Engineering

With KYTC Assistance – Formed an “As-Builts” Task Force

End Users

Erin Van Zee

Joe Tucker

Bart Asher

Chris James

Joe Van Zee

Earl Downey

Developers

Bart Bryant

Jeremy Brickey

Rob Harris

Tim Layson

Kevin Gearlds

Paul Manafort (remotely)



A checklist of Required As-Built Information was developed for each End User Group

- End User Group
- Required As-Built Information
- Minimum Acceptable Recording Method

End User	Required As-Built Information	Minimum Acceptable Recording Method
Bridge Maintenance	Pile tip elevations	Hand drawn
	Concrete cylinder breaks	Hand drawn
	Beam seat information	Hand drawn
	X-Dimensions	Hand drawn
	Culvert fill heights	Hand drawn
	Foundation layouts	Hand drawn
Pavement Design	Actual courses placed	Hand drawn
	Typical sections	Hand drawn
	Subgrade details	Hand drawn
	ADA ramp information	APP
	Intersection grades	Mobile LiDAR
Highway Design	Anything underground	Hand drawn
	Alignments	Hand drawn
	Picture of completed project	Camera
	LiDAR scan of completed project	Mobile LiDAR
Structural Design/Geotechnical	Footing information	Hand drawn
	Pile lengths	Hand drawn
	Stationing equations for where bridges and roads meet	Hand drawn
	Changes in bridge length	Hand drawn
	Peers built at wrong skew	Hand drawn
	Bearing details	Hand drawn
	Rock cut slopes	Drone
	Cut and fill slopes	Hand drawn
Utilities	Subsurface utility information	Hand drawn
	Utility conflict information	Hand drawn
	Alignments	Hand drawn
	Depths	Hand drawn
	Clearances	Hand drawn
Permits	Permitted facilities	Hand drawn



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	X-Dimensions	Hand drawn
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	Foundation layouts	Hand drawn
Pavement Design	Actual courses placed	Hand drawn
	Typical sections	Hand drawn
	Subgrade details	Hand drawn
	ADA ramp information	APP
	Intersection grades	Mobile LiDAR
Highway Design	Anything underground	Hand drawn
	Alignments	Hand drawn
	Picture of completed project	Camera
	LiDAR scan of completed project	Mobile LiDAR



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	Peers built at wrong skew	Hand drawn
	Bearing details	Hand drawn
	Rock cut slopes	Drone
	Cut and fill slopes	Hand drawn
Utilities	Subsurface utility information	Hand drawn
	Utility conflict information	Hand drawn
	Alignments	Hand drawn
	Depths	Hand drawn
	Clearances	Hand drawn
Permits	Permitted facilities	Hand drawn



Required As-Built Information Checklist by Work Type

- Major Work Product
- Work Components
- Work Items
- Required As-Built Information
- Collection Method
- Future Collection Method

Major Work Product	Work Product Components	Individual Work Items	Required As-Built Information	Collection & Recording Method - (Current Recommendation))	Future Collection & Recording Methods
STRUCTURES	Foundation	Piles	Concrete Cylinder Breaks	Test & Record in SiteManager	
			Pile Tip Elevations/Lengths	Direct Measure & Record on Pile Logs	
		Measured Bearing	Direct Measure & Record on Pile Logs		
	Substructure	Foundation Layout	Bottom of Footer Elevations	Direct Measure & Record on Plans	
			Abutment/End Bent	Beam Seat Elevations	Direct Measure & Record on Plans
		Beam Seat Layout	Direct Measure & Record on Plans		
		Wing Wall Dimensions	Direct Measure & Record on Plans		
	Piers	Beam Seat Elevations	Direct Measure & Record on Plans		
		Beam Seat Layout	Direct Measure & Record on Plans		
	Superstructure	Bridge Deck	X-Dimensions	Surveyed & Record as PDF	
Culvert		Finished Grade	Direct Measure & Record on Plans		
		Culvert Fill Heights	Direct Measure & Record on Plans		
	Wing Wall Dimensions	Direct Measure & Record on Plans			
		Foundation Layout	Bottom of Footer Elevations	Surveyed & Record as PDF	
ROADWAY		Right of Way	Actual R/W Monuments & Lines	Survey & Record on Plans	Google Earth
		Completed Project		Picture & GPS and Record on ArcGIS	Google Earth
	Subgrade	Stablization method	Cement/Lime/Rock Roadbed	Record Method Used as PDF	
	Asphalt/Concrete Pavement	Base Courses	Actual Courses & Thickness Placed	Direct Measure & Record on Plans	
PERMITTED FACILITIES		Entrances	Permitted Facilities Scaled Drawings	Visual Inspection & Record on Plans Record on Plans	GPS/GIS Asset Management System PDF Red-Line Editor
UTILITIES		Underground Utilities	Subsurface Information	Measured or Surveyed & Record on Plans	As per ASCE 38-02
			Conflict Information	Record in Maintenance Database	As per SHRP2 R01A
			Alignments, Depths, & Clearances	Measured or Surveyed & Record on Plans	GPS/Asset Management



Major Work Product	Work Product Components	Individual Work Items	Required As-Built Information	Collection & Recording Method - (Current Recommendation)	Future Collection & Recording Methods
STRUCTURES			Concrete Cylinder Breaks	Test & Record in SiteManager	
	Foundation	Piles	Pile Tip Elevations/Lengths	Direct Measure & Record on Pile Logs	
			Measured Bearing	Direct Measure & Record on Pile Logs	
		Foundation Layout	Bottom of Footer Elevations	Direct Measure & Record on Plans	
	Substructure	Abutment/End Bent	Beam Seat Elevations	Direct Measure & Record on Plans	
			Beam Seat Layout	Direct Measure & Record on Plans	
			Wing Wall Dimensions	Direct Measure & Record on Plans	
		Piers	Beam Seat Elevations	Direct Measure & Record on Plans	
			Beam Seat Layout	Direct Measure & Record on Plans	
	Superstructure	Bridge Deck	X-Dimensions	Surveyed & Record as PDF	
Finished Grade			Direct Measure & Record on Plans		
Culvert		Culvert Fill Heights	Direct Measure & Record on Plans		
		Wing Wall Dimensions	Direct Measure & Record on Plans		
		Foundation Layout	Bottom of Footer Elevations	Surveyed & Record as PDF	



Major Work Product	Work Product Components	Individual Work Items	Required As-Built Information	Collection & Recording Method - (Current)	Future Collection & Recording Methods
ROADWAY		Right of Way	Actual R/W Monuments & Lines	Survey & Record on Plans	Google Earth
		Completed Project		Picture & GPS and Record on ArcGIS	Google Earth
	Subgrade	Stabilization method	Cement/Lime/Rock Roadbed	Record Method Used as PDF	
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PERMITTED FACILITIES		Entrances	Permitted Facilities Scaled Drawings	Visual Inspection & Record on Plans Record on Plans	GPS/GIS Asset Management System PDF Red-Line Editor
UTILITIES		Underground Utilities	Subsurface Information Conflict Information Alignments, Depths, & Clearances	Measured or Surveyed & Record on Plans Record in Maintenance Database Measured or Surveyed & Record on Plans	As per ASCE 38-02 As per SHRP2 R01A GPS/Asset Management



“Fun Facts” Discovered During this Project

End Users

- Majority believe As-Built information is very useful
- More interested in the availability and accuracy as-built information than the delivery method.
- PDF is acceptable to all End Users interviewed
- Anything that will be underground or covered up needs to be captured....somehow!
- Desired level of detail is dependent on work type
- When as-built information is not available end users are forced to use the most conservative assumptions.



Even More “Fun Facts”

Developers

- Section Offices want to help develop and deliver As-Built Information. Unfortunately, they have limited resources and the process can be very time-consuming.
- They want to make sure they are collecting the correct information and providing in an appropriate format.
- It helps to know the information is needed and will be utilized.
- The latest and greatest TECHNOLOGY is great but just because it exists does not mean it must always be used!!!



Recommendations for KYTC Consideration

- Update records retention schedule to reflect current practice and eliminate inconsistencies
- Continue to explore utilizing new technology as a collection method. (i.e. Bluebeam, LiDAR, etc.)
- Look at ways to easily update existing As-Built Information. (Asset Management)
- Recommended “tweaks” to current process have been presented to KYTC Leadership
- Long-term recommendations have been presented as well.





***Thank You for
Listening!!!***



Recently reduced! Won't last long! #HandyManSpecial!



