



Natural Gas Distribution

Cross Bore Safety

Pipeline Safety Seminar

Alabama Public Service Commission

Montgomery, December 3, 2014

**By: Mark Bruce, President,
Cross Bore Safety Association**

www.crossboresafety.org



Cross Bores - Recognized in 1976

- 2 persons killed
- 4 persons injured
- Entered house through 6” sewer lateral
- Drain cleaner punctured 2-inch plastic main.

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.S.T., NOVEMBER 12, 1976

(202) 426-8787

ISSUED: November 12, 1976

Forwarded to:
Mr. C. S. McNeer
President
Wisconsin Natural Gas Company
233 Lake Avenue
Racine, Wisconsin 53401

SAFETY RECOMMENDATION(S)
P-76-83 through P-76-86

At 8:53 a.m., on August 29, 1976, an explosion and fire destroyed a house at 6521 20th Avenue in Kenosha, Wisconsin. Two persons were killed, four persons were injured, and two adjacent houses were damaged. The destroyed house was not served by natural gas. However, natural gas, which was escaping at 58 psig pressure from a punctured 2-inch plastic main located 39 feet away, had entered the house through a 6-inch sewer lateral. The gas was ignited by an unknown source. After the accident, the National Transportation Safety Board's investigation disclosed that the gas main had been installed by boring through the bottom of the sewer tile; the gas main was perpendicular to the sewer tile. 1/

Definition

“Cross bores are defined as an intersection of an existing underground utility or underground structure by a second utility resulting in direct contact between the transactions of the utilities that compromises the integrity of either utility or underground structure.” *



Quantifying Cross Bore Issue

- Large projects up to 3 per mile
- Found at a hospital and at schools
- Small project 12 cross bores of 147 inspections
- Most expensive cross bore explosion = \$30 million, 2 girls burned
- Expected average estimate = ± 0.4 / mile.

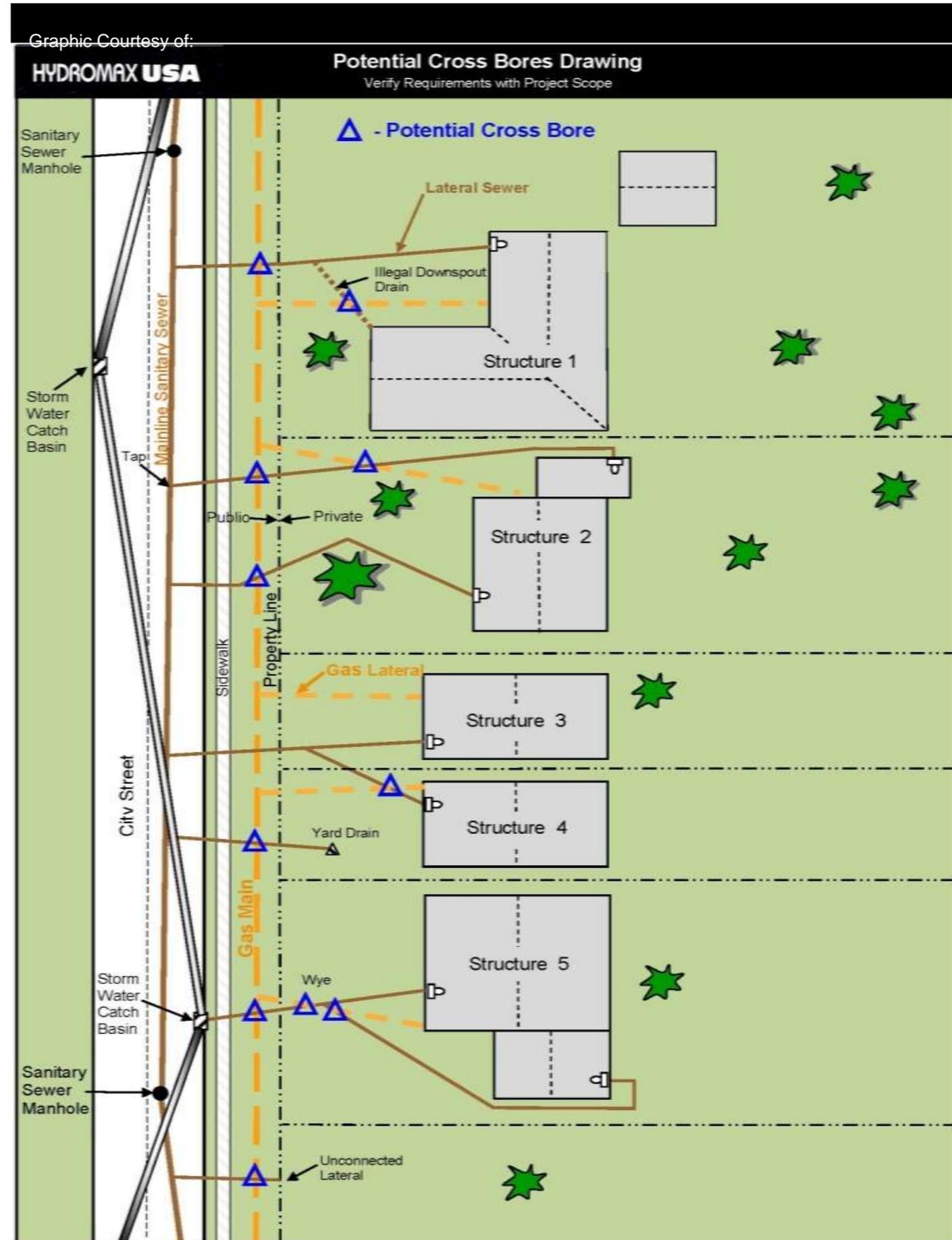
Cross Bore Risks Factors

- Trenchless construction methods used
 - slip lining / insertion of gas laterals – may reduce cross bore risks
- Sewer utilities are unknown or unmarked
- Depths of utilities are unknown
- No post construction video inspections of sewers adjacent to construction?



Potential Cross Bores

- Sanitary sewers
- Storm sewers
- Gutter drains
- Yard drains
- Cleanouts
- Offset cleanouts
- Branched laterals



Class 1 Cross Bores

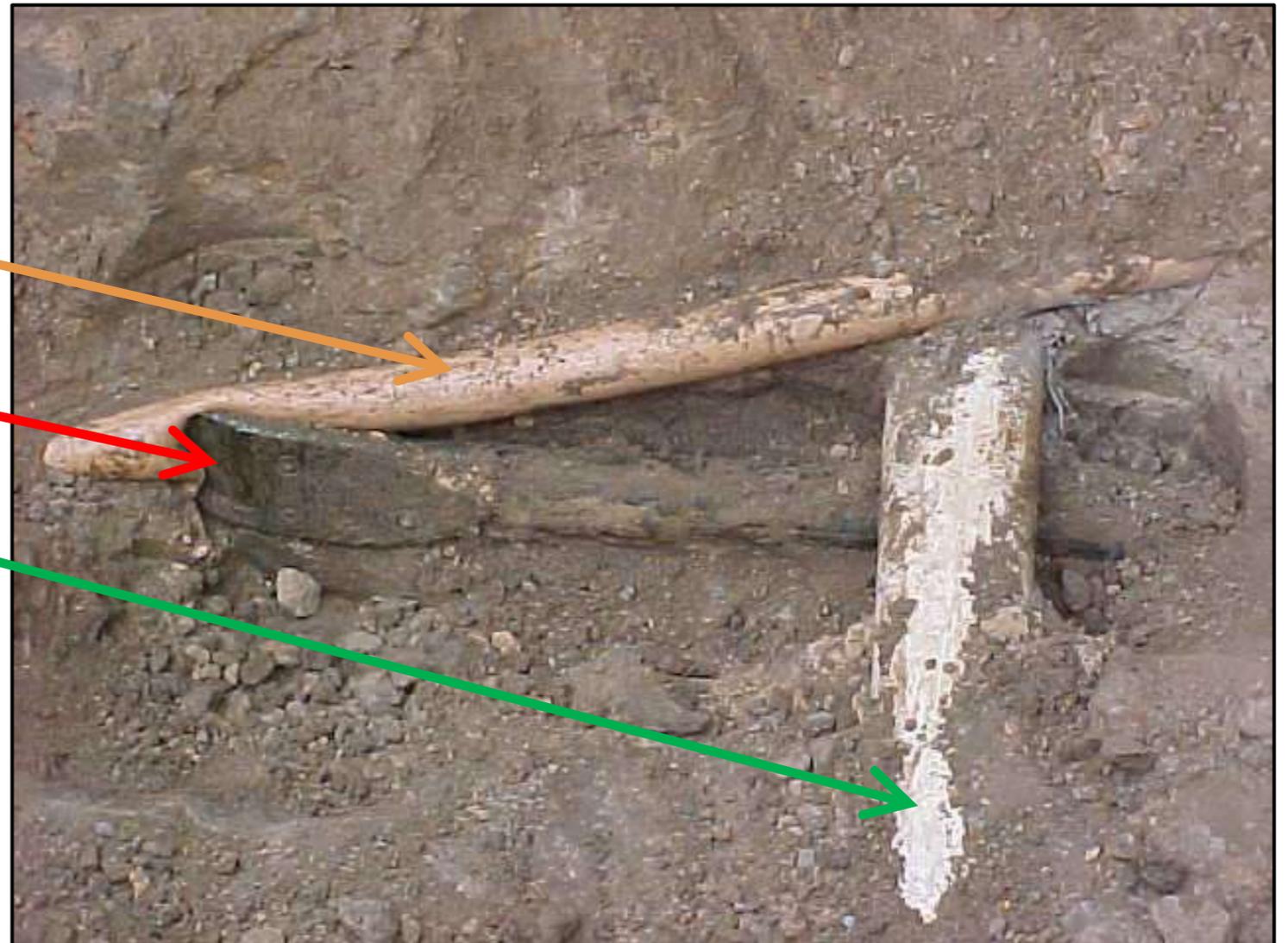


Class 1 Crossbore Explosions



Class 2 Cross Bore

Gas line
HDD tool
Sewer to house



Class 2 Cross Bore Explosion



Cross Bore Required Repairs

- Gas cross bore repairs to sewers shown on this slide cost >\$150,000.
- EPA illegal pollution, fines
- Disruptive to community



Inspection Project Planning

- Select management team
- Determine goals
 - New construction
 - Post construction / Legacy
 - Both?
- Determine reasonable timeline
 - Large systems >15 years for legacy?
- Communicate with utility commission early
- Develop processes & quantify volume
- Determine budget, get approval & funding





Program Elements

- Trial program before ramping up final program
- Allow only proven high confidence processes & tools that are repeatable and verifiable (auditing)
- QA/QC all work results – 100% video, GPS verification, time stamp of work and GIS verification full limits are inspected
- Data shall integrate with the GIS systems and utility's mapping standards & other needs of gas utility
 - Property risk status – call center can verify “cleared”
 - DIMP reporting
 - Future construction plans



Community Outreach

- Integrate community outreach program early
 - Include residents
 - Include plumbers & drain cleaners
 - Include drain cleaning rental companies
 - Include municipalities & sewer utilities
- Media methods
 - Door hangers, meetings, mailings, TV news, website, social media
- Emphasis safety efforts for newly recognize risk
- Ask for help and cooperation from all

Community Outreach Video



Online Links to Video:

<https://www.pse.com/safety/NaturalGasSafety/Pages/Blocked-Sewer.aspx>

<http://www.youtube.com/watch?v=jPAR-3YiSEM&feature=youtu.be>

Plumbers Beware!



Effective July 1, 2002, the Virginia Underground Utility Damage Prevention Act ("Act") was amended to require that any plastic or other nonmetallic utility lines installed underground shall be installed in such a manner as to be locatable.

Be a damage prevention partner.

You can do your part by ensuring that any nonmetallic utility line that you install underground meets the requirements of the Act. By doing so, you will be complying with the law and helping reduce the possibility of the sewer line being bored through in the future, and most importantly protecting the citizens and communities you serve!

Underground Utility Color Codes

-  RED - Electric Power Lines, Cables, Conduit and Lighting Cables
-  YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials
-  ORANGE - Communications, Alarm or Signal Lines, Cables or Conduits
-  BLUE - Potable Water
-  PURPLE - Reclaimed Water, Irrigation and Slurry lines
-  GREEN - Sewer and Drain Lines
-  PINK - Temporary Survey Markings
-  WHITE - Proposed Excavation

This brochure should be used for educational purposes only. It is not intended to be an opinion, legal or otherwise, of the State Corporation Commission.

Plumbers Beware!

A blocked sewer line may be the result of another utility line (gas, electric, telecommunications) having been accidentally bored through the sewer line.



Attempting to clear this type of blockage can result in a serious accident involving loss of life, injuries, and significant property damage.

Please follow the precautionary measures in this brochure to help prevent such accidents.



Prepared by
Virginia State Corporation Commission
Division of Utility and Railroad Safety

Order Instituting Rulemaking to Develop a Risk-based Decision-Making Framework to Evaluate Safety and Reliability Improvements and Revise the General Rate Case Plan for Energy Utilities.

FILED
PUBLIC UTILITIES COMMISSION
NOVEMBER 14, 2013
SAN FRANCISCO, CALIFORNIA
RULEMAKING 13-11-006

CASE STUDY
SUBMITTED BY
SAN DIEGO GAS & ELECTRIC COMPANY
AND SOUTHERN CALIFORNIA GAS COMPANY

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March 11 2014



Cross Bore Solutions in Practice

AGA American Gas Association

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Pipeline Safety Reauthorization

Distribution

Transmission Pipelines

Other Advocacy

Agency Notices

AGA Comments

Technical Reports/Papers

Industry Practices

SoCalGas

For Your Home | For Your Business

Safety

- Safety at Home and Work
- Contractor Safety
- Call 811 Before You Dig
- Natural Gas Odor Fade
- Clearing an Exterior Sewer Line
- Purging Gas Lines for Maintenance
- Emergency Information
- Pipeline Safety
- Aliso Canyon Storage Facility Project
- Playa del Rey Storage Operations
- Safety Brochures
- Scam Alert!

Natural gas

Plumbing Alert: Natural gas sewer lines outside of

A blockage in an exterior sewer line is a rare chance that a natural gas line is installed. If this occurred, an

Gas

If you need to clear an exterior sewer line, call SoCalGas at 1-800-427-2 or visit the site to determine no charge to you.

Safety Steps for Clearing

OTD

Cross Bores - Best Practice and Outreach Program

Member Login

Home

About Us

Available Reports

Submit Your Idea

News Room

Upcoming Events

Cross Bores:

The OTD cross bore program provides information to operators, the sewer operators, the sewer program can reduce toward the prevention of internal and contractor developed, this program technology to be

The following outreach program:

- Cross Bore Best Practice
- Cross Bore Best Practice
- Cross Bore Best Practice
- Cross-Bores - Best Practice PowerPoint presentation appropriate sectors
- Cross Bore Quick Reference (printable on 8 1/2" x 11" Dispatch)
- Two-sided tailgate signs to be used by field
- Two-sided tailgate signs to be used by field
- Three How-To videos
 - Plumber - to install
 - Training Field Installations
 - Homeowner/Inspector - to identify clogged sewer

Cross Bore Information

Numerous associated safety. This listing is information:

- Cross Bore Safety
- Common Ground
- American Gas Association
- Distribution Conference
- Call Before You Dig

CITY OF PALO ALTO

View Text Version | Tuesday, December 2, 2014 | The City | Resident

Visiting | Doing Business | Government | Services | Community Partners | I want to...

RESIDENTIAL

Utilities Home | Pay My Bill | Rebates | Programs | Projects | Safety | Outages

City Home > ... > Utilities Programs for Residential Customers > Utilities Safety Information > Cross

Crossbore Inspection Program

NAVIGATION

- Government Home
- Departments Home
- Utilities Home
- Residential Home
- Safety Home
- Cross Bore
- Gas Safety When Working at Your Home
- Gas Safety for Homes with Slab Foundations

Customer Service

New Services

News

Outages

Rebates

The City of Palo Alto

Starting in 2011

to ensure

Cross

The City of Palo Alto LLC is the contractor work began in v through Decem crossbores have

Check out this some background program is add

You do not need trucks will get to

...to minimize the risk for injury, loss of life and property damage from utility cross bores

CBSA

Announcement

If you are interested in reducing risk from cross bores from all types of utilities, this is the best opportunity to get involved. Read the featured article to the right.

Contact us today to join the Best Practices creation effort.

Home

History

News & Articles

Best Practices

Legacy Cross Bores

New Construction

System Integrity

Risk Evaluation

Drain Cleaner Safety

Videos

Photos-Cross Bores+

State Regs and Rulings

Papers and Presentations

Tools and Technology

Information Sources

Join Now - Membership

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Best Practices

CBSA Best Practices Development for Cross Bores

Discussion of the Consensus Driven Process For Elimination of Existing Cross Bores and Prevention of Future Cross Bores

August 19, 2014

This summary was co-written by Mark Bruce, President of the Cross Bore Safety Association, and Greg Scoby, Cross Bore Safety Association board member.

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August 19, 2014

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Introduction

The purpose of the Cross Bore Safety Association is to bring people and organizations together to create comprehensive high quality standards, guidelines, best practices, means and methods, courses, training, instructional materials and other related resources for the education and training of owners, installers, regulators, users, inspectors, maintainers and others who can benefit



Prioritize – Higher Risk First

- Higher occupancy – schools, hospitals, apartments
- Difficult to evacuate
- Higher pressure mains
- New gas installs
 - Cross bore may cause backup soon after installation
- Areas where multiple utilities are likely to be near the same elevation
 - High water table, rock, slab home construction affect utility locations

Mainline Cameras w/ Lateral Launch Camera

- Inspect mainline sewers for cross bores through manholes
 - 550 feet from manhole
 - Determines # of laterals, structures may have multiple
- Inspect lateral sewer up to 120 ft from sewer tap in good conditions



Lateral Line Traces could remain flagged / spray painted until Gas Line installation crews arrive...

This trace line has bends in the line...which are now reflected in GIS



Push Cameras

- Manual push camera on stiff cable
- Distance to 200 ft or more of cable
- Used when mainline robotic cameras do not reach required limits of inspection
- Video, depth and GPS loaded into GIS mapping



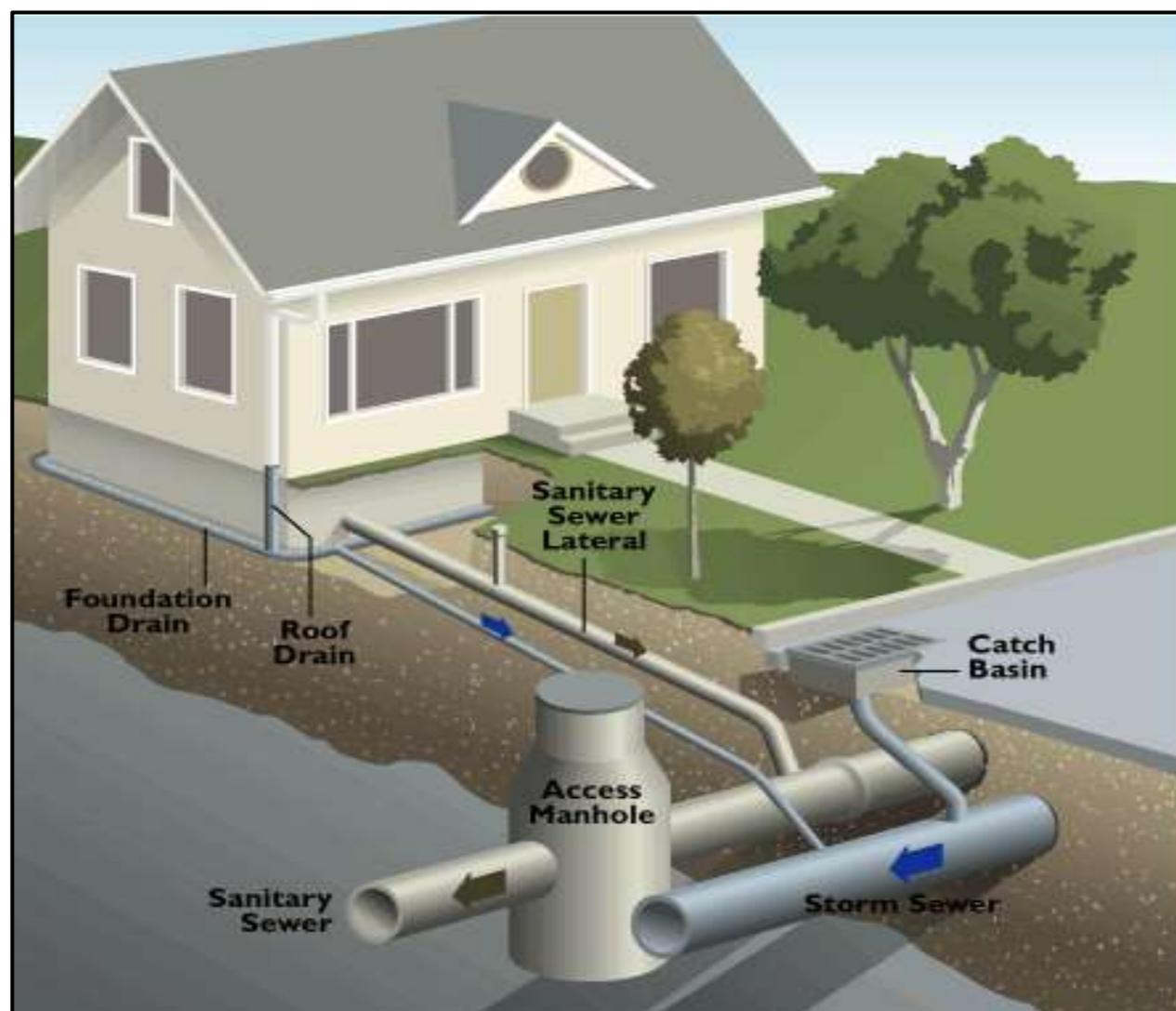
Sonde - Radio Frequency Transmitter & Camera

Locator, Frequency Generator, Sonde & GPS

- Locator - horizontal and vertical
- Sonde - (behind camera) transmits to above ground walk over receiver
- Frequency induced (energized) in tracer conductor transmits to receiver
- Receives signal determines depth and horizontal position of signal
- GPS records location for GIS mapping

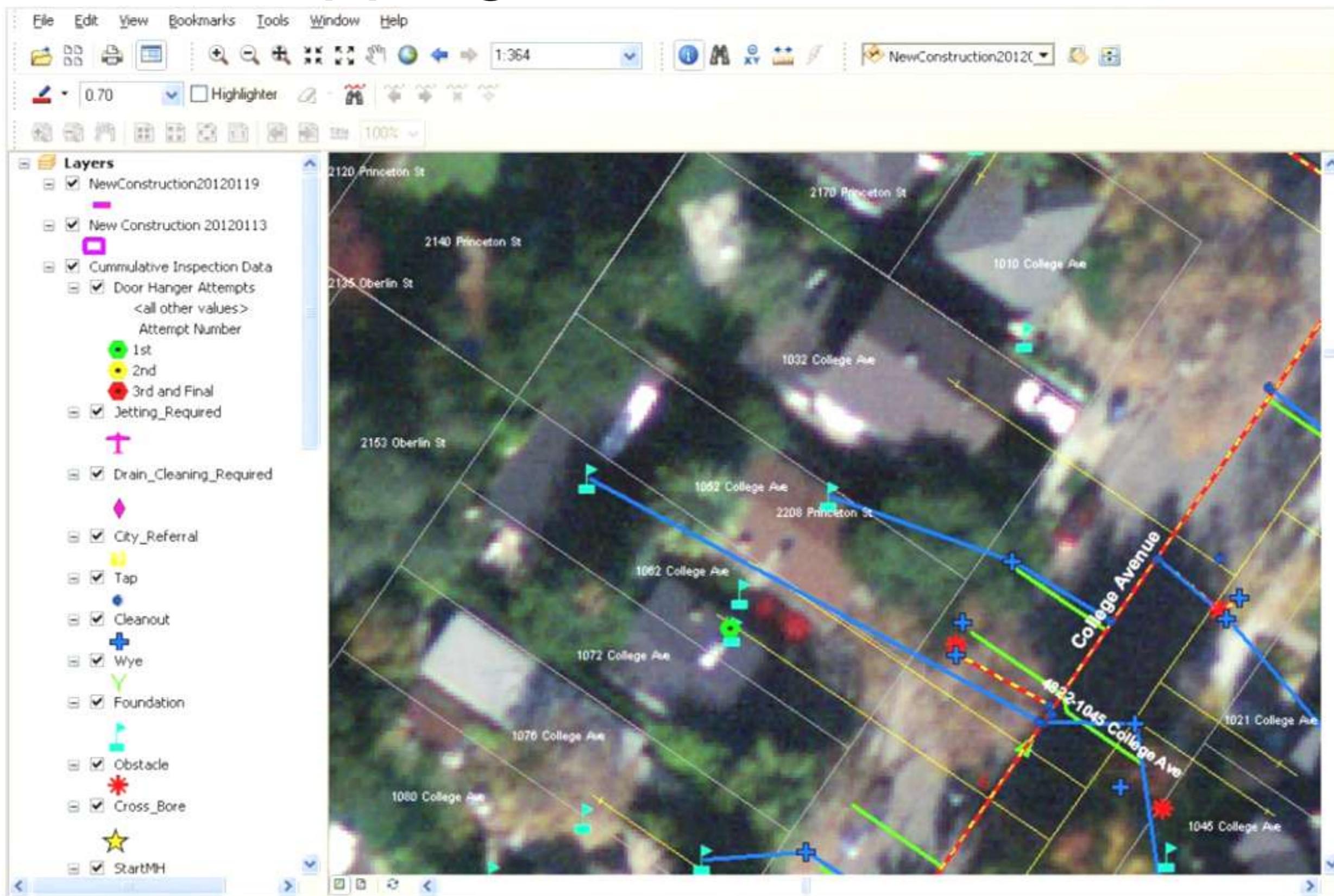


Residential Plumbing Connection to City Sewers



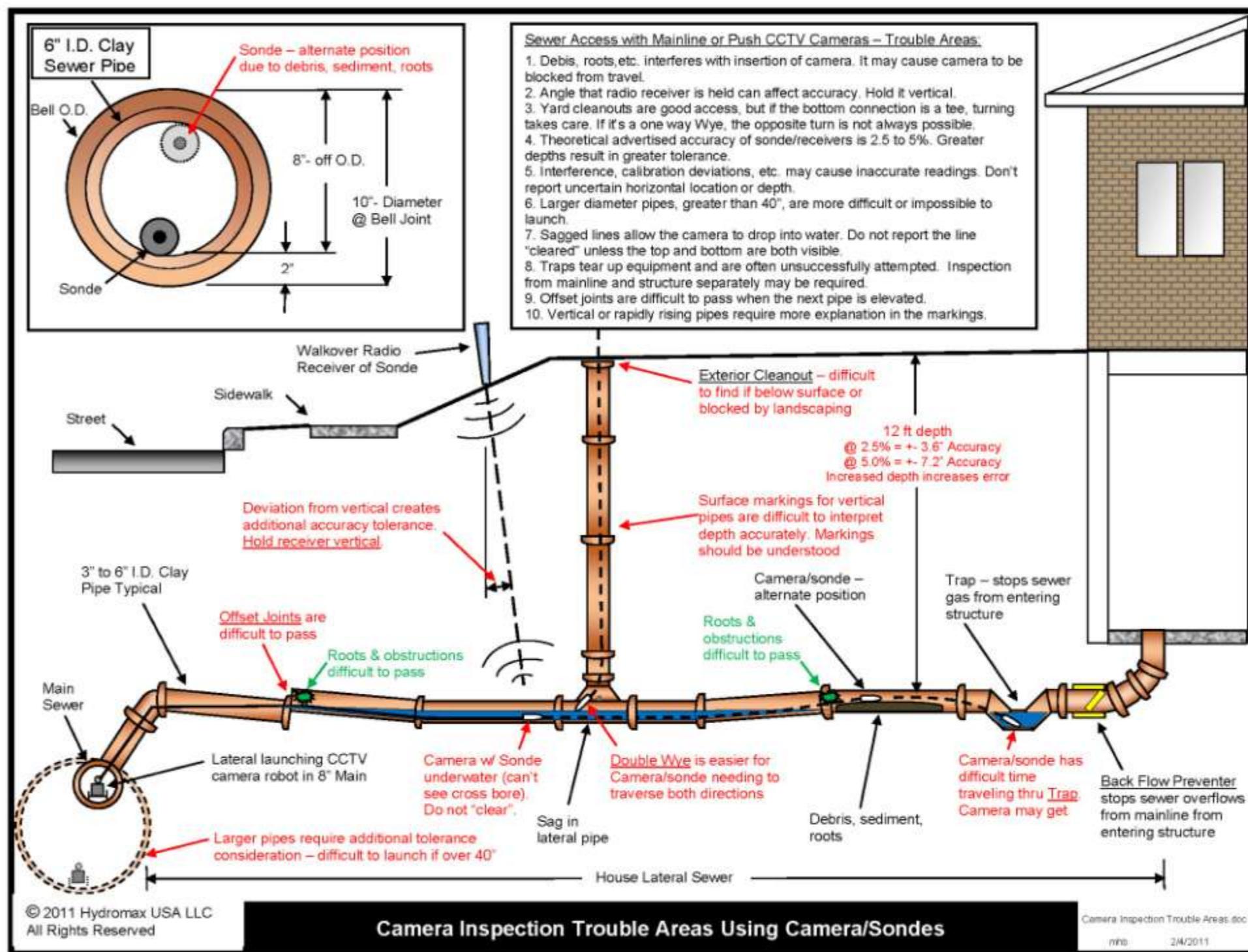
House with 5 mainline sewers on perimeter

GIS Mapping – Visual Data Results



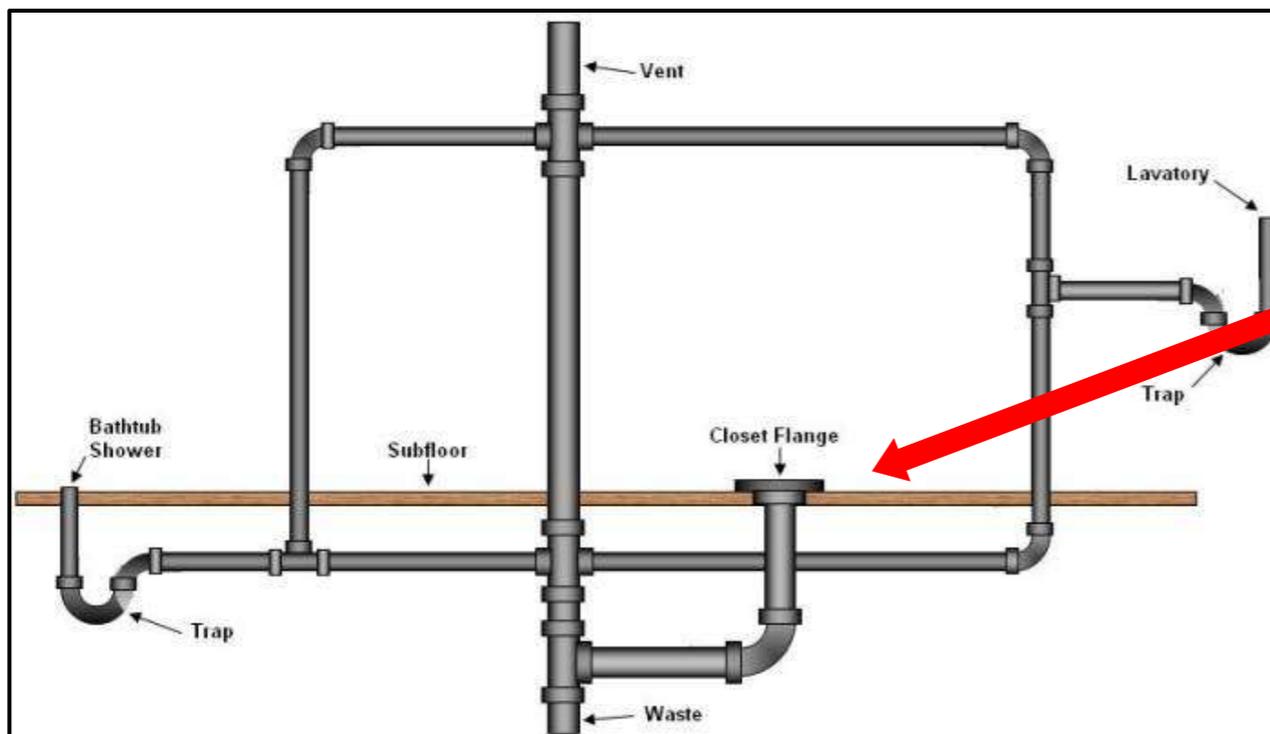
Camera Inspection Trouble Areas

- Water in sags
- Roots
- Sonde Angle
- Sonde Position
- Traps
- Back flow preventers



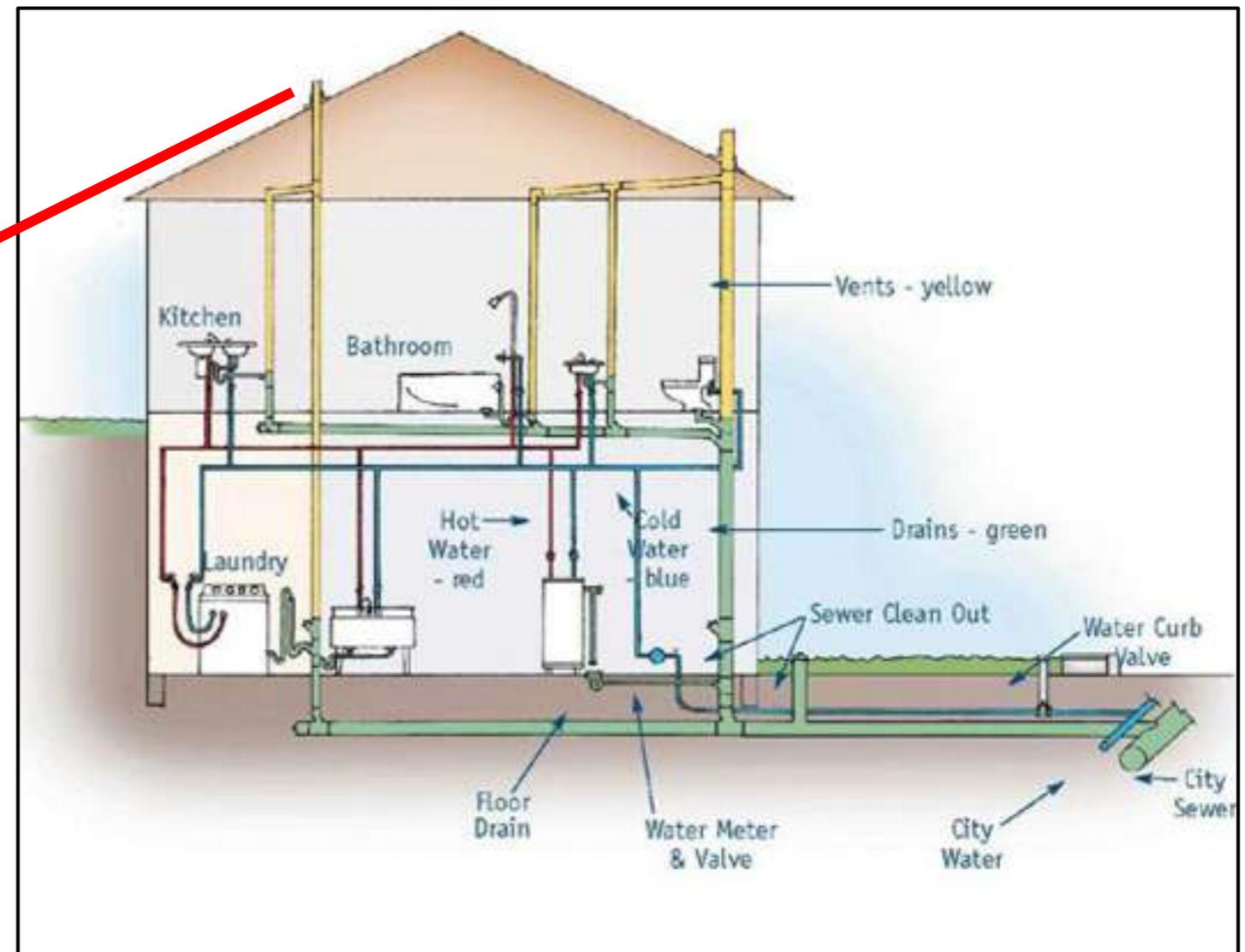
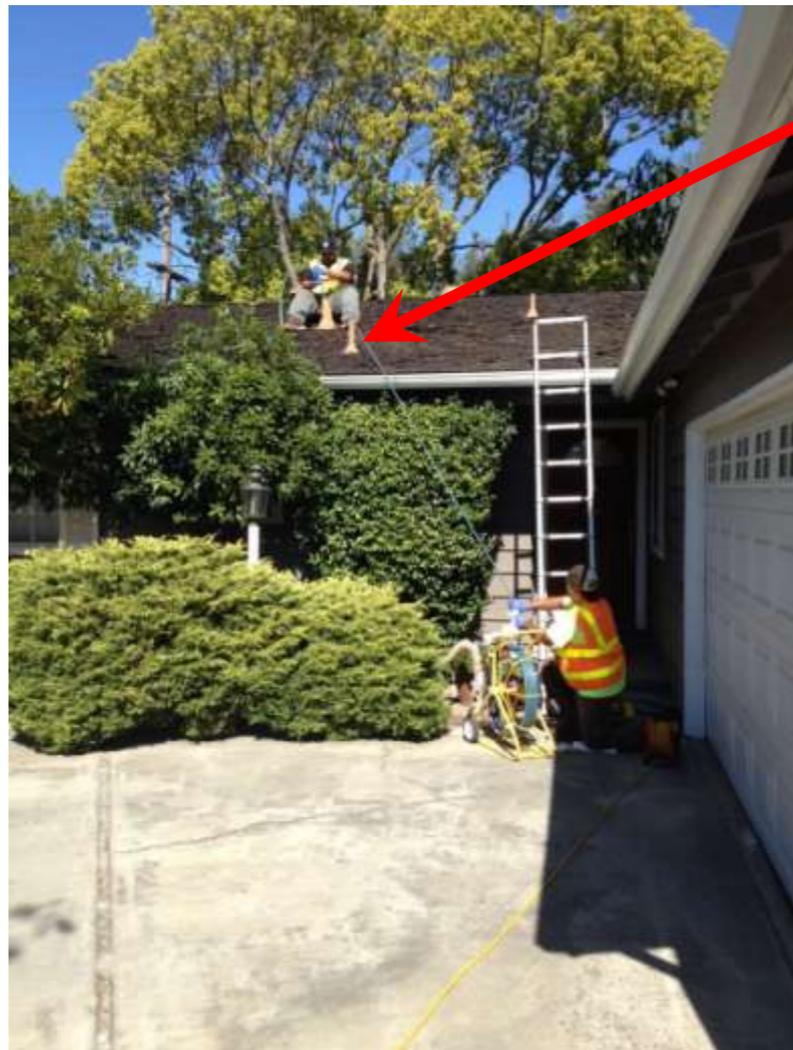
When Exterior Access is Limited or Pipes Impassable

- Interior access through pipe, roof vents or interior cleanouts
- Permission from owner



Roof Vent Access

- Usually only 1 story houses
- Permission from owner
- Protect from falls



Roof Vent Access



Cross Bore

Sample Cross Bore Report

HYDROMAX USA

Cross Bore Report

Date: 2/5/2014

Address: 222 3th Ave W
City, ST 88888

Parcel Number: 69175
Claim Number: 8870/351
Crew Operator: Jarred Stull Sewer
Asset Type: Service Lateral
Distance from Mainline Tap (for lateral sewer cross bore): 25' upstream from mainline tap.
Distance from Manhole (for main sewer cross bore): NA
Sewer Diameter: 4"
Sewer Pipe Material: Concrete Pipe
Gas Mapping Review:
Gas Asset Type: Mainline
Gas Line Diameter: 6"
Gas Line Material: MPE
Gas Installation #: 95385
Gas Installation Date: 1/1/1996
Yrs/Mos Since Install: 18yrs/1mos
Installation Method:
Hole Hog HDD Unknown

Type of Inspection:
 Emergency (if checked fill in below)
 Time Call Received _____
 Arrival Time _____
 New Construction
 Legacy

Cross Bore Type:
 New Construction
 Legacy

Job Type:
 Simple Service
 Main & Service
 Main with Test & Ties

Primary Equipment Used:
 Mainline Lateral Launch CCTV
 Push Rod CCTV
 Other (specify): _____

Additional Equipment Used:
 Mainline Lateral Launch CCTV
 Other (specify): _____

Additional Notes:



Aerial Photo

←



Above Ground Site Photo

←



Interior Pipe Photo

←

Cross Bore

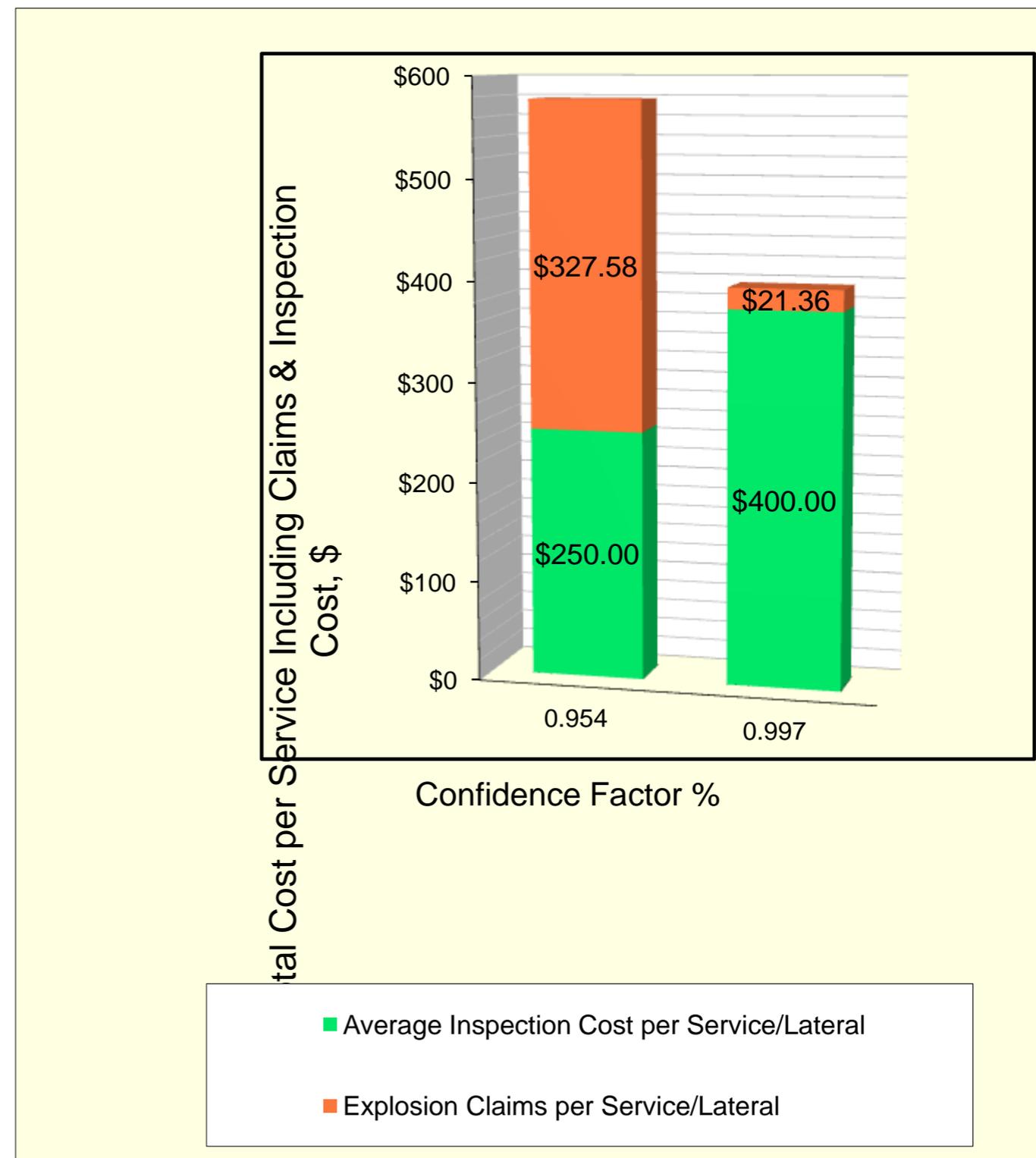


Evaluation of Higher Confidence Evaluation

Based Upon Total Gas Services in U.S. and Canada = +/- 75,000,000		
Confidence Factor of Locate / Inspection Processes	95.4% (2 σ)	99.7% (3 σ)
Total Cross Bores Expected to be in Project Area	267,000	267,000
Cross Bores Expected to be NOT Found	12,288	796
Cross Bores Not Found & Expected to Result In Explosion Claims, expect 20% <u>will</u> result in explosion.	2458	159
Expected \$ Cost of Cross Bore Explosion Claims	\$24,580,000,000	\$1,590,000,000
Explosion Claims per Total Services in Project Area	\$328	\$21
Avg. Inspection Cost per Lateral Estimated, (Note: excludes program management, scoping, data storage costs – variable as to trenchless usage and sewer configurations)	\$250	\$400
Total Apparent Cost per Service/Lateral	\$578	\$421
Net Cost Savings, 2 σ vs. 3 σ	\$13.6 Billion <u>Savings</u> & <u>Many Lives</u>	

High Confidence Processes Saves \$

- Net cost of high confidence work is less expensive¹.
- Higher percentage of explosions from lower confidence processes.
- Net savings = US\$12 Billion
- Less impact on reputation
- Less impact on regulatory rate making process



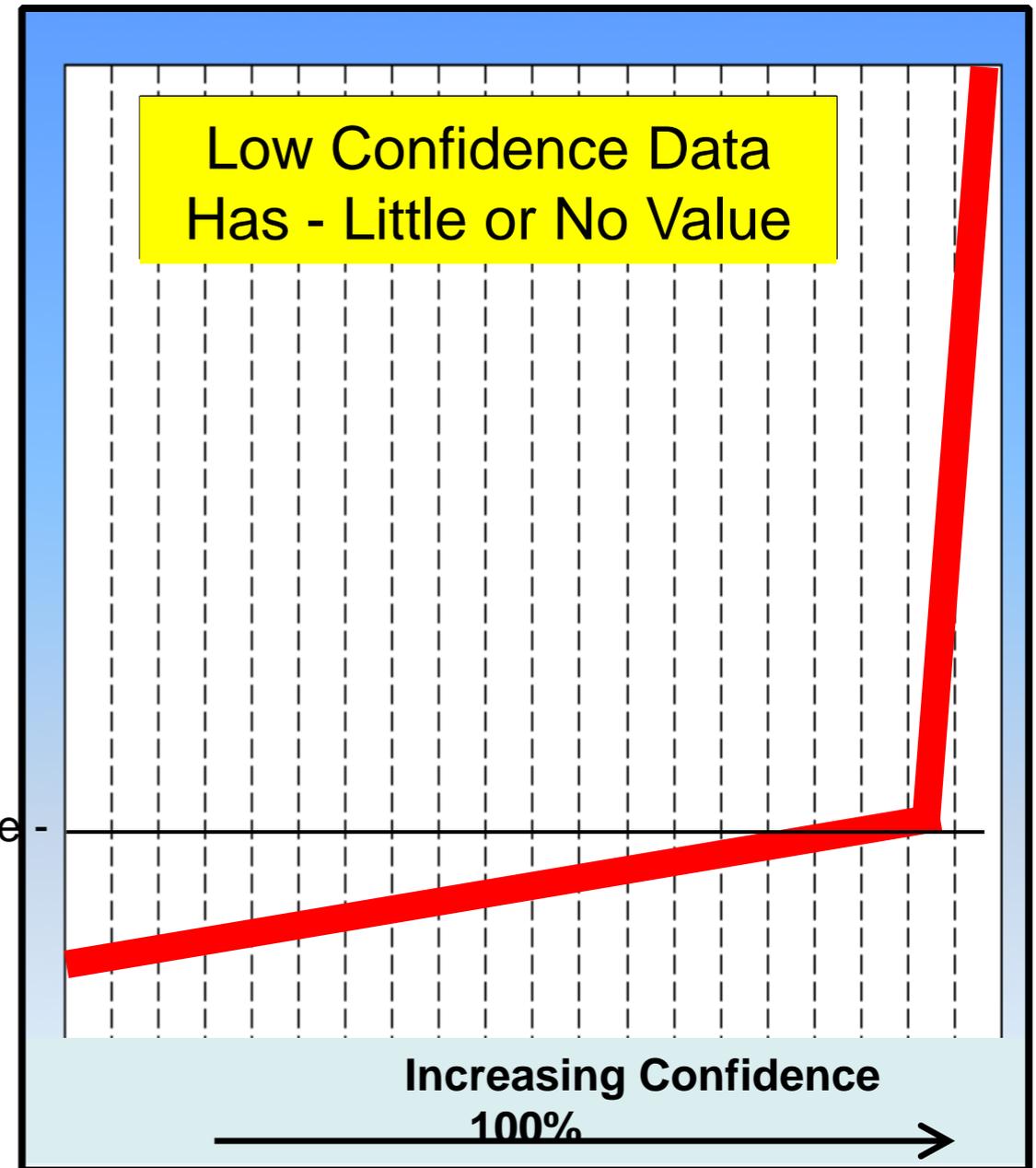
¹ Creating High Confidence Results for Cross Bore Elimination Projects, NoDig 2012 Conference, M. Bruce & J. Graham, revised

Value Increases with Higher Confidence Processes

- Low confidence results create false security
- Low confidence results may have negative value
- Low quality work may have to be completely reworked.

100% Value -

0 Value -





OK – What's The Cost – An Estimate

- Approximately – 75,000,000 service in U.S. and Canada
 - 60% of legacy pipes need inspections, estimate
 - = 45,000,000
- Expected increase during next 2 decades
 - 1.2% new services per year
 - 25% compounded
 - = 18,750,000
- Total = 63.8 million services need inspection
- Avg. cost inspections + program management
 - High confidence >\$400 avg. = >\$25 billion + damages
 - Low confidence >\$250 avg. = >\$16 billion + damages



Proven Rules

- Records are only as good as original accuracy
- Records must be readily accessible to be useful
- When visual evidence is not conclusive, additional measures must be taken rule out existence of crossbores
- There is no accurate way to predict the path of sewer lines on private property
- Lateral launching systems from mainline will provide indications of all taps/laterals serving a parcel
- One gas cross bore is too many



Survey

1. Were you aware of cross bore risks before today?
2. Does your company have plans for cross bore reduction and elimination?
 1. Time line: 5, 10, 20 years duration?
3. Does the magnitude of costs / benefits appear appropriate?
 1. Too high of cost?
 2. Too low of cost?
 3. Roughly agree?
4. New ideas to reduce new & eliminate legacy cross bores?



Questions?

For more information on cross bores:
www.crossboresafety.org