DESIGN TESTING PLAN
ORLANDO DOWNTOWN RECREATION COMPLEX AND TENNIS CENTRE PARCEL
ORLANDO, ORANGE COUNTY, FLORIDA

Prepared for:

The City of Orlando
Public Works Division
5100 L.B. McLeod Road
Orlando, Florida, 32811
EPA Brownfields Cooperative Agreement BF-00-D10313

ECT Environmental Consulting & Technology, Inc.
www.ectinc.com
3660 Maguire Boulevard, Suite 107
Orlando, Florida 32803

ECT Project No. 150592

December 2015

PROFESSIONAL CERTIFICATION

Design Testing Plan
Orlando Downtown Recreation Complex and Tennis Centre Parcel
649 Bentley Street
Orlando, Orange County, Florida 32801
Brownfield Cooperative Agreement BF-00-D10313

As a registered professional engineer, as authorized by Chapters 471, Florida Statutes, I certify that I am a qualified environmental professional, with knowledge and experience in soil and/or groundwater assessment and remediation. I also certify that, in my professional judgment, this design testing plan meets the requirements set forth in Chapter 62-780, Florida Administrative Code.

Prepared by:

James J. Orioles, P.E.
Senior Engineer
Florida License No. 60206

29 December 2015
Date

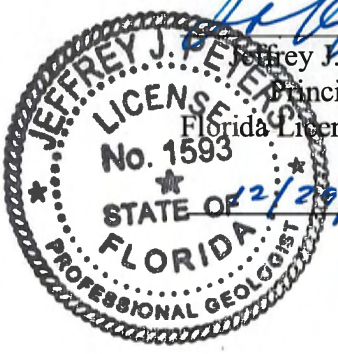
ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.
3660 Maguire Boulevard, Suite 107, Orlando, Florida 32803
Florida Engineering Business Certificate No. 5520

PROFESSIONAL CERTIFICATION

Design Testing Plan
Orlando Downtown Recreation Complex and Tennis Centre Parcel
649 Bentley Street
Orlando, Orange County, Florida 32801
Brownfield Cooperative Agreement BF-00-D10313

As a registered professional geologist, as authorized by Chapters 492, Florida Statutes, I certify that I am a qualified environmental professional, with knowledge and experience in soil and/or groundwater assessment and remediation. I hereby certify that I have supervised the preparation of this design testing plan, in accordance with Chapter 62-780, Florida Administrative Code. I have not evaluated and do not certify aspects of this report that are outside my area of expertise.

Prepared by:



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12/29/2015
Date

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1.0 INTRODUCTION

Environmental Consulting & Technology, Inc. (ECT) has been retained by the City of Orlando to prepare this Design Testing Plan (DTP) for the Orlando Downtown Recreation Complex and Tennis Centre (Site), which is located at the northeast corner of the intersection of North Parramore Avenue and Bentley Street, Orlando, Florida. The Site is currently in use and part of the Creative Digital Village Master Plan. This document was prepared using funding from Environmental Protection Agency (EPA) Brownfields Cooperative Agreement BF-00-D10313.

1.1 PURPOSES AND SCOPE

The purpose of this DTP is to evaluate and test the product Petrox 3™ to reduce the dieldrin concentrations in the groundwater in the areas of MW-1, MW-10, and MW-11 presented in the Analysis of Brownfields Cleanup Alternatives (ABCA) prepared by ECT, dated March 2015. Consistent with the findings of the Phase II Environmental Site Assessment (ESA) prepared by ECT, dated August 2014 and other previous environmental investigations, dieldrin-impacted groundwater exceeding Groundwater Cleanup Target Levels (GCTL) per Chapter 62-777 Florida Administrative Code (F.A.C.) were detected at one general location in the southern half of the Site. This DTP will provide the foundation to facilitate the reduction of dieldrin-impacted groundwater at the Site.

Information on known Site conditions is based on the results of investigations completed for various redevelopment and/or cleanup projects within Creative Digital Village. These investigations, which are summarized in Section 3.0, include the following:

- July 2005, Phase I ESA, Professional Service Industries, Inc. (PSI)
- November 22, 2006, Phase II ESA, PSI
- November 4, 2011, Draft ABCA, Cardno TBE
- October, 2012, Phase I ESA, Cardno TBE
- November 27, 2013, Phase I ESA, ECT
- August 2014, Phase II ESA, ECT
- March 2015, Phase II ESA Addendum, ECT
- March 2015, ABCA, ECT

2.0 SITE BACKGROUND

The Site consists of three adjoining separate parcels totaling approximately 26.81 acres. The Site is bound by West Amelia Street to the north, North Parramore Avenue to the west, Bentley Street to the south, and vacant property (former Amway Center Parking lots) to the east. The Site consists of a main building with annex, several outbuildings that collectively comprise the multipurpose Orlando Downtown Recreation Complex, a detached maintenance building, and 16 tennis courts that collectively comprise the Orlando Tennis Centre. The Orange County Property Appraiser's Office information identifies the Site as parcel identification number 26-22-29-0000-00-007 located within Section 26 of Township 22 South, and Range 29 East in Orlando, Orange County, Florida. A Location Map is provided as **Figure 1**. A United States Geological Survey (USGS) Topographic Map, 1990, West Orlando, which includes the Site and the surrounding area, is provided as **Figure 2**. A Site Map depicting the location of the proposed Livingston Street Extension is provided as **Figure 3**.

Historically, the Site appears to have been developed as early as 1919, based on review of Sanborn Maps. Past uses of the Site have included: 1) Armory and Naval Training Center; 2) Orange County and Orlando Fair Grounds/Exposition Center; 3) a horse racing track and stables; 4) ball fields and various athletic fields; 5) residential (northern portion of the property); 6) United States Department of Agriculture (USDA) Bureau of Entomology and USDA Essential Oils Branch; 7) Orlando Police Training facility; and 8) refrigeration sales.

2.1 ADJACENT PROPERTY LAND USE

The Site is located in a developed area of Orlando, the Parramore Heritage District. Vacant land and parking areas that are part of the Creative Digital Village Master Plan are located to the north and east. Nap Ford Charter School is located to the south. Mixed commercial, residential and vacant properties are to the west (including a coin operated laundry, Hope of Salvation Church and a convenience store).

2.2 FUTURE SITE USE

The Site is part of the Creative Digital Village, a project that involves the replacement of aging and obsolete public infrastructure currently in place to support the 60-acre City-owned Orlando Centroplex venue. Future redevelopment of the Site and the creation of the Creative Digital Village will transform the local area into a live, work, learn and play mixed-use community built around a foundation of technology based employment and educational opportunities, mixed-income and attainable housing, neighborhood commercial and public open spaces. The technology-based employment and educational expansion opportunities at Creative Digital Village will help to rejuvenate the community and expand the regional Orlando economic cluster of tech-based, digital media production, modeling and simulation industries.

3.0 SUMMARY OF PREVIOUS ASSESSMENT ACTIVITIES

In July 2005, PSI conducted a Phase I ESA for the Centroplex Site located at 600 Amelia Avenue, Orlando, FL. The results of that Phase I ESA identified several recognized environmental concerns (RECs) in connection with the Centroplex Site. The July 2005 Phase I ESA identified that an armory, USDA automobile storage facility, and various USDA laboratories were historically located at the subject Site. Furthermore, review of Sanborn maps showed that an underground storage tank (UST) was on the property from at least 1950 to 1965.

Based on the RECs identified during the July 2005 Phase I ESA for the Centroplex Site, PSI conducted a Phase II ESA and the results of the investigation are described in a report dated November 23, 2006. The assessment identified benzo(a)pyrene in the soil exceeding soil cleanup target levels (SCTLs) near the former UST, arsenic in the soil above SCTLs at three locations across the site, and dieldrin in the groundwater above groundwater cleanup target levels (GCTLs) in one temporary monitoring well. PSI recommended further soil and groundwater assessments in the area of the former Armory/USDA laboratories to determine the vertical and horizontal extent of petroleum-related compounds, metals and pesticides in the soil and groundwater beneath the Site.

Additionally, Cardno TBE identified RECs at the adjacent east property in a Phase I ESA for the New North Terry Avenue and West Livingston Street Alignments dated October 2012.

Based on information presented in the assessments discussed above, the City of Orlando requested ECT conduct a Phase I ESA for the Site to evaluate the presence/absence of RECs in anticipation of future redevelopment activities. The Phase I ESA dated November 2013, identified the following RECs associated with the Site: 1) former USDA facility, former USDA field laboratory (northeast portion of Site); 2) former USDA facility (west-central portion of Site); 3) former armory facility; and 4) the former Orlando Gasification Plant as benzene impacts were present on the southeastern portion of the Site.

Based on the opinions presented in the November 2013 Phase I ESA, ECT recommended a Phase II ESA be completed. The objective of the Phase II ESA was to determine the presence, magnitude, and distribution of soil and groundwater impacts, associated with the RECs identified during the previous investigations. The Phase II ESA was completed in August 2014. The assessment identified arsenic-impacted soils in five areas and dieldrin impacts in the groundwater in three monitor wells (MW-1, MW-10 and MW-11). There were no petroleum impacts identified in groundwater or soil in the vicinity of the former UST area. The Phase II ESA recommended that an ABCA be prepared for the Site to evaluate remedial costs. In addition, the Phase II ESA recommended supplemental horizontal and vertical delineation of soil in select areas to facilitate preparation of a remedial strategy for the removal of arsenic-impacted soils. The March

2015 Phase II ESA addendum identified four source areas with arsenic-impacted soils to be further delineated. An Interim Source Removal Plan (ISRP) for the removal of arsenic-impacted soils was prepared by ECT and submitted to FDEP on May 6, 2015. The ISRP was subsequently approved by FDEP on May 7, 2015.

Interim source removal of the five arsenic-impacted soil areas identified in the August 2014 Phase II ESA was conducted between May 26 and June 11, 2015. The details of these activities were presented in the Interim Source Removal Action Report prepared by ECT and dated July 2015.

4.0 DESIGN TESTING PLAN

Based on the evaluation of previous assessment findings and conservative assumptions of future Site use for residential/mixed-use development, various alternatives were considered in the March 2015 ABCA for the reduction of dieldrin from impacted groundwater at three locations; MW-1, MW-10, and MW-11 as depicted on **Figure 4**. As stated in the ABCA, groundwater pump and treat (P&T) and in-situ bioremediation (ISBR) were evaluated as two methodologies that would be cost-effective, could be implemented in a timely manner, and produce results quickly enough to meet the grant end date of September 30, 2016. A phased approach to the implementation of these methods will be planned to determine which produces the greatest removal of dieldrin from the groundwater and therefore the best strategy to achieve the goals of protecting human health and the environment at the Site. The goal of this design testing is to determine the most cost effective and efficient means of reducing dieldrin concentrations in the groundwater at MW-1, MW-10, and MW-11 to below the dieldrin GCTL of 0.002 µg/l.

4.1 PHASE 1 - ISBR

Phase 1 design testing will consist of ISBR as the method of groundwater remediation near MW- 10 and MW-11. The dieldrin concentration from groundwater samples collected at MW-10 and MW-11 on January 28, 2014 was 2 and 3.9 µg/l, respectively, as depicted on **Figure 4**. ISBR will involve the injection of CL Solutions Petrox 3™ into the subsurface to react in-situ with the dieldrin and converting it into harmless by-products such as carbon dioxide and water. Petrox 3™ contains a highly-concentrated solution of live, strains of lyophilized (freeze-dried) pseudomonas organisms that occur naturally in earth's ecosystem. These cultures are free of pathogens and there is no artificial mutation or genetic engineering involved. Petrox 3™ was reviewed and approved by the FDEP on May 2, 2006 (**Appendix A**). A Safety Data Sheet (SDS) for Petrox along with product information and a dieldrin case study is also provided in **Appendix A**. The following sections describe the sequential events to occur in Phase 1.

4.1.1 MONITORING WELL REPLACEMENT

MW-10 was damaged during interim source removal activities in June 2015. MW-10 will be replaced with MW-10R to facilitate groundwater monitoring for the implementation of Phase 1. MW-10R will be constructed of 2-inch diameter polyvinyl chloride (PVC) screened from 10 to 20 feet (ft) below land surface (bls) using 0.006-inch slotted screen, with a 30/45 sand pack, and installed to 20 ft bls and flush mounted with a concrete pad (2 ft x 2 ft).

4.1.2 BASELINE SAMPLING

After replacement well MW-10R has been installed, a baseline sampling event will be performed from the 17 MWs installed during completion of the Phase II ESA. The

groundwater samples from the 17 MW's will be analyzed according to United States Environmental Protection Agency (EPA) Method 8081B for organochlorine pesticides by gas chromatography.

4.1.3 BIO-INJECTION PROCEDURES

One day prior to mobilizing with our drilling subcontractor to conduct the ISBR injections, ECT will mobilize to the Site to prepare two 55-gallon drums of Petrox 3™ for injection in general accordance with the manufacturer's recommendations. The Petrox 3™ will arrive is a cooler with dry ice and packaged in drum liners. Each drum liner contains approximately 5 pounds of Petrox 3™ that requires hydration with 55 gallons of water 1 day prior to injection. Dextrose will be added to the Petrox 3™ solution as a carbon (food) source to promote initial biological growth. ECT and our drilling subcontractor will then mobilize to the Site to conduct the Petrox 3™ injections near MW-10R and MW-11. One 55-gallon drum of Petrox 3™ will be injected under low pressure at four injection points located in the four cardinal directions approximately 3-5 ft from MW-10R and MW-11. The Petrox 3™ will be injected from 20 ft bls to 10 ft bls at rate of approximately 1.375 gallons per foot. Each injection point will receive approximately 13 gallons of prepared Petrox 3™ solution. The bio-injection will be accomplished using a direct push technology (DPT) drill rig. Refer to **Figure 5** for a design plan depicting the locations of the proposed injection points.

4.1.4 PERMITTING

In general accordance with rule 62-528.630(2)(c) F.A.C., Class V wells associated with aquifer remediation projects shall be authorized under the provisions of a remedial action plan or other enforceable mechanism, provided the requirements of the rules governing the remediation project, as well as the construction, operation, and monitoring requirements of Chapter 62-528 are met. Therefore, an Underground Injection Control (UIC) permit will not be required for the bio-injection of Petrox 3™ defined in this DPT.

4.1.5 GROUNDWATER MONITORING

Groundwater monitoring and sampling will be conducted in accordance with Table A below:

Table A: Groundwater Monitoring and Sampling Schedule - Phase 1: Weeks 1-12

MW-ID	Sampling Dates	EPA Method 8081B	EPA Method 9215B	EPA Method 9060A
MW-10R	Prior to ISBR	X	X	X
	Weeks 2, 4, 6, 8, 10 & 12	X	X	X
MW-11	Prior to ISBR	X	X	X
	Weeks 2, 4, 6, 8, 10 & 12	X	X	X

EPA Method 8081B – dieldrin
EPA Method 9215B – heterotrophic plate count (HPC)
EPA Method 9060A – total organic carbon (TOC)

Heterotrophic Plate Count (HPC) is a procedure for estimating the number of live heterotrophic bacteria in water. The analysis of HPC will assist in evaluating the overall effectiveness in the subsurface of the Petrox 3™.

Organic carbon binds to non-polar organic chemicals and some metals (weakly). As organic carbon content increases, bioavailability of these chemicals decreases. Therefore, the total organic carbon (TOC) content of sediment and soil can be utilized to adjust TOC-normalized screening values. Adjusting TOC-normalized screening values to account for site-specific organic carbon content is valid only if the TOC is greater than 0.2%. At TOC concentrations less than 0.2%, organic carbon is no longer the predominant factor in determining partitioning between soil/sediment and water.

At the conclusion of week 12, the results will be evaluated as to effectiveness of the Petrox 3™ ISBR injections. If a sufficient decrease in dieldrin concentrations has been recorded, then another Petrox 3™ ISRB injection will be performed near MW-10R and MW-11, along with expanding the injection protocol to MW-1. Following injections in May 2016, another three months of groundwater monitoring will be performed in accordance with Table B:

Table B: Groundwater Monitoring and Sampling Schedule – Phase 1: Weeks 14-24

MW-ID	Sampling Dates	EPA Method 8081B	EPA Method 9215B	EPA Method 9060A
MW-10R	Prior to ISBR	X	X	X
	Weeks 14, 16, 18, 20, 22 & 24	X	X	X
MW-11	Prior to ISBR	X	X	X
	Weeks 14, 16, 18, 20, 22 & 24	X	X	X
MW-1	Prior to ISBR	X	X	X
	Weeks 14, 16, 18, 20, 22 & 24	X	X	X

EPA Method 8081B – dieldrin
EPA Method 9215B – HPC
EPA Method 9060A – TOC

At the conclusion of week 24, a final report will be prepared documenting the results and effectiveness of the Petrox 3™ ISBR injections.

If the results of the first injection of Petrox 3™ show minimal to no reductions in dieldrin concentrations after week 12, Phase 2 – groundwater pump and treat (P&T) will be considered near MW-1 as an alternate treatment technology. Phase 2 will only be performed with the City of Orlando approval.

4.2 PHASE 2 – GROUNDWATER (P&T)

Groundwater P&T may be performed in Phase 2 in the vicinity of MW-1. The dieldrin concentration from the groundwater sample collected at MW-1 on January 27, 2014 was 7.9 µg/l as depicted on **Figure 4**. P&T involves the withdrawal of groundwater from the impacted portion of the Site and discharge of the groundwater into the City of Orlando's sanitary sewer. P&T can be very effective in lowering initial levels of contamination very quickly. However, slow diffusion of contaminants from subsurface soils can result in limited reductions of dieldrin at concentrations above the required GCTL levels. Therefore, information obtained from this design testing methodology could be incorporated into the other remedial or long term strategies at the Site.

4.2.1 DEWATERING WELL POINTS

Groundwater P&T implementation at the Site will require vertical well points to be installed in the vicinity of MW-1 for the purposes of groundwater extraction. The recovered groundwater will be pumped to the City of Orlando's sanitary sewer and treated through the municipal wastewater treatment plant. Three 2-inch diameter PVC temporary dewatering well points will be installed to a depth of 25 ft bls for groundwater extraction. The well points will be screened from 15 to 25 ft bls and installed approximately ten feet from MW-1 in a triangular pattern. The well points will be connected by a common header pipe using a pump with sufficient capacity to lower the

groundwater table to 20-25 ft bls at MW-1. Groundwater pumping will be conducted for two weeks. The groundwater effluent will be discharged to the City of Orlando sanitary sewer via a 4-inch diameter cleanout in the parking lot behind the kiln building in the vicinity of MW-1. It is anticipated that no pretreatment of the effluent will be required; however this assumption will be verified with the City of Orlando prior to initiating this activity. The well points will be removed upon completion of the groundwater recovery portion of the P&T design testing. In the event the well points cannot be pulled from the ground, they will be abandoned in place with grout. Refer to **Figure 6** for the proposed locations of the recovery wells near MW-1.

4.2.2 PIEZOMETER AND OBSERVATION WELLS

In order to determine the effective radius of influence (ROI) one piezometer will be installed approximately 10 ft west of MW-1. Piezometer one (PZ-1) will be constructed with 1-inch diameter PVC and screened between 10 and 25 ft bls. Additionally MW-4 located approximately 60 ft south of MW-1, and MW-2 located approximately 120 ft west of MW-1 will be used as observation wells. Depth to water (DTW) measurements will be taken at MW-1, MW-2, MW-4 and PZ-1 prior to commencing dewatering operations. During the first 8 hours of groundwater withdrawal, DTW measurement will be taken every 30 minutes. Subsequent DTW measurements will be taken daily over the 2-week pumping phase of the design test.

MW-1 will be utilized for groundwater collection and analysis of dieldrin. No additional monitoring wells are proposed to be installed for the purposes of this design testing plan. Refer to **Figure 6** for the proposed PZ-1 location.

4.2.3 GROUNDWATER MONITORING

Groundwater monitoring and sampling will be conducted in accordance with Table C below:

Table C: Groundwater Monitoring and Sampling Schedule – Phase 2: Weeks 4-12

MW-ID	Sampling Dates	EPA Method 8081B	Depth to Water Measurement
MW-1	Prior to P&T, weeks 4, 8 & 12	X	X
P&T effluent	Startup, end of weeks 1 & 2	X	

EPA Method 8081B – dieldrin

To evaluate the dieldrin removal efficiency from the source area, initial groundwater monitoring will be conducted prior to the P&T phase of the design test. ECT personnel will record the groundwater elevation and collect one groundwater sample from MW-1 for laboratory analyses of dieldrin by EPA Method 8081B, prior to initiating the P&T to establish a baseline. ECT will collect one groundwater sample from the pump effluent for analysis of dieldrin at the end of the first and second weeks of pumping. One week following the P&T phase, one groundwater sample will be collected at MW-1 and then subsequent groundwater samples will be collected from MW-1 monthly and analyzed for

dieldrin to determine if dieldrin-impacted groundwater persists at MW-1. Groundwater sampling will conclude in August 2016. A total of four groundwater samples will be collected from MW-1 and three effluent samples from the dewatering pump during the P&T phase of the design testing.

4.3 LITHOLOGY

Soil encountered during the course of assessment activities from land surface to approximately 20 ft bls can be generally classified as poorly graded fine grained sands to silty/clayey sand mixtures of various shades of brown, light brown, tan, yellowish orange to orange or grey. This is consistent with Smyrna fine sand as indicated in the National Resource Conservation Service (NRCS) Soil Survey of Orange County, Florida.

4.4 AQUIFER CHARACTERISTICS

The surficial aquifer is considered a Class G-II groundwater per Chapter 62-520, F.A.C. Typically, the depth to water is between 12 and 16 ft bls. The general direction of groundwater flow is northeast as shown on **Figure 7**.

4.5 PROJECT OVERSIGHT

Daily direct oversight of design testing activities will be performed by a State of Florida licensed professional engineer, competent through education and experience to provide direction and oversight throughout the process. Additional review and regulatory oversight will be provided by the EPA Project Officer administering the grant activities. Copies of reports generated throughout the process will be submitted to both the FDEP and EPA for review and comment.

4.6 REPORTING

Upon the completion of groundwater monitoring, ECT will prepare a Design Testing Report to summarize the implementation methodology and the results of the design testing.

4.7 SCHEDULE

It is anticipated that review of the DTP will take approximately 2-3 weeks. Therefore, field work is tentatively scheduled to begin the first week of January 2016, pending City of Orlando/FDEP/EPA approval of the DTP. Submittal of a Design Testing Report is anticipated by October 2016 following the completion of groundwater monitoring in September 2016.

4.8 COST ESTIMATE

ECT has prepared a cost estimate for implementation of Phase 1 only, and it is summarized below in Table D.

Table D: Estimated Costs

Subtask	Labor	Equip/supplies/etc.	Subcontractors
Planning/Support	$3,554.00	$8.00	$0.00
Install MW-10R	$2,445.00	$302.00	$1,495.00
Baseline Sampling	$4,560.00	$383.00	$6,357.00
ISBR/monitoring	$20,382.00	$2,265.00	$9,024.00
Design Test Report	$10,093.00	$36.00	$2,500.00
Subtotals	$41,034.00	$2,994.00	$19,376.00
TOTAL	**$63,404.00**		

5.0 CONCLUSION

This DTP was developed to implement a phased approach for treatment of the dieldrin–impacted groundwater at the Site. Phase 1 will consist of ISBR near MW-10R and MW-11. A three-month evaluation of the effectiveness of ISBR near MW-10R and MW-11 will dictate whether to implement Phase 2 of the DTP. The estimated costs for the implementation of Phase 1 is approximately $63,404.00.

FIGURES

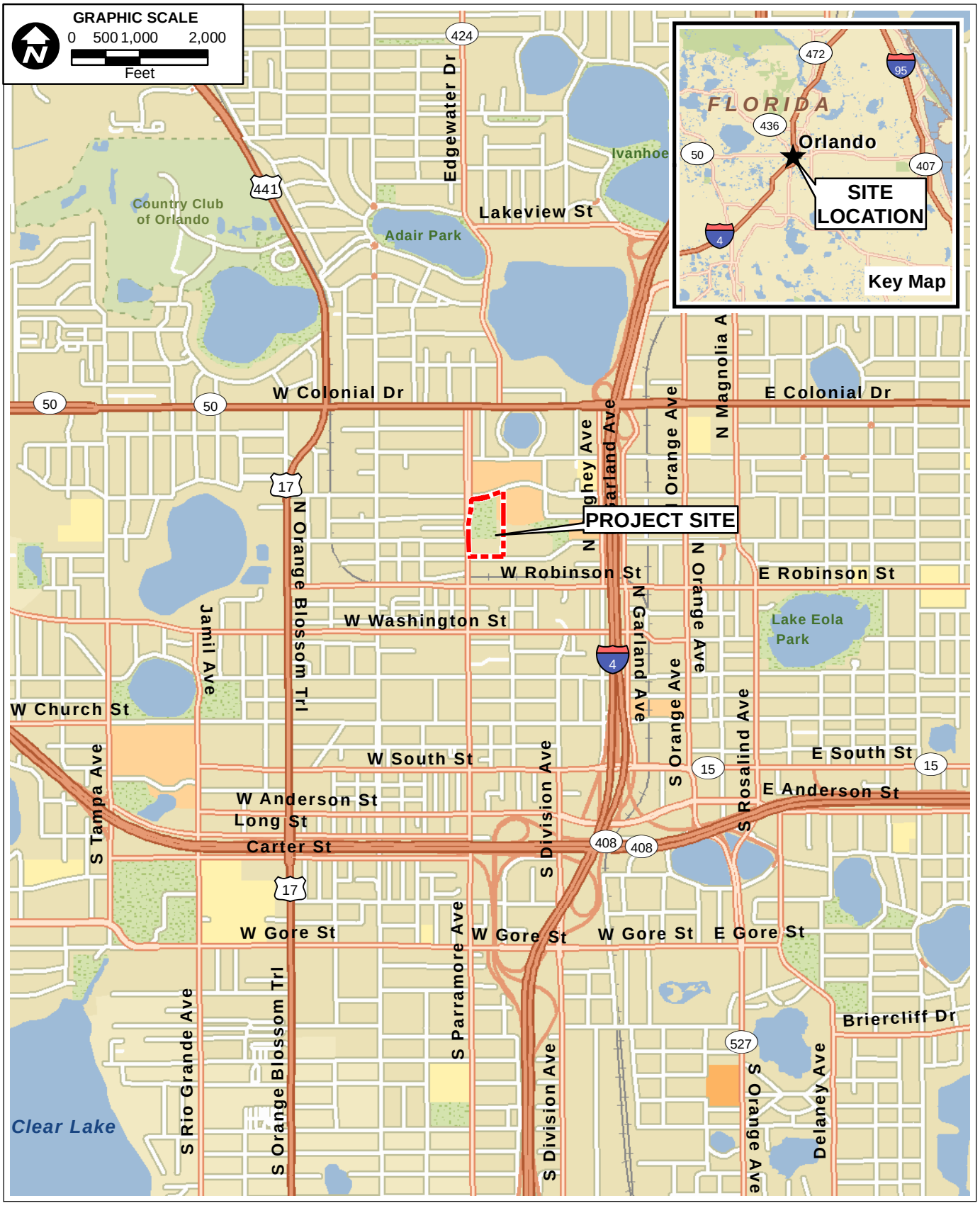

FIGURE 1.
LOCATION MAP
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: ESRI 2014 Street Maps; ECT, 2015.

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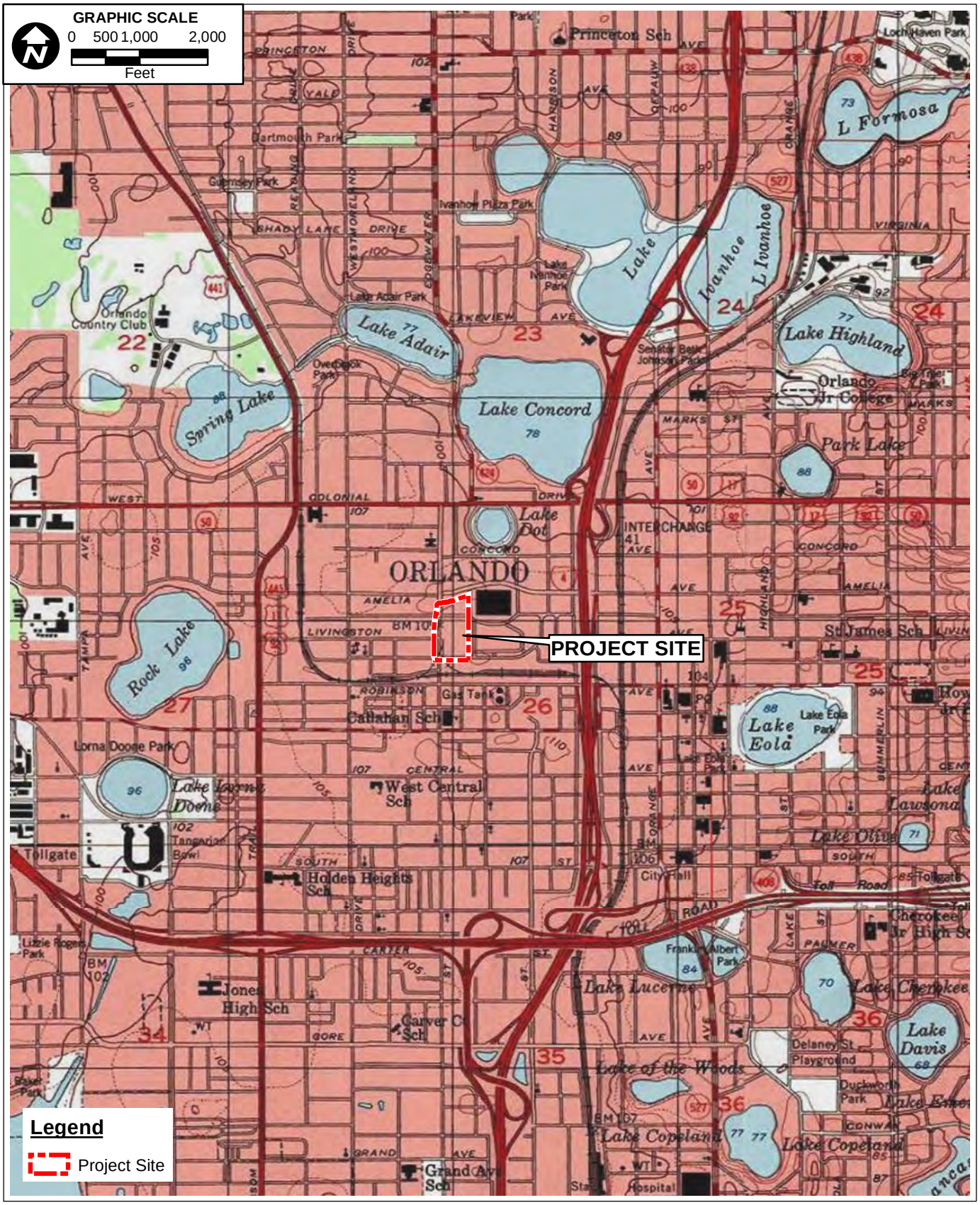

FIGURE 2.
USGS TOPOGRAPHIC MAP
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: USGS Quad: Orlando West, FL, 1980; ECT, 2015.

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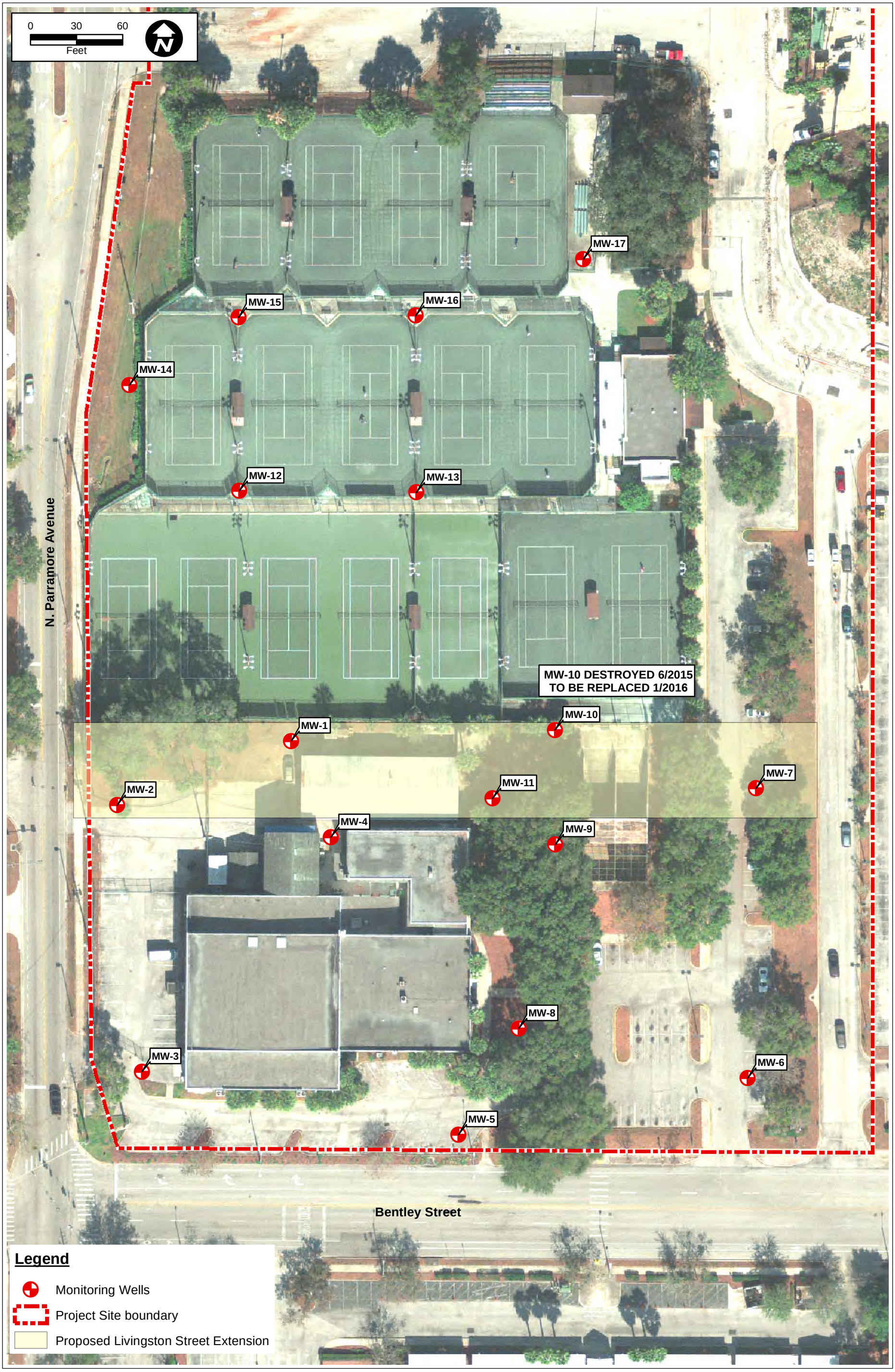


FIGURE 3.
SITE MAP
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: FDOT Imagery 2012; ECT, 2015.

ECT Environmental Consulting & Technology, Inc.

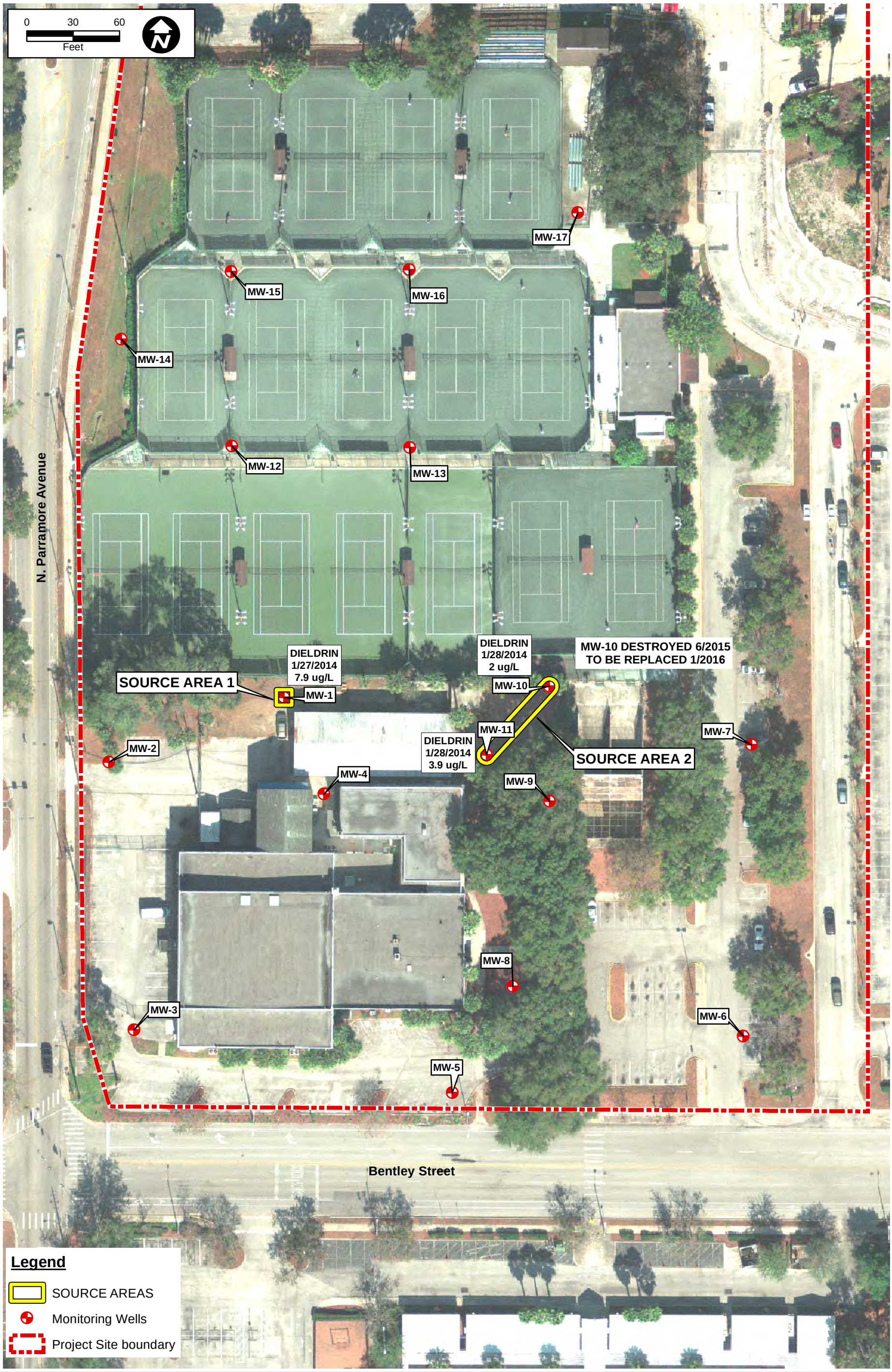


FIGURE 4.
DIELDRIN GROUNDWATER IMPACTS
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: FDOT Imagery 2012; ECT, 2015.

ECT Environmental Consulting & Technology, Inc.

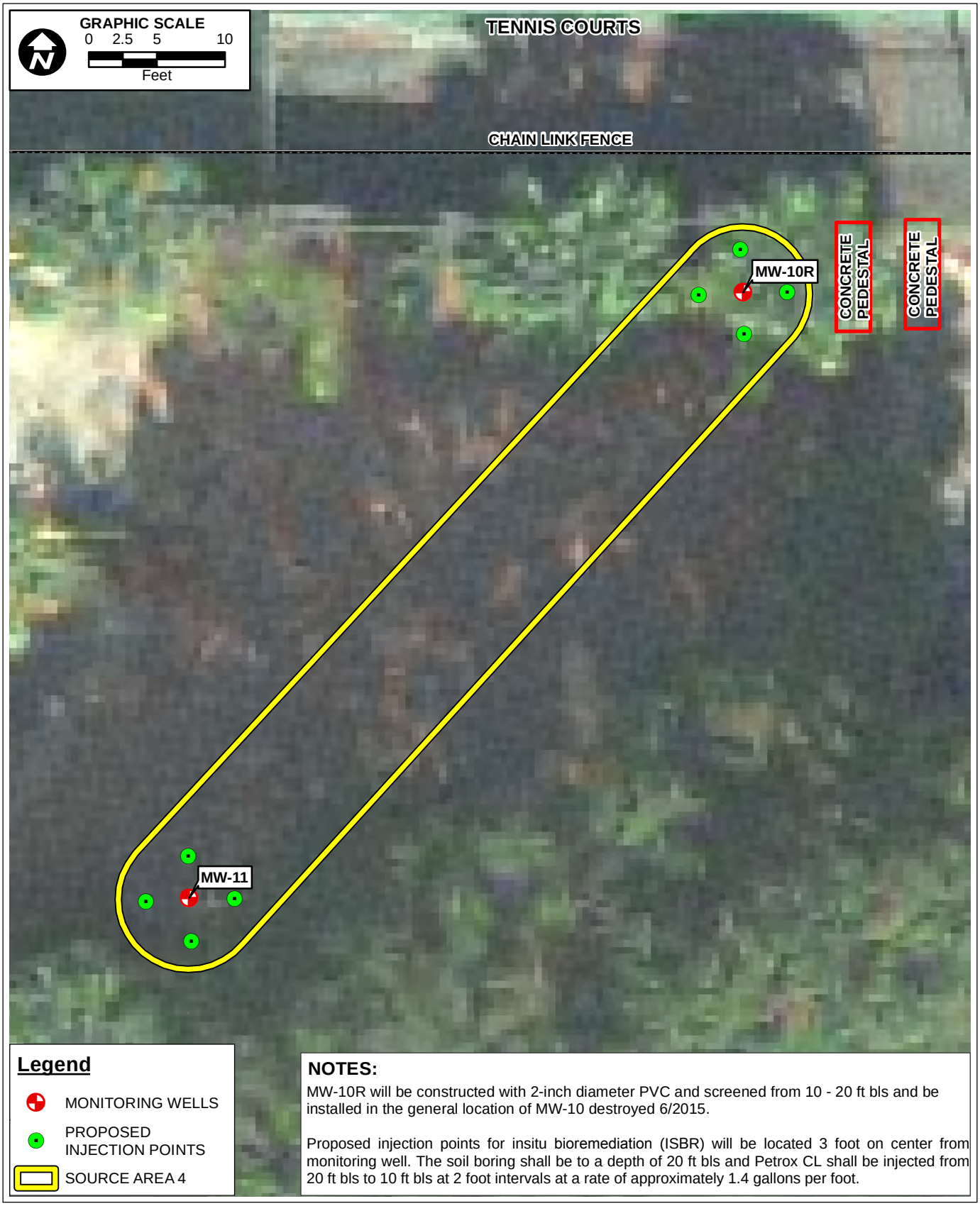


FIGURE 5.
IN-SITU BIOREMEDIATION DESIGN PLAN
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: USGS Quad: Orlando West, FL, 1980; ECT, 2015.

ECT Environmental Consulting & Technology, Inc.

FIGURE 6.
PUMP AND TREAT DESIGN PLAN
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: USGS Quad: Orlando West, FL, 1980; ECT, 2015.

ECT Environmental Consulting & Technology, Inc.

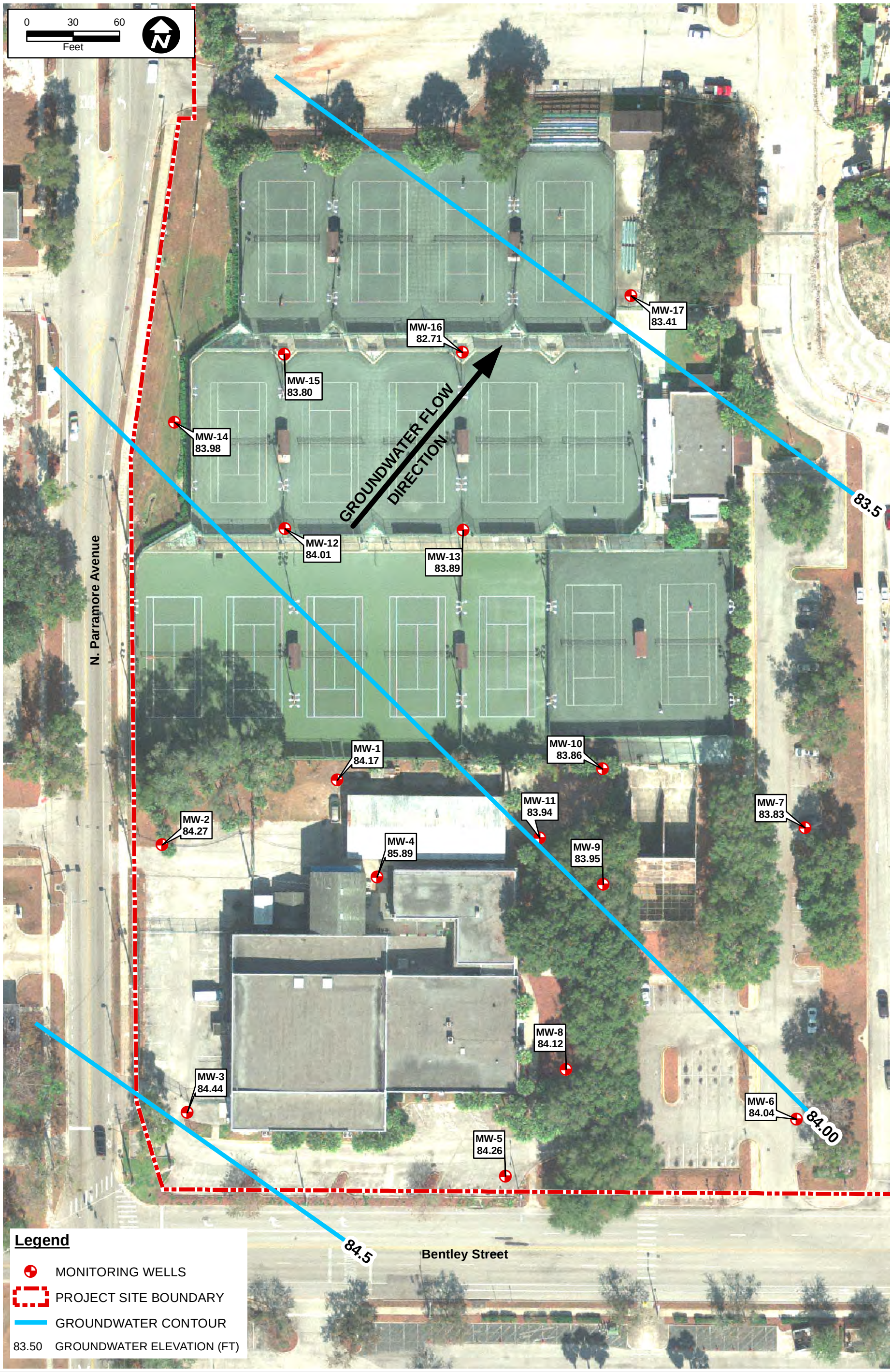
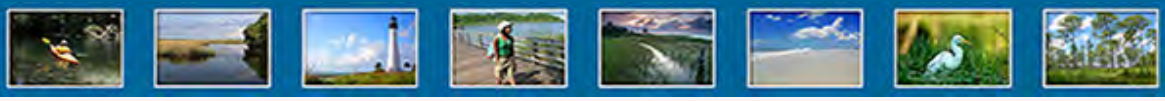


FIGURE 7.
GROUNDWATER ELEVATION AND FLOW DIRECTION - JULY 21, 2014
ORLANDO DOWNTOWN RECREATION COMPLEX & TENNIS CENTRE
CITY OF ORLANDO, ORANGE COUNTY, FLORIDA
SECTION 26, TOWNSHIP 22S, RANGE 29E

Sources: FDOT Imagery 2012; ECT, 2015.

ECT Environmental Consulting & Technology, Inc.

APPENDIX A



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Department of Environmental Protection

Technology Library

See page 6 for Petrox approval

The following technology proposals have been reviewed and accepted by DEP.

Division/Program: Category (if DWM): Keywords:

Back to Search

ID	Company (Website)	Primary Applicant (Email)	Secondary Applicant (Email)	Request Title (Description)	Reviewer (Email)	Finalized
1516	Tersus Environmental	David Alden	David Alden	Nutrisulfate® - High Sulfate Metabolic Supplement	Rick Ruscito	13-Nov-2015
1510	Solar Water Works	Doug Winkie	Doug Winkie	Solar Photocatalytic Treatment of Groundwater	Elena Compton	13-Nov-2015
1487	PeroxyChem	Patrick Hicks	Patrick Hicks	MetaFix Reagents for Treatment of Priority Heavy Metals in Soil, Sediment, and Groundwater	John Svec	13-Nov-2015
1513	En Rx Incorporated	Erik Piatt		FOCIS and Vertebrae	Rick Ruscito	29-Sep-2015
1476	Regenesis	Drew Baird	Drew Baird	PlumeStop Colloidal BioMatrix	Rick Ruscito	31-Aug-2015
1507	Innovative Remediation Technologies, LLC	Mark Santangelo	Mark Santangelo	Request for change of ownership of approved BIOX technology. Foemerly under BioManagement Services, Inc	Rick Ruscito	03-Aug-2015
1488	CS Products	Gary Mims	Gary Mims	Coco Absorb - Petroleum Remediation Product	Elena Compton	28-Jul-2015
1475	Hepure Technologies Inc.	William Guite	William Guite	Ferox Iron Powders - ZVI	John Svec	12-Jun-2015
1480	Fabco Industries, Inc.	Robert Woodman		StormBasin by Fabco Industries	Beth Alvi	06-Feb-2015
1479	Fabco Industries, Inc.	Robert Woodman		StormSack by Fabco Industries	Beth Alvi	06-Feb-2015
1478	ACF Environmental	Randy Thomas		FocalPoint High Performance Modular Biofiltration System	Beth Alvi	06-Feb-2015
1321	OVT Environmental Products			OVT Container	Rick Ruscito	30-Oct-2014
1473	SEEK Enterprises Inc	Ralph E. Elliott (Butch)		Use of Naturally Occurring Microbes to Improve Water Quality and Reduce	David Whiting	20-Aug-2014

Highlights

Program Description
- Search Accepted Technologies
- In-House Technology Requests

Division Applications
- Water
  - Application Form
  - Application Instructions
  - Accepted Technologies
  - In-House Requests
- Waste
  - Program Description
  - Application Form
  - Application Instructions
  - Accepted Technologies
  - In-House Requests
- Air
  - Application Form
  - Frequently Asked Questions
  - Technologies Onfile
  - In-House Requests

Please email John Watts if you have any questions or concerns about these forms.

				Organic Bottom Solids.		
1472	Provectus Environmental Products	Jim Mueller	Jim Mueller	Provect-CH4 methane inhibitor / ERD ISCR Supplement	Gary Millington	10-Jul-2014
1469	Provectus Environmental Products	Jim Mueller	Jim Mueller	Provect-IR antimethanogenic ISCR Reagent	Gary Millington	16-Jun-2014
1470	Provectus Environmental Products	Jim Mueller	Jim Mueller	Provect-OX Self Activating ISCO/enhanced bioremediation reagent	Gary Millington	16-Jun-2014
1465	Osprey Biotechnics, Inc.	Osprey Biotechnics, Inc.	Michael Saul	Petrox EC	Rick Ruscito	13-Jun-2014
1452	Regenesis	Ben Mork	Drew Baird	CRS - Chemical Reducing Solution	Rick Ruscito	27-Mar-2014
1462	Redox Tech, LLC	Joe Rossabi	Joe Rossabi	Stabilized Hydrogen Peroxide (SHP)	Gary Millington	14-Mar-2014
1454	Rhamnolipid Companies, Inc.	Keith DeSanto	Rick Ruscito	Rhamnolipids for Environmental Cleanup	Rick Ruscito	24-Feb-2014
1450	Geologic Restoration, PLLC	Brian E Chew Sr. P.G.	Brian E. Chew, Sr P.G.	GR-320-IRC Carbon Based Injectate.	Rick Ruscito	24-Feb-2014
1448	Redox Tech, LLC	Joe Rossabi	Joe Rossabi	ABC Ole	Gary Millington	02-Oct-2013
1447	Terra Systems, Inc.	SRS-M	Michael D Lee, Ph.D.	Terra Systems Slow Release Substrate Metals or SRS-M	Gary Millington	25-Sep-2013
1423	Tersus Environmental	Nutrimens	Michael Spacil	Nutrimens Metabolic Supplements for Enhancing Anaerobic Bioremediation of Oxidized Metals and Chlorinated Compounds	Gary Millington	20-Sep-2013
1428	Regenesis	Drew Baird	Drew Baird	Innovative Technology Application for PersulfOx	Rick Ruscito	16-Sep-2013
1426	Redox Tech, LLC	Joe Rossabi	Joe Rossabi	Oxygen BioChem+ (OBC+)	Rick Ruscito	30-Jul-2013
1382	In-Viro-Situ LLC	In-Viro-Situ LLC	Keith Barker	Earth I.V.	Rick Ruscito	05-Jun-2013
1410	Foremost Environmental Solutions, LLC	Foremost Environmental Solutions	Seth C. Hunt	X-PeRT System	Gary Millington	31-May-2013
1374	Redox Tech LLC			Oxygen BioChem (OBC)	Rick Ruscito	16-May-2013
1405	Oil Solutions International	Paula Cella		Oil Solutions Powder and Liquid	Rick Ruscito	25-Apr-2013
1187	EOS Remediation, LLC	Brad Elkins		EOS	Rick Ruscito	21-Mar-2013
1370	Natural Solutions Group Corp.	Sami Benhamou	Orik Dagan	VirO2Syl	Rick Ruscito	07-Mar-2013
1400	Eurovix USA	David Bloom	David Bloom	Micropan Petrol	Rick Ruscito	20-Feb-2013
1186	OnMaterials	Clint Bickmore		In-Situ Chlorinated Compound Degradation using Injectable Metal Alloys	Gary Millington	20-Feb-2013

1401	Pureous Products, LLC	Pureous Hydrocarbon Fix	John Himelfarb	Pureous Hydrocarbon Fix	Rick Ruscito	20-Feb-2013
1188	Tersus Environmental, LLC	Tersus Environmental, LLC	David Alden	EDS-ER (Electron Donor Solution - Extended Release) Self-Emulsifying Soybean Oil Substrate	Gary Millington	08-Feb-2013
1393	TECHBlue Center	Dale Gilbert		Research. Standards and Benchmarks for Water Clean (Industrial Ionizer Equipment)	Rick Ruscito	31-Jan-2013
1185	BOOSUSA, LLC	Otto Sova	Marian Kupcik	Biological substances, enzymatic decontamination	Rick Ruscito	01-Oct-2012
1178	Ergofit USA LLC	Warren Russell	Gonzalo A. Pozo	Bioremediation Agent (Microbiological Culture, Enzyme Additive, Nutrient Additive.	Rick Ruscito	06-Sep-2012
1170	EOS Remediation	Brad Elkins		CoBupHMg	Gary Millington	28-Aug-2012
1171	Tersus Environmental	Gary M. Birk, P.E.	Don Ray	TersOx - Inorganic Peroxygen for Enhanced Aerobic Bioremediation	Rick Ruscito	08-Aug-2012
1163	The LatAm Group, Corp.	Gabriel Sebastian		Bioremediation, in-situ and ex-situ of hydrocarbons and raw sewage.	Rick Ruscito	30-Jul-2012
1305	MicroSorb Environmental Solutions, LLC.		Gabriel Sebastian	MicroSorb (MicroSorb Environmental Solutions, LLC)	Rick Ruscito	26-Jul-2012
1159	Clift Industries, Inc.	Matt Barnhill	Matt Barnhill	BioRem-2000 Nutrient Blend	Rick Ruscito	30-May-2012
1149	Groundwater & Environmental Services, Inc.	Charles Whisman, Charles Blanchard, Denise Good	Richard Evans	HypeAir	Rick Ruscito	11-May-2012
1151	Groundwater & Environmental Services, Inc.	Charles Whisman, Charles Blanchard, Denise Good	Richard Evans	Six Phase Chemical Oxidation	Rick Ruscito	11-May-2012
1150	Groundwater & Environmental Services, Inc.	Charles Whisman, Charles Blanchard, Denise Good	Richard Evans	HypeAir-EX	Rick Ruscito	11-May-2012
1124	EOS Remediation, LLC	Stephen Richardson	Stephen Richardson	Novel Application of Biodegradable Oils (VOS) for Vadose Zone Bioremediation	Gary Millington	09-May-2012
1152	Maxum Resources, LLC	Broc Segura	Broc Segura / Bill Rippetoe	NXT Technology	Rick Ruscito	18-Apr-2012
1123	Advanced Oxidation Technology	Robyn T. Price	Robyn T. Price	VTX Catalyst	Rick Ruscito	28-Feb-2012
1241	Cross-Fire Soil Remediation, LLC			Cross-Fire Thermal Destruction	Rick Ruscito	30-Jan-2012

1350	RPS Evironmental Solutions, LP			Remedia Hydrocarbon Stabilizer	Rick Ruscito	19-Dec-2011
1357	Sarva Bio Remed LLC			SpillRemed (Industrial) (a.k.a. HydroRemed, a.k.a. AgroRemed)	Rick Ruscito	06-Dec-2011
1260	Ergofit Manufacturers and Distribution (Pty) Ltd.		Contact	Ergofit MicroMix (Ergofit LLC)	Rick Ruscito	20-Oct-2011
1261	Ergofit Manufacturers and Distribution (Pty) Ltd.			Ergofit MicroMix (Maxum Resources LLC)	Rick Ruscito	20-Oct-2011
1207	EOS Remediation, LLC			BAC-9 (EOS Remediation)	Gary Millington	04-Oct-2011
1175	Clift Industries, Inc.	Matt Barnhill	Matt Barnhill	BioRem-2000: (1) Oil Digester-Anaerobic; (2) Oil Digester-MTBE; (3) MTBE-Anaerobic	Rick Ruscito	31-Aug-2011
1243	Custom Biologicals, Inc.			Custom HC-100	Rick Ruscito	23-Jul-2011
1329	Regenesis		Drew Baird, P.G.	PetroCleanze	Rick Ruscito	18-Jul-2011
1246	EOS Remediation Inc.			EAS	Rick Ruscito	08-Jul-2011
1359	Bio Blend Technologies, LLC		Contact	Star System	Rick Ruscito	05-Jul-2011
1200	Biovation Environmental Services, LLC		Contact	ABC Method (Biovation)	Rick Ruscito	06-Jun-2011
1335	US Dept of Energy - Savannah River Operations		Richard B. Smith	PHOSter Nutrient Injection System (Smith)	Rick Ruscito	25-May-2011
1334	US Dept of Energy - Savannah River Operations		L. Chip Priester	PHOSter Nutrient Injection System (phA)	Rick Ruscito	25-May-2011
1333	US Dept of Energy - Savannah River Operations		Mike McJilton	PHOSter Nutrient Injection System (eGeo)	Rick Ruscito	25-May-2011
1332	US Dept of Energy - Savannah River Operations		Suzanne Schomer	PHOSter Nutrient Injection System (AECOM)	Rick Ruscito	25-May-2011
1398		SFWMD, Watershed Technologies, LLC		Aluminum Sulfate	Everglades Restoration Planning and Permitting	29-Dec-2010
1343	APTwater Incorporated		Contact	PulseOx	Rick Ruscito	30-Nov-2010
1201	Advanced BioCatalytics Corporation			Accell Clean	Rick Ruscito	29-Nov-2010
1397		Cemex Construction Materials Florida, LLC		FLOPAMTM EM 230 PWG (Polyacrylamide)	Bureau of Mining and Minerals Regulation	20-Oct-2010
1361	Carus Chemical Company			Stimulox	Rick Ruscito	10-Sep-2010
1217	Environmental Remediation Consultants, Inc.			BIO-INTEGRATION	Rick Ruscito	24-Aug-2010

1344	1st EnviroSafety, Inc.			Purely Green Oil Clean	Rick Ruscito	14-Jun-2010
1222	Bioremediation, Inc.			Bio-Rem-2000 Oil Digester (aka Baad Bugs Oil Digester)	Rick Ruscito	25-May-2010
1214	G&C Ambientpetrol V, Inc.			Biodex	Rick Ruscito	14-Apr-2010
1298	EarthWorks Environmental, Inc.			Matrix Enhanced Treatment System (METS)	Rick Ruscito	07-Apr-2010
1230	G&C Ambientpetrol V, Inc.			BROS-PLUS	Rick Ruscito	11-Jan-2010
1263	ETEC, LLC			Etec Bioremediation Enhancements, EZT-CBN Custom Blended Nutrients, NutriMax, DO-IT & others	Rick Ruscito	14-Dec-2009
1293	JRW Bioremediation LLC			LactOil (JRW Bioremediation LLC)	Gary Millington	05-Oct-2009
1202			Contact	Aqua Kleen	Rick Ruscito	10-Aug-2009
1337	Perkins Enterprises, Inc.			Polyzyme 2000	Rick Ruscito	19-May-2009
1203	EOS Remediation, LLC			AquaBupH (EOS Remediation, LLC)	Gary Millington	28-Apr-2009
1352	Biobased AG			RM-103, RM-106 & RM-107	Rick Ruscito	19-Feb-2009
1248	1st EnviroSafety, Inc.			ECCO Commercial All Purpose Cleaner	Rick Ruscito	04-Feb-2009
1292	FMC Corporation			Klozur CR	Rick Ruscito	19-Dec-2008
1252	Thermal Remediation Services, Inc.		Contact	Electrical Resistance Heating (ERH)	Rick Ruscito	19-Nov-2008
1368	Terra Systems, Inc.			TSI EZVI (Terra Systems)	Gary Millington	07-Nov-2008
1231	BioRemedial Technologies, Inc.			BRT Nutrients	Rick Ruscito	30-Sep-2008
1218	Bio-Matrix / Spill Sorb		Craig McGree	Bio-Matrix (US) Spill Sorb (Canada)	Rick Ruscito	04-Sep-2008
1390		Miami-Dade County		Ciba Krysalis FC 2106D, Ciba Krysalis FC 2406D, Callaway 4864, Nalso PSC 7118	Bureau of Beaches and Coastal Systems	20-Aug-2008
1287	inVentures Technologies, Inc.		Don Ray	iSOC/HiSOC (inVentures Technologies)	Gary Millington	13-Aug-2008
1270	inVentures Technologies, Inc.			qPRO® (inVentures Technologies)	Gary Millington	13-Aug-2008
1367	Terra Systems, Inc.			TSI DC (Terra Systems)	Gary Millington	12-Aug-2008
1313	O2 Tube Technologies, Inc.			O2 Tube	Rick Ruscito	29-Jul-2008
1320	Ecosafe Products, Inc.		Contact	Organicide	Rick Ruscito	09-Jul-2008
1213	Regenesis		Drew Baird,	Bio-dechlor	Gary	24-Jun-

		P.G.	INOCULUM PLUS (BDI PLUS) (Regenesis)	Millington	2008
1325	OxyGreen Corporation		OxyGreen	Rick Ruscito	12-Jun-2008
1283	Resource Control Corporation		In Situ Chemical Oxidation with Ozone, Air and Oxygen (ISCO OAO)	Rick Ruscito	23-May-2008
1235	Etec, LLC	Brian Timmins	CarBstrate	Gary Millington	31-Mar-2008
1360	Emerald Bay Environmental Technologies, Inc.	Michael J Fitzsimmons	STI Technology (Natural Remediation, LLC)	Rick Ruscito	08-Jan-2008
1358	Terra Systems Incorporated		SRS - Slow-Release Substrate (Terra Systems)	Gary Millington	03-Jan-2008
1354	VeruTek Techologies, Inc.		S-ISCO (Surfactant-Enhanced In Situ Chemical Oxidation)	Rick Ruscito	18-Sep-2007
1254	AR Environmental Services, Inc.		Enhanced Bioremediation for Soil and Groundwater (EBSG)	Rick Ruscito	22-Aug-2007
1237	En Rx Incorporated		CHEMRED	Rick Ruscito	08-Aug-2007
1267	Arrius Environmental Inc.		GASOx	Rick Ruscito	27-Jul-2007
1206	Accelerated Remediation Technologies, LLC		ART System	Rick Ruscito	19-Jun-2007
1205	Virotec AquaSolve		Arsenic ProActiv	Rick Ruscito	04-Jun-2007
1341	Universal Remediation, Incorporated		PRP/Oil Buster	Rick Ruscito	18-May-2007
1365	Remediation Products, Inc.		Trap & Treat BOS 100	Rick Ruscito	19-Apr-2007
1366	Remediation Products, Inc.		Trap & Treat BOS 200	Rick Ruscito	17-Apr-2007
1249	GPET, LLC		ECOSAFE	Rick Ruscito	16-Oct-2006
1226	ConSeal International, Inc.		BioSurf 425-NF	Rick Ruscito	30-Aug-2006
1265	Biotech Restorations LLC		Factor Remediation Formula (FRF)	Rick Ruscito	17-Jul-2006
1331	Osprey Biotechnics, Inc.	Contact	Petrox DN	Rick Ruscito	04-May-2006
1239	Osprey Biotechnics, Inc.	Contact	CL-Out	Rick Ruscito	03-May-2006
1330	Osprey Biotechnics, Inc.	Contact	PETROX	Rick Ruscito	02-May-2006
1306	CBA Environmental Services, Inc.	Kiron Senapati	Mobile Injection Treatment Unit (MITU)	Rick Ruscito	31-Mar-2006
1216	X-19 Biological Products		Bio-Gel	Rick Ruscito	28-Mar-2006
1276	Regenesis	Drew Baird, P.G.	HRC Advanced	Rick Ruscito	23-Mar-2006

Safety Data Sheet (SDS)
OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 05/29/2015 Reviewed on 05/29/2015

* 1 Identification

· **Product identifier**

· **Trade name: Petrox**
· **Relevant identified uses of the substance or mixture and uses advised against**
· **Product description** Soil bioremediation solution used to neutralize pollutants.
· **Application of the substance / the mixture** Bioremediation of soil.

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Osprey Biotechnics, Inc.
1833A 57th Street
Sarasota, FL 34243
941-351-2700
· **Emergency telephone number:** Chemtrec 1-800-424-9300 or outside USA 1-703-527-3887

* 2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS03 Flame over circle

Ox. Sol. 2 H272 May intensify fire; oxidizer


GHS07

Acute Tox. 4 H302 Harmful if swallowed.
Acute Tox. 4 H332 Harmful if inhaled.
Eye Irrit. 2A H319 Causes serious eye irritation.
STOT SE 3 H335 May cause respiratory irritation.

· **Label elements**
· **GHS label elements**
The product is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**


GHS03 GHS07

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Trade Secret
Sodium Nitrate
· **Hazard statements**
May intensify fire; oxidizer.
Harmful if swallowed or if inhaled.
Causes serious eye irritation.
May cause respiratory irritation.
· **Precautionary statements**
Take any precaution to avoid mixing with combustibles.
Keep away from heat.

(Contd. on page 2)

Keep/Store away from clothing/combustible materials.
Avoid breathing dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wear protective gloves / eye protection / face protection.
Wear eye protection / face protection.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If swallowed: Call a poison center/doctor if you feel unwell.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
If eye irritation persists: Get medical advice/attention.
Rinse mouth.
In case of fire: Use for extinction: CO2, powder or water spray.
Store locked up.
Store in a well-ventilated place. Keep container tightly closed.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· ***Unknown acute toxicity:***
18 percent of the mixture consists of ingredient(s) of unknown toxicity.

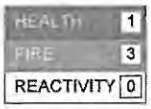
· ***Classification system:***

· ***NFPA ratings (scale 0 - 4)***

Health = 2
Fire = 3
Reactivity = 0

The substance possesses oxidizing properties.

· ***HMIS-ratings (scale 0 - 4)***



Health = 1
Fire = 3
Reactivity = 0

· ***Hazard(s) not otherwise classified (HNOC):*** None

* [redacted]

· ***Chemical characterization: Mixtures***
· ***Description:*** Mixture of substances listed below with nonhazardous additions.

· ***Dangerous Components:***

Trade Secret 25-50%
Acute Tox. 4, H302; Acute Tox. 4, H332; STOT SE 3, H335; Eye Irrit. 2B, H320; Combustible Dust

7631-99-4 Sodium Nitrate 15-35%
Ox. Sol. 2, H272; Eye Irrit. 2A, H319

[redacted]

· ***Description of first aid measures***
· ***General information:***
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.

(Contd. on page 3)

· **After inhalation:**
Supply fresh air. If required, provide artificial respiration. Consult doctor if symptoms persist.
In case of unconsciousness, place patient securely on side position for transportation.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
· **After swallowing:** Immediately call a doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed:** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

* 5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
If incinerated, product will release the following: Sodium Oxides, Nitrogen Oxides (NOx), Carbon Oxides, Sulfur Oxides.
· **Advice for firefighters**
Product has a combustible dust hazard. Avoid generating dust while extinguishing any fires.
Wet or damp material may start to decompose and release heat causing any nearby combustibles to catch fire. If containers begin to discolor or vent violently, emergency responders should evacuate area.
Use water spray to cool unopened containers.
When product decomposes, it will release oxygen, which may intensify fires. Use caution.
· **Protective equipment:**
Mouth respiratory protective device.
As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**
Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Dispose contaminated material as waste according to section 13.
Ensure adequate ventilation.
Dispose of the collected material according to regulations.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

* 7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Thorough dedusting.
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of dust.
· **Information about protection against explosions and fires:**
Protect from heat.
Keep protective respiratory device available.

(Contd. on page 4)

· **Conditions for safe storage, including any incompatibilities**
Store away from strong acids, strong bases, strong oxidizing agents, strong reducing agents, powdered metals, organic materials, Alkali metals, Alkaline earth metals, Cyanides and Thiocyanates.
· **Storage:**
· **Requirements to be met by storerooms and receptacles:**
Store below 32 °F and keep frozen until ready to hydrate.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:**
Keep receptacle tightly sealed.
Protect from heat and direct sunlight.
· **Specific end use(s)** No further relevant information available.

* 8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see section 7.

· **Control parameters**
All ventilation should be designed in accordance with OSHA standard (29 CFR 1910.94). Use local exhaust at filling zones and where leakage and dust formation is probable. Use mechanical (general) ventilation for storage areas. Use appropriate ventilation as required to keep Exposure Limits in Air below TLV & PEL limits.
· **Components with occupational exposure limits:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
· **Additional information:** The lists that were valid during the creation of this SDS were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing and wash before reuse.
Wash hands before breaks and at the end of work.
· **Breathing equipment:**
Use suitable respiratory protective device in case of insufficient ventilation.
Not necessary if room is well-ventilated.
· **Protection of hands:**
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Select glove material based on penetration times, rates of diffusion and degradation.
· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break-through time has to be determined and observed by the manufacturer of the protective gloves.
· **Eye protection:**

Safety glasses

(Contd. on page 5)

Safety Data Sheet (SDS)
OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 05/29/2015 Reviewed on 05/29/2015

Trade name: Petrox

* [redacted]

· **Information on basic physical and chemical properties**
· **General Information**
· **Appearance:**

Form:	Crystalline powder
Color:	Light Tan
· **Odor:**	Savory
· **Odor threshold:**	Not determined.
· **pH-value @ 20 °C (68 °F):**	< 8
· **Change in condition**	
Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	600 °C (1112 °F)
· **Flash point:**	210 °C (410 °F)
· **Flammability (solid, gaseous):**	Contact with combustible material may cause fire.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Auto igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Not determined.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not applicable.
· **Density:**	
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
· **Solubility in / Miscibility with**	
Water:	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0.0 %
Solids content:	100.0 %
· **Other information**	No further relevant information available.

* [redacted]

· **Reactivity** No further relevant information available.
· **Chemical stability** Stable under normal conditions.
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.

(Contd. on page 6)

· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:**
Strong acids, strong bases, strong oxidizing agents, strong reducing agents, powdered metals, organic materials, Alkali metals, Alkaline earth metals, Cyanides and Thiocyanates.
· **Hazardous decomposition products:**
Sodium Oxides, Nitrogen Oxides (NOx), Carbon Oxides, Sulfur Oxides.

* Toxicological Information

· **Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **on the skin:** No irritating effect.
· **on the eye:** Causes serious eye irritation.
· **Additional toxicological information:**
The product shows the following dangers according to internally approved calculation methods for preparations:
Harmful
Irritant

· **Carcinogenic categories**
· **IARC (International Agency for Research on Cancer)**
Substance is not listed.
None of the ingredients are listed.

· **NTP (National Toxicology Program)**
None of the ingredients are listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients are listed.

* Ecological Information

· **Toxicity**
· **Aquatic toxicity:**
7631-99-4 Sodium Nitrate
EC50 6000 mg/l (Water flea)
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:** Not known to be hazardous to water.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

* Disposal Information

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

(Contd. on page 7)

· **Uncleaned packagings:**
· **Recommendation:**
Packagings that cannot be cleansed are to be disposed of in the same manner as the product.
Disposal must be made according to official regulations.

14 Transport information

· **UN-Number**	
· **DOT, ADR, IMDG, IATA**	UN1479
· **UN proper shipping name**	
· **DOT**	Oxidizing solid, n.o.s. (Sodium nitrate)
· **ADR**	UN1479 Oxidizing solid, n.o.s. (Sodium nitrate)
· **IMDG, IATA**	OXIDIZING SOLID, N.O.S. (SODIUM NITRATE)
· **Transport hazard class(es)**	
· **DOT**	
	
· **Class**	5.1 Oxidizing substances
· **Label**	5.1
· **ADR**	
	
· **Class**	5.1 (O2) Oxidizing substances
· **Label**	5.1
· **IMDG, IATA**	
	
· **Class**	5.1 Oxidizing substances
· **Label**	5.1
· **Packing group**	
· **DOT, ADR, IMDG, IATA**	III
· **Environmental hazards:**	Not applicable.
· **Special precautions for user**	Warning: Oxidizing substances
· **Danger code (Kemler):**	50
· **EMS Number:**	F-A,S-Q
· **Segregation groups**	Powdered metals, ammonium compounds, cyanides, peroxides
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 25 kg On cargo aircraft only: 100 kg

(Contd. on page 8)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 05/29/2015 Reviewed on 05/29/2015

Trade name: Petrox

· **ADR**

· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 1000 g

· **IMDG**

· **Limited quantities (LQ)**	5 kg
· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 1000 g
· **UN "Model Regulation":**	UN1479, Oxidizing solid, n.o.s. (Sodium nitrate), 5.1, III

* **15 Regulatory information**

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Sara**

· **Section 355 (extremely hazardous substances):**

None of the ingredients are listed.

· **Section 313 (Specific toxic chemical listings):**

None of the ingredients are listed.

· **TSCA (Toxic Substances Control Act):**

50-99-7 glucose

7631-99-4 Sodium Nitrate

7772-98-7 Sodium thiosulphate

· **California Proposition 65**

· **Chemicals known to cause cancer:**

None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for females:**

None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for males:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

None of the ingredients are listed.

· **TLV (Threshold Limit Value established by ACGIH)**

None of the ingredients are listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

None of the ingredients are listed.

· **GHS label elements**

The product is classified and labeled according to the Globally Harmonized System (GHS).

(Contd. on page 9)

· **Hazard pictograms**

GHS03 GHS07

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Trade Secret
Sodium Nitrate

· **Hazard statements**
May intensify fire; oxidizer.
Harmful if swallowed or if inhaled.
Causes serious eye irritation.
May cause respiratory irritation.

· **Precautionary statements**
Take any precaution to avoid mixing with combustibles.
Keep away from heat.
Keep/Store away from clothing/combustible materials.
Avoid breathing dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wear protective gloves / eye protection / face protection.
Wear eye protection / face protection.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If swallowed: Call a poison center/doctor if you feel unwell.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
If eye irritation persists: Get medical advice/attention.
Rinse mouth.
In case of fire: Use for extinction: CO2, powder or water spray.
Store locked up.
Store in a well-ventilated place. Keep container tightly closed.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **National regulations:**

The product is subject to be classified according with the latest version of the regulations on hazardous substances.

· **State Right to Know**

	Trade Secret Acute Tox. 4, H302; Acute Tox. 4, H332; STOT SE 3, H335; Eye Irrit. 2B, H320; Combustible Dust	25-50%
CAS: 50-99-7	glucose	25-50%
CAS: 7631-99-4	Sodium Nitrate Ox. Sol. 2, H272; Eye Irrit. 2A, H319	15-35%
CAS: 91079-46-8	Peptones, soybean	5-10%
CAS: 7772-98-7 RTECS: XN6476000	Sodium thiosulphate	≤ 2.5%

All ingredients are listed.

(Contd. on page 10)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 05/29/2015 *Reviewed on 05/29/2015*

Trade name: Petrox

· ***Chemical safety assessment:*** A Chemical Safety Assessment has not been carried out.

The information and recommendations in this safety data sheet are, to the best of our knowledge, accurate as of the date of issue. Nothing herein shall be deemed to create warranty, expressed or implied, and shall not establish a legally valid contractual relationship. It is the responsibility of the user to determine applicability of this information and the suitability of the material or product for any particular purpose.

· ***Date of preparation / last revision*** 05/29/2015 / -

· ***Abbreviations and acronyms:***

ADR: The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN: The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
Ox. Sol. 2: Oxidising Solids, Hazard Category 2
Acute Tox. 4: Acute toxicity, Hazard Category 4
Eye Irrit. 2A: Serious eye damage/eye irritation, Hazard Category 2A
Eye Irrit. 2B: Serious eye damage/eye irritation, Hazard Category 2B
STOT SE 3: Specific target organ toxicity - Single exposure, Hazard Category 3

· **** Data compared to the previous version altered.***

SDS created by MSDS Authoring Services www.msdsauthoring.com +1-877-204-9106

Petrox

- **Applications:**
  Commonly used at fuel terminals and gas stations, in the metals and chemicals industries, citrus production, railroads, manufactured gas plants, and wood treatment facilities. Designed for stand-alone application or for augmentation of existing treatments, including vapor stripping, sparging, excavation, and dual-phase extractions technologies.

Petrox™ delivers active, rapid bioremediation of environmental contamination caused by industrial and commercial hydrocarbons.

An All-Natural Product

It contains a highly-concentrated solution of live, strains of lyophilized (freeze-dried) Pseudomonas organisms that occur naturally in the earth's ecosystem. These cultures are free of pathogens and there is no artificial mutation or genetic engineering involved. Extracted from a once-contaminated site and isolated under controlled laboratory conditions, these "hungry bacteria®" have only one purpose in life: to seek and destroy petroleum hydrocarbons, organic solvents, and semi-volatile hydrocarbons at their source, and then quickly convert them into harmless, naturally recyclable by-products.

From Brown To Green Faster

Site closure often occurs in a matter of weeks or months versus several years or more for other methods, giving users the combined benefit of fast site closure and remarkable cost savings.

Standard Blends

Available in three standard blends or custom formulated for specific needs, Petrox can be used as a highly effective stand-alone decontamination solution or as a powerful augmentation to speed the remediation of existing treatment systems.

Petrox 1™- BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene), Dichlorotoluene (2,5-), Dioctylphthalate (common plasticizer), Fuels (gasoline, diesel and heating oils), Methyl Ethyl Ketone (MEK, 2-butanone), Methylene Chloride, Mineral spirits, Naphthalene, Stoddard solvents, Polycyclic Aromatic Hydrocarbons (PAHs), and trimethylbenzene isomers.

Petrox 2™– Citrus Industry by-products, D-Limonene (Including citrus-based cleaning compounds), Isoprenoids (A class of organic compounds produced by plants), Terpene compounds (Natural hydrocarbons produced by plants), and Terpene-based solvents.

Petrox 3™– Anthracene, Chlorotoluene (M-), Chlorotoluene (O-), Chlorotoluene (P-), Chrysene, Cresols, Creosote, Fluorene, Oils and Greases (Food and petroleum), Pesticides, including 1,2-D, 2,4-D, Aldrin, Endrin, Pentachlorophenol (PCP), Phenanthrene, and Phenol.

Each Petrox product batch is manufactured under sterile conditions, and subjected to stringent quality control protocols before release for shipment. Available as a freeze-dried powder and hydrated on site for the highest possible microbial activity, each culture is provided with unique nutrient/growth factor formulation to maximize viable cell count.

Environmental Conditions for Effective Treatment

Parameter	Effective Range	Optimum Range
PH	5.0-9.0	6.5-7.5
Temperature	55-95ºF	65-75ºF
Salinity	0-5%	<5%
Dissolved Oxygen	>1.0ppm	1-8ppm

Petrox: Demonstrated Remediation Rates

Contaminant	Initial Concentration (ppm)	Final Concentration (ppm)	Test Period (hours)	Percent Reduction	Degradation Rate (mg/L/hr at 1E06 CFU/ml)
Fuel Oil in Water	2,000	1,400	40	30%	15
Fuel Oil in Sand	2,000	1,400	240	30%	2.5
Ethyl Benzene	3	0	168	100%	0.02
Xylene	3.6	0.4	168	89%	0.02
Toluene	99	15	168	85%	0.5
Methyl Ethyl Ketone	21	4	168	81%	0.1
Phenol	90	0	48	100%	1.9
Methylene Chloride	15	0	168	100%	0.09
Pentachlorophenol	50	32	84	35%	0.21
Dioctylphthalate	100	70	120	30%	0.25

15Sep2014

Share

Bioremediation of Pesticides Using Petrox® to Meet Part per Trillion Remediation Goals

Summary

Petrox bioremediation successfully reduced pesticide contaminant concentrations in ground water at a pest control company in Florida. Dieldrin and heptachlor epoxide were found in ground water at concentrations exceeding state drinking water standards, which were measured in parts per trillion. After three applications of Petrox, the pesticide concentrations decreased more than 99% in three source area monitoring wells.

Geology and Hydrogeology

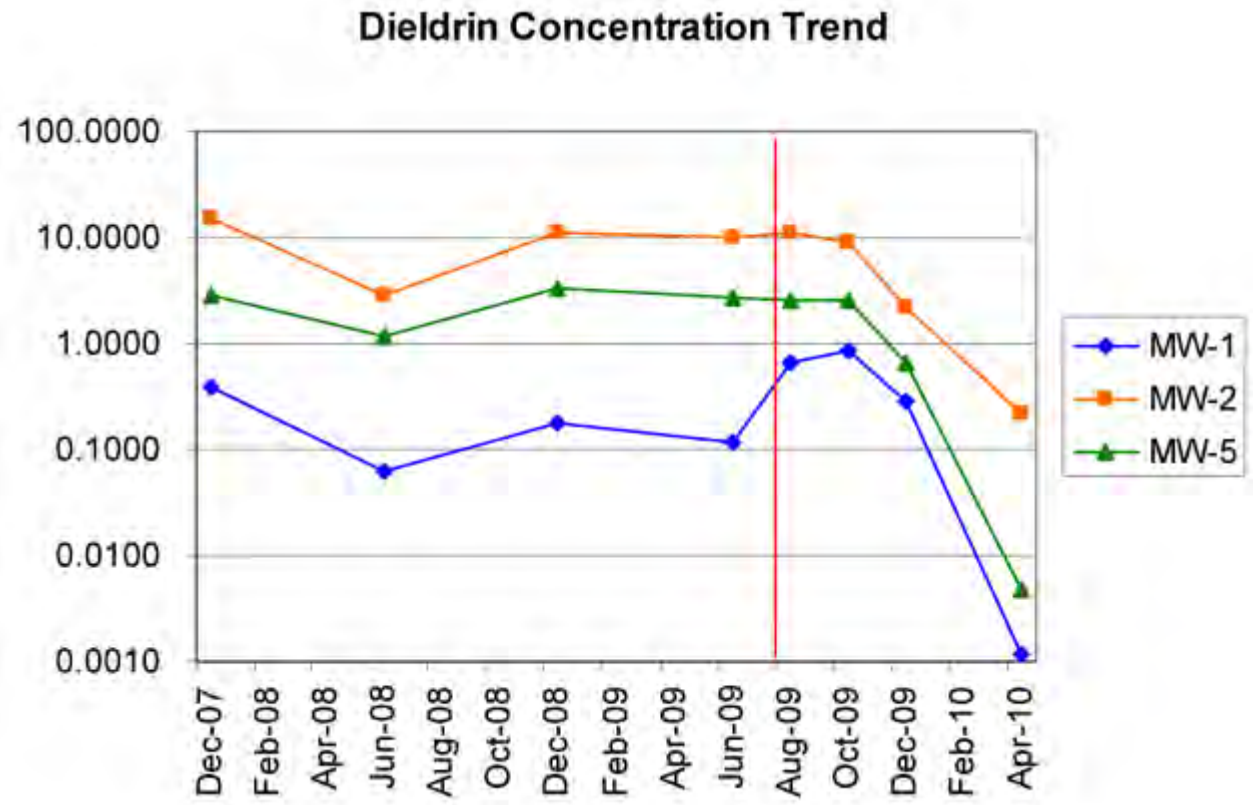
The site is set in the Florida Panhandle where thick coastal sediments characterize the shallow geology. The sediments underlying the site were fine-grained sand and silt more than 60 feet thick. The depth to the water table was approximately 45 feet.

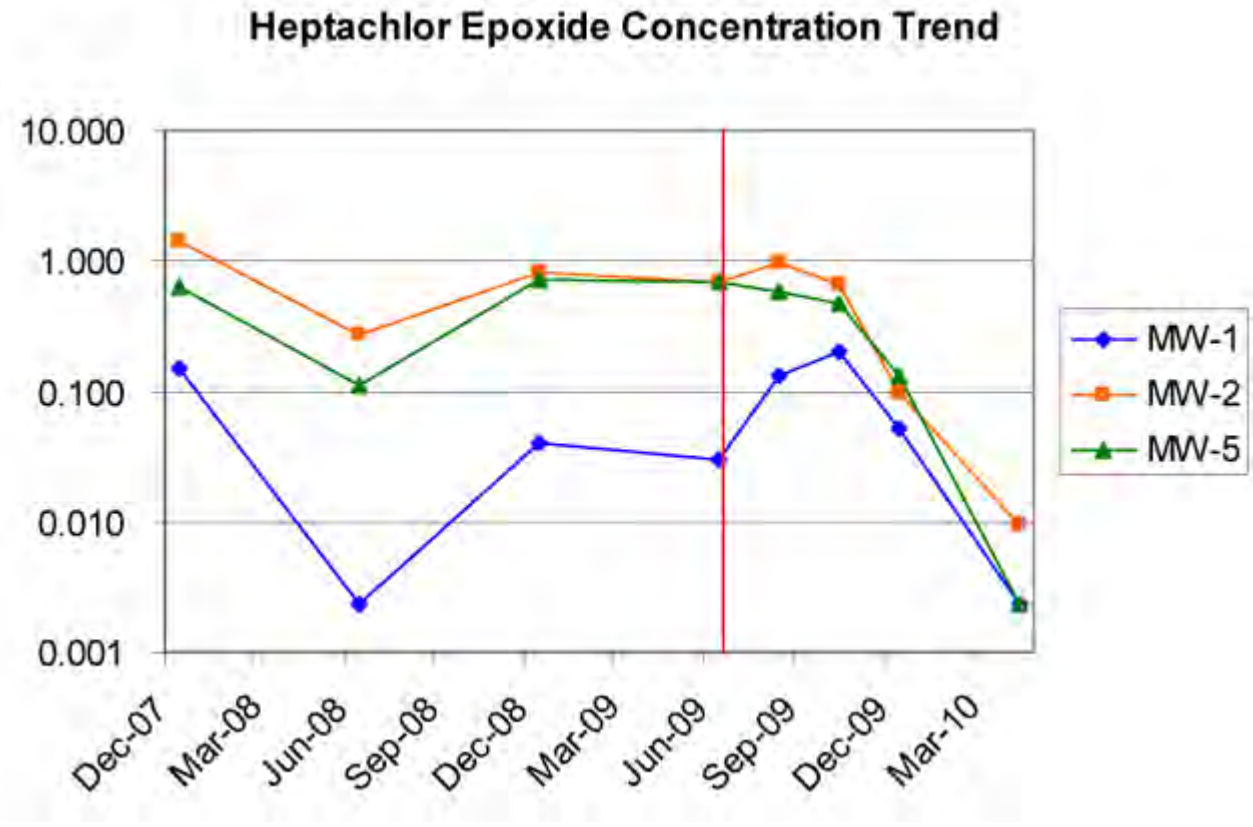
Contamination

Pesticides were found in shallow soil and ground water at the property. Pesticides had also migrated off the source property in the ground water. The pesticide concentrations in the ground water were relatively low, but exceeded state regulatory standards by orders of magnitude. Prior to remediation, the maximum concentration of dieldrin in ground water was 9.8 µg/L, while the remediation goal was 0.002 µg/L. Heptachlor epoxide was present in the source area ground water at 0.68 µg/L, with a remediation goal of 0.200 µg/L. The remediation challenge was to reduce the contamination levels from the very low initial concentrations to meet even lower remediation goals.

Remediation Design

Petrox bioremediation was direct injected into the ground water in three applications approximately 30 feet apart. During each injection 275 gallons of hydrated Petrox were injected into the three locations over a 15 foot thick interval. Monitoring wells in the treatment area were sampled to assess the progress of the remediation. Three injections were completed on 60 day intervals. The following charts show the contaminant concentration trends in the monitoring wells. The vertical red line shows the initiation of bioremediation.





Results

Despite the low initial concentration and dispersed contamination, Petrox bioremediation significantly reduced the contaminant concentrations over the full treatment area. The

heptachlor epoxide concentrations met the remediation goals in all monitoring wells in the treatment area. The maximum dieldrin concentration was reduced from 9.8 µg/L to 0.22 µg/L. After three treatments and less than 9 months, the dieldrin and heptachlor epoxide concentrations were reduced by more than 99%. The product cost for treatment was less than $15,000. Petrox provided an efficient, cost-effective remediation solution for the site.