



Norfolk, VA GIS Wholesale Conversion

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City of
Norfolk
Department of Utilities



Water Distribution System



- Central water utility system established in 1871
- Department of Utilities officially established in 1969
- Provides water for more than 820,000 people in Hampton Roads
- >800 miles of water distribution mains
- >65,000 Water meters
- Approximately 24,000 Valves
- >42,000 Fittings
- 2 Water Treatment Plants

Sanitary Sewer System



- Central sewer utility system established in 1879
- >800 miles of gravity sewer mains
- >62 miles of sewer force mains
- 126 pump stations
- >20,000 Manholes
- 66 square miles
- Hampton Roads Sanitation District (HRSD) for sewer treatment

Reasons for a New Record System

- Enterprise GIS
- Consolidation into one system.
- Increasing update speed.
- Integration with HANSEN.
- Increased speed in map distribution of maps and data.

Data Conversion

Data Conversion

- History

- Data Development
- Data Maintenance

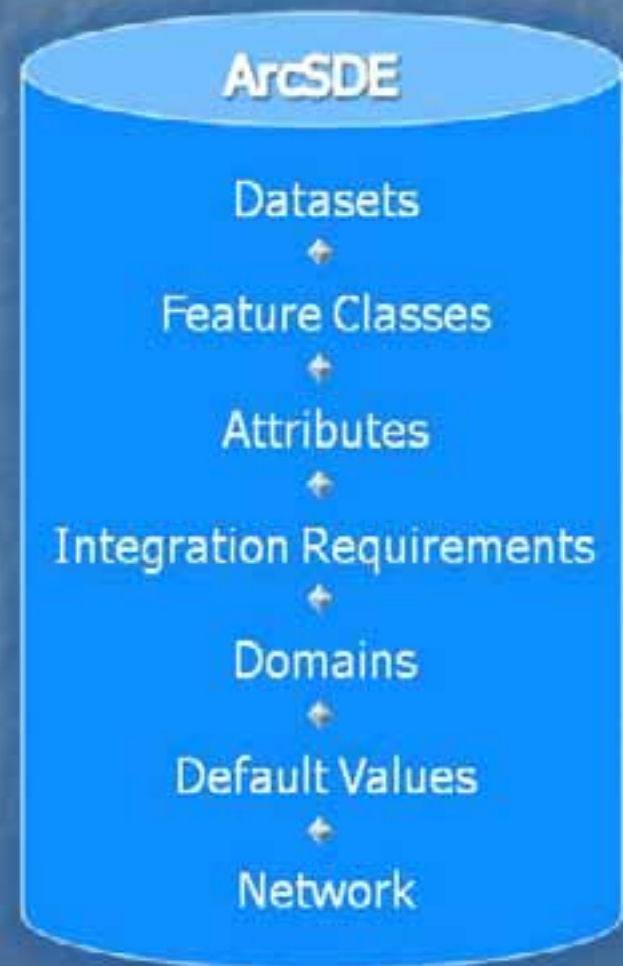
- Data Sources

- Planimetric Drawings
- Intersection Drawings
- As-Built Drawings
- GIS Data (Shapefiles)



GeoDatabase Design

- Water
 - Standard ESRI
 - Customizations
 - Geometric Network
- Sewer
 - Standard ESRI
 - Customizations
 - Geometric Network



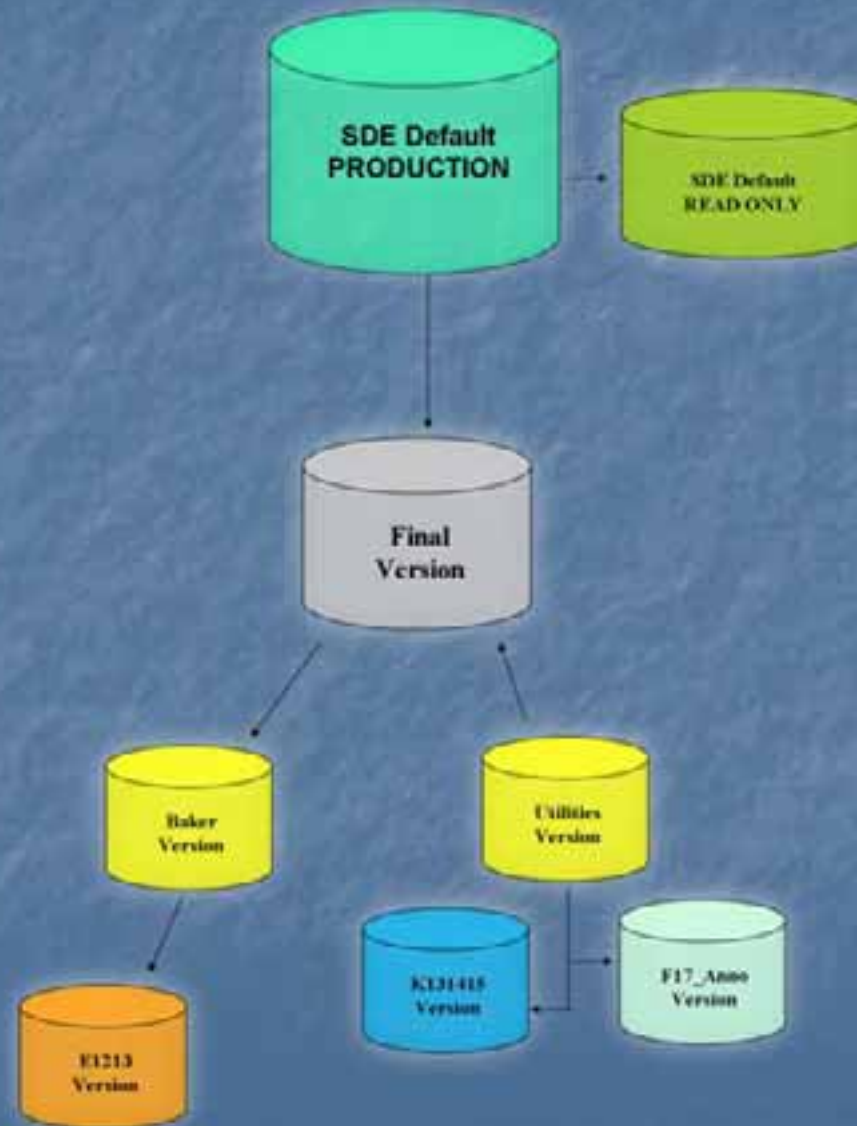
Methodology

- Digitizing
- Versioning
- Disconnected Editing
- Workflow Management



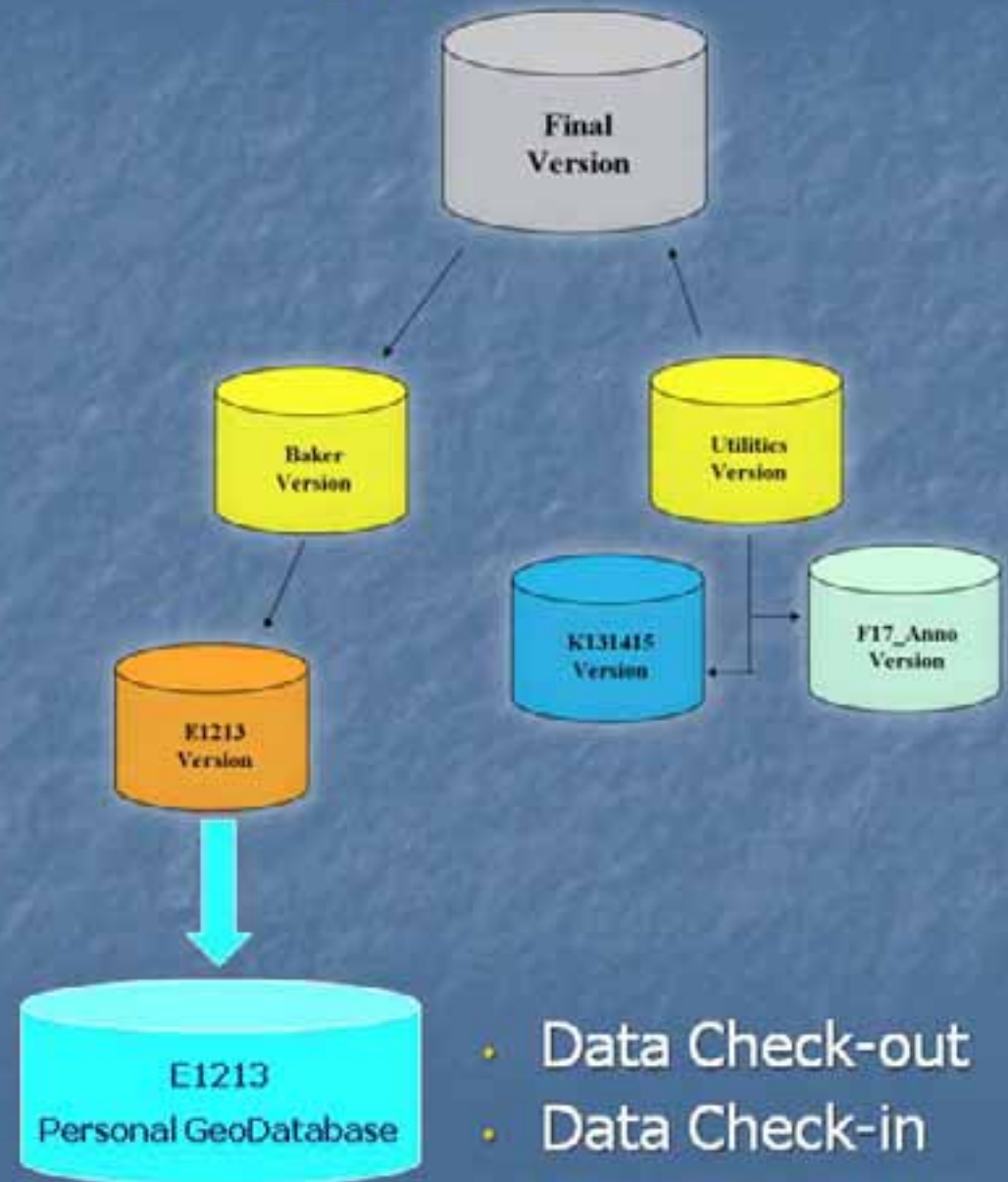
Methodology

- Digitizing
- Versioning
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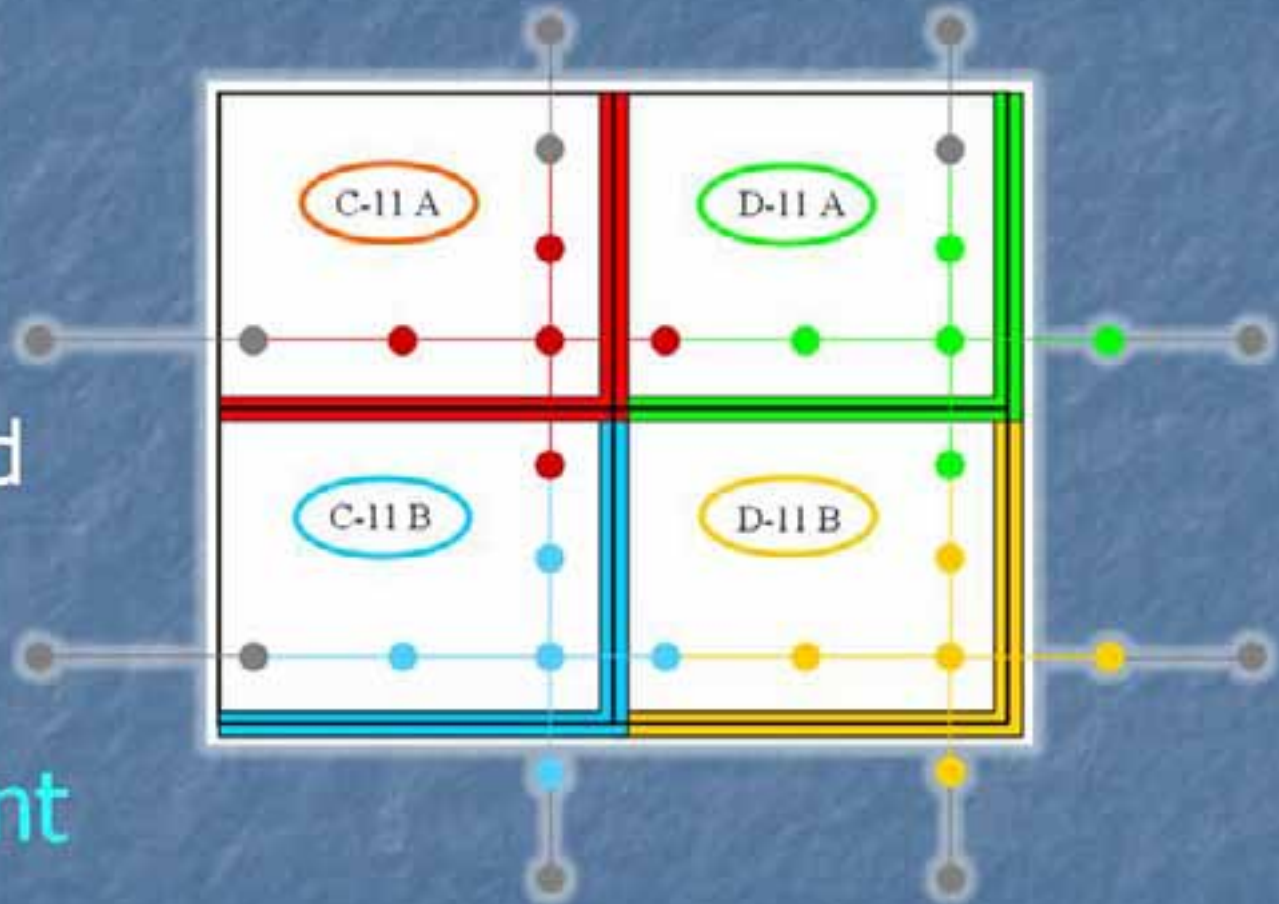
Methodology

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Methodology

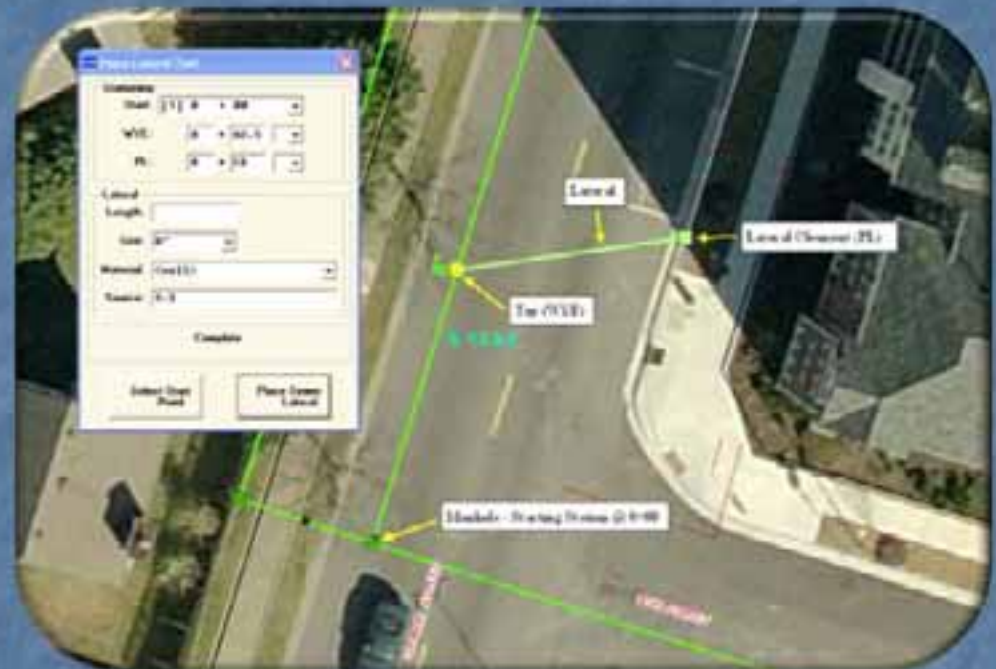
- Digitizing
- Versioning
- Disconnected Editing
- Workflow Management



Bottom-Right Rule

Custom Applications

- QC Tools
- Data Maintenance
- Calculated Length
- Lateral Placement Tool



Early Milestones

- Intersection Points
- Staff Training
- Staff Participation
- ArcReader



Integration with Hansen

Hansen Asset Management System

- Service Requests
- Work Orders
- Scheduled Maintenance
- Maintenance Cost
- Asset Valuation
- Condition Assessment

HOUSELINE/MANLINE WORK ORDER FORM
Wastewater Division

Service Request Number: _____
 Work Order Required? YES NO
 Priority: Highest Moderate Nice to have
 Supervisor (Print) _____
 Supervisor (Sign) _____

REPAIR WORK ORDER FORM
Wastewater Division

Service Request Number: _____
 Work Order Required? YES NO
 Priority: Highest Moderate Nice to have
 Supervisor (Print) _____
 Supervisor (Sign) _____

CCTV WORK ORDER FORM
Wastewater Division

Service Request Number: _____
 Work Order Required? YES NO
 Priority: Highest Moderate Nice to have
 Supervisor (Print) _____
 Supervisor (Sign) _____

Problem Code: HLEP MLEP CAV BPNW MNC
 Problem Comments: _____

Address: _____
 Location: _____

Initiated By: _____ Date: _____
 Assigned To: _____ Completed Date: _____

Activity Code: WWTYS (TV Insp. of Service Line)
 WWTYS (TV Insp. of Main Line) Additional Work Required? YES NO

Comments (Work Description): _____

Time	Employee Number	Employee Name	Date/Time			REG Hours	OT Hours
			Travel Start Time	Start Job	End Job		
			8:0	8:0	8:0		
			8:0	8:0	8:0		
			8:0	8:0	8:0		
			8:0	8:0	8:0		
			8:0	8:0	8:0		

Materials: _____ Unit Cost: _____ Amount: _____
 Vehicle/Equipment: _____ Hours: _____

Reasons to Integrate GIS with Hansen

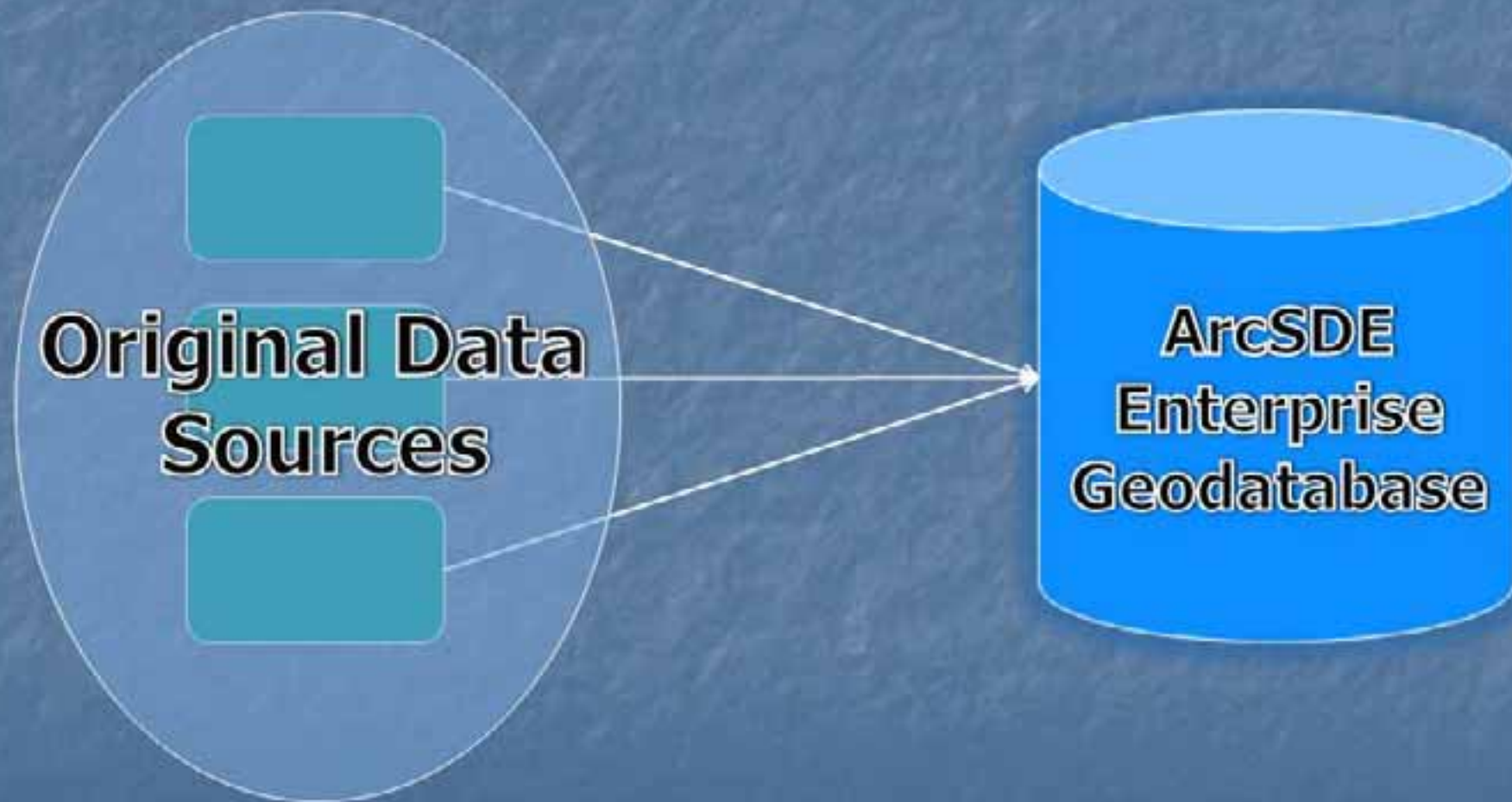
- Requires less labor to maintain
- Systems are more accurate
- Continuity among datasets
- Customers are better served
- More informed decision-making
- Existing investment

Geodatabase Design

- Hansen required fields
 - COMPKEY
 - UNITID
 - COMPTYPE
 - MAINCOMP1, MAINCOMP2
- Field Properties
- Code Tables / Domain Values
- Geometric Network

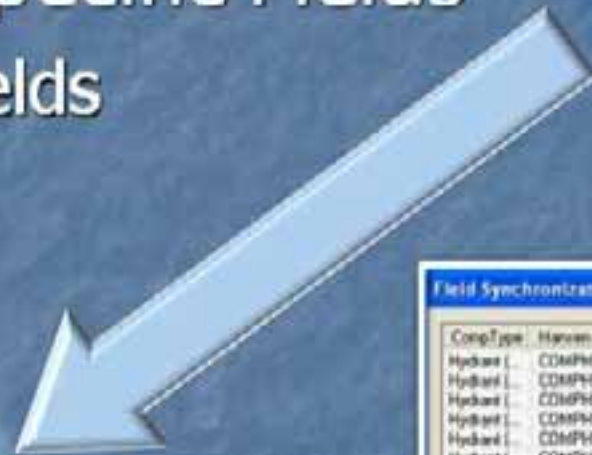


Populating the Geodatabase



Developing a Workflow

- Determine Ownership
- Map Related Fields
- Identify System Specific Fields
 - Hansen specific fields
 - GIS specific fields



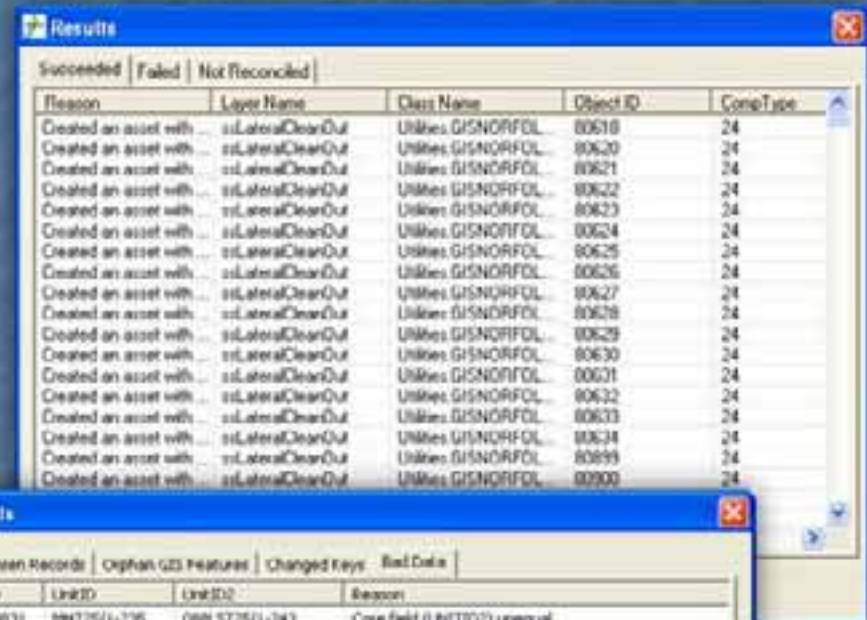
Field Synchronization Mapping

CompType	Hansen Table	Hansen Field	GIS Layer	GIS Field	Owner	Validation
Hydrant	COMPHY	ASBLT	whHydrant	PLAN	GIS	
Hydrant	COMPHY	COLOR	whHydrant	COLOR	GIS	MSV7.TE
Hydrant	COMPHY	INSTDATE	whHydrant	DATE	GIS	
Hydrant	COMPHY	MFGKEY	whHydrant	MFG	GIS	MSV7.M
Hydrant	COMPHY	Own	whHydrant	OwnE	GIS	MSV7.TE
Hydrant	COMPHY	SERVSTAT	whHydrant	STATUS	GIS	MSV7.TE
Hydrant	COMPHY	SPECNST	whHydrant	COMM	GIS	
Hydrant	COMPHY	UNITTYPE	whHydrant	UNITT	GIS	MSV7.TE
Sewer LR	COMPLS	INSTDATE	whPump	DATE	GIS	
Sewer LR	COMPLS	Own	whPump	OwnE	GIS	MSV7.TE
Sewer LR	COMPLS	SPECNST	whPump	COMM	GIS	
Sewer Ma	COMPSMN	DuNDPTH	whGrav	DuW	GIS	
Sewer Ma	COMPSMN	INSTDATE	whGrav	DATE	GIS	
Sewer Ma	COMPSMN	INSTDATE	whFace	DATE	GIS	

Buttons: Add, Remove, OK, Cancel

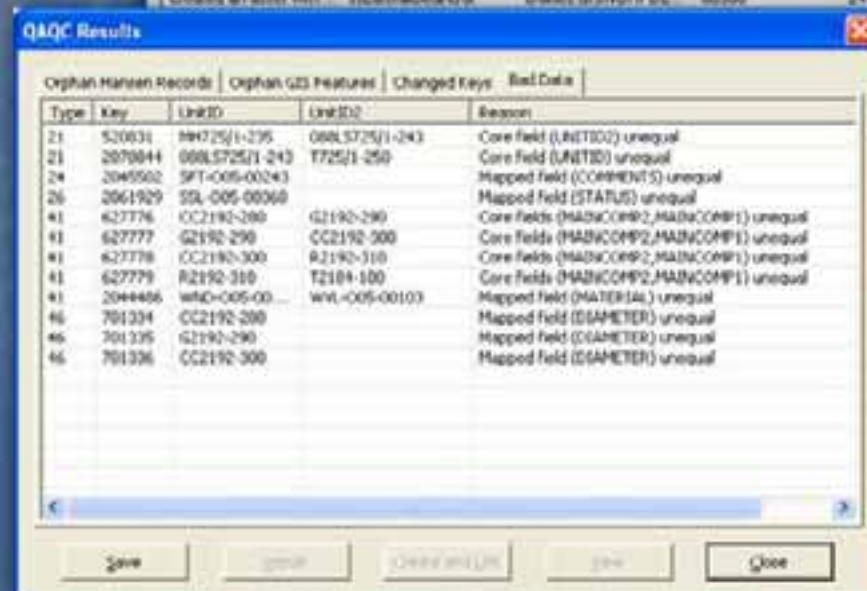
Validating the Data

- Resolving Sync Logs
- Orphan Hansen Assets
- Orphan GIS Features
- Changed Compkeys
- Bad Data



The screenshot shows a window titled "Results" with a tabbed interface. The active tab is "Succeeded". The table below lists sync log entries with columns for Reason, Layer Name, Class Name, Object ID, and CoreType.

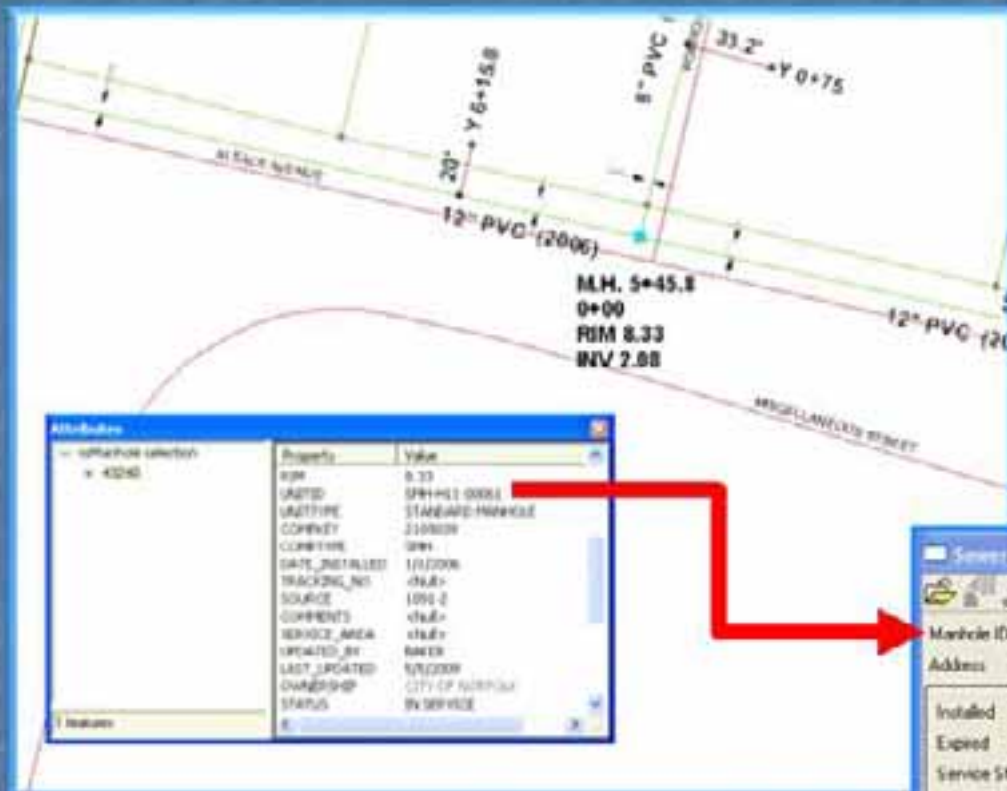
Reason	Layer Name	Class Name	Object ID	CoreType
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80618	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80620	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80621	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80622	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80623	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80624	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80625	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80626	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80627	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80628	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80629	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80630	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80631	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80632	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80633	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80634	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80635	24
Created an asset with...	ssLateralClearOut	Utilities.GISNORFOL	80900	24



The screenshot shows a window titled "QA/QC Results" with a tabbed interface. The active tab is "Orphan Hansen Records". The table below lists validation errors with columns for Type, Key, UnitID, UnitID2, and Reason.

Type	Key	UnitID	UnitID2	Reason
21	520831	MH025(1)-235	0885725(1)-243	Core field (UNITID) unequal
21	2070844	0885725(1)-243	7725(1)-250	Core field (UNITID) unequal
24	2045502	SFT-005-00243		Mapped field (COMMENT5) unequal
26	2061929	SSL-005-00060		Mapped field (STATUS) unequal
41	627776	CC2192-290	62192-290	Core fields (MADCOMP2,MADCOMP1) unequal
41	627777	62192-290	CC2192-300	Core fields (MADCOMP2,MADCOMP1) unequal
41	627778	CC2192-300	62192-310	Core fields (MADCOMP2,MADCOMP1) unequal
41	627779	62192-310	T2184-100	Core fields (MADCOMP2,MADCOMP1) unequal
41	2044466	WFO-005-00...	WFL-005-00103	Mapped field (MATERIAL) unequal
46	701334	CC2192-290		Mapped field (DIAMETER) unequal
46	701335	62192-290		Mapped field (DIAMETER) unequal
46	701336	CC2192-300		Mapped field (DIAMETER) unequal

One to One Link



Hansen

ArcSDE

Sewer Manhole Inventory

Manhole ID: SMH-III1-00061

Address: _____

Installed	01/01/2006	Site	_____
Expend	_____	Complex	_____
Service Status	I	Street Segment	_____
Ownership	CON	Intersection	_____
Budget #	_____		
As Built	_____		
Roadway	_____		

Location / Structure / Associated Assets / Comments / Mark / Prop

Mapping and Viewing Data

Automated creation of physical records

- Map Book Developer's Sample
 - Created a new grid based on previous Planimetric drawings
- Reason for creating physical records
 - Backup for power/network failure
 - Comfort of use for some customers and applications
- Updates to physical records
 - As needed due to changes in system

New Planimetric Sheet



DEPARTMENT OF UTILITIES
SEWER

CITY OF NORFOLK VIRGINIA
D-01

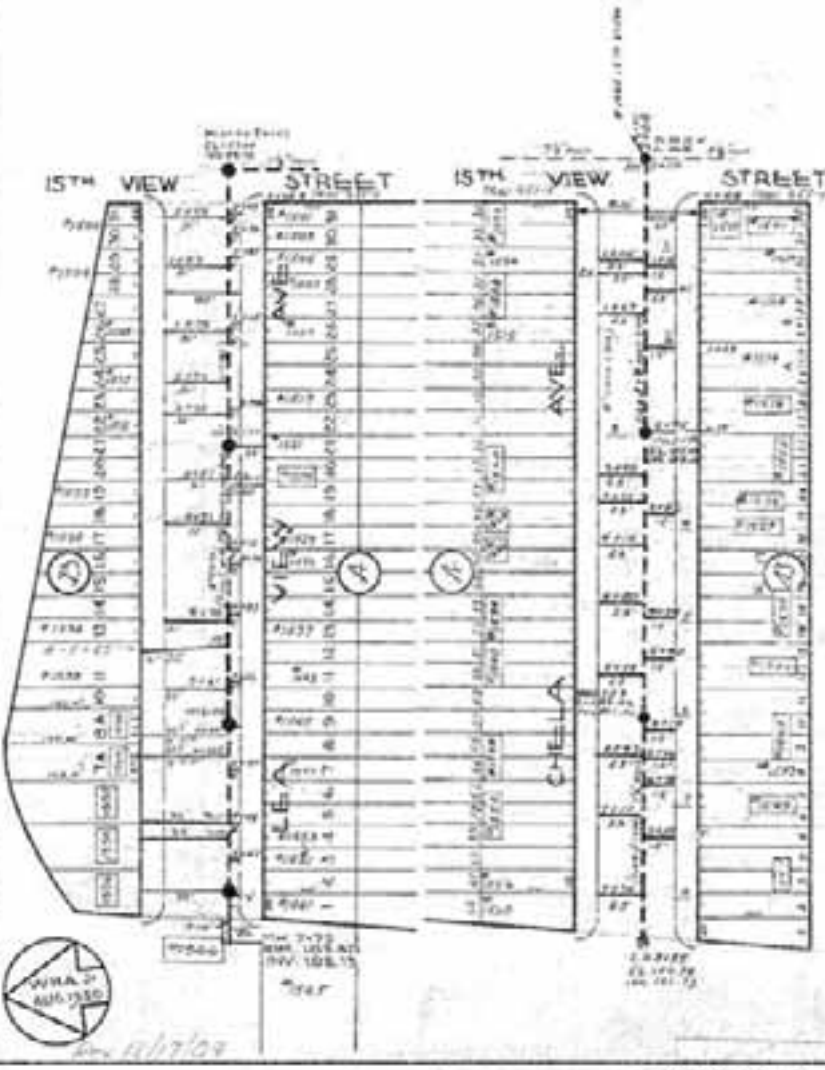


Old Planimetric Sheet

514-1

Old Intersection Drawings

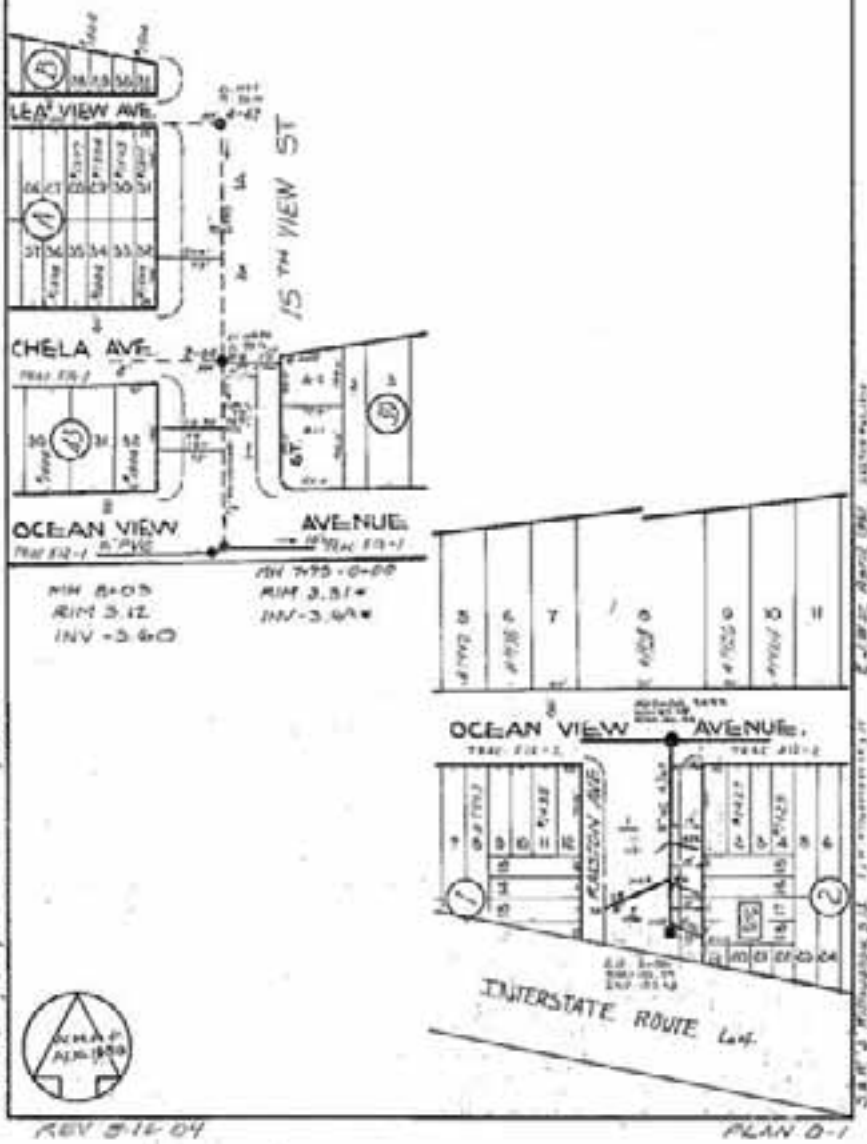
Willoughby Beach plots



Scale: 1" = 20' (Horizontal), 1" = 40' (Vertical) Date: April 1951

451-1

Willoughby Beach plots



Scale: 1" = 20' (Horizontal), 1" = 40' (Vertical) Date: April 1951

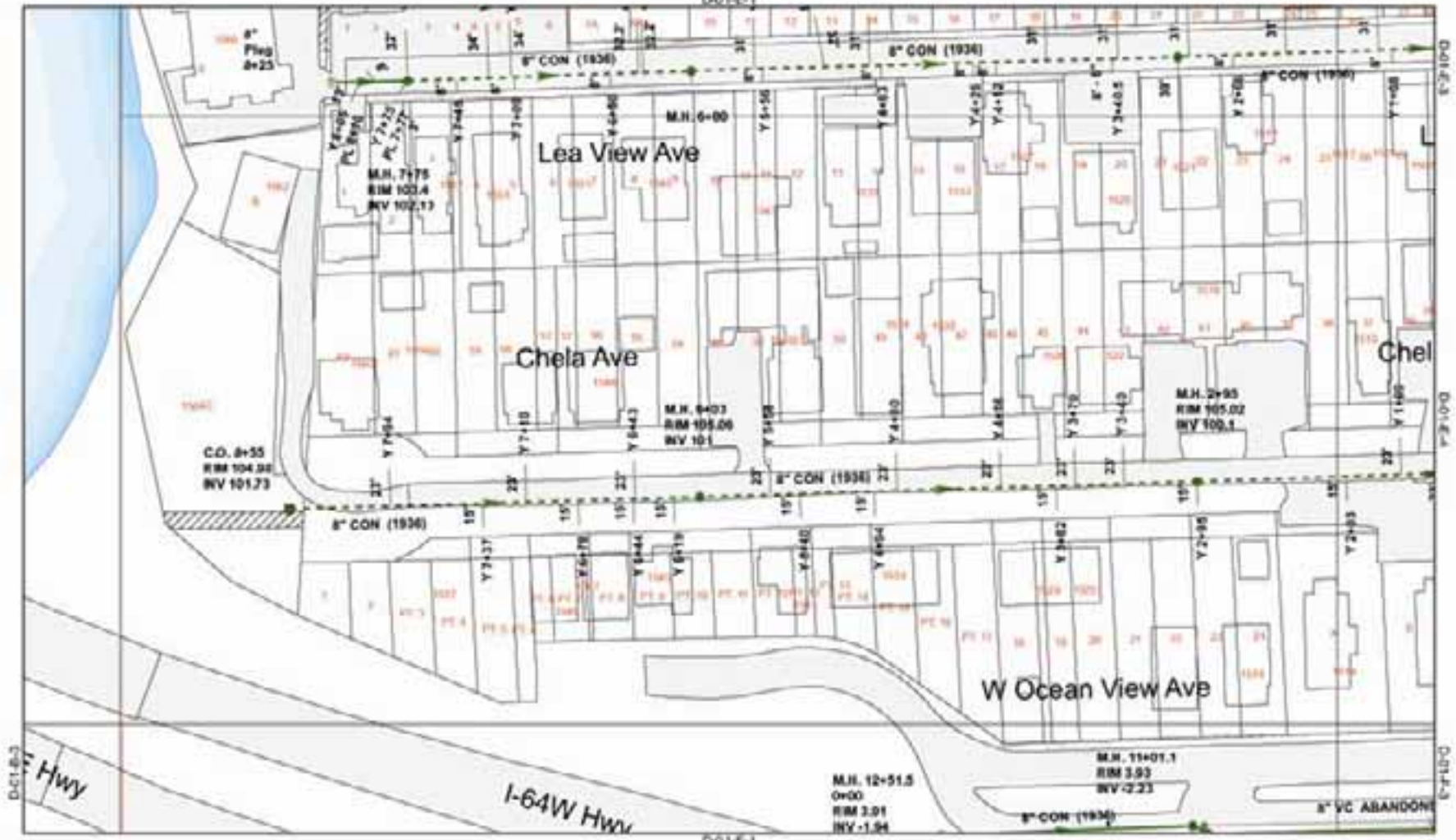


REV 5-14-04

PLAN D-1

New Sheet Drawings

City of Norfolk
 Department of Utilities
 400 Granby St.
 Norfolk, VA 23510



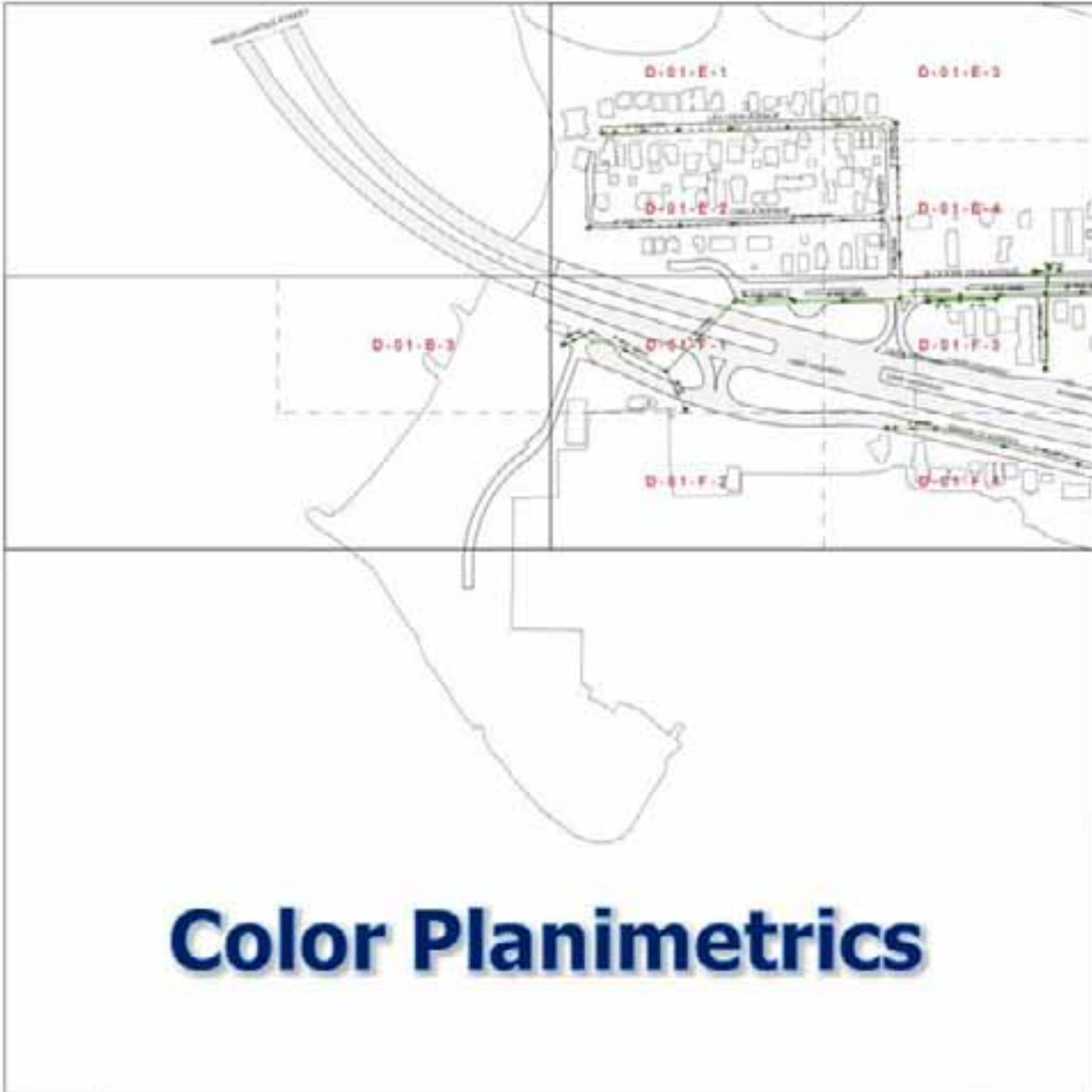
Note: Locations, elevations, and inverts are approximate and should be field verified. City does not guarantee accuracy. Check with private utility owners for further information.

Remember: Before you dig call Miss Utility at 811

Sewer Sheet:
D-01-E-2



Improvements of The New Record System



Color Planimetrics

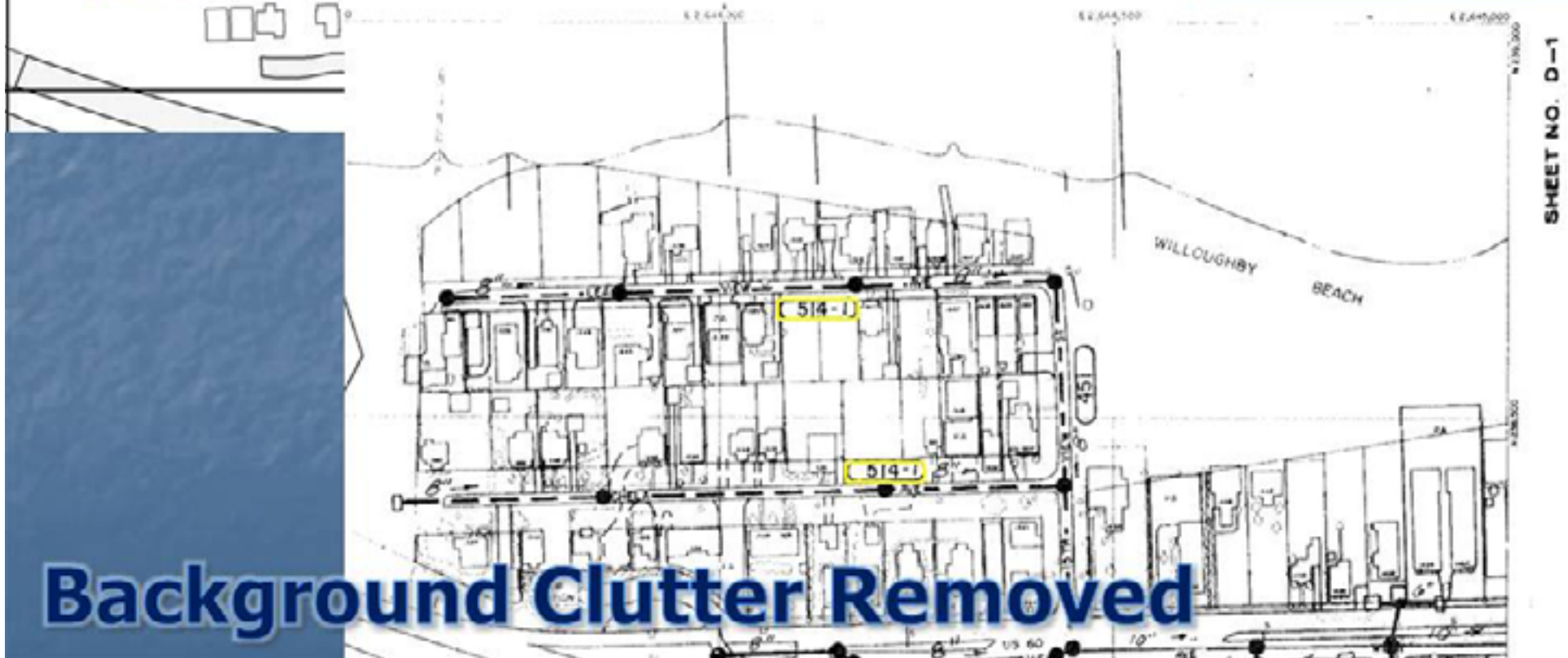
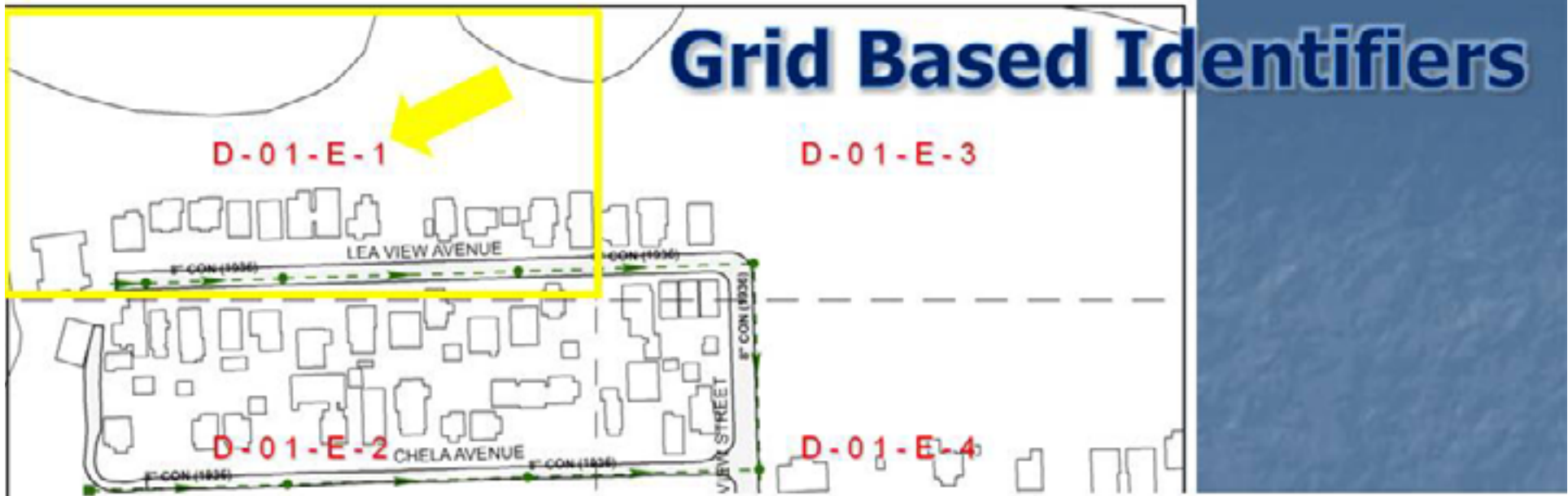


DEPARTMENT OF UTILITIES
SEWER



PLANNING MAP
CITY OF NORFOLK VIRGINIA
D-01

Grid Based Identifiers

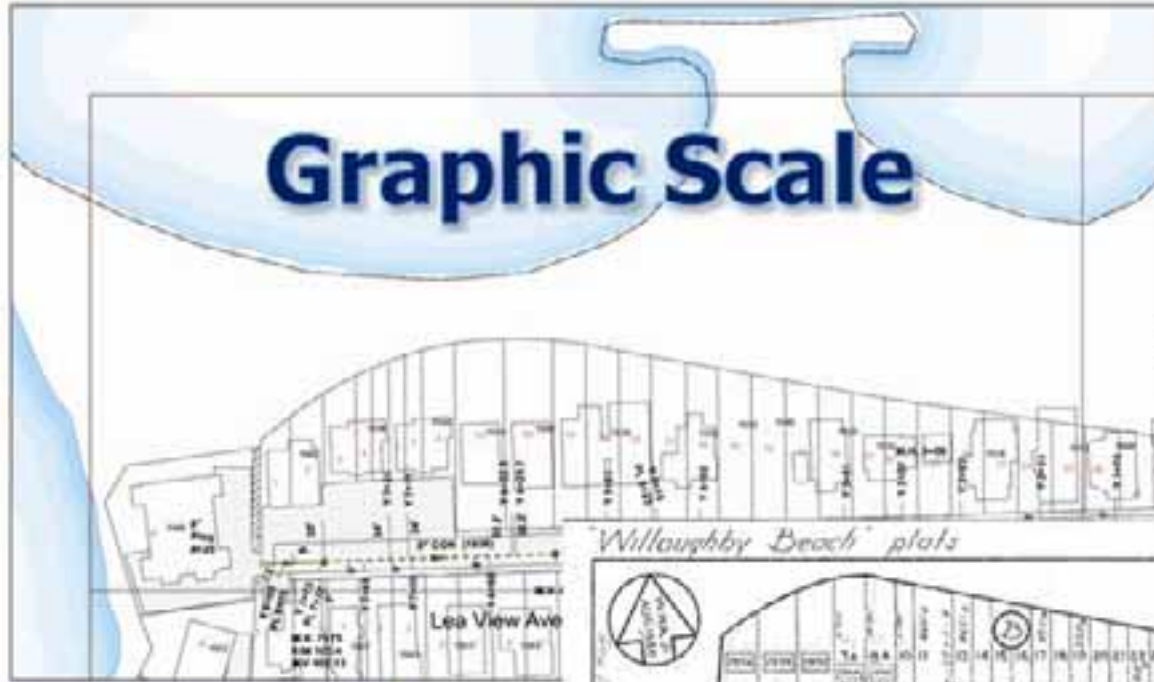


SHEET NO. D-1

Background Clutter Removed

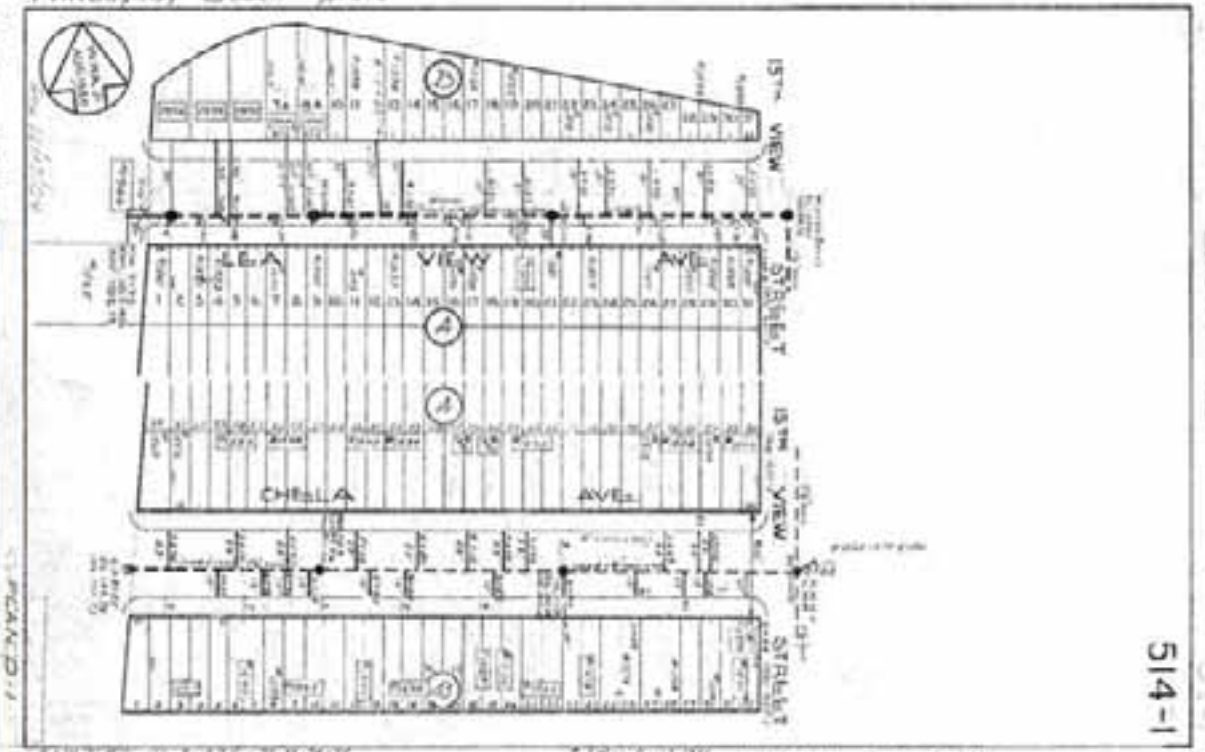


Graphic Scale



Note: Location, situation
and should be first verified
Check with private utility or
Remember: Before you dig

Willoughby Beach plots



514-1

514-1



Up to date Addresses



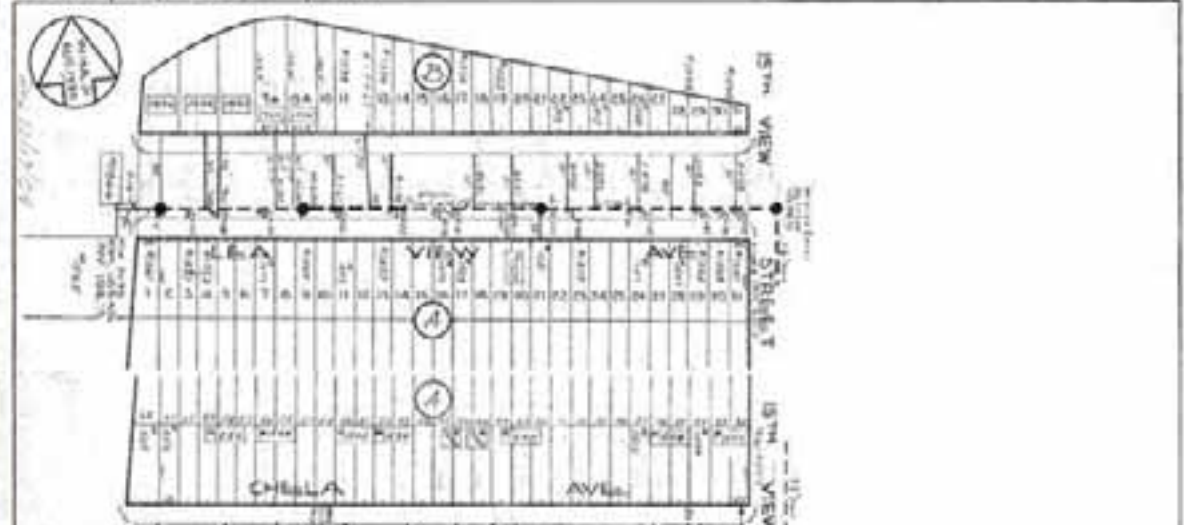
Note: Locations, elevations, and depths are approximate and should be field verified. City does not guarantee accuracy. Check with private utility owners for further information.
Remember: Before you dig call 811 or 800-451-7233

Sewer Sheet:
D-01-E-1

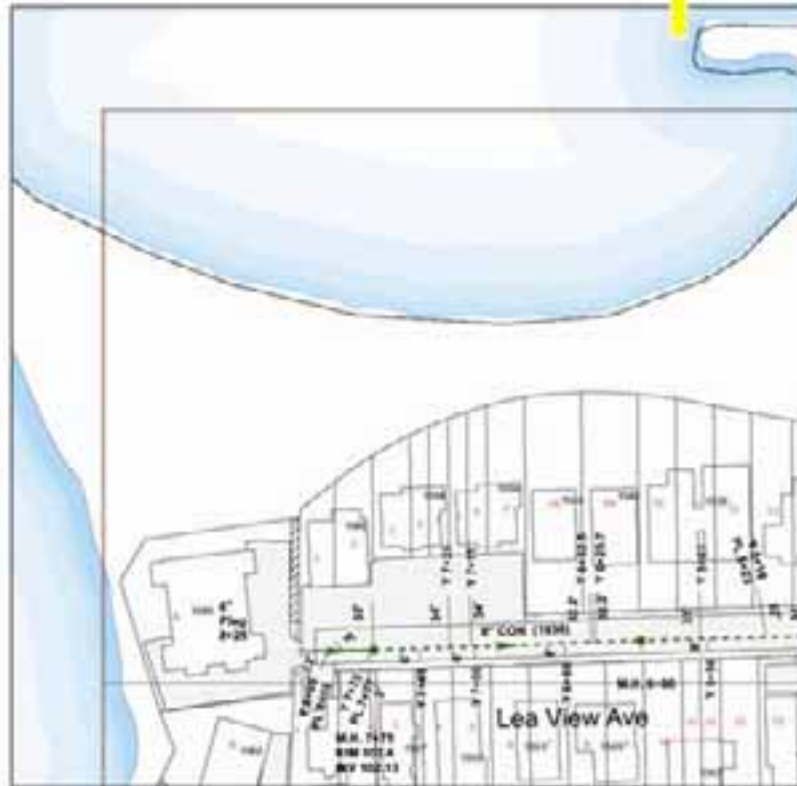
Lot Lines

Buildings

"Willoughby Beach" plots



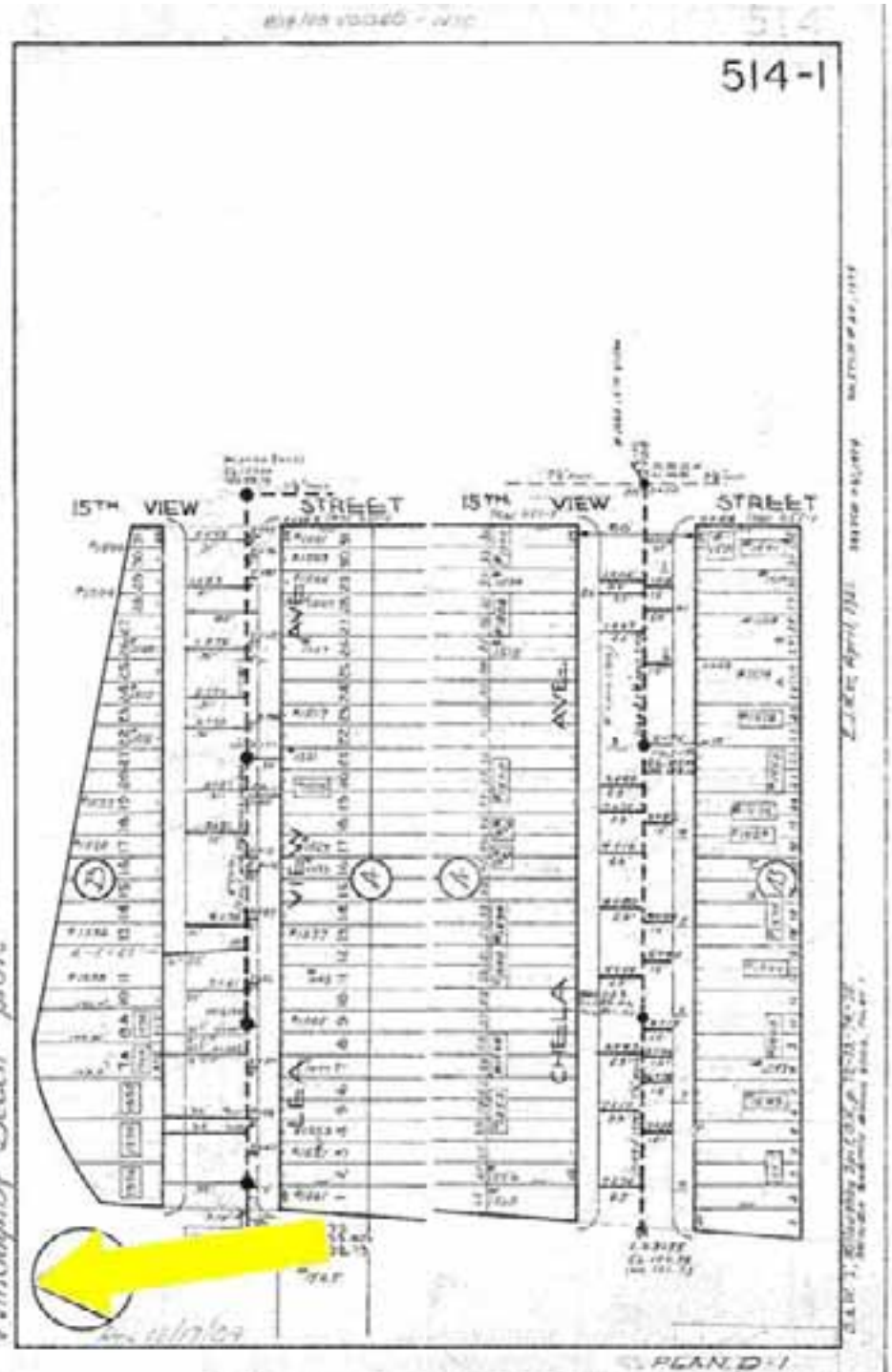
City of Norfolk
Department of Utilities
400 Granby St.
Norfolk, VA 23510



Note: Locations, elevations, and events are approximate and should be field verified. City does not guarantee. Check with private utility owners for further information.
Remember: Before you dig call 811

**North Oriented to
Top of Map
Sheet**

Willoughby Beach plots

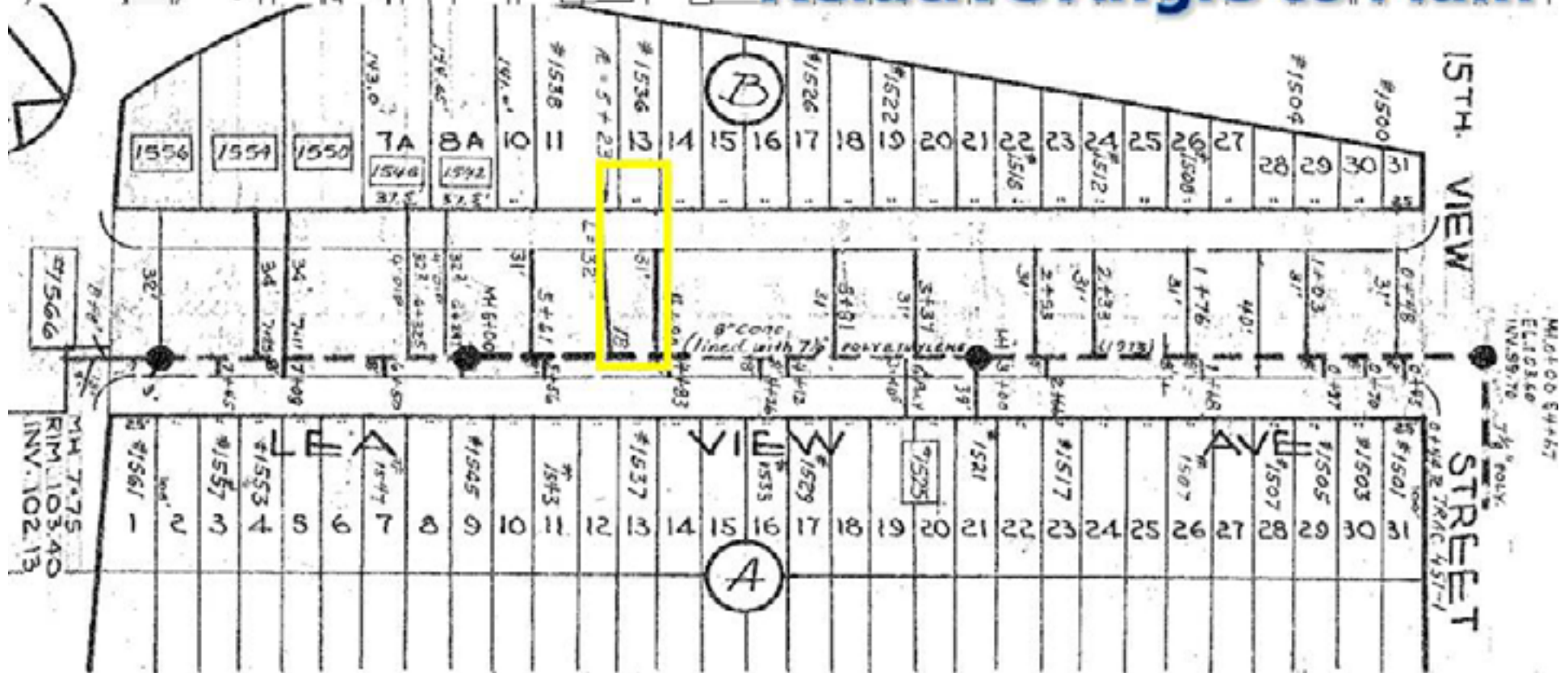


DATE: 11/20/2014
DRAWN BY: [illegible]
CHECKED BY: [illegible]
DATE: April 2011
SCALE: AS SHOWN
PROJECT: [illegible]

**Main:
Flow Direction**



**Laterals:
Relative Angle to Main**



City of Norfolk
Department of Utilities
400 Granby St.
Norfolk, VA 23510



Uniform Scale Overlapping Sheets

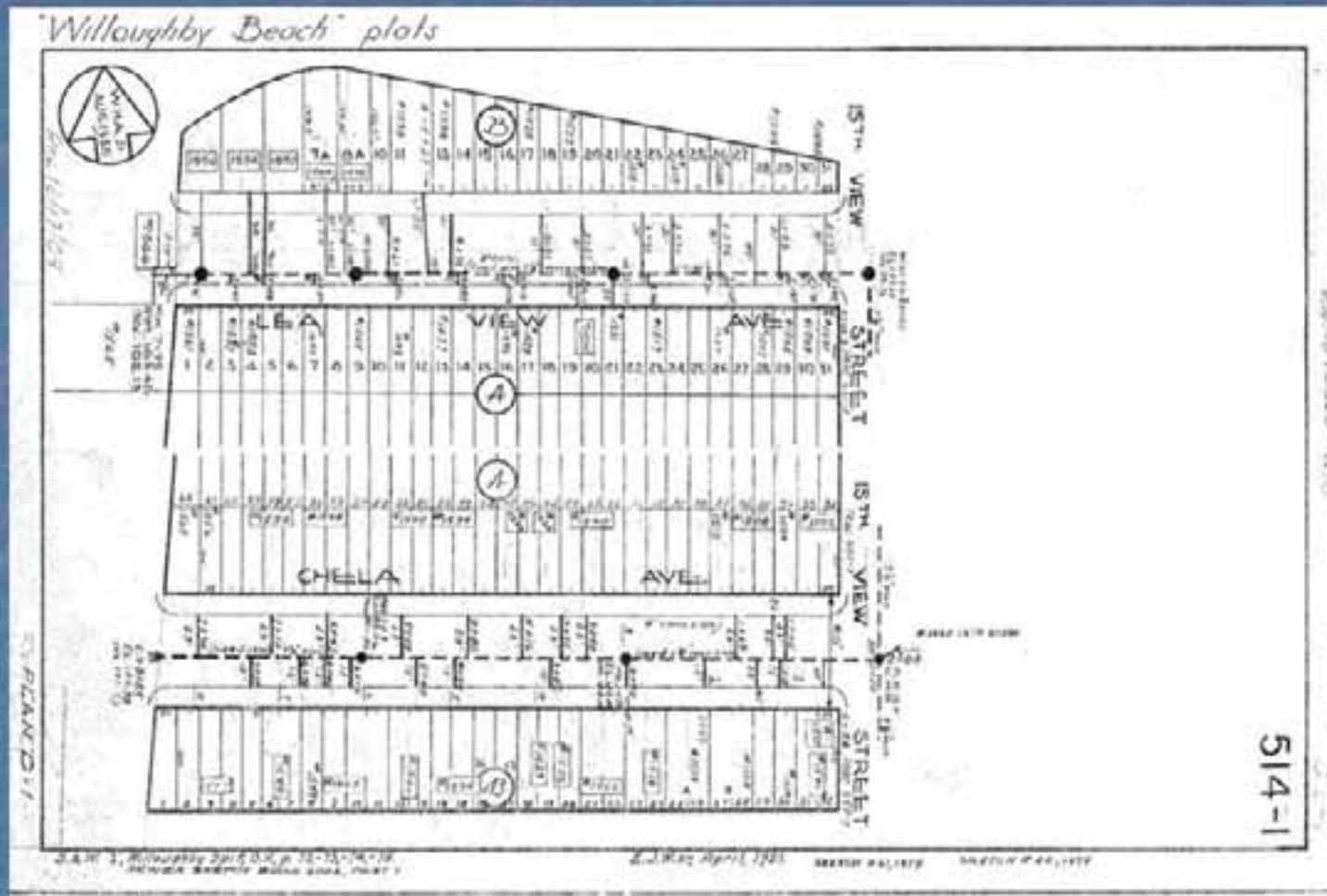


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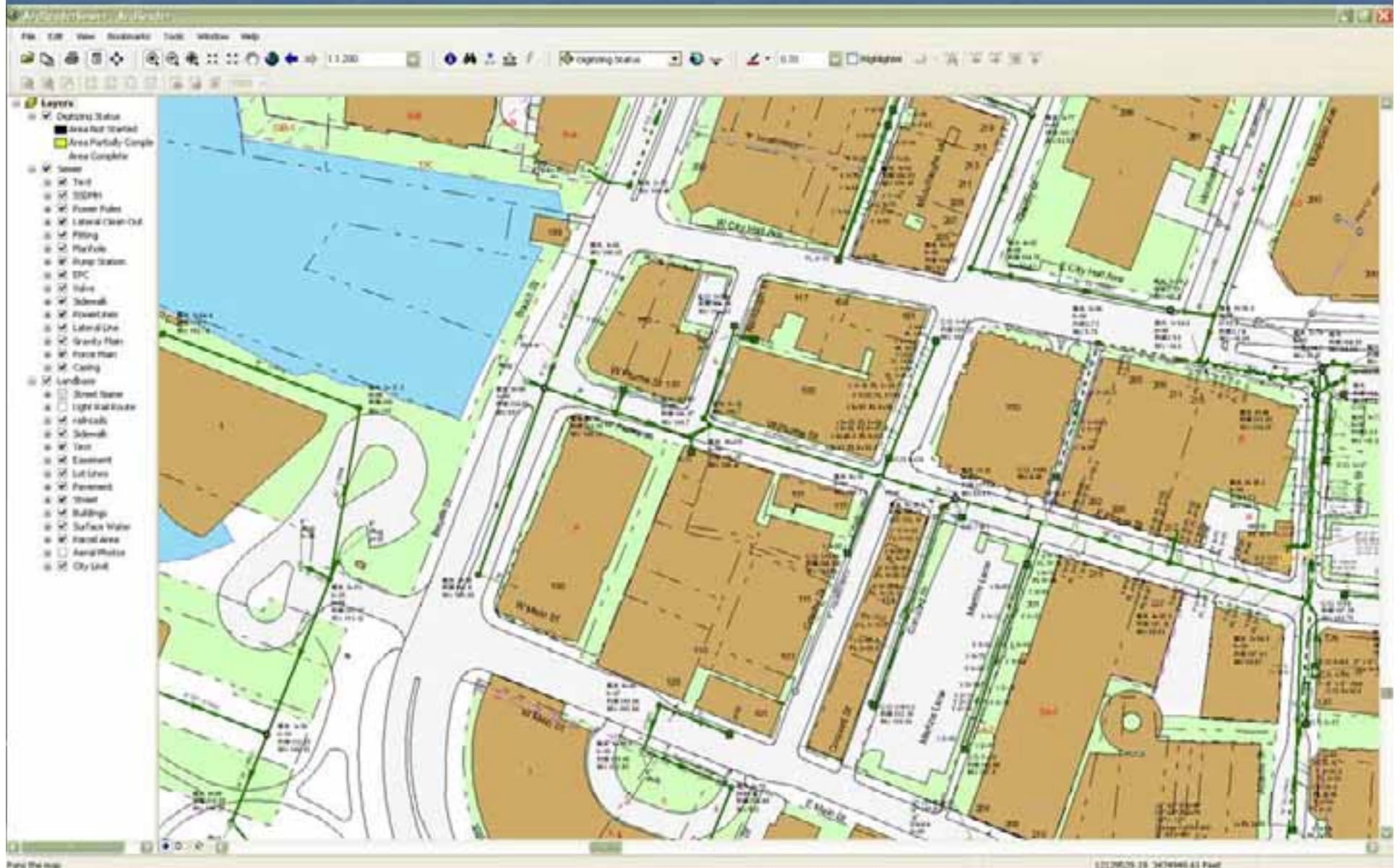
Sewer Sheet:
D-01-E-3

Old Drawings: No Uniform Scale



Other Areas

ArcReader



Reasons for ArcReader

- Ease of viewing records digitally.
- Standalone program.
- Allows easy printing of custom maps.

Implementation of ArcReader

- Packaging information
 - Field Use
- Frequency of Updates
 - Every 2 months or if major changes in shorter time
- Methodology of updating field computers
 - External hard drive
- Future of ArcReader Application
 - Will continue to update and use

Flex Viewer



Reasons for Flex Viewer Selection: Cost

- ESRI's Sample Flex Viewer is free to download, modify, and use
 - Minor modifications to Sample Flex Viewer requires only a text editor
- \$249 Standard edition for Personal/Business

Reasons for Flex Viewer Selection: Ease of Development

- Code well developed
 - Limited changes to code are easy to implement
 - Larger changes... not so much
- Large community of Users
 - More free code to add to the Flex Viewer
 - Free advice
 - From the basic: how do I get this to work on my computer
 - To the complex: how do I modify the code from the viewer to limit the search functionality to only return desired information on specific items

Reasons for Flex Viewer Selection: User Friendly Application

- Sample Flex Viewer appears to require less technical knowledge for the end user than ArcReader
 - Encourages people to use newer record system
 - Enables people to have multiple methods of getting to data

Modifications to Flex Viewer

- Config.xml
 - Text editor or Adobe Flex Builder 3
- Search Widget
 - Modified to search and identify based on limited feature classes
- Overview Map
 - Added back and forward buttons

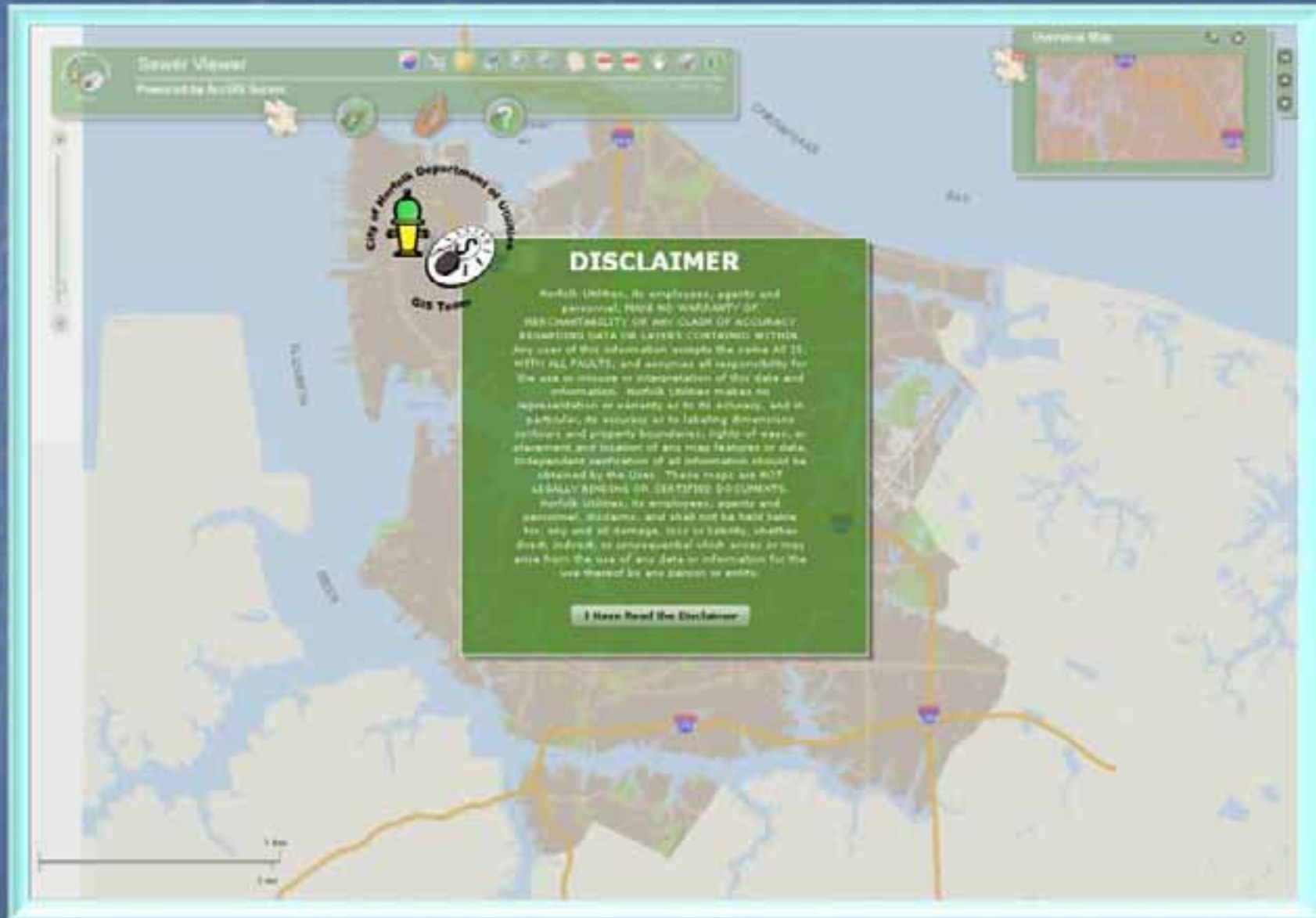
Modifications to Flex Viewer (continued)

- Added shortcut menu bar
 - Found file at the ESRI ArcGIS Server Flex API Resource Center
 - Contains icons that dock on upper right of menu bar
- Developed application specific help files
 - Enables easier learning curve for the new application

Flex Viewer Facts

- Sample flex viewer looks nice
- Minor changes easy to make
- Major changes can be a big hassle to make
- Acceptance has been greater than ArcReader by people who are not as comfortable with computers

Sewer Viewer Demonstration



Contact Information

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Department of Utilities