Proposed Remedial Action Plan

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Payson PCE WQARF Site
Payson, Arizona

Prepared for:

Arizona Department of Environmental Quality
Phoenix, Arizona
August 25, 2003

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Realizing the Potential

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1110 West Washington Street
Phoenix, AZ 85007

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The material and data in this Proposed Remedial Action Plan was prepared under the supervision and direction of the undersigned.

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE PRAP REPORT

This Proposed Remedial Action Plan (PRAP) report, prepared by GeoTrans, Inc. (GeoTrans) relies upon the data and findings of the Remedial Investigation (RI) activities and Feasibility Study (FS) (GeoTrans, 2003) that have been conducted by the Arizona Department of Environmental Quality (ADEQ) from 1993 through the present at the Payson PCE Water Quality Assurance Revolving Fund (WQARF) Site (the Site) (Figure 1-1). The PRAP outlines the proposed remedy that is capable of achieving defined Remedial Objectives (ROs) (Appendix E of the RI report; GeoTrans, 2002) to remediate the defined contamination at the Site. This PRAP is prepared in accordance with Arizona Revised Statues (ARS) §49-287.04(A), Proposed Remedial Action Plan; Rules and Arizona Administrative Code (AAC) Rule R18-16-408, Proposed Remedial Action Plan. The PRAP outlines and describes the selected remedy which has been shown in the FS to: 1) assure the protection of public health, welfare and the environment; 2) to the extent practicable, provide for the control, management, or cleanup of hazardous substances so as to allow for the maximum beneficial use of waters of the state; 3) be reasonable, necessary, cost-effective and technically feasible; and, 4) address any well that either supplies water for municipal, domestic, industrial, irrigation or agricultural uses or is a part of a public water supply system, if the well would now or in the foreseeable future produce water that would not be fit for its current or reasonably foreseeable end use without treatment.

The purpose of the report is to present the selected remedy, which has been shown to satisfy the criteria presented above. Specifically, in accordance with A.R.S. § 49-287.04(A), the PRAP must present and discuss:

1. The boundaries of the site or portion of the site that is the subject of the remedial action.
2. The results of the remedial investigation and feasibility study.
3. The proposed remedy and its estimated costs.
4. How the remediation goals and selection factors in section § 49-282.06 and rules adopted by the director have been considered.

The previously completed RI and FS Reports have documented the RI activities, the Early Response Actions (ERAs) constructed and the proposed remedy, including costs. Additionally, the FS evaluated contingency options which may affect the future operation of the treatment system proposed as the remedy. This report will further outline the selected remedy and contingencies, addressing the elements listed above.

1.2 REPORT ORGANIZATION

The remaining portions of the PRAP report have been organized into the following sections:

- Section 2.0 - SITE BACKGROUND - This section presents a summary of the site description, physiographic setting, nature and extent of contamination and a risk evaluation.

- Section 3.0 - SELECTED REMEDY - This section presents the selected remedy, including the remedial strategy and remedial measures, and includes a discussion of the associated treatment technology and discusses how it will achieve the ROs and metrics to evaluate the system effectiveness.

- Section 4.0 - LIFE CYCLE COSTS - This section presents the costs associated with the selected remedy, based on the operational time estimate from the FS.

- Section 5.0 - CONTINGENCY OPTIONS - This section presents a discussion of contingency options which have been identified in the FS, particularly options to be evaluated if water levels continue to drop at the Site, the Town of Payson, New McKamey Well becomes contaminated above relevant drinking water standards or if MTBE concentrations rise significantly at the Expanded Groundwater Treatment System (EGTS).

- Section 6.0 - DISPOSITION OF TREATED WATER - This section presents a discussion of the use of the treated water generated from operation of the proposed remedy at the Site.

- Section 7.0 - CONCLUSIONS - This section presents a concluding discussion of proposed remedy for the Site.

2.0 SITE BACKGROUND

The following description of the Site Background is taken from the *Remedial Investigation Report, Payson PCE WQARF Site, Payson, Arizona* (RI Report); (GeoTrans, 2002). The reader is directed to that report for a more detailed description of the Site.

2.1 SITE DESCRIPTION

The Site is approximately 110 acres in area and is located in the southern portion of the Town of Payson, bounded approximately by Frontier Street on the north, Beeline Highway on the east, Cedar Street on the south and McLane Road on the west (Figure 1-2). The Site is characterized by the presence of high levels of tetrachloroethene (PCE) and trichloroethene (TCE) in groundwater, associated with the former Old Payson Dry Cleaners (OPDC; the source), located north of the intersection of the South Beeline Highway and West Nugget Street.

2.2 PAYSON PCE WQARF REGISTRY SITE

Contamination at the Site was initially identified by the Town of Payson during their routine groundwater sampling in May 1990. The sampling was conducted for source water approval of four wells that were completed as future Town of Payson water supply wells (Wells TOP-4, -5, -19 and -20). The analytical testing of groundwater identified PCE in concentrations of 13,600 micrograms per liter (µg/L) and 542 µg/L in Well TOP -4 and, -5, respectively (Earth Technology Corporation [Earth Tech], 1992). The United States Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) for both PCE and TCE is 5 µg/L, which is equivalent to the Arizona Aquifer Water Quality Standard (AWQS) for PCE and TCE.

The Site was identified as a potential WQARF Site in 1990 and, in response, a comprehensive groundwater monitoring program was initiated by the ADEQ that involved the sampling of additional wells in the area. The monitoring indicated detectable concentrations of PCE in eight wells (Earth Tech, 1992).

In 1993, the initial investigation for the ADEQ was conducted by the Preliminary Assessment/Site Inspection Unit (PASI), which identified the OPDC as a possible source of PCE contamination. The OPDC reportedly has historically operated at 904-906 South Beeline Highway and 908-910 South Beeline Highway (Figure 1-3). The Site was added to the WQARF Priority List in December 1993. The Site was incorporated into the newly created WQARF Registry List in April 28, 1998, due to the presence of PCE and TCE in groundwater and the fact that the Town of Payson is wholly dependent on groundwater for their water supply.

2.3 SOURCE AREA DEFINITION

The PASI Unit of ADEQ identified two properties which were investigated to determine the source of contamination at the Site: the 904 and 906 South Beeline Highway property, which was the last

known location for the OPDC; and the 908 and 910 South Beeline Highway location, which currently is occupied by a Texaco Star Mart gasoline station and historically was occupied by the OPDC on the 908 S. Beeline parcel (ADEQ, 1993). The WQARF site boundaries have then been defined based on the extent of PCE contamination, which extended approximately from South Beeline Highway to South McLane Road, between West Main Street and West Aero Drive (Figure 1-2).

2.4 CHRONOLOGY OF SITE ACTIVITIES

To assist in reviewing the various investigation activities, this chronology was compiled of major investigative activities at the Site. The following outlines many of the events and investigative milestones for the project:

April 1990:	Town of Payson sampling finds PCE and TCE in groundwater collected from Wells TOP-4 and TOP-5 and reports results to ADEQ.
May 1990:	ADEQ identifies the Site as a WQARF Site and conducts initial groundwater sampling event.
December 1990:	Earth Tech, for ADEQ, re-samples wells TOP-4, -5, -19 and Worden.
February 1991:	Earth Tech, for ADEQ, presents workplan for hydrogeologic investigation.
April 1992:	Well elevation and locations surveyed by Yost and Gardner for ADEQ.
November 1992:	ADEQ identifies potential source area (OPDC).
February 1993:	ADEQ conducts Preliminary Assessment (PA) of OPDC.
March 1993:	Earth Tech, for ADEQ, samples wells near Site and prepares plume map.
March 1993:	Earth Tech, for ADEQ, conducts hydrophysical logging of TOP-4 and TOP-5.
April 1993:	ADEQ conducts Site Inspection (SI), including GeoProbe™ groundwater, soil vapor and soil sampling in source area..
December 1993:	Payson WQARF Site placed on the WQARF Site Priorities List.
February 1994:	ADEQ conducts additional Site investigation activities, including the drilling of monitor wells PP-01 (became EW-3), PP-02 and HydroPunch® sampling along four profiles at and near source area (OPDC).
February 1994:	ADEQ begins intermittent groundwater monitoring and sampling of wells near the Site, based on availability of funding.
June 1994:	ADEQ completes monitor well PP-01 (EW-3). Aquifer testing was subsequently conducted in December 1994.
January 1995:	ADEQ conducts an Expanded Site Inspection (ESI) investigation, including soil vapor and soil sampling and sampling of the suspected source area (septic tank).
June 1995:	Growth Environmental (Growth), for ADEQ, removes septic tank system at OPDC as an ERA under WQARF, identifies cesspool and collects confirmation samples beneath septic tank.

Jan-Mar 1996:	ADEQ drills five additional soil borings (including coring) on the Texaco and Rundle properties (B-1 through B-5); collects discrete groundwater samples using HydroPunch® from B-1, B-2 and B-5. Borings B-3 and B-4 completed as monitor wells PP-03 and PP-04 (Rundle 2-Inch and Rundle North). ADEQ installs extraction wells EW-1 and EW-2.
September 1996:	ADEQ contracts Dames and Moore to construct Interim Groundwater Extraction System (IGTS) as an ERA under WQARF.
Oct-Nov 1996:	ADEQ installs four monitor wells downgradient of the source area (DG-1, DG-2, DG-4A and DG-5) and three additional borings DG-3, DG-4 and DG-6. Depth- specific water sampling was conducted prior to well installation.
November 1996:	ADEQ conducts sampling of the OPDC cesspool.
Feb-Oct 1997:	Dames and Moore designs and builds IGTS.
Mar-Apr 1997:	Cesspool contents sampled, cesspool removed, with confirmation sampling, as an ERA under WQARF.
August 1997:	ADEQ contracts EMCON to develop Hydrogeologic Conceptual Model (HCM) and groundwater flow model and to evaluate, design and build the EGTS as an ERA under WQARF.
Aug-Oct 1997:	ADEQ installs well sets WS-1, WS-2 and WS-3.
December 1997:	HSI GeoTrans, for ADEQ, conducts aquifer testing on TOP-4, TOP-5, TOP-19, TOP-20, WS-1, WS-2, WS-3 and TOP-Skinner.
December 1997:	Dames and Moore takes over quarterly groundwater sampling at the Site and creates a database for sampling data.
Jan-Dec 1998:	ADEQ and EMCON formulate HCM as part of the development and construction of the groundwater flow model for the Site.
January 1998:	IGTS performance tested for 90 days.
March 1998:	Wellhead remediation system installed at the TOP-Skinner by Levine-Fricke-Recon (LFR) for ADEQ.
Apr 98-Apr 99:	TOP-Skinner wellhead treatment system operational.
Apr-Oct 1998:	EMCON designs and builds EGTS.
July 1998:	ADEQ contracts EMCON to conduct monitor well installation and aquifer testing.
July-Dec 1998:	EMCON installs, samples and conducts aquifer tests at 32 monitor wells to define the plume and provide additional hydrogeologic data.
October 1998:	IGTS and EGTS become fully operational and begin treating and delivering water to Town of Payson.
November 1998:	ADEQ and EMCON begin monitoring water levels in wells at the Site, with continuous monthly measurements by EMCON beginning in April 1999.
December 1998:	Extraction well EW-4 drilled, groundwater flow model report completed and delivered by EMCON.

April 1999:	Extraction well EW-4 connected to the IGTS and EW-1 and EW-2 disconnected due to declining water levels.
April 1999:	ADEQ contracts Geotechnical and Environmental Consultants, Inc. (GEC) to perform quarterly groundwater monitoring field activities and Dames and Moore continues to prepare quarterly reports and to maintain database.
June 1999:	TOP-Skinner wellhead treatment system removed and the well connected to the EGTS.
September 1999:	ADEQ contracts Environmental Science and Engineering, Inc. (ESE) to oversee removal of building and three USTs (which were previously abandoned) from Rundle property. USTs, the building/slab, underground utilities and contaminated soil were removed by ASL, who was retained by Kaibab Industries, purchaser of the Rundle property.
September 1999:	ESE conducts soil and soil vapor sampling and installs three sets of three nested vapor monitoring wells to evaluate the Rundle property.
September 1999:	IT, Corp (after acquiring EMCON in 1999) contracts HSI GeoTrans to measure groundwater levels and complete groundwater model update.
November 1999:	ESE collects soil vapor samples from 11 soil borings and discrete groundwater sample from three continuous core borings using HydroPunch® and installs three sets of discreet zone vapor sampling wells.
June 2000:	IT, Corp. completes monthly water level monitoring activities and GEC takes over water level monitoring on a quarterly basis in conjunction with sampling.
July 2000:	ADEQ contracts HSI GeoTrans to complete RI, drill additional extraction wells and complete investigation activities at the Site.
August 2000:	HSI GeoTrans completes vapor sampling of 14 wells (including vapor monitoring wells) at the Texaco and Rundle properties.
November 2000:	HSI GeoTrans conducts pilot soil vapor extraction (SVE) pilot test at Texaco and Rundle properties.
May 2001:	GeoTrans (formerly HSI GeoTrans) completes ADEQ-Approved Draft RI Report, presents information to CAB.
July 2001:	New extraction wells (EX -1 and EX - 2) online, providing water to EGTS.
July 2001:	GeoTrans and ADEQ present RI report to public for comment at meeting in Payson.
July 2001:	Town of Payson provides comments for RI report, identifies additional wells which have detections of PCE below AWQS.
August 2001:	GeoTrans completes construction of the SVE system and starts up the system extracting soil vapor from extraction wells EW-1 and EW-4.
August 2001:	ADEQ and GeoTrans meet with Town of Payson to discuss newly disclosed well impacts at Rodeo Grounds, Woodland Meadows No. 2 and McKamey wells.

Oct -Nov 2001:	GeoTrans completes geophysical logging and depth-specific groundwater sampling of three Town of Payson production wells.
Oct -Nov 2001:	GeoTrans completes six sentinel monitor wells at EGTS to monitor MTBE impacts.
January 2002:	GeoTrans presents a report to ADEQ and the Town of Payson outlining the results of investigation of additional PCE contaminated wells, which will be included as an Appendix to the RI report.
June 2002:	GeoTrans presents the Final RI Report to ADEQ and the Town of Payson.
August 2002:	GeoTrans discontinues SVE system, due to a less than 0.05 pound per day removal rate.
September 2002:	GeoTrans conducts soil sampling to confirm SVE effectiveness. Samples were all non-detect for VOCs (using EPA Method 8260B).
December 2002:	GeoTrans removes SVE system from the Site.
January 2003:	IGTS shutdown, pumping rate down to 15 gallons per minute (gpm). GeoTrans abandons former extraction wells EW-1, EW-2 and EW-3, and vapor monitoring wells CC-B1, CC-B2 and CC-B3. GeoTrans also abandons monitor well Rundle 2-Inch and domestic well Rundle.
May 2003:	GeoTrans delivers Final FS Report to ADEQ.

3.1 SELECTED REMEDY

Because the Town of Payson is completely dependent upon pumped groundwater to provide municipal water supplies, the aquifer near the Site is important as a critical water source for the Town of Payson. The Town of Payson reported on this as part of *Long Term Management Program of the Town of Payson's Water Resources* (Southwest Ground-water Consultants, Inc. 1998), which indicates that the aquifer beneath the Site is expected to supply approximately 35 percent of the Town of Payson's total water demands. Consequently, the Town of Payson has worked with ADEQ to construct an interim groundwater treatment system as an ERA under WQARF. ADEQ constructed the EGTS as an ERA under WQARF in 1998.

Remedial Strategy: The remedial strategy for the Selected Remedy will be plume remediation to achieve AWQS for the contaminants of concern (COCs) in the groundwater within the Site.

Remedial Measures: The remedial measures for the Selected Remedy will be to pump groundwater from existing (TOP-Skinner, TOP-4, TOP-5R and TOP-19) and new production wells (EX-1 and EX-2), treatment of COCs in the extracted groundwater by granular activated carbon (GAC) at the EGTS and delivery of the treated water to the Town of Payson. The Town of Payson will utilize the water as part of their municipal supply, with delivery to residential customers. No re-injection or recharge of treated water will occur, and discharge and transportation will be through the existing Town of Payson municipal water system.

Proposed Extraction Rates: The Selected Remedy will be pump-and-treat plume remediation using the EGTS at an operational pumping rate of 200 gpm. This pumping rate represents the approximate current operational rate for the EGTS, and reflects the current long term average pumping rate for the EGTS. This remedy assumes that following pumping rates will be employed (which are based on current production rates at the EGTS):

Table 3-1
Pumping Rates for Selected Remedy

Well	Rate	
EX-1	25	gpm
EX-2	30	gpm
TOP-4	40	gpm
TOP-5R	40	gpm
TOP-19	40	gpm
TOP-Skinner	25	gpm
Total	**200**	**gpm**

Source Control: Source control must be considered as an element of the Reference Remedy and all alternative remedies. Source control for the Site has been achieved through the implementation of the ERA SVE/Dual Phase Extraction (DPE) and IGTS systems at the source area. Therefore source control has been achieved and has not been included in the Selected Remedy.

Proposed Metrics: In accordance with *Arizona Administrative Code (AAC), Rule R18-16-408, Proposed Remedial Action Plan*, the PRAP must discuss how the remedial action progress will be measured. To measure the progress of achievement of the remedial objectives, it is proposed that a combination of groundwater gradient measurements and groundwater quality sample analysis be completed on a semi-annual basis to determine the effectiveness of the remedy for the Site.

- Groundwater levels have been measured since 1993 at the Site, with quarterly monitoring since 1997 (semi-annually since 2002). Following the completion of the monitor well network in 1998, sufficient wells have been monitored at the Site to determine the groundwater gradient for the peripheral portions of the plume. These measurements indicated an "inward" gradient toward the pumping wells when evaluated as part of the RI Report for the Site (GeoTrans, 2002). These measurements indicate plume capture and containment is currently occurring at the Site. Future semi-annual monitoring events should include a gradient evaluation to demonstrate inward gradients, affirming ongoing capture within the area of the Site.

- Groundwater quality sampling has been ongoing since 1993 at the Site, with quarterly sampling since 1997 (semi-annually since 2002). These measurements have shown the changes in the groundwater impacted with PCE over time, including spatial and temporal changes. Groundwater sampling will be a critical element to determine how the plume is changing spatially and temporally as the remedy at the Site operates. These samples will indicate whether the plume is expanding or contracting spatially, and how concentrations are changing with time.

Uncertainties and Contingencies: MTBE is the primary uncertainty related to groundwater contamination treatment. The Reference Remedy will include contingency treatment alternatives or revised pumping schemes if MTBE becomes an issue. Sentinel monitor wells have been installed to identify MTBE contamination before it reaches the EGTS production wells. This may require more frequent carbon change-outs, although based on operational history, mass loading has not been the driving factor for carbon change-out. Biofouling of the carbon has been the primary driving factor for carbon change-out.[1]

If the New McKamey well becomes impacted with PCE above AWQSs for three consecutive quarterly sampling events, the well will be evaluated for connection to the EGTS. An analysis of this contingency has been completed as part of the FS. This analysis evaluates whether to connect this well to the EGTS or install a wellhead treatment system, and will be presented later in this report.

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[1]Based on observation of Peter Storch, P.E. of URS, Inc. URS is contracted by ADEQ and Town of Payson to provide operation and maintenance services for the IGTS and EGTS.

Hydraulic capture is assumed to be effective at the pumping rates specified as part of this remedy, based on direct observation of the groundwater gradients between monitor wells and groundwater modeling simulations. Due to the observed declines in water levels at the Site, pumping rates for the wells currently connected to the EGTS may not remain at or higher than 150 gpm as water levels fall due to low recharge rates. For this reason, it may be necessary to consider lowered pumping rates for each of the wells to maintain capture of the plume. The PRAP assumes that capture can be maintained if the water levels remain depressed relative to the surrounding areas, such that an inward hydraulic gradient is maintained. Steady, continuous declines in water levels will require a re-evaluation of this assumption.

The Selected Remedy for the Site consists of the EGTS, pumping at a rate similar to current operation, or approximately 200 gallons per minute (gpm).[2] The Selected Remedy has been demonstrated, as part of the FS, to:

- Best assure, the protection of public health and welfare and the environment;
- To the extent practicable, provide for the control, management and cleanup of the PCE contamination, maximizing beneficial use of the groundwater in the Town of Payson; and,
- Is reasonable, necessary, cost-effective and technically feasible.

The EGTS has been successfully delivering treated groundwater to the Town of Payson since 1998. The EGTS is currently operating at the Site at approximately 200 gpm and has not had detectable concentrations of PCE in the effluent throughout its operational history. The EGTS consists of two 20,000-pound GAC units connected in series, which currently receive contaminated groundwater from up to six extraction wells, EX-1, EX-2, TOP-4, TOP-5R, TOP-19 and TOP-Skinner (Figure 3-1). The water flows through a bag-filter and enters the carbon units, exiting to a storage tank at the Site. The system includes variable frequency drive pumps, which can be set to pump at the desired pumping rate for each well individually. The EGTS is equipped with piping and inlet works for connecting up to two additional groundwater extraction wells or well sets. The EGTS design and construction has been documented by Advanced Remediation Technologies (ART) as part of the *Construction Report: Payson WQARF Site, EX-1 & EX-2 Extraction Wellheads, Payson, Arizona*, (ART, May 2002) and *Construction Report: Expanded Groundwater Treatment System, Payson, Arizona*, (ART, March 2000).

The GAC vessels and other components of the treatment system are housed in a 3,000-square-foot manufactured steel building. The carbon is periodically backflushed or replaced, based on results of water sampling. Generally, the carbon has been changed whenever breakthrough between the first and second vessels occurred, which has been approximately two years between events. The treated water is chlorinated by the Town of Payson in a contact chlorination tank located adjacent to the EGTS building and delivered to the Town of Payson potable water supply system through an onsite inter-connect.

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[2]The EGTS operates at rates from about 150 gpm to over 300 gpm, depending on demand by the Town of Payson. A calculation of total gallons produced versus total time elapsed gave a value of 186 gpm, representing the average rate with shutdown periods included (November 1998 to October 2001).

The EGTS is controlled by means of a PLC and a personal computer (PC). The PC functions as the data storage device and is the means by which changes in operations parameters (setpoints) can be input to the PLC. The PLC is programmed to automatically dial a list of personnel should the system go off-line. Figure 3-2 shows the completed EGTS design with the EX-1 and EX-2 extraction wells.

3.2 ACHIEVEMENT OF REMEDIAL OBJECTIVES

The ROs for the Site have been developed with input from land owners, local governments, water providers and the public. The ROs for the Site are generally consistent with the Town of Payson Water Management Plan and General Land Use Plan. The ROs were developed based upon the current and reasonably foreseeable uses of land and reasonably foreseeable beneficial uses of water of the states. The ROs were prepared for each listed use in the following terms:

- Protecting against the loss or impairment of each listed use that is threatened to be lost or impaired as a result of a release of a hazardous substances;
- Restoring, replacing, or otherwise providing for each listed use to the extent that it has been or will be lost or impaired as a result of a release of a hazardous substance;
- Time frames when action is needed to protect against or provide for the impairment or loss of the use; and,
- The projected duration of the action needed to protect or provide for the use.

3.2.1 Remedial Objectives for Land Use

The former source area for the Site is located at 904-906 S. Beeline Highway (the Property). The Property was previously a dry cleaning facility and is now a vacant site, owned by Mr. Perry Overstreet, (recently purchased from Sawmill Crossing, LLC). According to the current property owners, the Property is being redeveloped for commercial/retail use and preliminary plans for a building pad are available. A Chili's Restaurant has been constructed on a pad immediately north of the Property. The area is zoned C-3 for commercial structures and these plans appear to be consistent with zoning and Town of Payson planning.

Three early removal actions were conducted at the Property to remove underground structures and contaminated soils: 1) a septic tank used for disposal of dry cleaning waste; 2) a cesspool, approximately 40 feet in depth, along with some surrounding soils; and 3) three underground storage tanks used for the storage of gasoline and diesel. Soils impacted by PCE have been removed from the former source area. Because there may have been remaining PCE mass in the soil beneath the former source area, where the water table has been lowered, PCE was removed from these soils through vapor extraction as an ERA. For the purposes of this PRAP, any remaining residual PCE in soil is assumed to be sufficiently deep that it is unlikely to cause a threat to potential land use at the Property and only presents a potential threat to groundwater quality, if water levels rise and groundwater re-saturates the remaining impacted soil.

Land use throughout the Site is generally residential and commercial, with large areas of open space. The Green Valley Redevelopment Plan, established by the Town of Payson to revitalize the Main Street corridor area, will encourage zoning changes and infrastructure improvements to facilitate this development. Based on information from the Payson Roundup and Town of Payson, Payson Regional Housing Development has acquired three acres of the property, formerly owned by Mr. Dannie Garcia located east of McLane Road, between Main Street and Aero Drive. This low income housing project is currently being constructed, and is scheduled for completion in July 2003. There are additional preliminary development plans under discussion for portions of the Site. ADEQ will work with the Town of Payson and potential site developers to promote a final remedy for groundwater that is compatible with these future land uses.

The redevelopment of the 904-906 S. Beeline Highway property for commercial/retail use is currently proceeding and is reasonably foreseeable. The proposed RO for this use is:

- Protect against possible exposure to hazardous substances in surface and subsurface soils that could occur if the property was developed for commercial/retail use. If additional work at the Property is necessary beyond the previously conducted ERAs (see Section 4 for details), ADEQ will coordinate with the Town of Payson and local property owners and work towards a final remedy that is compatible with these development plans.

Soil vapor extraction and soil removal actions were implemented as ERAs to complete source control and to remove soil contamination at the Site. No soil samples collected as part of the closure of the SVE system exceeded relevant soil standards (GPLs or SRLs) (GeoTrans, 2002a). For this reason, remedial objectives for soils have been achieved, and no metrics for future evaluation are needed.

3.2.2 Remedial Objectives for Groundwater Use

The Town of Payson businesses and residents are solely dependant upon the groundwater aquifer for their water supply. Groundwater within and near the Site is used by both municipal and private users. The Town of Payson is the primary municipal water provider and is completely dependant upon groundwater to meet their water needs. Additionally, many private well owners are dependent upon their wells for their water supply.

Currently, five of the Town of Payson production wells (TOP-4, TOP-5R, TOP-19, TOP-20 and TOP-Skinner) within the Site have been impacted with PCE above the 5.0 micrograms per liter (µg/L) Aquifer Water Quality Standard (AWQS). Four of the Town of Payson production wells (TOP-4, TOP-5R, TOP-19 and TOP-Skinner) and two recently installed ADEQ extraction wells (EX-1 and EX-2) are used to extract groundwater from the Site. The IGTS, which most recently obtained pumped groundwater from extraction well EW-4, was shutdown in January 2003. Well EW-4, which has delivered water for the Town of Payson municipal supply, has not been abandoned at this time. The Town of Payson production well TOP-New McKamey has detected PCE in groundwater samples, but the concentrations have never exceeded the AWQS.

The Town of Payson operates two groundwater treatment systems (the IGTS and the EGTS), which remediate water to below the PCE AWQS and directly deliver treated groundwater to its municipal customers. The Town of Payson is dependant upon the treated groundwater to meet current and

customers. The Town of Payson is dependant upon the treated groundwater to meet current and future water demand. The groundwater resource within the Site, without treatment, may be considered lost and/or impaired and further impacts to groundwater may be possible if the groundwater contamination plume is not managed. A discussion of reasonably foreseeable water uses and the remedial objectives proposed for each use follows.

Lost or Impaired Municipal Use of Groundwater

The use of groundwater by the municipal water provider is considered reasonably foreseeable. The RO for this use is:

- To restore, replace, or otherwise provide for the use of groundwater currently lost or impaired by PCE contamination at the Site. Water will be provided to the Town of Payson in continuity with existing water treatment at the Site. The action will continue for as long as the need for the water exists, the resource remains available and PCE concentrations in the water prevent its direct use as a domestic water supply.

In the absence of groundwater treatment, Town of Payson production wells TOP-4, TOP-5R, TOP-19, TOP-20 and TOP-Skinner would be "lost" since PCE concentrations exceed the relevant MCL of 5 µg/L. The installation and operation of the EGTS as the Selected Remedy provides water from these wells in accordance with the ROs for the Site. The metric for evaluating the remedial action will be to measure the changes in PCE concentrations in these wells to demonstrate whether concentrations are declining at each well. The goal will be to achieve PCE concentrations of less than the AWQS of 5 µg/L in these wells and nearby monitor wells to demonstrate cleanup.

Threatened Municipal Use of Groundwater

Groundwater threatened by PCE from the Site will be needed for future use by the Town of Payson. Currently, the Town of Payson production well TOP-New McKamey has detected PCE in the groundwater samples. It is possible that the detected PCE in this production well is associated with the Site, though the detected PCE concentrations are below the AWQS. If the PCE concentrations in New McKamey exceed the AWQS, ADEQ will evaluate the connection of this well to the EGTS. A preliminary contingency evaluation of the costs and construction requirements for connection of the New McKamey well to the EGTS is included as part of the remedy contingency evaluation in Section 5 of this report.

The threatened municipal use of groundwater is considered reasonably foreseeable and the RO for the use is:

- To protect or otherwise provide for the use of groundwater currently threatened by PCE contamination from the Site. The protection of threatened groundwater will occur as soon as possible and continue for as long as the need exists, the resource remains available and PCE contamination threatens municipal use of groundwater.

In the absence of groundwater pumping for treatment, Town of Payson production well TOP-New McKamey would be "threatened" since PCE concentrations have been detected in groundwater samples, although none have exceeded the relevant MCL of 5 µg/L. The installation and operation

of the EGTS as the Selected Remedy captures and contains the PCE plume for the Site, which will prevent the further spread of PCE contamination to the TOP-New McKamey well. The metric for evaluating the remedial action will be to measure the changes in PCE concentrations in this well to demonstrate whether concentrations are increasing and the potential for PCE concentrations to exceed MCLs of 5 µg/L. Additionally, monitoring the groundwater gradient near monitor well sets WS-10, WS-11 and WS-14 will identify potential changes in plume capture during the operation of the EGTS.

Threatened Private Groundwater Use

The threatened use of groundwater by the private groundwater user is considered reasonably foreseeable. The RO for this use is:

- To protect or otherwise provide for the use of groundwater currently threatened by PCE contamination from the Site. The remedy will provide protection for individuals owning a threatened well and will be implemented in continuity with existing actions designed to protect and preserve water quality. The action will continue for as long as the need for the water exists, the resource remains available and PCE contamination in the water prevents its direct use.

As illustrated in Table 3-2, seven domestic wells are considered threatened due to historical proximity of the PCE plume. Currently, no private domestic wells have measured PCE concentrations greater than the AWQS at the Site. Thirteen wells are currently dry, but if water levels rise, these wells might become impacted in the future. The RO of containment and capture of the PCE plume was demonstrated for the selected remedy in the FS. The conclusion of the evaluation in the FS was that the selected remedy is capable of meeting the objective of capturing and containing the plume. This is based on the observed water levels which show that the gradient has reversed toward the Site, with complete capture conditions. The FS model results indicate that the gradient will continue to remain inward to the extraction wells maintaining capture during the lifecycle of the Selected Remedy. The metric for evaluating the remedial action will be to measure the changes in PCE concentrations and groundwater gradients in the nearby monitor wells to demonstrate whether plume capture is maintained.

ADEQ has supplied, on an emergency basis, bottled water to impacted well owners for drinking water uses. This remedy can be implemented temporarily if wells become impacted. ADEQ recommends connecting to the Town of Payson's municipal water system, which is the preferred option for impacted private well owners, if feasible. The Town of Payson has a limited or no-cost option for connection of private residences.

Threatened Tonto Apache Tribe Groundwater Use

The threatened use of groundwater by the Tonto Apache Tribe (the Tribe) is considered reasonably foreseeable. The Tribe currently owns a well located at McLane Road and the Beeline Highway which was evaluated as part of the FS. The Tribe also owns land near McLane Road and Aero Drive (Figure 1-2) which may be used in the future to provide domestic water for use on Tribal lands.

Because of this possible new water use, ADEQ has included the potential water use of the Tonto Apache Tribe as a supplemental RO for the Site. The RO for this use is:

- To protect the possible future use of groundwater currently threatened by PCE contamination from the Site. The remedy will provide protection for Tribal owned land and will be implemented in continuity with existing actions designed to protect and preserve water quality. The action will continue for as long as the possible need for the water exists, the resource remains available and PCE contamination in the water may prevent its direct use.

The RO of containment and capture of the PCE plume was demonstrated for the selected remedy in the FS. The conclusion of the evaluation in the FS was that the selected remedy is capable of meeting the objective of capturing and containing the plume, preventing the plume from migrating to the lands owned by the Tribe. The metric for evaluating the remedial action will be to measure the changes in PCE concentrations and groundwater gradients in the nearby monitor wells (Well Sets WS-5, WS-6 and WS-7) to demonstrate whether plume capture is maintained in the western portion of the Site.

If a production well is installed on Tribal owned lands near McLane Road and Aero Drive, further evaluation of the potential impacts on the ongoing remedial action will need to be completed. This evaluation will need to determine whether the volume and rate of proposed pumping will cause changes in plume configuration and loss of plume capture. ADEQ does not recommend the installation of such a well, since loss of plume capture is possible and potential PCE impacts in this well may prevent its direct use.

3.3 DEFINITION OF REMEDIATION AREAS

As part of the FS, the extent of contamination is defined by the individual samples with detectable concentrations of VOCs above the relevant MCLs for groundwater. Based on the review of the data in the FS, PCE, TCE and cis-1,2-DCE were defined as the primary COCs. AWQS exceedences of 1,2-DCA, benzene, toluene and ethylbenzene have been noted in samples from wells near the Site, but these compounds are generally associated with leaks from gasoline USTs. 1,2-DCA is a common additive to gasoline and each of the wells with exceedences appear to be associated with the UST sites in the area ([Texaco StarMart (Texaco)] and [Whiting Bros. Service Station (Whiting)]). Figures 3-3 through 3-5 illustrate the latest available map outlining the plume of contamination in each of the defined hydrologic units at the Site (refer to the RI Report for definition of the hydrologic units from the Site).

Since none of the primary COCs listed appear in samples separately from PCE,[3] the RI for the Site focused on identifying the extent of PCE in groundwater to define the extent of contamination at the

[3]One sample from DMW-13B collected during the aquifer test in November 1998 had an exceedence of TCE, but not of PCE. PCE was detected at a concentration of 0.8 µg/L.

Site. As part of the FS, the remedies were evaluated to determine whether the COCs would be remediated as part of the selected remedy.

Other Areas of Concern

MTBE has recently become a significant concern for groundwater contamination in many areas due to its common use in gasoline as an oxygenating compound to improve air quality. MTBE does not currently have an established AWQS, but it is likely that a standard may be adopted in the future. MTBE presents some significant challenges to designing and operating a remediation system, due to the difficulty of air stripping or remediating MTBE from groundwater using carbon adsorption techniques. It is believed that MTBE is associated with the LUST sites along the Beeline Highway near the site: the Texaco site (910 S. Beeline), the Whiting site (804 S. Beeline) and a former Union 76 at 901 S. Beeline. MTBE has been used in gasoline since the mid-1980s and each of the sites listed has been an active gasoline station since that time. MTBE has been detected in soil and groundwater samples from the Whiting station and in soils at the former Unocal station. MTBE has not been noted in samples from the Texaco site, but many sampling events (soil, vapor and water) did not include MTBE analysis.

MTBE is a "mobile" constituent of gasoline, implying that it is transported effectively in groundwater with limited retardation. Due to the difficulties in remediating MTBE using the existing treatment systems at the site, the presence of MTBE causes some significant concerns regarding operation of the treatment system. Based on a review of the groundwater database, 18 samples had MTBE concentrations greater than 30 µg/L, with a maximum detected concentration of 1,500 µg/L at well DMW-11A (September, 2000). This suggests that the Whiting site (804 S Beeline) may represent a source of MTBE which must be considered in an evaluation of the remedy for the Site. MTBE concentrations will continue to be measured at monitor wells near the site to determine whether MTBE is migrating to extraction wells connected to the EGTS and whether system operational changes should be considered.

3.4 ACHIEVEMENT OF REMEDIAL ACTION CRITERIA PURSUANT TO ARS §49-282.06

It is recommended that the Reference Remedy from the FS be selected as the Final Remedy for the Site. Based on a comparison with the Less Aggressive and More Aggressive Remedies (see FS Report, GeoTrans, 2003), the Reference Remedy appears to:

- Best assure, the protection of public health and welfare and the environment;
- To the extent practicable, provide for the control, management and cleanup of the PCE contamination, maximizing beneficial use of the groundwater in the Town of Payson; and,
- Is reasonable, necessary, cost-effective and technically feasible.

Because the EGTS is currently operational and data indicates that it contains, captures and will remediate the plume, this remedy is clearly the best choice. The results of model simulations and review of operational data suggest that the system is reasonably efficient and that no significant changes are warranted.

Although the groundwater flow modeling was not conclusive regarding time-frames to complete the cleanup of the Site, an analysis of the current trends in the measured PCE concentrations was completed for a variety of monitor wells and currently used extraction wells at the Site, as part of the FS. This analysis lead to an estimate of 30 years of system operation to complete remediation at the Site. The data presented in the FS suggested that the EGTS will achieve the ROs, presuming that water level declines do not cause significant changes in the operation of the EGTS, which was evaluated as a contingency. These possible future declines in water levels may cause changes in the effectiveness of plume capture and containment, which has been attained by the EGTS. For these reasons, the 30-year life-cycle estimates were thought to reasonably account for uncertainty in time frames for remediation.

3.5 CONSISTENCY WITH WATER MANAGEMENT PLANS

The water management plans presented by the Town of Payson all require the pumping of the impacted wells connected to the EGTS as an integral portion of the available supply (projected as 35% of available supply; Southwest Ground-water Consultants, 1998). For this reason, the pumping of these wells in accordance with the specified Reference Remedy pumping rates is fully consistent with the water management plan for the Town of Payson. The Town of Payson is currently operating the EGTS through a Governmental Agreement (GA) with ADEQ.

3.6 CONSISTENCY WITH GENERAL LAND USE PLANNING

The Town of Payson has provided land for use of the EGTS and IGTS treatment systems which currently occupy Town of Payson land that is zoned as commercial and residential. The Site is located in a mixed commercial/industrial/residential area of the Town of Payson and construction of the treatment system has conformed with Town of Payson requirements. For these reasons, the treatment system, current well locations and piping are consistent with the existing land use planning for the Town of Payson.

4.0 LIFE-CYCLE COSTS

GeoTrans has complied an estimate of life-cycle costs for the estimated 30-year operational lifetime for the EGTS (Table 4-1). The EGTS has been selected as the final remedy for the Payson PCE WQARF Site, based on the findings of the FS Report previously completed. This life-cycle estimate is based on interpretation of the PCE concentration time series graphs for wells at the Site, assuming a conservative cleanup time-frame. These graphs[4] suggest that the concentration of PCE will be below 5 µg/L at each of the monitor wells (except possibly DMW-4C) by 2030, based on exponential decline rates. This life-cycle cost estimate is based on the following factors and assumptions:

- Groundwater extraction rates will not rise or fall significantly over the operational life span of the EGTS (unless water level changes force reconsideration of this factor-see Section 5.0 for further discussion);
- If groundwater extraction rates drop over the operational life span of the EGTS, the costs will not change significantly since the majority of operational costs are not based on pumping rates;
- The IGTS was shut down in January 2003, and the costs to operate or decommission this system have not been included in this estimate;
- Semi-annual groundwater monitoring of the existing monitor well network will continue through the operational life of the EGTS, and for 3 years after the operational life of the EGTS;
- Quarterly ADEQ Drinking Water compliance monitoring reporting will continue through the operational life of the EGTS;
- GAC change-outs will occur approximately every two years based on biological-and/or mineral-related fouling of the carbon rather than VOC mass contaminant loading;[5]
- No new extraction or monitoring wells will be drilled, and deepening of the existing production wells will not be completed;
- The O&M estimate does not include significant capital equipment replacement over the life cycle of the remedy, but assumes normal maintenance and repair of existing capital equipment; and,

[4]See figures 8-1 through 8-6 in the *Feasibility Study Report, Payson PCE WQARF Site* (GeoTrans 2002).

[5]Based on observations of Peter Storch, P.E. of URS, Inc. URS is contracted by ADEQ and Town of Payson to provide operation and maintenance (O&M) services for the IGTS and EGTS.

- A life cycle of 30 years was assumed to evaluate the annualized cost of the EGTS. For the purpose of the cost analysis, a time frame of ADEQ FY 2004 through 2033 (30 years) is assumed for system O&M on the selected remedy (EGTS only), and FY 2004 through 2036 for groundwater monitoring activities. Groundwater monitoring costs are included through FY 2036, presuming ongoing monitoring will be required to confirm plume cleanup. The O & M and sampling costs have been assumed to increase on an inflationary basis of 3% per annum for the duration of the remedial action.[6]

This estimate of the implementation cost of the final remedy does not include costs incurred during other ERA activities which are completed, such as the bottled water supplied to impacted domestic well owners, the SVE/DPE system, the Skinner wellhead treatment system, the IGTS, the septic removal and the cesspool removal actions previously documented. An estimate of the total system implementation costs for the selected remedy (EGTS portion only) includes:

- $ 2.2 Million (M) in capital equipment, system construction and O&M (for EGTS) incurred through FY 1999;

- $ 1.2 M in system O&M and groundwater sampling costs from ADEQ FY 2000 through 2003;[7] and,

- Expansion of the EGTS with new wells EX-1, EX-2 occurred in FY 2002 for a cost of $450,000.

The estimate for the selected remedy cost of implementation (EGTS capital equipment construction, system O&M and groundwater monitoring) is approximately $3.9 million, through FY 2003.

Based on the assumptions listed above the selected remedy has an approximate life cycle cost of $14,272,624, representing an average annual cost of $459,785 through the presumed 30 year life cycle, plus the 3 additional years of groundwater monitoring. This amount does not include the above listed $3.9 M capital implementation cost for the EGTS. Groundwater monitoring activities are assumed to continue for 3 years following system shutdown to confirm cleanup. The estimates for O & M, related consulting and monitoring include annual costs of $300,000/yr.[8] starting with FY 2004 for the selected remedy (EGTS), increasing at a 3% rate over the next 30 years. The O&M costs were developed using the Town of Payson Fiscal Year 2002 Ledger costs associated with the

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[6]GeoTrans has identified a U.S. Federal Reserve Board estimate of the long term outlook for inflation of 2.5% per year over the next 10 years (see http://www.phil.frb.org/files/spf/survq101.html), and has rounded that figure to 3.0% for the purpose of this analysis. See also a reference, http://www.axaonline.com/rs/3p/sp/5015.html#inflation, which discusses long term inflation rates, which appear to be in the 2.5 to 3.0 % range over the duration of the 1900's.

[7]Assumes $284K year for FY 2000 and 2001 and $300K for FY 2002 and 2003, after increased monitoring due to MTBE implemented in FY 2002. These values were derived from information provided by Town of Payson and the ADEQ Project Manager, and presume that the costs for the IGTS are reflected in the estimated savings numbers, which were removed from reported O&M total costs.

[8]This estimate is based on an evaluation of costs confirmed by the ADEQ Project Manager.

Inter-Governmental Agreement (IGA).[9] Such costs include analytical testing, electrical power, equipment repair, GAC usage and other consumable supplies as part of O&M. Table 4-1 presents a summary of the life cycle cost analysis for the future estimated expenses of the selected remedy.

[9] The IGA between ADEQ and the Town of Payson became a Governmental Agreement (GA) during 2002. This change was due to clarification of the legal status for the agreement between the Town of Payson and ADEQ.

5.1 CONTINGENCIES

GeoTrans has completed an evaluation of the connection of the TOP-New McKamey production well to the EGTS as a contingency, if a hydraulic connection between the TOP-New McKamey well and the WQARF Site causes the well to become contaminated with PCE above 5 µg/L. This analysis was presented in Appendix C to the FS Report. This evaluation recommends that the TOP-New McKamey well be connected to the EGTS, if needed, although the costs will be significant.

5.1.1 New Water Main Connection from New McKamey to the EGTS

This option involves installing a 4-inch HDPE water main to convey up to 350 gpm of pumped groundwater from the TOP-New McKamey production well to the EGTS. As part of the FS, an evaluation of two remedies for this contingency were evaluated, and the selected remedy was to install a water main from the TOP-New McKamey well to the EGTS.[10] The route for the water main is shown on the attached conceptual layout (Figure 5-1). Installing the new water main would be a significant construction effort due to the length of piping (approximately 3,370 lineal feet), and the presence of several challenging construction zones:

- The new water main would cross beneath Highway 87 at the intersection of Frontier Street. Per the requirements of the Arizona Department of Transportation (ADOT), a lateral boring would need to be drilled to complete the construction (i.e., conventional trenching across the highway is not allowed by ADOT). The lateral drilling and jacking equipment would need to be set-up on currently open land at the southwest corner of Highway 87 and Frontier Street. Access to this property and the property across the highway would need to be negotiated and obtained from the respective land owners (Gila County). The physical construction of the highway crossing is feasible for a cost of approximately $40,000;

- According to the Town of Payson Public Works Department, there are significant quantities of underground utilities at and near the intersection of South Colcord Road and West Frontier Street, including a gas main, potable water mains and a fiber optic telecommunications cable. These utilities, along with the typical traffic congestion at the adjacent U.S. Post Office and County Complex, are expected to delay the progress of the construction; and,

- There are several underground storm culverts along the proposed route of construction that the water main would need to pass beneath, resulting in delays and supplemental construction costs. A photographic log of the proposed construction route is included in the FS Report.

[10]The options evaluated included: connection of the TOP-New McKamey well to the EGTS, or construction of an independent treatment system at the TOP-New McKamey well. The connection option was deemed to be the more feasible option.

Construction of the new water main would terminate at the south side of the Main Street right-of-way. At this location, the new main would be connected to the existing 4-inch HDPE water line that had been constructed for connection to formerly planned extraction well EX-3 (see Figure 5-1).

The total estimated costs for designing, permitting, access, and construction is $453,750. This cost assumes that the submersible pump currently operating at TOP-New McKamey would be replaced with a new pump and control system with full integration to the EGTS. The supplemental O&M costs associated with connecting TOP-New McKamey to the EGTS is considered negligible. It is believed that a potential increase of up to 350 gpm flow will not affect the schedule for GAC change-out or represent significant additional costs for treatment chemicals and/or other consumables.[11]

Recently, the ADEQ Project Manager completed a revised map representing exposed bedrock for the area near the Site. This map was completed to assist in determining whether a possible bedrock ridge underlies the area between the Site and the TOP-New McKamey production well which would hydraulically isolate the TOP-New McKamey well from the Site. Figure 5-2 illustrates the estimated areas of exposed bedrock, based on field observations. This map indicates a narrow gap in areas of exposed bedrock between the TOP-New McKamey well and the Site: from the intersection of Ponderosa Street and Frontier Street to the intersection of Frontier Street and Colcord Road. The shallow bedrock encountered during drilling activities at the Tonto and Cherry WQARF Site supports this conclusion. This evidence of a shallow bedrock ridge or area may provide the solution to observed hydraulic conditions from the groundwater modeling completed for the FS, which suggest that the TOP-New McKamey well is hydraulically isolated from the Site. Further monitoring of the TOP-New McKamey well will be needed to fully evaluate the degree of interconnection, and the future need for a connection of TOP-New McKamey well to the EGTS.

5.1.2 Declining Water Levels and Operational Changes for the EGTS

If water levels continue to decline, as suggested by modeling scenarios, the EGTS can be adjusted to accept lower flow rates than the current 200 gpm from the extraction well network. The minimum recommended flow for the EGTS is 80 gpm, which coincides with the minimum design flow for the existing GAC vessels. Flow rates below 80 gpm may allow short-circuiting of contaminated water preventing maximum or sufficient contact with the GAC. Flow can be adjusted from each extraction well through the individual variable frequency drive (VFDs) devices installed for each submersible pump (minimum setpoint is 30 Hertz and maximum setpoint is 60 Hertz). Additionally, each extraction well can be mechanically adjusted at the wellhead by throttling the flow with a butterfly valve. Throttling and running the pumps at the minimum setpoint will reduce the usable life of the pump motors which may require more frequent pump replacement than during normal pumping conditions.

If sustainable flow drops below the minimum 80 gpm, the EGTS could be converted to a cycled pumping scenario. Extraction wells could be cycled (time delayed) on and off for control pumping

[11] According to Mr. Peter Storch. P.E. of URS Corporation, experience has shown that the controlling factor for carbon change-out is fouling of the carbon, not VOC mass loading. It is believed that the current change-out schedule of the primary GAC vessel every two years will remain relatively consistent, regardless of the additional flow from the New McKamey Well. This assumes that ADEQ will continue its policy of changing out the primary 20,000-lb GAC vessel as soon as breakthrough is detected.

durations. The master PLC within the EGTS and remote PLC at Skinner, EX-1 and EX-2 can be programmed for this type of pumping scenario that could effectively extend the time for extraction of contaminated water and still provide containment of the plume. If a cycled pumping scenario is implemented, the VFDs will also need to be adjusted for slow ramp-up of power to the submersible pump motors. This will minimize the quick start of the pump and reduce sediment disturbance within the well. For example, the wells could be programmed to start up and operate for a 12 hour period and then shutdown for a 12 hour period. The total flow rate from all of the wells while operating would have to be above 80 gpm, and individual rates could be established for the wells based on observed flow conditions, such as remaining saturated thickness and production capabilities. Additionally, the operation of the Town of Payson distribution pump which transfers treated water to the municipal water system may need to be programmed into the PLC. An evaluation of the prospective management of the system and possible problems with implementing shutdown periods should be completed, if necessary, in the future.

Currently there are two unused manifold connections at the EGTS. If flows continue to drop below 80 gpm, additional extraction wells could be installed and connected to the system. One of the two connections is the piping installed across the Sawmill development. This 4-inch diameter HDPE pipe could be extended to another extraction well either near Main Street or TOP-20, or TOP-New McKamey well, if needed. The second available connection is at the northeast corner of the EGTS. This connection could be used for extending a pipeline to a new extraction well located near McLane Road, if pumping rates fall such that westward plume containment may be jeopardized. Adding either one or two new extraction wells could also extend the operation of the system, assuming there is sufficient groundwater to be pumped.

The addition of new wells to the EGTS is not recommended at this time based on the semi-annual groundwater sampling results which document that PCE contamination is not spreading to other areas. Other than the TOP-New McKamey well, contamination has not been detected at other wells outside of the areas where wells currently known to be impacted are located.

5.1.3 Possible Installation of New Tonto Apache Tribe Production Well

As previously discussed, the Tonto Apache Tribe currently owns land at Aero Drive and McLane Road, immediately west of the current location of the plume (Figure 1-2). This property has an existing domestic well (Hillside well, see Table 3-2), which could be used to pump groundwater for use by the Tonto Apache Tribe. Since this well, or a possible new well at this site, would be immediately downgradient of the current PCE plume, it is possible that the potential added water production could cause PCE to migrate to the well. If this occurs, a re-evaluation of the capture zone of the Selected Remedy should be completed. Also, it may be necessary to consider the addition of a supplemental extraction well near Well Set 6 and pumpage rate changes in TOP-Skinner to prevent loss of plume capture. This evaluation will need to consider proposed water production rates from the Tonto Apache Tribe, recommend whether an additional extraction well is needed and select a location for a new extraction well. ADEQ will maintain contact with local parties (Town of Payson and others) to identify new water production wells which may impact the operation of the Selected Remedy.

5.1.4 MTBE Contamination

MTBE has recently become a significant concern for groundwater contamination in many areas due to its common use in gasoline as an oxygenating compound to improve air quality. MTBE does not currently have an established AWQS, but it is likely that a standard may be adopted in the future. The existing GA between ADEQ and the Town of Payson specifies that GAC changeout will occur when MTBE concentrations reach 17.5 µg/L in samples collected between the two vessels. MTBE presents some significant challenges to designing and operating a remediation system, due to the difficulty of air stripping or remediating MTBE from groundwater using carbon adsorption techniques. GeoTrans has assumed that MTBE is associated with the LUST sites along the Beeline Highway near the site: the Texaco site (910 S. Beeline), the Whiting site (804 S. Beeline) and a former Union 76 at 901 S. Beeline. MTBE has been used in gasoline since the mid-1980s and each of the sites listed have been active gasoline stations since that time. MTBE has been detected in soil and groundwater samples from the Whiting station and in soils at the former Unocal station. MTBE has not been noted in samples from the Texaco site, but many sampling events (soil, vapor and water) did not include MTBE analysis.

MTBE is a "mobile" constituent of gasoline, meaning that it is transported effectively in groundwater with limited retardation. Due to the difficulties in remediating MTBE using the existing treatment systems at the site, the presence of MTBE causes some significant concerns regarding operation of the treatment system. Based on a review of the groundwater database, 18 samples had MTBE concentrations greater than 30 µg/L, with a maximum detected concentration of 1,500 µg/L at well DMW-11A (September, 2000). MTBE was measured in Whiting site monitor well MWK-14 (Figure 5-3) at a concentration of 1,200 µg/L in September 1997. This indicates that the Whiting site (804 S Beeline) represents a source of MTBE which must be considered in an evaluation of the remedy for the Site. MTBE concentrations will continue to be measured at monitor wells near the Site to determine whether MTBE is migrating to extraction wells connected to the IGTS and EGTS systems and whether system operational changes should be considered.

The presence of MTBE is a concern for operation of the EGTS due to the fact that MTBE does not adsorb to carbon in the GAC system as effectively as PCE. For this reason, carbon change-outs may need to occur more frequently if MTBE breaks through in a shorter time than the PCE. GeoTrans installed sentinel monitor wells to detect the presence of MTBE near the extraction wells which supply the EGTS (Figure 5-3). To date the highest concentration detected in the sentinel monitor wells is 13 µg/L at SW-3B in December 2001. These concentrations will need to be monitored to determine whether a significant plume of MTBE contamination may impact the EGTS. URS Corporation completed an analysis of MTBE concentrations, *MTBE Dilution Evaluation for the EGTS*, (URS Corp., 2003), which was included as an attachment to the FS Report. The conclusions from this analysis suggest that:

- MTBE has been detected in wells TOP-4 and TOP-5R;
- Concentrations of MTBE entering the EGTS may rise if the recently restarted well TOP-4 draws more MTBE contaminated water to this well;

- An increase in combined MTBE concentrations in wells TOP-4 and TOP-5 to 300 µg/L will cause EGTS influent concentrations to reach 50 µg/L; and,

- An MTBE concentration of 50 µg/L in influent water to the EGTS will substantially increase the carbon changeout frequency for the EGTS and may require an evaluation of supplemental treatment technologies.

Based on the conclusions of this report, continued review and monitoring of MTBE will be necessary to properly operate the EGTS and meet operating guidelines regarding MTBE concentrations in the effluent.[12]

5.2 CONCLUSIONS

Although evidence from the RI and FS investigations indicates that plume capture has been maintained, the results of the modeling are not useful for projecting results or definitively evaluating these results. But in general, the key concern will be whether the water levels continue to decline at the Site. If water levels decline into the fractured/competent granite (FG/CG) and aquifer recharge rates stay low, a re-evaluation of the operation of the EGTS will be needed to determine appropriate pumping rates necessary to continue operation of the remedial system, as indicated above. The connection of the TOP-New McKamey well to the Site is also a concern, which will need to be addressed if PCE concentrations in this well rise above 5 µg/L, as additional sampling is completed.

[12]The GA between ADEQ and Town of Payson specifies that if effluent from the EGTS exceeds a concentration of 17.5 µg/L for MTBE, carbon will be changed in the GAC units.

6.0 DISPOSITION OF TREATED WATER

Since the startup of the IGTS and EGTS, treated water has been delivered directly to the Town of Payson municipal water supply system from a distribution pump located within the EGTS facility. The acceptance of treated groundwater from the IGTS and EGTS was agreed to as part of an IGA between ADEQ and the Town of Payson, which was formalized in 1998. This agreement is renewed each year and was recently changed (in 2002) to a GA to reflect some legal language concerns regarding these agreements. The IGA, and current GA, require that the Town of Payson accept a minimum of 150 gpm of treated groundwater on a continuous basis from the IGTS and EGTS systems. This minimum pumping rate is thought to assure groundwater plume capture and containment based on previous evaluations (see the RI and FS Reports for details). The Town of Payson operates both systems and has delivered the minimum required volumes since the treatment systems became operational (except during periods of temporary shutdown or maintenance). Figure 6-1 lists pumping rates in gpm over the period of November 1998 through October 2001 for the IGTS, EGTS and the total average for each month. The average rate over this period is 186 gpm, with most months exceeding 150 gpm.[13] The treated effluent from these systems has not had detectable concentrations of PCE during the history of system operation.

Town of Payson well TOP-4 was recently restarted, and is currently pumping water to the EGTS. This well had been offline since April 2000 to limit the chance of capturing MTBE- contaminated groundwater, which could adversely affect the operation of the EGTS. Previous high levels of MTBE were detected in monitor well DMW-11A, located north of the former IGTS well EW-4. EW-4 had the highest concentrations of MTBE of 270 µg/L in October 1999. Concentrations of MTBE have declined significantly since that time, although the continued monitoring of the sentinel monitor wells and TOP-4 will be critical for identifying potential problems with MTBE contamination that may affect operation of the EGTS. Recent groundwater sampling results from wells TOP-5R and TOP-4 indicate MTBE contamination is present in each well, with concentrations of 18 µg/L and 4.3 µg/L, respectively, for the latest available samples (URS Corp, 2003).

[13]This average pumping rate was derived from the total monthly volume pumped divided by the number of days between totalizer readings, such that shutdown periods are included (November 1998 through October 2001). The average operational pumping rate for the EGTS has ranged from 150 to 300 gpm.

7.0 CONCLUSIONS

Based on the information presented within, the PRAP for the Site is to continue operation of the existing EGTS at the current pumping rates, as specified in the FS. The average pumping rate has been 186 gpm over the period from November 1998 through October 2001, which appears to be both adequate to contain and capture the plume and to satisfy the municipal water demands identified in the ROs. The EGTS has operated effectively since 1998, providing drinking water to the Town of Payson that meets federal MCLs.

It is recommended that contingency plans for connection of the TOP-New McKamey well to the EGTS be evaluated as new information is generated regarding PCE concentrations at that well, if needed. Additionally, low water levels may cause alteration of the pumping plans for the system and changes to system operation may need to be addressed if water levels continue to decline in zones of production wells connected to the system. Appropriate operational pumping rates will need to be evaluated as conditions at the Site change, since the wells may not decline in production uniformly relative to current rates. Similarly, implementation of recommendations in the *MTBE Dilution Evaluation for the EGTS*, (URS Corp., 2003) will need to be addressed if MTBE concentrations rise significantly in the influent to the EGTS.

8.0 REFERENCES

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TABLES

Table 3-2
Threatened and Potentially Threatened Domestic Wells
Payson PCE WQARF Site

Well Name	ADWR Registration	ADEQ No.	Currently Operational	Known to be Dry	Impacted Historically	Threatened Domestic Wells
404WMAIN	503419	56741		X		
AERO	632369	2163		X	X	
AUTOCLINIC		2161		X	X	
B&B AUTO	631255	46016		X	X	
BAPTISTCHURCH	643865	46015		X	X	
BMRENTALS	637023	56742	X			X
BUSE		56743		X		
CHAPMAN		2158		X		
GASKILL	649714	56603		X	X	
HARRISON-A		57552	X		X	X
HILLSIDE		57699				
KACHINA	629728	2159		X	X	
KACHINANEW	559385	56602	X		X	X
MORGAN-HANDDUG		46025		X	X	
PAYSONGLO-S	509839	46026	X		X	X
RAYAUTO		56747		X	X	
RICHARDSON-2		56748	X		X	X
ROGERS		56749	X		X	X
SHEEHAN	629822	56604	X		X	X
TOP-MORGAN		2160	X		X	X
UHAUL	515109	2157		X	X	
WORDEN	628729	46017		X	X	

Table 4-1
Lifecycle Cost Analysis for Selected Remedy
Payson PCE WQARF Site
Payson, Arizona

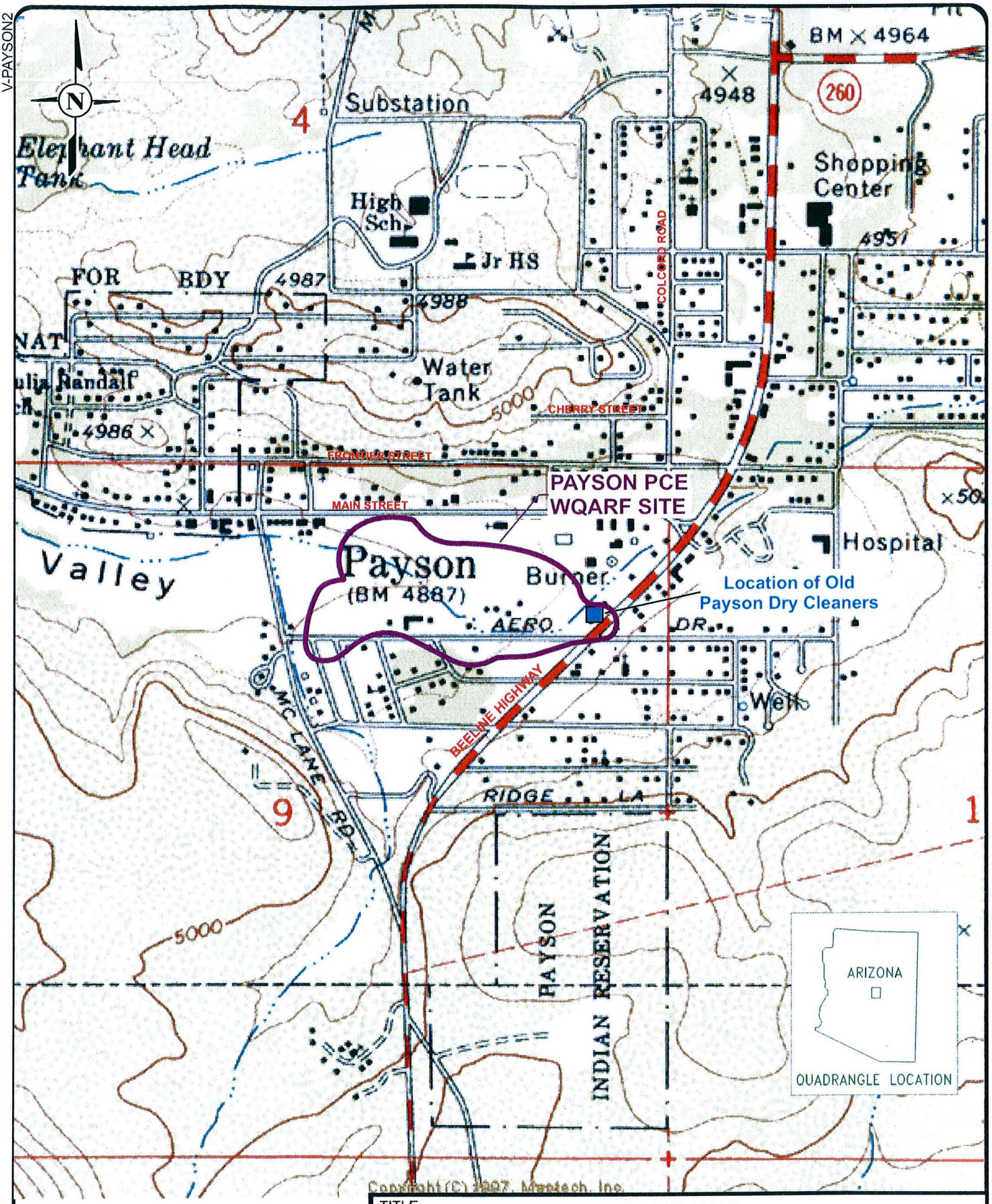
Payment Period (n)	ADEQ Fiscal Year	EGTS O&M and Consulting	GW Monitoring, Sampling, and Reporting	Combined Annual O&M and GW Monitoring Cost	Rate of O&M Increase with Time
1	2004	$ 180,000	$ 120,000	$ 300,000	3.0%
2	2005	$ 185,400	$ 123,600	$ 309,000	"
3	2006	$ 190,962	$ 127,308	$ 318,270	"
4	2007	$ 196,691	$ 131,127	$ 327,818	"
5	2008	$ 202,592	$ 135,061	$ 337,653	"
6	2009	$ 208,669	$ 139,113	$ 347,782	"
7	2010	$ 214,929	$ 143,286	$ 358,216	"
8	2011	$ 221,377	$ 147,585	$ 368,962	"
9	2012	$ 228,019	$ 152,012	$ 380,031	"
10	2013	$ 234,859	$ 156,573	$ 391,432	"
11	2014	$ 241,905	$ 161,270	$ 403,175	"
12	2015	$ 249,162	$ 166,108	$ 415,270	"
13	2016	$ 256,637	$ 171,091	$ 427,728	"
14	2017	$ 264,336	$ 176,224	$ 440,560	"
15	2018	$ 272,266	$ 181,511	$ 453,777	"
16	2019	$ 280,434	$ 186,956	$ 467,390	"
17	2020	$ 288,847	$ 192,565	$ 481,412	"
18	2021	$ 297,513	$ 198,342	$ 495,854	"
19	2022	$ 306,438	$ 204,292	$ 510,730	"
20	2023	$ 315,631	$ 210,421	$ 526,052	"
21	2024	$ 325,100	$ 216,733	$ 541,833	"
22	2025	$ 334,853	$ 223,235	$ 558,088	"
23	2026	$ 344,899	$ 229,932	$ 574,831	"
24	2027	$ 355,246	$ 236,830	$ 592,076	"
25	2028	$ 365,903	$ 243,935	$ 609,838	"
26	2029	$ 376,880	$ 251,253	$ 628,133	"
27	2030	$ 388,186	$ 258,791	$ 646,977	"
28	2031	$ 399,832	$ 266,555	$ 666,387	"
29	2032	$ 411,827	$ 274,551	$ 686,378	"
30	2033	$ 424,182	$ 282,788	$ 706,970	"
31	2034	$ -	$ 291,271	$ 291,271	"
32	2035	$ -	$ 300,010	$ 300,010	"
33	2036	$ -	$ 309,010	$ 309,010	"
Projected Totals		**$ 8,563,574.83**	**$ 5,709,049.88**	**$ 14,272,624.71**	
Average Annual Costs Over Remaining Lifecycle		**$ 285,452.49**	**$ 200,283.06**	**$ 459,785.33**	

EGTS = Extended Groundwater Treatment System
O&M = Operation and Maintenance
GW = Groundwater

Notes: O & M cost includes normal activated carbon changeout, power for system operation, Town of Payson's performance sampling, consumables (eg. sodium hypochlorite and bag filters) and consulting engineering to support operation of the remedy (for both ADEQ and Town of Payson). Groundwater monitoring and reporting includes semi-annual sampling and reporting, and quarterly reporting for drinking water compliance. Reporting in years 31 through 33 assumes that the sampling report will be the final reporting for the remedy. GeoTrans has assumed a 3% rate of inflation for O&M and monitoring services. Extraordinary repair and system modification costs are not included in this estimate. Assumptions are further detailed in section 4.0 of the report.

FIGURES

V-PAYSON2



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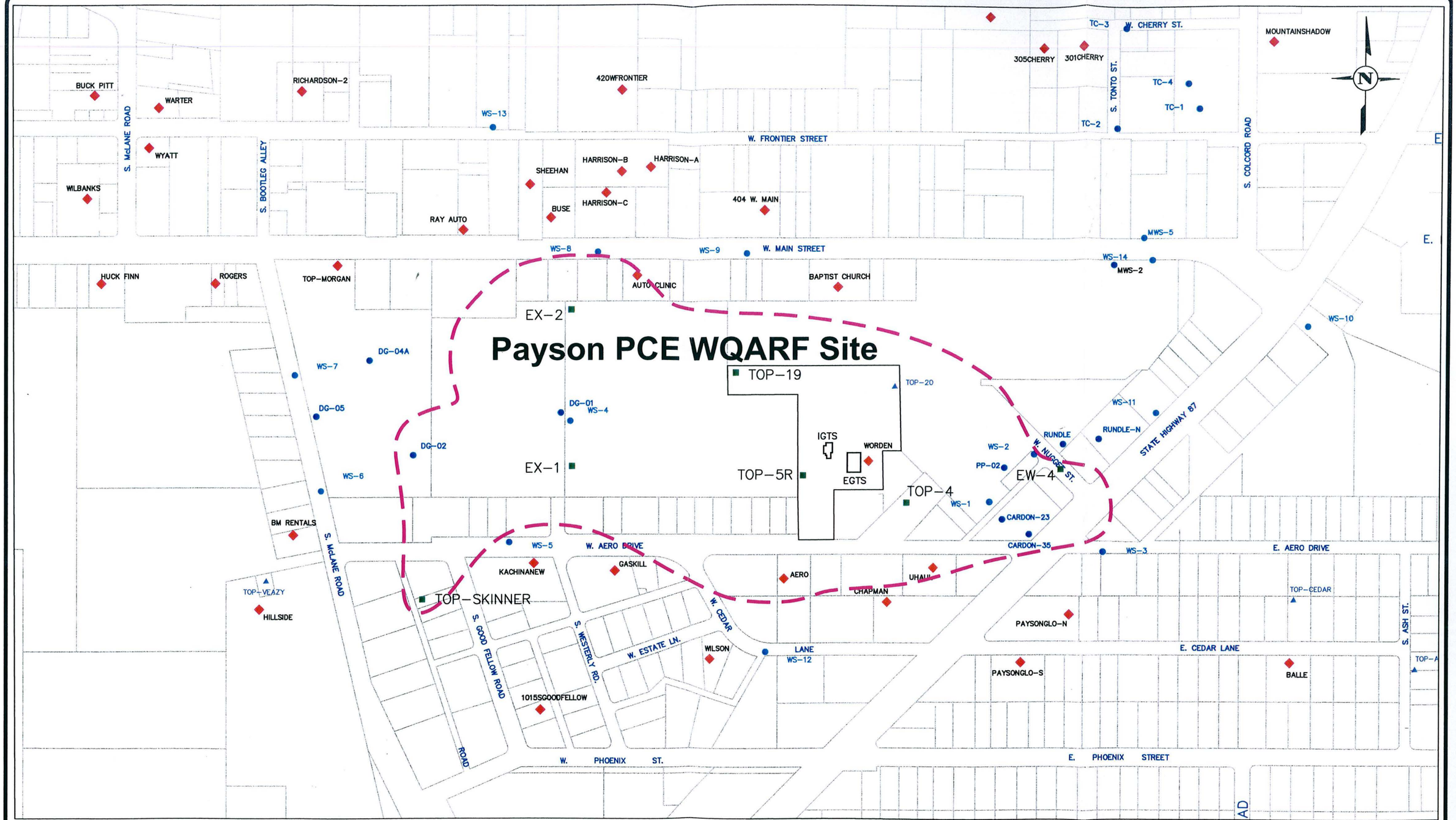
APPROXIMATE SCALE IN FEET

TITLE	VICINITY MAP PAYSON PCE WQARF SITE
LOCATION	PAYSON, ARIZONA

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	PRP	FIGURE
DRAFTED	DBS	1-1
PROJECT	F144	
DATE	6/18/03	



EXPLANATION

- Monitor Well
- Extraction Well
- Town of Payson Well
- Domestic Well
- Approximate WQARF Site Boundary

0 150 300 600

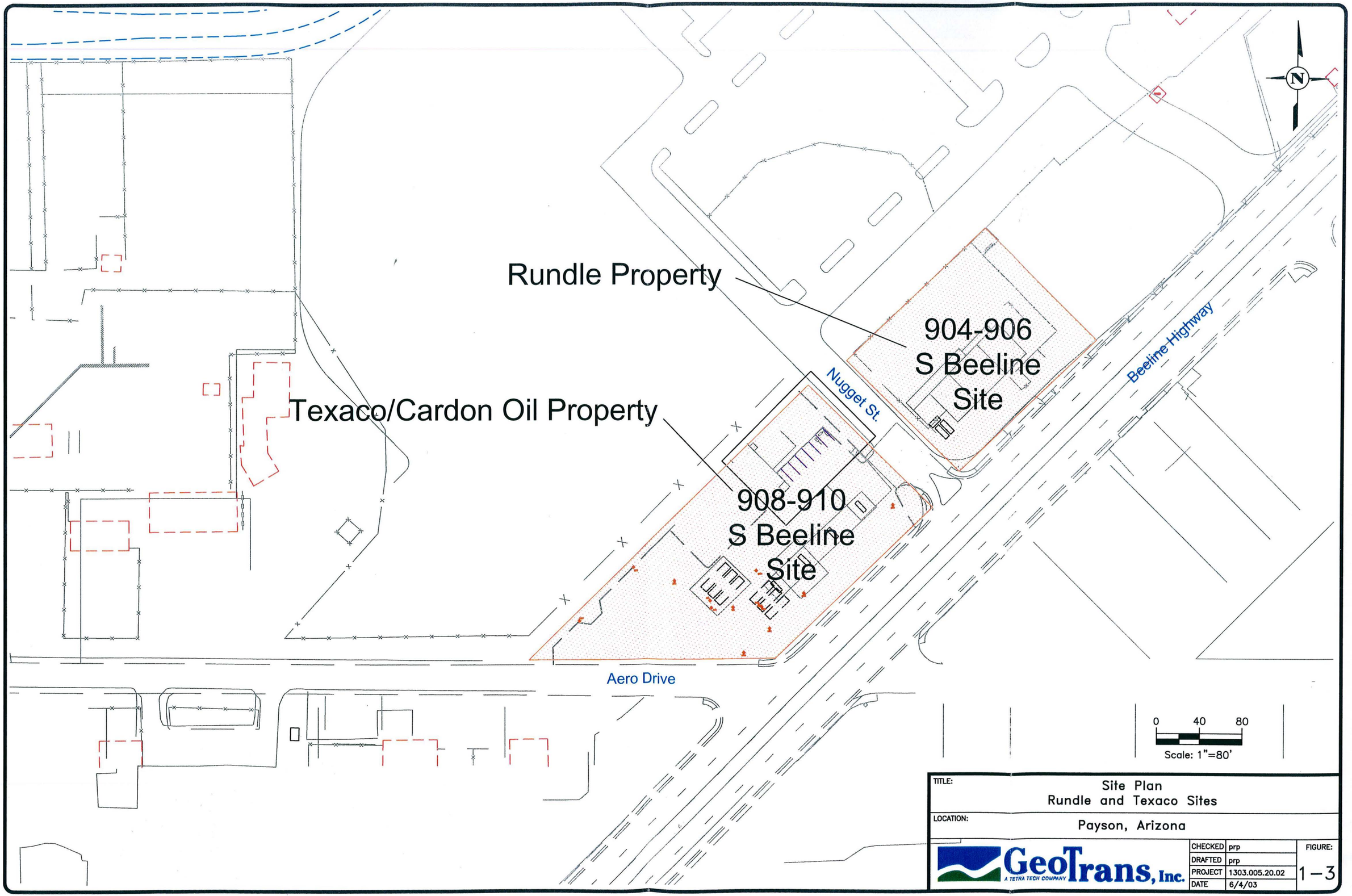
APPROXIMATE SCALE IN FEET

TITLE:	SITE BOUNDARIES PAYSON PCE WQARF SITE
LOCATION:	PAYSON, ARIZONA

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	PP	FIGURE
DRAFTED	DBS	1-2
PROJECT	F144-G66	
DATE	2/7/02	

P:\ACAD\dwg-library\F144\E40\PRAPFig1 , 08/22/2003 16:30:29



TITLE: Site Plan
Rundle and Texaco Sites

LOCATION: Payson, Arizona

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	prp
DRAFTED	prp
PROJECT	1303.005.20.02
DATE	6/4/03

FIGURE: 1 – 3

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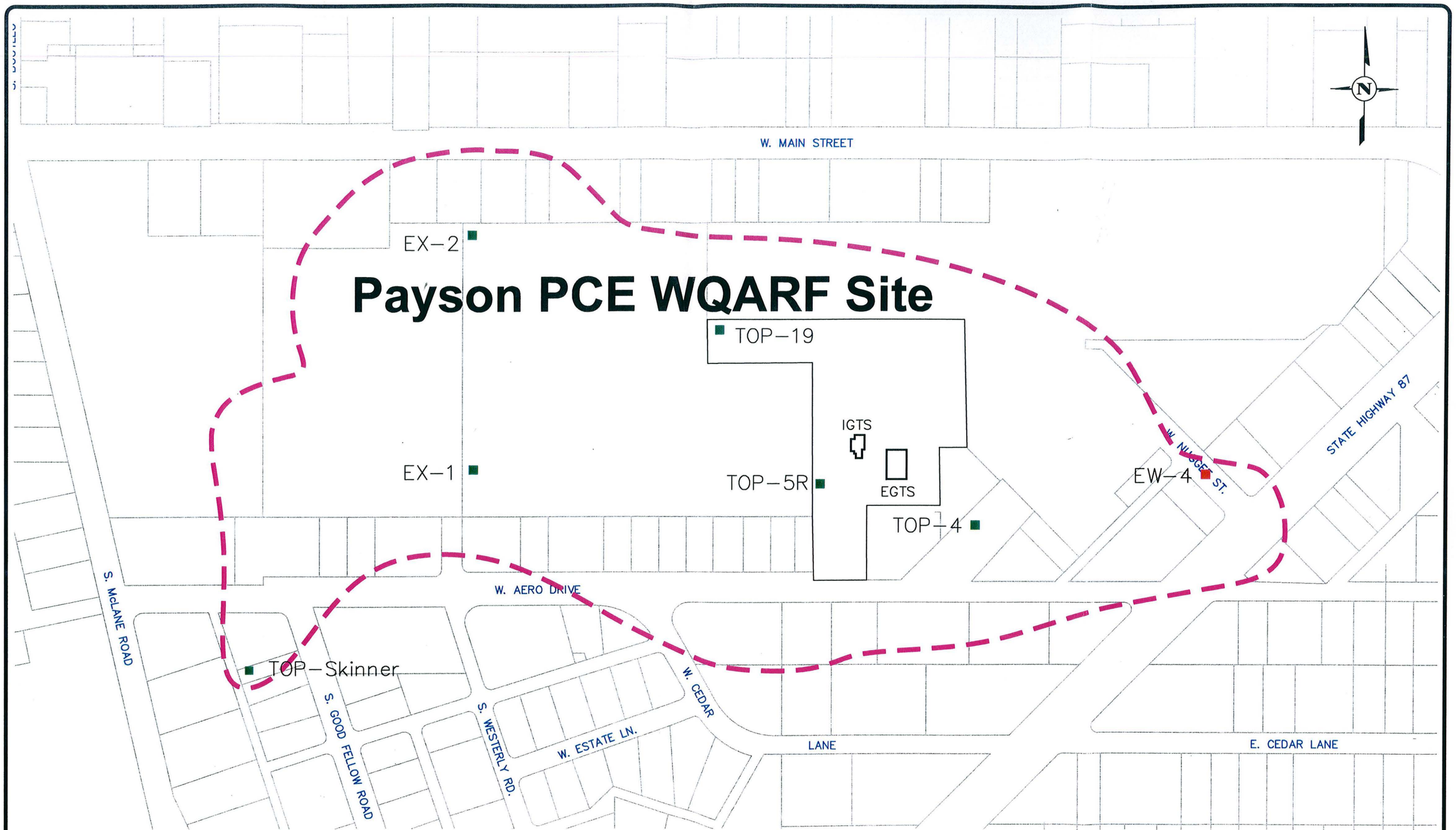

EXPLANATION

- Current EGTS Extraction Well
- IGTS Extraction Well (decommissioned January 2003)
- Approximate WQARF Site Boundary

TITLE: CURRENT EXTRACTION WELLS
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

LOCATION: PAYSON PCE WQARF SITE

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	PP	FIGURE
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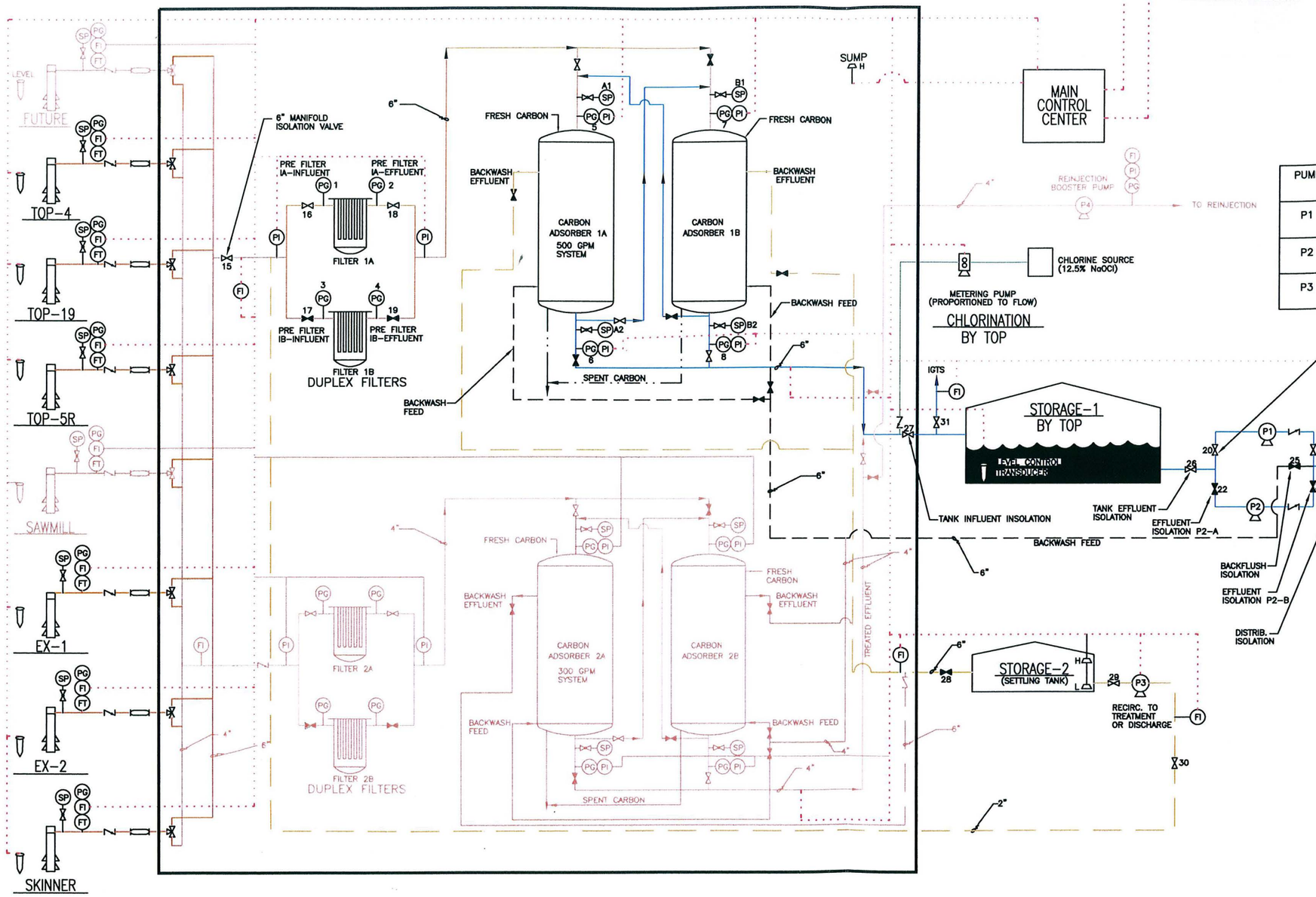
PROJECT	F144-D00	
DATE	2/7/02	



NOTES

1. EACH CARBON ADSORBTION VESSEL TO BE FACTORY PLUMBED WITH CARBON FILL PIPE ON TOP, AND CARBON EMPTY PIPE ON BOTTOM.
2. CARBON REPLACEMENT WILL BE THROUGH FILL AND EMPTY PIPE IN A SLURRY FORM.
3. SETTLING TANK IS CONSTRUCTED OF REINFORCED FIBERGLASS. INFLUENT TO TANK IS PIPED TO THE TOP OF THE TANK WITH DIRECT DISCHARGE AT THE TOP.

PUMP SCHEDULE

PUMP	EST. RATE	RECOMMENDED MODEL	HORSE-POWER
P1	300-800 GPM	PACO 3095-5	60
P2	300-800 GPM	PACO 3095-5	60
P3	45-63 GPM	GOULD NPE 1 x 1-1/4 - 5	2.0

LEGEND

- SINGLE CONTROL LINE
- BUNDLED CONTROL LINE
- BACKWASH EFFLUENT
- BACKWASH FEED
- FRESH & SPENT CARBON
- CHLORINATION FEED LINE
- PRESSURE TRANSDUCER
- PRESSURE GAGE No. 7
- PRESSURE INDICATOR
- FLOW TOTALIZER
- FLOW INDICATOR
- OPEN VALVE No. 7
- CLOSED VALVE No. 8
- CHECK VALVE
- SAMPLE PORT
- TANK LEVEL FLOATS
- ELECTRIC SUBMERSIBLE PUMP
- HARDNESS PRETREATMENT DEVICE

THESE RECORD DRAWINGS HAVE BEEN PREPARED BASED ON INFORMATION PROVIDED BY OTHERS. ADVANCED REMEDIATION TECHNOLOGIES, INC. HAS NOT VERIFIED THE ACCURACY AND/OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

REVISION INFORMATION

MILESTONE	DATE	REVIEWING AGENCY
RECORD DRAWING	03/11/02	ARIZONA DEQ

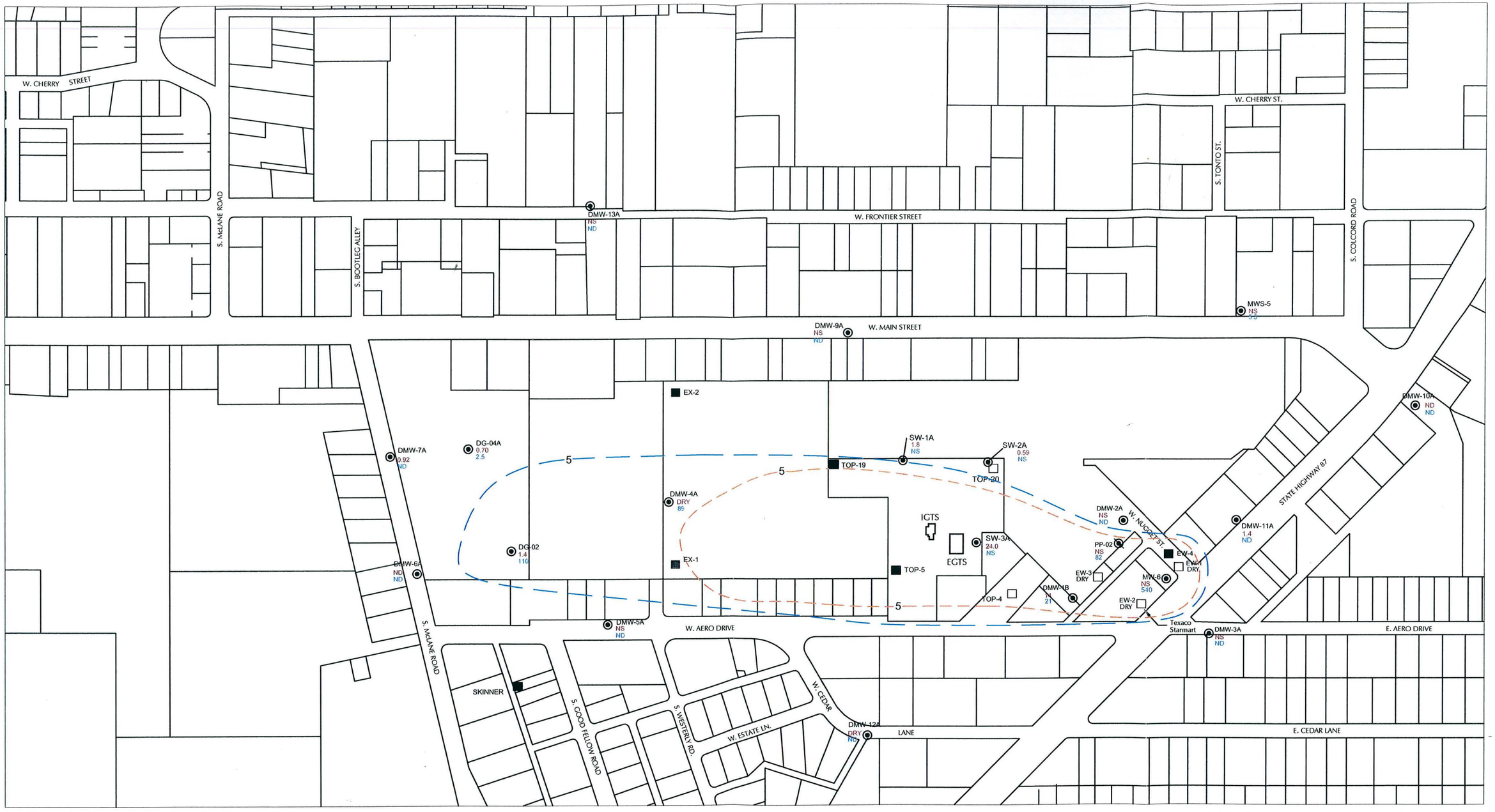
"PARTNERS IN SERVICE"
Advanced Remediation Technologies Co.
119 NW 4TH AVE CANBY, OREGON 97013
PHONE: (503) 266-2122 fax: (503) 266-4724

ARIZONA DEQ
TOWN OF PAYSON - WQARF
PAYSON, ARIZONA
PROCESS & INSTRUMENTATION DIAGRAM

DATE	03/11/02
DRAWN	LAD
DESIGN	LAD
CHECK	
SCALE	NTS

P&ID

SHEET **3-2** OF



LEGEND:

PCE CONCENTRATIONS

- September 2002 5ppb PCE Contour (inferred)
- December 1999 5ppb PCE Contour (inferred)

ND Not Detected

NS Not Sampled

WELL LOCATIONS

- Extraction Well - Operating
- Extraction Well - Not Operating
- Monitor Well
  - 19 PCE Concentration (September 2002)
  - 21 PCE Concentration (December 1999)
- Abandoned Well

NOTES

1. Method Detection Limit (MDL) for ND wells is <0.5 µg/l.
2. All concentrations are µg/l.

N

0 300 600

SCALE IN FEET

PCE Concentration Contours

AL Unit

Comparison of September 2002 and December 1999 Data

Payson WQARF Site

Figure 3-3

URS

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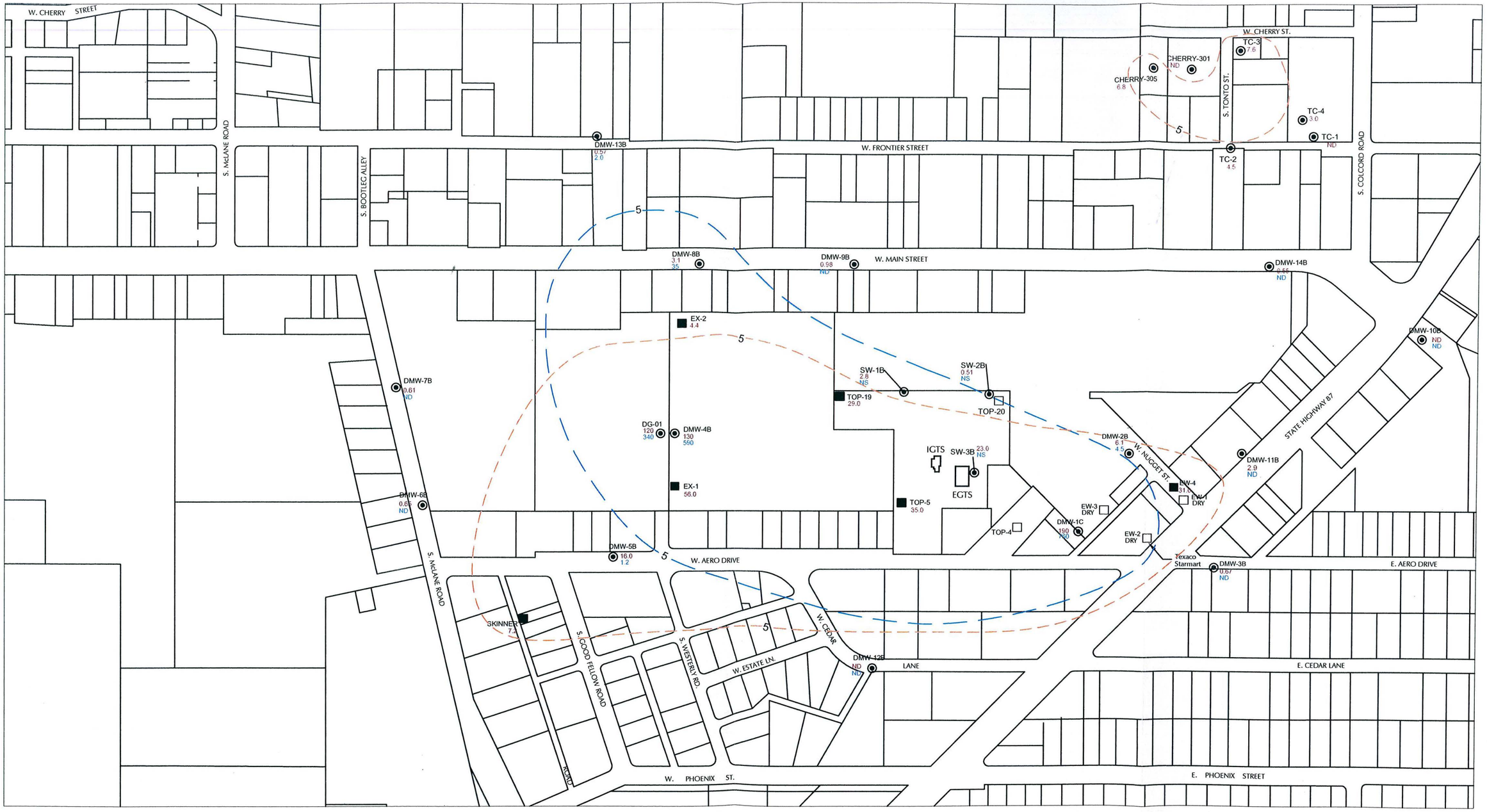

LEGEND:

PCE CONCENTRATIONS

- September 2002 5ppb PCE Contour (inferred)
- December 1999 5ppb PCE Contour (inferred)
- ND Not Detected
- NS Not Sampled

WELL LOCATIONS

- Extraction Well - Operating
- Extraction Well - Not Operating
- Monitor Well
  - 19 PCE Concentration (September 2002)
  - 21 PCE Concentration (December 1999)
- Abandoned Well

NOTES

1. Method Detection Limit (MDL) for ND wells is <0.5 µg/l.
2. All concentrations are µg/l.

N

0 300 600

SCALE IN FEET

PCE Concentration Contours

DG/FG Unit

Comparison of September 2002 and December 1999 Data

Payson WQARF Site

Figure 3-4

URS

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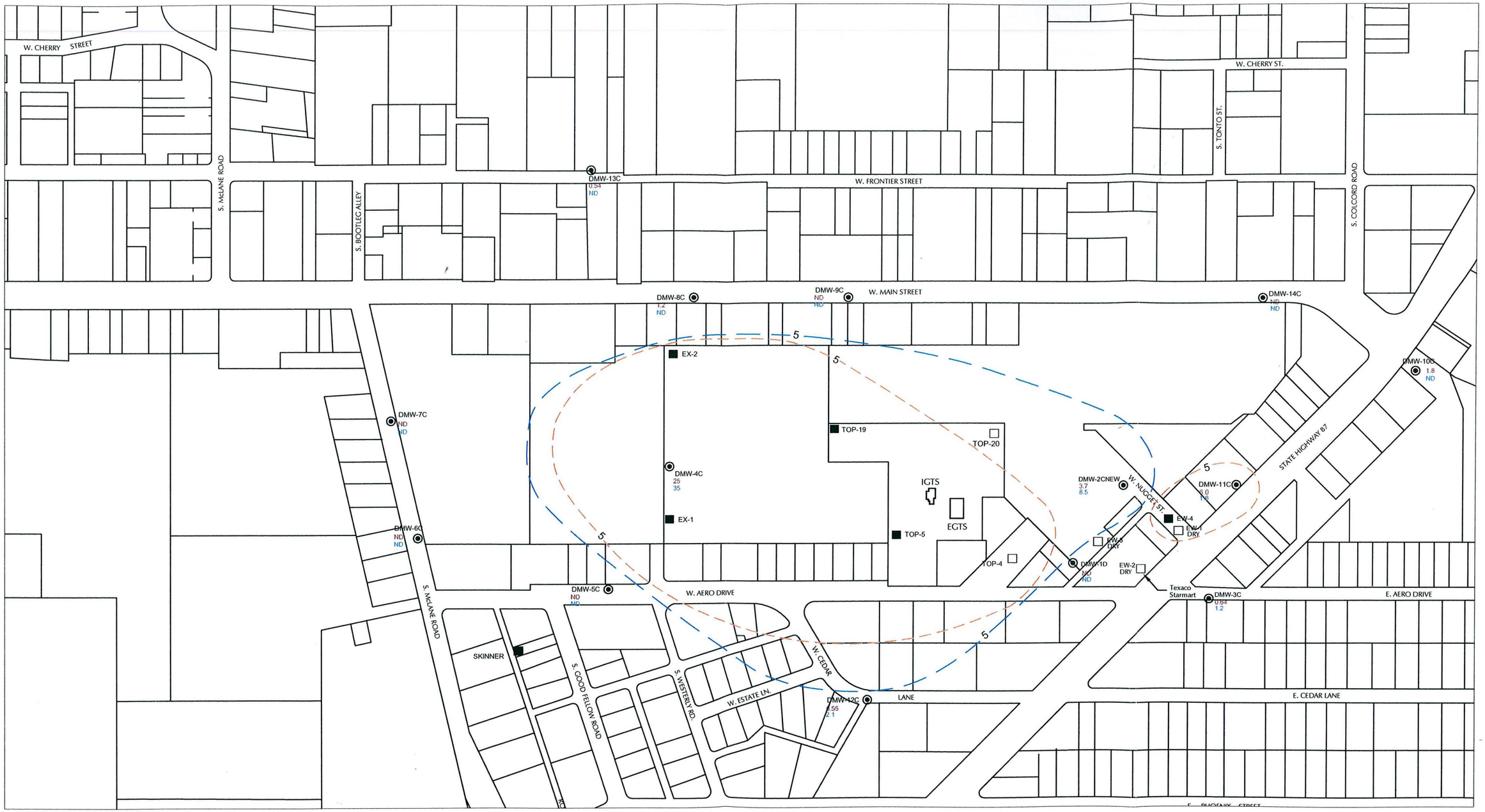

LEGEND:

PCE CONCENTRATIONS

- September 2002 5ppb PCE Contour (inferred)
- December 1999 5ppb PCE Contour (inferred)
- ND Not Detected
- NS Not Sampled

WELL LOCATIONS

- Extraction Well - Operating
- Extraction Well - Not Operating
- Monitor Well
  - 19 PCE Concentration (September 2002)
  - 21 PCE Concentration (December 1999)
- Abandoned Well

NOTES

1. Method Detection Limit (MDL) for ND wells is <0.5 µg/l.
2. All concentrations are µg/l.

N

0 300 600

SCALE IN FEET

PCE Concentration Contours

FG/CG Unit

Comparison of September 2002 and December 1999 Data

Payson WQARF Site

Figure 3-5

URS

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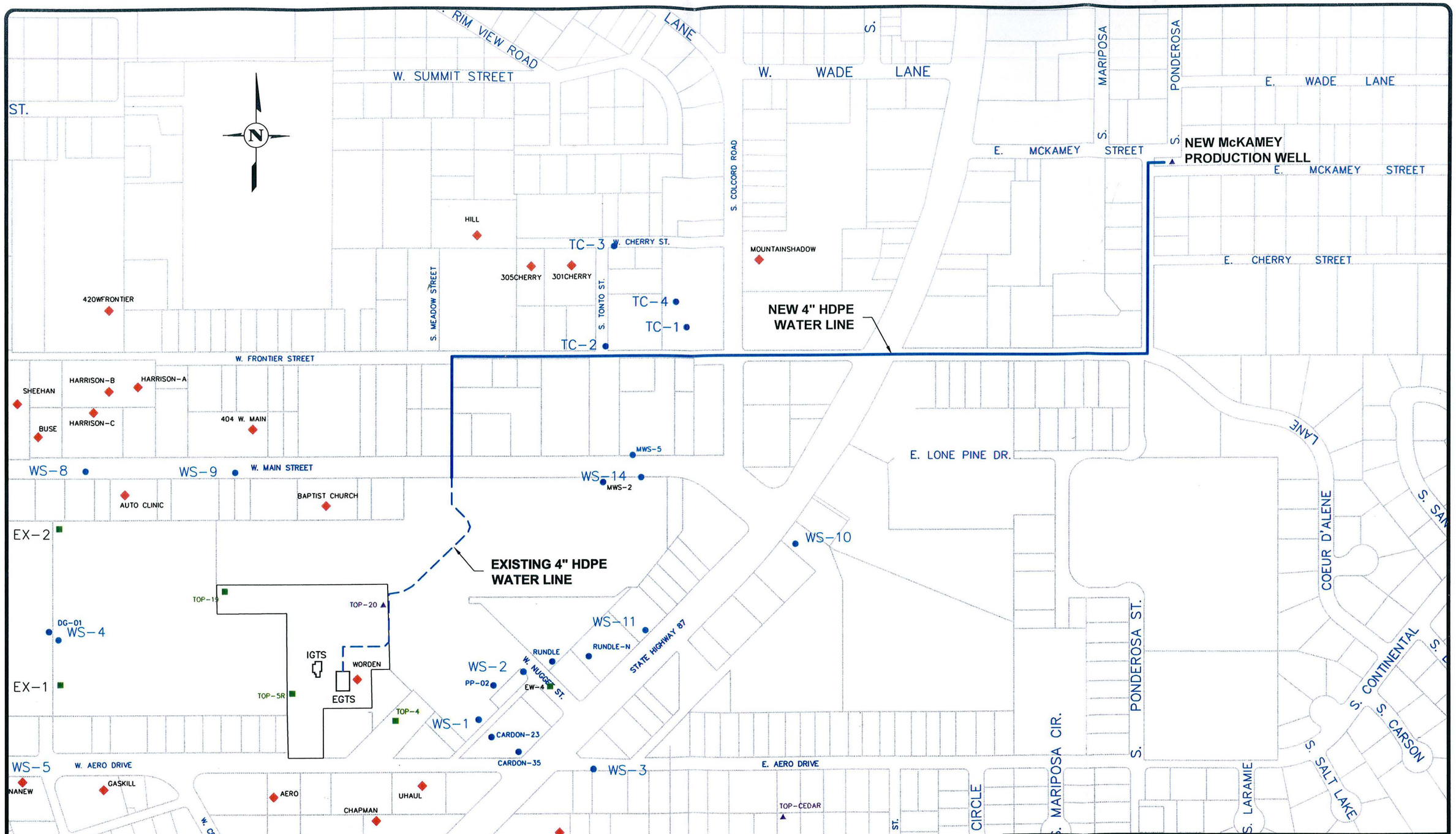

TITLE: CONCEPTUAL LAYOUT FOR NEW MCKAMEY WATER LINE CONNECTION TO EGTS

LOCATION: PAYSON PCE WQARF SITE

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JWR	FIGURE
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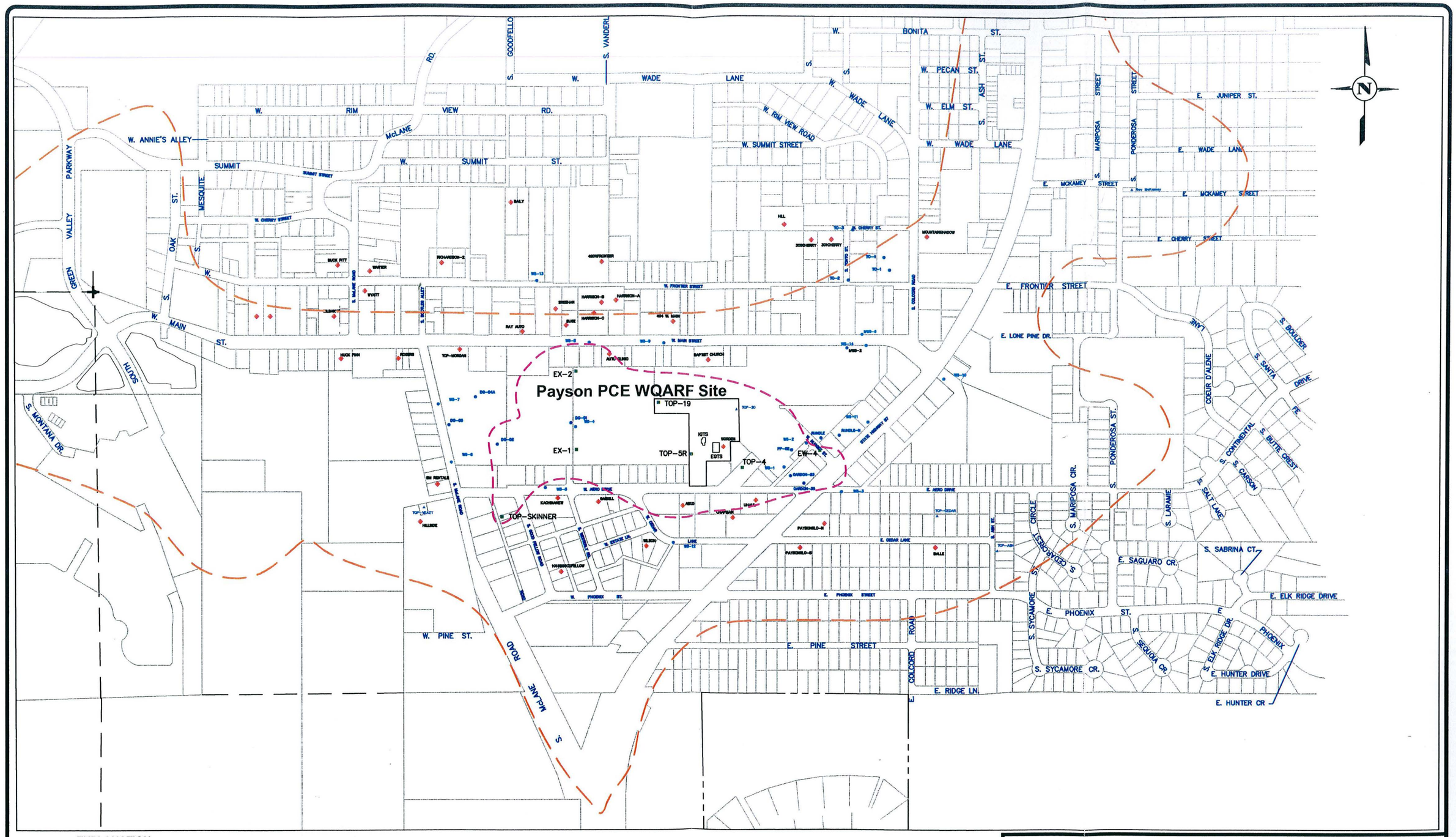
PROJECT	F144-C22	
DATE	8/19/02	



EXPLANATION

- FIELD OBSERVATION OF EXPOSED BEDROCK
- MONITOR WELL
- EXTRACTION WELL
- TOWN OF PAYSON WELL
- DOMESTIC WELL
- APPROXIMATE WQARF SITE BOUNDARY

0 300 600 900

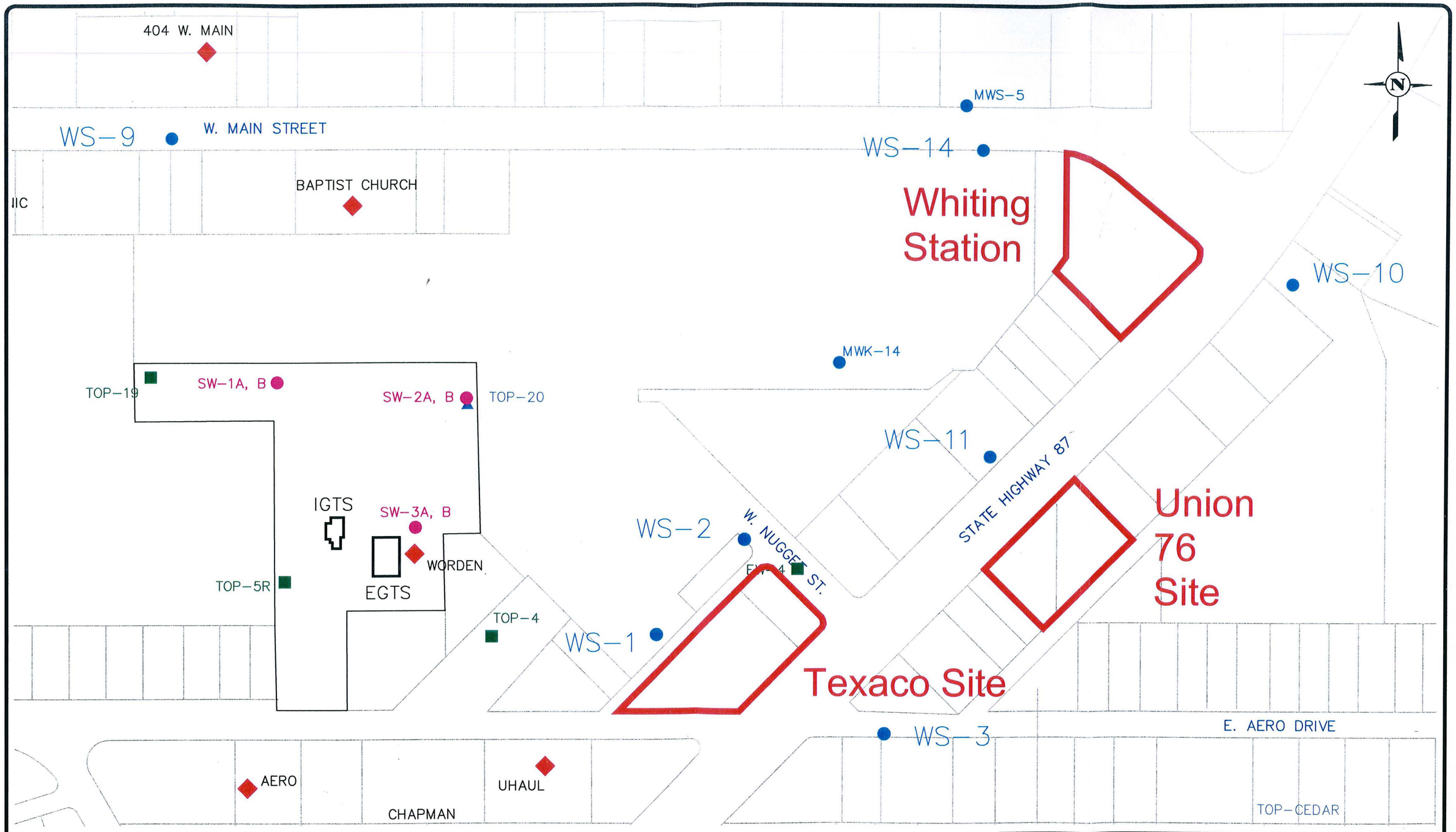
APPROXIMATE SCALE IN FEET

TITLE: **FIELD OBSERVATION OF EXPOSED BEDROCK PAYSON PCE WQARF SITE**

LOCATION: **PAYSON, ARIZONA**

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	PP	FIGURE
DRAFTED	DBS	5-2
PROJECT	F144-G66	
DATE	6/18/03	



EXPLANATION

- Monitor Well
- Extraction Well
- Town of Payson Well
- Domestic Well
- Site Boundaries
- MTBE Sentinel Monitor Well

NOTE: Monitor wells DMW-1A, DMW-2A, DMW-3A, Worden and MWS-5 and former extraction wells EW-1, EW-2 and EW-3 are currently dry

0 75 150

Scale: 1"=150'

TITLE:	Onsite MTBE Sentinel Monitor Wells Payson PCE WQARF Site
LOCATION:	Payson, Arizona

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	prp	FIGURE:
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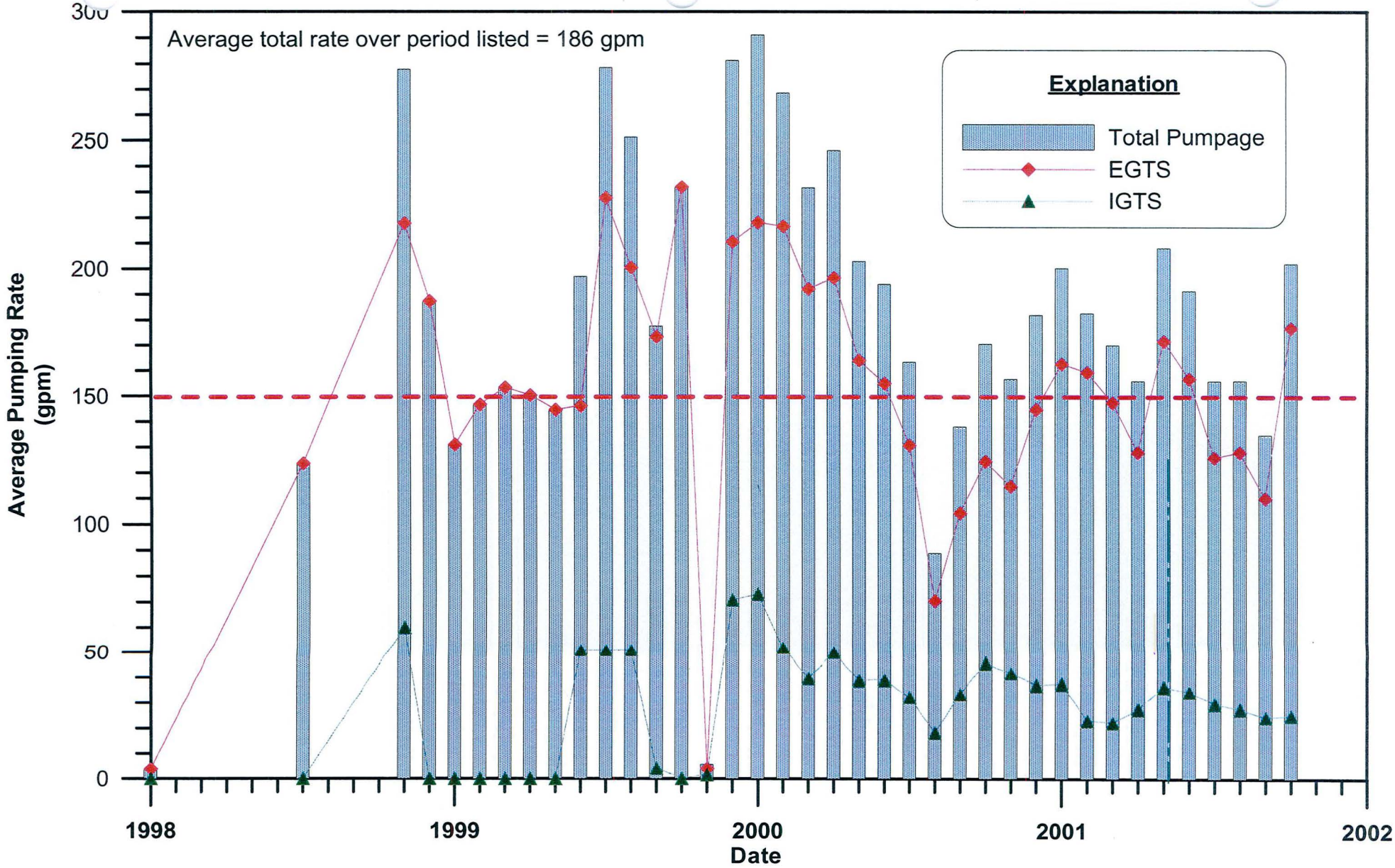
PROJECT	F144	
DATE	09/30/02	



GeoTrans, Inc.

IGTS / EGTS Average Monthly Pumpage
Payson PCE WQARF Site
Arizona Department of Environmental Quality

FIGURE
6-1

DISTRIBUTION

PROPOSED REMEDIAL ACTION PLAN
PAYSON PCE WQARF SITE
PAYSON, ARIZONA

Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, AZ 85007

Copy No. 1

Copy 1: David Haag, ADEQ
Copy 2: ADEQ File
Copy 3: Paul Plato
Copy 4: Jeff Rackow
Copy 5: Payson PCE WQARF Site Repository, Payson Library
Copy 6/7: Colin "Buzz" Walker, Town of Payson, Arizona
Copy 8: Vivian Burdette, Tonto Apache Tribe
Copy 9: Paul Peterson, Kaibab Industries
Copy 10: Michael Beasley, Equiva Services
Copy 11: John Fortune, ADWR
Copy 12: Joel Goode, Northern Gila County Sanitation District
Copy 13: Robert Ware, Community Advisory Board
Copy 14: GeoTrans File

Quality Control Reviewer

Jasenka Zbozinek

Jasenka Zbozinek, Ph.D.
Operations Manager