



GEOSPATIAL INFORMATION &  
TECHNOLOGY ASSOCIATION®

# **Construction Project Data Management**

Establishing Foundations for an  
Asset Database



Scot Twining



# Project Activities Supported by GIS

- Cadastral Mapping
- Proposed Pipeline Route Selection
- Right Of Way Acquisition
- Survey Planning and Tracking
- Survey Data Collection and Management
- Environmental Permit Application Maps
- Construction Drawing Generation
- Community Relations and Public Meetings





# Benefits of Using GIS in Construction Projects

- Concurrent Pre-Construction Activities
- Data-Centric Approach to Project Activities
- Avoid Spending Time on Unnecessary Activities
- Manage Centralized Project Data
- Get Answers Quickly to Managers and Engineers
- More Planning, Less Field Work, Less Sitting Around
- Use of Existing GIS Datasets
- Progress is Easily Tracked
- Public Perception of Competence
- Reduce Rework
- Reduce Cost

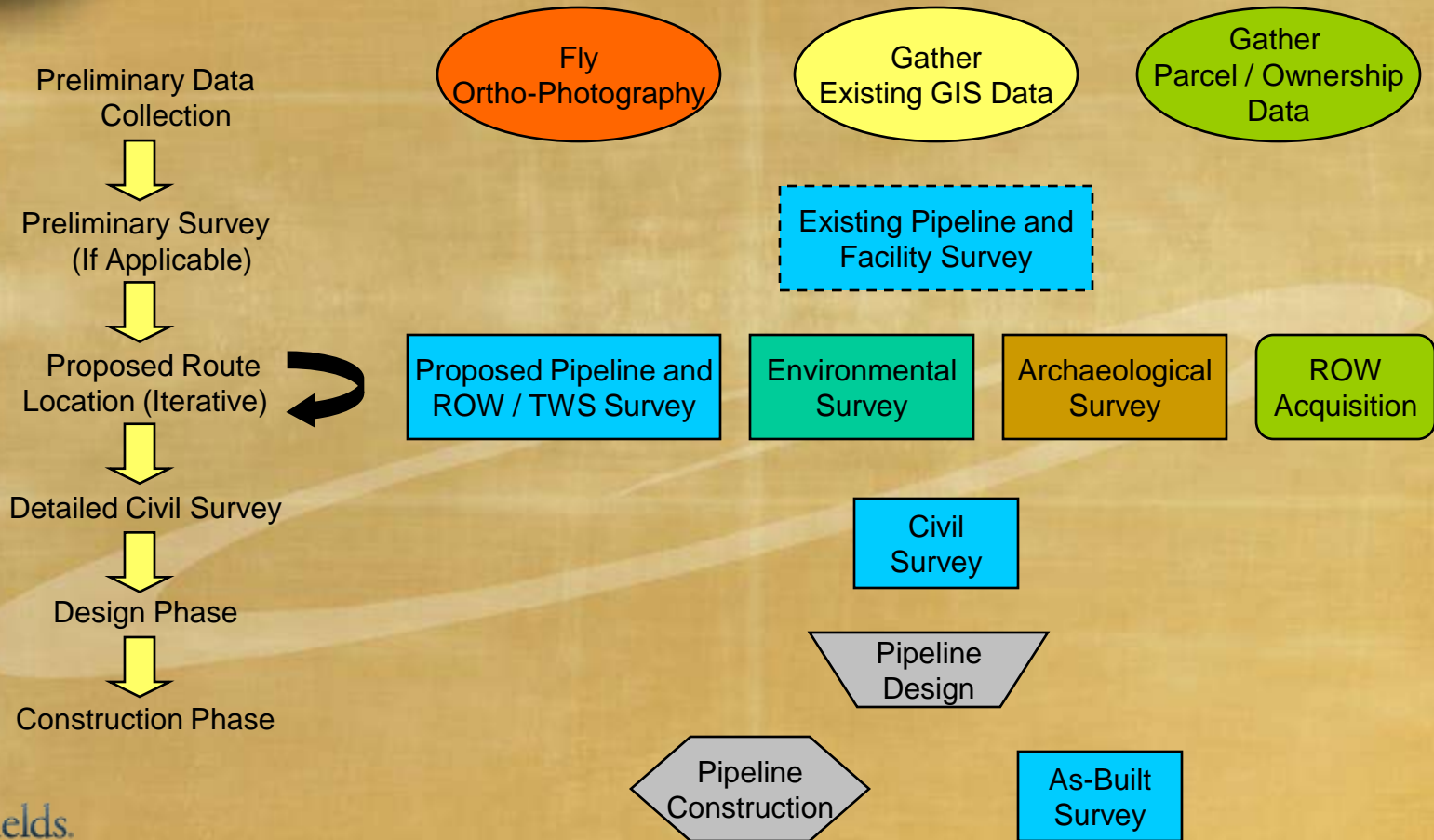


# Construction Project Data Requirements

- Ortho-Corrected Aerial Photography
- Land Parcel Boundaries
- Land Parcel Ownership Information
- Survey Permission and Completion Status
- Existing Pipelines and Pipeline Features (If Applicable)
- Proposed Pipeline Routes
- Construction Access Roads
- Environmental Features
- Archaeological Sites
- ROW and Temporary Workspace Layout
- Civil Survey Information for Ties and Crossings
- Proposed Pipeline Design



# Data Collection & Survey Chronology







# Aerial Photography

- Ortho-Correction is Necessary
- Plan for Flights During Winter
- Cover All Proposed Routes
- High Resolution for Large Scale Map Products Such as Plat Maps



# Land Parcel Data

- ROW Acquisition Support
- Appears on All Mapping Products
- ROW / Workspace Dependencies
- Parcel Polygons – Ownership Data Linkage
- Importance of Scale and Accuracy
- Municipal & Tax Map Sources
- Parcel Title Searches (Best Method)
- Refine with Property Corner Surveys (< cm)
- Ownership Attributes for ROW acquisition
- Survey Permission Attributes to Avoid Trespassing
- Survey Progress Attributes for Progress Reporting
- Construction Sheet Ownership Band Display



# Existing Pipeline C/L and Features

- For Construction in an Existing ROW
- Sub-Centimeter Survey for Construction Purposes (Avoid Existing Facilities)
- Existing ROW Configuration Offset from C/L
- Proposed Pipeline C/L Offset from Existing C/L
- Temporary Workspace Offset from Existing C/L
- Crossover Planning
- Refine Existing Facility Data
- Features that Affect Construction





# ROW & Temporary Workspace Configuration

- Increase of Existing ROW or Development of New ROW
- Temporary Workspace for Entire Length of Construction
- Additional Workspace at Road, Railroad, and Water Crossings
- Where Do You Park Vehicles ?
- Where Do You Store Materials ?
- Where Do You Store Spoil ?
- Sloping Areas Require More Temporary Workspace
- Environmental Features to Avoid
- Directional Drilling Pads



# ROW & Temporary Workspace Configuration







# Access Roads

- Select and Locate Access Roads Early
- Private Roads Require Owner Permission
- Use Access Roads for Surveys Also
- Environmental Permitting Must Cover Access Roads as well as Proposed ROW
- Survey From Proposed ROW to Paved Road





# Environmental Survey

- For Permit Applications
- Helps with Construction Method Planning at Water Crossings
- Include Wetlands, Ponds, Lakes, Waterways, T & E Plants, T & E Animals, and Archaeological Sites
- Features as Insignificant as Wet Weather Conveyances Are Considered in Most States
- Intersection with Proposed ROW and Access Roads
- Re-Routing Proposed C/L to Avoid Sensitive Areas will Save Money and Ensure Permitting
- Involve Regulators from the Beginning
- Environmental Band on Construction Alignment Sheets
- Other Mapping Products



# Utility, Road, & Railroad Crossings

- Collect During Civil Survey of Proposed Corridor
- Sub-Centimeter Survey will Ensure that Crossings Fall in the Correct Parcel Polygon
- Drilling Planning Support
- Casing Location Planning Support
- Avoidance of Overhead Crossings During Construction
- Some Crossings Have a ROW and Some can be Represented with a Single Line
- Will be Mapped in the Film Window and Stationing Band of Construction Alignment Sheets



# Point Features

- Collect During Civil Survey of Proposed Pipeline Corridor
- i.e. Poles, Building Corners, Existing Aerial Markers, Drinking Water Wells
- Avoid or Move During Construction
- Use Perpendicular Distances for Ties on Construction Alignment Sheets





# Proposed Pipeline Design Data

- Use Preliminary Construction Alignment Sheets as Basis for Design
- Proposed Centerline Route and Stationing Should be Finalized
- Design Data can be Provided Using Coordinate Geometry or Stationing
- Design Data Includes: Pipe Material Specifications, Pipeline Coatings, Concrete, Casings, Appurtenances, Valves, and CAD Drawing References
- Design Data will be Displayed in Design Bands and Materials Lists on the Final Construction Alignment Sheets



# Survey Permission & Survey Progress

- Necessary if Client Wishes to Track Survey Permission and Progress Using GIS
- Attributes Should be Linked to Parcel Polygons
- Survey Permission Attributes Should be Updated Daily and Maintained by ROW Agents
- Survey Progress Attributes Should be Updated Daily and Maintained by Survey Contractors
- Web-Based GIS Survey Tracking Software is Ideal For Displaying and Maintaining These Data
- Beneficial for Planning Daily Survey Activities
- Multiple Survey Efforts Can be Tracked at the Same Time
- Maps Can be Created to Aid Survey Contractors in Finding Locations and Staying in Permitted Areas



# Data Management

- Survey, Pipeline Design, Land Parcel, Ownership, and Survey Progress Data
- Must be Able to Generate Sheets for Constantly Changing Pipeline Route
- Many Sources of Input
- Sheets Must Reference Data Vintage
- Web-Based Project Collaboration Software is Very Helpful in Managing Data Submittals, Data Deliveries, and Map Product Deliveries
- Must Ensure That Client and Other Contractors Always Have Access to the Most Recent Data
- Survey Data Dictionaries, Procedure Documents, and Training are Essential
- Linear Referencing is Required





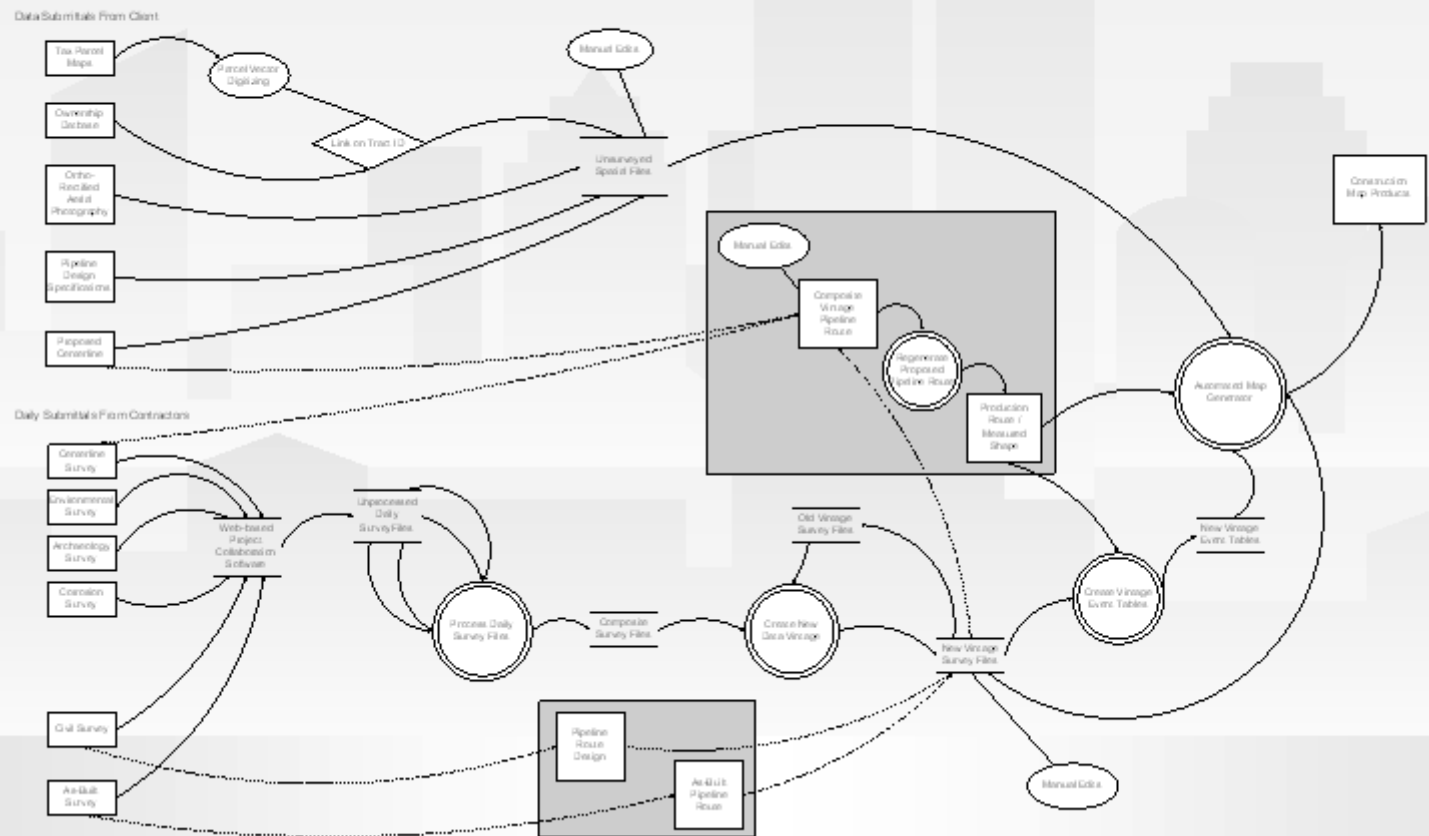
# Survey Data Dictionaries

- Keep Final Output in Mind
- Consider Existing Facility Data Model
- Will Ensure Data is Formatted Properly for Input into Data Processing Programs
- Must be Coupled with Procedures and Training
- Should be Instrument Independent
- Use Consistent Feature Attributes, Required Fields, and Drop-Down Menus
- Keep it Simple
- Whenever Possible, Collect Lines as Lines to Avoid Post-Processing of Survey Data



# Data Flow & Processing

Pipeline Construction Project Data Management  
Data Flow and Processes





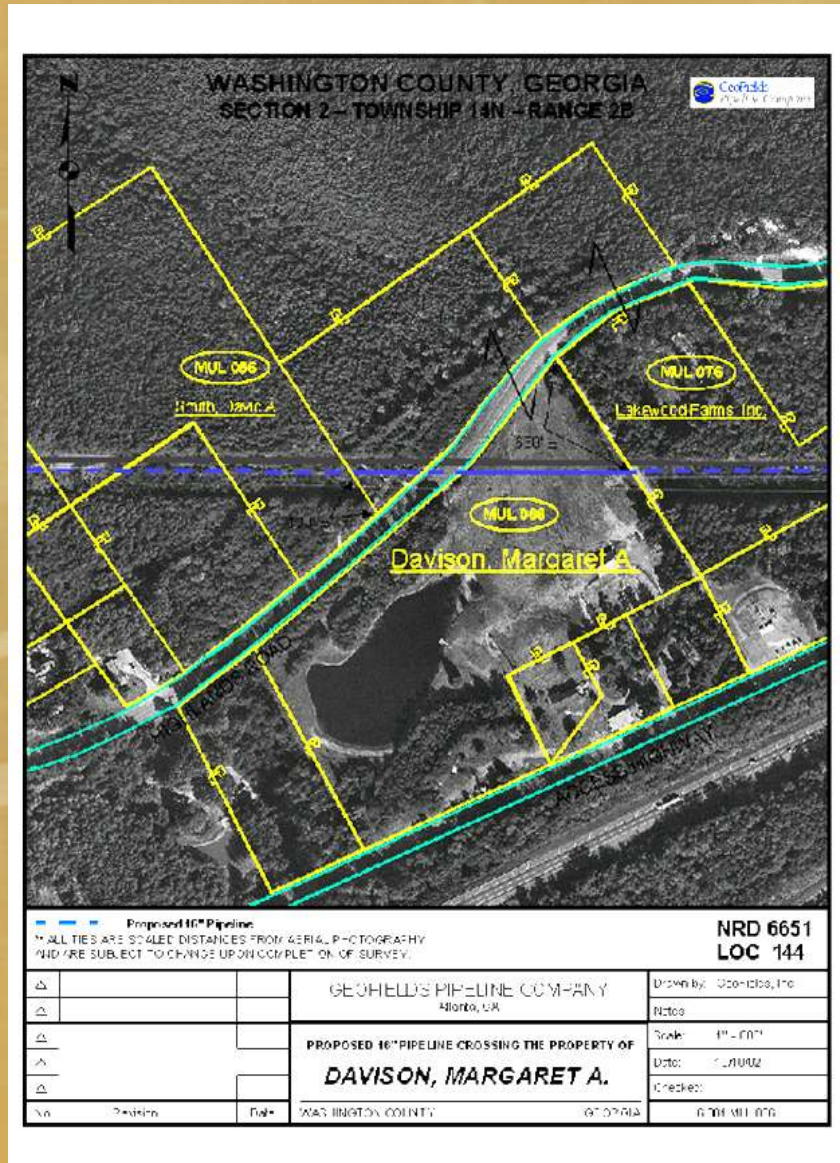
# Map Output & GIS Applications

- Land Parcel Plat Maps
- Web-Based GIS Survey / Activity Progress Tracking Application
- Environmental Permit Application Maps
- Construction Alignment Sheets
- Mobile GIS for Data Collection & Verification
- As-Built Alignment Sheets





# Land Parcel Plat Maps







# Web-Based GIS Survey Tracking Application

Facility Explorer 4.0 - FE-Land - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address: https://fe.geofields.com/default.asp?geom=gfpipeline

GeoFields

Menu DisplayList Layer Query Report

Welcome users: geofields

Search:

- by Pipeline
- by Parcel
- by Zip code
- by Address
- by Area code
- by Lat/Long

ROW:

Update status

Last update: 11/11/2002 4:40:22 PM

ROW Report

Map:

- Print Map
- Legend
- Index Map
- BackGround

Corporate: What's new

Print Map:

Title: GFPL ROW Map

Size: Custom

Width: 20 inch

Height: 20 inch

Get Map

MUL-034, MUL-035, MUL-036, MUL-045, MUL-064, MUL-066, MUL-067, MUL-075, MUL-077

Scale: 1:2029

X: -110.1077

Y: 22.6079

Map Created with Facility Explorer 4.0

0 0.04 mi

Loading complete Initialize map Total process time: 4 seconds Projection: Cylindrical server: gfpnd-web4







# Web-Based GIS Survey Tracking Report

Report - Microsoft Internet Explorer

Address: [https://gfprd-web5/Row\\_Report](https://gfprd-web5/Row_Report)

**FE-Land**

[Detailed Report](#)

County	County Abr	Total Tract	PERMISSION		REFUSED		CENT		ENV		ARCH		CIV		PREON		CATH	
			%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count
Randolph, AL	RAN	103	82.52%	85	12.62%	13	58.25%	60	80.58%	83	75.73%	78	0%	0	0%	0	60.19%	62
Clarke	CLA	138	78.99%	109	20.29%	28	55.8%	77	71.74%	99	69.57%	96	0%	0	0%	0	55.8%	77
Carroll	CAR	4	100%	4	0%	0	75%	3	100%	4	75%	3	0%	0	0%	0	75%	3
Barrow	BAR	27	92.59%	25	3.7%	1	70.37%	19	96.3%	26	92.59%	25	0%	0	0%	0	70.37%	19
Douglas	DOU	129	81.4%	105	17.83%	23	60.47%	78	71.32%	92	66.67%	86	0%	0	0%	0	58.91%	76
Jackson	JAC	117	70.94%	83	29.06%	34	52.14%	61	65.81%	77	53.85%	63	0%	0	0%	0	49.57%	58
Fulton	FUL	264	55.68%	147	31.44%	83	42.8%	113	50%	132	48.48%	128	0%	0	0%	0	40.15%	106
Forsyth	FOR	48	64.58%	31	16.67%	8	43.75%	21	56.25%	27	56.25%	27	0%	0	0%	0	41.67%	20
Gwinnett	GWI	194	54.64%	106	35.05%	68	27.84%	54	43.3%	84	43.3%	84	0%	0	0%	0	27.84%	54
Washington	MUL	118	44.92%	53	38.98%	46	30.51%	36	31.36%	37	31.36%	37	0%	0	0%	0	22.03%	26
Lumpkin	LUM	94	68.09%	64	22.34%	21	37.23%	35	46.81%	44	46.81%	44	0%	0	0%	0	37.23%	35
Dawson	DAW	77	48.05%	37	19.48%	15	33.77%	26	33.77%	26	33.77%	26	0%	0	0%	0	20.78%	16
Hall	HAL	133	50.38%	67	49.62%	66	43.61%	58	51.13%	68	39.85%	53	0%	0	0%	0	43.61%	58
Cobb	COB	46	39.13%	18	26.09%	12	26.09%	12	34.78%	16	30.43%	14	0%	0	0%	0	26.09%	12
Banks	BAN	29	89.66%	26	10.34%	3	79.31%	23	86.21%	25	68.97%	20	0%	0	0%	0	79.31%	23
<b>Total</b>		<b>1521</b>	<b>63.12%</b>	<b>960</b>	<b>27.68%</b>	<b>421</b>	<b>44.44%</b>	<b>676</b>	<b>55.23%</b>	<b>840</b>	<b>51.55%</b>	<b>784</b>	<b>0%</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>42.41%</b>	<b>645</b>







# Environmental Permit Application Maps

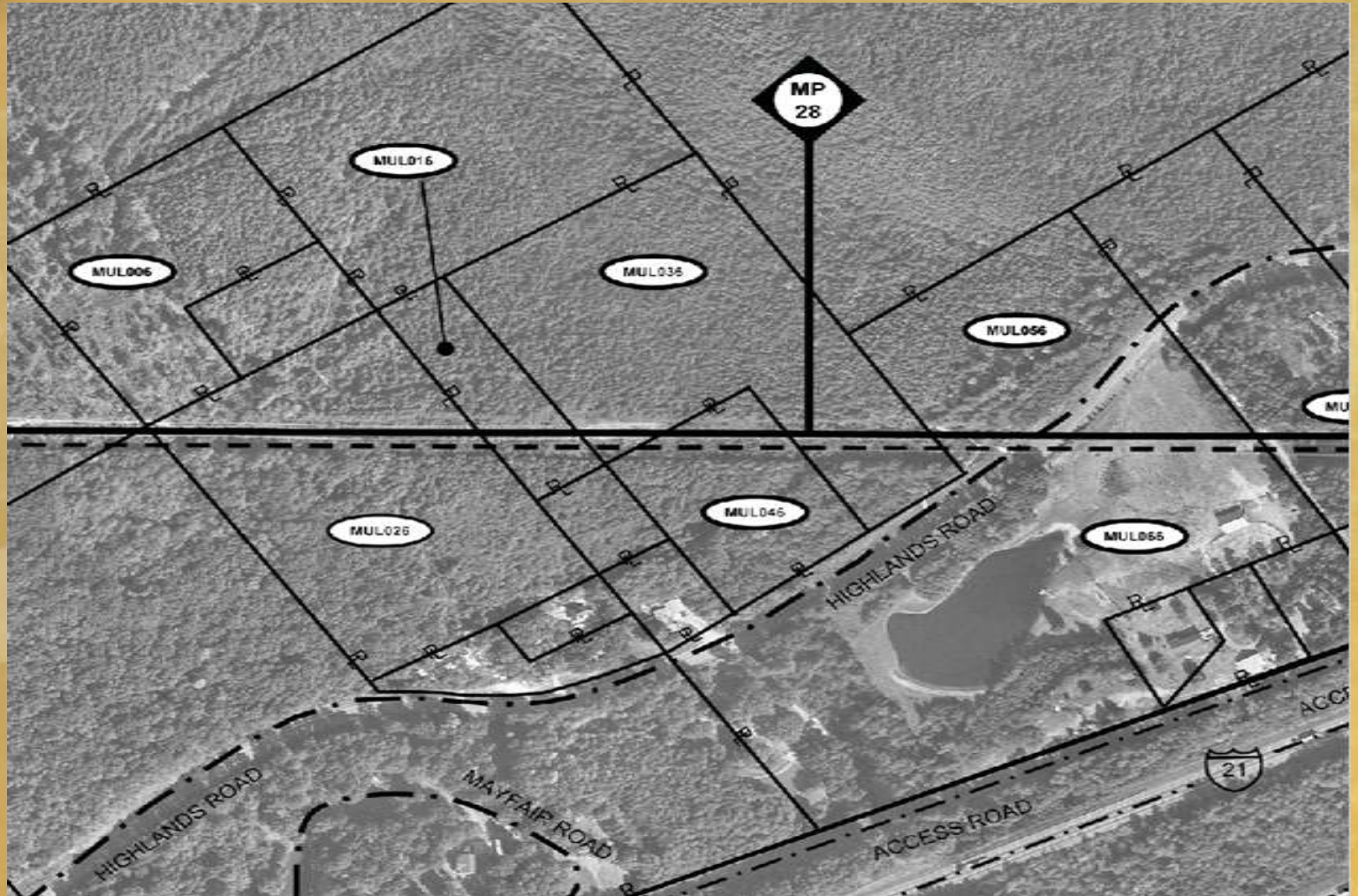








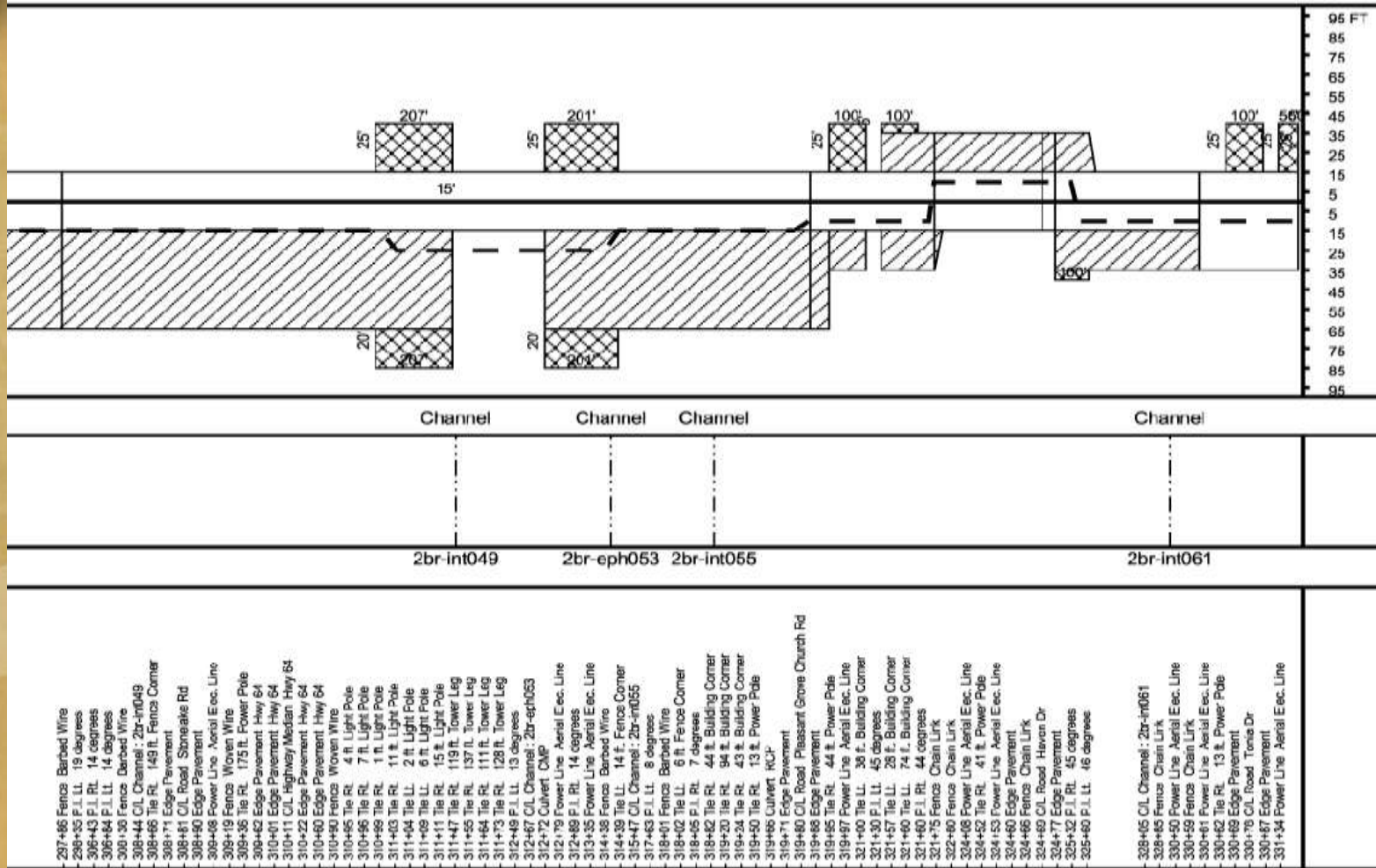
# Map Area Blow-Up







# Linear Band Blow-Up





# Conclusion

- Keep Final Products of Project in Mind
- Make Sure Data is of Sufficient Accuracy
- Use Ortho-Corrected Aerial Photography
- Use Survey Data Dictionaries, Defined Survey Procedures, and Provide Training to Surveyors
- Web-Based Project Collaboration Software is Ideal for Managing Data Submittals from the Field and Deliveries of Map Products
- Survey Permission and Progress Tracking is Very Useful to Construction Managers and Subcontractors
- The Proposed Pipeline Route is Dynamic, so Data Vintage Should be Tracked and Reported on Map Products