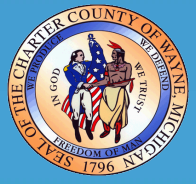
Wayne County Illicit Discharge Investigator Training Program



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Program Outline

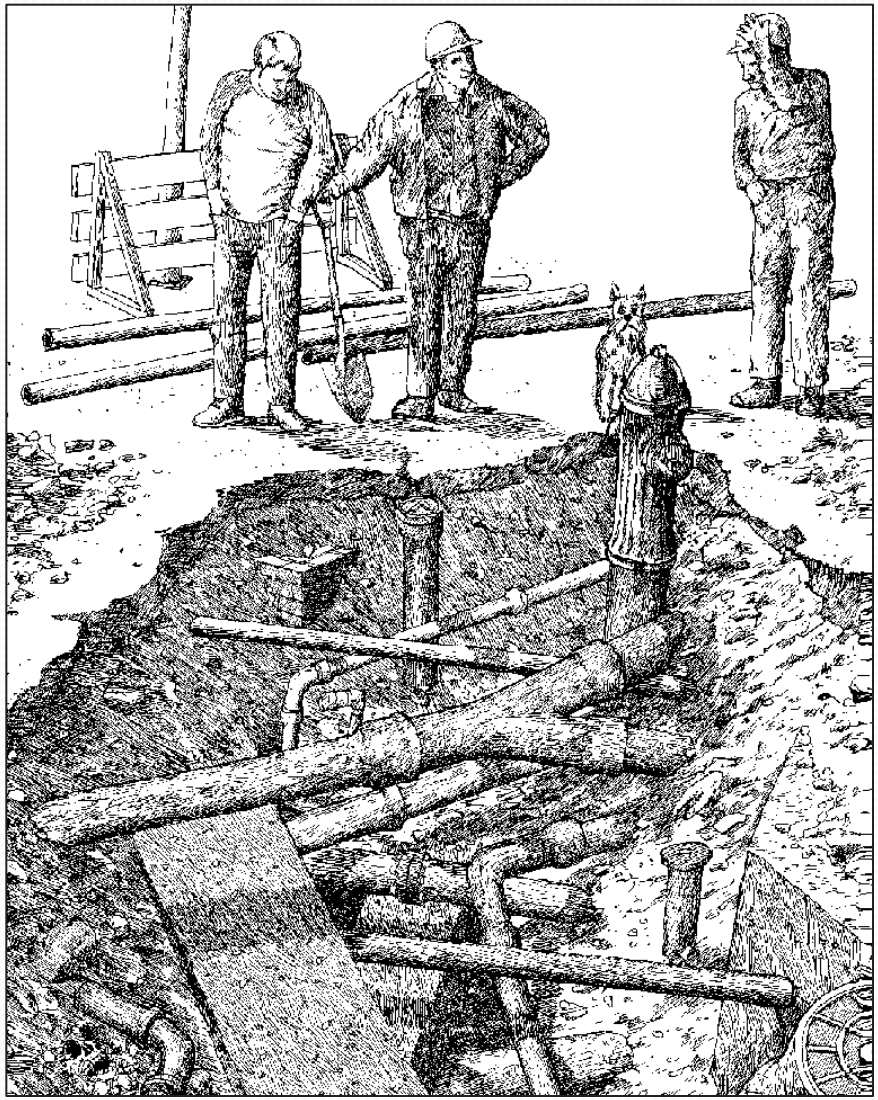
- **Introduction**
- Basic Investigations
- Advanced Investigations
- Prevention Considerations
- Case Studies
- Tabletop Exercise

WHAT IS AN ILLICIT DISCHARGE?

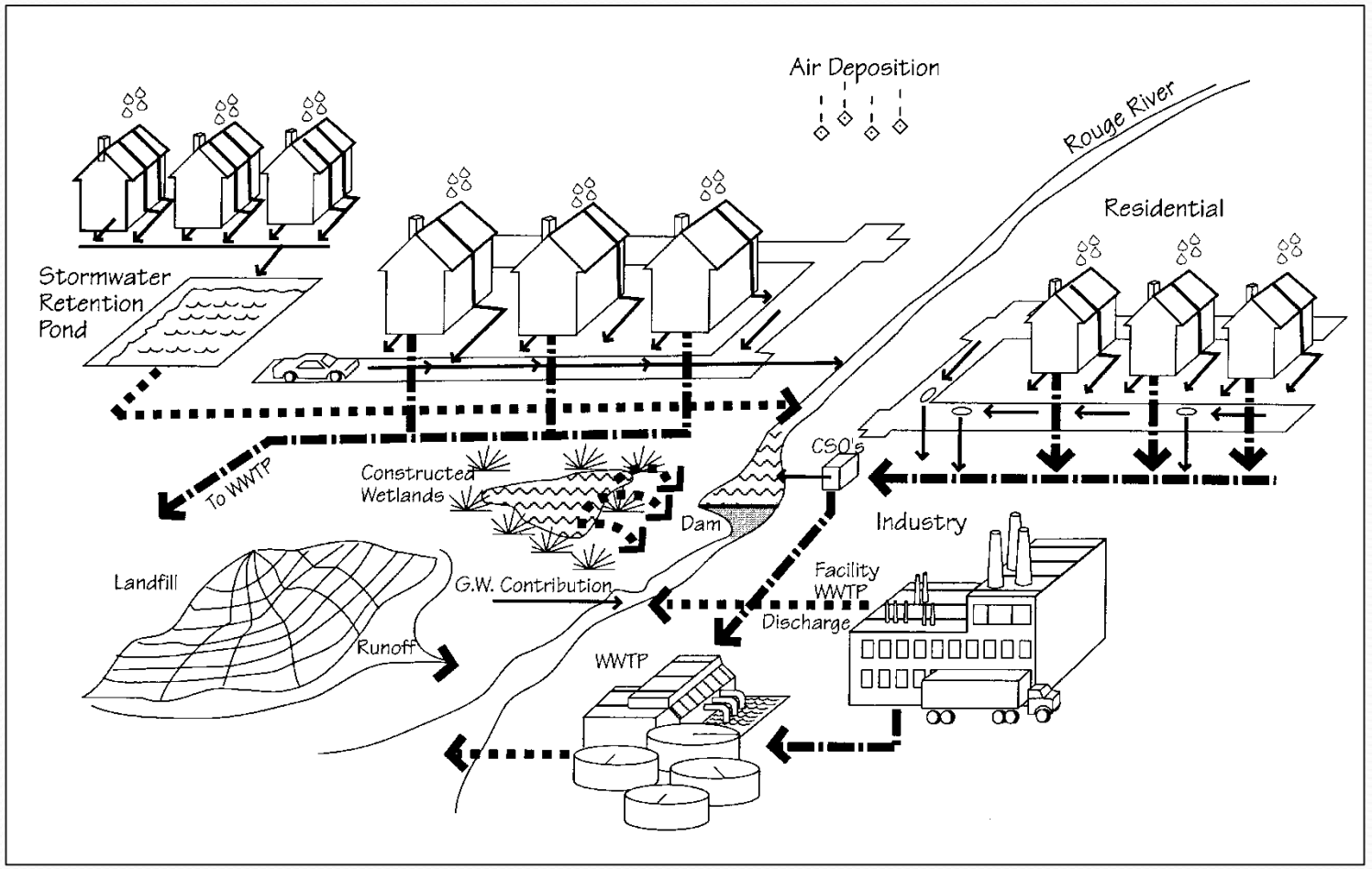
- Failing septic field
  - When sanitary sewage escapes an on-site sewage disposal system and migrates to a water course
- Spilling or dumping
  - Mishandling materials in a manner which allows those materials to migrate to a water course
- Illicit Connection
  - Creates an illicit discharge

WHAT IS AN ILLICIT CONNECTION?

- When a pipe intended for a sanitary sewer ends up in a storm drain



WHAT ARE WE TRYING TO VERIFY?

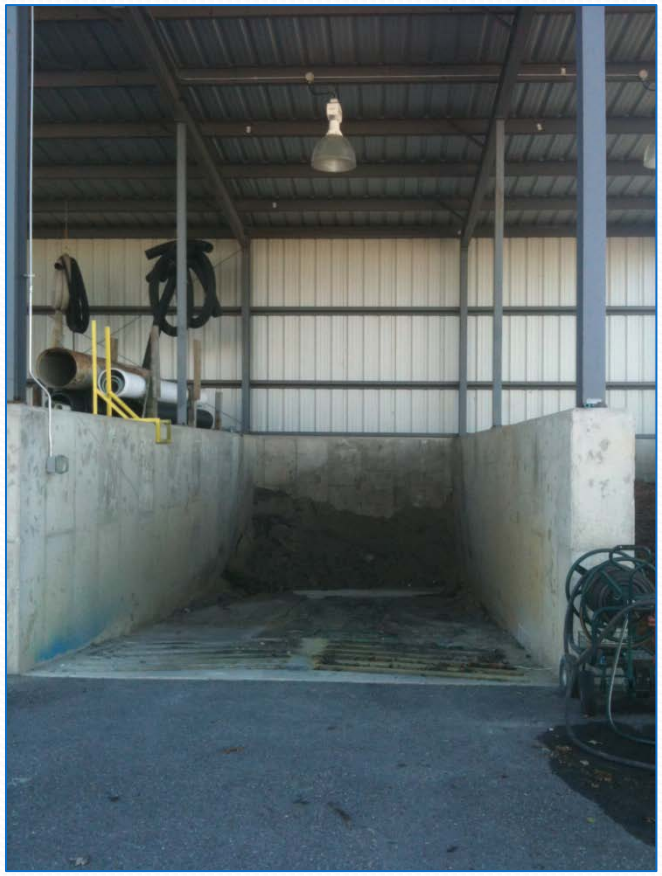


WHAT CAN THE FIELD STAFF DO TO CLEAN UP OUR ENVIRONMENT?

- Be an alert observer
- Report suspicious discharges

Remember - even small discharges are large pollutant sources if they pollute day after day after day…

APPLICABLE TO DPW YARDS AND OPERATIONS



Program Outline

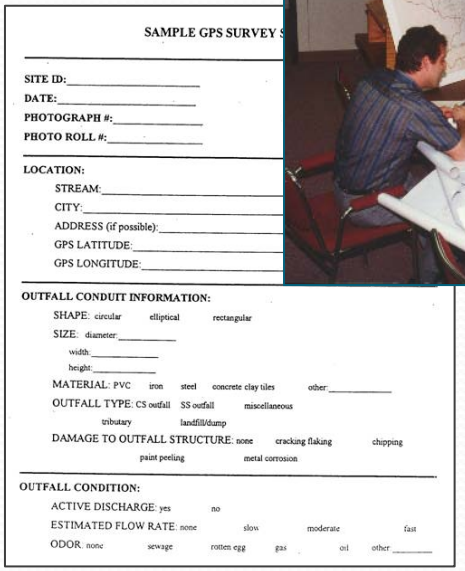
- Introduction
- **Basic Investigations**
- Advanced Investigations
- Prevention Considerations
- Case Studies
- Tabletop Exercise

WHAT IS THE PURPOSE OF AN OUTFALL SURVEY?

- Locate outfalls
- Identify areas with potential illicit connections/discharges
- Determine conditions of outfall structures
- Locate potential sample collection points
- Identify failing septic systems
  along streambanks
- Locate abandoned dumps
  along streambanks

FIELD PLANNING & PREPARATIONS

- Pre-survey planning
  - Identify area
  - Prepare data collection method
  - Develop sampling method, if necessary
  - Community notification
  - Examine sewer maps
  - Identify outfall ownership
  - Assemble equipment
  - Survey form



SAMPLE GPS SURVEY S

SITE ID:_____
DATE:_____
PHOTOGRAPH #:_____
PHOTO ROLL #:_____

LOCATION:
STREAM:_____
CITY:_____
ADDRESS (if possible):_____
GPS LATITUDE:_____
GPS LONGITUDE:_____

OUTFALL CONDUIT INFORMATION:
SHAPE: circular elliptical rectangular
SIZE: diameter:_____
width:_____
height:_____
MATERIAL: PVC iron steel concrete clay tiles other:_____
OUTFALL TYPE: CS outfall SS outfall miscellaneous
tributary landfill/dump
DAMAGE TO OUTFALL STRUCTURE: none cracking flaking chipping
paint peeling metal corrosion

OUTFALL CONDITION:
ACTIVE DISCHARGE: yes no
ESTIMATED FLOW RATE: none slow moderate fast
ODOR: none sewage rotten egg gas oil other:_____

FIELD PLANNING & PREPARATIONS

- Personnel safety
  - Property rights
  - Traffic control
  - Confined space entry
  - Opening of manhole covers
  - Exposed barrels
  - Crew size
- Communication & security
- Personal safety equipment
- Insects & animals
- First aid
- Terrain
- Plants

OUTFALL SURVEY

- Field procedure
  - Photographs
  - Measurements
  - Location/GPS
  - Type of outfalls

- Record physical condition of outfall/headwall
- Record stream conditions
- Other observations
- Ownership verification

TYPES OF OUTFALLS

OUTFALL SURVEY: SUSPICIOUS DISCHARGES

- Recognizing the signs
- Potential pollution sources
- Describe on outfall survey form
- Sampling

OUTFALL SURVEY: SUSPICIOUS DISCHARGES

- Stream bank observations
  - Exposed fill
  - Erosion
  - Discharging septic systems
  - Former landfills
  - Dump sites

Former landfill site

OUTFALL SURVEY:

DISTINGUISHING VISUAL OBSERVATIONS

- Sewage discharge
- Non-sewage discharge
- Natural phenomena

SEWAGE DISCHARGE

- Gray/Black water/staining

SEWAGE DISCHARGE

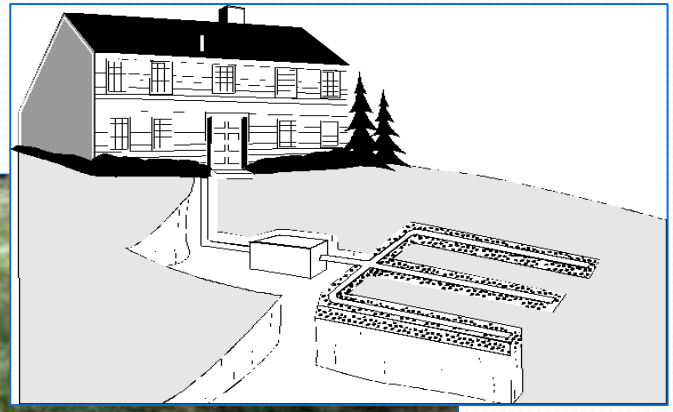
- Sewage Fungus

SEWAGE DISCHARGE

- Oil and paper

SEWAGE DISCHARGE

- Failing drain field



SEWAGE DISCHARGE

- Septic system discharge

NON-SEWAGE DISCHARGE

- Oily discharge

NATURAL PHENOMENA

- False Oil sheen

NATURAL PHENOMENA

- Foaming and Tannin

NATURAL PHENOMENA

- Iron bacteria

OUTFALL SURVEY: PHYSICAL PARAMETERS

- Odor
  - Industrial sources: can include spoiled organic (rotten egg smell) products, oil, gasoline, specific chemicals, solvents
  - Sewage sources: foul odor
- Color/Turbidity
  - Groundwater is usually clear and colorless
  - Inappropriate discharges are often turbid or discolored water

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

OUTFALL SURVEY: PHYSICAL PARAMETERS

- Floatable Matter
  - Industrial sources: animal fats, food products, oils, solvents, sawdust, foams, packing materials, fuels
  - Sanitary sources: fecal matter, other sanitary wastes
- Deposits and Stains
  - Coatings that remain on the streambank or on the outfall structure after a non-stormwater discharge has ceased.
  - Industrial sources: often dark staining
  - Sanitary sources: black and gray

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

OUTFALL SURVEY: PHYSICAL PARAMETERS

OUTFALL SURVEY: PHYSICAL PARAMETERS

- Vegetation
  - Inhibited or excessive growth at the outlet based on surrounding conditions
  - Consider weather conditions and time of year
  - Vegetation conditions can show effects after the flow ceases

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

OUTFALL SURVEY: PHYSICAL PARAMETERS

- Structural Damage
  - Industrial discharges with abnormal pH can cause pitting or spalling of the outfall structure
  - Don't confuse with the results of structure age, hydraulic scour or poor construction

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

OUTFALL SURVEY: CHEMICAL PARAMETERS

- Ammonia (NH3)
  - Produced by decay of organic nitrogen compounds
  - Low background levels exist from decay of plant and animal matter
  - Use to identify sanitary wastewater & septic tank effluent. Can also indicate ammonia based cleaners & fertilizer runoff
  - Visual method, numeric result

OUTFALL SURVEY: CHEMICAL PARAMETERS

- Detergents (Anionic Surfactants)
  - Found in household detergents
  - Use to identify sanitary wastewater, but not septic tank effluent
  - Visual method, numeric result
  - Low background levels exist – why?

OUTFALL SURVEY: CHEMICAL PARAMETERS

- Conductivity
  - Use as an indicator of dissolved solids
  - Use to identify sanitary wastewater, septic effluent, industrial water and irrigation water
  - Instrumental method, numeric result
  - Tap water very low (225 µS/cm)

OUTFALL SURVEY: CHEMICAL PARAMETERS

- Temperature
  - Use to identify sanitary wastewater, septic effluent and industrial water
  - Useful during cold months
  - Instrumental method, numeric result

SOUTHEAST MICHIGAN EXPERIENCE: FIELD PARAMETERS

	Threshold Value by Agency				
Parameter	**Wash Co WRC**	**SCCHD**	**WCDPS**	**MCHD**	**OCWRC**
E. coli (cfu/100 mL)	>1,000	>1,000	>1,000	>1,000	>1,000
Surfactants (mg/L)	>1		>0.5		>0.5 (rural) >0.75 (urban)
Ammonia (mg/L)			>1		>1
Physical signs [2]	X	X	X	X	X
Conductivity (uS/cm)					>1,000 +/- 20% of local average
Turbidity (NTU)					>5
TDS (mg/L)					>500
Dissolved oxygen (mg/L)					< 5
Temperature (°F)					+5 warm water stream [1] +2 cold water stream [1]
pH					>9 <6.5

[1] change from local average

[2] physical signs include odor, color, clarity, floatables, deposits, stains, vegetation change, outfall structural damage, unusual flow

POST SURVEY TASKS

- Summarize field information
- Prioritize your sites based on field screening
- Address “hot spots” and complaints first
- Determine system ownership
- Determine approach for investigation

Program Outline

- Introduction
- Basic Investigations
- **Advanced Investigations**
- Prevention Considerations
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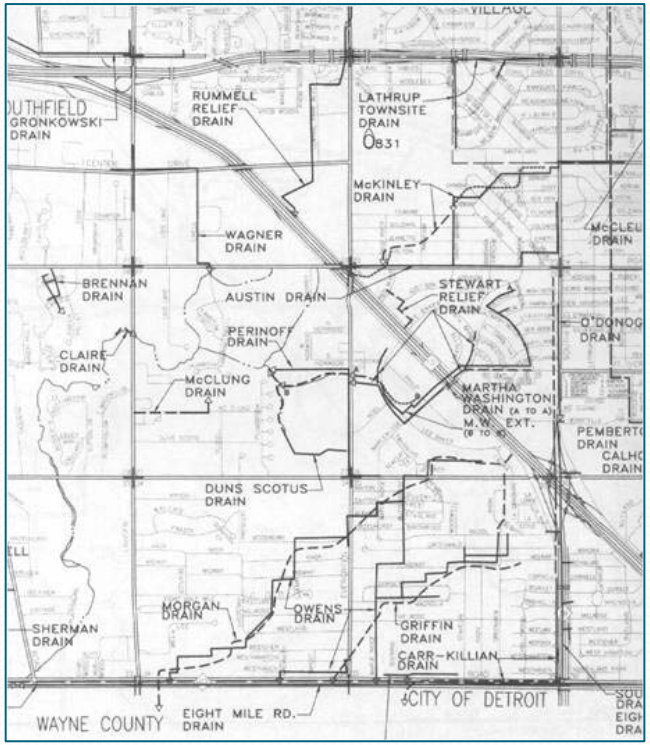
- Tabletop Exercise

ELEMENTS OF ADVANCED INVESTIGATION

- Planning the investigation
- Narrowing down the problem area
- Isolating the source

PLANNING THE INVESTIGATION

- What area does the outfall/storm sewer system drain?
- What is the land use in area?
  - Residential/business/commercial
  - Know the “lay of the land”



NOTE:

-Is it a CSO area?

–Sewer separation projects

–Hybrid systems

–Other exceptions

PLANNING THE INVESTIGATION

- Reviewing drain plans
- Select inspection points
  - Field verify
- Notify affected parties of investigation efforts/problem
- Utilize mailings to gain public buy-in

PLANNING THE INVESTIGATION

- Discuss investigation details (safety, procedures and equipment)
- Notify local agencies

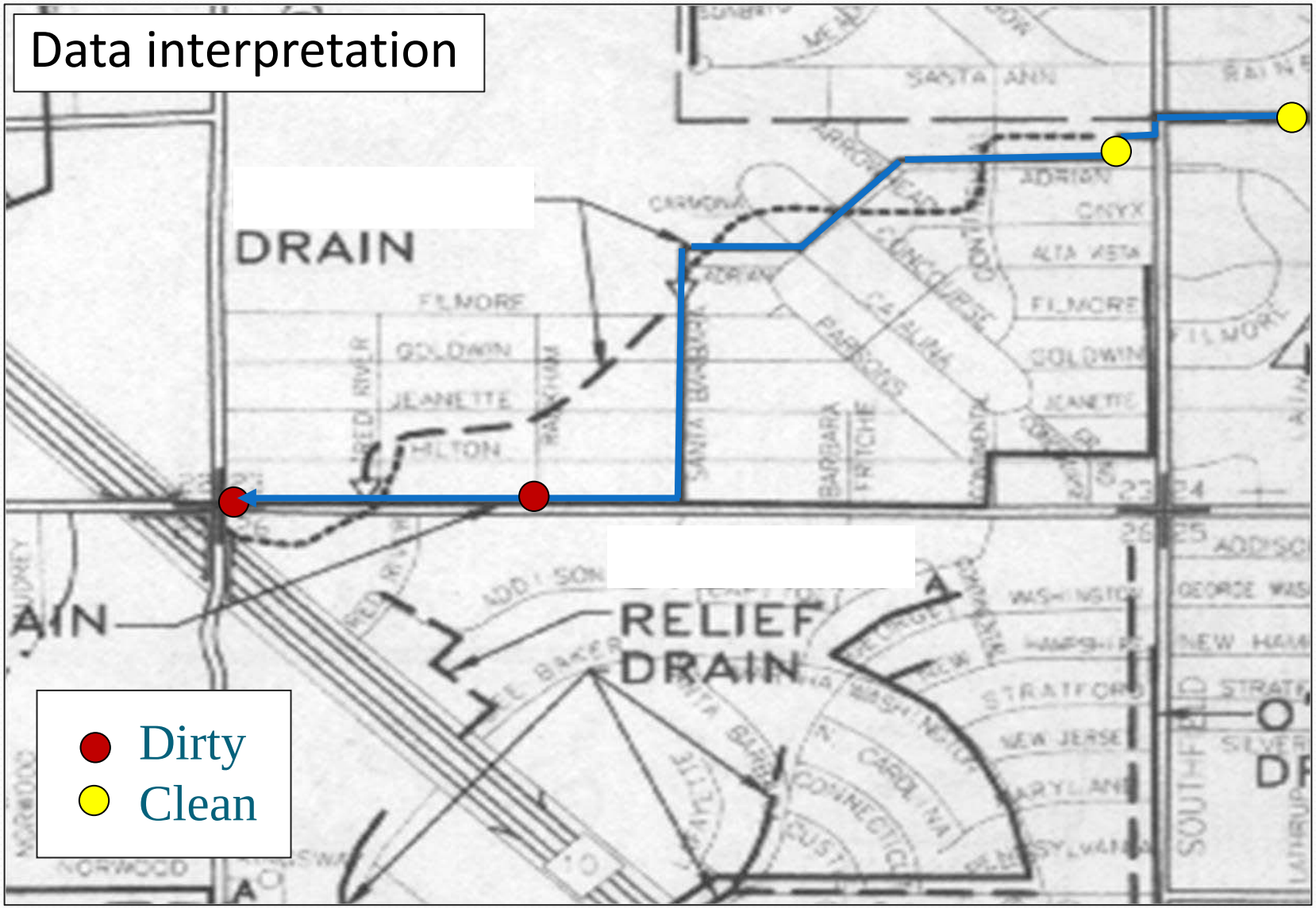
TYPICAL EQUIPMENT

- Survey forms
- USGS maps
- Compass
- Backpack/equipment bag
- Sledgehammer
- Manhole hook
- Measuring tape
- Flashlight
- Rope
- Mirrors
- Hard hats
- Safety vests
- Latex gloves
- Waders
- Field radios
- Camera
- GPS
- Test kits/meters

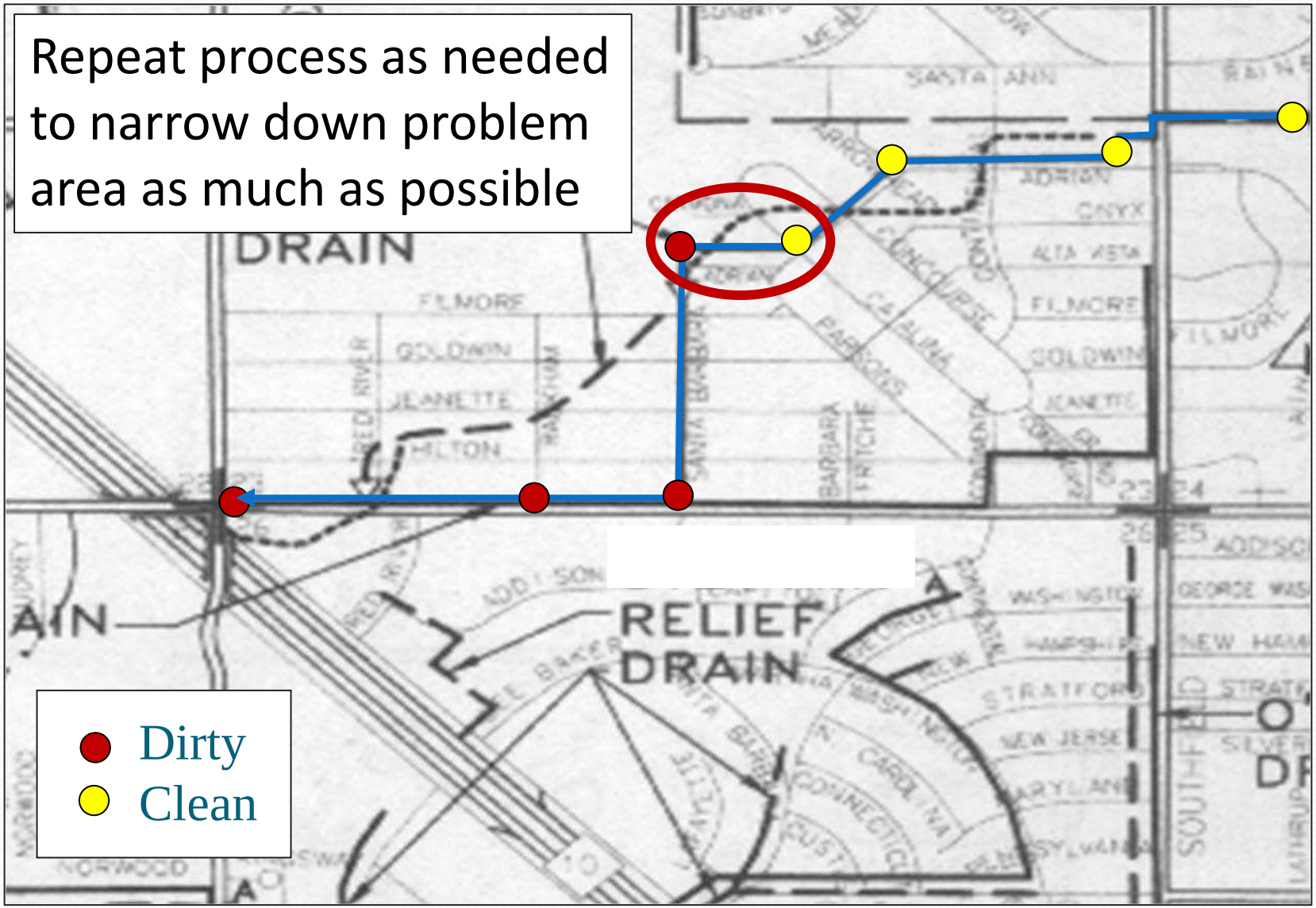
NARROWING DOWN THE PROBLEM AREA

- Inspect planned locations
- Survey the investigation area
  - Adjacent land use
  - Commercial/industrial housekeeping practices
  - Signs of dumping
  - Other irregularities

NARROWING DOWN THE PROBLEM AREA



NARROWING DOWN THE PROBLEM AREA



ISOLATING THE SOURCE

- Techniques
  - Televising the sewer
  - Dye testing
  - Intensive sampling
  - Other

TELEVISING TECHNIQUE

- Televising (T.V.) the sewer
  - To see illicit taps
  - To see condition of the sewer line
  - To create permanent record

PROS/CONS OF TELEVISING

- Pros
  - May have equipment in-house
  - Easy to see active taps
  - Record of observations
  - Only way to observe pipe between manholes
  - Less intrusive
- Cons
  - Expensive to hire out work
  - Difficult to characterize inactive taps
  - Interpreting the results is time consuming
  - Won't work on obstructed sewers (root overgrown, etc.)
  - May require confined space entry
  - May be pipe-size limited, depending on type of equipment
  - Won't work in water-filled pipes

DYE TESTING TECHNIQUE

- Storm sewer
  - May show inter-connections between sewer systems
  - Leaks from a sanitary sewer to storm sewer (e.g.., sanitary sewer goes through a county drain)
  - Must obtain Michigan Rule 97 approval
- Facility
  - To determine if illicit connections exist

DYE TESTING FACILITIES

- Equipment
  - Million candle power light
  - Dye
  - Radios
  - Other, as required
- Other issues
  - Confined space
  - Manhole access

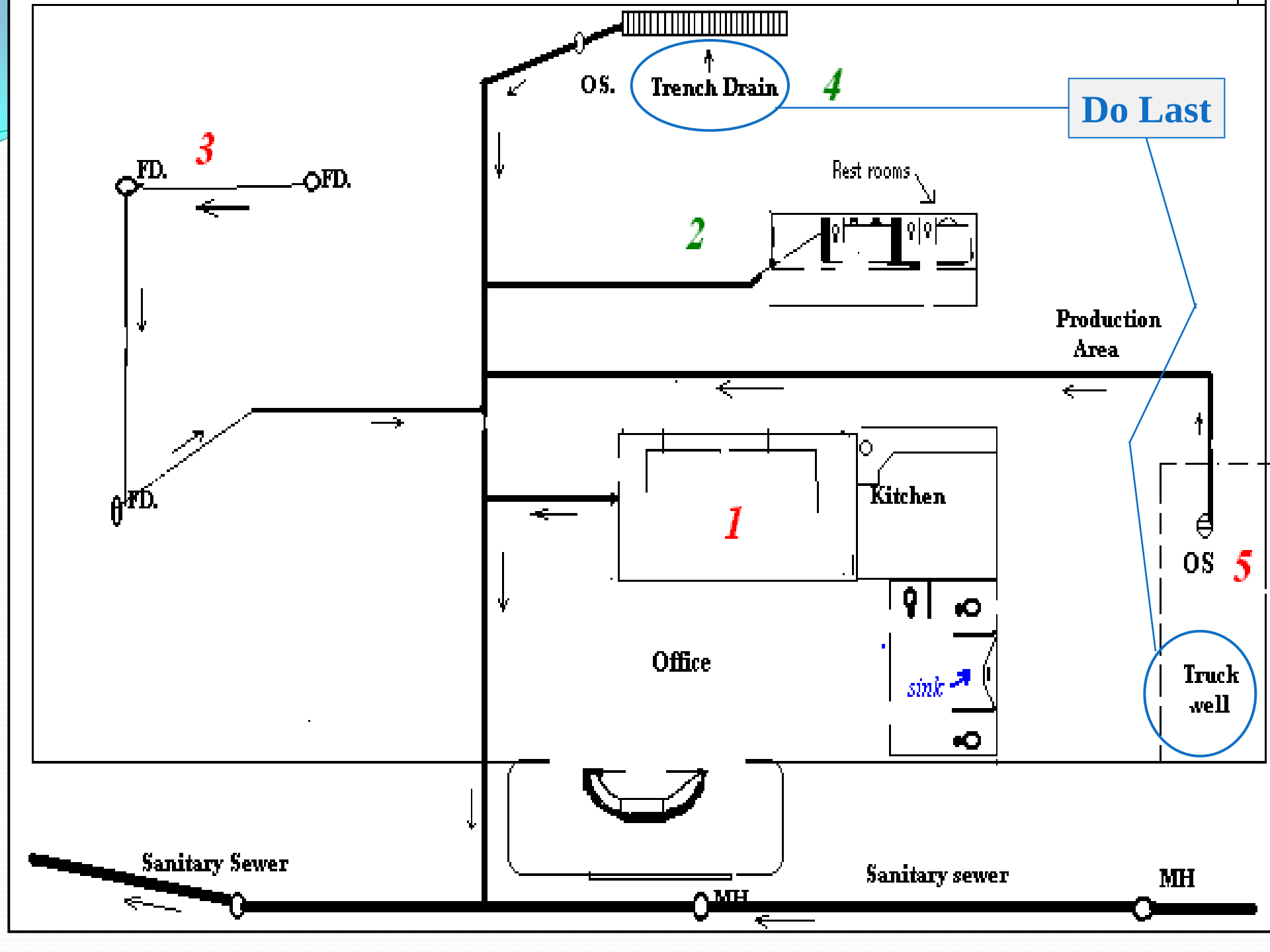
DYE TESTING FACILITIES

- Site visit
  - Program introduction
    - Visit purpose
    - Small facility
    - Large facility

- Site evaluation
  - Small facility
    - Site visit
    - Housekeeping practices
  - Large facility
    - Site drawings
    - Site visit
    - Housekeeping practices
    - Formulate testing plan

DYE TESTING FACILITIES

- Must obtain Michigan Rule 97 approval
- Dropping the dye
  - Liquid/strips (state-approved)
  - Alternate colors
  - Account for all dye


OS.
Trench Drain
4
Do Last
FD.
3
FD.
FD.
Rest rooms
2
Production
Area
1
Kitchen
OS
5
Office
sink
Truck
well
Sanitary Sewer
MH
Sanitary sewer
MH

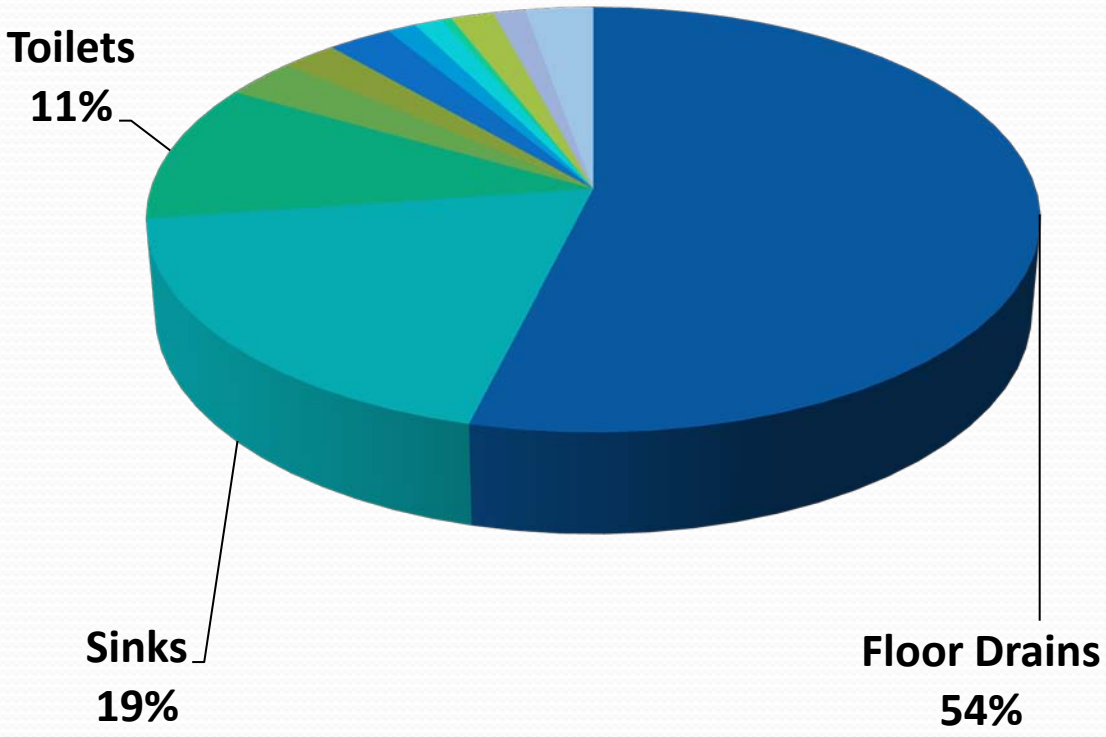
DYE TESTING FACILITIES

- Field records
  - Site utility plan
  - Mark plan
  - Field sketch
  - Field data
    - Fixtures tested, date, time and dye color
  - Photos

DYE TESTING FACILITIES

- Exit interview
  - Results of dye test
  - Other potential issues
    - Storm water in sanitary sewer
    - Improper housekeeping practices (change SOPs)

Types of Illicit Discharges Identified Wayne County: 1987 through 2012



Violations less than 3%

- Outdoor Washing Pads
- Washing Machines
- Drinking Fountains
- Sump Pumps
- Swimming Pool Drains
- Machinery Process Water
- Showers
- Urinals
- Other (Not specified)

PROS/CONS OF DYE TESTING

- Pros
  - Easy to do
  - Materials are inexpensive
  - Results will show specific source
- Cons
  - Time consuming in low flow
  - Difficult to see dye
  - Need homeowners/business owners cooperation
  - Public reaction to dye in stream

INTENSIVE SAMPLING TECHNIQUE

- To find off-hours or intermittent flows or peak activity
  - Automatic samplers
  - Flow meters
  - Multiple sampling at specific sites

PROS/CONS OF INTENSIVE SAMPLING

- Pros
  - Good for intermittent flows
  - Fills data gaps
  - Good for off-hour sampling
  - Auto samplers can be left unstaffed
  - Useful in residential areas
  - Effective method to isolate source areas
- Cons
  - Does not point to specific source
  - May create inconclusive data
  - Limited holding times
  - Expensive lab analysis
  - May require confined space entry

OTHER TECHNIQUES

- Smoke testing
- Drain walk
- Use your imagination

ELIMINATING THE DISCHARGE

- Contact the responsible party by informal and formal means
- State and federal regulations
  - Clean Water Act
  - Michigan Act 451, Part 31, Section 324.3109 of 1994
- Local codes and ordinances
  - Failing septic systems (Health Code)
  - Illicit connections (Michigan/International Plumbing Code)
  - Discharges to County Drains (Michigan Drain Code)
  - Dumping (litter ordinances)

ELIMINATING THE DISCHARGE

- Give responsible party time to address problem
- Follow-up investigation (to see if problem is fixed)
- If problem is fixed, investigation is closed
  - Site visit to confirm corrections
  - Send confirmation letter

Program Outline

- Introduction
- Basic Investigations
- Advanced Investigations
- **Prevention Considerations**
- Case Studies
- Tabletop Exercise

PREVENTION CONSIDERATIONS

- Designers and plan reviewers are a key to “prevention”
  - Plans and specs
  - First line of IDEP defense
- Site related design issues
  - Know public sewer infrastructure
  - Foundation sump pumps
  - Mobile floor washing machines
- Building related issues: original design, modifications and additions
  - Truck wells, floor drains

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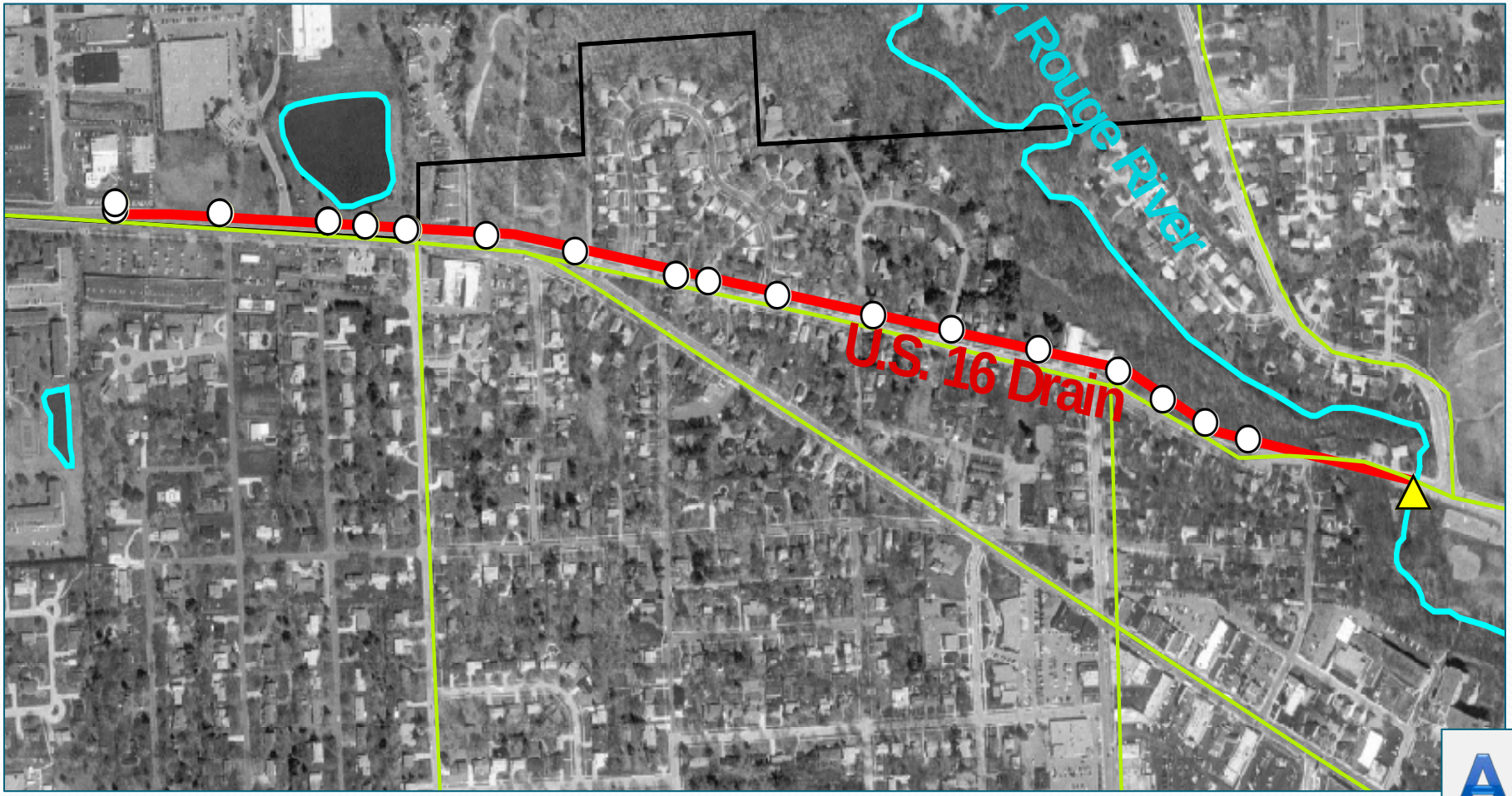
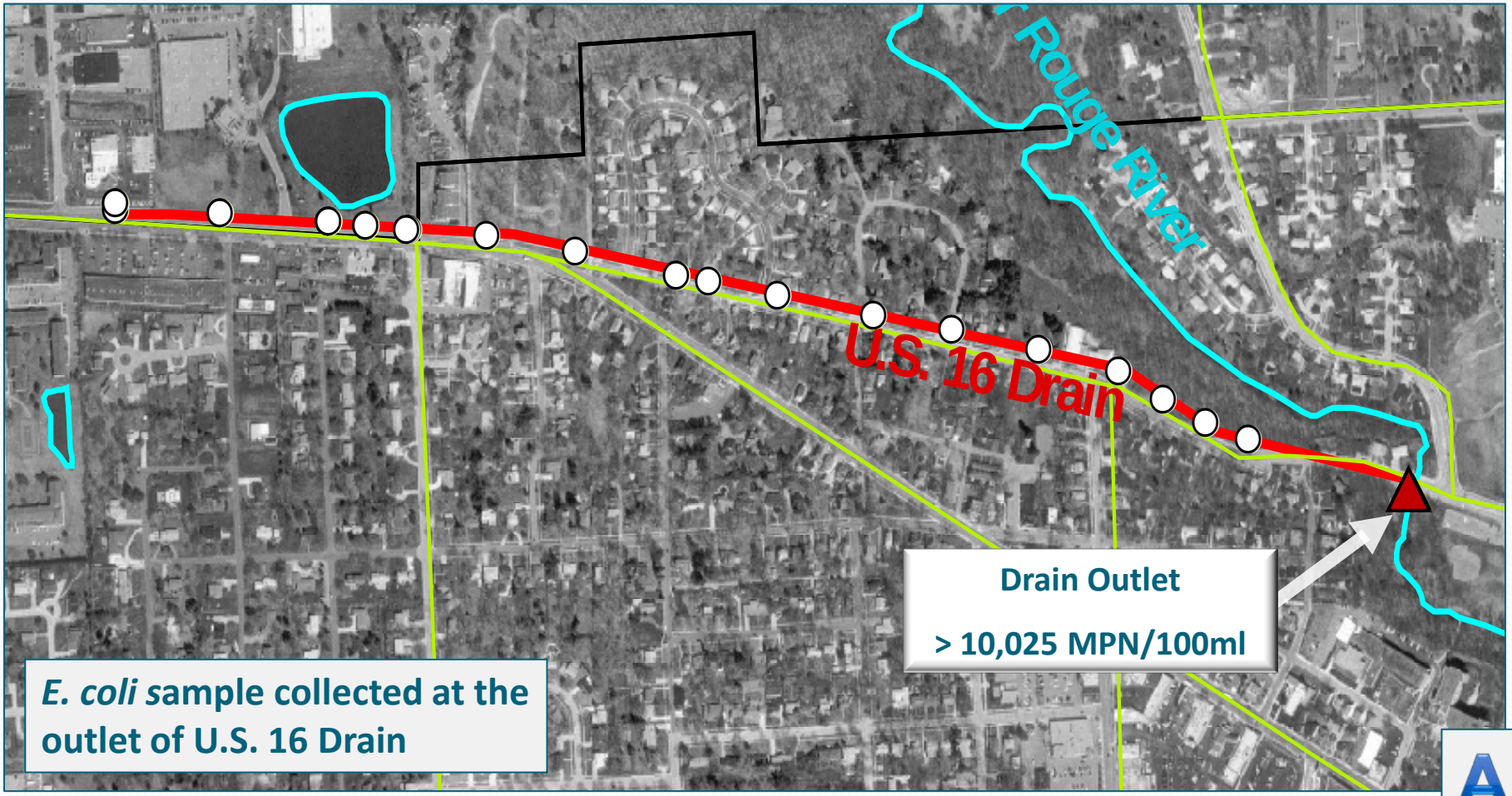
CASE HISTORY – ELIMINATING 15 YEARS OF DISCHARGE ALONG THE UPPER BRANCH



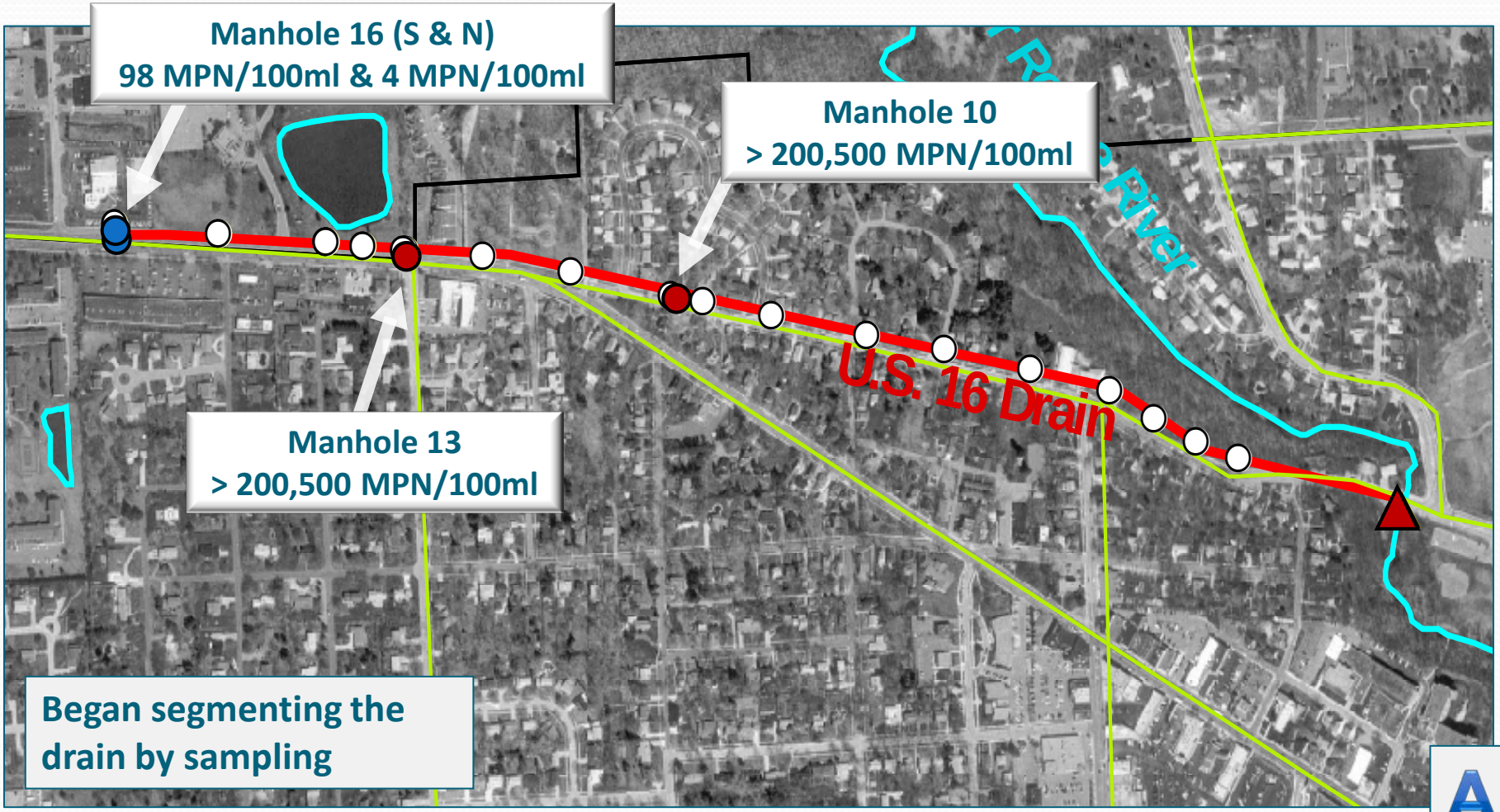
CASE HISTORY

INITIAL OUTFALL SURVEY – AUGUST 18, 1999



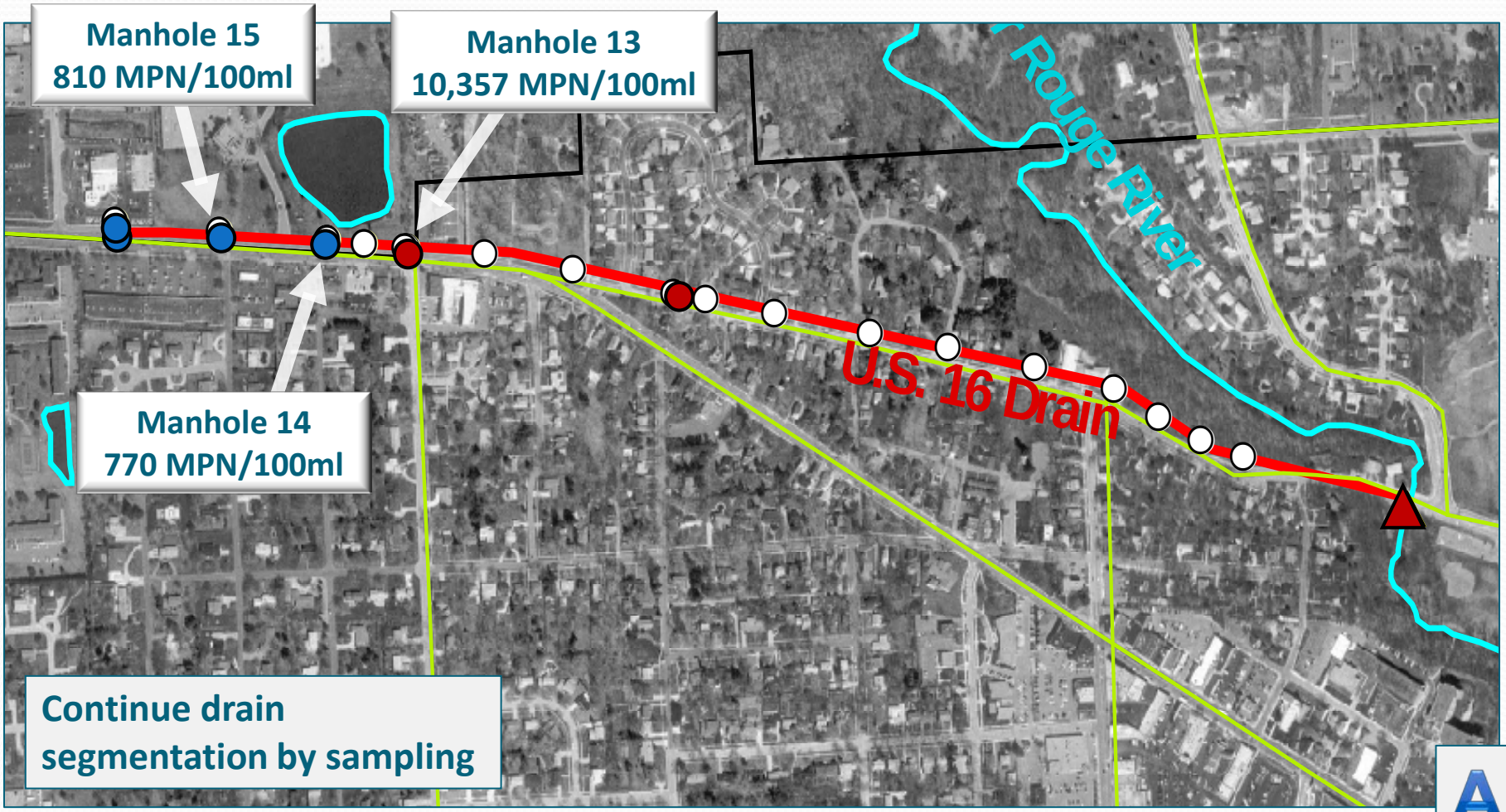
CASE HISTORY

FOLLOW-UP INVESTIGATIONS – FEBRUARY 16, 2000



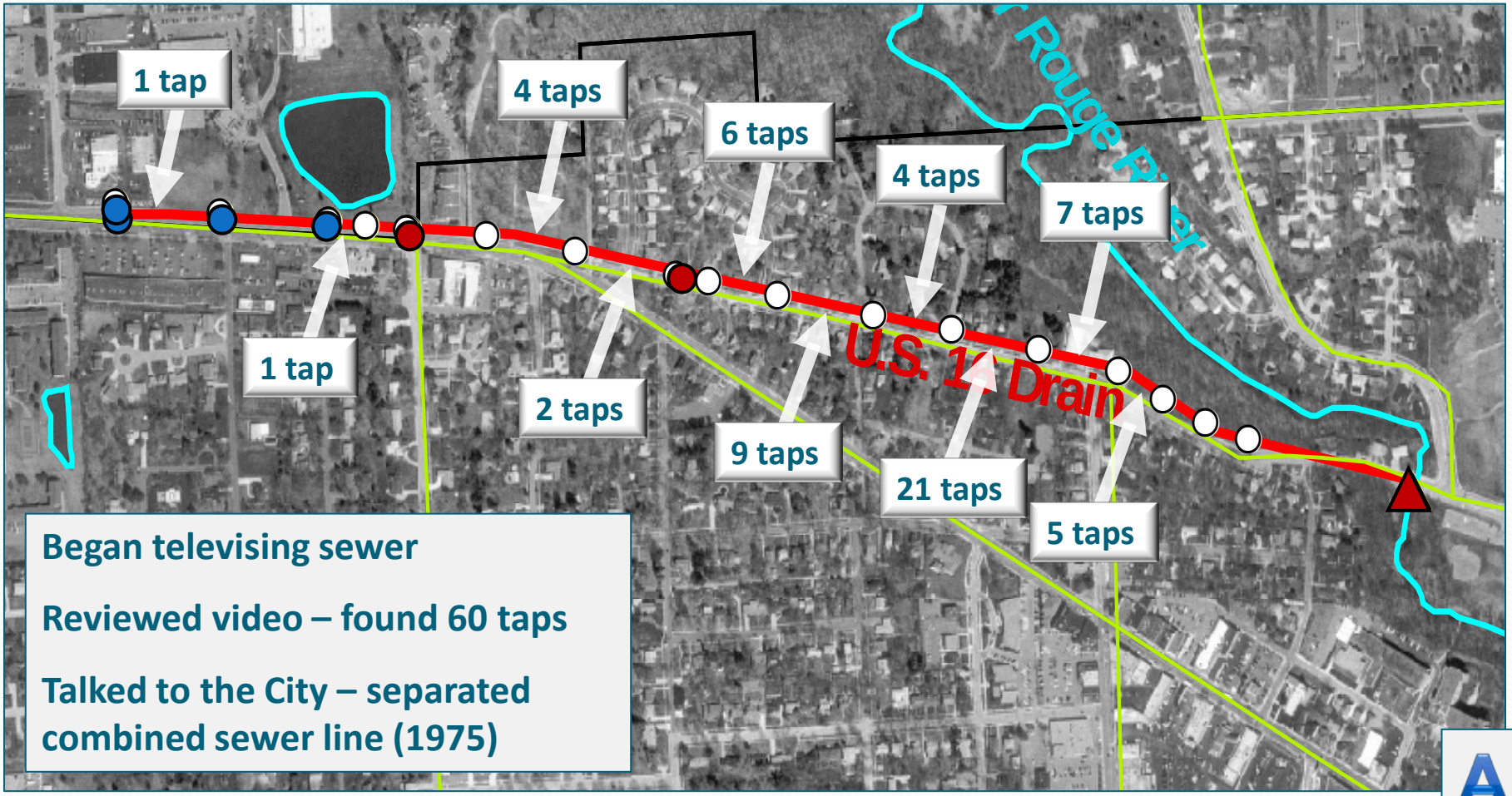
CASE HISTORY

FOLLOW-UP INVESTIGATIONS – FEBRUARY 22, 2000



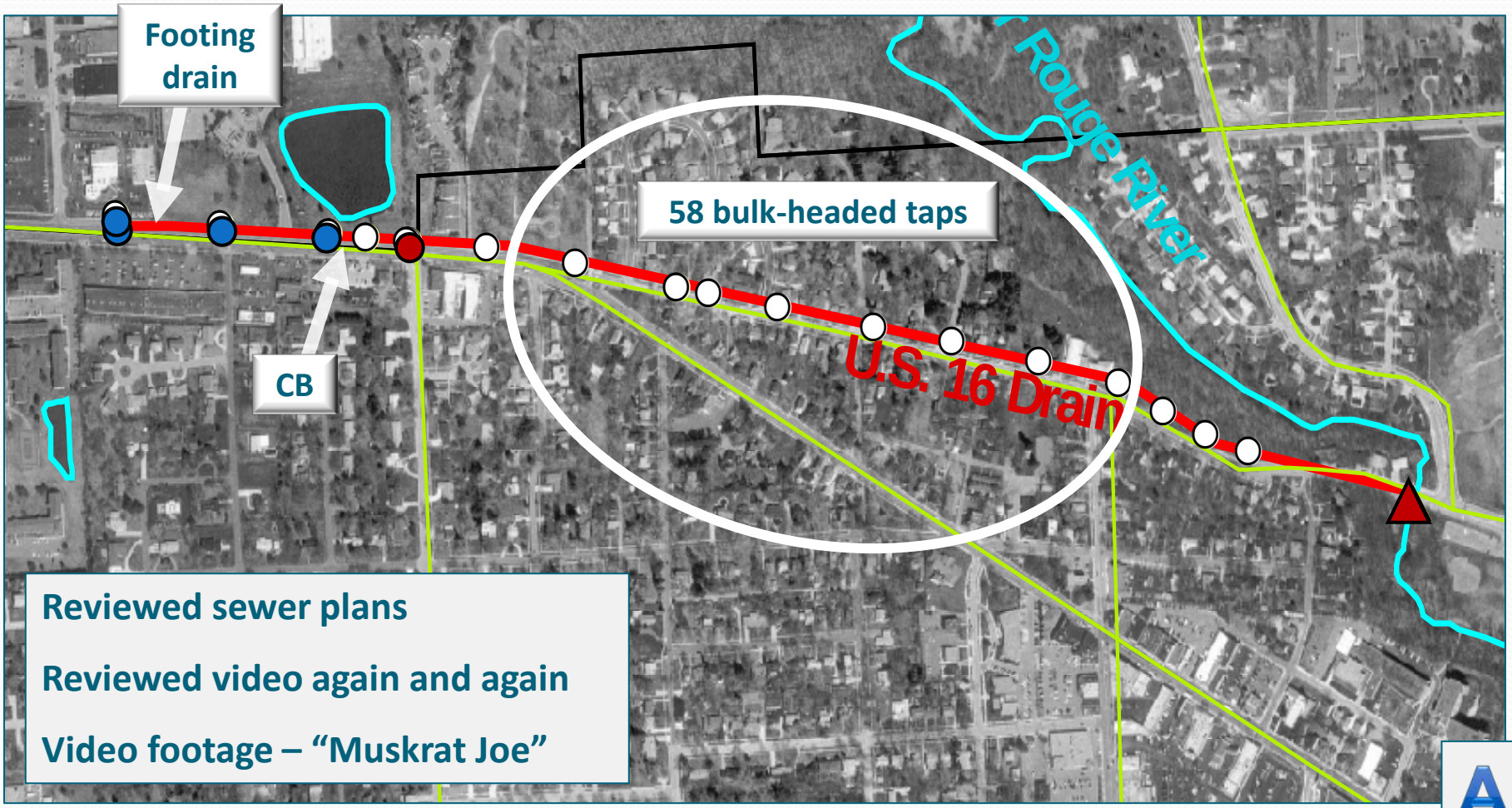
CASE HISTORY

FOLLOW-UP INVESTIGATIONS – MARCH 7, 2000



CASE HISTORY

FOLLOW-UP INVESTIGATIONS – MARCH 9, 2000



- Reviewed sewer plans
- Reviewed video again and again
- Video footage – “Muskrat Joe”

CASE HISTORY

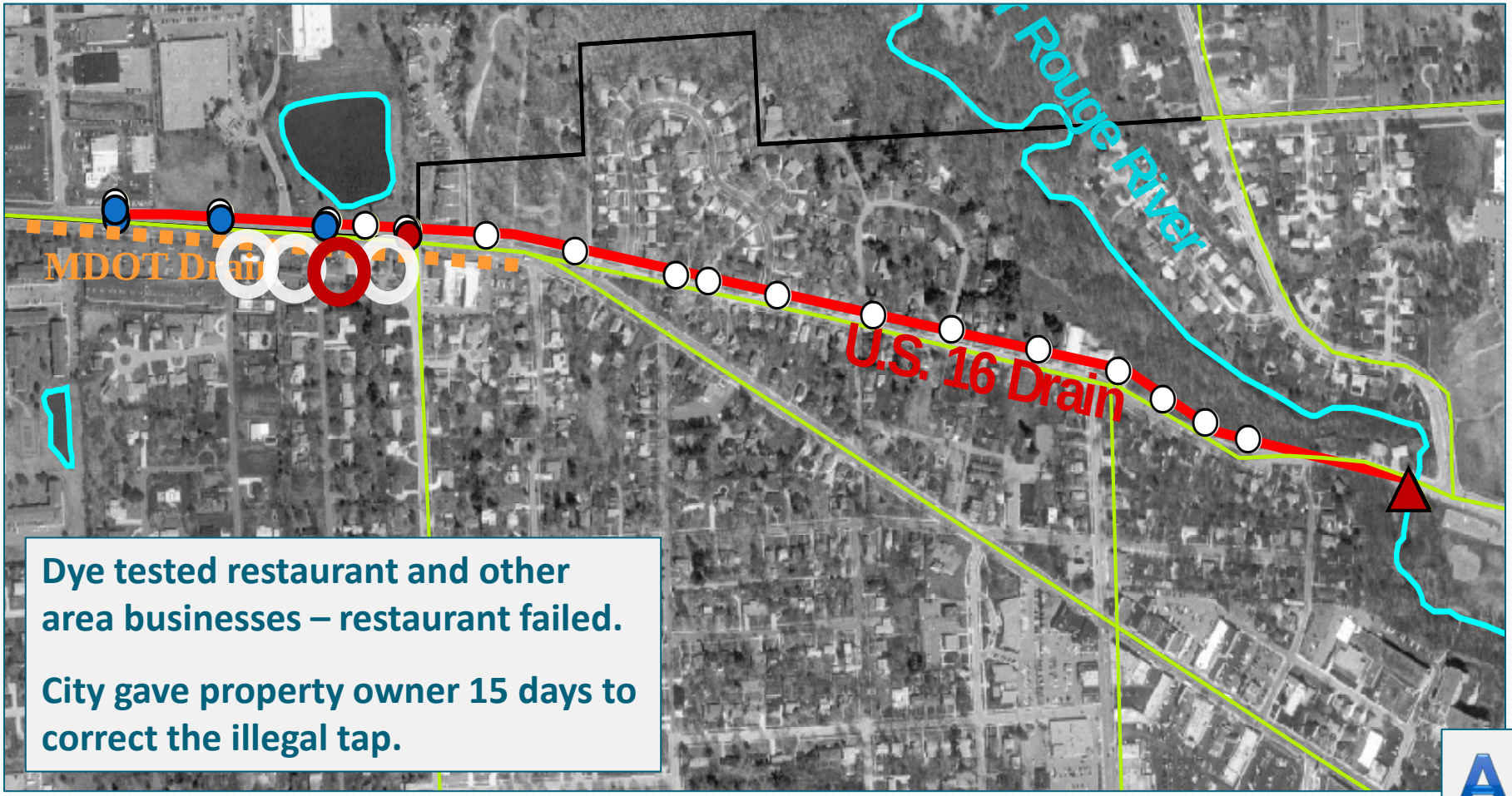
FOLLOW-UP INVESTIGATIONS – APRIL 5, 2000

Met with the City – "All taps were verified following sewer separation." Sanitary for shopping centers and animal hospital known, restaurant not mentioned

Upland investigation

CASE HISTORY

FOLLOW-UP INVESTIGATIONS – APRIL 19, 2000

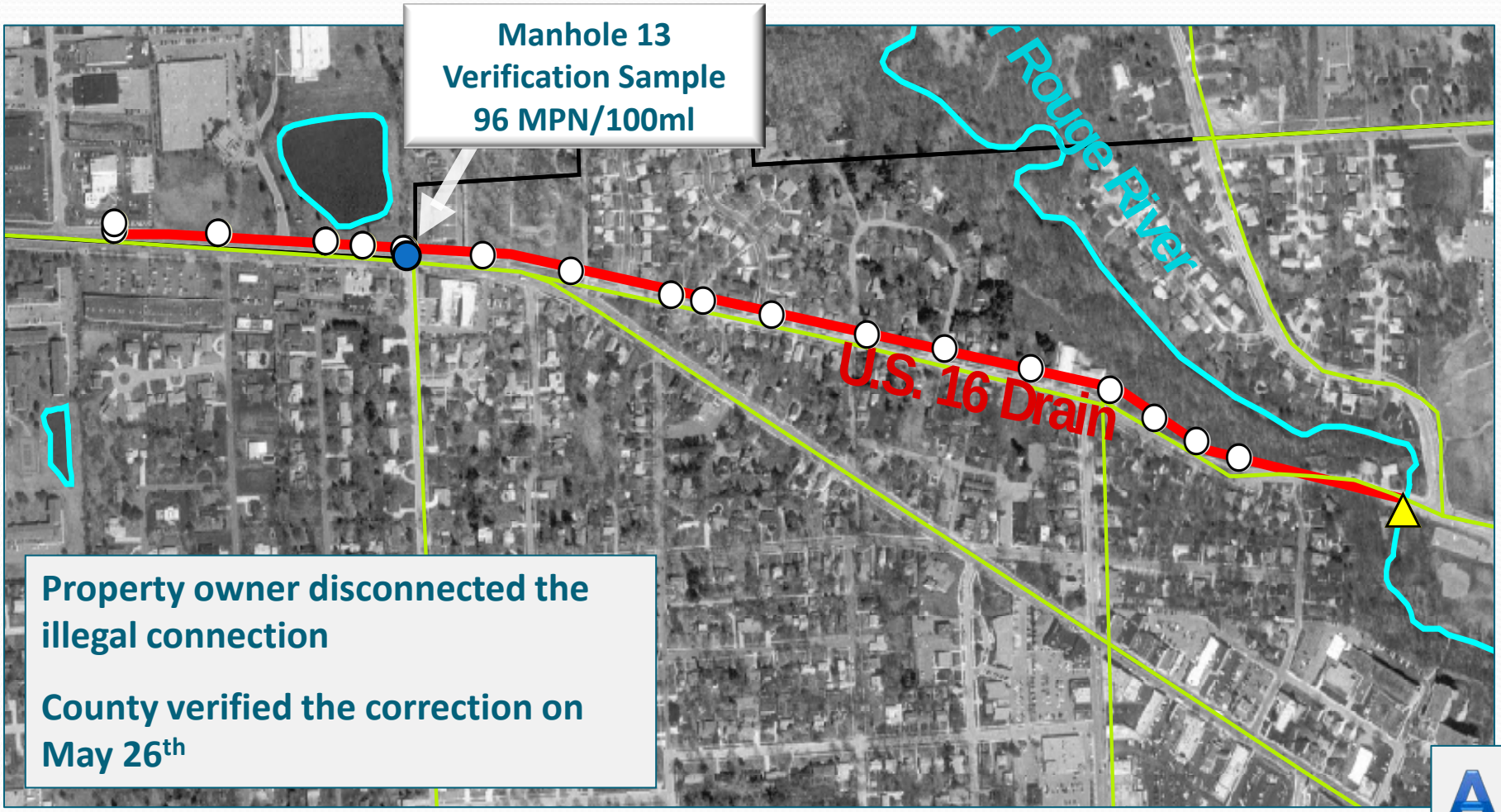


Dye tested restaurant and other area businesses – restaurant failed.

City gave property owner 15 days to correct the illegal tap.

CASE HISTORY

ELIMINATING THE DISCHARGE – MAY 7, 2000



Property owner disconnected the illegal connection

County verified the correction on May 26th

CASE HISTORY
WHAT DID WE LEARN?

ELIMINATING 15 YEARS OF DISCHARGE TO THE UPPER ROUGE

- 3 months to find and correct
- When reviewing the video
  - Look at water quality, not just the taps
  - Sewer separation may not account for “funky” plumbing
- Talk to the local agencies
  - Ask questions
  - What is being said and more importantly what is not being said?

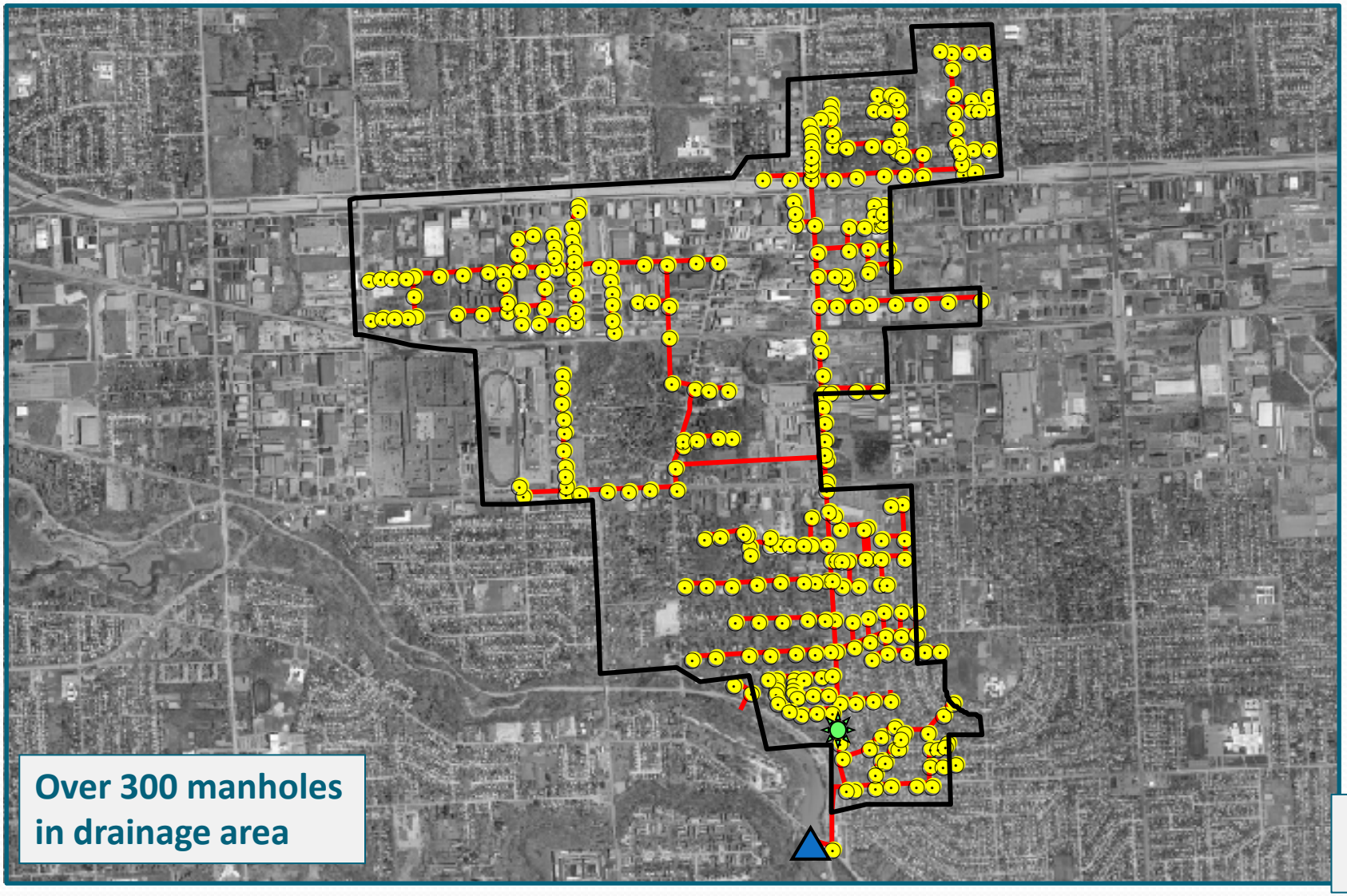
CASE HISTORY – RESTORING RECREATIONAL USE ALONG THE MIDDLE BRANCH

1996

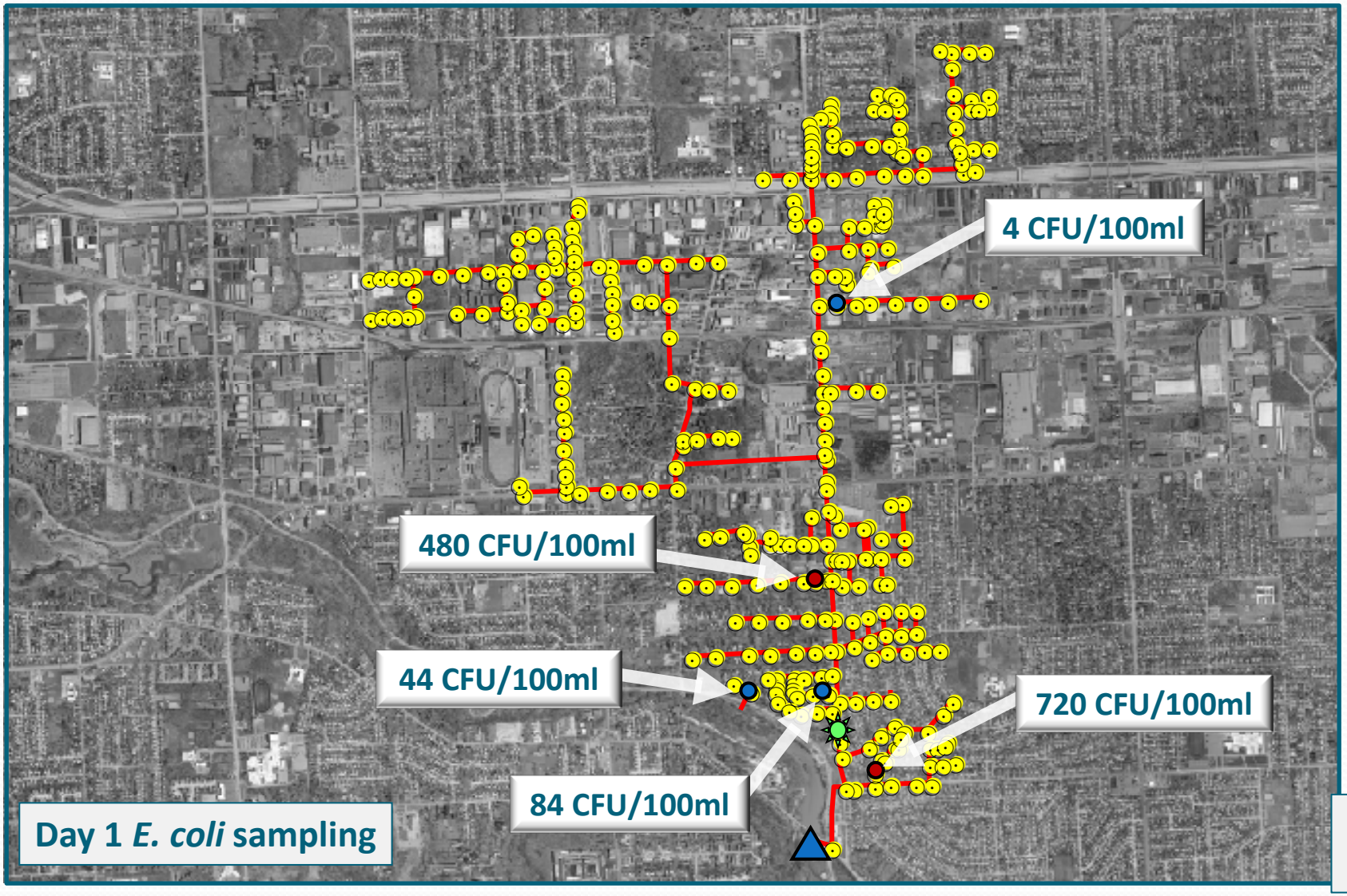
Newburgh Lake to Nankin Lake meets *E. coli* standards

Downstream of Nankin Lake does not meet *E. coli* standards

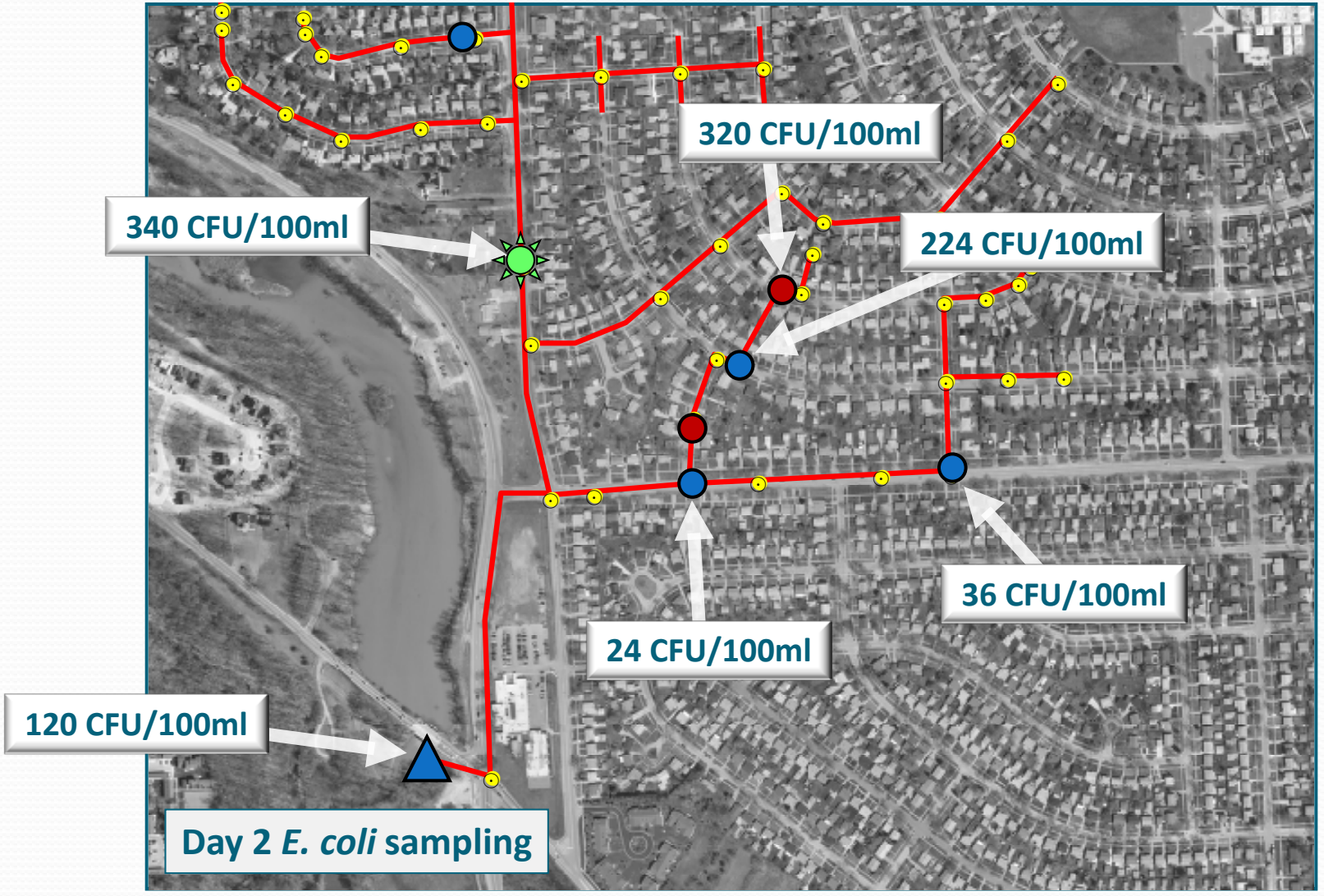
CASE HISTORY – PROBLEM AREA



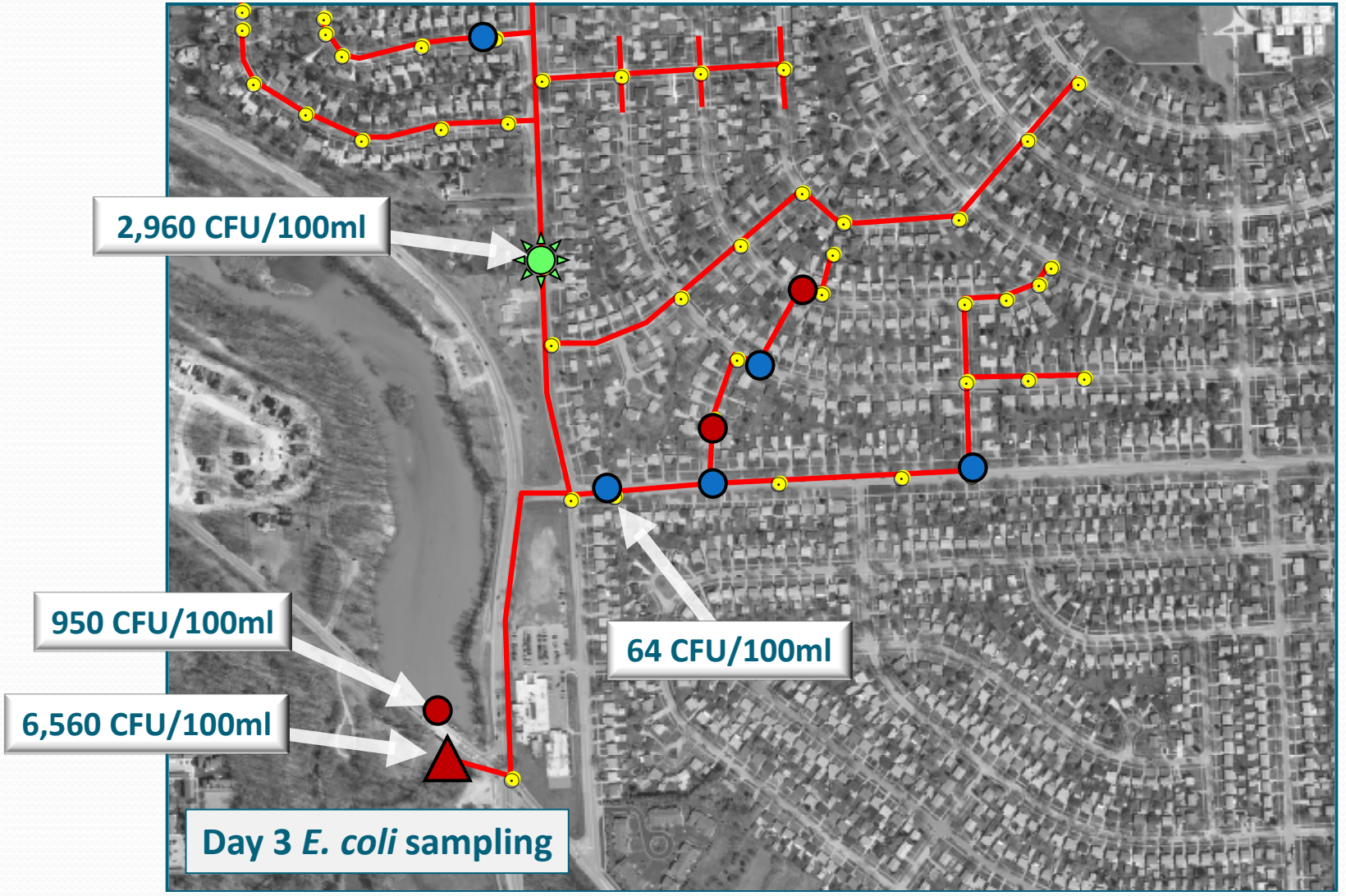
CASE HISTORY – MAY 20, 1997



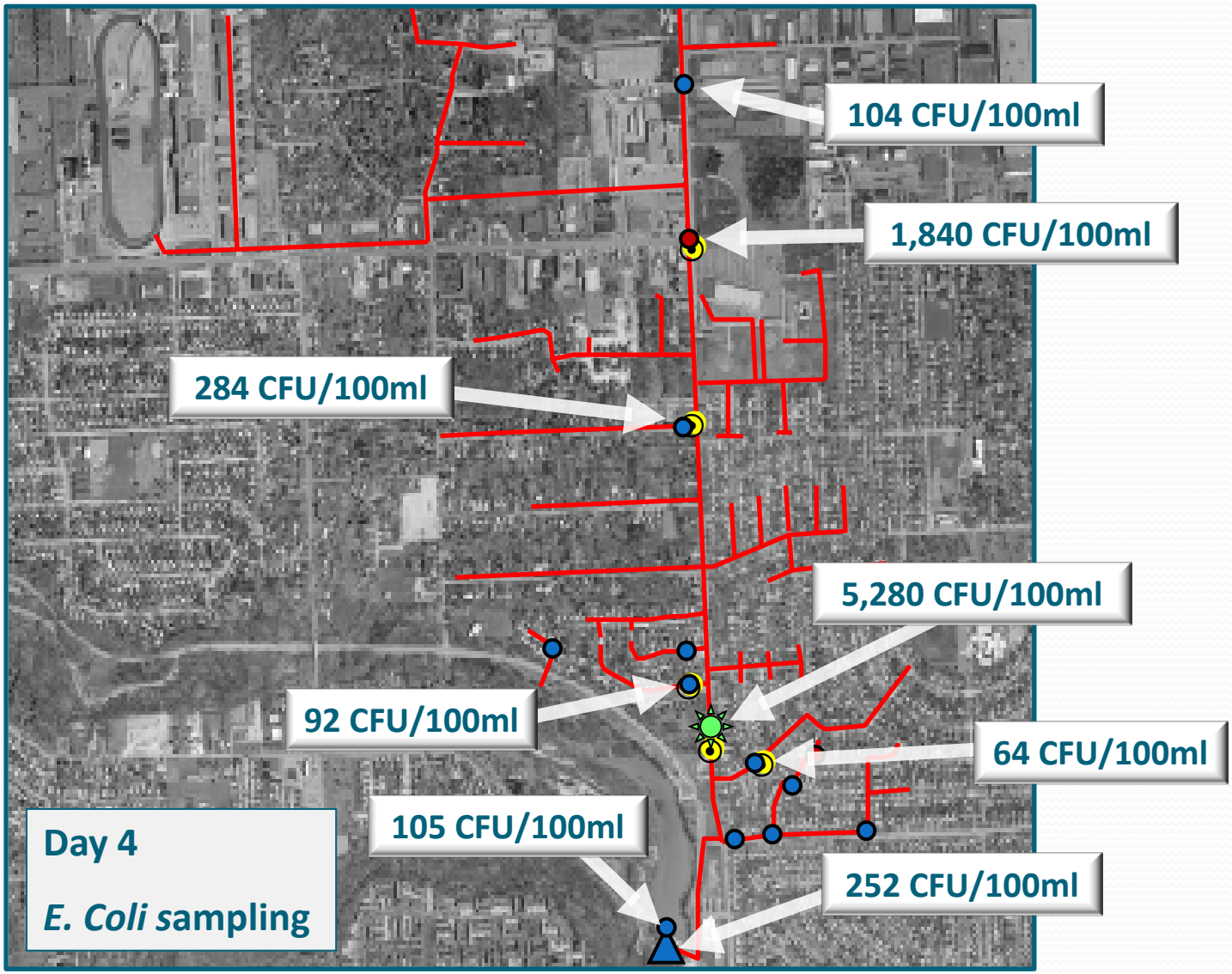
CASE HISTORY – MAY 21, 1997



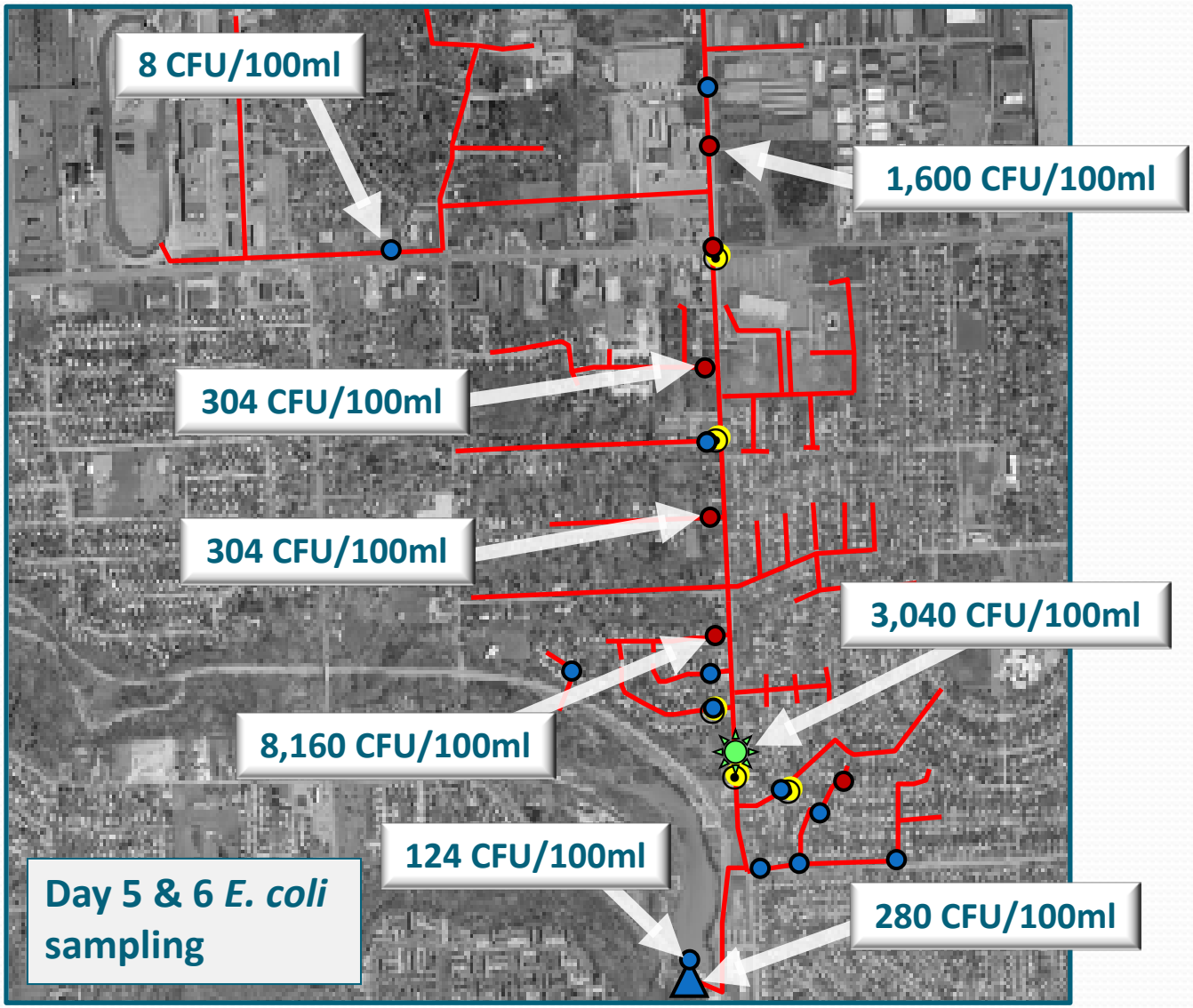
CASE HISTORY – MAY 23, 1997



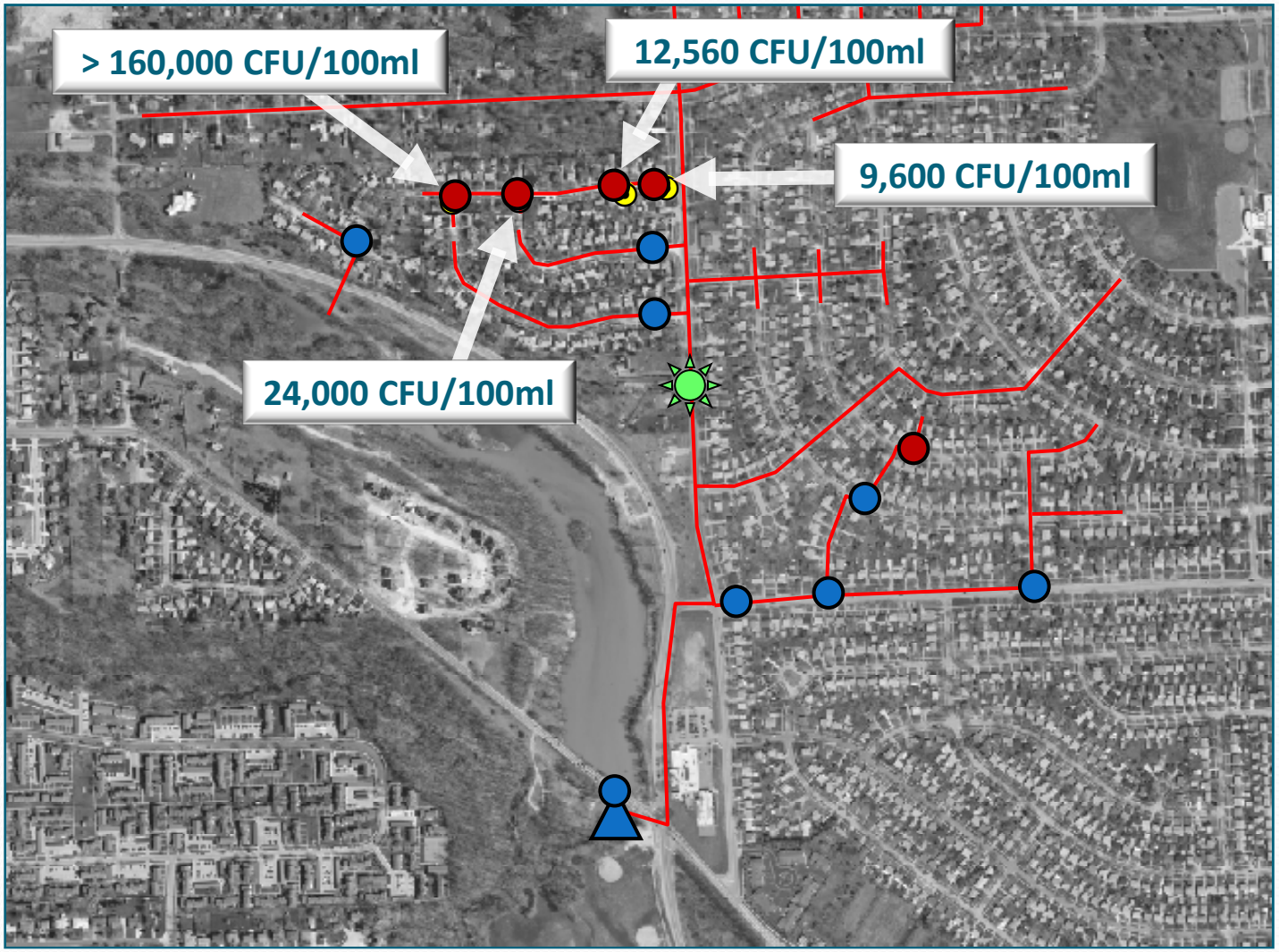
CASE HISTORY – MAY 28, 1997



CASE HISTORY – JUNE 6 & 11, 1997



CASE HISTORY – JUNE 13, 1997



CASE HISTORY

INITIAL INVESTIGATIONS

- 1997 city planning
  - TV'ed sewer – no taps (completed)
  - Sent letters to residents (not completed)
  - Dye tested homes (not completed)
- 1997 County actions
  - Intermittent monitoring
  - Does problem still exist?
    - Evidence of problem disappeared
    - Continued monitoring

CASE HISTORY

ELIMINATING THE DISCHARGE

- Memorial Day 1998 – problem back!
  - Sent letters out
  - Dye testing
  - Educational material sent to homeowners
- Late 1998 – evidence problem disappeared
- 1999 - Clean
- 2000 - Clean

CASE HISTORY

WHERE DID IT COME FROM?

- Probable cause
  - Recreational vehicle/boat dumping sanitary waste
  - Pet waste

CASE HISTORY

WHAT DID WE LEARN?

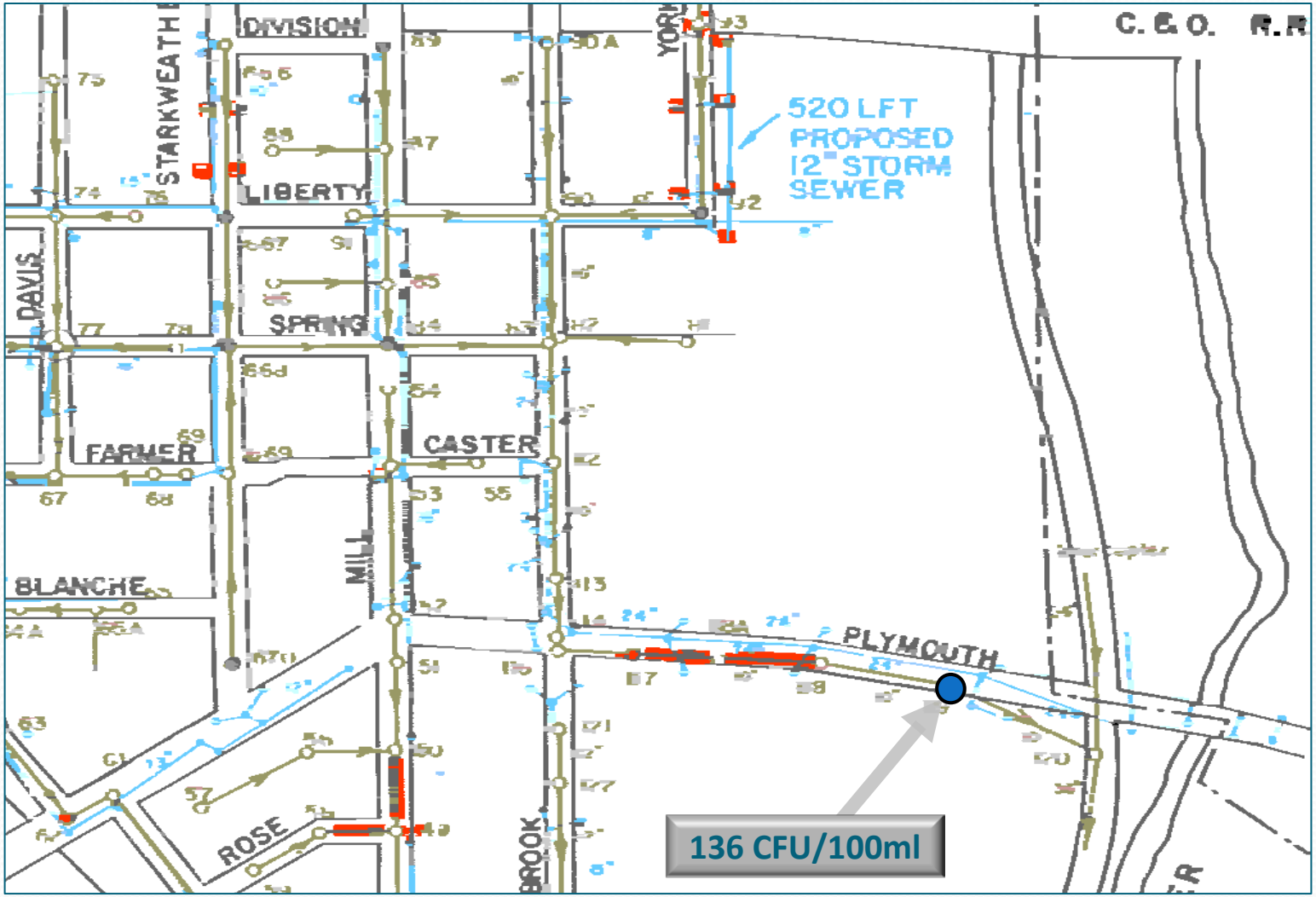
RESTORING RECREATIONAL USE ALONG THE MIDDLE BRANCH

- Persistence pays
- Observable presence in the area had an affect
- Public education worked

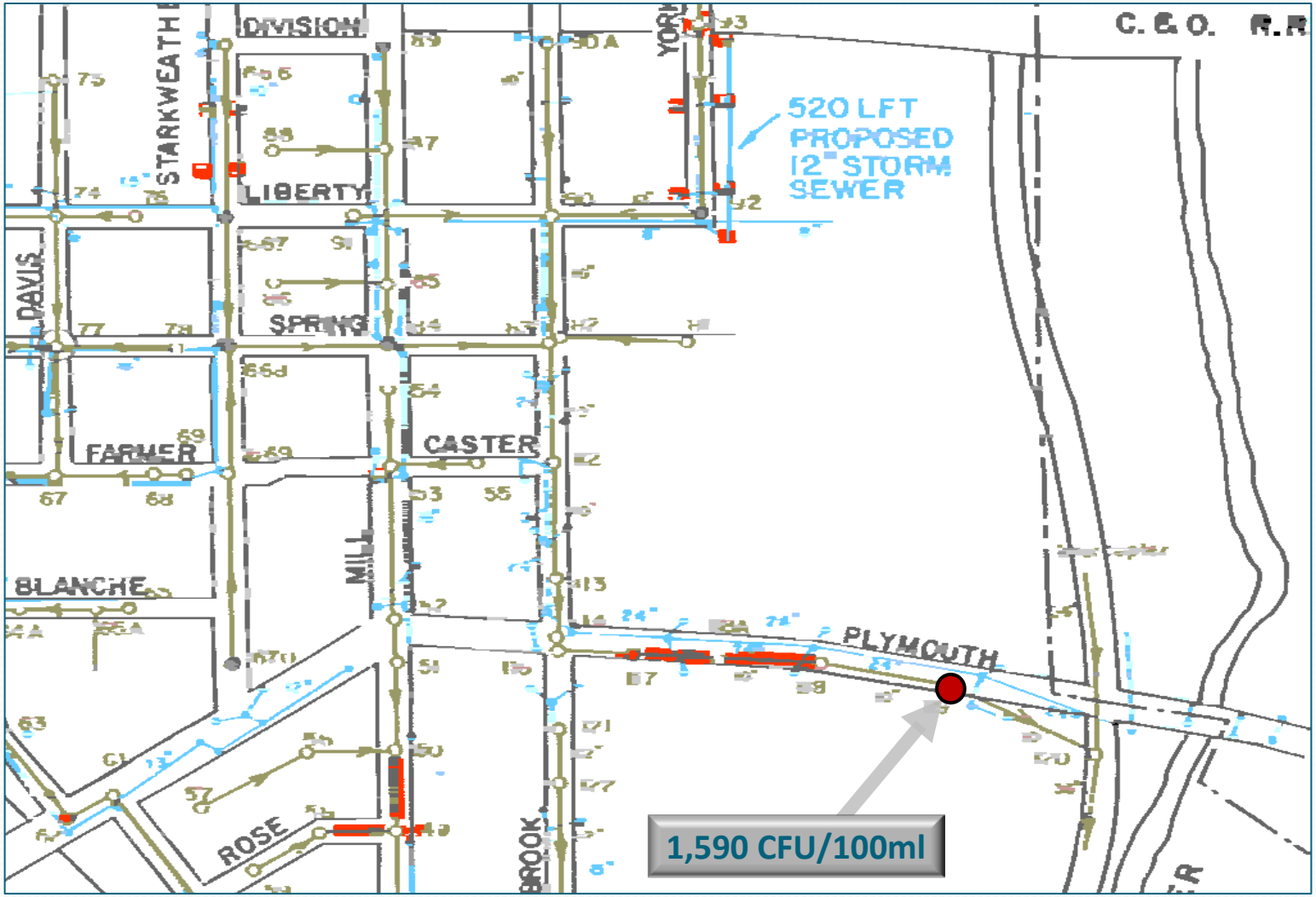
CASE HISTORY – FOLLOW YOUR NOSE

- Foul odor in wood lot near residential property
- Sewage like odor coming from manhole in the street

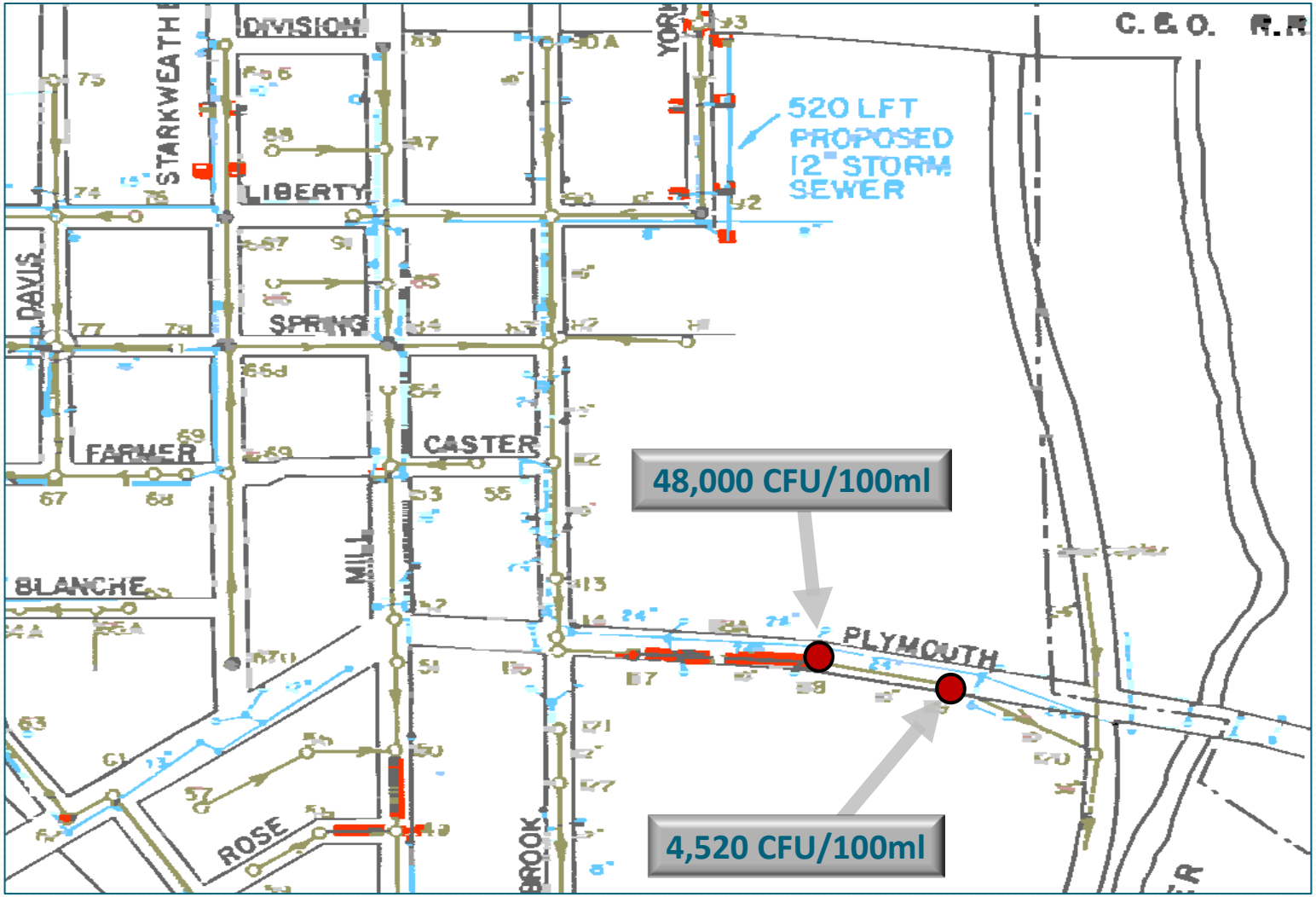
CASE HISTORY – JULY 1997



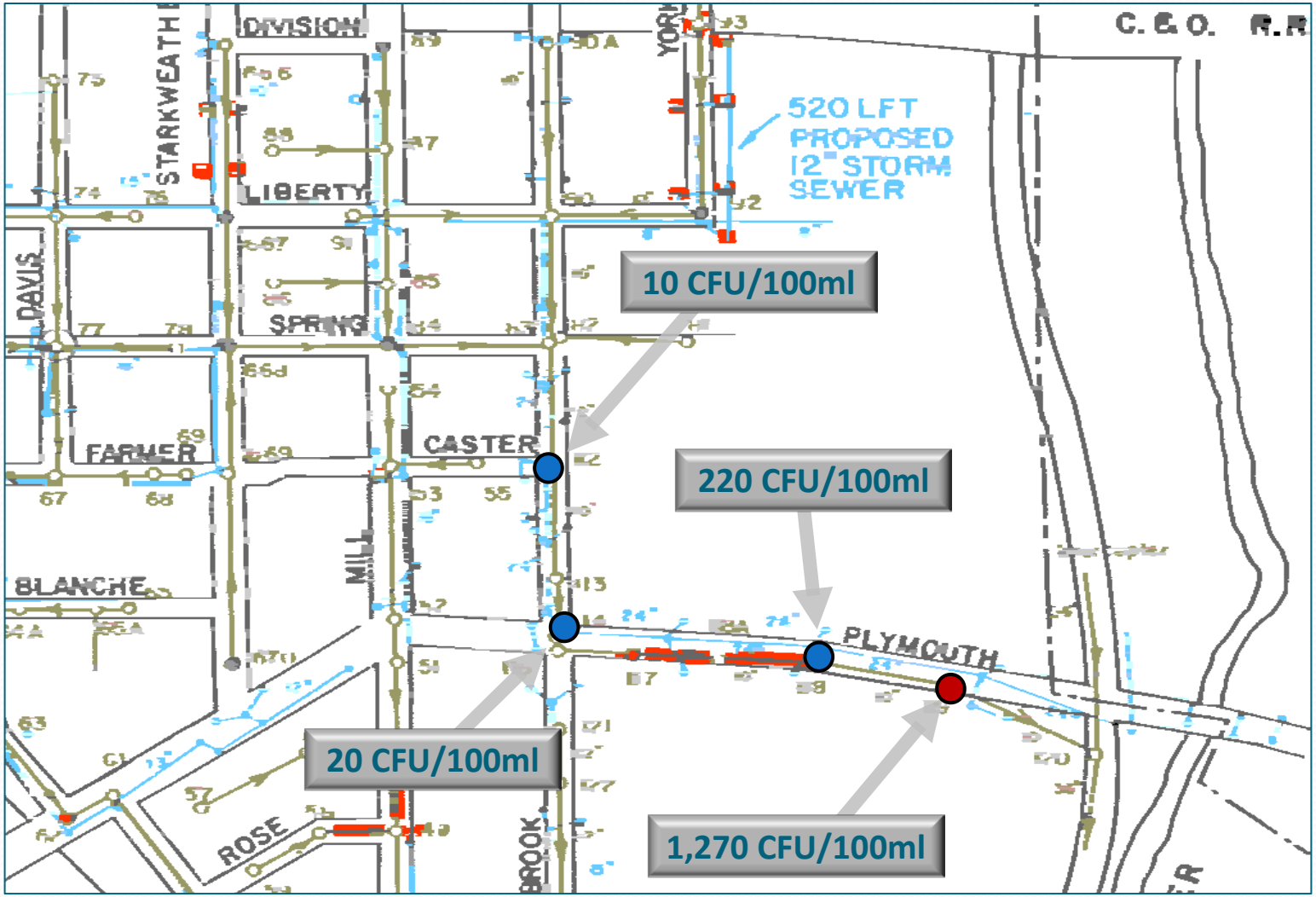
CASE HISTORY – NOVEMBER 1997



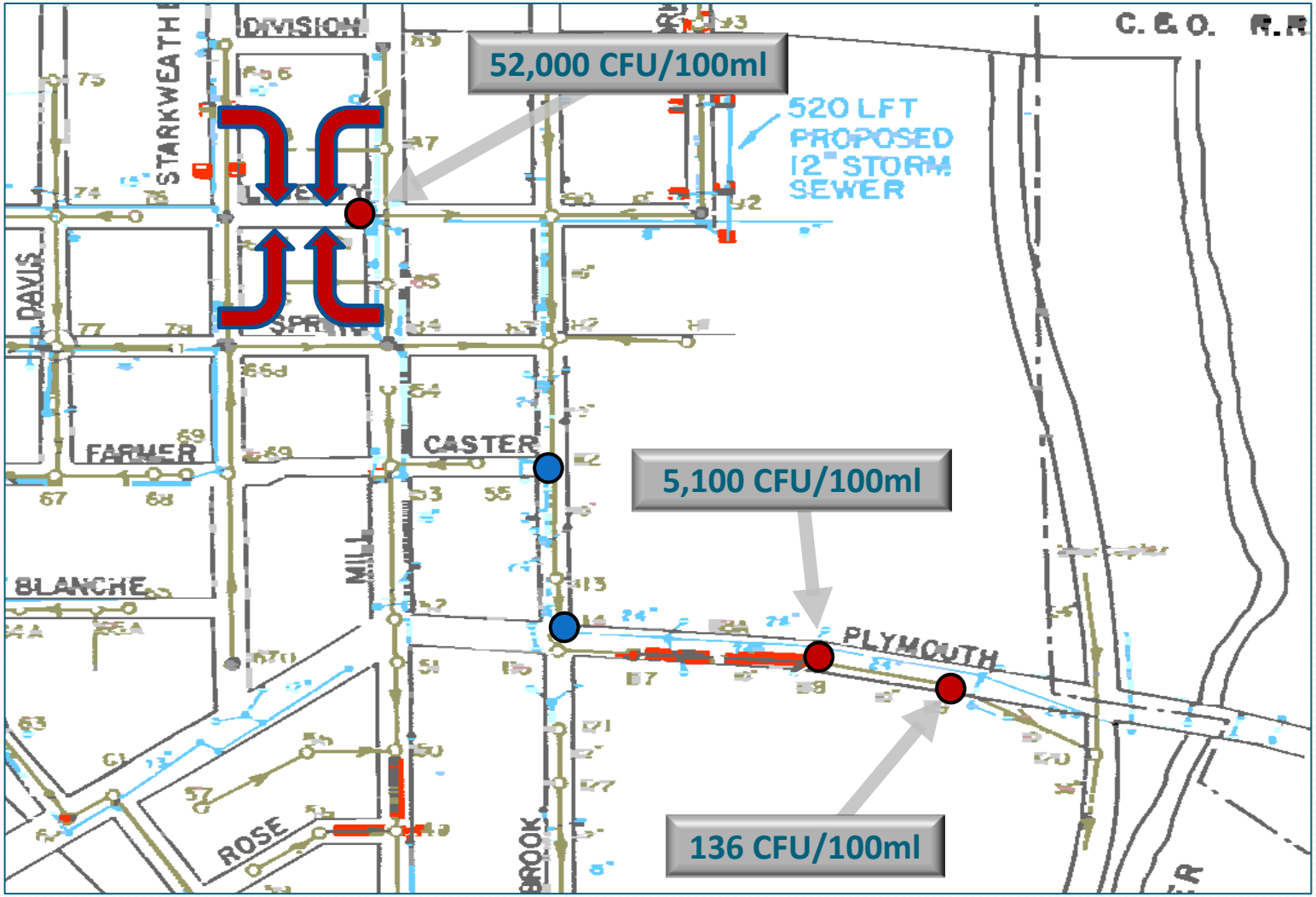
CASE HISTORY – MAY 15, 1998



CASE HISTORY – MAY 27, 1998



CASE HISTORY – SEPTEMBER 27, 1998



CASE HISTORY

WHAT DID WE LEARN?

FOLLOW YOUR NOSE

- There is usually a basis for a persistent complaint
- Timing is everything
- Sometimes you just get lucky

CASE HISTORY

JUST WHEN YOU THOUGHT IT WAS SAFE

CASE HISTORY – JUNE 2, 2005

- Strong sewage odor reported from the same manhole in the street
- Investigation leads to the same outfall
  - A plugged sanitary sewer line upstream is found
  - Line unplugged, jetted and the sewage flow stops in the storm sewer
  - How did it get into the storm sewer???

CASE HISTORY

ISOLATING THE SOURCE

- A cracked sanitary sewer crossing through the storm sewer is the culprit…
- The sanitary sewer line blockage caused sewage to back up and overflow into the storm sewer

CASE HISTORY
ELIMINATING THE DISCHARGE

- Now is it really safe?!?!

Program Outline

- Introduction
- Basic Investigations
- Advanced Investigations
- Prevention Considerations
- Case Studies
- **Tabletop Exercise**

GROUP PROBLEM SOLVING SESSION

- Divide the class into groups
- Each group must select a leader
- Leaders will present problem methodology and solution to the class
- Rules
  - Each group will have limited resources
  - Each group will have 1 hour to solve the problem
  - Facilitators will be available to answer questions

GROUP PROBLEM SOLVING SESSION

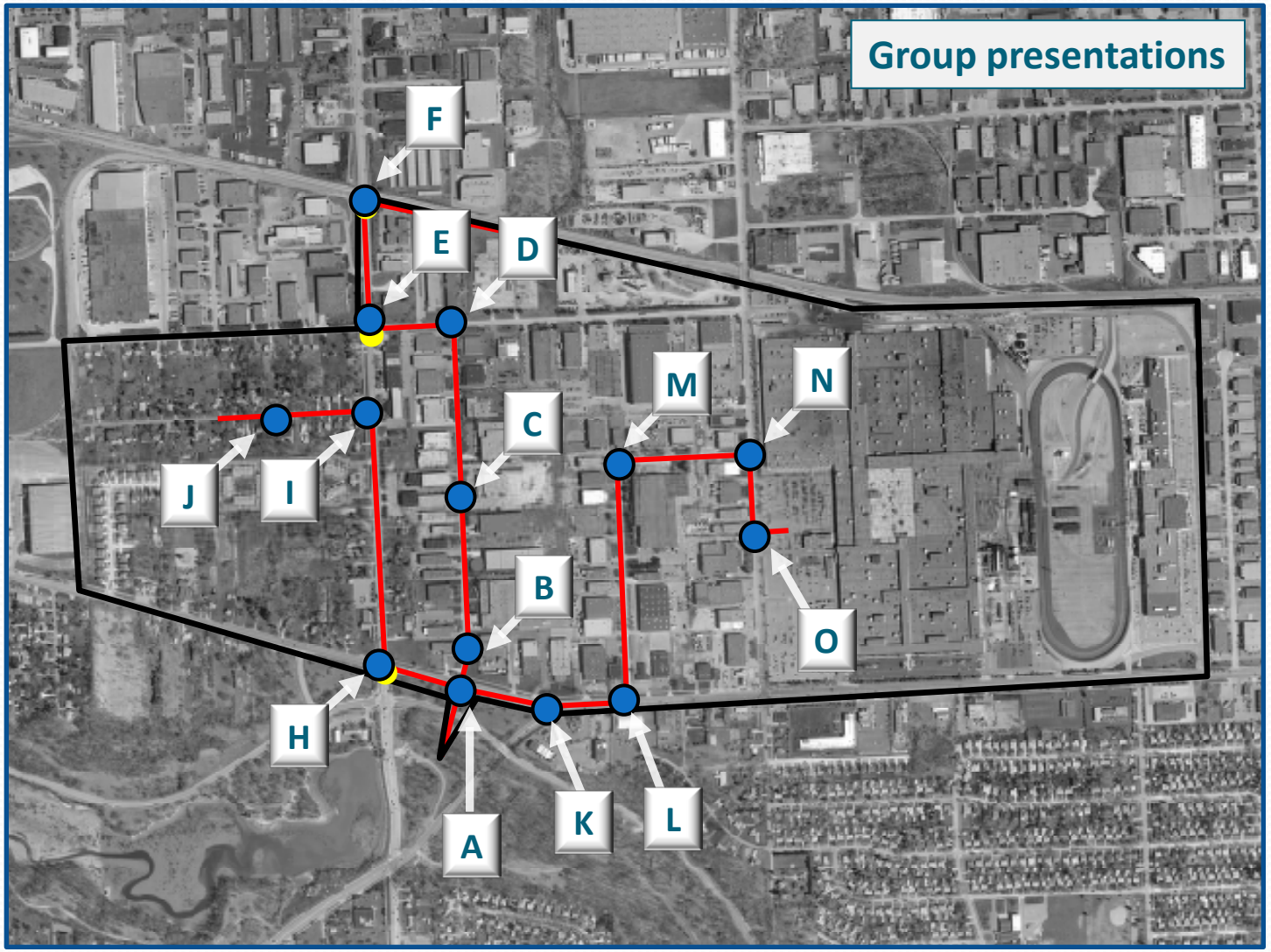
PROBLEM

- Milky white discharge
- Happens frequently; not every day
- Sewage-like odor
- Black grease and oil observed
- Suds noticed on riffles 3 feet downstream of outfall
- No suds present upstream of outfall
- On way to site, drove through commercial strips and medium/light industrial area
- Investigation begins in late summer

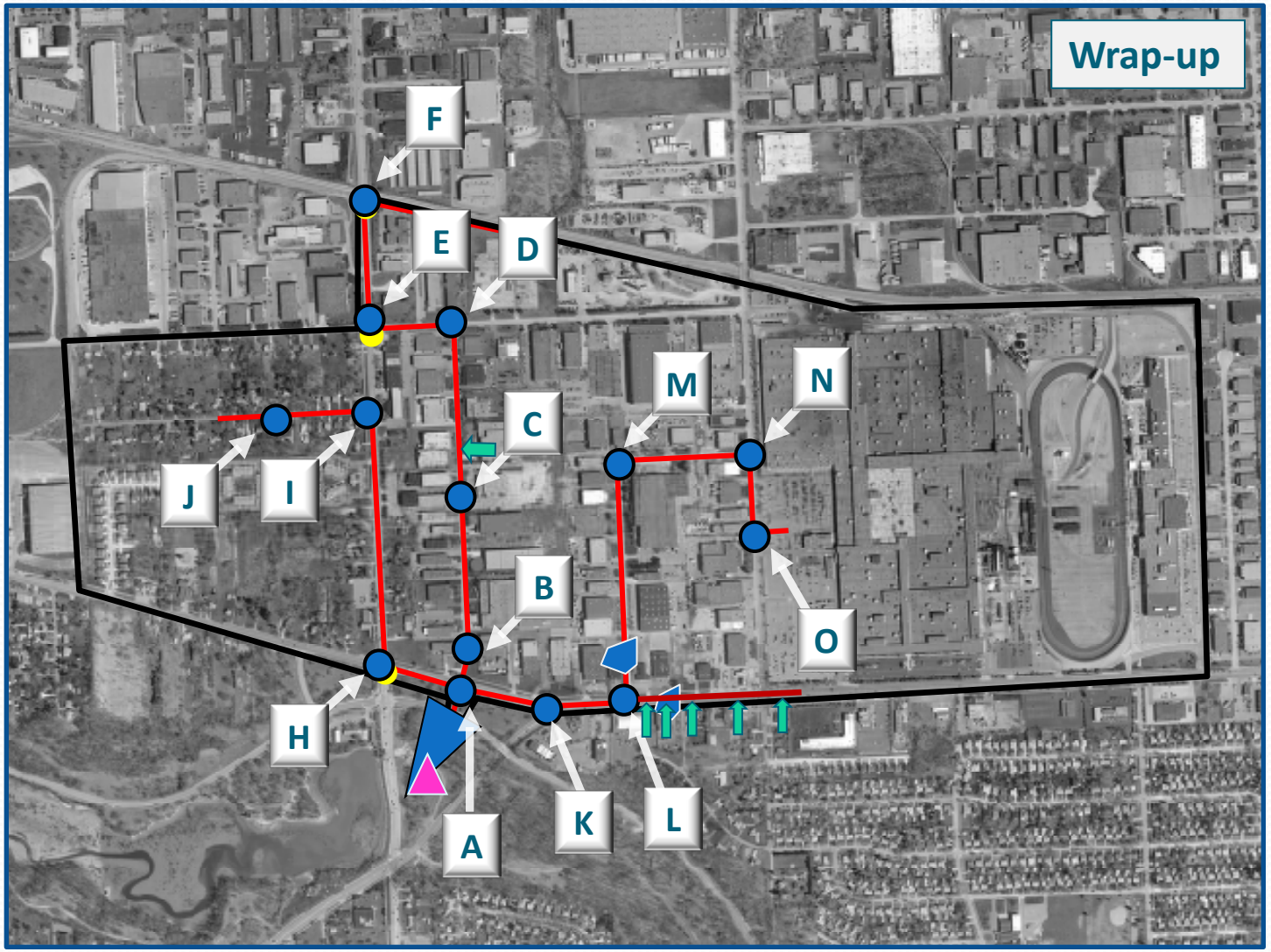
OBJECTIVE

- Find the source(s) of the illicit discharges

GROUP PROBLEM SOLVING SESSION



GROUP PROBLEM SOLVING SESSION



GROUP PROBLEM SOLVING

WHAT WE FOUND - BUILDING #20

USEFUL WEBSITES

- www.waynecounty.com/doe_wqm
- www.cwp.org
- www.rougeriver.com
- www.epa.gov
- www.michigan.gov/deq
- On-site Sewage Disposal Ordinances online:
  - www.macombcountymi.gov/publichealth
  - www.waynecounty.com/doe_wqm_res_stormwm
  - www.ewashtenaw.org/government/departments/environmental_health/wells_septic

It takes a partnership for effective pollution prevention

Robert A. Ficano
County Executive

Alliance of Downriver Watersheds
OURS TO PROTECT

Alliance of Rouge Communities
OURS TO PROTECT
Working together, restoring the river

THE ROUGE RIVER PROJECT
A WORLD CLASS EFFORT
BRINGING OUR RIVER BACK TO LIFE

Department of Public Services
Wayne County

ECT Environmental Consulting & Technology, Inc.

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