

Greenpoint Petroleum Vapor Intrusion Study

Thanks to Ed Hampston & Kevin Hale
NYSDEC

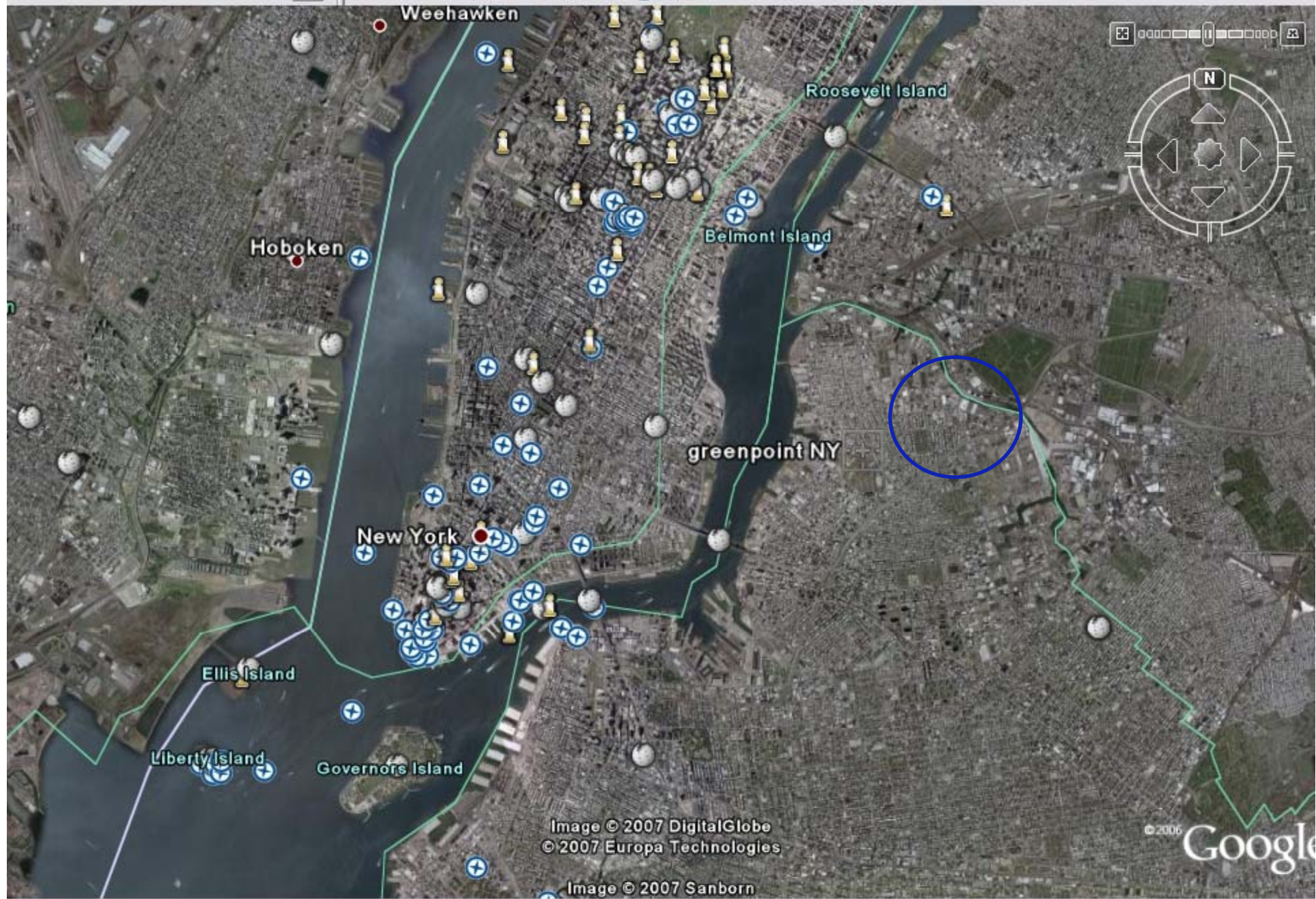


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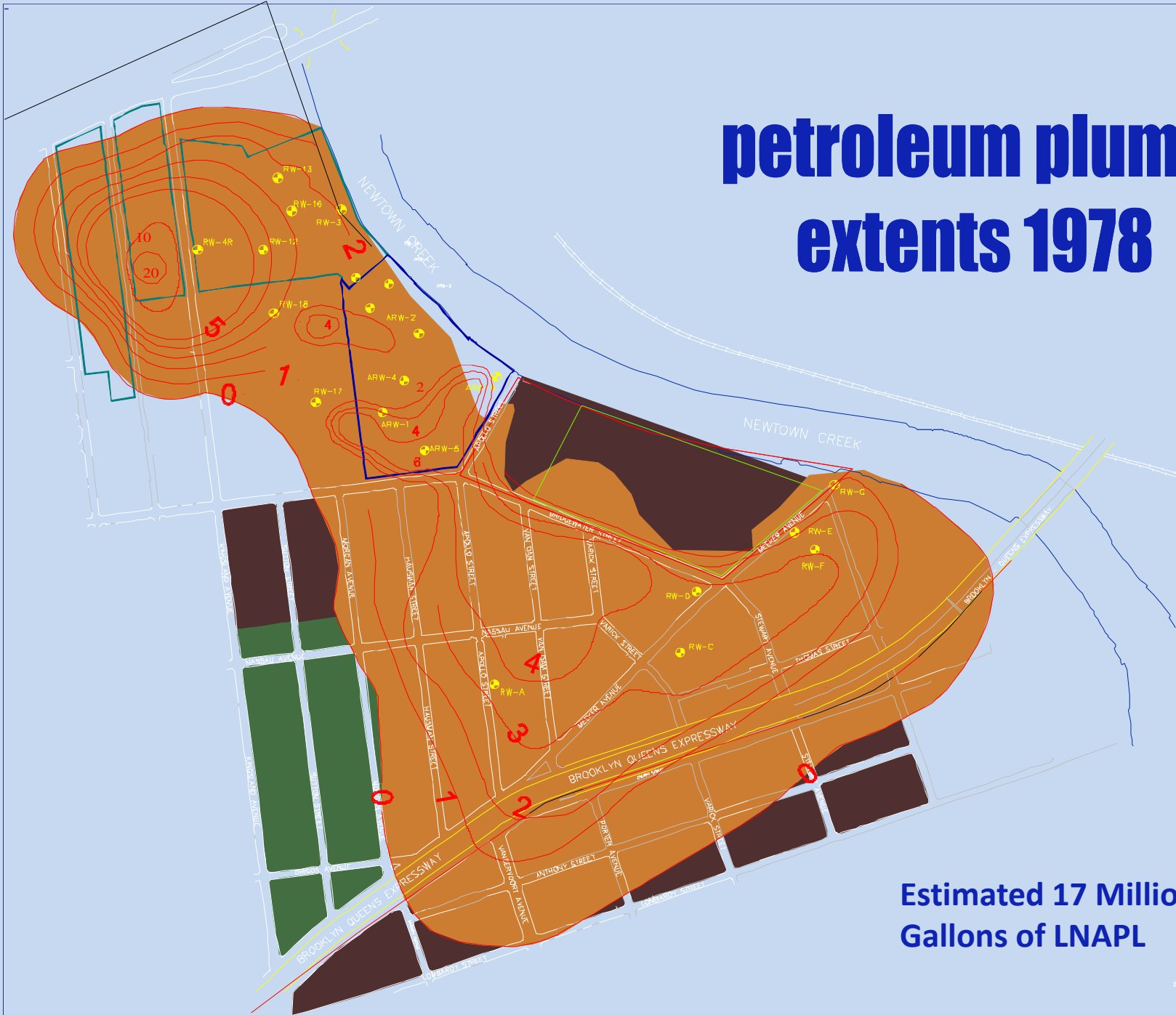
Site History

- **Petroleum Refining Operations Began in 1866**
- **More than 50 Refineries Along Newtown Creek by 1870**
- **Refinery Operations Ceased in 1966**
- **Coast Guard Finds Oil Slick in 1978**
- **Bulk Storage Ceased at ExxonMobile in 1993**
- **Still Ongoing at BP**



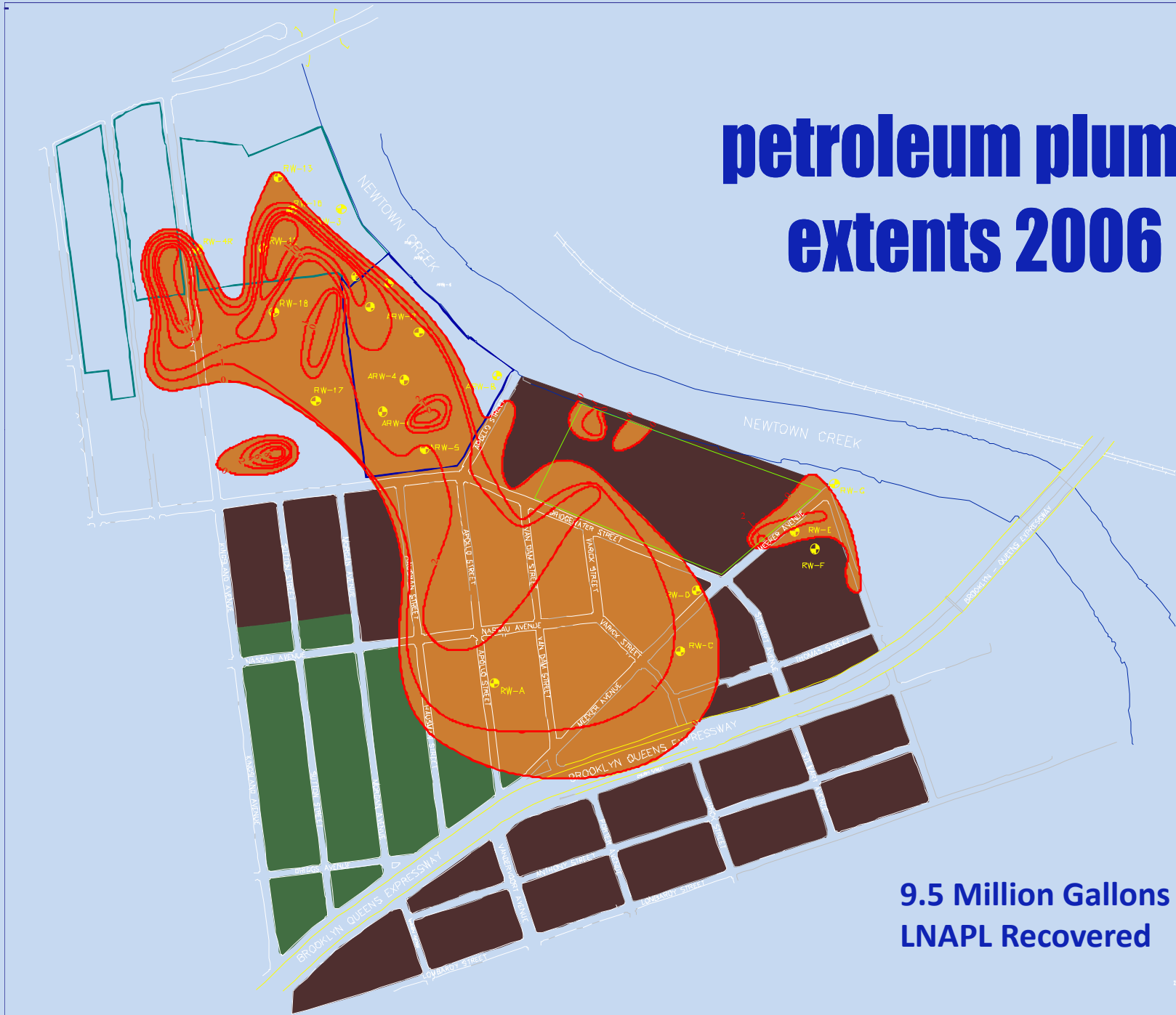
1978: The Coast Guard Discovered Oil Floating on Newtown Creek

petroleum plume extents 1978



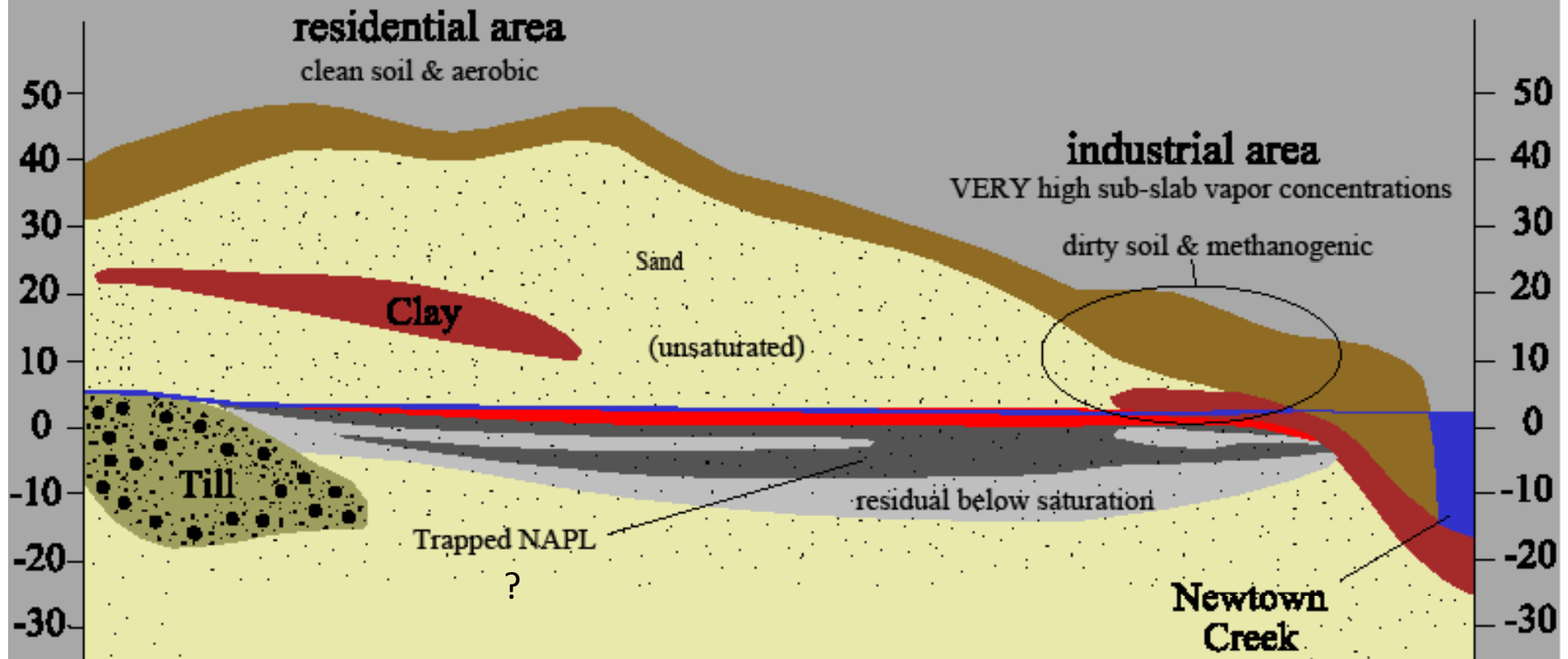
Estimated 17 Millions
Gallons of LNAPL

petroleum plume extents 2006



9.5 Million Gallons of
LNAPL Recovered

Conceptual Cross-Section of the Greenpoint Oil Spill

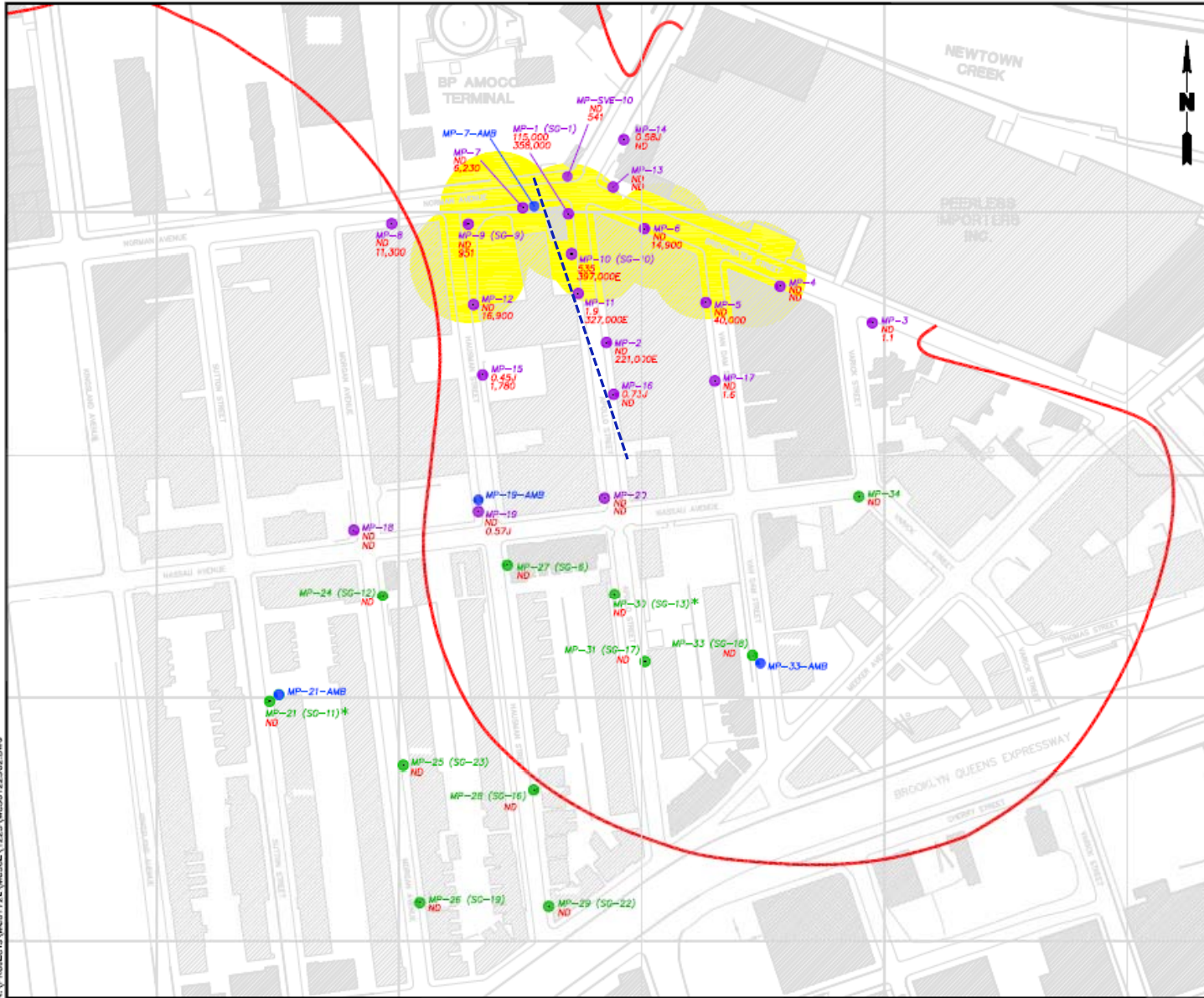


Near Source – Industrial Area

- **Product Recovery Underway - Exxon Mobile Currently Removing ~100,000 Gallons/Month**
- **High Concentrations of Benzene and Methane in Some Shallow Soil Gas Points**
- **SVE System Installed to Mitigate Methane and Other VOCs in Shallow Soil Gas**



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LEGEND

- MP-3
ND
1.1
- NESTED PERMANENT PHASE IV SOIL VAPOR MONITORING POINT (2 PER LOCATION)
SAMPLING INTERVALS: 2-3 FOOT DEPTH
7-8 FOOT DEPTH
- ND
COMPOUND WAS NOT DETECTED
- J
ESTIMATED VALUE BELOW REPORTING LIMIT
- E
VALUE EXCEEDS CALIBRATION RANGE
- MP-1(SG-1)
- DESIGNATION OF PHASE IV PERMANENT MONITORING POINT WITH CORRESPONDING PHASE I / II SOIL VAPOR SAMPLING POINT IN PARENTHESES
7-8 FOOT DEPTH
- MP-22
- PERMANENT PHASE IV SOIL VAPOR MONITORING POINT (1 PER LOCATION)
SAMPLING INTERVAL:
- CURRENT EXTENT OF FREE-PRODUCT PLUME (BASED ON MAY 21, 2008 APPARENT FREE-PRODUCT THICKNESS MEASUREMENTS IN THE REGIONAL AQUIFER)
- MP-19-AMB
- AMBIENT SAMPLE LOCATION
- ANTICIPATED RADIUS OF INFLUENCE OF THE PROPOSED SVE SYSTEM
- EXISTING BUILDING / STRUCTURE

| SAMPLE ID | 1st SAMPLING EVENT | 2nd SAMPLING EVENT |
|-------------|--------------------|--------------------|
| MP-21 | 2/5/09 OR 2/10/09 | 3/5/2009 |
| MP-30 | ND | ND |
| MP-30 (DUP) | ND | - |

* MONITORING LOCATION SAMPLED TWICE DURING THIS BIENNIAL SAMPLING ROUND

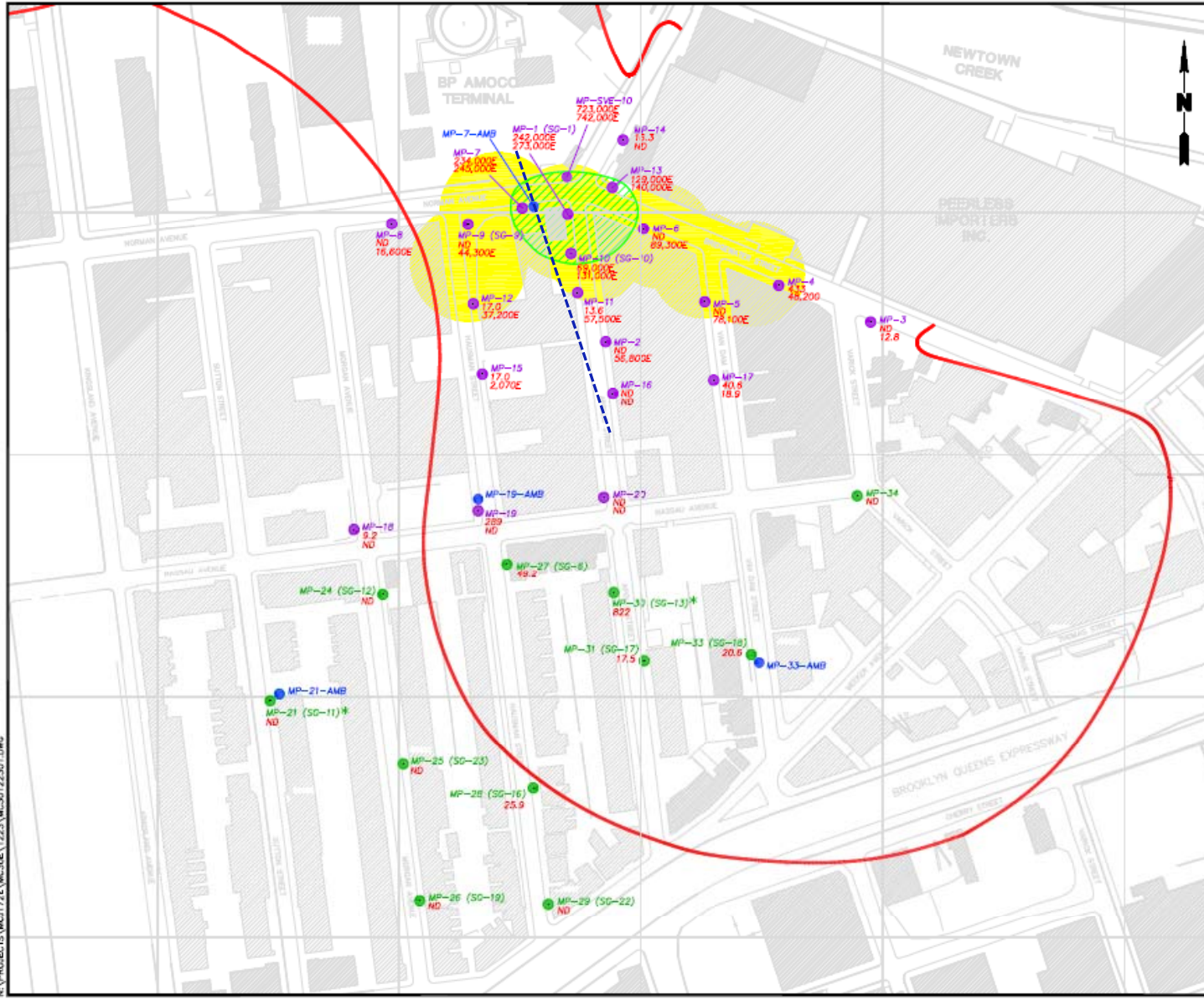


THE
**BENZENE CONCENTRATIONS
 IN SOIL VAPOR
 JANUARY 2009**
 BIENNIAL SOIL VAPOR SAMPLING - OFF-SITE AREA
 GREENPOINT, BROOKLYN, NEW YORK

Prepared For:
 EXXONMOBIL OIL CORPORATION
 BROOKLYN, NEW YORK

| | | | |
|---|---------------------|-------------------|-------------------------|
| ROUX ASSOCIATES, INC. <small>Environmental Consulting & Assessment</small> | Compiled by: T.J.L. | Date: 07/18/09 | ROUX 3 |
| | Prepared by: G.M. | Scale: AS SHOWN | |
| | Project Mgr: C.P. | Office: NY | |
| | File No: M030122302 | Project: 17230Y23 | |

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LEGEND

- **MP-3**
ND
12.6
NESTED PERMANENT PHASE IV SOIL VAPOR MONITORING POINT (2 PER LOCATION)
SAMPLING INTERVALS: 2-3 FOOT DEPTH
7-8 FOOT DEPTH
- METHANE CONCENTRATION IN PPMV
SAMPLING INTERVALS: 2-3 FOOT DEPTH
7-8 FOOT DEPTH
- ND** COMPOUND WAS NOT DETECTED
- J** ESTIMATED VALUE BELOW REPORTING LIMIT
- E** VALUE EXCEEDS CALIBRATION RANGE
- MP-1(SG-1)** DESIGNATION OF PHASE IV PERMANENT MONITORING POINT WITH CORRESPONDING PHASE (VI) SOIL VAPOR SAMPLING POINT IN PARENTHESES
- **MP-22** PERMANENT PHASE IV SOIL VAPOR MONITORING POINT (1 PER LOCATION)
SAMPLING INTERVAL: 7-8 FOOT DEPTH
- CURRENT EXTENT OF FREE-PRODUCT PLUME (BASED ON MAY 21, 2008 APPARENT FREE-PRODUCT THICKNESS MEASUREMENTS IN THE REGIONAL AQUIFER)
- APPROXIMATE EXTENT OF METHANE EXCEEDING 25,000 ppmv AT THE 2-3 FOOT DEPTH SAMPLING INTERVAL
- **MP-19-AMB** AMBIENT SAMPLE LOCATION (AMBIENT SAMPLES ARE COLLECTED APPROXIMATELY 5 FEET UPWIND OF THE RESPECTIVE SOIL VAPOR POINT.)
- ANTICIPATED RADIUS OF INFLUENCE OF THE PROPOSED SVE SYSTEM
- EXISTING BUILDING / STRUCTURE

| SAMPLE ID | 1st SAMPLING EVENT | 2nd SAMPLING EVENT |
|-------------|--------------------|--------------------|
| MP-21 | 2/5/09 OR 2/10/09 | 3/5/2009 |
| MP-30 | 1,580E | 822 |
| MP-30 (DUP) | 2,170E | — |

* MONITORING LOCATION SAMPLED TWICE DURING THIS BIENNIAL SAMPLING ROUND

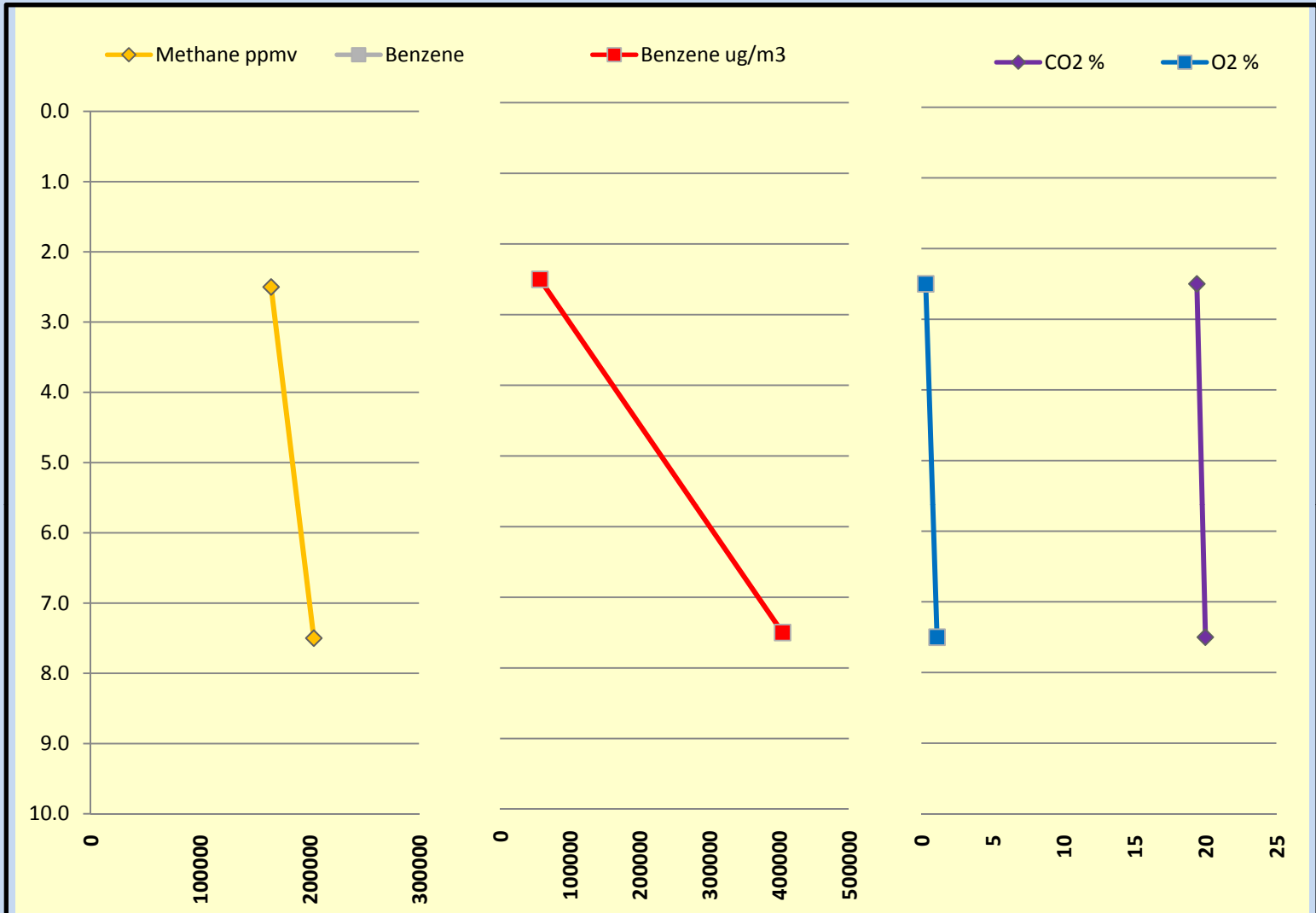


Title: METHANE CONCENTRATIONS IN SOL VAPOR
JANUARY 2009

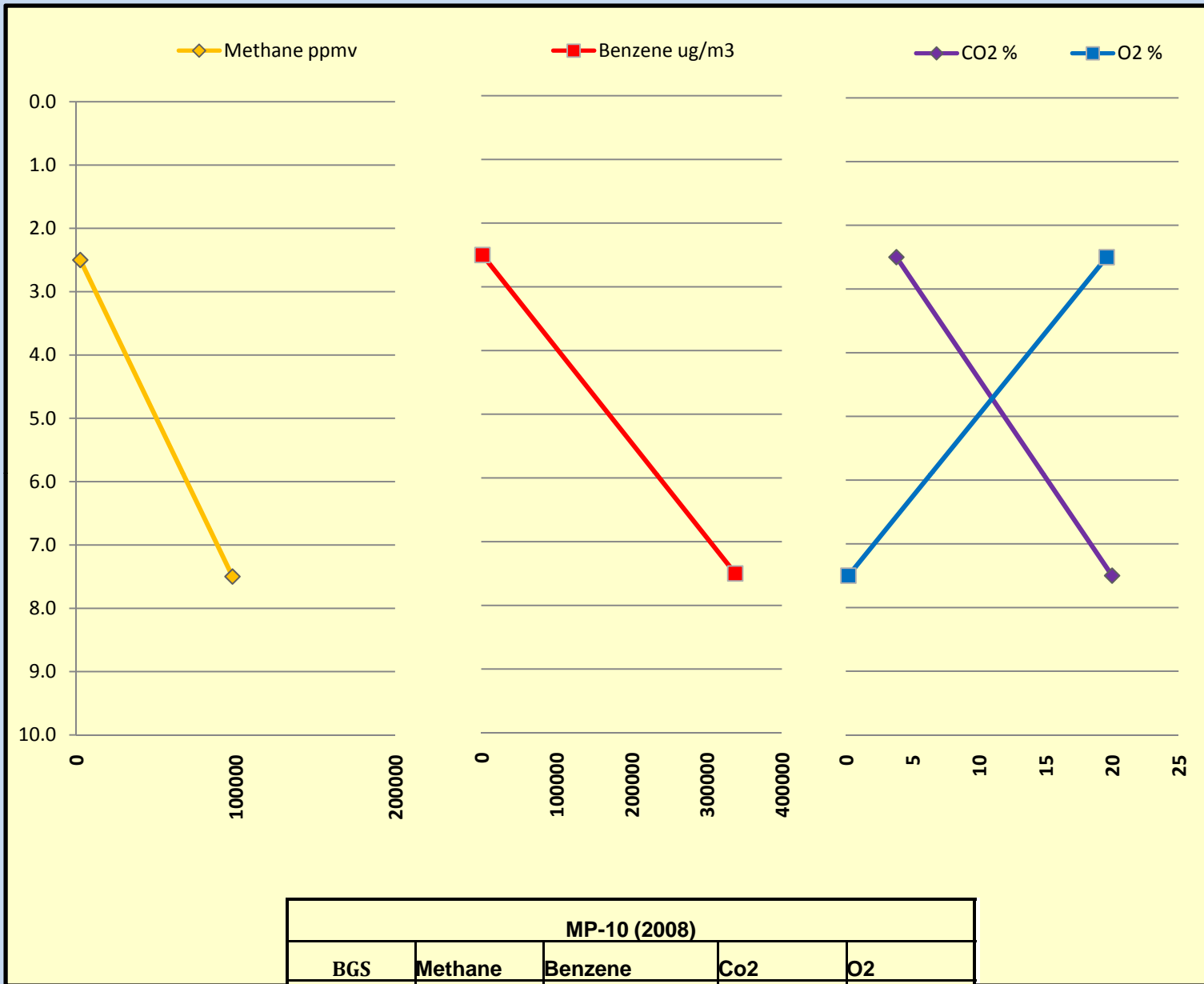
BIENNIAL SOIL VAPOR SAMPLING - OFF-SITE AREA
GREENPOINT, BROOKLYN, NEW YORK

Prepared For: EXXONMOBIL OIL CORPORATION
BROOKLYN, NEW YORK

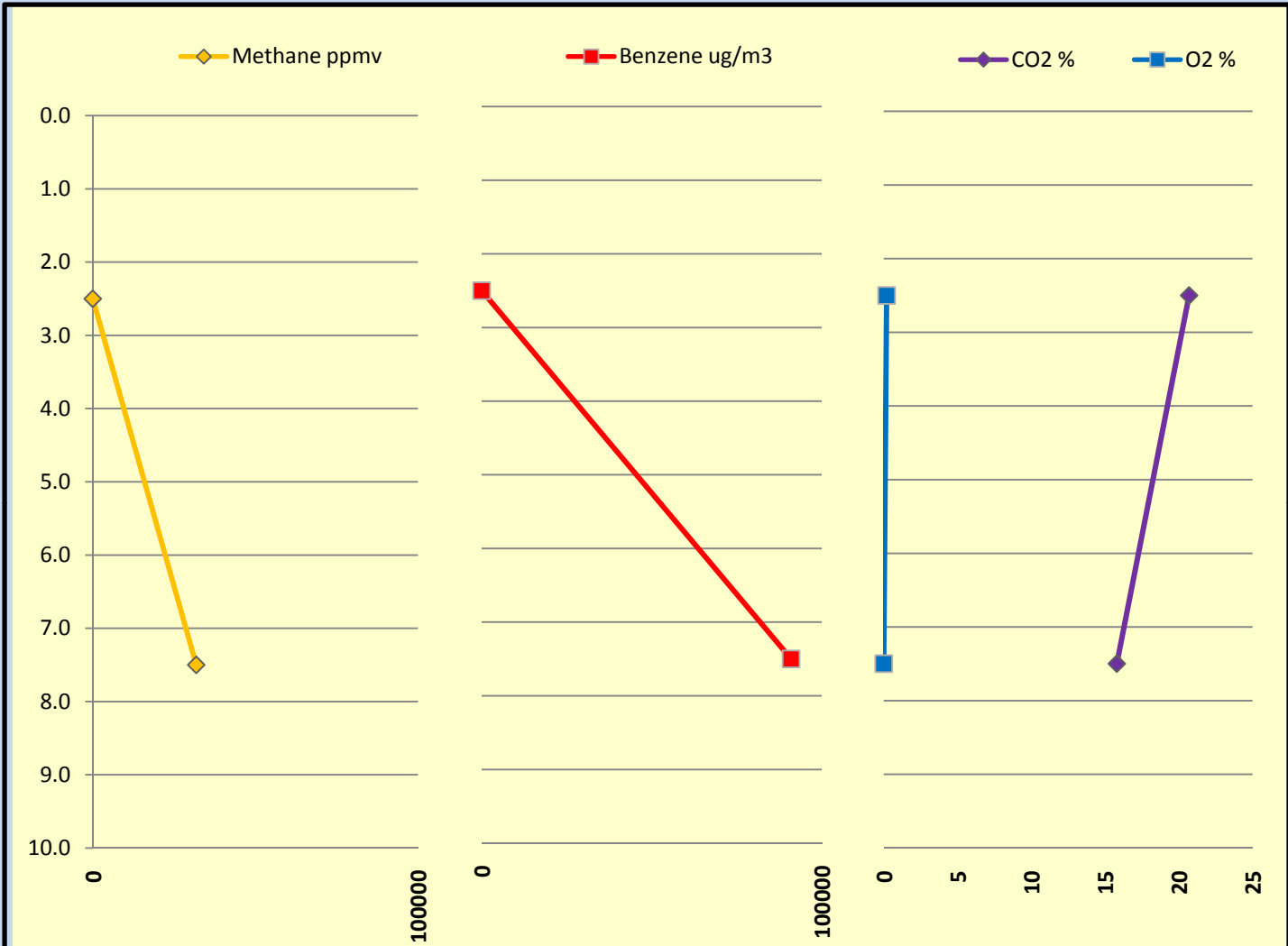
| | | | |
|--|---------------------|-------------------|-------------------------|
| ROUX ROUX ASSOCIATES, INC. <small>Environmental Consulting & Management</small> | Compiled by: T.B. | Date: 07/09/09 | ROUX 4 |
| | Prepared by: G.M. | Scale: AS SHOWN | |
| | Project Mgr: C.P. | Office: NY | |
| | File No: M030122301 | Project: 17230723 | |



| MP-1 (2008) | | | | |
|-------------|---------|---------|------|-----|
| BGS | Methane | Benzene | Co2 | O2 |
| 2.5 | 165000 | 57300 | 19.4 | 0.3 |
| 7.5 | 204000 | 405000 | 20 | 1.1 |

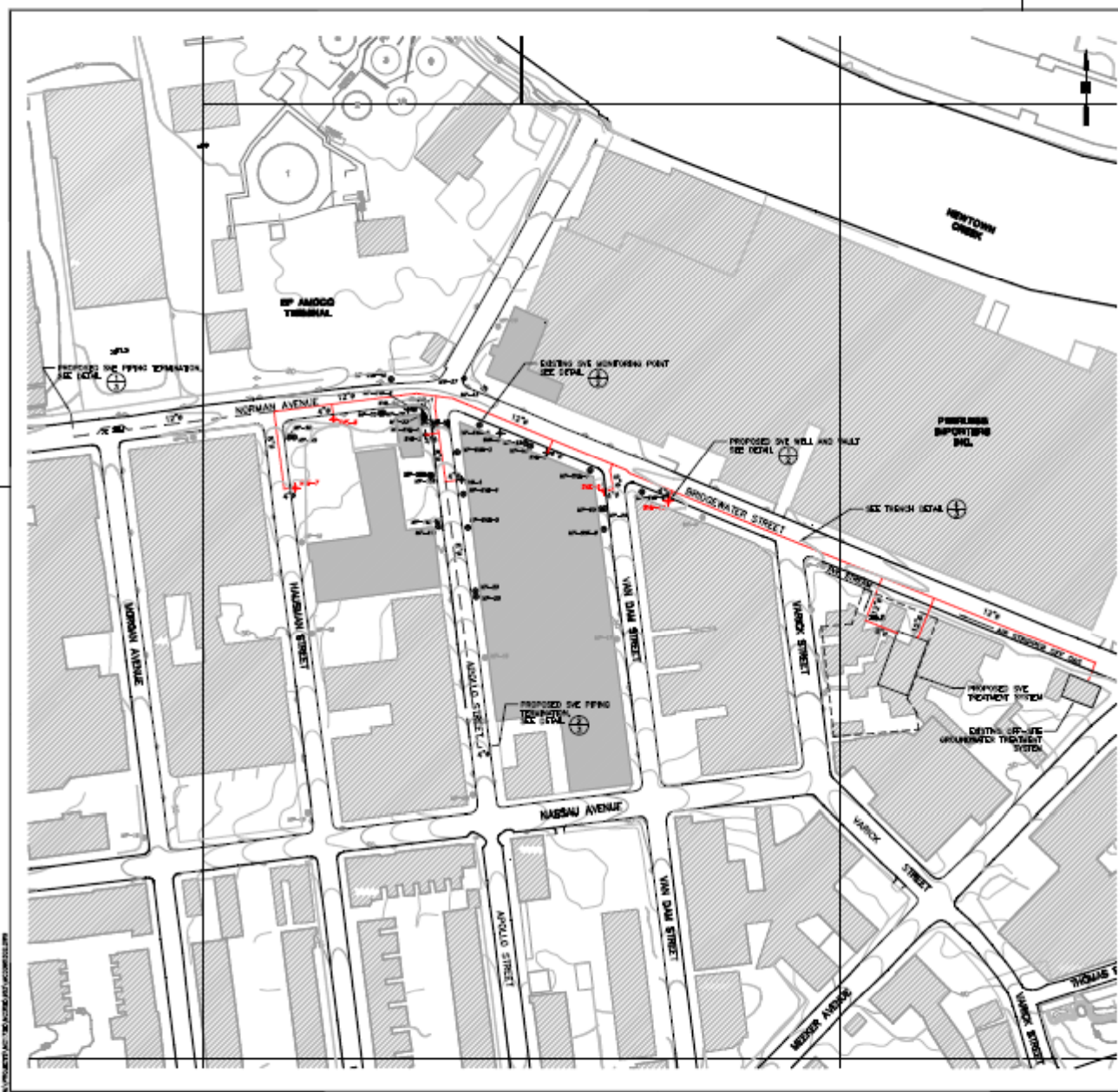


| MP-10 (2008) | | | | |
|--------------|---------|---------|-----|------|
| BGS | Methane | Benzene | Co2 | O2 |
| 2.5 | 2680 | 1630 | 3.8 | 19.6 |
| 7.5 | 98100 | 338000 | 20 | 0.2 |



| MP-2 | | | | |
|------|---------|---------|------|------|
| BGS | Methane | Benzene | Co2 | O2 |
| 2.5 | 5 | 1.6 | 20.7 | 0.20 |
| 7.5 | 31800 | 91000 | 15.8 | 0 |

?



- LEGEND**
- EXISTING MAJOR GROUND SURFACE ELEVATION CONTOUR (INTERNAL = 10 FT-MASS)
 - EXISTING MINOR GROUND SURFACE ELEVATION CONTOUR (INTERNAL = 2 FT-MASS)
 - ▨ EXISTING BUILDING / STRUCTURE
 - ⊕ EXISTING SOIL VAPOR EXTRACTION WELL NOT USED FOR THE FULL SCALE SYSTEM
 - ⊕ EXISTING SOIL VAPOR EXTRACTION WELL USED FOR THE FULL SCALE SYSTEM
 - ⊕ PROPOSED SOIL VAPOR EXTRACTION WELL
 - ⊕ GROUNDWATER MONITORING WELL
 - ⊕ EXISTING SOIL VAPOR MONITORING POINT (SAMPLING INTERVAL 2-3 FT BLS)
 - ⊕ EXISTING SOIL VAPOR MONITORING POINT (SAMPLING INTERVAL 7-8 FT BLS)
 - ⊕ NOTED SOIL VAPOR MONITORING POINTS (3 PER LOCATION)
 - ⊕ - SMALLER (2-3 FT BLS)
 - ⊕ - INTERMEDIATE (7-8 FT BLS)
 - ⊕ - DEEP (14-18 FT BLS)
 - 12" SVE PIPING FOR PROPOSED SVE SYSTEM WITH PVC (SCHEDULE 40)
 - SVE PIPING FOR POSSIBLE FUTURE EXPANSION
 - PROPERTY BOUNDARY (LOT 8 AND LOT 25 ACQUIRED BY EXXONMOBIL FOR SVE SYSTEM INSTALLATION)

- NOTES**
1. DATE MAP PREPARED FROM AERIAL SURVEY PERFORMED BY OFFICE OF ATCHAFALAYA SERVICES, LLC, MAY 2005. ALL TOPOGRAPHIC AND PLANNING DETAILS WERE PREPARED USING PHOTOGRAMMETRIC METHOD.
 2. HORIZONTAL LOCATIONS ARE COORDINATED AND IN U.S. FEET RELATIVE TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
 3. ELEVATIONS ARE IN U.S. FEET RELATIVE TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1989 (NGVD 89). THE NGVD 89 DATUM IS ALSO KNOWN AS THE U.S. COAST AND GEODETIC SURVEY (USC&GS) MEAN SEA LEVEL DATUM OF 1985.
 4. THE PROPOSED TOPOGRAPHIC BENCHMARK DATUM IS 2.58 FEET ABOVE THE NGVD 89 DATUM AT BROADWAY STREET, NEW JERSEY. TO CONVERT THE ELEVATIONS DATUM TO BROADWAY TOPOGRAPHIC BENCHMARK ELEVATIONS, SUBTRACT 2.58 FEET FROM THE BENCH MARK 89 ELEVATIONS.
 5. SAMPLE LOCATIONS ARE APPROPRIATE.
 6. EXISTING SVE WELLS SVE-1, SVE-4 AND SVE-11 ARE SCHEDULED FROM 13 TO 18 FT BLS. PROPOSED SVE WELLS SVE-7, SVE-8, SVE-9 AND SVE-10 ARE TO BE SCHEDULED FROM 13 TO 18 FT BLS.
 7. THE PROPOSED SVE PIPING (6", 8" AND 12") ARE NPIPE 304 17.
 8. THE PROPOSED SVE PIPING NETWORK IS BASED ON THE DRAWING NO. 45 OF THE PERMIT SUBMITTED TO THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION OF NEW YORK (DEC DOT) DATED 04/26/07, FOR SECONDARY SYSTEM DESIGN PROJECT.

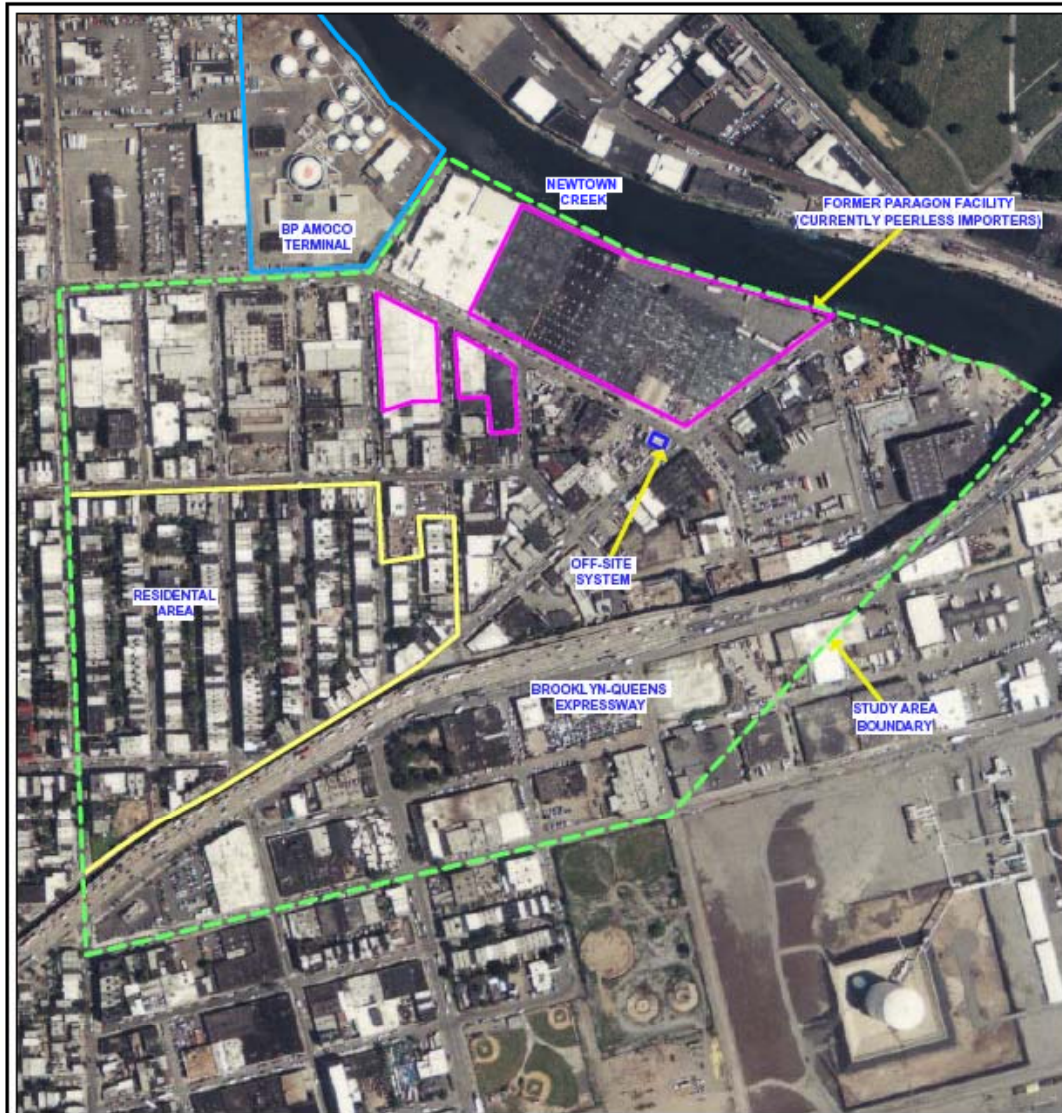


PROPOSED SVE SYSTEM PIPING LAYOUT

VAPOR MITIGATION DESIGN
GREENWICH, BROOKLYN, NEW YORK

Prepared For:
EXXONMOBIL REFINING & SUPPLY COMPANY
INWOOD, NEW YORK

| | | |
|-------------------|-------------------|----------|
| Compiled by: E.T. | Date: 3/10/07 | PLATE |
| Prepared by: G.M. | Scale: AS SHOWN | 1 |
| Project Mgr: G.M. | Office: N.Y. | |
| File No: M0306532 | Project: 17230021 | |



EXPLANATION

- BP AMOCO TERMINAL
- FORMER PARAGON FACILITY
- EXTENT OF RESIDENTIAL AREA
- - - EXTENT OF SOIL VAPOR STUDY AREA



| | | | |
|--|---------------------|--|------------------------|
| Title: | | SITE PLAN | |
| | | GREENPOINT BROOKLYN, NEW YORK | |
| | | OFF-SITE SOIL VAPOR INVESTIGATION - PHASE IV GREENPOINT, BROOKLYN, NEW YORK | |
| Prepared For: | | EXXONMOBIL REFINING & SUPPLY CO. INWOOD, NEW YORK | |
| ROUX ROUX ASSOCIATES INC Environmental Consulting & Management | Compiled by: C.P. | Date: 11SEP06 | FIGURE 1 |
| | Prepared by: C.P. | Scale: AS SHOWN | |
| | Project Mgr: J.P.K. | Office: NEW YORK | |
| | File No: MC2075013 | Project: 17230E17 | |

Greenpoint Residential VI Study Phase I



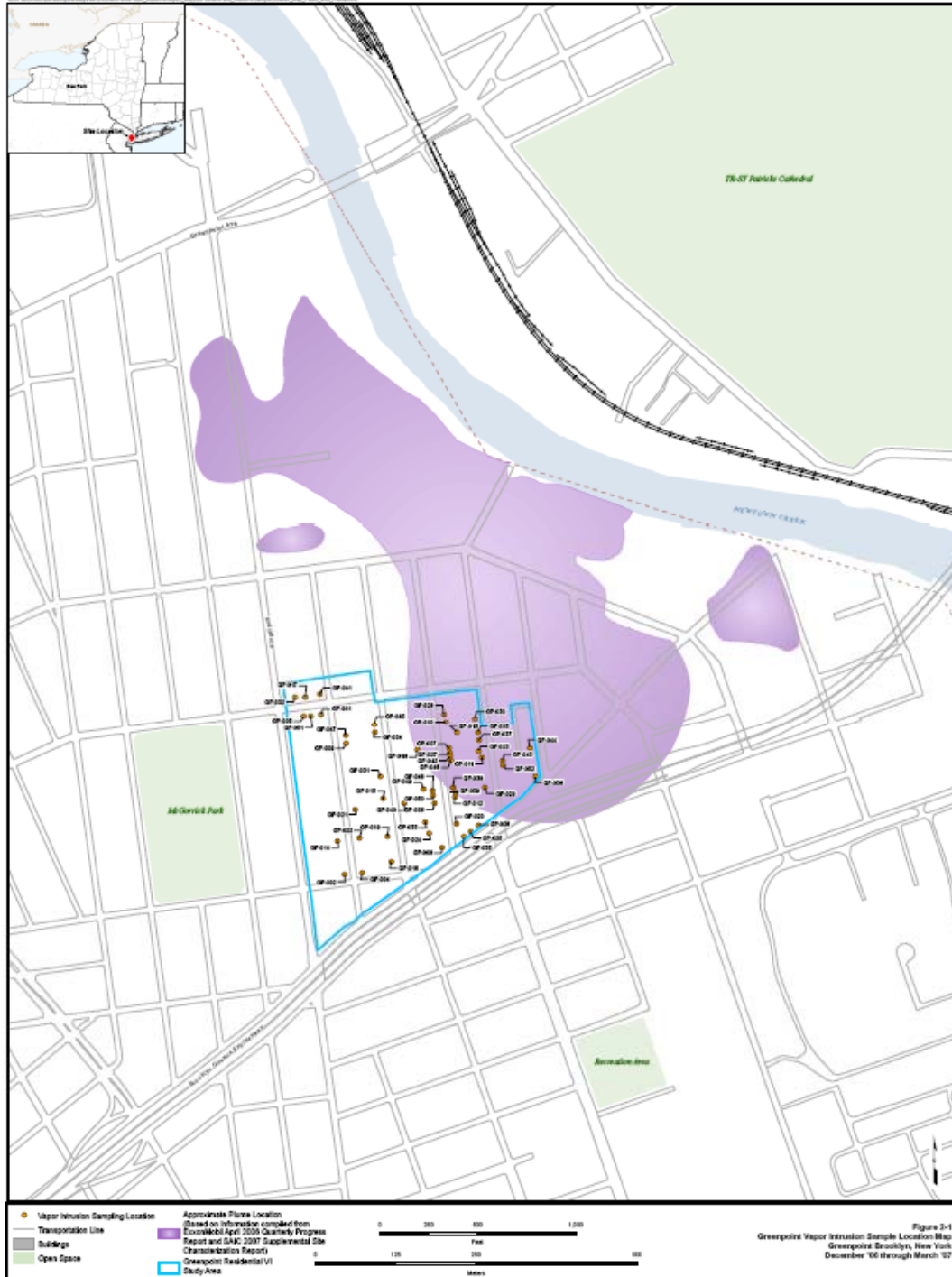
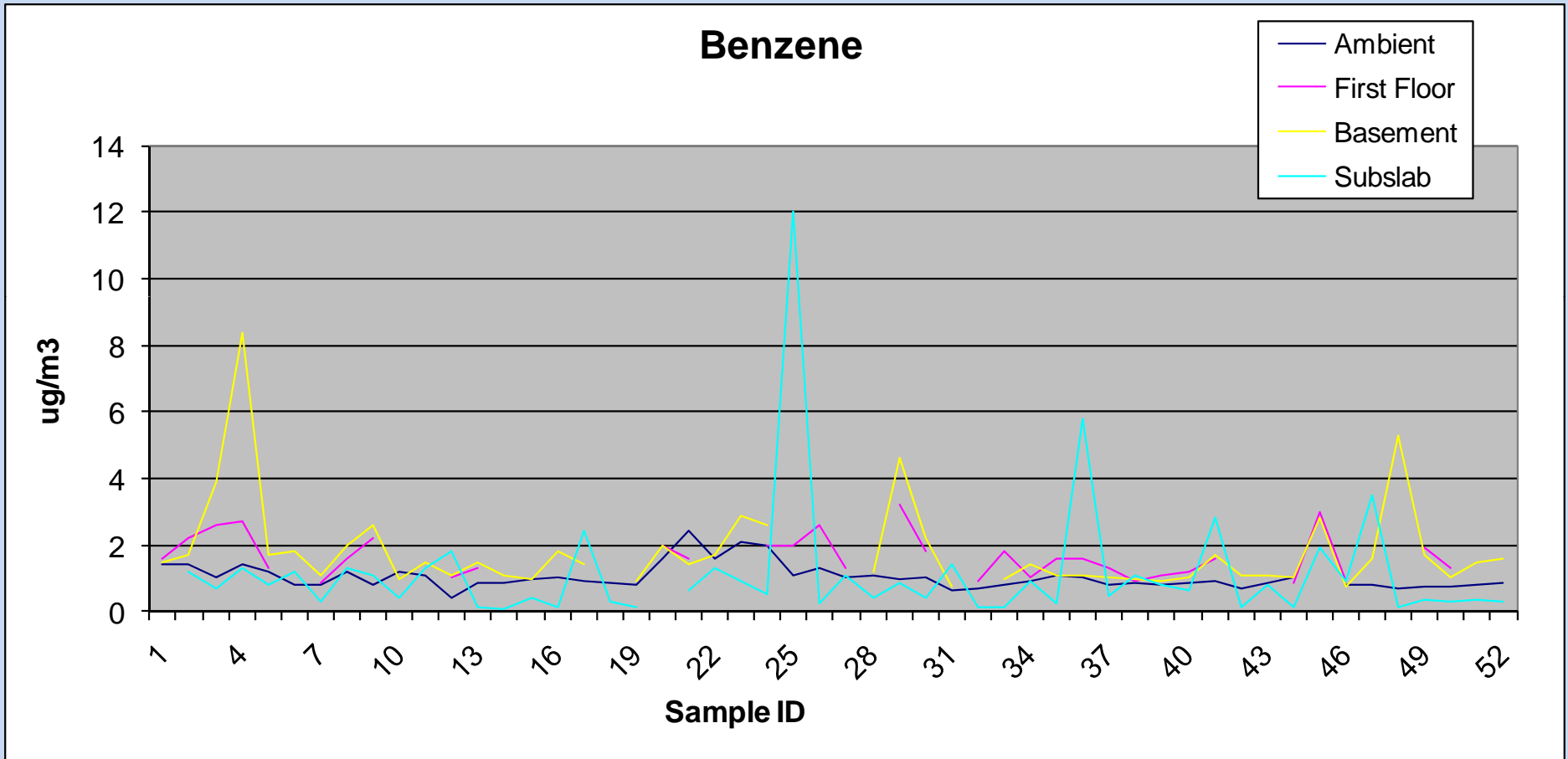


Figure 2-1
Greenpoint Vapor Intrusion Sample Location Map
Greenpoint, Brooklyn, New York
December '06 through March '07

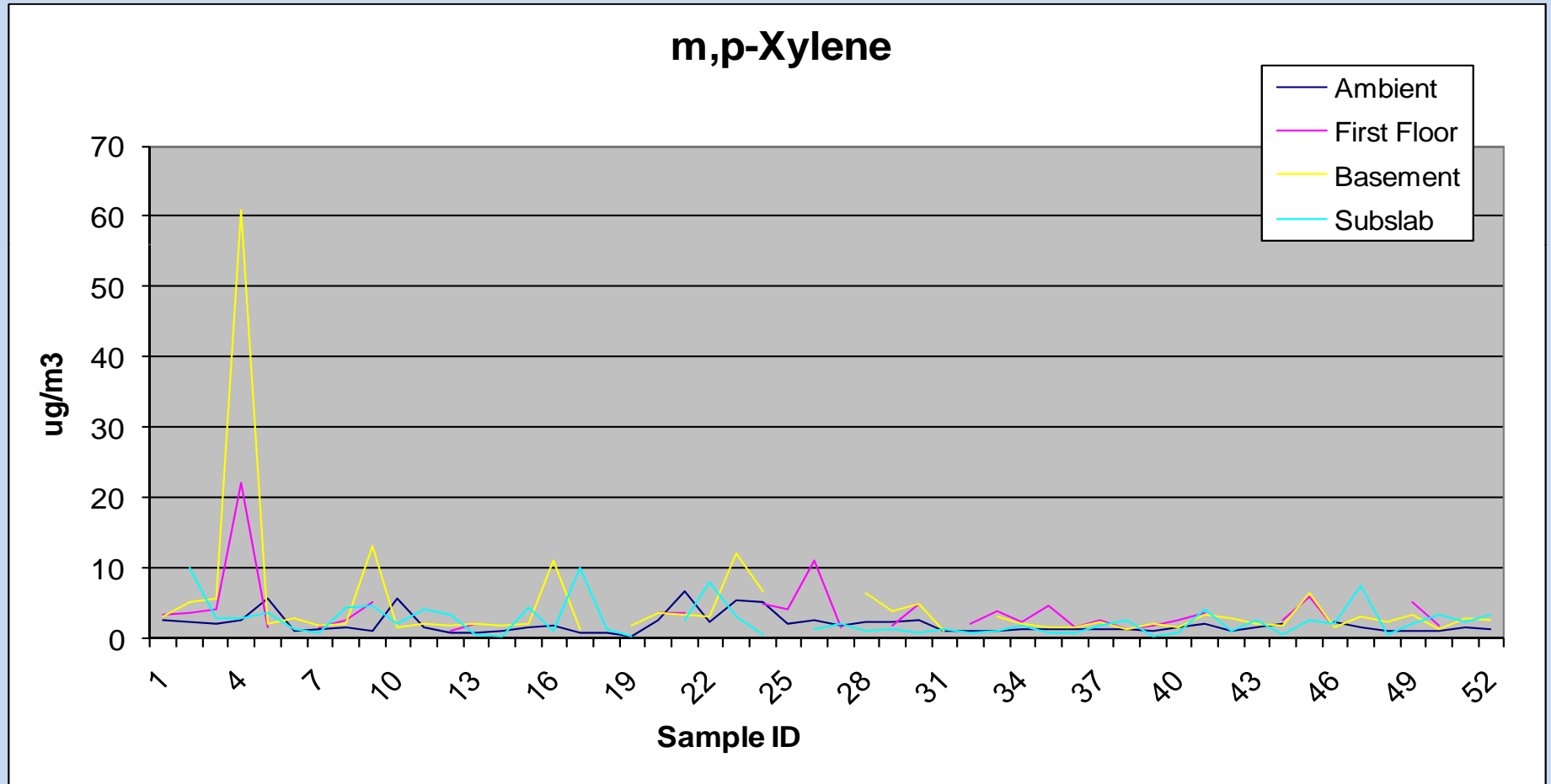
Structure Sampling

O₂ Fosters Biodegradation

Results of Greenpoint Structure Sampling for Benzene



Results of Structure Sampling for m,p -Xylene





STATE OF NEW YORK
DEPARTMENT OF HEALTH

Flanigan Square 547 River Street Troy, New York 12180-2216

Richard F. Daines, M.D.
Commissioner

James W. Clyne, Jr.
Executive Deputy Commissioner

September 16, 2009

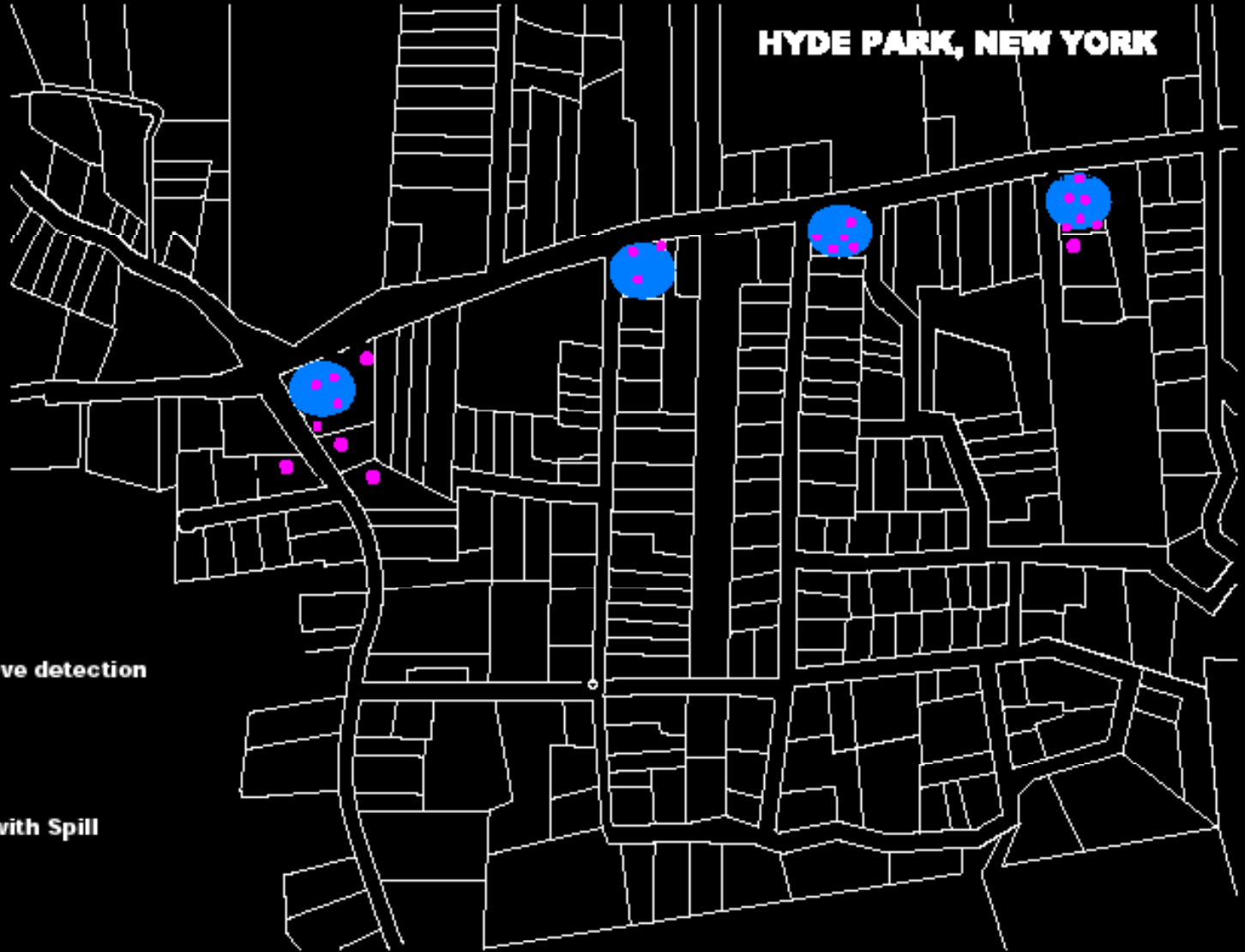
- **Conclusion:**
- **NYS DOH and ATSDR conclude that petroleum-related compounds in the Exxon/Mobile Greenpoint Off-site free-product plume area are not expected to harm people's health via the soil vapor intrusion pathway.**
- **Concentration of VOCs in most homes generally similar to concentrations in homes unaffected by VI.**
- **In homes with elevated concentrations of VOCs, the SS concentrations were lower. Most likely due to indoor source, not VI.**

Hyde Park NY

Petroleum Station Sources

BTX vs MTBE Distribution

HYDE PARK, NEW YORK



LEGEND

 = BTEX & MTBE above detection

 = Gas Station with Spill




New York State Department of Environmental Conservation

K. BULL

HYDE PARK, NEW YORK



LEGEND

-  = BTEX & MTBE above detection
-  = MTBE only above detection
-  = Gas Station with Spill

New York State Department of Environmental Conservation

K. B.M.

Thank You