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report.VCP.V00433.2001-09-14.In-Situ Bio Presentation

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IVI
ENVIRONMENTAL, INC.
Environmental Engineers
IN-SITU BIO-CHEMICAL REMEDIATION SERVICES
PRESENTATION
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(914) 694-9600 ext. 279 (tel)
jerry.vorbach@ivi-intl.com (E-mail)

Inspection & Valuation International and
IVI Environmental, Inc.

The IVI Companies History

- Consists of Inspection & Valuation International and IVI Environmental, Inc.
- Started in 1973 as an engineering consulting firm.
- Headquartered in White Plains, New York, with ±120 Employees as of 2001.
- Premier provider of technical environmental and construction consulting, and real estate due diligence services.

IVI's Offices (Fully Staffed)

- White Plains, New York (Headquarters)
- Washington, D.C. (Regional Office)
- Miami, Florida (Regional Office)
- Dallas, Texas (Regional Office)
- Los Angeles, California (Regional Office)
- Austin, Texas (Field Office)
- Atlanta, Georgia (Field Office)

Summary of Services Offered by IVI

- **Project Management Oversight (PMO) Division**
  - Construction Loan Monitoring
  - Construction Management
  - Owners Representation
- **Facilities Assessment (FA) Division**
  - Equity/Acquisition Inspections
  - Debt/CMBS Property Condition Assessments (PCA)

  IVI authored the S&P Standard and ASTM Standard for PCAs

Summary of Services Offered by IVI Environmental

- Phase I Environmental Site Assessments
- Phase II Environmental Site Assessments
- Phase II Remedial Investigations and Feasibility Studies
- Phase III Remediation
- Phase IV Operations & Maintenance Programs
- Asbestos and Lead Based Paint Surveys
- Asbestos and Lead Based Paint Abatement Management

Summary of Phase II-IV Services

- Phase II Drafting
- Phase II Subsurface Environmental Site Assessments (ESA)
- Phase II ESA Oversight
- Phase II Underground Storage Tank (UST) Tightness Testing
- Phase II Geotechnical Investigations
- Phase II Remedial Investigations
- Phase II/III Regulatory File Reviews
- Phase II/III Regulatory Compliance/Permitting
- Phase III Remedial Action (RA) Oversight
- Phase III Well Closures
- Phase III UST Repairs
- Phase III UST Removals, Closures and Site Assessments
- Phase III Groundwater (GW) Monitoring
- Phase III Feasibility Studies
- Phase III Soil Remediation
- Phase III GW Remediation
- Phase III Subsurface Sewage Disposal System Remediation
- Phase IV Remedial System Operation and Maintenance

Summary of In-Situ Bio-Chemical Remediation Services

In-Situ Bio-Chemical Remediation

- Definition: Process in which bio-chemical reagents are injected into subsurface soil and groundwater to convert organic chemical contamination into carbon dioxide, water, and minerals.

Advantages of In-Situ Bio-Chemical Remediation

- Fastest in-situ remediation technology;
- Lower costs than competitive technologies (no long term O & M costs);
- Unlimited in feasibility to remediate any organic chemical contamination; and,
- Unlimited in feasibility to remediate within any geological formation.

Limitations of In-Situ Bio-Chemical Remediation

- Not feasible to apply in areas where free product is present; and
- May not be cost effective to apply within geological formations with high levels of scavengers such as limestone, carbonates, and naturally occurring organics.

In-Situ Bio-Chemical Remediation Process Steps

I. Fracturing - to create preferential, highly conductive, horizontal pathways within the areas of contamination:

- Determine the depths and locations of fractures required;
- Install injection wells to depth of desired fractures;
- Inject high pressure water/air to create and advance the fracture;
- Determine the extent of the fracture; and
- Prop the fracture.

In-Situ Bio-Chemical Remediation Process Steps

II. In-situ Chemical Oxidation - to create optimum chemical reaction conditions to destroy organic chemical contamination:

- Inject water into the vadose and capillary zone fractures to saturate them (applicable to soil remediation);
- Inject proprietary catalyst solution into the fractures;
- Inject mixture of proprietary acid and hydrogen peroxide solution into the fractures;
- Monitor the real-time progress and extent of reaction using various analytical field equipment.

In-Situ Bio-Chemical Remediation Process Steps

III. Biological Restoration - to restore the natural background levels of microorganisms, dissolved oxygen and pH in the saturated zone, as well as complete the destruction of residual organic contaminants through biodegradation processes:

- A natural consequence of the oxidation step as a result of the generation of biologically-reactive minerals and oxygen as byproducts of the oxidation reactions within the areas of contamination; and
- May be enhanced through the addition of one or more of the following substances:
  - Oxygen/hydrogen releasing compounds; and
  - Biodegradable surfactants.

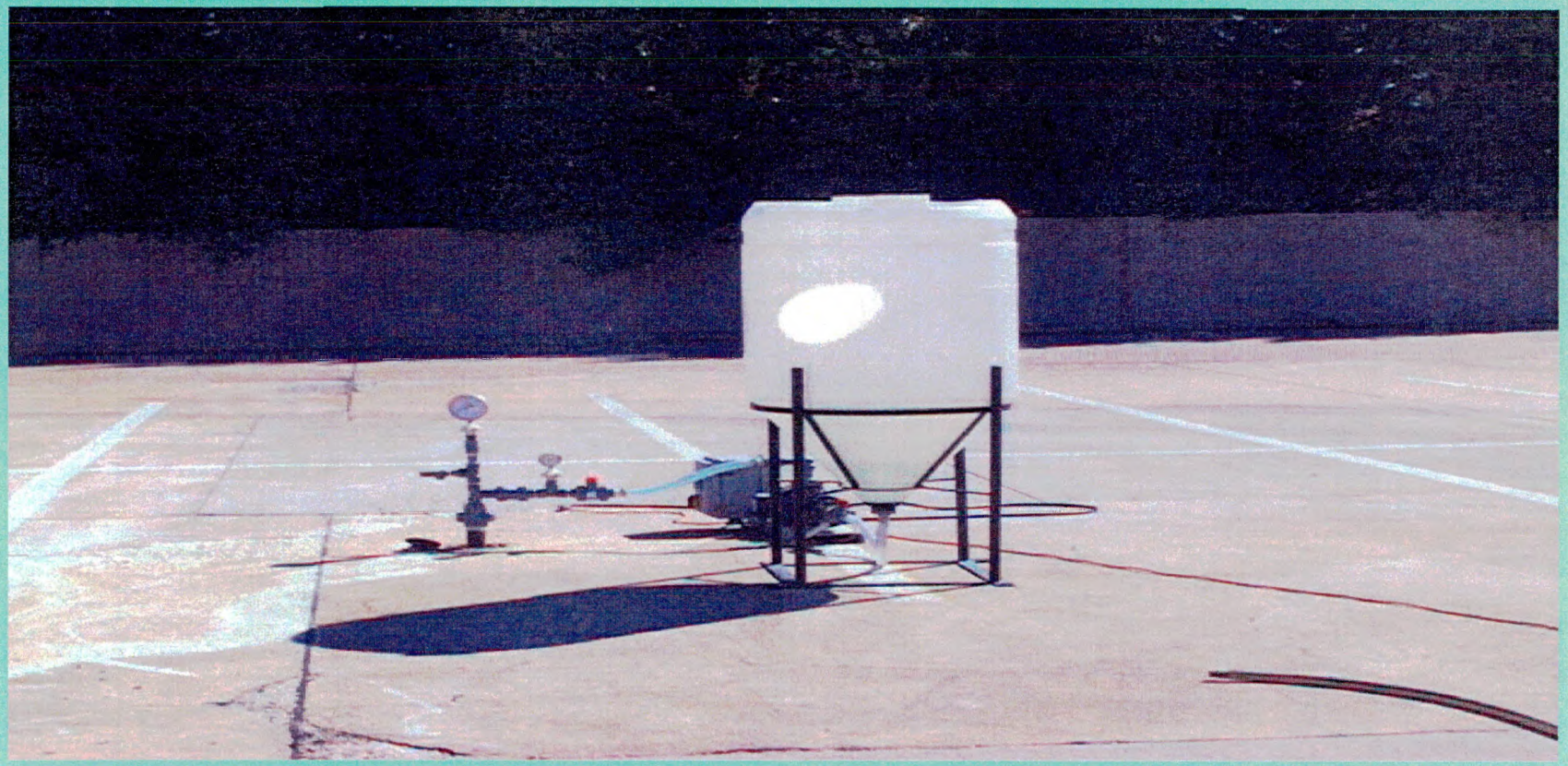
In-Situ Bio-Chemical Remediation
Fracturing Step

- Can advance up to 4 to 6 fractures/day.
- Fractures can be safely advanced in close proximity to utility lines (approximately 4' vertical distance)

In-Situ Bio-Chemical Remediation
Fracturing Step

In-Situ Bio-Chemical Remediation
Fracturing Step

In-Situ Bio-Chemical Remediation
In-Situ Chemical Oxidation and Biological Restoration Step



- Can remediate contaminated sites within two weeks to two months depending on site-specific conditions.
- Can safely inject bio-chemical reagents in close proximity to utility lines (approximately 10' lateral distance).

Case Study Sites Successfully Remediated

Case Study Sites Successfully Remediated: Parkwood Square, Richwood, and Green Oaks Shopping Centers in Dallas, TX Area

- **Phase I Environmental Site Assessments**
- **Phase II Dry Cleaner Site Screenings**
- **Phase II Supplemental Investigations**
  - Geoprobe Investigation - Real-Time Analysis of Soil & Groundwater Samples using Field GC
  - Monitoring Well Installation, Surveying, & Gauging
  - Groundwater Sampling and Analysis
- **Supplemental Investigation Report/Response Action Workplans Plans approved by the Texas Natural Resources Conservation Commission (TNRCC).**

Case Study Sites Successfully Remediated: Parkwood Square, Richwood, and Green Oaks Shopping Centers in Dallas, TX Area (continued)

- Phase III Feasibility Studies
  - In-Situ Soil & Groundwater Chemical Remediation
  - Bioremediation.
- Phase III In-Situ Soil and Groundwater Chemical Remediation

  On-site remedial activities were conducted within two weeks at each site with no impacts to dry cleaners and other on-site businesses.
- Phase III Post-Remediation Monitoring
  - The first groundwater monitoring events for the Parkwood Square and Richwood Shopping Centers were performed in January 2001. The results indicated % reductions of total chlorinated solvents ranging from 83.2 to 100 %, with an average of 94.2% for the Parkwood Square Shopping Center, and 95.4 to 100 percent, with an average of 97.8% for the Richwood Shopping Center. All residual concentrations are below applicable TNRCC standards.

Case Study Sites Successfully Remediated: Parkwood Square, Richwood, and Green Oaks Shopping Centers in Dallas, TX Area (continued)

- Post-Remediation Monitoring (continued)
  - The first groundwater monitoring event for Green Oaks Shopping Center was performed in July, 2001. The results indicated % reductions of total chlorinated solvents ranging from 68 to 100%, with an average of 90%. All residual concentrations are below applicable TNRCC standards.
  - The post-remediation soil sampling events for Parkwood Square and Richwood Shopping Centers were conducted in March 2001. Results indicated % reductions of total chlorinated solvents averaging 99.9% for the Parkwood Square Shopping Center, and 99% for the Richwood Shopping Center. All residual concentrations are below applicable TNRCC standards.

Case Study Sites Successfully Remediated: Parkwood Square, Richwood, and Green Oaks Shopping Centers in Dallas, TX Area (continued)

- **Post-Remediation Monitoring (continued)**
  - **The post-remediation soil sampling event for Green Oaks Shopping Center was conducted in August 2001. We are awaiting the analytical results for the samples collected.**
  - **Two additional groundwater monitoring events were completed in April and July 2001 for the Parkwood Square and Richwood shopping Centers. These results are consistent with those from the first event described above.**
  - **Two additional groundwater monitoring events will be conducted for the Green Oaks Shopping Center in October 2001 and January 2002.**

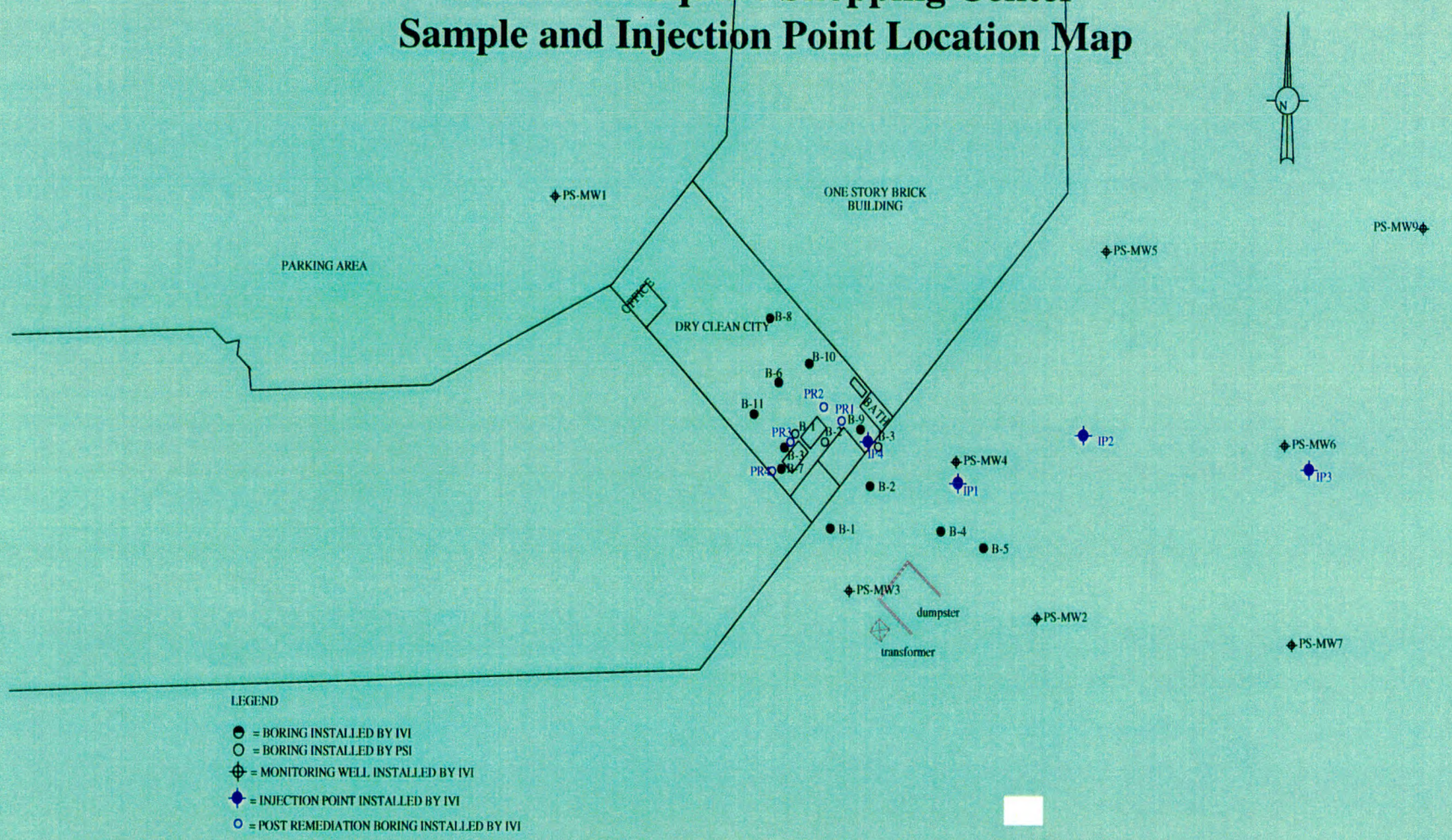
Case Study Sites Successfully Remediated: Parkwood Square, Richwood, and Green Oaks Shopping Centers in Dallas, TX Area (continued)

- **Post-Remediation Monitoring (continued)**
  - **IVI's successful remediation of the Parkwood Square, Richwood, and Green Oaks Shopping Centers account for 43% of the Texas dry cleaner contaminated sites which have been remediated below applicable TNRCC standards.**

Summary of Case Study Sites Successfully Remediated

Project Data	Parkwood Square Shopping Center	Richwood Shopping Center	Green Oaks Shopping Center
Services Provided and Associated Costs	• Phase I Environmental Site Assessment - $2,500 • Phase II Remedial Investigation - $60,300 • Phase III Soil and Groundwater Remediation - $153,700	• Phase I Environmental Site Assessment - $2,500 • Phase II Remedial Investigation - $64,000 • Phase III Soil and Groundwater Remediation - $103,600	• Phase I Environmental Site Assessment - $2,500 • Phase II Remedial Investigation - $70,600 • Phase III Soil and Groundwater Remediation - $168,000
Soil Type	Low Permeable Clay	Low Permeable Clay	Low Permeable Clay
Depth to Bedrock	16' - 18' below ground surface	7' - 12' below ground surface	>40' below ground surface
Maximum Total VOC Concentration in Soils	47,350 ug/kg	44,590 ug/kg	19,890 ug/kg
Volume of Contaminated Soil Above Applicable TNRCC Standards	150 - 200 cubic yards	110 cubic yards	500 cubic yards
Maximum Total VOC Concentration in Groundwater	3,800 ug/L	676 ug/L	113,290 ug/L
Area of Groundwater Contamination Above Applicable TNRCC Standards	0.74 acres	0.41 acres	0.52 acres
Average Percent Reduction of Total VOCs in Soils	99.9%	99.0%	Awaiting Analytical Results
Range and Average Percent Reduction of Total VOCs in Groundwater	Range= 83.2 to 110%; Average= 94.2%	Range= 95.4 to 100%; Average = 97.8%	Range= 68 to 100%; Average = 90%

Parkwood Square Shopping Center
Sample and Injection Point Location Map



Sample Location Plan

Project Name: Parkwood Square Shopping Center
Plano, Texas

Project No.: E9013987

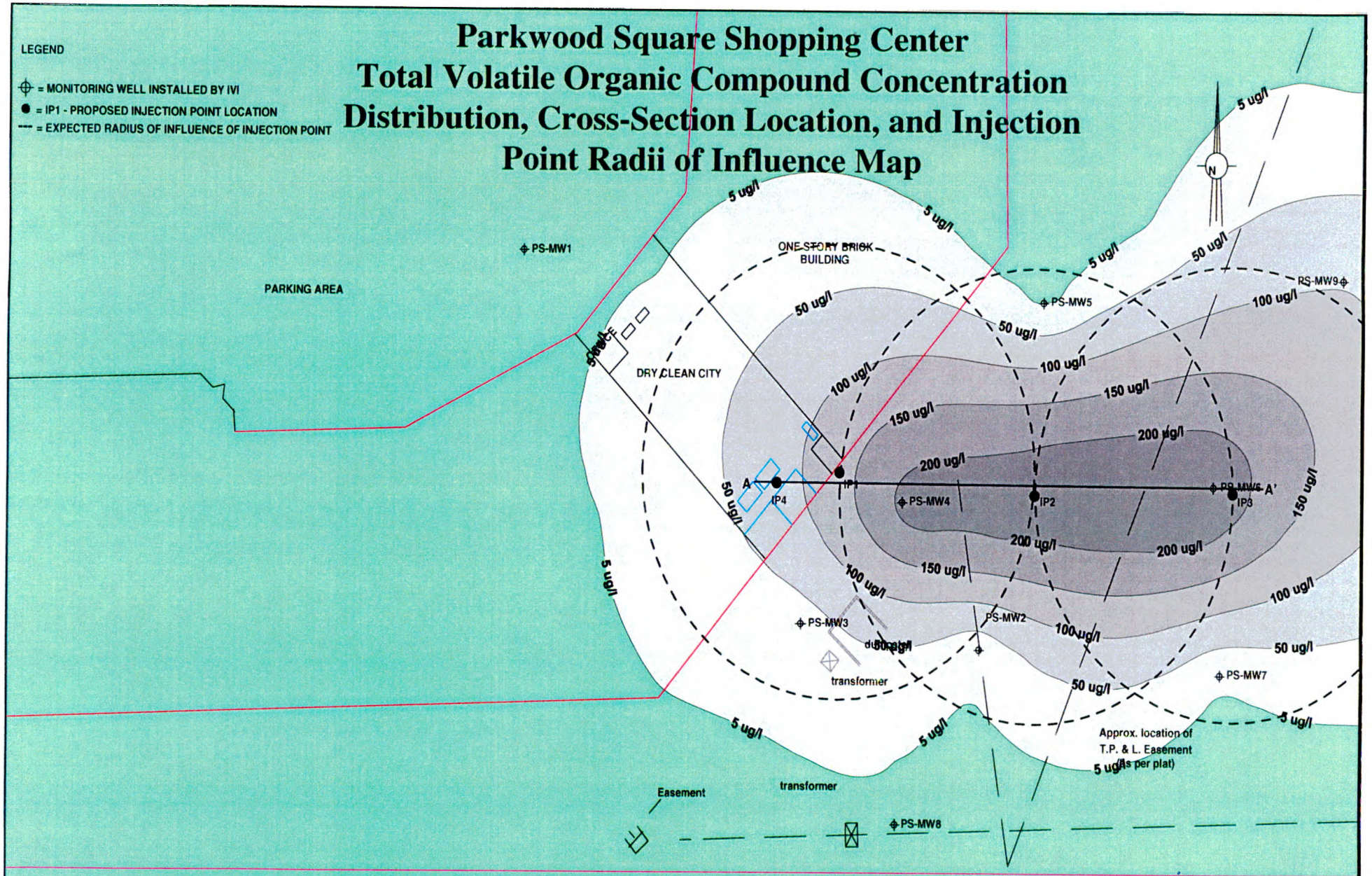
9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600 (tel)
(914) 694-2903 (fax)

August 1, 2001

0' 30' 60'

Parkwood Square Shopping Center
Total Volatile Organic Compound Concentration Distribution, Cross-Section Location, and Injection Point Radii of Influence Map



Cross Section Location Map - Proposed In-Situ Oxidation Injection Well Locations

PROJECT NAME: PARKWOOD SQUARE SHOPPING CENTER

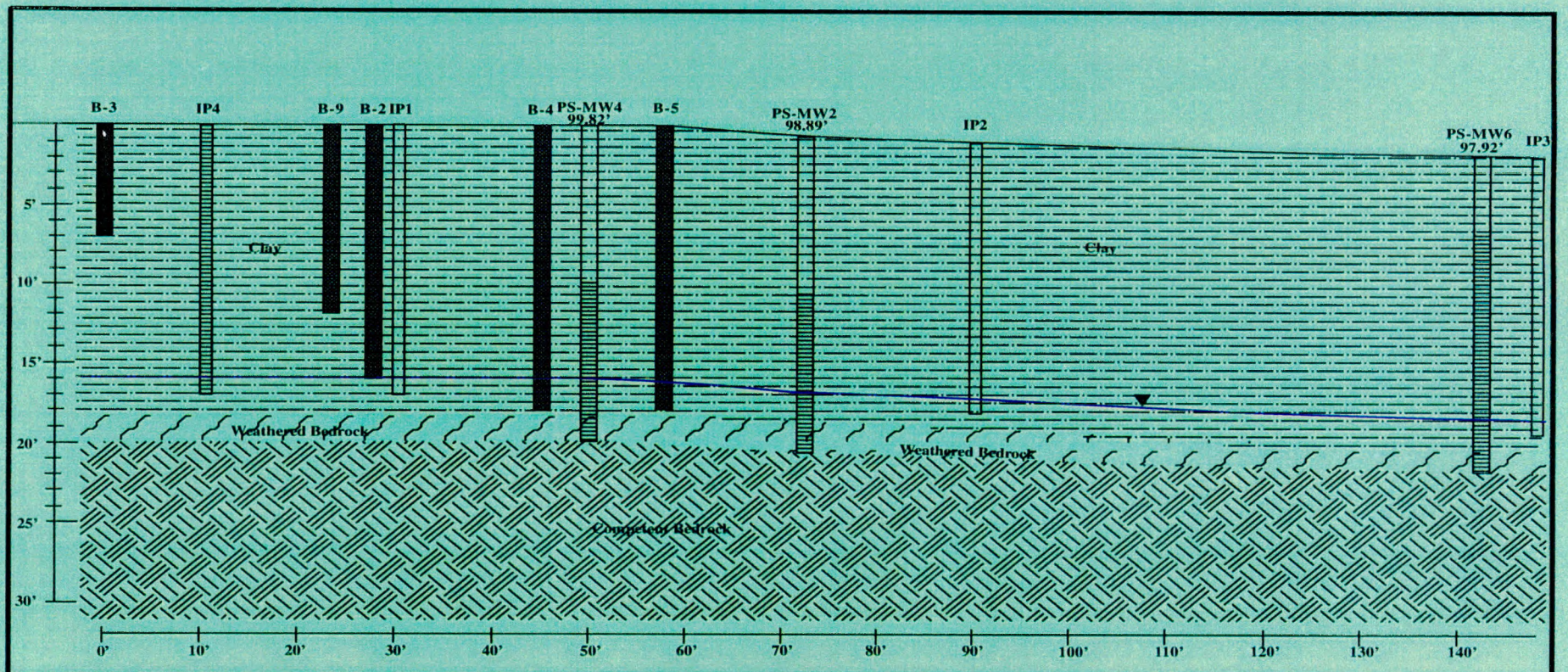
PROJECT NO. E9013987

9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600 (Tel)
(914) 694-3724 (Fax)

DATE: October 1, 1999

Parkwood Square Shopping Center
Geologic Cross Section



Geologic Cross Section A - A'- Proposed In-Situ Oxidation Injection Points

Project Name: Parkwood Square Shopping Center
Plano, Texas

Project No. E9013987

IVI Environmental, Inc.
105 Corporate Park Drive
White Pains, New York 10604
(914) 694-9600 (tel)
(914) 694-1335 (fax)

Date: December 20, 1999

Scale: Horizontal - 1"=10'
Vertical - 1"=5'

LEGEND

- Solid PVC Well Casing
- Screened PVC Well Casing
- Groundwater Table
- Geoprobe Boring
- IP1 Proposed Injection Point

IVI

Parkwood Square Shopping Center
Total Volatile Organic Compound Concentration Distribution and Groundwater Contours Map

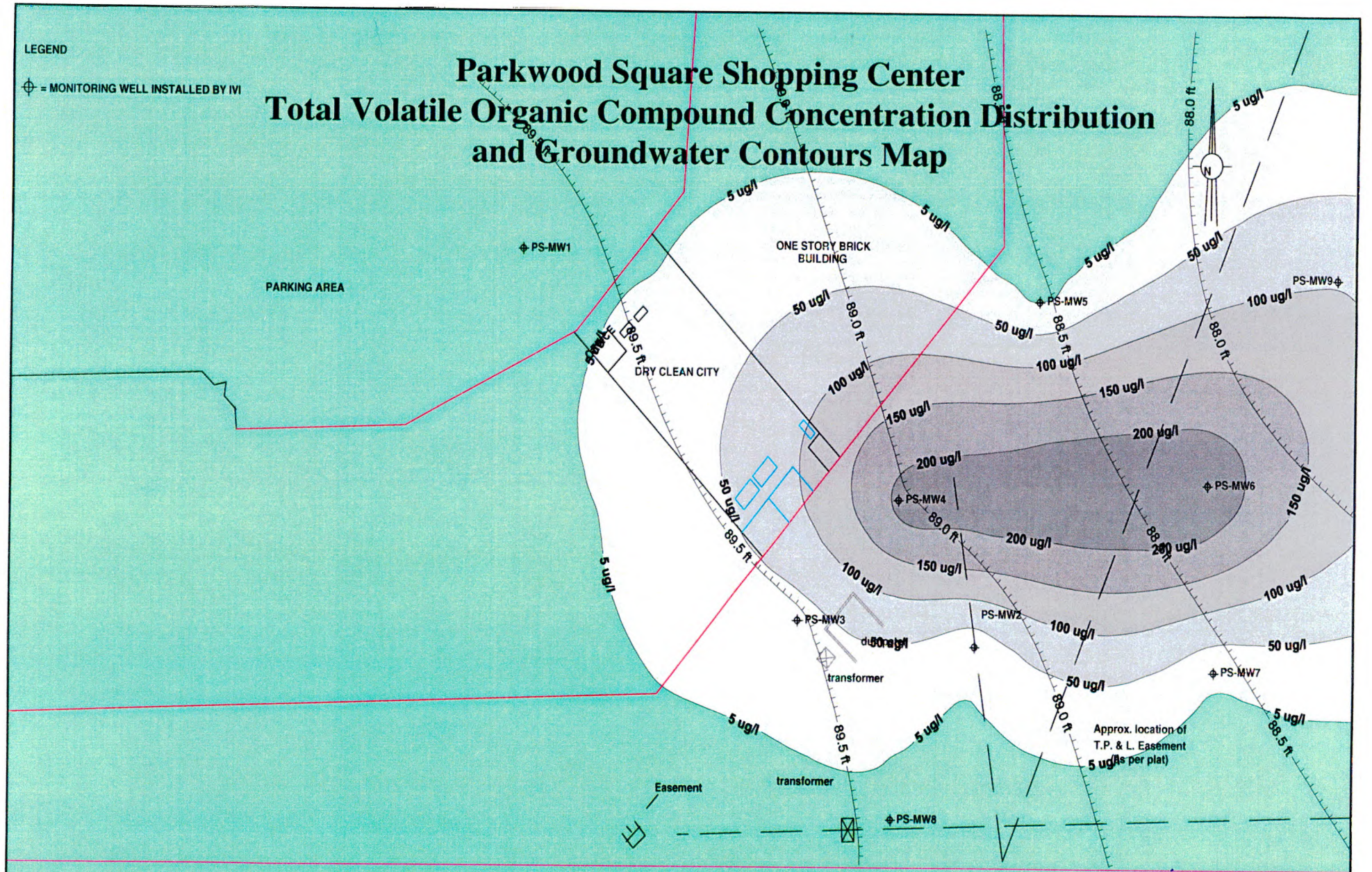


Figure 6 - Total Volatile Organic Compound Concentration Distributions - May 27, 1999

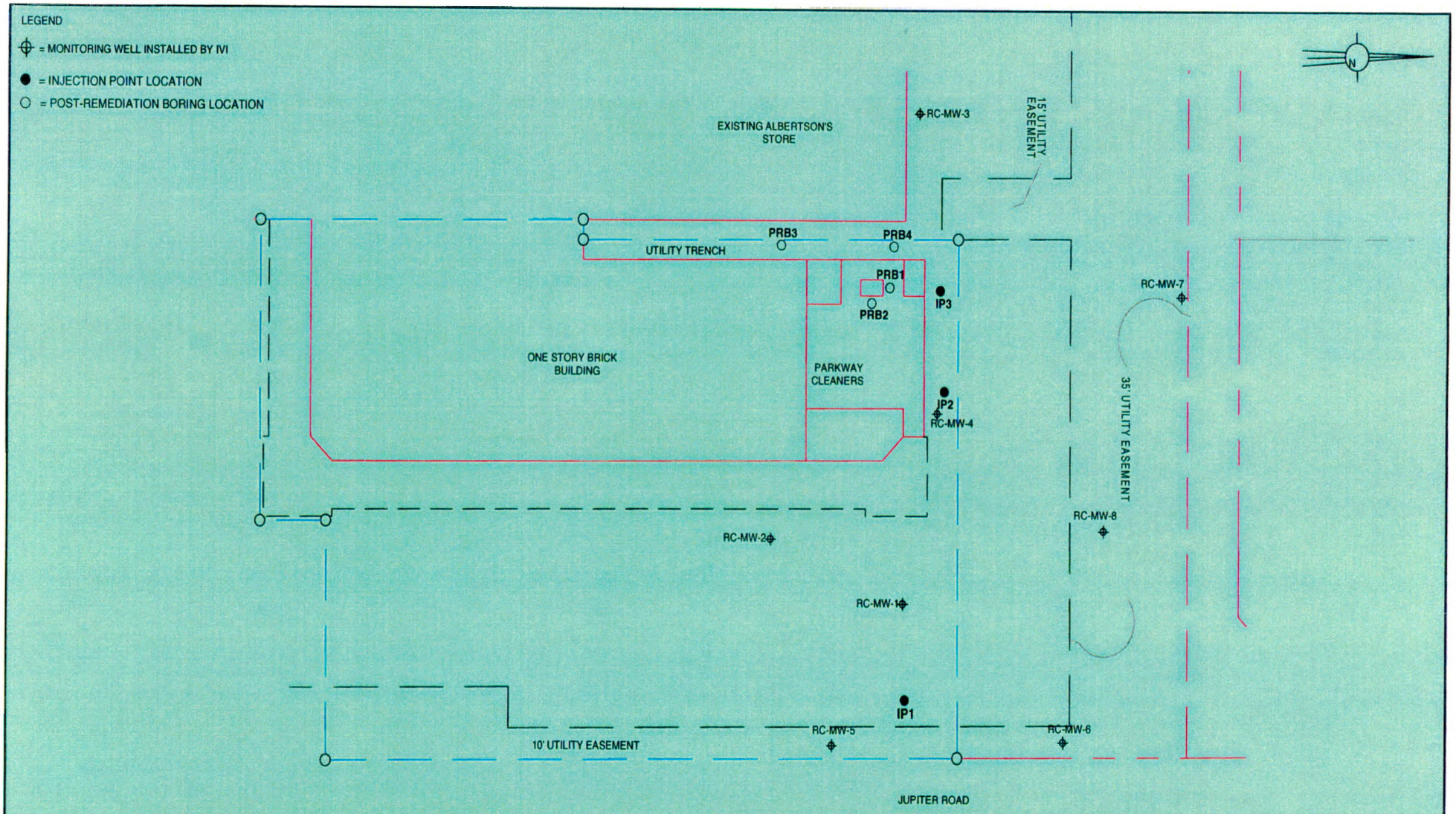
PROJECT NAME: PARKWOOD SQUARE SHOPPING CENTER

PROJECT NO. E9013987

9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600 (Tel)
(914) 694-3724 (Fax)

DATE: October 1, 1999



Richwood Shopping Center
Sample and Injection Point Location Map

Post-Remediation Soil Sample Location Map

PROJECT NAME: RICHWOOD SHOPPING CENTER

PROJECT NO. E9013989

9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600 (Tel)
(914) 694-3724 (Fax)

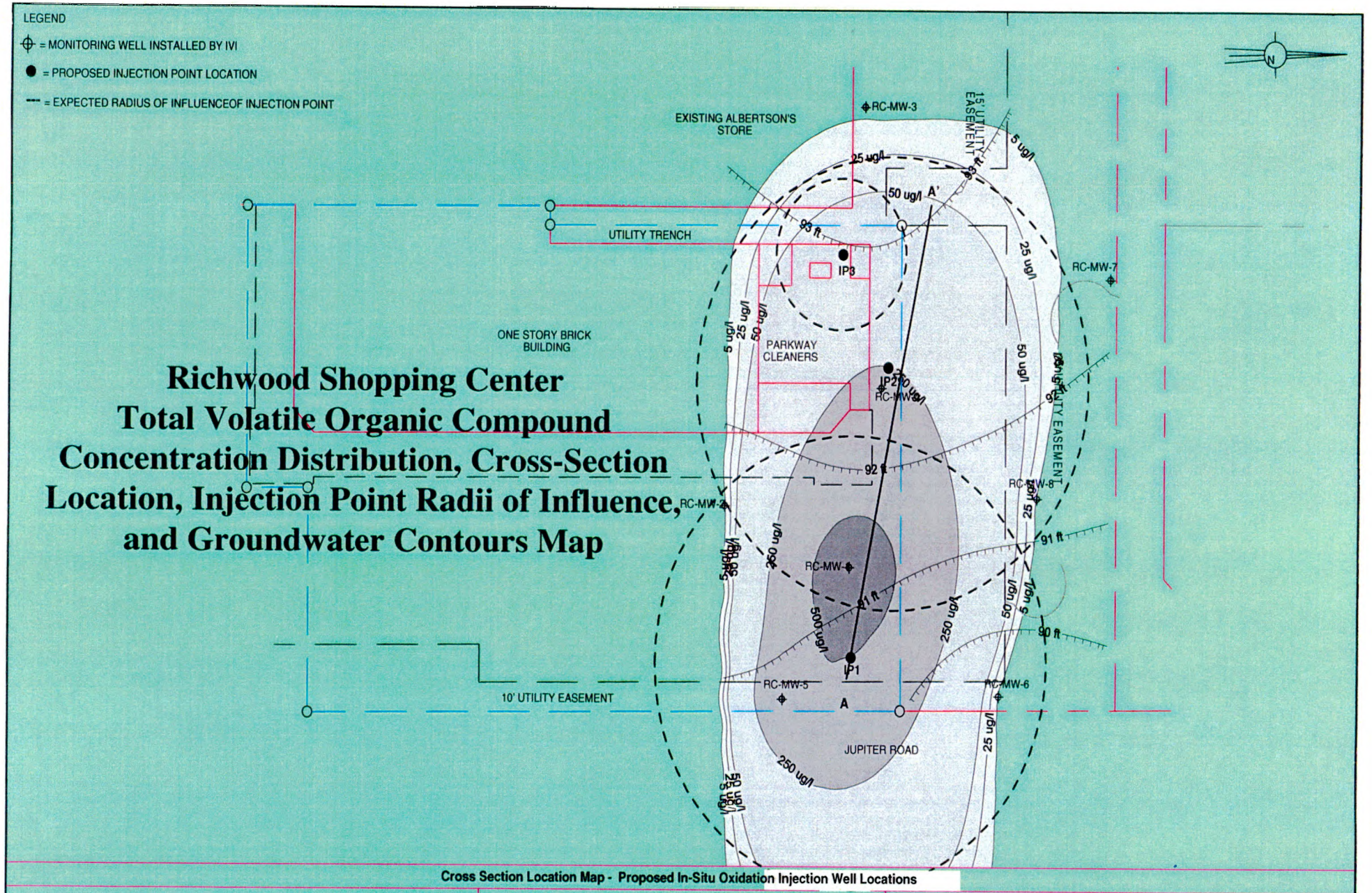
DATE: February 9, 2001

29

25 0 12.5 25 50 100

1"=25'-0"

Richwood Shopping Center
Total Volatile Organic Compound Concentration Distribution, Cross-Section Location, Injection Point Radii of Influence, and Groundwater Contours Map



Cross Section Location Map - Proposed In-Situ Oxidation Injection Well Locations

PROJECT NAME: RICHWOOD SHOPPING CENTER

PROJECT NO. E9013989

9/14/2001

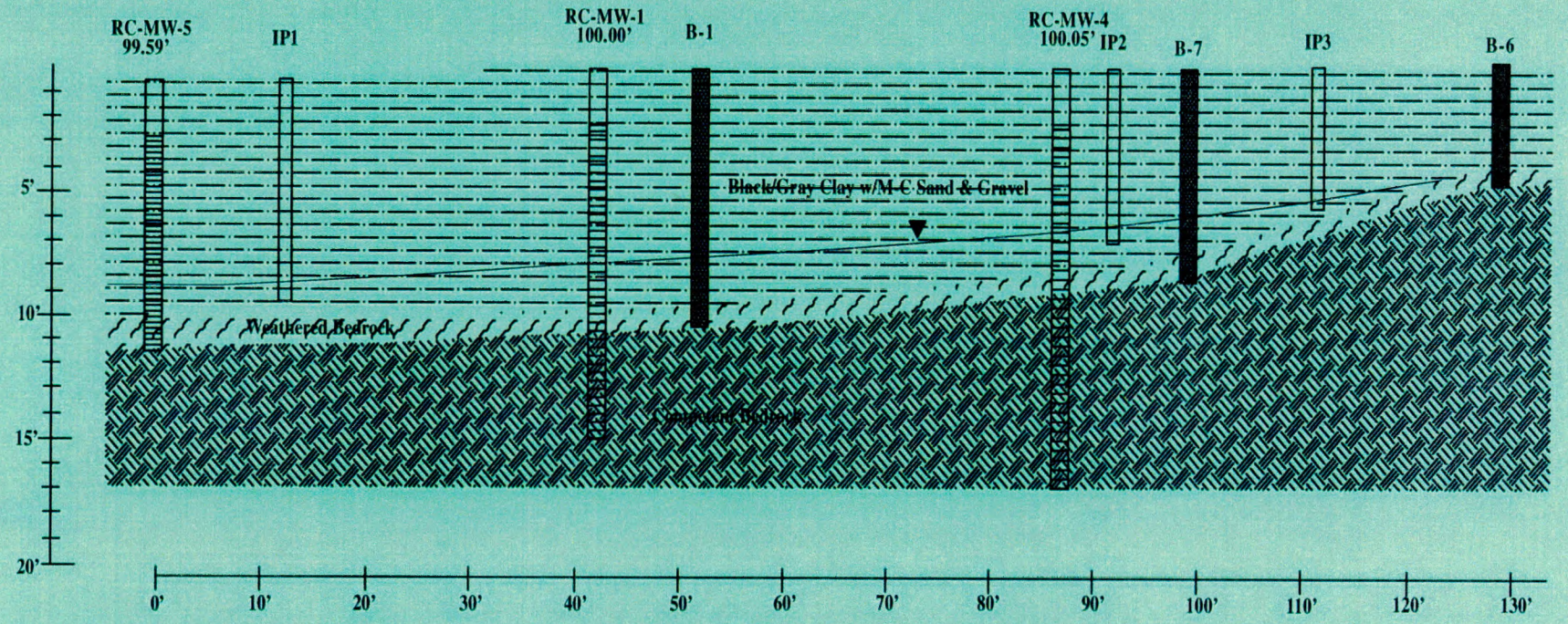
IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600 (Tel)
(914) 694-3724 (Fax)

DATE: November 5, 1999

25 0 12.5 25 50 100

1"=25'-0"

Richwood Shopping Center
Geologic Cross Section



Geologic Cross Section A - A'- Proposed In-Situ Oxidation Injection Points

Project Name: Richwood Shopping Center
Richardson, Texas

Project No. E9013989

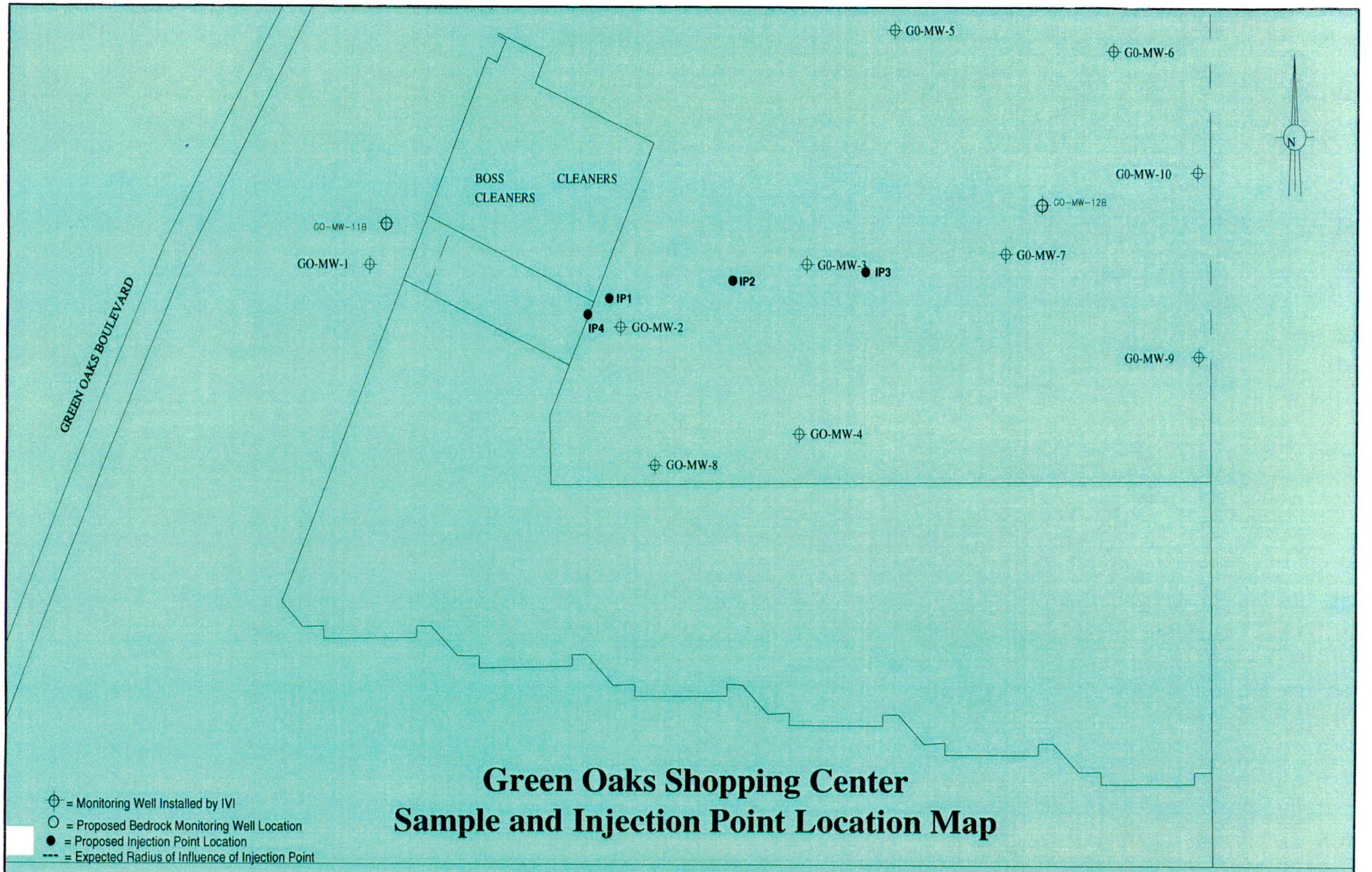
9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Pains, New York 10604
(914) 694-9600 (tel)
(914) 694-1335 (fax)

Date: December 21, 1999

Scale: Horizontal - 1"=10'
Vertical - 1"=5'

LEGEND
- Solid PVC Well Casing
- Screened PVC Well Casing
- Groundwater Table
- B-1 Geoprobe Boring
- IP1 Proposed Injection Point



Green Oaks Shopping Center
Sample and Injection Point Location Map

= Monitoring Well Installed by IVI
= Proposed Bedrock Monitoring Well Location
= Proposed Injection Point Location
= Expected Radius of Influence of Injection Point

Figure 1 - Monitoring Well Location Map

Project Name: Green Oaks Village Shopping Center

Project No: E90[illegible]

9/4/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600
(914) 694-3724

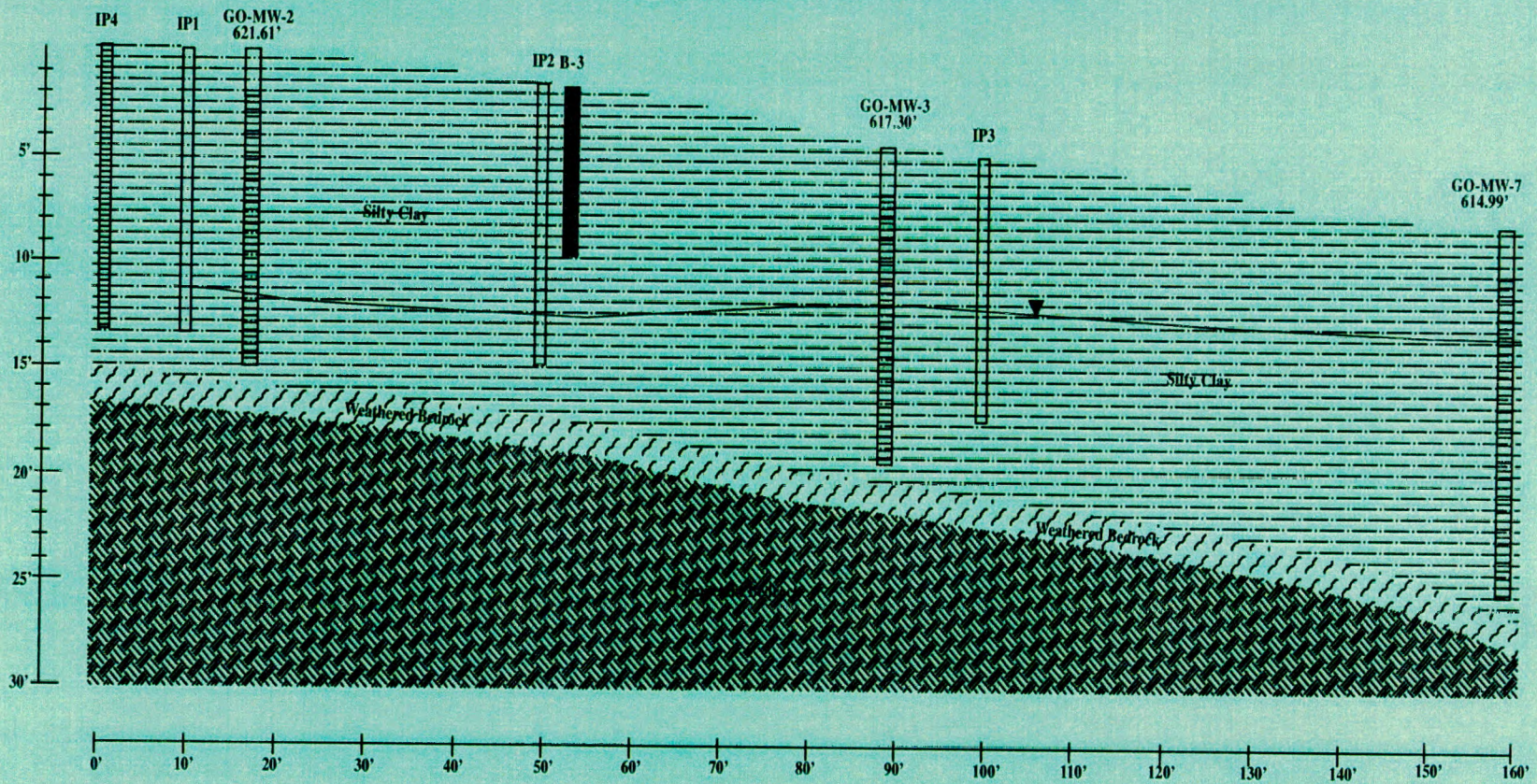
Date August 22, 2001

32

30 0 15 30 60 120

1"=30'-0"

Green Oaks Shopping Center
Geologic Cross Section



Geologic Cross Section A - A'- Proposed In-Situ Oxidation Injection Points

Project Name: Green Oaks Shopping Center
Plano, Texas

Project No.: [illegible]

9/14/2001

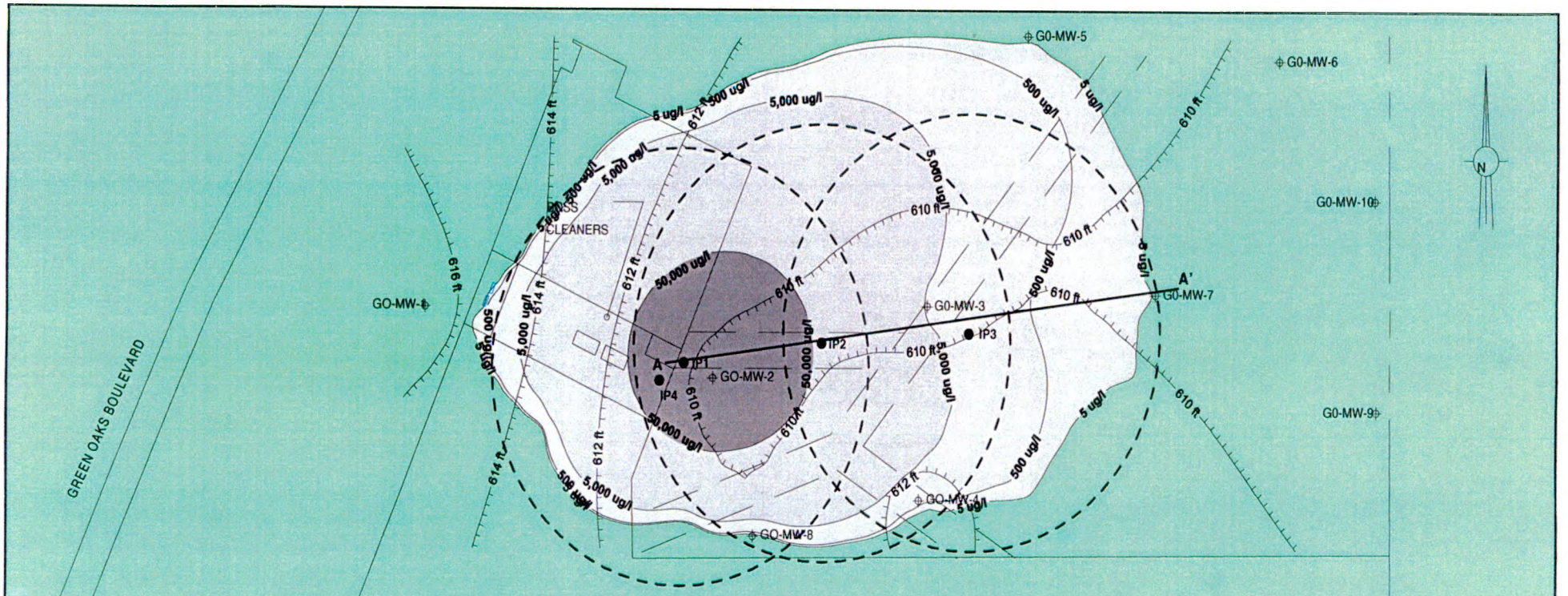
IVI Environmental, Inc.
105 Corporate Park Drive
White Pains, New York 10604
(914) 694-9600 (tel)
(914) 694-1335 (fax)

Date: December 21, 1999

Scale: Horizontal - 1"=12'
Vertical - 1"=6.25'

LEGEND
- Solid PVC Well Casing
- Screened PVC Well Casing
- Groundwater Table
- Geoprobe Boring
- IP1 Proposed Injection Point

H:Promo/Phase II-III/Powerpoint Presentations/In-Situ Biochemical Remediation Services Presentation



Green Oaks Shopping Center
Total Volatile Organic Compound Concentration Distribution, Cross-Section Location, Injection Point Radii of Influence, and Groundwater Contours Map

LEGEND

= MONITORING WELL INSTALLED BY IVI
= Proposed Injection Point Location
= Expected Radius of Influence of Injection Point

Cross Section Location Map - Proposed In-Situ Oxidation Injection Well Locations

PROJECT NAME: GREEN OAKS VILLAGE SHOPPING CENTER

PROJECT NO. E9013988

9/14/2001

IVI Environmental, Inc.
105 Corporate Park Drive
White Plains, New York 10604
(914) 694-9600
(914) 694-3724

DATE: October 1, 1999

33

30 0 15 30 60 120

1"=30'-0"