

**Five-Year Review
South Cavalcade Street Superfund Site
Houston, Harris County, Texas**

September 2002



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6**

917454



FIVE-YEAR REVIEW
South Cavalcade Street Site
EPA ID# TXD980810386
Houston, Harris County, Texas

This memorandum documents EPA's approval of the findings, actions needed, and determinations for the South Cavalcade Street Site first five-year review, including the following Five-Year Review Report prepared by EPA Region 6.

Summary of Five-Year Review Findings

The current site conditions were found to be protective of human health and the environment. The Dense Non-Aqueous Phase Liquid (DNAPL) collection and ground water treatment systems are operating as expected and are well maintained. The concrete caps in the southeastern and southwestern areas are in good condition and ensure that there is no current or future exposure to the encapsulated contaminated soils. A vertical offset in the driveway adjacent to the southwestern cap was noted and related to a wash-out from a water line break after the cap was constructed. The integrity of the cap does not appear to be impacted; no cracks or indications of settling were observed.

Reasonable interpretation of the existing ground water data would indicate that the DNAPL and ground water plume have migrated offsite at the southwestern corner and southern boundary, which is consistent with the 1988 Record of Decision (ROD). Monitoring data, however, is not sufficient to indicate if further migration has occurred, and if so, where the leading edge of the contamination is located. That information is necessary to ensure that there are no new exposure pathways to be considered and that the remedy will remain protective into the future. It should be noted, however, that there is no indication that the impacted shallow aquifer is being used as a drinking water source. The City of Houston continues to provide drinking water on-site and to neighboring residences.

A minor deficiency was noted during the August 2002 Site inspection. A segment of the perimeter fencing is down at the northeastern corner of the Site, providing access to the Site through the rail right-of-way to the east. Current and future protectiveness of the remedies are not an issue; rather fence repairs would further support the Site security already in place.

In addition, land use immediately adjacent to the Site at the western boundary is subject to change in the near future. The Harris County Toll Road Authority plans to expand the Hardy Toll Road along the rail right-of-way along the western boundary of the South Cavalcade Street Site. Workers may have a short term exposure to DNAPL and the ground water plume at certain points along the boundary during construction. In addition, precautions must be taken during construction to ensure that pathways of migration to deeper zones will not be created.

Actions Needed

EPA is evaluating the Beazer proposal supporting natural attenuation as an alternative remedial action for ground water. As part of this re-examination of remedial options and objectives, ground water monitoring requirements and extraction to contain the dissolved plume should also be evaluated and reinstated as appropriate. Should remedial objectives change, the remedy decision process will be documented through a ROD amendment or an Explanation of Significant Differences.

Additional work should be done to locate the leading edge of the DNAPL and plume at the southwestern

and the southern boundaries to determine if the plume is expanding further off-site, and if so, determine if human health and the environment are still protected. Evaluation of boundary conditions should be completed within a two-year time frame.

Perimeter fencing should be repaired to further secure the Site.

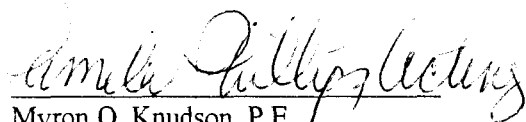
EPA will continue discussions and coordination with the Harris County Toll Road Authority to ensure that protective measures are in place during the Toll Road construction to provide for worker safety and to further prevent the inadvertent vertical migration of DNAPL to deeper zones.

Determinations

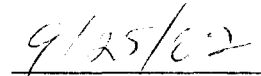
I have determined that the remedy for the South Cavalcade Street Site in Houston, Texas, is protective of human health and the environment in the short term and will remain protective in the future if additional ground water monitoring data is collected to verify the extent of contaminant migration in ground water.

Approved by:

Date:



Myron O. Knudson, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency

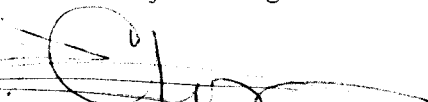


CONCURRENCES

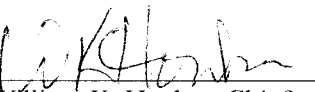
FIVE-YEAR REVIEW
for the
South Cavalcade Street Site
EPA ID# TXD980810386

By: 
Camille D. Hueni
Remedial Project Manager

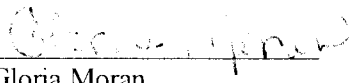
Date: Sept. 23, 2002

By: 
Gustavo T. Chavarria, Chief
AR/TX Project Management Section


Date: 9-24-02

By: 
William K. Honker, Chief
AR/TX Branch

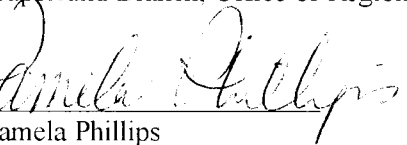
Date: 9/24/02

By: 
Gloria Moran
Site Attorney

Date: 9/24/02

By: 
Mark Peycke, Chief
Superfund Branch, Office of Regional Counsel

Date: 09/25/02

By: 
Pamela Phillips
Superfund Deputy Division Director

Date: 9/25/02

FIVE-YEAR REVIEW

**First Five-Year Review Report for
South Cavalcade Street Superfund Site
Houston
Harris County, Texas**

September 2002

**Prepared By:
Region 6
United States Environmental Protection Agency
Dallas, Texas**

Executive Summary

The first five-year review of the South Cavalcade Street Superfund Site located in Houston, Harris County, Texas was completed in August 2002. The results of the five-year review indicate that the remedy is expected to be protective of human health and the environment in the short-term, however additional information is necessary to ensure that the remedy is also protective into the future. Overall, the remedial actions appeared to be functioning as designed, and the site has been maintained appropriately. One minor deficiency was noted that does not directly impact the short-term protectiveness of the remedy.

The original Record of Decision (ROD), signed September 26, 1988, addressed both ground water and soil contamination. Contaminants of concern included Polynuclear Aromatic Hydrocarbons (PAHs) and metals in both media.

For ground water remediation, the 1988 ROD required the extraction and treatment of contaminated ground water, including the recovery and treatment of a Dense Non-Aqueous Phase Liquid (DNAPL). Extraction would continue to decrease contaminant levels to the maximum extent possible, and at that point, collection would cease and any remaining contamination would be allowed to naturally attenuate to background levels. The ROD has also made allowances to consider in-situ biological treatment to meet remedial goals. The ground water extraction system and treatment plant were put into operation on September 1995 with 2800 gallons of DNAPL recovered to date.

In 1995, the U.S. Environmental Protection Agency (EPA) and Beazer East, Inc. (hereafter referred to as "Beazer" or "BEI"), the responsible party (RP), agreed to reconsider remedial goals outlined in the ROD, including options such as natural attenuation, or a Technical Impracticability (TI) waiver. EPA and the Texas Commission on Environmental Quality (TCEQ) (formerly the Texas Natural Resource Conservation Commission, or TNRCC) are evaluating information submitted by Beazer to support natural attenuation for the site. Ground water monitoring and extraction to further inhibit migration of the plume in the shallow impacted aquifer has been delayed pending re-evaluation of remedial goals and this approach. DNAPL collection, to address the source area, has continued as has monitoring of the deeper aquifer.

Operation and monitoring (O&M) requirements have been in place for both the DNAPL collection system and the treatment system since January 1996. One modification has been made to the treatment system to address a one-time excursion of ammonia in the discharge stream. O&M reports are submitted on a quarterly basis and support that the system continues to perform as expected.

The ground water remedy can be considered protective in the short-term as there is no completed exposure pathway. As indicated in the 1988 ROD, the City of Houston continues to supply drinking water to the facility, surrounding businesses, and residences to the west, through the City's public water supply system. There are no indications that private wells are in use in the area down-gradient from the ground water plume. However, future protectiveness of the remedy is uncertain due to the lack of monitoring data and the possibility of further off-site migration at the southwest corner and along the south boundary.

For soil remediation, the 1988 ROD also specified soil flushing and soil washing to attain a risk-based remedial

goal of 700 parts per million (ppm) for carcinogenic PAHs, based on ingestion and direct contact. The remedial action was later reduced to the soil washing option. After a pilot study indicated that soil washing would not reduce contamination to the specified remedial goal, Beazer submitted a proposal to contain the waste at the site under a constructed cap. On June 26, 1997, the Regional Administrator signed an Amended Record of Decision to allow for a remedy to seal and contain contaminated soils under a six-inch thick reinforced concrete cap. The cap, constructed in two separate areas, would also serve as a parking area for trucks, optimizing use of the property by the trucking businesses operating on site. Construction of the reinforced cap was completed in July 2000.

Beazer conducted its first annual cap inspection in November 2001 and confirmed that the concrete cap in both the southeast and southwest portions of the site were in good condition, that effective O&M procedures are in place, and that the remedy continues to be protective.

In summary, the remedial action for soils at the Site as set forth in the original 1988 Record of Decision and the 1997 amended Record of Decision have been implemented as planned and continue to be protective of human health and the environment. The ground water remedy can be considered protective for the short-term, however future protectiveness is uncertain due to the possibility of further migration of the plume off-site and the absence of monitoring data. These uncertainties will be evaluated and any necessary actions taken to ensure future protectiveness as remedial alternatives are reconsidered within the next two years. Any new remedial options not specified in the 1988 ROD will be considered through the remedy decision process as a ROD Amendment or Explanation of Significant Differences.

Table of Contents

Section	Page
Executive Summary	3
List of Acronyms	7
Five-Year Review Summary Forms	9
1.0 Introduction	13
2.0 Site Chronology	14
3.0 Background	15
3.1 Physical Characteristics	15
3.2 Land and Resources Use	15
3.3 History of Contamination	16
3.4 Initial Response	17
3.5 Basis for Taking Action	18
4.0 Remedial Actions	19
4.1 Remedy Selection (General)	19
4.2 Soil Remedy Selection	19
4.3 Ground Water Remedy Selection	20
5.0 Remedy Implementation	21
5.1 Soil Remedy	21
5.2 Ground Water Remedy	22
5.2.1 Ground Water Collection and DNAPL Recovery System	22
5.2.2 Ground Water Treatment Plant Construction	23
5.3 Preliminary Close Out for Soils and Ground Water	24
6.0 System Operations	24
6.1 Soil	24
6.2 Ground Water	26
6.3 Operations and Maintenance (O&M)	27
7.0 Progress Since the Last Five-Year Review	27
8.0 Five-Year Review Process	28
8.1 Administrative Component	28
8.2 Community Involvement	28
8.3 Document Review	28
8.4 Data Review	29
8.5 Site Inspection	29
8.6 Interviews	30
8.7 Risk Information Review	32
8.8 Exposure Pathways	32
9.0 Technical Assessment	32
10.0 Issues	35
11.0 Recommendations and Follow-up Actions	35
12.0 Protectiveness Statement	36
13.0 Next Review	37

Tables

Table 1: Chronology of Site Events. 14
Table 2: Annual System Operations/O&M Costs. 27

Figures

Figure 1: Site Location Map
Figure 2: Site Plan
Figure 3: Concrete Cap Limits
Figure 4: Ground Water and DNAPL Recovery Systems

Attachments

Attachment 1: List of Documents Reviewed
Attachment 2: Interview Record Forms
Attachment 3: Site Inspection Checklist
Attachment 4: Site Inspection Photographs

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BAT	Best Available Technology
BEI	Beazer East, Inc. (also referenced as Beazer)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DNAPL	Dense Non-Aqueous Phase Liquids
EPA	Environmental Protection Agency
GPCT	Groundwater Pilot Collection Trench
GWFTER	Ground Water Fate and Transport Evaluation Report
HASF	Health and Safety Plan
NPDES	National Pollutant Discharge Elimination System Requirements
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OUs	Operable Units
PAHs	Polynuclear Aromatic Hydrocarbons
RAWP	Risk Assessment Work Plan
RD/RA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
TCEQ	Texas Commission on Environmental Quality
TDWR	Texas Department of Water Resources
TI	Technical Impracticability
TNRCC	Texas Natural Resource Conservation Commission

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Five-Year Review Summary Forms		
SITE IDENTIFICATION		
Site name (from WasteLAN): South Cavalcade Street		
EPA ID (from WasteLAN): TXD980810386		
Region: EPA Region 6	State: TX	City/County: Houston/Harris Co.
SITE STATUS		
NPL Status: <input checked="" type="checkbox"/> Final Deleted Other (specify):		
Remediation status (choose all that apply): Under Construction <input checked="" type="checkbox"/> Operating Complete		
Multiple OUs? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Construction completion date: 9-15-00	
Has site been put into reuse? <input checked="" type="checkbox"/> Yes No		
REVIEW STATUS		
Reviewing agency: <input checked="" type="checkbox"/> EPA(lead) <input checked="" type="checkbox"/> State (support) Tribe Other Federal Agency:		
Author: Camille Hueni, Remedial Project Manager, EPA Region 6		
Review period: 7-15-02 to 8-29-02		
Date(s) of site inspection: 5-10-00; 8-7-02		
Type of review: <input checked="" type="checkbox"/> Statutory Policy <input checked="" type="checkbox"/> Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review number: <input checked="" type="checkbox"/> 1 (first) 2 (second) 3 (third) Other (specify):		
Triggering action: Actual RA Onsite Construction at OU# _____ <input checked="" type="checkbox"/> Actual RA Start for Ground Water (no OU designation) Construction Completion Recommendation of Previous Five-Year Review Report Other (specify):		
Triggering action date (from WasteLAN): 1-11-95		
Due date (five years after triggering action date): 1-11-00		

Five-Year Review Summary, cont.

Deficiencies:

The portion of the perimeter fencing which is down in the northeast corner should be repaired to further secure the site. This is a measure to further secure the ground water collection and treatment system. Current and future protectiveness of the remedies are not at issue.

Monitoring and ground water extraction to contain the dissolved phase has been delayed pending re-evaluation of the remedial action for ground water at the Site, as per the agreement between EPA and Beazer. Reasonable interpretation of the most recent ground water data indicates off-site migration of the DNAPL at the southwest corner and the south boundary, however there is not adequate monitoring information to verify if further migration has occurred. The remedy is protective in the short term, but future protectiveness is uncertain pending additional information on the location of the DNAPL and the leading edge of the plume and the relative rate of migration.

Recommendations and Follow-up Actions:

EPA recommends that the property owners proceed with inspection and repair of cracks and joint systems as required to maintain the structural integrity of the entire existing paving system. Action ensures continued protectiveness.

EPA recommends follow-up to the Beazer submittal supporting the use of natural attenuation as an alternative remedial action for ground water. As part of this discussion, ground water monitoring and ground water extraction to contain the dissolved plume should be re-evaluated and reinstated as appropriate. Additional work should be done to locate the leading edge of the DNAPL at the southwest corner and south boundary to determine if the plume is expanding off-site, within a two-year time frame.

EPA recommends continued discussions with the City of Houston and the Harris County Toll Road Authority on potential site impacts to be considered in construction of the toll road expansion. Worker health and safety should be considered for those areas where short-term contact with ground water contamination is anticipated. Precautions should also be taken during construction to prevent the creation of conduits and preferential pathways for migration of DNAPL to deeper aquifers. Action ensures protectiveness for a short-term exposure scenario and provides for the continued protection of deeper ground water zones.

EPA recommends perimeter fence repairs (NE corner) to further secure the site. This does not impact protectiveness of the remedy.

EPA recommends the evaluation of the current monitoring plan for deep wells LCW-01 and DW-02 and NPDES monitoring requirements for treatment plant discharge to determine if sampling frequency can be extended with no impact to protectiveness.

Protectiveness Statement(s):

This five-year review for the South Cavalcade Street Site indicates that the remedial actions implemented at the Site will remain protective of human health and the environment for soils, and protective in the short-term for ground water. Institutional controls have been established at the Site to ensure that future use of the Site remains non-residential and to prohibit on-site groundwater use. Current information shows that shallow groundwater is not currently being used in the vicinity of the Site and the deeper ground water has not been impacted by site-related constituents. Furthermore, site security restricts property access to authorized personnel. Perimeter fence repairs will further enhance existing security measures in place.

The concrete cap eliminates any potential for direct contact with impacted soil. The long-term O&M plan for the concrete cap will ensure that the potential for future exposure to underlying soil is eliminated. The concrete cap ensures current and future protection of human health and the environment.

The DNAPL recovery and groundwater treatment systems are operating effectively to reduce the contaminant source over time. The ground water remedy can be considered protective for the short-term, however future protectiveness is uncertain due to the possibility of further off-site migration of the plume to the south and southwest *and* the absence of data to confirm whether or not migration is continuing. These uncertainties will be evaluated and any necessary actions taken to ensure future protectiveness within the next two years.

Other Comments: None.

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South Cavalcade Street Superfund Site First Five-Year Review Report

The United States Environmental Protection Agency (EPA) Region 6 has conducted the first five-year review of the remedial actions implemented at the South Cavalcade Street Superfund Site located in Houston, Harris County, Texas (Figure 1). The review was initially conducted from March 2000 through May 2000 for the period January 1995 to January 2000. This period reflects the initial five-year period from the statutory "start" date (January 11, 1995). The draft report has been expanded to also incorporate the period up to September 30, 2002, the expected concurrence date for this final report. Beazer East, Inc. (BEI), the Responsible Party (RP) for remedial action at the South Cavalcade Street Site, provided information for the initial draft report and for the expanded period. That information has been verified and incorporated into this report by EPA.

For purposes of this report, the phrase "five-year review" will apply to all remedial actions which have taken place during the extended period, January 1995 to September 2002. The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. This report documents the results of the review for this Site.

1.0 Introduction

The five-year review for South Cavalcade Street Superfund Site is required by statute.

Statutory reviews are required for sites where, after remedial actions are complete, hazardous substances, pollutants, or contaminants will remain on-site at levels that will not allow for unrestricted use or unrestricted exposure. This requirement is set forth by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Statutory reviews are required only if the ROD was signed on or after the effective date of the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA §121(c), as amended by SARA, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP §300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review for the South Cavalcade Street Superfund Site. The triggering action for this review is the EPA approval for the remedial design for both the ground water collection and treatment systems and the soil remedy on January 11, 1995. A five-year review is required when hazardous substances, pollutants or contaminants remain at the site above levels that would permit unrestricted use and unlimited

exposure, as is the case for this Site.

2.0 Site Chronology

Table 1 lists the chronology of significant events for the South Cavalcade Street Superfund Site.

Table 1: Chronology of Site Events

Date	Event
1910	Wood Treating Plant Constructed
1944	Coal Tar Distillation Plant Constructed
1962	Wood Treating and Coal Tar Distillation Facilities Cease Operations
1983	Site Investigation by Houston Metro Transit Authority
April 1984	TDWR Recommends Site for NPL
March 1985	Koppers Co. Enters into AOC with EPA to Perform a Remedial Investigation/Feasibility Study (RI/FS)
June 1986	Site Added to National Priorities List (NPL)
August 1988	RI/FS Completed
September 1988	Record of Decision (ROD) Issued
March 1991	Remedial Design/Remedial Action (RD/RA) Consent Decree Signed
March 1992	Remedial Design Workplan Completed
June 1992	Administrative Order on Consent Entered into with Property Owners
September 1992	Soil Delineation Report Approved by EPA
December 1993	Pilot Studies for Soil Washing, Groundwater Collection and Groundwater Treatment are Completed
February 1994	Soil Remedy Evaluation Memorandum for In Situ Bioremediation Issued
January 1995	EPA Approves Final Remedial Designs for the In Situ Bioremediation Soil Remedy, DNAPL Recovery and Groundwater Collection System, and Groundwater Treatment System
May 1995	EPA Approves Remedial Action Work Plan (RAWP)
September 1995	Ground Water Collection and DNAPL Recovery System Installed, Ground Water Treatment Plant Upgrades Performed and Soil Delineation Completed

Date	Event
October 1995	Ground Water Collection Suspended/DNAPL Recovery System in Operation
January 1996	Ground Water Fate and Transport Evaluation Activities Initiated
June 1997	Amended ROD Issued with Reinforced Concrete Cap for Soil.
August 1997	Final Ground Water Fate and Transport Evaluation Report (GWFTER) Submitted to EPA/Texas Natural Resource Conservation Commission (TNRCC). TNRCC is now known as Texas Commission on Environmental Quality (TCEQ).
August 1998	Final Work Plan for GWFTER Verification Submitted to EPA/TNRCC
November 1999	Final Remedial Action Workplan (RAWP) Issued
November 1999	EPA Approval of Soil Concrete Cap Design
November 1999	Soil Concrete Cap Construction Activities Initiated
November 1999	Work Plan for GWFTER Verification is Implemented
May 2000	Five-Year Review Site Inspection
July 2000	Concrete Cap Construction Completed; Final Inspection Held
July 2000	Verification of Ground Water Fate and Transport Evaluation Submitted for EPA/TNRCC Review
August 2000	Interim Remedial Action Report Submitted
September 2000	Preliminary Close Out Report Signed
August 2002	Five-Year Review Site Inspection (Final)
September 2002	First Five-Year Review Finalized

3.0. Background

3.1 Physical Characteristics

The South Cavalcade Street Superfund Site occupies approximately 66 acres of land located approximately three miles north of downtown Houston, Texas, and about one mile southwest of the intersection of Interstate Loop 610 and U.S. Highway 59. It is bounded by Cavalcade Street to the north, Collingsworth Street to the south, and the Missouri and Pacific Railroads to the east and west. The Site is rectangular in shape with a length of approximately 3,400 feet (in the north-south direction) and a width of approximately 900 feet (in the east-west direction). A South Cavalcade Street Site base map is provided as Figure 1.

3.2 Land and Resource Use

Land use in the vicinity of the Site is a mixture of commercial, industrial, and residential. Industrial and commercial properties are located to the east and across Collingsworth Street to the south. Active rail lines immediately border the Site boundaries to the east and the west. The North Cavalcade Street Superfund Site is located directly north of the South Cavalcade Site, separated by Cavalcade Street. A residential area is located to the west of the Site, and continues to the south, north, and west.

EPA does not anticipate population growth in those areas surrounding the Site because this area of Houston is "built out," indicating that growth has probably peaked. Access from two major freeways, Interstate Highway (IH) 610 and U.S. Highway 59, makes this property ideal for continued trucking terminal operations. The Site's location within an existing industrial corridor, bordered by railroad tracks and other businesses, most likely will ensure that the Site will remain industrial. The Harris County Toll Road Authority has also proposed an extension to the Hardy Toll Road, to be built along the rail right-of-way adjacent to the western boundaries of the South and North Cavalcade Street Superfund Sites. The Toll Road, if constructed as planned, will further separate these industrial properties from the neighborhood to the west.

The Site is currently occupied by three trucking firms; thus, much of the ground surface, especially in the southern and northern portions of the Site, is covered by concrete or asphalt pavement, or buildings, as shown on Figure 2. The central portion of the Site has remained largely undeveloped; however, one of the trucking firms has expanded operations to this section in the last two years, adding yet another warehouse. A ground water treatment facility is located along the eastern site boundary in the central portion of the Site. The concrete caps, covering two areas of contaminated soils in the southeast and southwest portions of the Site, were designed for soil containment and for truck parking (Figure 3). The capped areas are currently being used for parking by two of the firms. Access is limited by perimeter fencing and further enforced by 24-hour security.

Continued future use of the Site properties for non-residential purposes is expected. An Administrative Order, entered into with EPA and the landowners, provides an institutional control to discourage residential land use. Under the order, the landowners were required to file a notice in the land records of Harris County, within 60 days of the effective date, to subsequent purchasers that "hazardous substances were disposed of and will continue to remain in both the soils and ground water at the Site." Language was also included that "development of the Site for residential use is inappropriate due to the continuing presence of hazardous substances at the Site." In addition, copies of the Consent Decree and Consent Order between EPA and Beazer, were included with the notice and will be attached to future land transactions. The responsibility to provide appropriate notice to future purchasers rests with the landowners, with penalties for failure to do so stipulated in the Administrative Order, effective January 24, 1992. The consent agreements between EPA and the respective property owners also prohibit on-site ground water use.

3.3 History of Contamination

The wood preserving facility consisted of an operations area, a drip track, and treated and untreated wood storage areas. The operations area included wood treating cylinders, chemical storage tanks, and a wastewater lagoon; this area was located in the southwestern part of the site, along what is now Collingsworth Street. Creosote and metallic salts were used in the operation. The drip track ran diagonally from the operations area

to the northeast; and ended before the central part of the Site. The coal tar plant was located in the southeastern part of the Site.

National Lumber and Creosoting Company acquired legal title to the Site in 1910 and constructed and operated a wood preserving facility there until the property was acquired in 1938 by the Wood Preserving Corporation, a subsidiary of Koppers Company. In 1940, the Wood Preserving Corporation became a part of Koppers Company. Koppers Company, Inc. (Koppers), now known as Beazer East, Inc. (Beazer), operated the wood treating facility from 1940 until closure in 1962. A coal tar distillation plant was constructed by Koppers on the southeastern portion of the Site in 1944 and continued in operation until 1962, at which time the property was sold to Merchants Fast Motor Lines. The Site was later subdivided and sold to the landowners referenced in the 1992 Administrative Order. In 1995, the Baptist Foundation of Texas sold its 22 acres (of the 66 acre South Cavalcade Street Superfund Site) to Nations Way (NW) Transport Service, Inc.

3.4 Initial Response

In 1983, the Houston Metropolitan Transit Authority investigated the Site for potential use in the municipal mass transit system and found evidence of creosote in the subsurface. The Site was referred to the Texas Department of Water Resources (TDWR), which conducted further investigations and determined that the Site could pose a threat to human health and the environment. In April 1984, TDWR recommended to EPA that the Site be placed on the National Priorities List (NPL). EPA proposed the South Cavalcade Street Site to the National Priorities List (NPL) on October 15, 1984 (49 FR 40320), and added the Site to the final list on June 10, 1986 (51 FR 21054).

In March 1985, Koppers entered into an Administrative Order on Consent (AOC) with EPA to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Site. The RI/FS was completed by Koppers in August 1988 with submittal of the *Remedial Investigation Report* and the *Feasibility Study Report* to EPA. The RI identified two primary areas of potential creosote impact in the surficial soil, defined as surface to six feet below grade: one area in the southern portion, corresponding to the former locations of the coal tar plant and wood treating operations; and one area in the northern portion, corresponding to a pond observed in a 1964 aerial photo of the Site. Total surficial soil Polynuclear Aromatic Hydrocarbons (PAHs) ranged from below detection levels to 8567 mg/kg. Contaminants of concern released to soil were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene. Copper, chromium, arsenic, zinc, and lead were also present in concentrations exceeding background.

The RI also indicated that PAHs, from below detection limits to observed non-aqueous phase creosote at several wells, were present in the shallow aquifer underlying the Site, at 6 to 10 feet below the surface to a depth of about 22 feet. Metals, including arsenic, chromium, copper, lead, zinc, and aromatic volatile organics, specifically benzene, toluene, ethylbenzene, and xylene, were also detected. Contaminants appear to be confined to the shallow aquifer. PAHs were not detected in the deeper aquifer, located at depths 175-205 feet below surface. Beazer has been sampling two deeper monitoring wells (at depths 220 and 530 feet) in the vicinity of the site, annually, since 1993, further confirming that deeper ground water has not been impacted by Site-related activities. An evaluation of ground water use in the vicinity of the Site confirmed that there is no use of the shallow ground water within a one-mile radius of the Site. Although, the deeper aquifer is potentially useable as a public water supply source, on-site and neighboring residents are all served by the City

water supply which originates from a deeper aquifer 10 miles from the Site, or a surface water reservoir located over 20 miles from the Site. In addition, the Houston-Galveston Coastal Subsidence District requires notification and permits for the drilling of new ground water wells, discouraging the use of private wells in those areas adequately served by the City of Houston municipal water supply system.

3.5 Basis for Taking Action

Contaminants: Hazardous substances that have been released at the Site for each media

<u>Soil</u>	<u>Ground Water</u>	<u>Drainage Ditch Water</u>	<u>Drainage Ditch Sediment</u>
Arsenic	Arsenic	Arsenic	Arsenic
Chromium	Chromium		Chromium
Copper	Copper	Copper	Copper
Lead	Lead	Lead	Lead
Zinc	Zinc	Zinc	Zinc
Acenaphthene	Acenaphthene		
Anthracene	Anthracene		
Benzo(a)anthracene	Benzo(a)anthracene		Benzo(a)anthracene
Benzo(a)pyrene	Benzo(a)pyrene		Benzo(a)pyrene
Benzo(b&k)fluoranthene	Benzo(b&k)fluoranthene		Benzo(b&k)fluoranthene
Benzo(g,h,i)pyrene	Benzo(g,h,i)pyrene		Benzo(g,h,i)pyrene
Chrysene	Chrysene		Chrysene
Fluoranthene	Fluoranthene		Fluoranthene
Flourene	Flourene		Ideno(1,2,30cd)pyrene
2-Methylnaphthalene	2-Methylnaphthalene		
Naphthalene	Naphthalene		
Phenanthrene	Phenanthrene		
Pyrene	Pyrene		Pyrene
	Benzene		
	Ethylbenzene		
	Toluene		
	Xylenes		

Investigation and remedial actions were taken due to the presence of carcinogenic PAHs in soils, and carcinogenic PAHs, volatile organic compounds, and metals in ground water. Remedial goals considered that the Site would remain in commercial use and that the aquifers to be remediated were not being used as water supplies, and were unlikely to be used as there readily available water sources in the area. Soil remedial goals also considered further impact to ground water from leaching contaminants in the surface and subsurface. Ground water remedial goals provided for the extraction and treatment of ground water, and the collection of the Dense Non-Aqueous Phase Liquids (DNAPLs), and to prevent the off-site migration of contaminants and further reduce source areas.

Surface water and sediment samples were collected in drainage ditches on, and bordering, the Site. No PAHs

were detected in surface water samples; several metals (arsenic, zinc, lead, iron, copper, and nickel) were detected. PAH components were detected in sediment samples, with concentrations ranging from 2.3 to 236 mg/kg. Higher concentrations were located in the southern end of the Site and were most likely due to the ongoing trucking activities in that area.

4.0 Remedial Actions

4.1 Remedy Selection (General)

The Record of Decision (ROD)¹ for the South Cavalcade Site was signed by EPA on September 26, 1988. The ROD presented the selected remedial alternatives for Site surface and surficial soil, and ground water. The ROD did not designate separate operable units for remediation of the Site.

The remedial action objectives for surface and surficial soil, and ground water, as stated in the Feasibility Study Report, were to:

Surface (0 to 6" below surface) and Surficial Soil (0 to 6 feet below ground surface)

- Prevent continued migration to ground water; and,
- Reduce risks to public health.

Ground Water

- Prevent the vertical migration of contaminants to lower ground water zones or horizontal migration to off-site wells.

4.2 Soil Remedy Selection

The remedial goals for surface and surficial soils, as specified in the ROD, were 700 parts per million (ppm) total potentially carcinogenic PAHs and no potential for leaching to ground water. The remedial goals for soils were selected to prevent an additional risk of cancer from exposure to soils of greater than 1 in 100,000 (10^{-5}) for on-site commercial occupants and also ensure against any non-carcinogenic hazards. As stated in the ROD, the attainment of the remedial goals for soil would also assure that contaminants would not leach into the ground water. A combination of soil washing and soil flushing was selected in the ROD as the most appropriate solution for remediating contaminated soils.

However, an August 1992, Keystone Environmental "Soil Delineation Report" concluded that the estimated soil quantity requiring remediation was significantly less than the ROD estimate. As a result, the report concluded that it would be more efficient and cost-effective to use one remediation technology rather than two. EPA agreed with the soil delineation proposal and granted Beazer approval to begin remedial design using only soil washing.

¹ U.S. EPA, September 1988, *Record of Decision (ROD), South Cavalcade Street Site, Houston, Texas.*

In 1993, during the remedial design phase Beazer conducted a soil washing pilot study; however, the study concluded that soil washing would not provide overall protection of human health and the environment as forty percent of the soil volume could not be washed to meet the remedial goals. Consequently, there was no benefit to implement full-scale operations. Therefore, Beazer stated that it did not believe contamination beneath the surface posed a realistic health risk and petitioned EPA to reconsider the reasonableness of any risk posed by such contamination. EPA reassessed the original remedial goals to consider guidance published in 1991 defining "principal threat"² and concluded that the contamination on-site does not constitute a "principal threat" as the risk assessment did not identify any health risks from soil contaminants greater than 1 in 1000 (1×10^{-3})³. Since the waste on site was not considered a principal threat, the National Contingency Plan (NCP) 40 CFR § 300.430(a)(1)(iii)(B) allowed EPA to use "...engineering controls, such as containment, for waste that poses a relatively long term threat." After review, EPA decided that as long as the contamination remained below the surface, it posed no unacceptable risk. As a result, on September 29, 1995, Beazer proposed permanently covering the contaminated areas with a concrete cap in lieu of the originally selected 1988 remedies.

An Amended ROD for the soil remedy was signed on June 27, 1997, to seal areas where surface contamination exceeded the ROD established soil cleanup goal with a reinforced concrete cover. The remedial action objectives, as amended, were:

- To cover areas where surface contamination exceeds the ROD established soil cleanup goal of 700 ppm total potentially carcinogenic polyaromatic hydrocarbons (cPAH); and,
- To prevent against an excess lifetime increased cancer risk of 8×10^{-6} for likely on-site exposure to soil. The concrete cover would eliminate the risk to human health from direct exposure to surface soils.

The component soil remedial actions were:

- To provide field delineation of impacted soil;
- To construct a concrete cap to cover and contain impacted soils beneath at least six inches of reinforced concrete designed to withstand the current and anticipated freight truck traffic;
- To provide a barrier preventing on-site commercial occupants from inadvertently ingesting, inhaling or directly contacting impacted soils;
- To provide a plat to show the exact location and dimensions of each impacted area with respect to permanently surveyed benchmarks. This survey and plat forms part of the institutional control used to alert future owners that impacted soil has been left on site; and,

² "A Guide to Principal Threat and Low Level Threat Wastes," USEPA, Office of Solid Waste and emergency Response (OSWER) Directive No. 9380.3FS, November 1991.

³ "Feasibility Study," Keystone Environmental Resources, Inc. p. 2-28a, August 1988.

- To prepare and execute a post-closure plan that describes the maintenance activities that will be carried on after the impacted soils are covered.

4.3 Ground Water Remedy Selection

The selected remedial alternative for ground water included extraction and treatment of ground water containing constituent concentrations greater than the remedial goals specified in the ROD. The remedial goals, as specified in the ROD, were selected to comply with Federal drinking water standards, National Pollutant Discharge Elimination System (NPDES) Best Available Technology (BAT) requirements, and the Texas Water Quality Standards, or existing background levels. The remedial level for potentially carcinogenic PAHs was selected to assure that, in conjunction with other contaminants, the overall risk to potential consumers of ground water would be less than 10^{-4} . The ROD stipulated that "ground water collection will continue until constituents have been recovered to the maximum extent possible," as "determined during the Remedial Action, based upon experience in operating the ground water collection and treatment system, and [that] it must be as close to drinking water standards and no detectable carcinogenic PAHs to the maximum extent possible."

The ROD specified that recovered ground water would be treated on the Site by physical/chemical separation followed by filtration and activated carbon adsorption. A portion of the treated ground water would be re-injected into the aquifer along with surfactants to help recover the contaminants and that excess treated ground water would be discharged to the drainage ditch leading into Hunting Bayou in accordance with a NPDES permit. The ROD specified that once EPA had determined that ground water constituents have been recovered to the maximum extent possible, ground water collection would cease and any remaining constituents would be allowed to naturally attenuate to background levels. The ROD also indicated that the ground water could be remediated via in-situ biological treatment if equal performance was demonstrated.

5.0 Remedy Implementation

5.1 Soil Remedy

Delineation of impacted soils at the Site was performed during the 1995 construction activities in accordance with the Confirmation Sampling Plan. The remedial design for the Site soil remedy was initiated by Dames & Moore in 1998 and completed in November of 1999. The EPA approval of the concrete cap design was obtained on November 11, 1999.

Beazer contracted with Bay Ltd. (Bay) to construct the soil remedy. Construction activities on the concrete cap began on November 17, 1999, and in accordance with the design parameters, the concrete cap was constructed to withstand truck traffic.

The soil remedial action concrete cap system was to cover impacted as well as non-impacted areas in the Southeast and the Southwest Areas, therein providing usable parking and driveway systems for the current property owners. The extent of the concrete cap is shown in Figure 3. The concrete cap is eight inches thick in the Southwest Area and ten inches thick in the Southeast Area. Soils in the northeast area were not capped in place, but were excavated and used, along with existing on-site stockpiled materials, as fill under the concrete cap structures in the southeast and southwest Areas. The northeast area was backfilled with clean imported fill from an off-site source.

Cap construction also provides a positive drainage system to eliminate standing rainwater and provides a cover for all presently known impacted soil surfaces. Provisions for storm water drainage and collection were provided in the design, and included the construction of a below-grade detention basin to comply with the City of Houston's permitting requirements.

Cap construction work was completed in July 2000.

5.2 Ground Water Remedy

In March 1991, Beazer entered into a Consent Decree with EPA for implementation of the remedial design and remedial action for the Site. The proposed plan for completion of the remedial design process, including pre-design and pilot studies, was presented in the Remedial Design Work Plan (RDWP) which was submitted to EPA in March 1992. Pilot study tasks conducted to support the ground water remedial design included a ground water collection well pilot study, ground water recovery trench pilot study and ground water treatment system pilot study. Pilot study tasks were completed in October 1993. The final (100%) ground water remedial designs for the Site were approved by EPA in January 1995. Following approval of the remedial designs, Beazer prepared the *Remedial Action Work Plan (RAWP)*⁴ which presented the procedures and requirements for construction of the remedial alternatives. The RAWP was approved by EPA in May 1995. Remedial construction was initiated in June 1995.

5.2.1 Ground Water Collection and DNAPL Recovery System

Construction for the ground water collection and DNAPL recovery system was initiated in June 1995. Construction included the installation of 11 recovery wells. One DNAPL recovery well (RWN-4) and four groundwater collection wells (RWN-1, RWN-2, RWN-3 and RWN-5) were installed within Ground Water Remedial Action Area (GRAA) 1 located in the northern section of the Site. One DNAPL recovery well (RWS-5) and three ground water collection wells (RWS-3, RWS-4, and RWS-6) were installed within GRAA 2, which includes the area formerly occupied by the coal tar distillation plant. Two combined ground water collection/DNAPL recovery wells (RWS-1 and RWS-2) were installed within GRAA 3, which includes the area formerly occupied by the wood treating process area. A total 22 piezometers were installed as part of the groundwater remedial action. (Figure 4). Start-up of the ground water collection and DNAPL recovery components of the ground water remedy was conducted in September 1995, following completion of the ground water treatment plant modifications.

In an EPA letter dated October 6, 1995⁵, EPA indicated that "there is some question as to whether EPA will continue to apply the current remedial action goals [i.e., the remedial goals specified in the ROD issued in

⁴ Dames and Moore, for Beazer East, Inc., *Final Remedial Action Work Plan*, Vol. 1 and 2, May 1995; Modifications incorporated November 1999.

⁵ U.S. Environmental Protection Agency, October 6, 1995. *South Cavalcade Street Superfund Site Groundwater Exposure Assessment Work Plan, September 1996, EPA Review Comments.*

1988] to ground water cleanup.” This direction was taken in response to a July 31, 1995 EPA memorandum⁶ directing a policy favoring applicable and relevant and appropriate requirement (ARAR) waivers at sites where it is technically impracticable to remediate ground water to Federal or State standards. As provided by the October 6, 1995, EPA letter and, in accordance with an agreement between EPA and Beazer, ground water extraction to minimize off-site migration, and monitoring, has been delayed pending determination of the potential inapplicability of the ground water remedial goals specified in the 1988 ROD.

Since the 1995 EPA decision to re-evaluate the ground water remedial goals, Beazer has done additional work (*Ground Water Fate and Transport Evaluation Report - August 1997*; *Verification of Ground Water Fate and Transport Evaluation Report - July 2000*)⁷ to assess whether natural processes (e.g. adsorption, dispersion and biodegradation) would be effective in reducing concentrations of dissolved phase constituents to health-protective levels before ground water migrates to locations where exposure to ground water could reasonably occur, and to verify that natural attenuation is occurring. This re-evaluation of remedial goals is in keeping with the 1988 ROD language which allows for in-situ biological treatment of soil or ground water if equal or better performance can be demonstrated. The ROD further allows for the determination of “maximum extent possible” remediation goals during the RA phase. The EPA and TCEQ are evaluating the information submitted.

Operation of the DNAPL recovery component of the ground water remedy is currently ongoing. The DNAPL recovery system has been in operation since January 1996, for all three Ground Water Remedial Action Areas (GRAAs). Ground water extraction is ongoing in all three zones for gradient enhancement to optimize DNAPL recovery. The recovery system is meeting EPA’s expectations for continued source removal and containment. To date, approximately 2800 gallons of DNAPL have been removed from the shallow water-bearing zone, from DNAPL recovery wells RWS-1, RWS-2, RWS-5, RWN-4, and piezometer PZ-20. In addition to the ongoing DNAPL recovery, Beazer has been conducting annual ground water monitoring in two deep ground water wells since March 1993. The two deep monitoring wells, DW-02 and LCW-01, are screened at 220 feet and 530 feet, respectively, and are located just to the southwest of the South Cavalcade Street Site on American Warehouse property. LCW-01 has not been sampled over the last six years because a pump is lodged in the hole, preventing access; however, annual sample results from DW-02, screened at the shallower aquifer, has indicated no impact from Site-related activities.

5.2.2 Ground Water Treatment Plant Construction

In 1993 the Ground Water Pilot Collection Trench (GPCT) and the Ground Water Pilot Treatment Plant (GWPTP) were completed. The construction of the GWPTP was completed by Peters Construction Company.

⁶ U.S. Environmental Protection Agency, July 31, 1995, *Memorandum from Elliot Laws, Assistant Administrator, to Regional Administrators Region I - X Regarding Superfund Groundwater RODs: Implementing Change This Fiscal Year.*

⁷ Key Environmental, Inc., *Groundwater Fate and Transport Evaluation Report, South Cavalcade Superfund Site, Houston, Texas, August 1997.*

Key Environmental, Inc., *Verification of Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site, Houston, Texas, July 2000.*

Work included excavation and backfill, treatment plant piping, concrete structures, superstructures, mechanical, electrical and instrumentation equipment, and structural steel.

The GPCT was excavated using a biopolymer slurry. It was backfilled with select fill and on-site material. Collection pipes and sumps were installed to facilitate ground water collection. Water collected from the GPCT was treated by the GWPTP.

The GWPTP was equipped to process water from the ground water pumps. The processes included clarification, pH adjustment utilizing caustic and sulfuric acid additions, anionic polymer addition, and flocculation. The process also included air floatation, carbon adsorption, and air scouring. The GWPTP processed ground water collected from the ground water collection system.

In 1995 upgrades to the GWPTP were performed. Major upgrades included: installation, replacement and modification of pumps and required foundations; replacement of PVC piping with steel; installation of a new plant air compressor; installation of a new blower skid package; and installation of two heatless air dryers. Additional work included painting, tank modifications, piping modifications and other miscellaneous items. The upgrades were constructed by JWP Gowan, Inc. Additional services were supplied by Eagle Construction & Environmental Services, Inc.

The previously described GWPTP upgrades allowed for additional processes to be incorporated into the overall treatment process. Process additions include: metals pretreatment; sludge handling; material reuse, recycling, or disposal; carbon adsorption; effluent dissolved oxygen; flow control and storm water runoff. These process additions modified the GWPTP into a full-scale water treatment system.

More recently in 2001, an additional filtering component was added to the Ground Water Treatment to address a one-time exceedance of ammonia in the treatment effluent, thought to be related to a cleaning of the plant tanks. However, Beazer up-graded the treatment plant to include additional filtration to remove any ammonia in the treated water, as a precautionary measure.

The ground water system is effectively treating ground water prior to surface water discharge to a ditch. The ground water and DNAPL are removed and managed as separate liquids to reduce the constituent loading in the influent to the ground water treatment plant. The ground water pumps in the collection wells are set several feet above the bottom of the well such that only ground water is extracted through these wells and directed to the treatment plant. As such, the influent to the treatment system does not contain any non-aqueous phase liquid. The system operator removes DNAPL from the wells on an "as needed" basis using a portable pumping assembly. The recovered DNAPL is stored in a dedicated tank within the treatment plant area. Any water that separates from the DNAPL in the storage tank is decanted and directed through the treatment plant.

5.3 Preliminary Close Out for Soils and Ground Water

A final site inspection was conducted with EPA and the then Texas Natural Resource Conservation Commission (TNRCC) at the conclusion of the modified soil Remedial Action (RA) construction activities, on July 12, 2000. The Preliminary Close Out Report (PCOR), signed September 15, 2000, documented that Beazer had completed construction of all remedial designs in accordance with the 1988 ROD and 1997 ROD Amendment, and that institutional controls were in place. EPA and TCEQ are re-evaluating remedial goals

set forth in the 1988 ROD and considering options which may significantly change the ground water collection, treatment, and monitoring requirements for the Site, as well as the cleanup goals. If remedial goals are changed to better address conditions of the Site and expected performance of the current system, those changes will be made available for public comment and will be summarized in a ROD amendment, as appropriate. After ground water cleanup goals are met for the Site, EPA will issue a Final Close Out Report.

6.0 System Operations

6.1 Soil

The long-term operations and maintenance (O&M) of the soil remedy began after the construction of the concrete cap was completed in July 2000. However, the design of the concrete cap limits the long-term maintenance required. The design spacing of the expansion joints will control concrete cracking to the joint locations (Attachment 4). Long-term system operations of the concrete cap at the South Cavalcade site include the following:

- Property owners will inspect and repair cracks and joint systems as necessary to maintain the structural integrity of the paving system;
- Beazer will perform an annual inspection to ensure the Long-Term Operation & Maintenance activities are carried out; and,
- Beazer will submit a Long-Term Operations and Maintenance Annual Report to the EPA.

The first annual inspection, November 2, 2001, and *Long-Term Operations and Maintenance Annual Report*⁸, received January 8, 2002, for the soil remedy indicated that the condition of the cap, in both the southeast and southwest areas, were in good condition. No significant cracking was noted (i.e. other than surficial cracks associated with curing). Joint systems were intact; flow into storm water drainage system appeared to be unobstructed. Beazer followed up with the property owners to address minor maintenance issues to be addressed at the site; however, these issues do not affect the performance of the remedy design. Therefore, the cap continues to provide protection to human health and the environment by eliminating a surface exposure pathway and preventing further impact to ground water by providing a barrier to surface infiltration. Based on report findings, the following changes have occurred since the cap construction was completed in July 2000, and were documented in this report:

- Additional areas of adjacent Palletized property were paved, including areas adjacent to the northern and southern edges of the southeast cap;
- Trees planted by the City of Houston at the southeast corner of the property, and cap boundary, were removed;
- Additional warehouse space was constructed for American Warehouse, well outside the boundaries of the capped area;

8

URS Corporation Letter, Re: *Long-Term Operations and Maintenance Annual Report (Soil Remedy) - South Cavalcade Superfund Site - Concrete Cap*, January 2, 2002.

- Sullivan Transfer has purchased the former Nations Way property. This property is outside the boundaries of the capped areas.

Representatives from EPA, TCEQ, Beazer, and Remediation Technologies, Inc. (RETEC) conducted an inspection of the cap on August 7, 2002, for this Five-Year Review. The cap in both the southeast and southwest areas were in good condition (Attachment 4). An offset in the pavement just to the east of the eastern edge of the southwest cap (Attachment 4) may have been the result of a washout created when the water supply line broke over a year ago. Although the offset does not appear to have impacted the integrity of the cap or the protectiveness of the remedy, EPA recommends that cap be evaluated annually to ensure that settling or cracking of the adjacent cap does not occur with time.

6.2 Ground Water

DNAPL recovery operations were initiated in conjunction with ground water pumping during the November and December 1995 start-up/shakedown of the ground water treatment system was completed. In January 1996, operation of the DNAPL recovery system in the passive mode of operation (i.e. collection of DNAPL without ground water pumping to increase hydraulic gradients) was initiated in accordance with the EPA-approved 100% Remedial Design.

In June 1996, ground water extraction to enhance hydraulic gradients, was initiated in one GRAA (GRAA 3) to evaluate the effectiveness and practicability of this enhancement prior to its use in the other GRAAs. Evaluation of the DNAPL recovery data collected in GRAA 3 from July through September 1996 indicated that ground water extraction (at a pumping rate of 0.3 ppm from individual recovery wells) appeared to enhance DNAPL recovery in Wells RWS-1 and RWS-2. Based on this observation, DNAPL recovery with ground water extraction to enhance hydraulic gradients was initiated in GRAAs 1 and 2 in October 1996. Currently, enhanced DNAPL recovery is ongoing in all three GRAAs. As previously noted, approximately 2800 gallons of DNAPL have been removed from the shallow water-bearing zone. Beazer will continue operation of the DNAPL Recovery System in the gradient-enhanced mode, in accordance with the EPA-approved RAWP.

In addition to the ongoing DNAPL recovery operation, Beazer has been conducting annual ground water monitoring since March 1993 in deeper monitoring wells located in the vicinity of the Site, as stipulated in the ROD. This activity is independent of the natural attenuation assessment for shallow groundwater and is subject only to the applicable provisions of the ROD and EPA approved Remedial Design Work Plan. The results of this activity confirm that the deeper ground water-bearing units beneath the Site are not impacted.

Beazer initially contracted Roy F. Weston, Inc. to operate and maintain the DNAPL recovery and ground water treatment system. In 1997, Beazer contracted with RETEC to provide operation and maintenance services.

Ground water extracted from the DNAPL recovery wells is directed to the on-Site treatment system for treatment prior to discharge. DNAPL accumulated in the recovery wells is removed on an "as needed" basis by the system operator by pumping the DNAPL from the well into 55-gallon drums mounted on a portable trailer system. DNAPL is then transferred from the drums into a 6,500-gallon steel tank located at the

treatment system. Water that separates out from the DNAPL in the storage tank is decanted and directed to the treatment system. Once sufficient DNAPL has been collected, Beazer will have the recovered DNAPL shipped off-Site for recycling or disposal.

Typical operations involve weekly measurements of DNAPL thickness in the recovery wells and removal of DNAPL that has accumulated to a thickness of more than one foot. No major operational problems exist with the DNAPL recovery or ground water treatment system. The system includes several pumps, flow meters and other equipment that require frequent routine maintenance and periodic replacement. DNAPL recovery data and system operations information are summarized in the quarterly progress reports prepared by Beazer for submission to EPA.

6.3 Operations and Maintenance (O&M)

Beazer is conducting long-term monitoring and maintenance activities for the cap according to the O&M plan incorporated into the *Remedial Action Work Plan (RAWP)*, as modified in November 1999 and approved by EPA. The *Groundwater Extraction System Performance Monitoring Plan (GESPMP)*, included as Appendix A.2 in the RAWP, describes performance monitoring and data evaluation for the ground water collection and DNAPL recovery systems. Again, the extraction of ground water to manage the migration of dissolved phase contaminants, and the related ground water monitoring requirements, have been temporarily suspended as EPA, TCEQ, and Beazer are re-evaluating the inapplicability of ground water remedial goals defined in the 1988 ROD. Ongoing operation and maintenance activities extend to the DNAPL collection wells and the ground water treatment plant. O&M Standard Operating Procedures for the ground water collection and treatment systems, are included as Appendix B-2 in the modified RAWP.

Quarterly progress reports are submitted to EPA to document ongoing O&M activities at the site, as well as to track DNAPL volumes recovered and ground water treated and discharged (see above section). Fifteen *Quarterly Progress Reports* have been submitted to date (June 30, 2002), in accordance with Section XI of the Consent Decree. Monthly effluent reports from the treatment plant are submitted to TCEQ and EPA in accordance with Texas Permit No. WQ0003388-000.

O&M costs include the operation, maintenance, and monitoring of the ground water and DNAPL collection and treatment systems; effluent monitoring costs; and annual inspections of the concrete cap. Beazer estimates the following costs for the last five years of O&M:

Table 2		
Annual System Operations/O&M Costs		
Dates		Total Cost rounded to nearest \$100
From	To	
January 1, 1998	December 31, 1998	\$ 84,000
January 1, 1999	December 31, 1999	\$ 92,000

January 1, 2000	December 31, 2000	\$ 104,000
January 1, 2001	December 31, 2001	\$ 108,000
January 1, 2002	June 30, 2002	\$ 49,000

7.0 Progress Since the Last Five-Year Review

This was the first five-year review for the South Cavalcade Street Superfund Site.

8.0 Five-Year Review Process

8.1 Administrative Components

The South Cavalcade Site five-year review was first initiated in March 2000, by Noel Bennett, EPA Remedial Project Manager. He was assisted in this initial review by:

- Michael Bollinger, P.E. - Environmental Manager, Beazer East, Inc.
- Kristine Hinesley - Project Engineer, Dames & Moore
- James Zubrow - Principal Hydrogeologist, Key Environmental, Inc.
- Dr. Paul Anderson - Toxicologist, Ogden Environmental and Energy Services
- Vern McIlwain - Treatment System Operator, Remediation Technologies, Inc.

Key Environmental, Inc., on behalf of Beazer, Inc., submitted a draft Five-Review Report for consideration, on June 1, 2000. As previously discussed, the draft report was incorporated, as appropriate, into this expanded final version. Findings from the May 10, 2000 site inspection and data review are incorporated in this report, as well as findings from the follow-up August 7, 2002 inspection and data reviews. This five-year review was drafted and finalized by Camille Hueni, EPA Remedial Project Manager with assistance from:

- Michael Bollinger, P.E. - Environmental Manager, Beazer East, Inc.
- James Zubrow - Principal Hydrogeologist, Key Environmental, Inc.
- Paul S. Kilchenstein - Regional Treatment System Operator, Remediation Technologies, Inc.
- Carol Dye - Remedial Project Manager, Texas Commission on Environmental Quality

The final five-year review consisted of document reviews (Attachment 1), interviews (Attachment 2), and inspection findings (Attachment 3 and 4) conducted during the July-August 2002 time frame.

8.2 Community Involvement

A bilingual notice of the on-going five-year review was published in the August 8, 2002, zone edition of the Houston Chronicle. Postcard notices of the same announcement were mailed to the local community and government officials. The notice invited recipients to provide comments to Camille Hueni, EPA Remedial

Project Manager, by phone or e-mail. Another notice and mailing will be provided with the findings and recommendations of this final report. In addition, a copy of the five-year review will be available at the Houston Central Library, the Site repository, and at the EPA Region 6 and TCEQ offices.

8.3 Document Review

This five-year review consisted of a review of relevant documents including O&M records. Applicable ground water cleanup standards, as listed in the 1988 Record of Decision, are still appropriate and protective of human health and the environment. Remedial goals for ground water are being re-evaluated, as discussed throughout this report.

8.4 Data Review

DNAPL recovery data are summarized by Beazer and are included in the quarterly progress reports submitted to EPA. Review of these data indicate that the system is effectively recovering DNAPL from the shallow groundwater-bearing unit. No decrease in the amount of DNAPL collected over time has been observed.

Ground water monitoring activities have been suspended pending re-evaluation of the 1988 ROD remedial goals and consideration of a natural attenuation alternative. Monitoring requirements will be reinstated as appropriate after this evaluation.

8.5 Site Inspections

Representatives of EPA, TNRCC, Beazer, Key, Dames & Moore, and the United States Geological Survey (USGS) took part in an initial site inspection on May 10, 2000, for the draft five-year review. In the follow-up inspection for the final five-year review, representatives of EPA, TCEQ, Beazer, and RETEC participated in the site inspection on August 7, 2002.

During both site inspections, remedial systems including the ground water collection system, the ground water treatment plant, and the concrete cap were inspected. The Ground Water Treatment Plant (GWTP) was found to be in good condition. All major process components were inspected and found to be operating as designed. Standard maintenance for operation and treatment system optimization have been performed as needed. NPDES permitted surface water discharge to the White Oak Bayou is continuing via the City of Houston storm drainage collection systems. Discharge standards are typically met. One minor exceedance of the ammonia discharge standard has occurred in the past, however the treatment system was recently retrofitted with a filter to eliminate the ammonia in the discharge stream.

The well and access vaults in the southern well field were inspected during the May 2000 inspection and were found to be performing as designed, with well and vault covers in good condition. The RWS-2 well vault had a small air leak, and the well MW-5 in the southeast area was submerged. Both problems have since been remedied. The well and access vaults in the northern well field were photographed during the August 2002 site visit; wells were secure and vaults were in good condition.

Backfilling of the excavated soils in the northeast area, noted in the May 2000 draft report, has been completed and the area seeded.

The concrete cap in both the southeast (Palletized Trucking property) and the southwest (American Warehouse property) were in good condition (Photographs). Minor surface cracks, associated with curing, will be monitored through Beazer's annual inspections. URS (for Beazer) had reported, in their January 2002 report for the cap, that a small amount of joint material had become dislodged. No such problems were evident at the August 2002, as the material had been replaced. Components associated with the stormwater drainage system were also in good condition. Palletized Trucking expanded its concrete surface on the west and north side of the southeast cap to maximize the parking surface, with no impact to the protective cap.

The August 2002 inspection team noted that the driveway just to the east of the southwest cap had a vertical offset at the joint (Attachment 4). Beazer indicated that there had been a water break in this area just after the cap was completed and that the offset was likely due to a soil wash-out along the pipe. There was no discernible impact to the cap, or indications of settlement, however this should be followed in the annual inspections and any significant changes noted.

Perimeter fencing from the northeast corner south about 70 yards is partially down and overgrown (Attachment 4). This part of the fence separates the Nations Way property from the rail right-of-way bounding the Site on the east. [The January 2, 2002 annual O&M report for the cap noted that Sullivan Transfer had purchased the former Nations Way property. Property ownership should be verified.] Under the Access agreement, property owners are responsible for maintaining their sites, and will be contacted for repairs. There is very effective 24-hour security for the Site, but repairs to the perimeter fence along this section would further secure the ground water wells and treatment system. The southwest cap is outside the perimeter fence, but is being used as a parking lot for American Warehouse. The cap is an effective barrier to surface soils and is considered protective without the additional fencing.

Action items resulting from the inspections are:

- Monitor the eastern edge of the southwest cap for impacts from a historical water line break.
- Monitor the surficial cracks (from curing) in the caps for any significant changes over time.
- Verify property ownership of the Nations Way tract.
- Contact the property owner for perimeter fence repairs.

These action items do not indicate any problems which would impact the remedy protectiveness for human health and the environment. Rather, these are monitoring actions to detect changing conditions with the cap and actions to further secure the Site.

8.6 Interviews

The following individuals were interviewed in person, or by telephone, for the five-year review (Details of those discussions can be found in Appendix 2).

- Charles Roosevelt, City of Houston Department of Health and Human Services (5/18/00)
- Earl Hamilton, Security Supervisor for Palletized Trucking (5/18/00; 8/7/02)
- Paul Kilchenstein, Regional Plant Manager, RETEC, Inc. (8/7/02)

- Michael Bollinger, Remediation Manager, Beazer East, Inc. (8/7/02)
- Carol Dye, Superfund Project Manager, TCEQ (8/7/02)
- Bobbie Tallent, Community Advocate, Western Fifth Ward Community Services (8/13/02)

Mr. Roosevelt works for the Department of Health and Human Services in the Environmental Health Division, Bureau of Public Health Engineering. He was unaware of any specific issues or public comments raised with regards to the Site. He did however describe the appropriate protocol for residents of Houston to voice their concerns about the Site and mentioned that if necessary a review of the City's records could be made. He stated that due to the current and future use of the Site as an industrial trucking facility, public comment would likely be limited. When informed of the types of access restrictions and level of institutional controls in place at the Site, he responded that they seemed to be in accordance with the requirements for the Site.

Mr. Hamilton is the Security Supervisor for the Palletized Trucking facility at the Site. He described the site controls currently in place. These include perimeter fencing, 24 hour security patrol at the Palletized facility, and installed security systems in the area of the water treatment plant. He also mentioned that security responds to system alarms if the O&M contractor is not on-site; contact information is readily available at the ground water treatment plant. Several years ago, there were problems with vandalism. That is not the case now as security has tightened. In the May 2000 interview, Mr. Hamilton indicated that because of the Site's proximity to railroad tracks there are several instances a year where people gain access to the site. Although, this was not mentioned in the August 2002 interview, we did discuss the section of perimeter fencing that should be repaired. His contact with the community is limited, therefore he was not certain of specific community concerns about the Site.

Michael Bollinger, Remediation Manager with Beazer East, Inc., and Paul Kilchenstein, Plant Manager with RETEC, Inc., respectively represent the Site Responsible Party and the O&M management. Both individuals indicated that the soils and ground water remedies were working according to design and that there were no significant O&M problems since system start-up in 1995 and the cap completion in 2000. The treatment system was modified recently to further reduce ammonia concentrations in the treated effluent, prior to surface discharge. Mr. Bollinger and Mr. Kilchenstein are not aware of any community concerns. Rather, Mr. Bollinger cited the American Warehouse expansion as an indication of success in that businesses were operating and expanding at the Site. He was pleased that the cap design could contain contaminated soils and be used for truck parking at two of the three businesses. Mr. Bollinger requested that we complete evaluation of their submittal for a natural attenuation approach for ground water remediation so that the project can proceed to a final remedy and long-term monitoring. He also requested that EPA and TCEQ re-evaluate the need for deep well monitoring and the frequency of discharge monitoring for the treatment system.

Carol Dye, Superfund Project Manager for TCEQ, recommended that we re-examine plume and dissolved phase characteristics at the western, southern, and southwestern boundaries of the site. Information submitted in the July 2000 *Verification of Groundwater Fate and Transport Report* indicates that benzene concentrations may exceed the drinking water Maximum Contaminant Level (MCL) of 5 µg/l at different points along the boundary. Ms. Dye indicated that there may be a preferential path for ground water at the southwest corner that we should consider as other remedial options are discussed. She also noted that these are points for discussion, but agrees that the remedy remains protective in the short-term as there are still no known exposure pathways for ground water. There are deed notices and land use restrictions in place for the on-site property

and a prohibition against shallow ground water wells. Drinking water for the Site and the adjacent community is provided by the City.

Mr. Bollinger and Ms. Dye both expressed the need for coordination with the Harris County Toll Road Authority and the City of Houston as plans for the expansion of the Hardy Toll Road finalize. The current plans show the Toll Road following the rail right-of-way along the western boundary of the Site. The City of Houston also plans to widen Collingsworth, along the southern boundary, as part of that project. Again, information from the July 2000 report indicates that the dissolved plume and/or part of the DNAPL source may extend into these right-of ways, particularly at the southern boundary (Collingsworth Street) and out from the southeast corner (Collingsworth and Maury Streets). The City and the Harris County Toll Road Authority should take the proper precautions in these areas during construction to prevent worker exposure during construction and to prevent the creation of migration pathways to deeper aquifers.

Bobbie Tallent, Community Advocate, was interviewed by phone on August 13, 2002. She was not aware of any community concerns specifically for the South Cavalcade Street Superfund Site. However, Ms. Tallent noted that the community has a lack of awareness of activities in the adjacent industrial corridor and explained that this is very different from a perceived lack of interest. The Western Fifth Ward is becoming more stable as home ownership increases. She asked that we continue to keep the community in the loop on any environmentally related activities for the area. The community is Hispanic and African-American; bilingual notices are appropriate and critical for outreach.

Due to the lower level of recorded public interest and the continuous level of involvement of site property owners, it was determined that additional interviews would not significantly increase the understanding of the site.

8.7 Risk Information Review

The following standards were identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the ROD:

- National Primary Drinking Water Standards;
- National Secondary Drinking Water Standards;
- Maximum Contaminant Level Goals;
- Texas Water Quality Standards; and,
- National Pollutant Discharge Elimination System Best Available Technology Requirements.

The remedial goals specified in the ROD were selected to comply with these criteria. No changes to these standards have been made which affect the protectiveness of the groundwater remedy. However, as stated previously, EPA is evaluating these requirements in consideration of the policy enacted in 1995 that favors waivers of these ARARs at Sites where it is technically impracticable to remediate ground water to State and Federal standards.

8.8 Exposure Pathways

A review of land use at the Site and in the Site vicinity indicates no substantial changes. Consequently, no additional receptors or exposure pathways have been identified. The on-site buildings are still present and a secure (locked)

fence still surrounds most of the Site. No residences have been constructed closer to the site than were present when the 1988 risk assessment was completed. Potential on-site soil exposure has actually been reduced because the areas with elevated PAH concentrations have been capped, thereby eliminating the exposure pathways discussed in the 1988 ROD. Ground water at the Site is currently not used and future use is precluded through the application of a deed restriction. There is an uncertainty, however, as to whether the DNAPL and ground water plume is migrating further off-site. If further migration has occurred, the exposure pathway to ground water should be re-evaluated. At this point in time, a complete exposure pathway is not expected as drinking water is provided by the City; there are no known private wells down-gradient of the plume.

9.0 Technical Assessment

The following conclusions support the determination that the remedial actions at the South Cavalcade Site are expected to be protective of human health and the environment in the short-term, and identifies uncertainties which will be addressed to ensure future protectiveness of the remedies.

Question A: Is the remedy functioning as intended by the decision documents?

Health and Safety Plan (HASP)/Contingency Plan: The HASP is in place. This plan is sufficient to control risks on-site, and is properly implemented.

- **Implementation of Institutional Controls and Other Measures:** The use of the Site is restricted to non-residential use by virtue of the Administrative Order on Consent (AOC) between the property owners and the EPA. Non-residential use is consistent with the exposure assumptions used to develop the remedial goals for soil. Site access is restricted to authorized personnel via fencing, locked access gates and on-site security personnel. The AOC also prohibits the installation of on-site water wells (except for the purpose of ground water monitoring). Thus, this institutional control eliminates one of the potential ground water exposure pathways identified in the ROD and ensures that the selected ground water remedy remains protective. For those areas adjacent to the Site, the Houston-Galveston Coastal Subsidence District has notification and permitting requirements in place to further reduce ground water use and to discourage the use of private wells where a public water supply is readily available.
- **Remedial Action Performance:** Installed portions of the soil remedy are operating as anticipated. The concrete cap is effective in protecting human health and environment by eliminating direct contact with surface soils by on-site occupants. The cap has also provided positive drainage preventing standing surface water. The DNAPL recovery and ground water treatment systems are functioning as designed. DNAPL has been recovered from all four recovery wells. Monitoring data indicate that the treatment system is effective in reducing ground water constituent concentrations to levels less than the discharge standards.
- **System Operations/O&M:** The long-term operations and maintenance (O&M) of the soil remedy was initiated after the construction of the concrete cap was completed in August 2000. The O&M procedures, including annual inspections, should maintain the effectiveness of the remedial actions. No major problems with the DNAPL recovery and ground water treatment system operations and maintenance have been experienced. The system operator performs routine maintenance and repairs, as necessary. Documentation of system shut-down for repairs and/or maintenance is included in the quarterly progress reports prepared by Beazer.

- **Costs of System Operations/O&M:** O&M costs for both the soil remedy and for the operation and maintenance of the DNAPL recovery and groundwater treatment system have been within an acceptable range. Ground water monitoring has been temporarily suspended, and therefore is not reflected in the O&M costs provided.
- **Opportunities for Optimization:** Due to the current adequate performance of the concrete cap at the time of this five-year review, a need for optimization has not been identified. Similarly, the DNAPL recovery system and ground water treatment plant are performing as expected, hence this five-year review does not identify a need for optimization of those components at this time. Note again that overall ground water monitoring has been delayed pending re-evaluation of the 1988 ROD remedial options and goals so there is a lack of data which would support optimization of the overall system which provides for plume containment. Future five-year reviews will consider optimization for the ground water monitoring and DNAPL collection system, and the effectiveness of the ground water extraction system to reduce off-site migration. It is recommended that, first, ground water monitoring requirements be re-evaluated and reinstated to verify that the off-site plume is not migrating further off-site and that remedial ground water goals are being met, and second, to provide data to support future system optimization. Beazer has also requested that the frequency of deep well monitoring be reconsidered.
- **Early Indicators of Potential Remedy Failure:** No early indicators of potential failure of the soil and ground water remedies were noted during the review.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

- **Changes in Standards and To Be Considereds:** No changes in standards and “to be considereds” have been enacted, therefore the protectiveness of the remedies remain unchanged. EPA is currently evaluating the potential inapplicability of the ground water remedial goals specified in the ROD in consideration of the policy enacted in 1995 that favors waivers of State and Federal standards at sites, such as the South Cavalcade Site, where it may be technically impracticable to remediate ground water to these criteria. Any modifications, however, to remedial goals will have to also meet the protectiveness standard.
- **Changes in Exposure Pathways:** No changes in exposure pathways have occurred that would adversely affect the short-term protectiveness of the remedies. No new contaminants, sources, or routes of exposure were identified as part of this five-year review. Additionally, there are no current or planned changes in land use. The Site continues to be used for non-residential purposes and future use must remain non-residential in accordance with the restrictions established in the 1992 AOC entered into by the EPA and the property owners. Property owners have increased the amount of paved area at the Site, benefitting the overall serviceability of the cap system. The concrete cap is expected to perform consistently with the expectations of the Amended ROD and effectively eliminates this exposure pathway.

The ROD assumed that future exposure to ground water could occur if on-site ground water wells were installed or if there was further off-site migration to a point of exposure. The 1992 AOC among the EPA and property owners prohibits the installation of on-site water wells (except for the purpose of groundwater monitoring). This institutional control eliminates one of the potential exposure pathways identified in the

ROD and increases the protectiveness of the selected ground water remedy. The ROD concluded that shallow ground water within a one-mile radius of the Site is currently not being used. Recent work performed by Beazer as part of the Verification of the Groundwater Fate and Transport Evaluation further verified that shallow groundwater is not currently being used within a one-mile radius of the Site and is extremely unlikely to be used in the future. There is no data to conclusively determine that the plume has not migrated further offsite, hence there is uncertainty as to whether the remedy is protective of human health and the environment in the future. However, the annual deep groundwater monitoring performed by Beazer continues to demonstrate that the deeper aquifers beneath the Site have not been impacted.

- *Changes in Toxicity and Other Contaminant Characteristics:* There have been no significant changes in toxicity factors or other contaminant characteristics, therefore the protectiveness of the remedies still remain. (That protectiveness will be re-evaluated if the plume has migrated further off-site to a point of exposure.)
- *Changes in Risk Assessment Methodologies:* Risk assessment methodologies have not changed significantly since the time of the amended ROD, and therefore the protectiveness of the remedies still remain. (That protectiveness will be re-evaluated if the plume has migrated further off-site to a point of exposure.)

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

- No additional information has been identified that would call into question the protectiveness of the soil and ground water remedies other than those uncertainties regarding the further migration of DNAPL and the off-site plume. However, worker protection must be considered during construction of portions of the Hardy Toll Road and along Collingsworth as subsurface work will provide a short-term duration for exposure for contaminated ground water. Level C protective clothing is recommended. In addition, care must be taken during construction to not create any conduits or pathways for migration of DNAPL to the deeper aquifers. These considerations will be discussed with both the City of Houston and the Toll Road Authority.

10. Issues

A couple of minor issues were discovered during the five-year review which are not sufficient to warrant a finding of not protective as long as the recommended actions are taken. Beazer and the property owners should continue to maintain the concrete caps serving as truck parking. Any change should be noted and discussed with EPA. As both caps are currently in good condition, this is not listed as a deficiency; current and future protectiveness will be ongoing unless significant changes are noted.

The portion of the perimeter fencing which is down in the northeast corner should be repaired to further secure the Site, particularly the ground water collection and treatment systems. However, this Site is patrolled on a 24-hour basis. Contaminated soils are contained under two concrete cap areas. Although this is identified as the only deficiency, current and future protectiveness of the remedies are not at issue.

Monitoring and ground water extraction to contain the dissolved phase has been delayed pending re-evaluation of the remedial action for ground water at the Site, as per the agreement between EPA and Beazer. Reasonable interpretation of the most recent ground water data indicates off-site migration of the DNAPL at the southwest corner and south boundary, however there is not adequate monitoring information to verify if further migration has occurred. The remedy is protective in the short-term, but future protectiveness is uncertain pending additional information on the location of the DNAPL and the leading edge of the plume and the relative rate of migration.

11. Recommendations and Follow-up Actions

The following recommendations and follow-up actions are the result of this final five-year review:

- EPA recommends that the property owners proceed with the inspection and repair of cracks and joint systems as required to maintain the structural integrity of the entire existing paving system. Beazer is responsible for continuing annual cap inspections (next inspection due November 2002) and will discuss any changes with the property owners which may eventually impact protectiveness of the remedy.

Follow-up Action: Property Owners and Beazer

Oversight Agency: EPA Region 6

Action ensures continued protectiveness.

- EPA recommends follow-up to the Beazer submittal supporting a natural attenuation alternative remedial action for ground water. As part of this discussion, ground water monitoring should be reinstated as appropriate.

Follow-up Action: EPA to provide comments to Beazer by October 1, 2002.

Follow-up Action: Discussion with Beazer, EPA, TCEQ by November 1, 2002.

Monitoring and extraction well start-up to be included in discussion. The potential for further off-site migration of DNAPL and the ground water plume will also be further evaluated and addressed within a two year time frame.

Action ensure future protectiveness.

- EPA recommends continued discussions with the City of Houston and the Harris County Toll Road Authority on potential Site impacts to be considered in construction of the toll road expansion. Worker exposure is expected to be of a short-term duration. Precautions should be taken during construction to prevent the creation of migration pathways to the deeper aquifers.

Follow-up Action: Organize a joint meeting to include the Site Responsible Party, TCEQ, EPA, the City of Houston, and the Toll Road Authority. A meeting is tentatively scheduled for the October/November 2002 time frame.

Action ensures protectiveness for a short-term exposure scenario and future protection of deeper aquifers.

- EPA recommends perimeter fence repairs (NE corner) to further secure the site.

Owner responsible for repairs.

Action ensures site security.

Follow-up Action: Verify property ownership for Nations Way tract.

Follow-up Action: Letter to the property owner by October 1, 2002.

Action further enhances site security.

- EPA recommends the evaluation of the current monitoring plan for deep wells LCW-01 and DW-02 and NPDES monitoring requirements for the treatment plant surface discharge.

12. Protectiveness Statement

This five-year review for the South Cavalcade Street Site indicates that the remedial actions implemented at the Site will remain protective of human health and the environment in the short-term. Institutional controls have been established at the Site to ensure that future use of the Site remains non-residential and to prohibit on-site groundwater use. Current information shows that shallow ground water is not currently being used in the vicinity of the Site and the deeper ground water has not been impacted by site-related constituents. Furthermore, site security restricts property access to authorized personnel, which will be further improved as the perimeter fence is repaired.

The concrete cap eliminates any potential for direct contact with impacted soil. The long-term O&M plan for the concrete cap will ensure that the potential for future exposure to underlying soil is eliminated. The concrete cap ensures current and future protection of human health and the environment.

The DNAPL recovery and ground water treatment systems are operating effectively to reduce the contaminant source over time. Current information shows that shallow ground water is not currently being used in the vicinity of the Site and the deeper ground water has not been impacted by site-related constituents. The ground water remedy can be considered protective for the short-term, however future protectiveness is uncertain due to the possibility of further off-site migration of the plume to the south and southwest *and* the absence of data to confirm whether or not migration is continuing. These uncertainties will be evaluated and any necessary actions taken to ensure future protectiveness within the next two years.

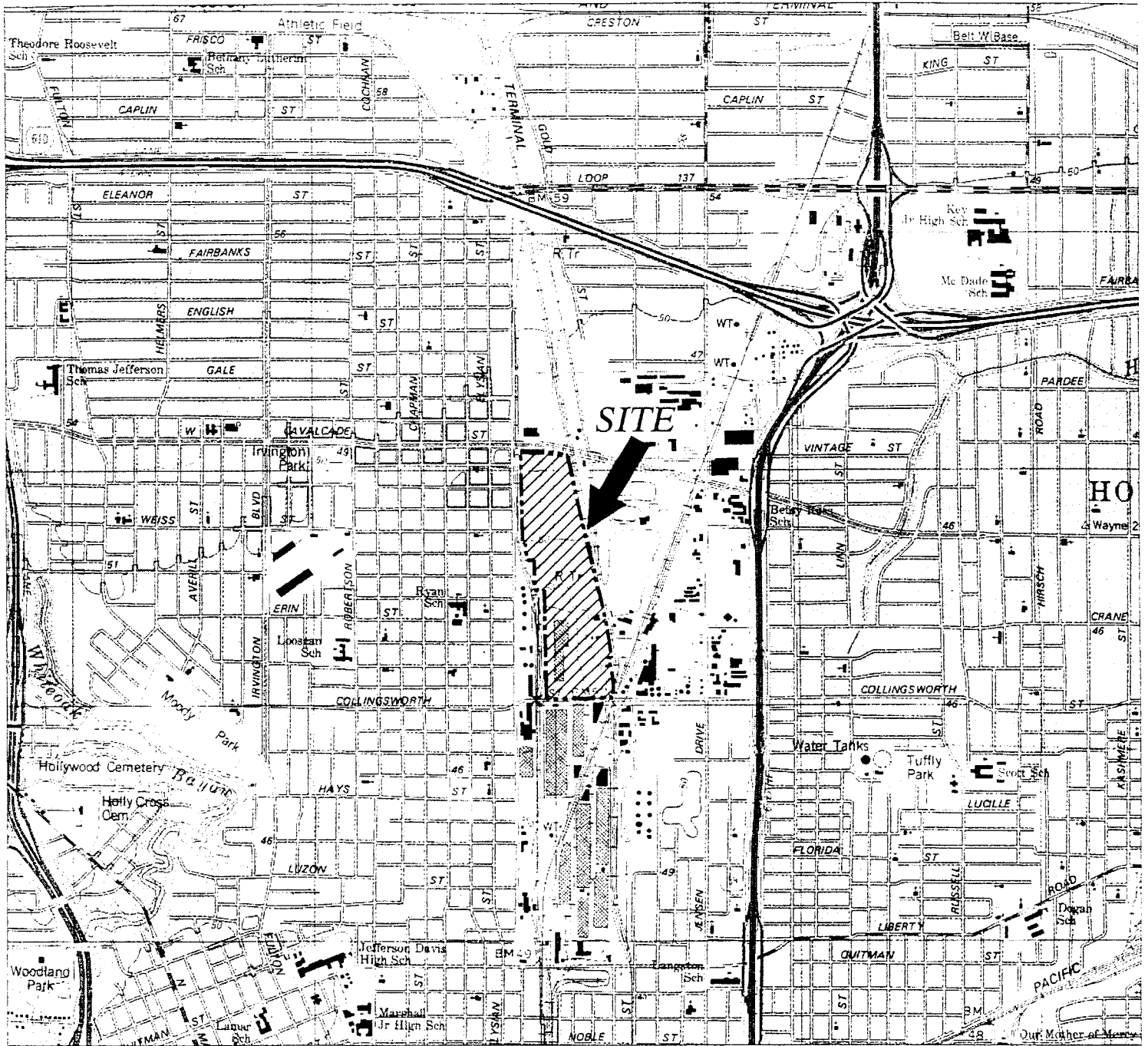
13. Next Review

This is a statutory review that requires ongoing five-year reviews. The next review will be conducted within five years of the completion of this five-year review report. The completion date is the date of the signature shown on the summary of findings page attached to the cover sheet.

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Figures

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QUADRANGLE LOCATION

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF SEVENCAST, TEXAS - 1982

ISSUE DATE:

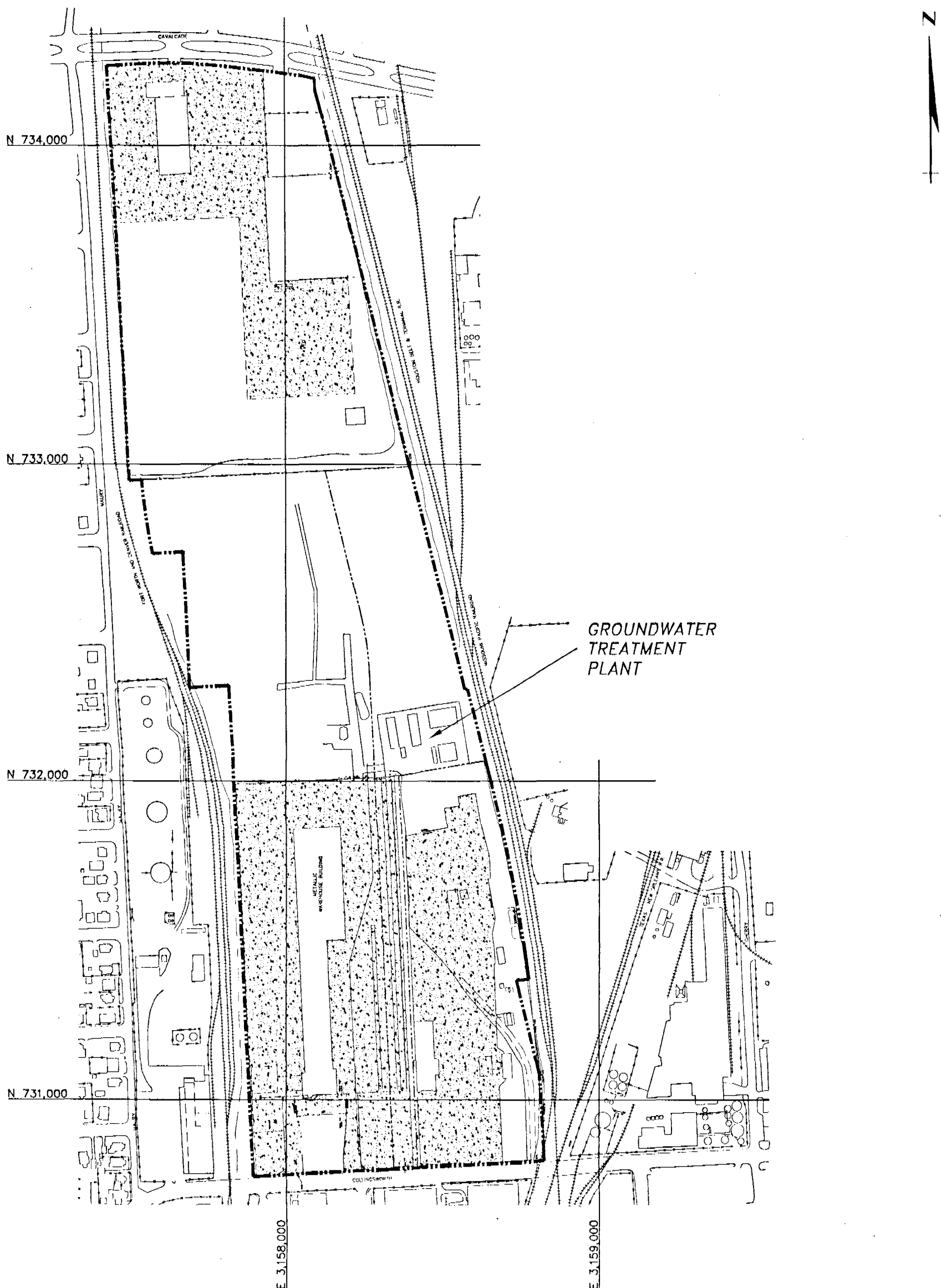
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRAWN: MEL DATE: 4/12/00
 CHKD: JSZ DATE: 4/12/00
 APPD: JSZ DATE: 4/12/00
 SCALE: 1" = 2000'

FIVE YEAR REVIEW REPORT
 SOUTH CAVALCADE SUPERFUND SITE
 BEAZER EAST, INC.
 HOUSTON, TEXAS

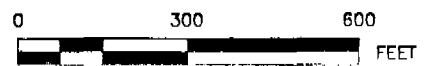
SITE LOCATION MAP

DRAWING NUMBER
00-019
FIGURE 1



LEGEND:

- SOUTH CAVALCADE SITE BOUNDARY
- PROPERTY BOUNDARIES
- AREAS COVERED WITH ASPHALT OR CONCRETE



BEAZER EAST, INC. PITTSBURGH, PENNSYLVANIA	
DRAWN: MEL	DATE: 4/12/00
CHKD: JSZ	DATE: 4/12/00
APPD: JSZ	DATE: 4/12/00
SCALE: AS SHOWN	
FIVE YEAR REVIEW REPORT SOUTH CAVALCADE SUPERFUND SITE BEAZER EAST, INC. HOUSTON, TEXAS	
SITE PLAN	DRAWING NUMBER 00 018 FIGURE 2

REV #	DATE	DESCRIPTION	APPD
△			
△			
△			

ISSUE DATE:

18804357.012 DRAWINGS\FINAL\5YEAR_REV\FIGURES.DWG

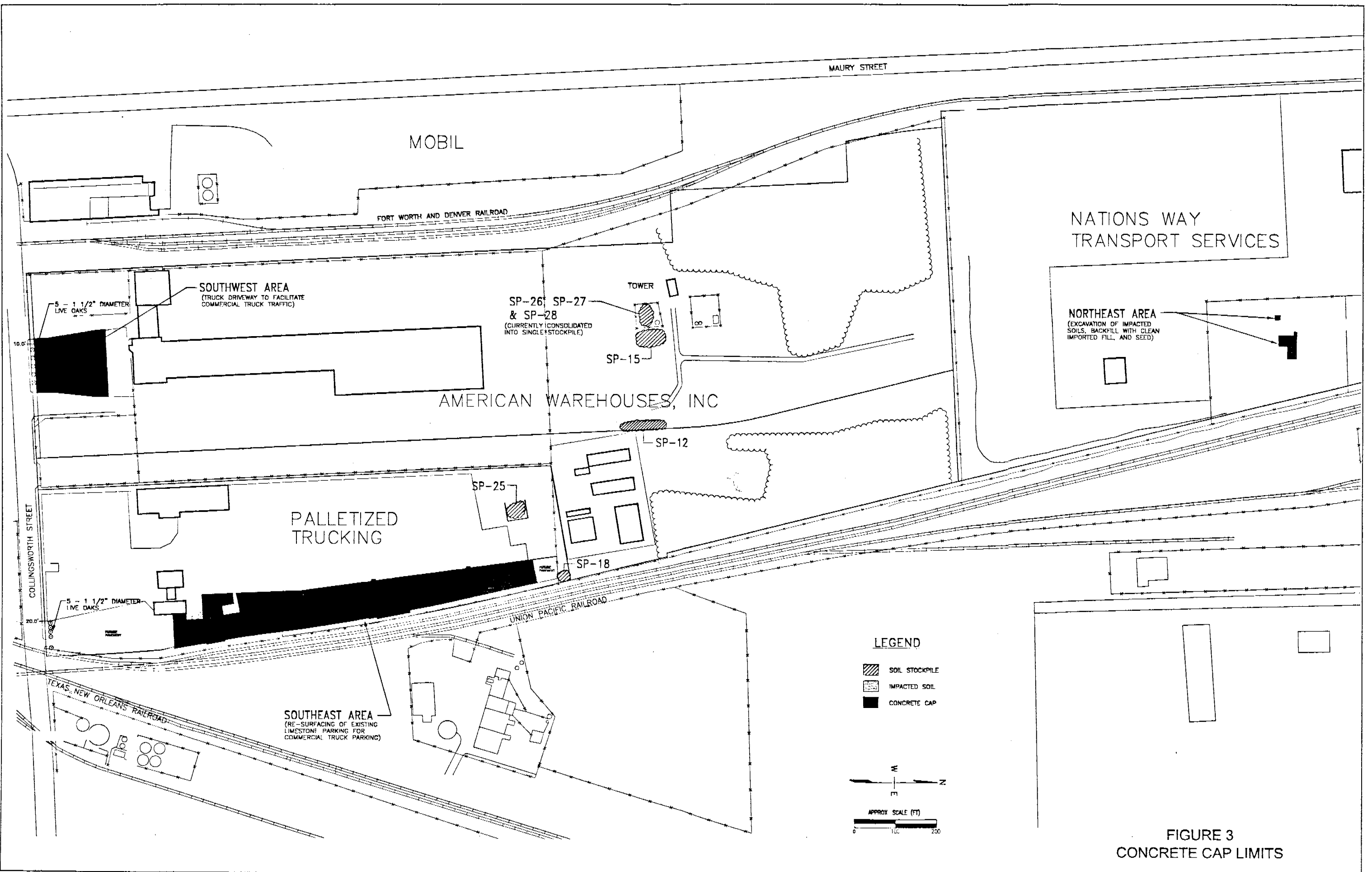
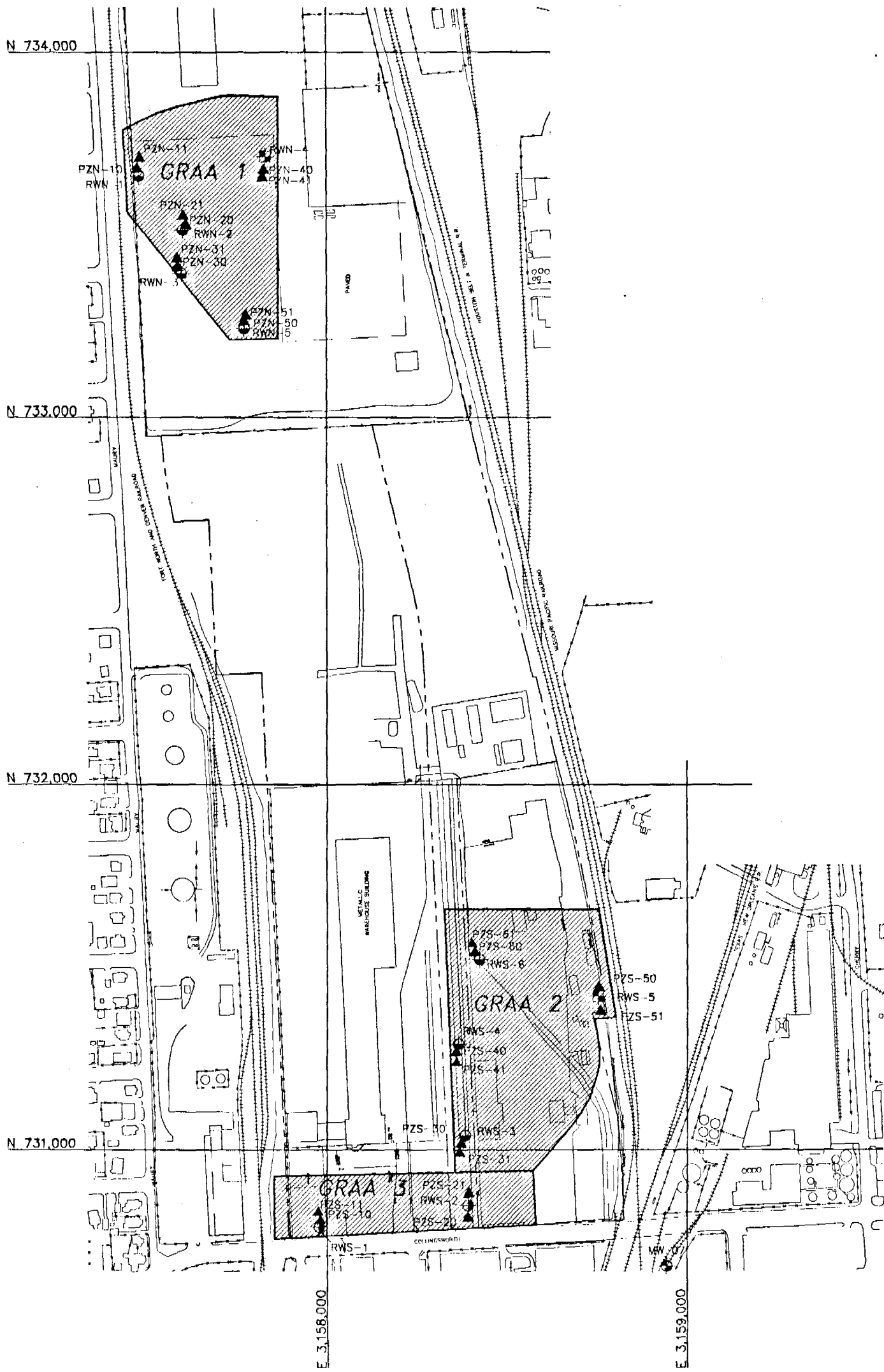
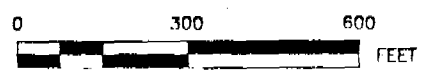


FIGURE 3
CONCRETE CAP LIMITS



LEGEND:

GROUNDWATER EXTRACTION WELL (FOR HYDRAULIC CONTAINMENT)	PIEZOMETER LOCATION
DNAPL AND GROUNDWATER EXTRACTION WELL (FOR HYDRAULIC CONTAINMENT AND SOURCE CONTROL)	GROUNDWATER REMEDIAL ACTION AREA (GRAA)
DNAPL RECOVERY WELL LOCATION (FOR SOURCE CONTROL)	



**BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA**

DRAWN: MEL	DATE: 4/12/00
CHKD: JSZ	DATE: 4/12/00
APPD: JSZ	DATE: 4/12/00
SCALE:	AS SHOWN

FIVE YEAR REVIEW REPORT
SOUTH CAVALCADE SUPERFUND SITE
BEAZER EAST, INC.
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD	ISSUE DATE:

GROUNDWATER AND DNAPL RECOVERY SYSTEM

DRAWING NUMBER
00-018
FIGURE 4

South Cavalcade Street Site
Houston, Texas (Harris County)

First Five-Year Review
September 2002

Attachments

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Attachment 1: Documents Reviewed

Baptist Foundation of Texas, April 17, 1995. *Assignment and Assumption of Access Agreement*. Dallas, Texas.

Bechtel Environmental, Inc., March 1992. *Remedial Design Work Plan, South Cavalcade Site*. Houston, Texas.

Chester Environmental, July 1994. *90 Percent Design Report Groundwater Treatment System: South Cavalcade Street Site*. Houston, Texas.

Dames & Moore, August 1999. *Final Remedial Action Work Plan: South Cavalcade Street Site*. Houston, Texas.

Dames & Moore, January 27, 1993. *Draft Operations Plan: South Cavalcade Street Site*. Houston, Texas.
Key Environmental, Inc., August 1995. *Groundwater Extraction System Performance Monitoring Plan, South Cavalcade Superfund Site*. Houston, Texas.

Gowan, Inc., *Plant Operations Plan: South Cavalcade Street Site*. Houston, Texas.

Key Environmental, Inc., August 1997. *Groundwater Fate and Transport Evaluation Report, South Cavalcade Superfund Site*. Houston, Texas.

Key Environmental, Inc., July 2000. *Verification of Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site*. Houston, Texas.

Keystone Environmental Resources, Inc., July 1988. *Final Report - Remedial Investigation, South Cavalcade Site*. Houston, Texas.

Keystone Environmental Resources, Inc., August 1988. *Feasibility Study, South Cavalcade Site*. Houston, Texas.

McLaren/Hart Environmental Engineering Corporation, December 1994. *100% Remedial Design for the Groundwater Collection and ReInjection System and Dense Non-Aqueous Phase Liquid Recovery System, South Cavalcade Superfund Site*. Houston, Texas.

U.S. EPA, September 1988. *Record of Decision (ROD), South Cavalcade Street Site*. Houston, Texas.

U.S. EPA, November 1991. *A Guide to Principal Threat and Low Level Threat Wastes*. "USEPA, Office of Solid Waste and emergency Response (OSWER) Directive No. 9380.3FS.

U.S. Environmental Protection Agency, March 1991. *South Cavalcade CERCLA ROD/RA Consent Decree, Civil Action No. H-90-2406*.

U.S. Environmental Protection Agency, July 1992. *Administrative Order on Consent. CERCLA Docket No. 6-08-92.*

U.S. Environmental Protection Agency, October 6, 1995. *South Cavalcade Street Superfund Site Groundwater Exposure Assessment Work Plan, September 1996, EPA Review Comments.*

U.S. Environmental Protection Agency, July 31, 1995. *Memorandum from Elliot Laws, Assistant Administrator, to Regional Administrators Region I - X Regarding Superfund Groundwater RODs: Implementing Change This Fiscal Year.*

U.S. EPA, June 27, 1997. *CERCLA Amended Record of Decision No. 1 for South Cavalcade Street Site, Houston, Harris County, Texas.*

Attachment 2
Interview Record Forms

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INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Charles Roosevelt	NA	City of Houston	5/18/00
Name	Title/Position	Organization	Date
Earl Hamilton	Security Supervisor	Sanjac Security Spec.	8/7/02
Name	Title/Position	Organization	Date
Paul Kilchenstein	Region Plant Manager	RETEC, Inc.	8/7/02
Name	Title/Position	Organization	Date
Michael Bollinger	Manager, Remediation	Beazer East, Inc.	8/7/02
Name	Title/Position	Organization	Date
Carol Dye	Project Manager	TCEQ	8/7/02
Name	Title/Position	Organization	Date
Bobbie Tallent	Community Advocate	Fifth Ward Community Services	8/13/02
Name	Title/Position	Organization	Date

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INTERVIEW RECORD		
Site Name: South Cavalcade Street		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Review		Time: 1:30 pm Date: 5/18/00
Type: <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> Visit <input type="checkbox"/> Other		<input type="checkbox"/> Incoming <input checked="" type="checkbox"/> Outgoing
Location of Visit: NA		
Contact Made By:		
Name: Noel Bennett	Title: EPA Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Charles Roosevelt	Title: NA	Organization: City of Houston
Telephone No: NA Fax No: NA E-Mail Address: NA	Street Address: City of Houston, Texas Department of Health and Human Services	
Summary Of Conversation		
<p>Mr. Roosevelt was contacted during the initial draft five-year review period. Mr. Roosevelt works for the Department of Health and Human Services in the Environmental Health Division, Bureau of Public Health Engineering. He was unaware of any specific issues or public comments raised with regards to the Site. He did however describe the appropriate protocol for residents of Houston to voice their concerns about the site and mentioned that if necessary a review of the City's records could be made. He state that due to the current and future use of the site as an industrial trucking facility, public comment would likely be limited. When informed of the types of access restrictions and level of institutional controls in place at the site, he responded that they seemed to be in accordance with the requirements of the site.</p>		

INTERVIEW RECORD		
Site Name: South Cavalcade Street Superfund Site		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Review		Time: 1:30 pm
Date: 8/7/02		
Type: Telephone <input checked="" type="checkbox"/> Visit Other Location of Visit: On-Site; Water Treatment Plant Office		
Contact Made By:		
Name: Camille Hueni	Title: Remedial Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Paul Kilchenstein	Title: Regional Plant Manager	Organization: RETEC, Inc.
Telephone No: (603) 880-8345 Fax No: (603) 880-0225 E-Mail Address: pkilchenstein@retec.com		Street Address: Field Office, P.O. Box 3485 City, State, Zip: Nashua, NH 03061
Summary Of Conversation		
<p>Mr. Kilchenstein indicated that the treatment plant is performing as expected; the only recent modification was to add a filter component in the treatment process to reduce ammonia in the effluent, prior to discharge. There is an O&M presence on site daily (Jeff Gillman); any problems or damage to the system is reported to John Helton or Rita Bauer.</p> <p>Again, the only modification to system outside of routine maintenance over the last two years was to eliminate minor ammonia exceedances in the plant effluent. The overall protectiveness or effectiveness of the ground water remedy was not impacted. There have been no unexpected O&M difficulties or costs since start-up. Although there have not been formal plans to optimize the system, RETEC is always looking to optimize O&M to save cost without sacrificing system efficiency. Discharge criteria are being met and the treatment plant is performing as planned, treating 2 gallons per minute of ground water, or approximately 3000 gallons per day.</p>		

INTERVIEW RECORD		
Site Name: South Cavalcade Street Superfund Site		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Reviews		Time: 10:00 am Date: 8/7/02
Type: Telephone <input checked="" type="checkbox"/> Visit Other		
Location of Visit: On-site; Treatment Plant Office		
Contact Made By:		
Name: Camille Hueni	Title: Remedial Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Earl Hamilton	Title: Security Supervisor	Organization: Palletized Trucking
Telephone No: (713) 446-7500	Sanjac Security Specialists	
Fax No: (713) 446-9183	Street Address: P.O. Box 654	
E-Mail Address: NA	City, State, Zip: Humble, Texas 77338	
Summary Of Conversation		
<p>Mr. Hamilton has been with the site security staff for the last nine years. When he first started working at this location, vandalism was a problem. However, that stopped about five years ago as security was tightened. Access is monitored 24 hours/7 days a week. [Mr. Hamilton drove up to my car less than a few minutes after I had parked at the Palletized Trucking offices. Others in our inspection team had the same experience.] Site Security is the first line of communication for any problems with the collection system or plant. Contact information for RETEC, the O&M site manager, is kept at the office trailers at the treatment plant. If any problems are detected with any portion of the ground water collection and treatment system, RETEC personnel are contacted. The treatment plant and office is secured with additional fencing.</p> <p>Mr. Hamilton had a concern about a portion of the perimeter fencing that was in ill-repair. That section of the fence was located on the northeastern corner of the property, extending about from Cavalcade Street south about 70 yards. The fence had fallen partially over and was very overgrown with weeds. The fence separates the portion of the site property owned by NW Transport Service, Inc., from the adjacent rail right-of-way. Site access is partially limited by the amount of undergrowth; however, the perimeter fencing would lend additional security to the site.</p>		

INTERVIEW RECORD		
Site Name: South Cavalcade Street Superfund Site		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Reviews		Time: 1:45 pm Date: 8/7/02
Type: Telephone <input checked="" type="checkbox"/> Visit Other		
Location of Visit: On-site; Treatment Plant Office		
Contact Made By:		
Name: Camille Hueni	Title: Remedial Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Michael Bollinger	Title: Remediation Manager	Organization: Beazer East, Inc.
Telephone No: (412) 208-8864 Fax No: (412) 208-8869 E-Mail Address: bollinger@hansonle.com	Street Address: One Oxford Centre, Suite 300 City, State, Zip: Pittsburgh, PA	
Summary Of Conversation		
<p>Mr. Bollinger indicated that the soil remedy is functioning as expected; caps are being utilized for truck parking, providing an example of successful reuse. DNAPL collection and treatment systems are performing as expected. Gradient enhanced extraction has been successful in reducing the contaminant source. Ground water monitoring was temporarily discontinued by EPA concurrence, pending re-evaluation of original remedial goals. The only modification at the Site was the installation of additional filtering equipment to address discharge exceedances recurring for ammonia. The ground water treatment system has been on-line since September 1995; current monitoring may be excessive. Request that frequency of monitoring be re-evaluated. Beazer has asked the O&M contractor to look at how ground water system can be optimized. In general, Mr. Bollinger is encourage by Beazer's MNA demonstration for the Site and is hopeful that this approach will lead to more cost-effective, yet protective remedy. He was not aware of any community concerns regarding the site or its operation or administration. He commented that the soil remedy was constructed to allow the site to be fully utilized by the on-site businesses, and noted that the on-site expansion of the American Warehouse facility is a good sign that businesses have not been adversely impacted (expansion occurred about a year ago). He was not aware of any incidents of vandalism, or complaints, requiring a response from his office.</p> <p>There is an O&M on-site presence during business hours and frequent communication between the field office, the Beazer office, and the RI/IEC office. The remedial goals of the 1988 ground water ROD are being revisited. Beazer has submitted information to support a natural attenuation application. However, this is due to a longstanding discussion with EPA, and is an alternative discussed in the original ROD. Mr. Bollinger requested that we discuss their proposal as soon as possible as it may be appropriate to modify the ROD accordingly. Ground water monitoring, and extraction to control further migration of the ground water dissolved phase, has been delayed since 1995 pending this re-evaluation. Beazer has continued to monitor deeper aquifers immediately to the southwest and have consistently reported no impact at the ~200 foot level. Existing institutional controls appear to be adequate. When property transfers, new owners understand the restrictions for the site. Case in point, when Baptist Foundation sold their tract to Nation's West Transport, Beazer was notified that the new owners had agreed to the provisions of the Access Agreement.</p>		

Individual Contacted:		
Name: Michael Bollinger, cont.	Title:	Organization:
Telephone No: See information on previous page. Fax No: E-Mail Address:	Street Address: City, State, Zip:	
Summary Of Conversation		
<p>[Continued from previous page.]</p> <p>Mr. Bollinger noted that the widening of Collingsworth and the expansion of the Hardy Toll Road along the western boundary of the site will potentially impact the site. Plans to date indicate that the caps will not be disturbed; however, workers along the western and southern boundaries may come into contact with contaminated ground water. Beazer has been sharing information with the City of Houston Collingsworth Street project staff. We discussed that coordination between the Harris Co. Toll Road Authority, Beazer, EPA, and TCEQ will also be necessary during the current planning stage, well in advance of actual construction.</p>		

INTERVIEW RECORD		
Site Name: South Cavalcade Street Superfund Site		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Review		Time: 2:15 pm
Type: Telephone <input checked="" type="checkbox"/> Visit Other		Date: 8/7/02
Location of Visit: On-site; Treatment Plant Office		
Contact Made By:		
Name: Camille Hueni	Title: Remedial Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Carol Dye	Title: Project Manager	Organization: TCEQ
Telephone No: (512) 239-1504	Street Address: 12100 Park 35 Circle	
Fax No: (512) 239-2450	City, State, Zip: Austin, Texas 78711-3087	
E-Mail Address: cdye@tceq.state.tx.us		
Summary Of Conversation		
<p>Ms. Carol Dye is a Project Manager in the Superfund Division, Texas Commission on Environmental Quality, and joined the South Cavalcade Street project after the completion of the soil remedy (construction of the concrete cap). Ms. Dye has concerns about the potential for off-site migration of the ground water contaminant plume off the southwest corner of the property; extent may not be fully defined. She wants to look further into a potential "channel effect" to the east and off the west boundary, in the southern section of the site. Because of the potential for off-site migration, she also has concerns about the construction work along Collingsworth. Has a notice been filed with the City? What is the City aware of, with regard to the Site? Although, there are off-site issues that should be evaluated when we reconsider remedial goals, Ms. Dye also said that concentrations appeared to be decreasing and that there is no known exposure pathway. At this point, we are not expecting any change in risk-based action levels. The remedy is functioning as expected, although the above points should be noted. However, further evaluation of the ground water and the potential for off-site migration may result in a change to the ROD.</p> <p>A vertical off-set in the concrete drive just the east boundary of the southwest cap was noted during the site inspection. Not long after construction on the site was completed in July 2000, a water pipe broke in this area and may have washed out some of the soil under the driveway. Ms. Dye suggested that the cap be monitored for any signs of settling, or cracking, as related to that event.</p> <p>Based on the low DNAPL collection rate, Ms. Dye would also like to investigate if the system can be optimized to increase the rate of DNAPL extraction. She is not aware of any community concerns other than the fact that the Toll Road expansion will potentially impact the site. We discussed how best to coordinate with the Hardy Toll Road Authority, Beazer, and EPA/TCEQ project managers for both the South and North Cavalcade Sites. As far as ongoing communication, TCEQ has been receiving the NPDES monitoring reports and Quarterly Progress Reports. She is not aware of any complaints, violations, or other incidents reported for the Site. Institutional controls on-site are adequate; what notices are in place to notify the City if there is off-site migration?</p>		

INTERVIEW RECORD		
Site Name: South Cavalcade Street Superfund Site		EPA ID No.: TXD980810386
Subject: Site Status/Five-Year Review		Time: 4:00 pm Date: 8/13/02
Type: <input checked="" type="checkbox"/> Telephone Visit Other		Incoming <input checked="" type="checkbox"/> Outgoing
Location of Visit:		
Contact Made By:		
Name: Camille Hueni	Title: Remedial Project Manager	Organization: EPA Region 6
Individual Contacted:		
Name: Bobbie Tallent	Title: Community Advocate	Organization: Western Fifth Ward Community Services
Telephone No: NA (personal no.)	Western Fifth Ward Community Services	
Fax No: —	Street Address: 1819 Semmes	
E-Mail Address: NA	City, State, Zip: Houston, Texas 77026	
Summary Of Conversation		
<p>Ms. Tallent is with the Western Fifth Ward Community Services, Urban Environmental Education Center, and has been involved in the community adjacent to the South Cavalcade Street Site for many years. In her work with the Urban Environmental Education Center, Ms. Tallent has worked with Crawford Elementary teachers to develop environmental projects for each class and has provided environmental training programs for area civic groups.</p> <p>Ms. Tallent emphasized that there is not a lack of interest of the part of Western Fifth Ward community in local environmental issues, but rather a lack of awareness about the businesses to the east and environmental issues in general. The area has been very transitional in the past, but recently is stabilizing as more families purchase and remodel homes in the area. This is an area that would be benefitted by more outreach on environmental issues.</p> <p>The Western Fifth Ward (west of Elysian/Hardy Streets and the S. Cavalcade site) is a predominantly Hispanic community, but contains a strong African-American community as well. She noted that the bilingual notice [published August 8, 2002], would reach more Hispanic community members. She offered to assist in future meetings regarding Site activities for both the South and North Cavalcade Site. Again, she knew of no community issues specific to the South Cavalcade Superfund Site, but then she thought that the community could be better informed.</p>		

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South Cavaleade Street Site
Houston, Texas (Harris County)

First Five-Year Review
September 2002

Attachment 3

Five-Year Review Site Inspection Checklist

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3. **Local regulatory authorities and response agencies** (i.e. State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency: TCEQ (Texas Commission on Environmental Quality
 Contact: Carol Dye Superfund Project Manager 8/7/02 (512) 239-1504
 Name Title Date Phone no.
 Problems; suggestions: Report - interview record attachment.

Agency: Palletized Trucking; Sanjac Security Specialists, Inc.
 Contact: Earl Hamilton Security Supervisor 8/7/02 (713) 446-7500
 Name Title Date Phone no.
 Problems; suggestions: Report - interview record attachment.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

<input checked="" type="checkbox"/> O&M manual	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> As-built drawings	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Maintenance logs	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A

Remarks: All materials including emergency contact information is kept at the O&M offices at the Ground Water Treatment Plant.

2. **Site-Specific Health and Safety Plan** Readily available Up to date N/A
 Contingency plan/emergency response plan Readily available Up to date N/A
 Remarks: None.

3. **O&M and OSHA Training Records** Readily available Up to date N/A
 Remarks: None

4. **Permits and Service Agreements**

<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
<input checked="" type="checkbox"/> Effluent discharge	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
<input type="checkbox"/> Other permits _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A

Remarks: None

5. **Gas Generation Records** Readily available Up to date N/A
 Remarks: _____

6. **Settlement Monument Records** Readily available Up to date N/A
 Remarks: _____

7. **Groundwater Monitoring Records** Readily available Up to date N/A
 Remarks: DNAPL vol.; Ground water volumes; Field information is also compiled and retained by RETEC at their New Hampshire office; Information reported in Quarterly Progress Reports, submitted by Beazer East, Inc.

8.	Leachate Extraction Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	x N/A
Remarks: _____				
9.	Discharge Compliance Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input type="checkbox"/> Air <input checked="" type="checkbox"/> Water (effluent)		<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
Remarks: Quarterly monitoring reports submitted by Beazer East, Inc.				
10.	Daily Access/Security Logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	x N/A
Remarks: Site security is monitored 24-hour/7 day basis; site is secured with perimeter fencing; treatment plant is secured with additional fencing.				
IV. O&M COSTS				
1.	O&M Organization	<input type="checkbox"/> State in-house	<input type="checkbox"/> Contractor for State	
<input checked="" type="checkbox"/> PRP in-house		<input checked="" type="checkbox"/> Contractor for PRP - Provides support for Beazer East, Inc.		
<input type="checkbox"/> Federal Facility in-house		<input type="checkbox"/> Contractor for Federal Facility		
<input type="checkbox"/> Other _____				
2.	O&M Cost Records	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	
<input type="checkbox"/> Funding mechanism/agreement in place				
Original O&M cost estimate: NA <input type="checkbox"/> Breakdown attached				
Total annual cost by year for review period if available:				
From 1/1/98 to 12/31/98		\$84,000 Total cost	<input type="checkbox"/> Breakdown attached	
From 1/1/99 to 12/31/99		\$92,000 Total cost	<input type="checkbox"/> Breakdown attached	
From 1/1/00 to 12/31/00		\$104,000 Total cost	<input type="checkbox"/> Breakdown attached	
From 1/1/01 to 12/31/01		\$108,000 Total cost	<input type="checkbox"/> Breakdown attached	
From 1/1/02 to 6/30/02		\$49,000 Total cost	<input type="checkbox"/> Breakdown attached	
3.	Unanticipated or Unusually High O&M Costs During Review Period: None			
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A				
A. Fencing				

1. **Fencing damaged** Location shown on site map Gates secured N/A
 Remarks: Perimeter fence from NE corner south about 70 yds. is partially down and overgrown.
 Recommend that property owner be notified for repairs. Site security is not obviously compromised as 24-hour security patrol is very effective.

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
 Remarks: Site is actively used by three trucking companies. Security is controlled by fencing and patrols.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
 Site conditions imply ICs not properly implemented Yes No N/A
 Site conditions imply ICs not being fully enforced Yes No N/A

Type of monitoring (*e.g.*, self-reporting, drive by): 24-hr/7-days security; O&M onsite monitoring during business hours; collection and treatment system equipped with low-high security level alarms.
 Frequency: Above
 Responsible party/agency: O&M On-site personnel
 Contact: Jeff Gillman Site Contact, RETEC

Reporting is up-to-date Yes No N/A
 Reports are verified by the lead agency Yes No N/A

Specific requirements in deed or decision documents have been met Yes No N/A
 Violations have been reported Yes No N/A
 Other problems or suggestions: No violations to date.

2. **Adequacy** ICs are adequate ICs are inadequate N/A
 Remarks: _____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident

2. **Land use changes on site** N/A
 Remarks: Land continues as industrial site as trucking facilities for 3 companies.

3. **Land use changes off site** N/A
 Remarks: The Hardy Toll Road expansion is planned for the rail right-of-way adjacent to the west boundary of the site. A detention pond is included in preliminary designs for the a portion of the central area of the Site.

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequatex N/A
B. Other Site Conditions			
Remarks: Site conditions were generally good. Areas were cleared at the monitoring wells.			
VII. SOIL COVERS (Concrete Cap) x Applicable <input type="checkbox"/> N/A			
A. Landfill Surface NA/ Concrete Caps cover contaminated soils in the southeast and southwest areas. Caps are reinforced to highway standards and are being used for truck parking.			
1.	Settlement (Low spots) Areal extent _____	<input type="checkbox"/> Location shown on site map Depth _____	x Settlement not evident
2.	Cracks Lengths _____ Widths _____ Depths _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Cracking not evident
Remarks: Cracking not significant; a few minor surficial cracks associated with curing. Condition will be monitored on PRP annual inspections. *A vertical off-set in a driveway joint adjacent to the east boundary of the southwest cap was noted during the site inspection and is most likely related to a break in a water piper, and washout, after the cap was completed. Off-set was approximately 3 vertical inches at the maximum point.			
3.	Erosion Areal extent _____	<input type="checkbox"/> Location shown on site map Depth _____	x Erosion not evident
Remarks: See above note about suspected washed-out adjacent to the southwest cap.			
4.	Holes	<input type="checkbox"/> Location shown on site map	x Holes not evident
5.	Vegetative Cover: NA		
6.	Alternative Cover (concrete, etc.)	<input type="checkbox"/> N/A	
Remarks: See all the above comments. Concrete cap in good condition at both southeast and southwest locations.			
7.	Bulges	<input type="checkbox"/> Location shown on site map	x Bulges not evident
8.	Wet Areas/Water Damage Remarks: Not directly applicable. See 2.		
9.	Slope Instability	<input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map	x No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable x N/A			
C. Letdown Channels <input type="checkbox"/> Applicable x N/A			

D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A Stormwater inlets in good condition.	
E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
F. Cover Drainage Layer <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
G. Detention/Sedimentation Ponds <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
H. Retaining Walls <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
I. Perimeter Ditches/Off-Site Discharge <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance
3.	Spare Parts and Equipment <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input checked="" type="checkbox"/> Oil/water separation (DNAPL separation) <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input checked="" type="checkbox"/> Carbon adsorbers <input checked="" type="checkbox"/> Filters: Green Sand filters, ammonia filter <input checked="" type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> Sampling ports properly marked and functional <input checked="" type="checkbox"/> Sampling/maintenance log displayed and up to date <input checked="" type="checkbox"/> Equipment properly identified <input checked="" type="checkbox"/> Quantity of groundwater treated daily: 3000gallons/day Remarks _____ _____

<p>Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.):</p> <p>The soil remedy, a concrete cap in over two areas of contaminated soil (southeast and southwest) was constructed to serve as truck parking, but it effectively provides a barrier to contaminated soils and eliminates surface infiltration to ground water. The remedy is effective and functioning as designed.</p> <p>The ground water DNAPL collection and treatment facility is operating as expected, and is successfully extracting source DNAPL. The monitoring component and extraction system to minimize off-site migration has been temporarily suspended pending re-evaluation of the remedial approach and goals. Natural attenuation is being considered, which is an alternative action under the 1988 ROD. The remedy, however, is designed to extract DNAPL and provide containment for off-site migration. One component is active, another is pending.</p>
<p>B. Adequacy of O&M</p>
<p>Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.</p> <p>O&M procedures are in place and ensuring that contaminated soils will be contained for long-term protection and that DNAPL will be collected to reduce the ground water contaminant source, and that process water will be properly treated before discharge to drainage ditches.</p> <p>Site security is very effective, but could be reinforced by repairing the perimeter fence at the northeast corner.</p>
<p>C. Early Indicators of Potential Remedy Problems</p>
<p>Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.</p> <p>There are no early indications that the ground water collection and treatment system or the concrete cap will fail or compromise protectiveness of the remedy in the future. Routine maintenance ensures that the ground water system is running smoothly and that treatment can accommodate expected volumes.</p>
<p>D. Opportunities for Optimization</p>
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <p>Beazer East, Inc. has requested that we re-evaluate the frequency of both the treatment system effluent and the monitoring of the deep aquifer off-site wells. This will be considered. Remedy optimization will also be considered as the remedial ground water goals are re-evaluated, after monitoring is re-established and trends in concentrations evaluated.</p>

Attachment 4
Site Inspection Photographs

South Cavalcade Street Site
Houston, Texas (Harris County)

First Five-Year Review
September 2002

South Cavalcade First Five Year Review



View looking north from access gate on eastern boundary of South Cavalcade Site to South Cavalcade Street. Note that fencing along eastern boundary is down; beyond this area is the railroad right-of-way.



This view is taken from South Cavalcade Street looking south down the eastern boundary of the Site. Note the eastern fence line is completely or partially down. The fence is partially down beyond the gate as well; access is somewhat limited as the fence line is very overgrown. The rail right-of-way is directly to the left of the fence line.

South Cavalcade First Five-Year Review

The top orienting view is taken at the eastern edge of the southwest capped area, looking south towards Collingsworth Street (running parallel to the first utility line). The concrete offset is along a joint in a driveway on the American Warehouse property. The offset is related to an earlier water main break and wash-out and does not appear to impact the cap integrity. The cap edge runs parallel to the off-set and is at the right edge of this photo. See detail below for offset comparison.

