Five-Year Review Report

Third Five-Year Review Report
for the
Compass Industries Superfund Site
Tulsa County, Oklahoma

April 2006

PREPARED BY:

CH2M HILL
Contract Number 68-W6-0036
Work Assignment Number 133-FRFE-06ZZ

PREPARED FOR:

Region 6
United States Environmental Protection Agency
Dallas, Texas

200076

[This page intentionally left blank.]

THIRD FIVE-YEAR REVIEW
Compass Industries Superfund Site
EPA ID# OKD980620983
Tulsa County, Oklahoma

This memorandum documents the United States Environmental Protection Agency's (EPA's) performance, determinations, and approval of the Compass Industries Superfund Site (site) third five-year review under Section 121(c) of the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA), 42 United States Code (USC) §9621(c), as provided in the attached Third Five-Year Review Report prepared by CH2M HILL, Inc., on behalf of EPA.

Summary of Five-Year Review Findings

The third five-year review for this site indicates that the current site conditions are protective of human health and the environment. The remedial actions for this site continue to be implemented as set forth in the decision document. This assessment has been made based on a review of data available for the site, a site inspection, technical evaluation, and interviews.

The short-term protectiveness of the remedy is not affected by the following minor deficiencies observed during the site inspection: woody vegetation growing in one location immediately adjacent to the perimeter fence; trees growing close to the edge of the landfill cap in the southwestern portion of the swale area; minor erosion and rip rap settlement along the western perimeter of the cap; 2005 vent monitoring data and settlement monitoring data scheduled for early 2006 have not yet been reviewed; and, the City of Sand Springs has determined that from 1987 through 2004 no restrictions, regulations, or guidelines from EPA or the State of Oklahoma were outlined in any conveying deeds associated with the site (**City of Sand Springs, 2004**). By September 2006, the Oklahoma Department of Environmental Quality (ODEQ), in consultation with EPA, plans to issue a deed notice (Notice of Remediation under CERCLA) involving the site. The deed notice is intended as an institutional control to restrict the uses of the land at the site and minimize potential exposure to contaminants.

Actions Needed

To address the issues identified during the third five-year review, several recommendations and follow-up actions have been identified for the site. To ensure continued long-term protectiveness, trees located along the perimeter fence and encroaching on the edge of the landfill in the southwestern portion of the site should be removed. In addition, erosion in the western area of the site should be checked and riprap added as necessary to prevent further erosion. The settlement monument surveying scheduled for early 2006 should be performed, and the results should be reviewed in the next annual report for the site. Also, the annual inspections

performed by the City of Sand Springs, during which the vegetative cover is inspected and the cap and liner system is checked for evidence of damage from brush and burrowing animals, should continue. Finally, an institutional control (deed notice) should be issued by September 2006, and should be checked in the next five-year review.

000227

I have determined that the remedy for the Compass Industries Superfund Site is protective of human health and the environment in the short term, and will remain so provided the action items identified in the Five-Year Review Report are addressed as described above.

for Samuel Coleman, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency, Region 6

Date

4/24/06

CONCURRENCES

THIRD FIVE-YEAR REVIEW
Compass Industries Superfund Site
EPA ID# OKD980620983

000228

By: _____ Date: 4/5/06
Katrina Higgins-Coltrain, U.S. EPA
Remedial Project Manager

By: _____ Date: 4/7/06
Sing Chia, U.S. EPA
Chief, Louisiana/Oklahoma Program Management Section

By: _____ Date: 4/24/06
Wren Stenger, U.S. EPA
Chief, Louisiana/New Mexico/Oklahoma Branch

By: Gloria Moran Date: 4-10-06
Gloria Moran, U.S. EPA
Practice Group Leader, Office of Regional Counsel

By: _____ Date: 04/14/06
Mark Peycke, U.S. EPA
Chief, Superfund Branch, Office of Regional Counsel

By: _____ Date: 4/24/06
Pam Phillips, U.S. EPA
Deputy Director, Superfund Division

[This page intentionally left blank.]

Table of Contents

List of Tables

List of Figures

Attachments

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FR	Federal Register
HDPE	High-density polyurethane
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
ODEQ	Oklahoma Department of Environmental Quality
O&M	Operation and Maintenance
OSDH	Oklahoma State Department of Health
OSWER	Office of Solid Waste and Emergency Response
OVA	Organic vapor analyzer
OWRB	Oklahoma Water Resources Board
ppm	parts per million
PRP	Potentially Responsible Parties
RAC6	Response Action Contract for EPA Region 6
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
TBCs	"To Be Considered" information
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
USC	United States Code

[This page intentionally left blank.]

Executive Summary

Pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation & Liability Act ("CERCLA" or "Superfund"), 42 United States Code (USC) §9621(c), the third five-year review of the remedy in place at the Compass Industries Superfund Site ("site" or "Compass Industries site") located in Tulsa County, Oklahoma, has been completed. The results of the five-year review indicate that the remedy implemented at the site is protective of human health and the environment in the short-term. No deficiencies were noted that currently impact the short-term protectiveness of the remedy, although issues were identified that require further action to ensure the continued long-term protectiveness of the remedy.

Under the statutory requirements of Section 121(c) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), P. L. 99-499, and the subordinate provisions of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300.430(f)(4)(ii), performance of five-year reviews are required for sites where hazardous substances remain on site above levels that allow for unlimited use and unrestricted exposure. This situation applies to the Compass Industries site. The U. S. Environmental Protection Agency (EPA) completed the first five-year review at the Compass Industries site in September 2000, and completed the second five-year review in December 2001.

The third five-year review identified several issues that do not currently affect the short-term protectiveness of the remedy. During the site inspection, the following observations were made: woody vegetation growing in one location immediately adjacent to the perimeter fence; trees growing close to the edge of the landfill cap in the southwestern portion of the swale area; minor erosion and rip rap settlement along the western perimeter of the cap; 2005 vent monitoring data and settlement monitoring data scheduled for early 2006 have not yet been reviewed; and, the City of Sand Springs has determined that from 1987 through 2004 no restrictions, regulations, or guidelines from EPA or the State of Oklahoma were outlined in any conveying deeds associated with the site (**City of Sand Springs, 2004**). By September 2006, the Oklahoma Department of Environmental Quality (ODEQ), in consultation with EPA, plans to issue an institutional control (deed notice) to restrict the uses of the land at the site and minimize potential exposure to contaminants.

To ensure continued long-term protectiveness, trees located along the perimeter fence and encroaching on the edge of the landfill in the southwestern portion of the site should be removed. In addition, erosion in the western area of the site should be checked and riprap added as necessary to prevent further erosion. The settlement monument surveying scheduled for early 2006 should be conducted, and the results should be reviewed in the next annual report for the site. Also, the annual inspections conducted by the City of Sand

Springs, during which the vegetative cover is inspected and the cap and liner system is checked for evidence of damage from brush and burrowing animals, should continue. Finally, an institutional control should be issued by September 2006, and should be checked in the next five-year review.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Compass Industries (Avery Drive)

EPA ID (from WasteLAN): OKD980620983

Region: EPA Region 6 | **State:** Oklahoma | **City/County:** Tulsa County

SITE STATUS

NPL Status: ☐ Final ■ Deleted ☐ Other (specify):

Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ■ Complete

Multiple OUs? ☐ Yes ■ No | **Construction completion date:** November 1990

Has site been put into reuse? ☐ Yes ■ No

REVIEW STATUS

Reviewing agency: ■ EPA ☐ State ☐ Tribe ☐ Other Federal Agency:

Author: EPA Region 6, with support from RAC6 contractor CH2M HILL, Inc.

Review period: January 2002 through March 2006

Date(s) of site inspection: October 19, 2005

Type of review:
■ Statutory
☐ Policy
- ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
- ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
- ☐ Regional Discretion

Review number: ☐ 1 (first) ☐ 2 (second) ■ 3 (third) ☐ Other (specify):

Triggering action:
- ☐ Actual RA On-site Construction
- ☐ Actual RA Start
- ☐ Construction Completion
- ■ Recommendation of Previous Five-Year Review Report
- ☐ Other (specify):

Triggering action date (from WasteLAN): December 26, 2001

Due date: The second five-year review, completed in December 2001, recommended the next five-year review, the third for the site, be conducted in 2006.

Five-Year Review Summary Form

Issues: The third five-year review for this site indicates that the remedial actions set forth in the decision documents for this site continue to be implemented as intended by the decision documents. This assessment has been made based on a review of data available for the site, a site inspection, technical evaluation, and interviews.

The short-term protectiveness of the remedy is not affected by the following minor deficiencies observed during the site inspection: woody vegetation growing in one location immediately adjacent to the perimeter fence; trees growing close to the edge of the landfill cap in the southwestern portion of the swale area; minor erosion and rip rap settlement along the western perimeter of the cap; 2005 vent monitoring data and settlement monitoring data scheduled for early 2006 have not yet been reviewed; and, the City of Sand Springs has determined that during 1987 through 2004 no restrictions, regulations, or guidelines from EPA or the State of Oklahoma were outlined in any conveying deeds associated with the site (**City of Sand Springs, 2004**). By September 2006, ODEQ, in consultation with EPA, plans to issue a deed notice intended as an institutional control to restrict the uses of the land at the site and minimize potential exposure to contaminants.

Recommendations and Follow-up Actions: To address the issues identified during the third five-year review, several recommendations and follow-up actions have been identified for the site. To ensure continued long-term protectiveness, trees located along the perimeter fence and encroaching on the edge of the landfill in the southwestern portion of the site should be removed. In addition, erosion in the western area of the site should be checked and riprap added as necessary to prevent further erosion. The settlement monument surveying scheduled for early 2006 should be conducted, and the results should be reviewed in the next annual report for the site. Also, the annual inspections conducted by the City of Sand Springs, during which the vegetative cover is inspected and the cap and liner system is checked for evidence of damage from brush and burrowing animals, should continue. Finally, an institutional control should be issued by September 2006, and should be checked in the next five-year review.

Protectiveness Statement(s): The remedy implemented at the Compass Industries site is protective of human health and the environment in the short-term, and will remain so provided the integrity of the cap is maintained through removal of woody vegetation, prevention of erosion, maintenance of the vegetative cover, and implementation of institutional controls.

Other Comments: Reuse of the property that remains protective of the cap integrity is encouraged.

Third Five-Year Review Report
Compass Industries Superfund Site

The United States Environmental Protection Agency (EPA) Region 6 has conducted a third five-year review of the remedial action implemented at the Compass Industries Superfund Site ("site" or "Compass Industries site"), located in Tulsa County, Oklahoma, for the period between December 2001 (when the second five-year review was completed) and March 2006. The purpose of a five-year review is to determine whether the remedy at a site remains protective of human health and the environment, and to document the methods, findings, and conclusions of the five-year review in a Five-Year Review Report. Five-Year Review Reports identify issues found during the review, if any, and make recommendations to address the issues. This Third Five-Year Review Report documents the results of the review for the Compass Industries Superfund site, conducted in accordance with EPA guidance on five-year reviews. EPA Response Action Contract for Region 6 (RAC6) contractor CH2M HILL, Inc. provided support for conducting this review and the preparation of this report.

EPA guidance on conducting five-year reviews is provided by Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (**EPA, 2001a**). EPA and contractor personnel followed the guidance provided in this OSWER directive in conducting the five-year review performed for the Compass Industries site.

1.0 Introduction

CERCLA, 42 United States Code (USC) ' 9601 *et seq*. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300 *et seq*., call for five-year reviews of certain CERCLA remedial actions. EPA policy also calls for a five-year review of remedial actions in some other cases. The statutory requirement to conduct a five-year review was added to CERCLA as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA), P.L. 99-499. The EPA classifies each five-year review as either Astatutory@ or Apolicy@ depending on whether it is being required by statute or is being conducted as a matter of policy. The third five-year review for the Compass Industries site is a statutory review. The EPA Five-Year Review guidance specifies that five-year reviews are required or appropriate whenever a remedial action results in hazardous substances, pollutants, or contaminants remaining on site at levels that will not allow for unlimited use or unrestricted exposure. As specified by CERCLA and the NCP, statutory reviews are required for such sites if the Record of Decision (ROD) was signed on or after the effective date of SARA. CERCLA '121(c), as amended, 42 USC ' 9621(c), 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 implementing provisions of the NCP, as set forth in the CFR, state at 40 CFR 300.430(f)(4)(ii):

> 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.

The EPA five-year review guidance further states that a five year review should be conducted as a matter of policy for the following types of actions:

- A pre-SARA remedial action that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure;
- A pre or post SARA remedial action that, once completed, will not leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure but will require more than five years to complete; or,
- A removal-only site on the National Priorities List (NPL) where the removal action leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure and no remedial action has or will be conducted.

In accordance with the EPA five-year review guidance, the five-year review for the Compass Industries site is being conducted because the implemented remedial action resulted in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure.

This is the third five-year review for the Compass Industries site. The first five-year review was completed in September 2000, and the second five-year review was completed in December 2001. EPA guidance indicates the triggering action date for the first statutory five-year review is the date at which on-site construction begins, and for subsequent five-year review reports the trigger action is the date of the previous five-year review. Therefore, the third review for the Compass Industries site must be completed by December 2006.

2.0 Site Chronology

A chronology of significant site events and dates is included in **Table 1**, provided at the end of the report text. Sources of this information are listed in **Attachment 1, Documents Reviewed**.

3.0 Background

This section describes the physical setting of the site, including a description of the land use, resource use, and environmental setting. This section also describes the history of contamination associated with the site. Remedial actions performed for the site are described in **Section 4**.

3.1 Physical Characteristics

The Compass Industries Superfund site is an abandoned landfill located in a former limestone quarry west of Chandler Park in Tulsa County, Oklahoma (see **Figure 1** for an illustration of the vicinity of the site). The site is situated on a bluff approximately one-quarter mile south and 200 feet above the Arkansas River, directly west of the Chandler Park softball facility (**EPA, 1992**). The Compass Industries site consists of approximately 125 acres, of which approximately 46 acres are located in the northeastern portion of the site, which is the primary area of concern (**Flint, 1994**). An aerial photograph of the site area is illustrated in **Figure 2**. The nonvegetated areas observed in this photograph around the Compass Industries site label generally correspond to the site boundary.

The site's topography slopes downward to the west and north (**EPA, 1992**). However, it has been modified by quarrying, landfilling, and remediation activities. The road to the south of the remediation area forms a drainage divide, and most of the surface water from Chandler Park flows into one of two ditches located in the park area (**EPA, 2001b**). The majority of runoff flows through water gaps in the east-west ridge above Avery Drive. Runoff from precipitation, springs, and seeps flows in a westerly direction into the Arkansas River through a network of small streams (**EPA, 1987b**).

The site is underlain by two aquifers. The Hogshooter Formation contains a shallow, unconfined, low-yield, perched aquifer; while the Layton Sandstone member of the Coffeyville Formation forms a somewhat deeper aquifer. Between the upper and lower aquifers is a sequence of 32 to 50 feet of shale, which acts as a confining bed that restricts the downward migration of ground water. Therefore, most of the ground water contamination is confined to the Hogshooter Formation and the overlying soils. The Hogshooter Formation is exposed at the surface on all sides of the site (**EPA, 1987b**).

Figure 1
Vicinity of the Site
Compass Industries
Tulsa County, Oklahoma

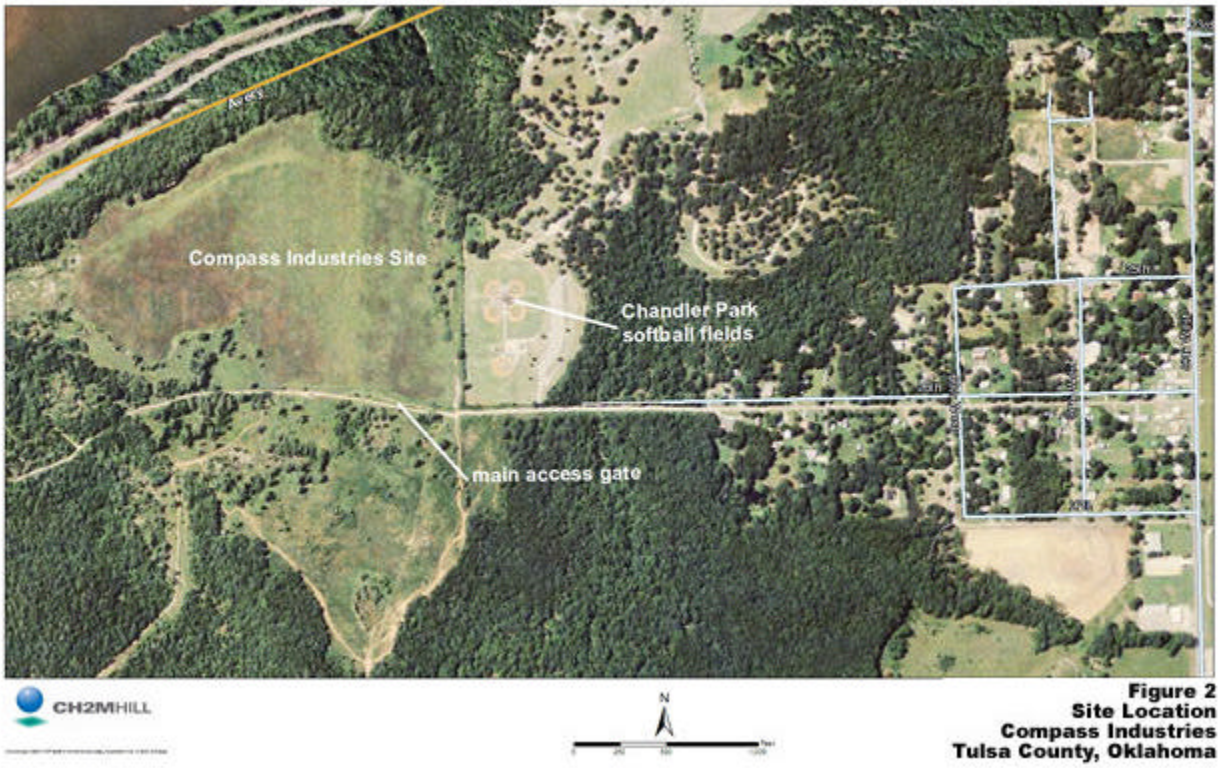


Figure 2
Site Location
Compass Industries
Tulsa County, Oklahoma

Recharge for both aquifers is from local precipitation infiltration and is discharged through seeps and springs into surface waters near and within the site. No use of water from either of these aquifers is known. Ground water flows to the west-northwest at the site. The average flow rate of both aquifers is 720 gallons per day, or an estimated 263,000 gallons of water per year (**EPA, 1987b**).

3.2 Land and Resource Use

Land ownership at the site can be classified as private. Land use around the site consists of residential and recreational areas. The Second Five-Year Review Final Report, indicated that institutional controls in the form of deed restrictions had been implemented and that the deletion of the site should include them to maintain the integrity of the cap (**EPA, 2001b**). In 2004, the City of Sand Springs retained the services of Cinnabar Service Company to investigate the land records for the site. The investigation determined that no restrictions, regulations, or guidelines from the EPA or the State of Oklahoma were outlined on any conveying deeds recorded from 1987 to 2004 (**City of Sand Springs, 2004**).

3.3 History of Contamination

The site was originally operated as a quarry, and limestone from the site was being utilized for cement and railroad ballast making as early as 1904. Quarry operations at the site continued into the early 1960s. Aerial photography from 1964 shows that by that time quarrying operations had ceased, and waste dumping activities had begun (**EPA, 2001b**).

Between 1972 and 1976, the site operated as a municipal solid waste landfill facility permitted by the Oklahoma State Department of Health (OSDH), now called ODEQ; however, photographic evidence shows waste disposal and landfill activities continued into the 1980s (**EPA, 2001b**). Disposal of industrial waste was performed at the facility, even though it was not allowed as part of the permit conditions and regulations. Site data indicates that wastes were disposed of in an irregular manner, making it difficult to ascertain where the wastes of concern were located (**EPA, 1987b**). Records show that the site accepted three categories of wastes: solids, liquids, and sludges, which included acids, caustics, potentially toxic solvents, and potentially carcinogenic materials (**EPA, 2001b**). The absolute volumes of the pollutants are unknown, but are estimated to be approximately 620,000 cubic yards (**EPA, 1987b**).

3.4 Initial Response

Several fires were reported at the landfill during the 1970's. Often these fires were the result of the spontaneous combustion of the waste materials, burned underground for extended periods of time, and expelled smoke from the ground which was multi-colored and produced odors (**EPA, 2001b**). The most recent fire

burned underground for several years, occasionally breaking through the top soil cover, and burned out in late 1984. Citizens and the media complained of odors early in 1983, which prompted air monitoring in the vicinity of the landfill by the EPA and OSDH. Air monitoring results revealed the presence of some organics, but at levels that were considered non-hazardous. The EPA proposed the Compass Industries site to the NPL in September 1983 (**EPA, 1987b**). The NPL is the list, compiled by EPA, of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response. During 1983 and 1984, approximately 28 borings were installed at the site to extinguish underground fires (**EPA, 2001b**). The site was listed on the NPL in September 1984.

In July 1984, the EPA and OSDH entered into a Cooperative Agreement to conduct a Remedial Investigation (RI) and Feasibility Study (FS) at the site (**Flint, 1994**). During the RI, samples were collected from soil, water, and air. The routes of offsite migration examined included surface runoff, ground water, transported sediments, and air. Analytical results identified 12 inorganic and 33 organic priority pollutants. The most common priority pollutants were base-neutral compounds, which had the greatest concentrations in samples of waste collected from surface and test trench soils. Findings from the RI included the following:

- Migration of contaminants in the ground water was being mitigated by attenuating mechanisms;
- Offsite migration of contaminants was limited to surface runoff and seeps;
- The shallow aquifer was contaminated, and the deeper aquifer was also contaminated, but to a lesser extent;
- Soil samples collected in the drainage ways were contaminated with inorganic priority pollutants, and wastes sampled on the ground surface showed significant concentrations of both inorganic and organic priority pollutants;
- The large spatial variation in compounds detected and their concentrations suggested that the disposal and types of wastes disposed may have varied widely across the site; and
- Some, but not all, of the random soil samples taken from the site showed significantly higher concentrations of priority pollutants than the background soil samples (**EPA, 1992**).

In July 1987, the FS for the site was completed (**EPA, 1992**). The EPA signed a Record of Decision (ROD) for the site on September 29, 1987 (**EPA, 1987b**). The remedy selected and implemented under the ROD was Capping and On-site Ground Water Treatment. The selected alternative is described in more detail in **Section 4**.

In August 1987, an Endangerment Assessment study was completed for the site. The study picked 15 chemicals as indicator chemicals from among those found at the site. The indicator chemicals were selected

using the magnitude of their indicator scores and an evaluation of their environmental fate and transport characteristics. Findings from the Endangerment Assessment included the following:

- Ingestion of ground water was not considered a potential exposure pathway since nearby residents use city water;
- Ingestion or dermal absorption of surface water was determined not to pose a health hazard; and
- Site soils represented the only contaminated environmental medium for which the exposure pathways were complete (**EPA, 1987a**).

3.5 Basis for Taking Action

The purpose of the response actions conducted at the Compass Industries site was to protect public health and welfare and the environment from releases or threatened releases of hazardous substances from the site. The primary threat that the Compass Industries site posed to public health and safety was the potential for recurring fires with toxic air emissions, which had the possibility of reaching nearby residences. In addition, there was a potential for surface discharges along the bluff below the landfill site. The area is also a bald eagle habitat (**EPA, 1987a**).

4.0 Remedial Actions

This section provides a description of the remedy objectives, remedy selection, and remedy implementation for the site. It also describes the ongoing Operations and Maintenance (O&M) activities performed at the site in the period since completion of the second five-year review.

4.1 Remedial Action Objectives

The specific remedial objectives of the remedial action were to:

- Prevent direct contact between the contaminated site materials, including soil, leachate, surface waters, and air emissions, and the human and animal population;
- Prevent the infiltration of precipitation into the waste; and,
- Divert surface run-on and promote natural drainage of precipitation from the landfill (**EPA, 2001b**).

4.2 Remedy Selection

The ROD was signed on September 29, 1987. The principal concerns addressed at the site were from surface soils contaminated with inorganic and organic priority pollutants. The remedy described in the ROD included the following elements:

- Resource Conservation and Recovery Act (RCRA) cap involving site grading, cap placement, diversion of surface water, and air emissions monitoring.
- Ground water will be treated at a later date if found to be necessary.
- Installation of security fences and signs to restrict access to the site.
- Monitoring of the site for 30 years to ensure no significant offsite migration.
- Additional remedial action if significant migration of contaminants occurs (**EPA, 1987b**).

4.3 Remedy Implementation

Essential elements of the remedial design (RD) included: landfill boundary investigation, cap design, subsurface drainage, runoff control, water treatment building, decontamination area, gas venting system, design drawings, treatment of ground water (if necessary, after compliance monitoring following the placement of the cap), cost effectiveness screening, and cost estimate. The contract for the RD was awarded to Bechtel Environmental, Inc. in August 1988 by the OSDH. The Final Design Report was completed in March 1989 and approved by EPA in April 1989 (**EPA, 1992**).

In late March 1989, EPA issued a Unilateral Administrative Order (UAO) to seven potentially responsible parties (PRPs) to assume responsibility for remedial actions at the site (**EPA, 1989**). Three of the PRPs (Sun, Texaco, and Standard Royalties, Inc.) agreed to perform the remedial action (RA) in accordance with the EPA approved RD. Bechtel Environmental, Inc. was the contractor selected by the PRPs to perform the RA. Essential elements of the remedial action included: subcontract award and mobilization, clearing and grubbing, grading, construction of the clay cap, placement of the liner, permanent vegetative cover, final inspection, and demobilization (**EPA, 1992**).

Site mobilization was initiated in January 1990. Site work involving clearing and grubbing and waste reshaping were performed in phases throughout the time frame beginning January 1990 and ending in October 1990 (**Bechtel Environmental, 1991**). A subsurface drainage system to collect leachate was also installed during February 1990. The waste was reshaped and compacted to reduce settlement of the cap using a large track dozer, rubber tire scrapers, and other heavy equipment. The excavation of a 36-inch wide perimeter trench and the plugging of the existing monitoring wells were done in conjunction with the reshaping of the waste (**EPA, 1992**).

A gas transmission geotextile layer was placed directly over the reshaped waste to intercept gases. The clay cap was then placed in 8 inch lifts and compacted until 24 inches of cover was attained. Following the completion of the clay liner, the geosynthetic liner system was installed, which included an impermeable 30 mil membrane (HDPE) liner and subsurface drainage system (consisting of geotextile, and geogrid panels). A sandy soil was then placed over the drainage system and covered with topsoil. The cover soil layer was placed in one 18-inch lift within 48 hours of the completion of the drainage system. Rip-rap was placed at the west end of the site and graded. A 4-inch layer of gravel was placed between the geogrid layer and the rip-rap to further facilitate drainage. The liner installation was completed by October 1990. The site was then seeded with temporary winter cover. Site work was completed by installing a new fence at the west end of the site and repairing the existing fence along the south side of the site. Demobilization activities were completed by the end of November 1990. The Remedial Action Report signifying the end of the RA was signed on January 28, 1991 (**Bechtel Environmental, 1991**). The final vegetative cover was deferred until the spring of 1991 to facilitate better growth of native spring grasses. Repair work and the final vegetative cover were completed by August 29, 1991. The Close Out Report was signed on June 2, 1992 signifying site completion (**EPA, 1992**).

4.4 Operation and Maintenance and Long-Term Monitoring

O&M activities prescribed by the ROD included a ground water and air monitoring and analysis program, inspection of the surface vegetation, and the periodic repair of the perimeter fence and signage. Cap maintenance entailed inspecting the cap and maintaining and replacing the passive gas filters in the gas collection and venting system. The ROD also required the site be monitored for a period of at least 30 years after the completion of the RA (**EPA, 1987b**).

Following construction activities, a post-closure O&M Plan was developed. Actions to be carried out during the post-closure period specified by the O&M Plan included Environmental Monitoring and Performance Monitoring (**EPA, 1992**). The scope of the Environmental Monitoring program was sampling and analysis of ground water, surface water, and sediment for parameters which could potentially pose a threat to human health and the environment. Ground water sampling was to be conducted through sampling of seeps on the northeast bluffs to check for the presence of chemical contaminants within the perched aquifer.

The Performance Monitoring program is designed to verify that the main engineered elements are performing as designed and to detect trends that could indicate weakness developing in the containment system so that corrective action can be taken before the integrity of the structure is compromised. Monitoring consists of visual inspection during walkovers, topographic surveys based on predetermined grid lines, and aerial surveys.

Settlement monuments are surveyed at least annually to determine settlement/swell within the landfill, and the landfill surface is inspected semiannually, and repairs performed as needed (**EPA, 1992**).

Flint Environmental Services (a division of Flint Engineering & Construction Co.) was contracted to operate the site and complete the tasks assigned in the O&M Plan (**EPA, 2001b**). O&M began at the site in 1991 with the collection of seep and background samples. In 1994, Flint Engineering & Construction Co. divested itself of Flint Environmental Services. Operation of the site then transitioned to Mr. J. Scott Stelle, R.E.M., who had been the project manager (**EPA, 2001b**). O&M activities during 2001 were performed by Stelle & Associates Inc. After the second five-year review report was completed, the responsibility for the O&M activities shifted to the City of Sand Springs (**City of Sand Springs, 2002**).

Surface water and seep sampling locations are illustrated in **Figure 3**, reproduced from the City of Sand Springs 2004 annual report. The last seep sampling event occurred in 1995. The last surface water sampling event occurred in 2000. The laboratory results showed no chemicals present above the monitoring levels. Most of the parameters were below detection limits for all quarters. In 2002, EPA concluded that a reduction in sampling of the surface water and seeps was appropriate due to the lack of occurrence of seeps and the lack of detected contaminants in surface water, although seep and surface water samples should still be collected at the time of the next five-year review (**EPA, 2003**). During 2002, 2003, and 2004, walkovers of the area were performed, with no resulting notice of seeping or surface water (**City of Sand Springs, 2002, 2003 and 2004**).

Vent sample locations are illustrated in **Figure 4**, reproduced from the City of Sand Springs 2004 annual report. A vent sampling event was conducted in 2000. Readings measured using an organic vapor analyzer (OVA) ranged from below detection limits to 150 parts per million (ppm). The vent sampling schedule was not understood by the City of Sand Springs after the second five-year review, however, and no vent sampling was recorded in 2002 or 2003. The vents were next sampled in 2004, during March and October, by Stelle & Associates Inc. Analytical results ranged from 0 ppm to just below 20 ppm (**City of Sand Springs, 2002, 2003 and 2004**).

Settlement monument locations are illustrated in **Figure 5**, reproduced from the City of Sand Springs 2004 annual report. The last settlement survey was conducted in April 2001 (**City of Sand Springs, 2004**), prior to completion of the second five-year review. The next settlement survey is scheduled for early 2006.

Site inspections have been conducted each year since the second five-year review. In 2002, the vegetative cover was found to be well-established and healthy, and no erosion sites were apparent on the cap. Slopes around the edges of the cap were monitored for woody brush growth that could damage the cap liner. No evidence of damage to the cap or liner system from brush or burrowing animals was discovered. The drainage system was inspected and appeared to be functioning properly. The cap perimeter was found to be secured with no evidence of continued or long-term use of the site, although evidence of unauthorized persons having been on the site was noted, including theft of warning signs and broken gates. In January 2002, the City of Sand Springs maintenance personnel repaired the fence, gates, and replaced the warning signs at the site (**City of Sand Springs, 2002**).

The site was again inspected in 2003. Findings from the 2002 site inspection remained unchanged, except for concluding that woody vegetation growth around the cap edges required monitoring, with some areas possibly requiring removal in 2004. In January 2003, the City of Sand Springs maintenance personnel again repaired the fence, gates, and replaced the warning signs at the site (**City of Sand Springs, 2003**).

A site inspection was also performed in 2004. Findings from the 2003 site inspection remained essentially unchanged. The site was mowed in September 2004, and the woody vegetation growth around the cap edges noted during the 2003 inspection was removed in December 2004. A previous repair of burrowing activities at vent location number 9 was checked and was determined to be satisfactory. Fence and gate repairs and replacement of the warning signs at the site is ongoing (**City of Sand Springs, 2004**).

4.5 Progress Since Initiation of Remedial Action

The remedial activities specified in the ROD have been implemented. The wastes were consolidated into the landfill and graded to promote drainage. Additional fill was used to raise the subgrade elevations to design levels. A multi-layer RCRA cap was placed over the landfill to prevent rainwater from penetrating the waste and leaching hazardous materials into the perched aquifer. The site has been provided with appurtenant structures, including fencing, signage, a gas transmission system, and settlement monuments (**EPA, 1992**).

Approximately two stream miles along the Arkansas River have been made safe from off-site migration of contaminants, allowing continued recreational activities by area residents. Approximately 46 acres are available for restricted recreational/commercial use. The potential for site fires to spread airborne contamination to the residents of Tulsa has been mitigated, and the American Bald Eagle habitat has been protected.

The first five-year review was delayed due to the lack of a clear definition of the capped area. In 1997, the cap was surveyed and defined by the legal metes and bound definition. The First Five-Year Review Report was completed on September 26, 2000. Monitoring at the site, which included sampling surface water and water from the seeps for five-plus years past the cap installation, has shown that the contaminants of concern are within the cleanup standards established in the O&M Plan (**EPA, 2000**). The remedy of a RCRA cap over the landfill was found to be operating as designed. It was in good condition, with minor repairs having been made. Settlement of the cap was minimal, and the appurtenant structures were in sound condition with no signs of physical deterioration. No major deficiencies were noted, but the following potential deficiencies were identified:

- Continued mowing of the native grasses may result in a buildup of thatch; therefore, if mowing continues, the site should be raked approximately every four years.
- As the area returns to native vegetation, woody plants with strong root systems may damage the liner system; therefore woody vegetation should be removed at least annually.
- Burrowing animals, including mice, rats, and snakes, may also damage the liner system; therefore, continued periodic checks on the site should be maintained.
- Erosion of the RCRA cap continues to be a concern, and the site should be periodically inspected to ensure that the full 24 inches of the RCRA cap remains intact (**EPA, 2000**).

The second five-year review was finalized on December 26, 2001, and is further discussed in **Section 5.0**. A Notice of Intent to Delete and a Direct Final Notice of Deletion were published on November 28, 2001 (**EPA, 2002a**). However, a comment was received during the comment period that requested an extension of the comment period. Because EPA did not publish a withdrawal before the date of deletion, the EPA published a removal of the deletion on March 19, 2002, and established a new comment period (**EPA, 2002a**). The Notice of Intent to Delete was published on May 16, 2002 (**EPA, 2002c**), with the public comment period ending on June 17, 2002. The Notice of Deletion was published on July 18, 2002 (**EPA, 2002c**).

4.6 Activities Conducted At the Site by Other Governmental Agencies

The United States Army Corps of Engineers (USACE) provided oversight for EPA through an Interagency Agreement. The USACE maintained full time oversight of the construction activities and assured quality by independent testing and ensured compliance with specifications and design drawings (**EPA, 2000**).

5.0 Progress Since the Second Five-Year Review

The second five-year review of the Compass Industries site was completed in December 2001, for the period from May 1995 through December 2000. The findings of the second five-year review, the status of recommendations and follow-up actions, the results of implemented actions, and the status of any other issues are described in the following sections.

5.1 Protectiveness Statements from Second Five-Year Review

The Second Five-Year Review report concluded that the remedial actions implemented at the Compass Industries site were expected to be protective; therefore, the remedy for the site was protective of human health and the environment. The Second Five-Year Review Report stated that the remedy was functioning as designed. The cap was generally in good condition, with noticeable minor repairs having been made in the past, and settlement had been minimal. All analyses of the surface water had shown no contaminants above the remedy threshold, and the fence had kept the site generally secure, with only infrequent trespassing (**EPA, 2001b**).

5.2 Second Five-Year Review Recommendations and Follow-up Actions

The second five-year review of the Compass Industries site, completed in December 2001, recommended the following follow-up actions:

- Removing woody vegetation from the north slope in the noted area.
- Adding more rip-rap to the lower end of the swale.
- Surveying the settlement monuments.
- Raking approximately every 4 years if mowing continues at the site.
- Removing woody vegetation at least annually.
- Maintaining continued periodic checks for burrowing.
- Periodically inspecting the cap to insure that the full 24-inches remains intact (**EPA, 2001b**).

The Second Five-Year Review Final Report indicated that institutional controls in the form of deed restrictions had been implemented and that the deletion of the site should include them to maintain the integrity of the cap (**EPA, 2001b**).

5.3 Status of Recommended Actions

This section describes the current status of implementation of the recommendations included in the Second Five-Year Review Report.

Woody vegetation was removed from the area along the northern slope and additional rip-rap material was placed at the west end of the drainage swale along the cap in 2001 (**City of Sand Springs, 2002**).

The settlement monuments were surveyed in April 2001 by Breisch & Associates. The Cap Settlement Marker Elevation Survey Report indicated only slight changes from the previous survey conducted in 1994 (**City of Sand Springs, 2002**). The next settlement monument survey is scheduled for early 2006 (**City of Sand Springs, 2004**).

The second five-year review also recommended that the site be raked approximately every four years if mowing continues at the site, and that the woody vegetation be removed on an annual basis. Slopes around the edges of the cap are being monitored for woody brush growth by the City of Sand Springs. The site was mowed in September 2004, and woody vegetation growth around the cap was removed in December 2004. No mention of raking was found in the annual reports (**City of Sand Springs, 2004**).

The second five-year review report also recommended continued periodic checks for burrowing and periodically inspecting the cap to ensure that the full 24-inches remain intact. The City of Sand Springs is inspecting the vegetative cover and is looking for evidence of damage to the cap or liner system from brush and burrowing animals twice a year (**City of Sand Springs, 2002, 2003, and 2004**).

The Second Five-Year Review Final Report indicated that institutional controls in the form of deed restrictions had been implemented and that the deletion of the site should include them to maintain the integrity of the cap (**EPA, 2001b**). EPA published the Notice of Direct Final Deletion in November 2001 with the final deletion occurring in July 2002 (**EPA, 2002b**). In 2004, the City of Sand Springs retained the services of Cinnabar Service Company to investigate the land records for the site. The investigation determined that no restrictions, regulations, or guidelines from the EPA or the State of Oklahoma were outlined on any conveying deeds recorded from 1987 to 2004(**City of Sand Springs, 2004**). By September 2006, ODEQ, in consultation with EPA, plans to issue an institutional control (deed notice) to restrict the uses of the land at the site and minimize potential exposure to contaminants.

6.0 Five-Year Review Process

This third five-year review for the site has been conducted in accordance with the EPA's Comprehensive Five-Year Review guidance dated June 2001 (**EPA, 2001a**). Interviews were conducted with relevant parties; a site inspection was conducted; and applicable data and documentation covering the period of the review were evaluated. The activities conducted as part of this review and specific findings are described in the following paragraphs.

6.1 Administrative Components

The five-year review for this site was initiated by the EPA when EPA contractor CH2M HILL, Inc., was tasked to perform the technical components of the review. The review team was led by the EPA Remedial Project Manager (RPM), Ms. Katrina Higgins-Coltrain/EPA Region 6, with participation from Mr. Hal Cantwell/ODEQ. The components of the review included community involvement, document review, data review, a site inspection, interviews, and development of this Five-Year Review Report, as described in the following paragraphs.

6.2 Community Involvement

Upon signature, the Third Five-Year Review Report will be placed in the information repositories for the site, both local to the site and at the EPA Region 6 office in Dallas, Texas. A notice will then be published in the local newspaper to summarize the findings of the review and announce the availability of the report at the information repositories. A draft copy of the public notice is provided as **Attachment 5** to this report.

6.3 Document Review

This third five-year review for the site included a review of relevant site documents, including decision documents, construction and implementation reports, sampling reports, and related monitoring data. Documents reviewed are listed in **Attachment 1**.

6.4 Data Review

In 2002, EPA concluded that a reduction in sampling of the surface water and seeps was appropriate due to the lack of occurrence of seeps and the lack of detected contaminants in surface water, although seep and surface water samples should still be collected at the time of the next five-year review (**EPA, 2003**). The last sampling was conducted prior to completion of the second five-year review. During 2002, 2003, and 2004, walkovers of the area were performed, with no resulting notice of seeping or surface water (**City of Sand**

Springs, 2002, 2003 and 2004). Locations to be sampled should surface water and seeps be observed are illustrated in **Figure 3**.

After the second five-year review, the vents were next sampled in 2004, during March and October. Analytical results ranged from 0 ppm to just below 20 ppm (**City of Sand Springs, 2004**). The next vent sampling events were scheduled for March and October, 2005, and will be submitted by the City of Sand Springs in the 2005 Annual Operation and Maintenance Report due by the end of May 2006. Locations of vents are illustrated in **Figure 4**.

Settlement monitoring was last conducted prior to completion of the second five-year review, in April 2001; the next monitoring event was scheduled for early 2006 (**City of Sand Springs, 2004**). Locations of settlement monuments are illustrated in **Figure 5**.

6.5 Interviews

During the course of this five-year review, interviews were conducted with Mr. Hal Cantwell/ODEQ, and Mr. Loy Calhoun, City Manager for the City of Sand Springs. Interview Record Forms which document the issues discussed during these interviews are provided in **Attachment 2**. Both interviews indicated a positive position about the site and its current condition. Community interest is currently low, as the site is appropriately maintained and no longer represents a hazard. Chandler Park provides a good neighbor to the site (because of the activity at the park, any trespass or activity at the site is noticed). ODEQ encourages appropriate re-use of the site that will be protective of the local community, the potential users of the site, and the remedy.

6.6 Site Inspection

An inspection was conducted at the site on October 19, 2005. In attendance were Ms. Katrina Higgins-Coltrain/EPA Region 6, Mr. Hal Cantwell/ODEQ, Mr. Frank Weigle, Public Works Division Supervisor for the City of Sand Springs, Ms. Margaret O'Hare/CH2M HILL (contractor to EPA), and Mr. Scott Stelle/Stelle and Associates (O&M contractor for the City of Sand Springs). The completed site inspection checklist is provided in **Attachment 3**. Photographs taken during the site inspection are provided in **Attachment 4**.

During the site inspection, the perimeter fence, the surface of the landfill cover, surface drainage, and the surface completions of the gas monitoring vents were inspected. The gas monitoring vents were properly labeled and in good condition (for example, Vent #1 illustrated in **Photograph 5**). The perimeter fence was in good condition overall, although there was one location where small trees were observed at locations that will ultimately impact the integrity of the fence (**Photograph 20**). All perimeter gates were locked and in good

condition (**Photographs 2, 11, 16**). Some evidence of erosion was observed at the western area of the site, where riprap had been placed to prevent previous erosion. Placement of additional riprap would limit the progression of erosion. Some trees at the southern end of the drainage area appear to be encroaching on the landfill cover, and should be removed.

7.0 Technical Assessment

The five-year review must determine whether the remedy at a site is protective of human health and the environment. The EPA guidance lists three questions used to provide a framework for organizing and evaluating data and information and to ensure all relevant issues are considered when determining the protectiveness of a remedy. These questions are answered for the site in the following paragraphs. At the end of the section is a summary of the technical assessment.

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The decision document for the Compass Industries site is the September 1987 ROD (**EPA, 1987**). As supported by the findings of the first and second five-year reviews (**EPA, 2000**, and **EPA, 2001**), the remedy is operating as designed. The Second Five-Year Review Final Report indicated that institutional controls in the form of deed restrictions had been implemented and that the deletion of the site should include them to maintain the integrity of the cap (**EPA, 2001b**). In 2004, the City of Sand Springs investigated land records at the Tulsa County Court House Records Office and identified several owners of the property associated with the Compass Industries site (**City of Sand Springs, 2004**). This investigation, conducted for conveying deeds between the years 1987 to 2004, determined that no restrictions, regulations, or guidelines from EPA or the State of Oklahoma were outlined in any conveying deeds recorded during those years, although a tract adjacent to the site refers to the site (**City of Sand Springs, 2004**), as illustrated in **Figure 6**. EPA and ODEQ are in the process of implementing this recommendation, which is expected to be complete by September 2006.

Optimization. In 2002, EPA concluded that a reduction in sampling of the surface water and seeps was appropriate due to the lack of occurrence of seeps and the lack of detected contaminants in surface water, although seep and surface water samples should still be collected at the time of the next five-year review, if water is present (**EPA, 2003**). Site inspections and vent monitoring are still required semiannually each year, with site maintenance (of the cap and perimeter fence) as needed. Settlement monitoring is now required every five years (at the time of the five-year review).

Early Indicators of Potential Remedy Problems. Early indicators related to the remedy implemented at the Compass Industries site would potentially include visible damage to the cap, through erosion, encroachment of woody vegetation, and/or burrowing animals, an increase in volatile concentrations detected at the site vents, a significant increase in settlement observed via the settlement survey monitoring, and/or a reoccurrence of seeps demonstrating elevated levels of site contaminants. Some encroachment of woody vegetation and minor erosion in the western area of the site was observed during the site inspection, although no significant damage to the cover has yet occurred. Seeps have not been observed at the site during site inspections conducted during the current five-year review period and no significant increase in volatile concentrations have been observed at the site vents.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

The purpose of this question is to evaluate the effects of any significant changes in standards or assumptions used at the time of remedy selection. Changes in promulgated standards or "to be considered" information (TBCs) and assumptions used in the original definition of the remedial action may indicate an adjustment in the remedy is necessary to ensure the protectiveness of the remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics. There have been no changes in exposure pathways for the Compass Industries site since completion of the Second Five-Year Review.

Changes in Applicable or Relevant and Appropriate Regulations (ARARs). ARARs for this site were identified in the September 1987 ROD, including, on the Federal level, the Resource Conservation and Recovery Act, the Toxic Substances Control Act, National Pollution Discharge Elimination System (NPDES) requirements, the Clean Water Act, the Fish and Wildlife Coordination Act, and the Endangerment Species Act. On the State level, ARARs identified for the remedy included the Oklahoma Clean Air Act and the Oklahoma Water Quality Standards. This five-year review for the site included review of ROD-specified ARARs to determine whether changes may have been implemented that may affect the protectiveness of the selected remedy. No changes were identified.

The ODEQ, Oklahoma Water Resources Board (OWRB), and the Federal regulations have not been revised to the extent that the effectiveness of the remedy at the site would be called into question. No new regulations have been issued by the State of Oklahoma or the Federal government that would call into question the effectiveness of the remedy.

7.3 Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy

The type of other information that might call into question the protectiveness of the remedy include potential future land use changes in the vicinity of the site or other expected changes in site conditions or exposure pathways. A request was made by a landowner immediately south of the landfill area to re-open a quarry at this location; both EPA and ODEQ responded with requests for further information, and the request for permit was ultimately denied. No other information has come to light as part of this third five-year review for the site that would call into question the protectiveness of the site remedy. By September 2006, ODEQ, in consultation with EPA, plans to issue an institutional control (deed notice) to restrict the uses of the land at the site and minimize potential exposure to contaminants.

7.4 Summary of the Technical Assessment

The technical assessment, based on the data review, site inspection, technical evaluation, and interviews indicates that the remedial actions selected for the site continue to be implemented as intended by the decision document.

8.0 Issues

The third five-year review identified several issues that do not currently affect the short-term protectiveness of the remedy. During the site inspection, the following observations were made: woody vegetation growing in one location immediately adjacent to the perimeter fence; trees growing close to the edge of the landfill cap in the southwestern portion of the swale area; minor erosion and rip rap settlement along the western perimeter of the cap; 2005 vent monitoring data and settlement monitoring data scheduled for early 2006 have not yet been reviewed; and, the City of Sand Springs has determined that from 1987 through 2004 no restrictions, regulations, or guidelines from EPA or the State of Oklahoma were outlined in any conveying deeds associated with the site (**City of Sand Springs, 2004**).

9.0 Recommendations and Follow-up Actions

To address the issues described in Section 8, the following recommendations and follow-up actions have been defined.

To ensure continued long-term protectiveness, trees located along the perimeter fence and encroaching on the edge of the landfill in the southwestern portion of the site should be removed. In addition, erosion in the western area of the site should be checked and riprap added as necessary to prevent further erosion. The

results of the settlement monument surveying scheduled for early 2006 should be conducted, and the results reviewed in the next annual report for the site. Also, the annual inspections conducted by the City of Sand Springs, during which the vegetative cover is inspected and the cap and liner system is checked for evidence of damage from brush and burrowing animals, should continue. By September 2006, ODEQ, in consultation with EPA, plans to issue an institutional control (deed notice) to restrict the uses of the land at the site and minimize potential exposure to contaminants.

10.0 Protectiveness Statement

The remedy implemented at the Compass Industries site is protective of human health and the environment in the short-term, and will remain so provided the integrity of the cap is maintained through removal of woody vegetation, prevention of erosion, maintenance of the vegetative cover, and implementation of institutional controls.

11.0 Next Review

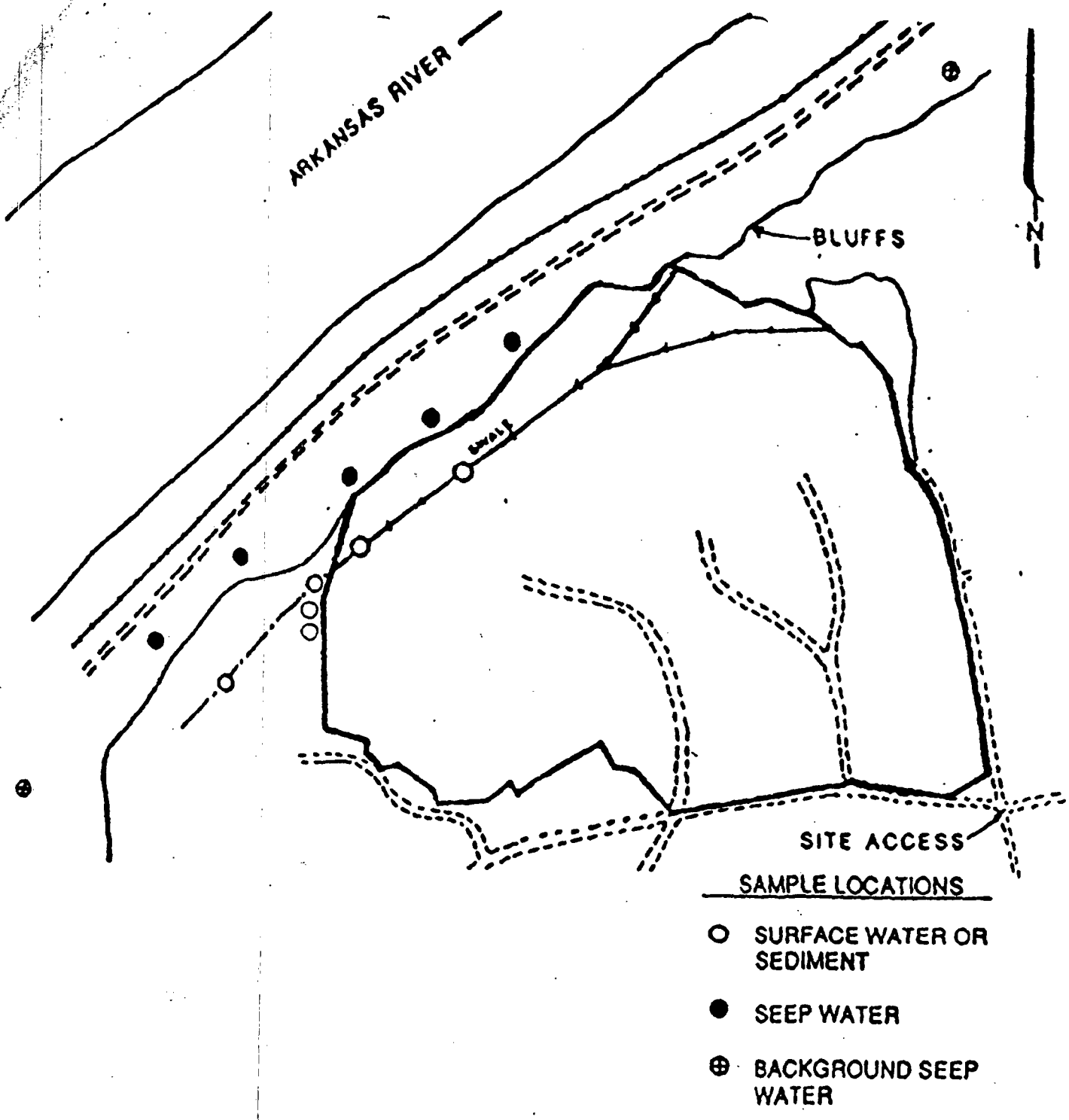
The next five-year review, the fourth for the site, should be completed during 2011. At this time, surface water and seep sampling should be conducted if surface water and seeps are evident at the site, and settlement monitoring should be conducted. The institutional control should be checked in this five-year review, to confirm that deeds for properties within the area of the landfill cap effectively communicate the need for protection of the cap integrity.

Table 1
Chronology of Site Events
Compass Industries Superfund Site
Third Five-Year Review Report

Date	Event
1904	The site is operated as a quarry and limestone from the site is being utilized for cement and railroad ballast making.
1964	Quarrying operations have ceased and waste dumping activities have begun.
1972-1976	The site is operated as a municipal solid waste landfill facility.
1970's	Several fires are reported at the landfill.
1980's	Waste disposal and landfill activities at the site cease.
Early 1983	Air monitoring is conducted by EPA and Oklahoma State Department of Health (OSDH) after repeated complaints were made by local residents and the media.
September 1983	The Compass Industries site is proposed to the National Priorities List (NPL).
1983-1984	Approximately 28 borings are installed to extinguish underground fires.
July 1984	EPA and OSDH enter into a cooperative agreement to conduct the RI/FS.
September 1984	The Compass Industries Site is formally added to the NPL.
Late 1984	The most recent burning underground fire burns out.
July 1987	The Remedial Investigation Report is published and the Feasibility Study is completed.
August 1987	The Endangerment Assessment is published.
September 29, 1987	The Record of Decision for the Compass Industries Site is signed.
March 1989	EPA issues a Unilateral Administrative Order against 7 PRPs.
May-June 1988	EPA installs a fence and posts warning signs around the site perimeter.
August 1988	The Remedial Design contract is awarded.
April 1989	EPA approves the Final Design.
January 1990	The Remedial Action begins with the construction of test fill.
February 1990	Clearing and grubbing is started and a subsurface drainage system is installed.
March 1990	Grubbing of the heavy vegetation is completed.
October 1990	The liner installation is complete.
April-May 1991	The final vegetative cover is planted.
January1991	The Remedial Action is complete with the acceptance of the Remedial Action Report.
August 29, 1991	The final site inspection for vegetative cover is completed.
August 1991	EPA accepts the O&M Plan.
1991	O&M begins at the site with the collection of seep and background samples.
June 30, 1992	The Close Out Report signifying site completion is signed.

Table 1
Chronology of Site Events
Compass Industries Superfund Site
Third Five-Year Review Report

Date	Event
October 1993	EPA notifies the PRPs of the intent to monitor vents and seeps adjacent to the cap.
1995	The last seep sampling event occurred.
2000	The last surface water sampling event occurred.
September 26, 2000	EPA finalizes the first five-year review for the Compass Industries site.
December 26, 2001	EPA finalizes the second five-year review for the Compass Industries site.
November 28, 2001	A Notice of Intent to Delete and a Direct Final Notice of Deletion are published.
March 19, 2002	EPA publishes a removal of the deletion and establishes a new comment period.
May 16, 2002	The Notice of Intent to Delete is published.
June 17, 2002	The public comment period ends.
July 18, 2002	The Notice of Deletion is published.
2002	O&M responsibilities shift to the City of Sand Springs. 2002 Annual Operation and Maintenance Report prepared and submitted by the City of Sand Springs.
2003	2003 Annual Operation and Maintenance Report prepared and submitted by the City of Sand Springs.
December 31, 2004	2004 Annual Operation and Maintenance Report submitted by the City of Sand Springs.
April 2006	Third Five-Year Review Report completed.



NOTE: The location of the monitoring points is approximate and will be limited to: 5 seep samples
2 background samples

FIGURE 1
SAMPLE PROGRAM LOCATION PLAN

FIGURE 1

[This page intentionally left blank.]

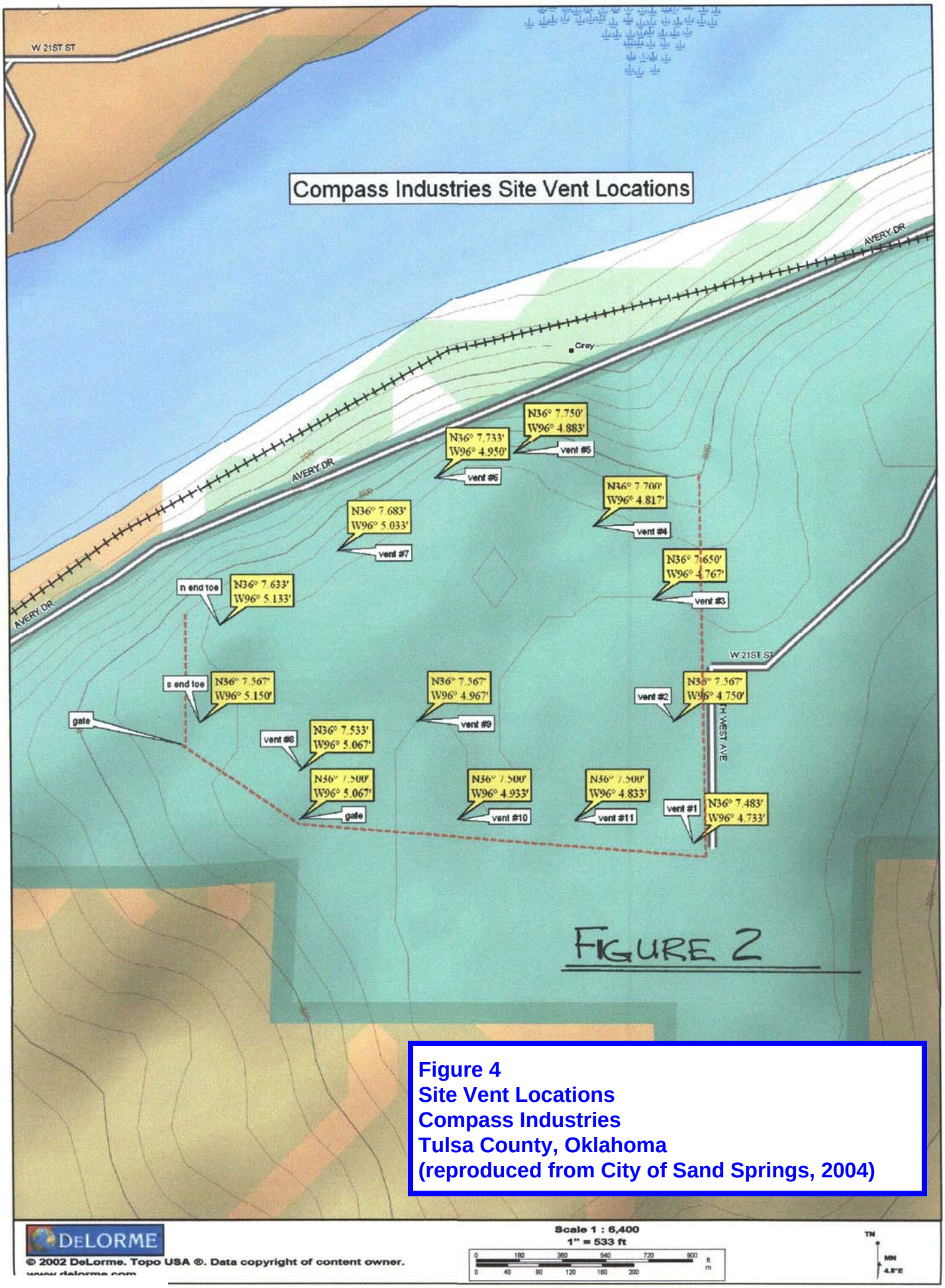


Figure 4
Site Vent Locations
Compass Industries
Tulsa County, Oklahoma
(reproduced from City of Sand Springs, 2004)

[This page intentionally left blank.]

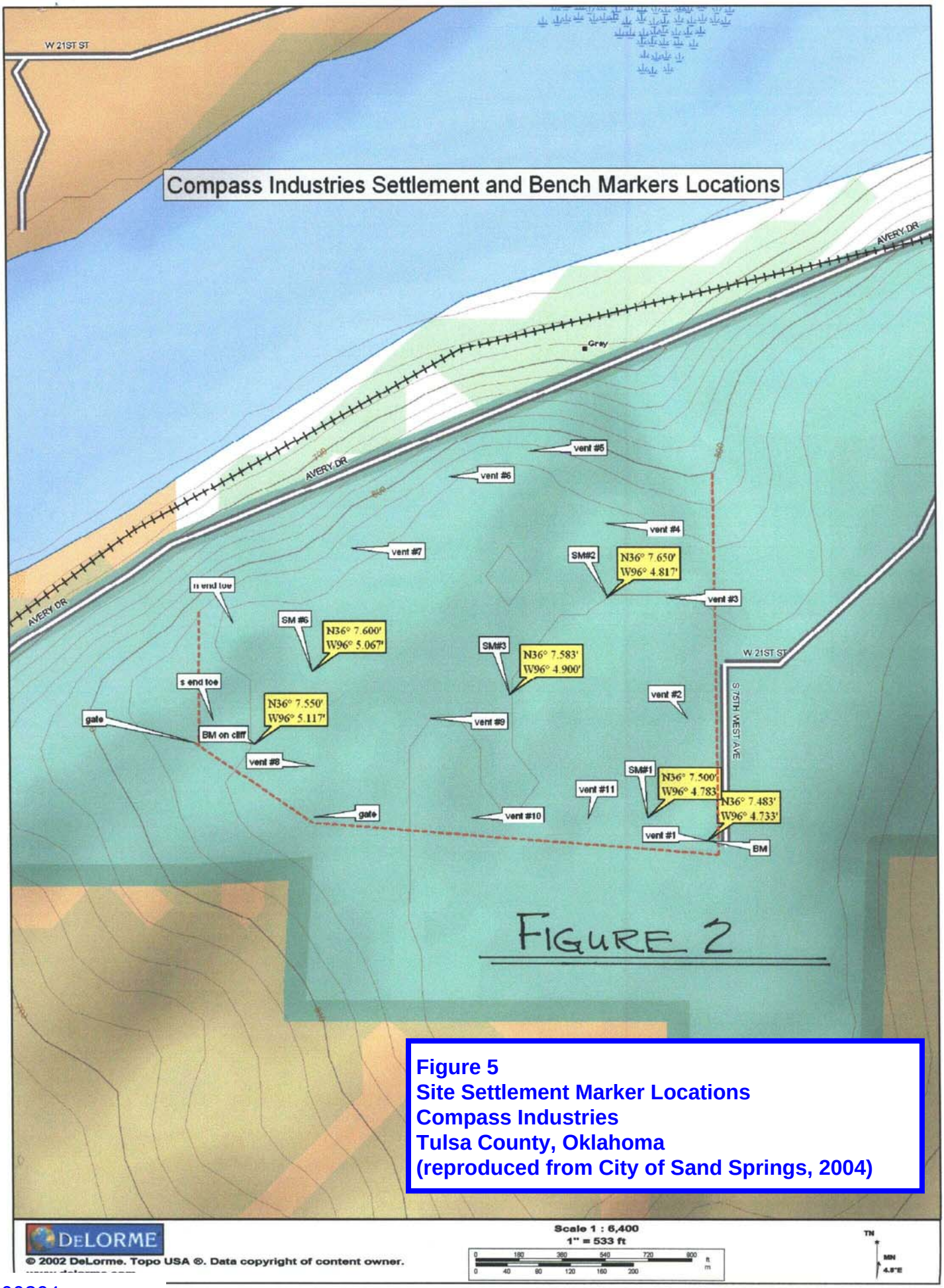


Figure 5
Site Settlement Marker Locations
Compass Industries
Tulsa County, Oklahoma
(reproduced from City of Sand Springs, 2004)

[This page intentionally left blank.]

Figure 6
Results of Title Search Performed for the City of Sand Springs
Compass Industries
Tulsa County, Oklahoma
(reproduced from City of Sand Springs, 2004)

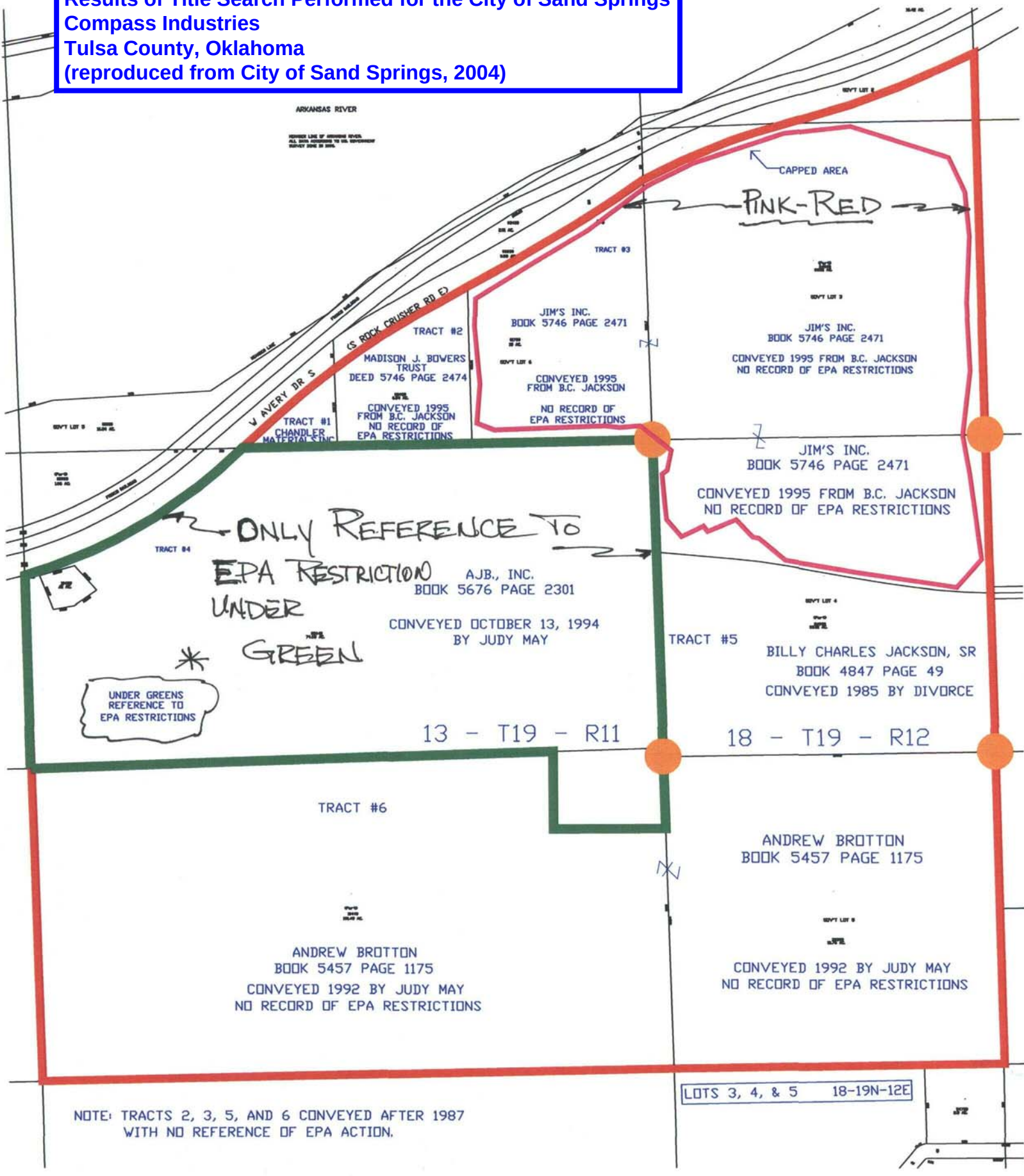


FIGURE 10

[This page intentionally left blank.]

Attachment 1

Documents Reviewed

[This page intentionally left blank.]

Attachment 1
List of Documents Reviewed

Bechtel Environmental, Inc., 1991. *Remedial Action Report for the Compass Industries Superfund Site, Tulsa County, Oklahoma.* January 28, 1991

City of Sand Springs, 2002. *2002 Annual Operation and Maintenance Report, Compass Industries Superfund Site, Tulsa County, Oklahoma.*

City of Sand Springs, 2003. *2003 Annual Operation and Maintenance Report, Compass Industries Superfund Site, Tulsa County, Oklahoma.*

City of Sand Springs, 2004. *2004 Annual Operation and Maintenance Report, Compass Industries Superfund Site, Tulsa County, Oklahoma.* December 31, 2004.

Flint Environmental Services, 1994. *1993 Annual Monitoring Report, Compass Industries Site.* January 18, 1994.

Stelle, J. Scott, R.E.M., 1994. *1994 Annual Monitoring Report, Compass Industries Site.* December 30, 1994.

Stelle & Associates Inc., 2000. *2000 Annual Monitoring Report, Compass Industries Site.* December 31, 2000.

U. S. Environmental Protection Agency (EPA), 1987a. *Endangerment Assessment, Compass Industries Site. August 10, 1987.*

U. S. Environmental Protection Agency (EPA), 1987b. *Summary of Remedial Alternative Selection,Compass Industries Landfill, Tulsa County, Oklahoma* (Record of Decision). September 1987.

U. S. Environmental Protection Agency (EPA), 1989. *Administrative Order Docket Number CERCLA VI-5-89. March 29, 1989.*

U. S. Environmental Protection Agency (EPA), 1992. *Close Out Report, Compass Industries Landfill Superfund Site, Tulsa County, Oklahoma*. June 30, 1992.

U. S. Environmental Protection Agency (EPA), 2000. *First Five-Year Review Final Report, Compass Industries Superfund Site, Tulsa County, Oklahoma*. September 26, 2000.

U. S. Environmental Protection Agency (EPA), 2001a. *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. June 2001.

U. S. Environmental Protection Agency (EPA), 2001b. *Second Five-Year Review Final Report, Compass Industries Superfund Site, Tulsa County, Oklahoma*. December 26, 2001.

U. S. Environmental Protection Agency (EPA), 2002a. Removal of the Direct Final Notice of Deletion Amendment, *Compass Industries Landfill Superfund Site, Tulsa County, Oklahoma.* March 1, 2002, published March 19, 2002.

U. S. Environmental Protection Agency (EPA), 2002b. *Notice of Intent to Delete, Compass Industries Landfill Superfund Site, Tulsa County, Oklahoma.* May 1, 2002, published May 16, 2002.

U. S. Environmental Protection Agency (EPA), 2002c. *Notice of Deletion, Compass Industries Landfill Superfund Site, Tulsa County, Oklahoma.* June 28, 2002, published July 18, 2002.

U. S. Environmental Protection Agency (EPA), 2003. *Letter to Mr. Frank Weigle of Sand Springs, Oklahoma regarding Operation and Maintenance for the Compass Industries Landfill Superfund Site.* April 10, 2003.

Attachment 2

Interview Record Forms

[This page intentionally left blank.]

Five-Year Review Interview Record Compass Industries Superfund Site Tulsa County, Louisiana	**Interviewee:** **Loy Calhoun, City Manager** **Affiliation:** **City of Sand Springs** **Telephone:** **Email address:**

Site Name	EPA ID Number	Date of Interview	Interview Method
Compass Industries (Avery Drive)	EPA ID# OKD980620983	October 19, 2006	Verbally, in person

Interview Contacts

Name	Organization	Phone	Email	Address
Katrina Coltrain	EPA Region 6	214-665-8143	coltrain.katrina@epa.gov	1445 Ross Ave Dallas, Texas 75202
Margaret O'Hare	CH2M HILL, EPA contractor	972-980-2170	mohare@ch2m.com	12377 Merit, Suite 1000 Dallas, Texas 75251

Purpose of the Five-Year Review

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, to confirm that human health and the environment continue to be protected by the remedial actions being performed at the site. This interview is being conducted as a part of the third five-year review for the Compass Industries site. The period covered by this five-year review is from completion of the second five-year review in 2001 to current.

Interview Comments

Mr. Calhoun's interview was conducted by Ms. Coltrain, with Mr. Frank Weigle/City of Sand Springs and Margaret O'Hare/CH2M HILL in attendance. Notes were taken by Ms. O'Hare.

Mr. Calhoun indicated during the discussion that there has been little interest in the community now the work is finished and little activity at the site. The presence of the county park adjacent to the site provides a good neighbor, as travel through the gates is noticed. Some trespassing and vandalism has occurred, particularly in the form of stealing site signs, which are replaced. Updates to the O&M at the site have occurred since the last five-year review, and this work is implemented by the City under Mr. Weigle's direction. Mr. Calhoun indicated there appear to be no issues associated with the site, although he qualified his answer by saying that future land use changes (ie. development in the area) may create issues at some point. Reference was made to the property owner to the south who applied to open a quarry (the application was eventually denied). Ms. Coltrain described the institutional controls to be put in place at the site which area expected to be in place by September 2006.

[This page intentionally left blank.]

Five-Year Review Interview Record Compass Industries Superfund Site Tulsa County, Oklahoma	**Interviewee:** **Hal Cantwell** **Affiliation:** **ODEQ** **Telephone:** **email:** Hal.Cantwell@deq.state.ok.us

Site Name	EPA ID Number	Date of Interview	Interview Method
Compass Industries (Avery Drive)	EPA ID# OKD980620983	February 8, 2006	By email

Interview Contacts

Name	Organization	Phone	Email	Address
Katrina Coltrain	EPA Region 6	214-665-8143	coltrain.katrina@epa.gov	1445 Ross Ave Dallas, Texas 75202
Margaret O'Hare	CH2M HILL, EPA contractor	972-980-2170	mohare@ch2m.com	12377 Merit, Suite 1000 Dallas, Texas 75251

Purpose of the Five-Year Review

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, to confirm that human health and the environment continue to be protected by the remedial actions being performed at the site. This interview is being conducted as a part of the third five-year review for the Compass Industries site. The period covered by this five-year review is from completion of the second five-year review in 2001 to current.

Interview Questions

1. What is your overall impression of the work conducted at the site since the second Five-Year Review period (November 2001)?

Response: Adequate

2. From your perspective, what effects have continued O&M at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: Little to no effects on surrounding community.

I know of no ongoing community concerns regarding the site or its operation and maintenance.

3. Please describe the frequency and content of routine communications or activities conducted by your office regarding the site (e.g. site visits, inspections, reporting activities, etc.).

Response: Visit and inspect site twice a year.

4. Are you aware of any unanticipated events, incidents, or activities that have occurred at the site, such as dumping, vandalism, fire, or anything that required emergency response from local authorities? If so, please give details.

Response: I know of none.

Have there been any complaints, violations or other incidents related to the site that required a response by your office? If so, please summarize the events and results.

Response: The request by the land owner to re-open a quarry just south of the site required that I work with EPA to ensure the state position was forwarded to the entity that reviewed the mining application.

3. Are you aware of any problems or difficulties encountered since the second five year review period (November 2001) which impacted the site or resulted in a change in O&M procedures? Please describe the changes and impacts.

Response: No, none

4. Have there been any changes in state or local environmental standards since the second five-year review period (November 2001) that may call into question the protectiveness or effectiveness of the remedy?

Response: no

5. Do you know of any opportunities to optimize the operation, maintenance, or sampling efforts at the site since the second five year review period (November 2001)? Have such changes been adopted?

Response: no

6. Do you feel well informed about the site's activities and progress?

Response: yes

7. Do you have any comments, suggestions, or recommendations regarding the site?

Response: DEQ would encourage appropriate re-use of the site that was protective of the local community, the potential users of the site, and the remedy.

Attachment 3

Site Inspection Checklist

[This page intentionally left blank.]

Compass Industries Superfund Site
Tulsa County, Oklahoma
Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program. N/A means "not applicable".

I. SITE INFORMATION

Site Name: Compass Industries Superfund Site	**EPA ID:** OKD980620983
City/State: Sand Springs, Tulsa County, Oklahoma	**Date of Inspection:** October 19, 2005
Agency Completing 5 Year Review: EPA	**Weather/temperature:** Sunny to partly cloudy, 90 degrees

Remedy Includes: (Check all that apply)
- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other:

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager: Mr. Loy Calhoun/City of Sand Springs City Manager
   Name:
   Title:
   Date:
   Interviewed: ☐ at site ☒ at office ☐ by phone Phone Number:
   ☒ Additional report attached (if additional space required) – see Attachment 2 to this five-year review report.
   Problems, suggestions:

2. O&M site manager: Frank Weigler/City of Sand Springs
   Name:
   Title: Public Works Division Supervisor for the City of Sand Springs
   Date:
   Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number:
   ☐ Additional report attached (if additional space required).
   Problems, suggestions:

3. O&M staff: Scott Stelle/Stelle and Associates
   Name:
   Title:

Date:
Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number:
☐ Additional report attached (if additional space required).
Problems, suggestions:

4. 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: ODEQ
Contact: Mr. Hal Cantwell
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☒ Additional report attached (if additional space required) – see Attachment 2 to this five-year review report.

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

5. Other interviews (optional) ☒ N/A ☐ Additional report attached (if additional space required).

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents
   - ☒ O&M Manuals — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☐ As-Built Drawings — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance Logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks:

2. Health and Safety Plan Documents
   - ☒ 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:
   Not reviewed.

3. O&M and OSHA Training Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

4. Permits and Service Agreements
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

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:

8. Leachate Extraction Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

9. Discharge Compliance Records — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks:

10. Daily Access/Security Logs — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks:

IV. O&M Costs ☐ Applicable ☒ N/A

O&M Organization
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Other: City of Sand Springs and contractor Stelle and Associates.

O&M Cost Records
☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate: ☐ Breakdown attached

Total annual cost by year for review period if available

From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached
From (Date):	To (Date):	Total cost:	☐ Breakdown attached

Unanticipated or Unusually High O&M Costs During Review Period ☒ N/A
Describe costs and reasons:

O&M costs not reviewed as part of this Five-Year Review

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

Fencing

Fencing damaged ☒ Location shown on site map ☐ Gates secured ☐ N/A
Remarks: Some damage to fence and some trees growing through fence that need to be removed.

Other Access Restrictions

Signs and other security measures ☒ Location shown on site map ☐ N/A
Remarks: Signs were new. Replaced recently due to theft.

Institutional Controls

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): Site Inspections.
Frequency:
Responsible party/agency:
Contact: City of Sand Springs
Name: Frank Weigler
Title:
Date:
Phone Number:
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: ☐ Additional report attached (if additional space required).

Adequacy ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A
Remarks: ODEQ, in consultation with EPA is in the process of providing information for the deeds of property associated with the site. Expected to be complete by September 2006.

General

Vandalism/trespassing ☐ Location shown on site map ☐ No vandalism evident
Remarks: O&M staff indicated there has been some evidence of trespassing in the past. Perimeter/fence gate vandalized and repaired on more than one occasion.

Land use changes onsite ☒ N/A
Remarks:

Land use changes offsite ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

Roads ☒ Applicable ☐ N/A

Roads damaged ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks: Dirt roads around perimeter of cap in good condition. Used to access vents for sampling and survey monuments for settlement monitoring.

Other Site Conditions

Remarks:

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

1. Landfill Surface

Settlement (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent: Depth:
Remarks: minor settlement of rip rap placed along the western perimeter.

Cracks ☐ Location shown on site map ☒ Cracking not evident
Lengths: Widths: Depths:
Remarks:

Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent: Depth:
Remarks: minor erosion along the western perimeter.

Holes ☐ Location shown on site map ☒ Holes not evident
Areal extent: Depth:
Remarks:

Vegetative Cover
Cover properly established ☒ No signs of stress ☐ Grass ☐ Trees/Shrubs
Remarks: Cover vegetation in good shape.

Alternative Cover (armored rock, concrete, etc.) ☒ N/A
Remarks:

Bulges ☐ Location shown on site map ☒ Bulges not evident
Areal extent: Height:
Remarks:

Wet Areas/Water Damage ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent:
☐ Ponding ☐ Location shown on site map Areal extent:
☐ Seeps ☐ Location shown on site map Areal extent:
☐ Soft subgrade ☐ Location shown on site map Areal extent:
Remarks:

Slope Instability ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent:
Remarks:

Benches ☐ Applicable ☒ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1. Flows Bypass Bench Remarks:	☐ Location shown on site map	☒ N/A or okay
2. Bench Breached Remarks:	☐ Location shown on site map	☒ N/A or okay
3. Bench Overtopped Remarks:	☐ Location shown on site map	☒ N/A or okay
Letdown Channels ☒ Applicable ☐ N/A		
Settlement Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of settlement
Material Degradation Material type: Remarks:	☐ Location shown on site map Areal extent:	☒ No evidence of degradation
Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of erosion
Undercutting Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ No evidence of undercutting
Obstructions Type: Areal extent: Remarks:	☐ Location shown on site map Height:	☒ N/A
Excessive Vegetative Growth ☐ Evidence of excessive growth ☐ Location shown on site map Remarks:	☒ No evidence of excessive growth ☐ Vegetation in channels but does not obstruct flow Areal extent:	

Cover Penetrations ☒ Applicable ☐ N/A

Gas Vents ☐ N/A
- ☐ Active ☒ Passive ☒ Routinely sampled
- ☒ Properly secured/locked ☒ Functioning ☒ Good condition
- ☐ Evidence of leakage at penetration ☐ Needs O& M

Remarks:

Gas Monitoring Probes ☒ N/A
- ☐ Routinely sampled
- ☐ Properly secured/locked ☐ Functioning ☐ Good condition
- ☐ Evidence of leakage at penetration ☐ Needs O&M

Remarks:

Monitoring Wells (within surface area of landfill) ☒ N/A
- ☐ Routinely sampled
- ☐ Properly secured/locked ☐ Functioning ☐ Good condition
- ☐ Evidence of leakage at penetration ☐ Needs O&M

Remarks:

Leachate Extraction Wells ☒ N/A
- ☐ Routinely sampled
- ☐ Properly secured/locked ☐ Functioning ☐ Good condition
- ☐ Evidence of leakage at penetration ☐ Needs O&M

Remarks:

Settlement Monuments ☒ Located ☒ Routinely surveyed ☐ N/A

Remarks: Next surveying planned for early 2006.

Gas Collection and Treatment ☐ Applicable ☒ N/A

Gas Treatment Facilities ☐ N/A
- ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
- ☐ Good condition ☐ Needs O& M

Remarks:

Gas Collection Wells, Manifolds and Piping ☐ N/A
- ☐ Good condition ☐ Needs O& M

Remarks:

Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ N/A
- ☐ Good condition ☐ Needs O& M

Remarks:

Cover Drainage Layer	☒ Applicable	☐ N/A
Outlet Pipes Inspected Remarks:	☒ Functioning	☐ N/A
Outlet Rock Inspected Remarks: Some minor erosion noted, needs to be watched and additional riprap added as appropriate.	☒ Functioning	☐ N/A
8. Detention/Sedimentation Ponds	☐ Applicable	☒ N/A
Siltation Areal extent: Depth: Remarks:	☐ Siltation evident	☐ N/A
Erosion Areal extent: Depth: Remarks:	☐ Erosion evident	☐ N/A
Outlet Works Remarks:	☐ Functioning	☐ N/A
Dam Remarks:	☐ Functioning	☐ N/A
Retaining Walls	☐ Applicable	☒ N/A
Deformations Horizontal displacement: Vertical displacement: Rotational displacement: Remarks:	☐ Location shown on site map	☒ Deformation not evident
Degradation Remarks:	☐ Location shown on site map	☒ Degradation not evident
Perimeter Ditches/Off-site discharge	☐ Applicable	☒ N/A
Siltation Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ Siltation not evident
Vegetative Growth Areal extent: Type: Remarks:	☐ Location shown on site map	☐ Vegetation does not impede flow

Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent: Depth:
Remarks:

Discharge Structure ☐ Location shown on site map ☐ N/A
☐ Functioning ☐ Good Condition
Remarks:

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Settlement ☐ Location shown on site map ☐ Settlement not evident
Areal extent: **Depth:**
Remarks:

Performance Monitoring ☐ N/A
☐ Performance not monitored
☐ Performance monitored Frequency:
☐ Evidence of breaching Head differential:
Remarks:

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

Pumps, Wellhead Plumbing, and Electrical ☐ N/A
☐ All required wells located ☐ Good condition ☐ Needs O& M
Remarks:

Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
☐ System located ☐ Good condition ☐ Needs O& M
Remarks:.

Spare Parts and Equipment ☐ N/A
☐ Readily available ☐ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:

Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

Collection Structures, Pumps, and Electrical ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

Spare Parts and Equipment ☐ N/A
☐ Readily available ☐ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:

Treatment System ☐ Applicable ☒ N/A

Treatment Train (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers ☐ Filters (list type): Sand
☐ Additive (list type, e.g., chelation agent, flocculent)
☐ Others (list):
☐ Good condition ☐ Needs O&M
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually (list volume): Approximately 6,000,000 gallons
☐ Quantity of surface water treated annually (list volume): 0
Remarks:

Electrical Enclosures and Panels (properly rated and functional) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

Tanks, Vaults, Storage Vessels ☐ N/A
☐ Good condition ☐ Proper secondary containment ☐ Needs O&M
Remarks:

Discharge Structure and Appurtenances ☐ N/A
☒ Good condition ☐ Needs O& M
Remarks:

Treatment Building(s) ☐ N/A
☐ Good condition (esp. roof and doorways) ☐ Needs Repair
☐ Chemicals and equipment properly stored
Remarks:

Monitoring Wells (pump and treatment remedy) ☐ N/A
☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☐ Needs O&M
Remarks:

Monitored Natural Attenuation	☐ Applicable	☒ N/A	
Monitoring Wells (natural attenuation remedy)			☐ N/A
☐ All required wells located	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled
☐ Good condition	☐ Needs O&M		
Remarks:			
5. Long Term Monitoring	☐ Applicable	☒ N/A	
Monitoring Wells			☐ N/A
☐ All required wells located	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled
☐ Good condition	☐ Needs O&M		
Remarks:			

X. OTHER REMEDIES ☐ Applicable ☒ N/A

XI. OVERALL OBSERVATIONS

9. Implementation of the Remedy

The remedy is operating as planned. No significant issues noted during the site inspection, although, woody vegetation impacting the perimeter fence was noted, as well as woody vegetation encroaching the southwestern boundary of the cap. Also minor erosion was observed in the western swale area.

2. Adequacy of O&M

O&M procedures are being implemented in accordance with the plan, and appear to be adequate.

3. Early Indicators of Potential Remedy Failure

No significant issues noted during the site inspection, although, woody vegetation impacting the perimeter fence was noted, as well as woody vegetation encroaching the southwestern boundary of the cap. Also minor erosion was observed in the western swale area.

4. Opportunities for Optimization

Frequency of O&M has been reduced due to the lack of seeps and surface water observed at the site.

Site Inspection Team Roster

Name	Organization	Title
Ms. Katrina Coltrain	EPA Region 6	Remedial Project Manager
Mr. Frank Weigle	CITY OF SAND SPRINGS	Public Works Division Supervisor for the City of Sand Springs and Project Manager for O&M
Mr. Hal Cantwell	ODEQ	Project Manager
Mr. Scott Stelle	Stelle and Associates	Site supervisor for O&M
Ms. Margaret O'Hare	CH2M HILL, Inc.	Project Manager for the Five-Year Review

[This page intentionally left blank.]

Attachment 4

Site Inspection Photographs

[This page intentionally left blank.]

Photo 1: Area access gate at west end of paved portion of West 26th Street, facing west (refer to Figure 2 for location of this gate).

Photo 2: Closed and locked site entrance gate, facing north (refer to Figure 2 for location of this gate). Photograph 2 of 49

Photo 3: Site entrance gate, facing north (refer to Figure 2 for location of this gate).

Photo 4: Signs on site entrance gate, facing north (refer to Figure 2 for location of this gate). Photograph 4 of 49

Photo 5: Vent #1, facing north (refer to Figure 4 for locations of site vents).

Photo 6: Vent #1, facing northeast, with lights for Chandler Park softball fields in background (refer to Figure 4 for locations of site vents).

Photo 7: Facing north across landfill cover.

Photo 8: Settlement marker #1, facing north (refer to Figure 5 for location of settlement markers).

Photo 9: Vent #11, facing southwest, with southern perimeter fence in background (refer to Figure 4 for locations of site vents).

Photo 10: Site perimeter fence on the south side, facing southeast.

Photo 11: Locked gate within southern side of perimeter fence, facing southwest (between Vent #10 and 11; refer to Figure 4 for location of site vents).

Photo 12: Vent #10, facing southwest (refer to Figure 4 for locations of site vents).

Photo 13: Locked gate within southern side of perimeter fence (south of Vent #8; refer to Figure 4 for location of site vents).

Photo 14: View from top of bluff northeast across landfill, toward Vent #8 (refer to Figure 4 for location of site vents).

Photo 15: View from top of bluff northeast toward Vent #8 (refer to Figure 4 for location of site vents) – this is a closer view of previous photograph).

Photo 16: Locked access gate at southwest corner of site, facing west (refer to Figure 4 for location of gate). Photograph 16 of 49

Photo 17: Main entrance gate at west end of paved portion of West 26th Street, facing west.

Photo 18: Main entrance gate at west end of paved portion of West 26th Street, facing west.

Photo 19: Main entrance gate at west end of paved portion of West 26th Street, facing west.

Photo 20: Trees growing through perimeter fence on south side.

Photo 21: View east along bluff in southern part of site.

Photo 22: View west along bluff in southern part of site (view is toward area of Vent #9). Photograph 22 of 49

Photo 23: Vent #9 (refer to Figure 4 for locations of site vents).

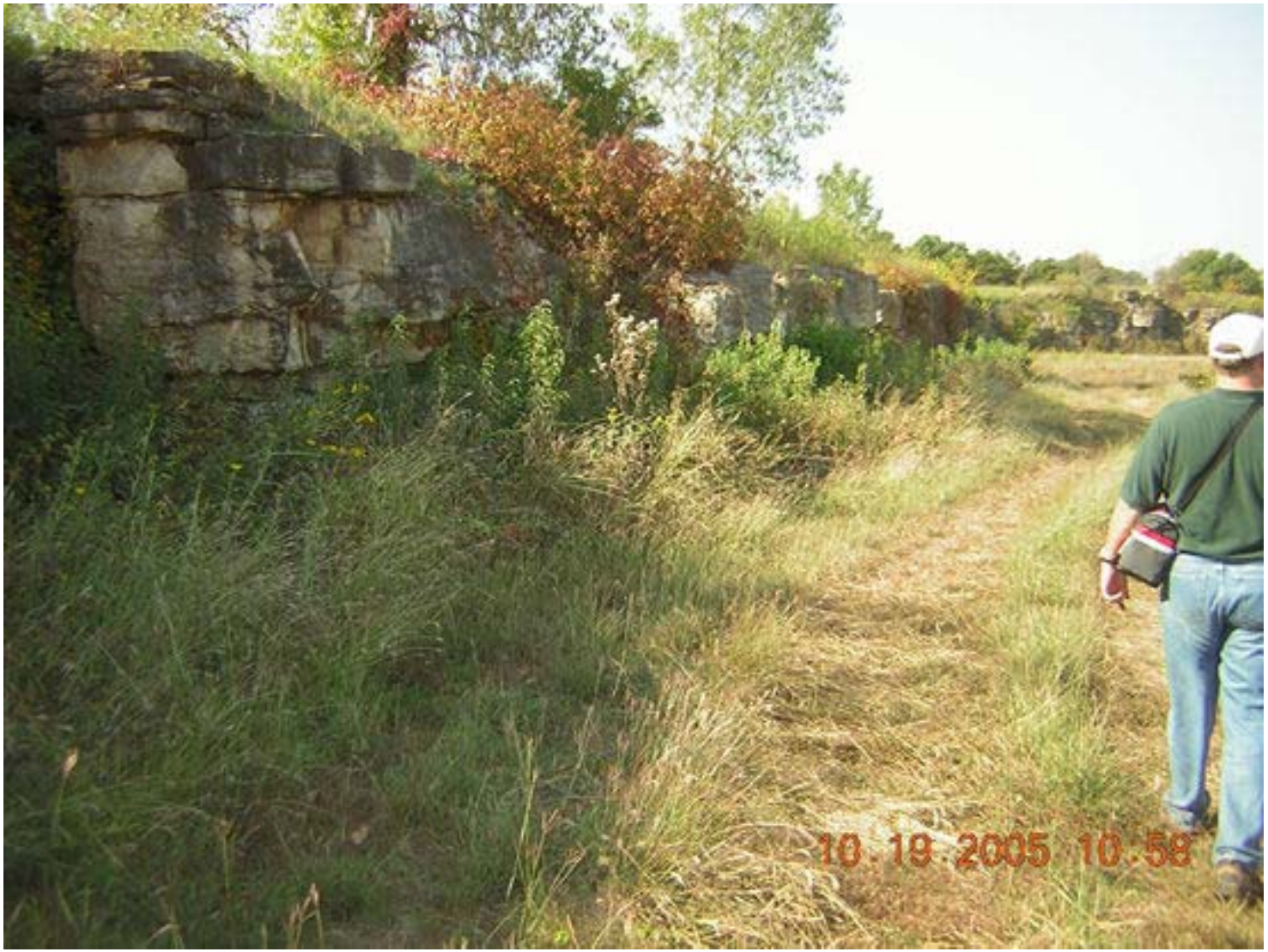


Photo 24: View west along bluff in southern part of site, between Vent #8 and 9 (refer to Figure 4 for location of site vents).

Photo 25: View north across landfill.

Photo 26: Vent #8 (refer to Figure 4 for locations of site vents).

Photo 27: View north across western edge of landfill (site drainage area).

Photo 28: Western edge of landfill area. Note riprap to prevent erosion, and western perimeter fence.

Photo 29: Some minor erosion observed at western edge of landfill area. Note presence of riprap.

Photo 30: Western perimeter fence, with restricted access sign visible.

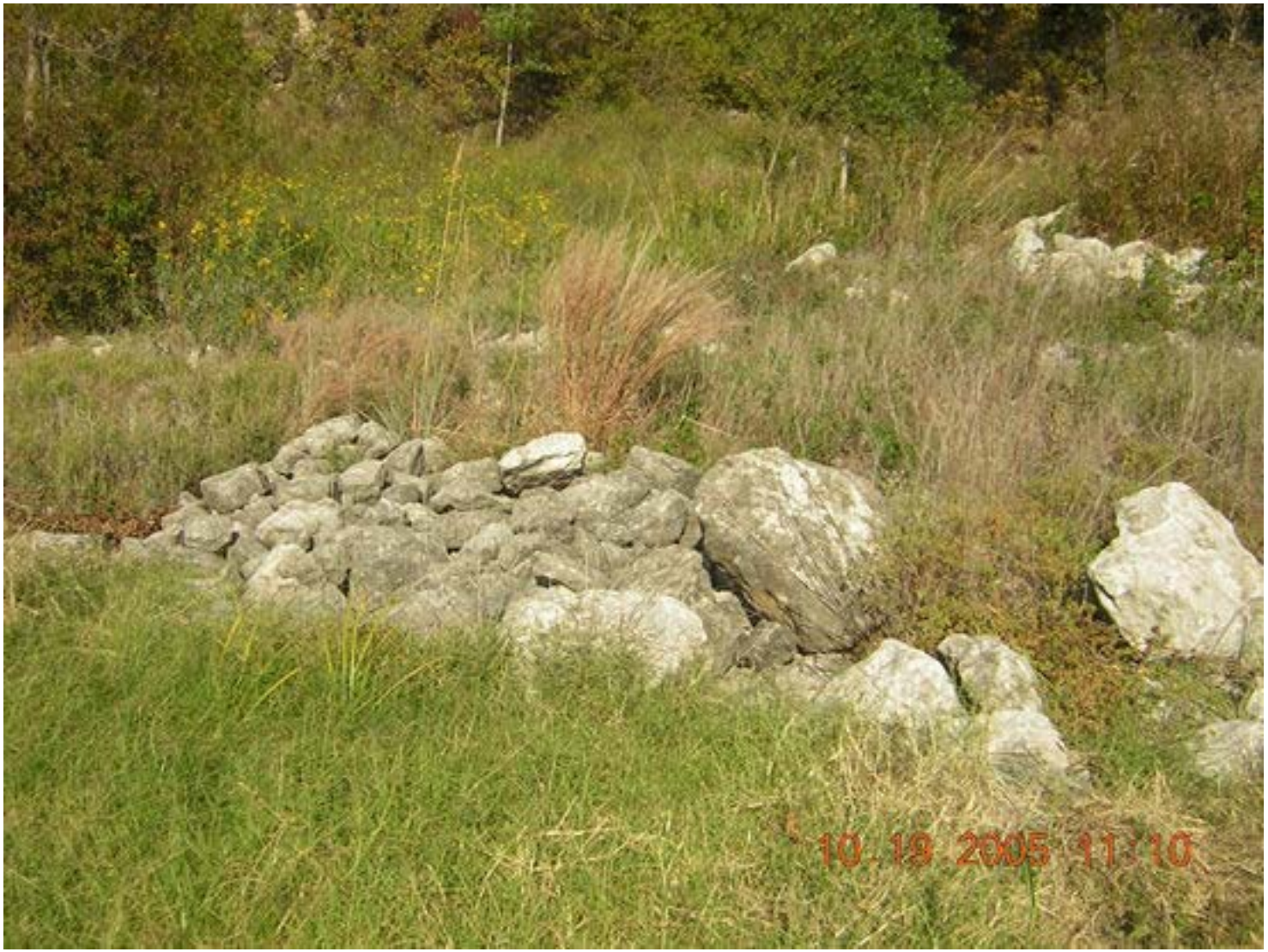


Photo 31: Riprap to prevent erosion along western edge of landfill.

Photo 32: Western edge of landfill. Note riprap to prevent erosion.

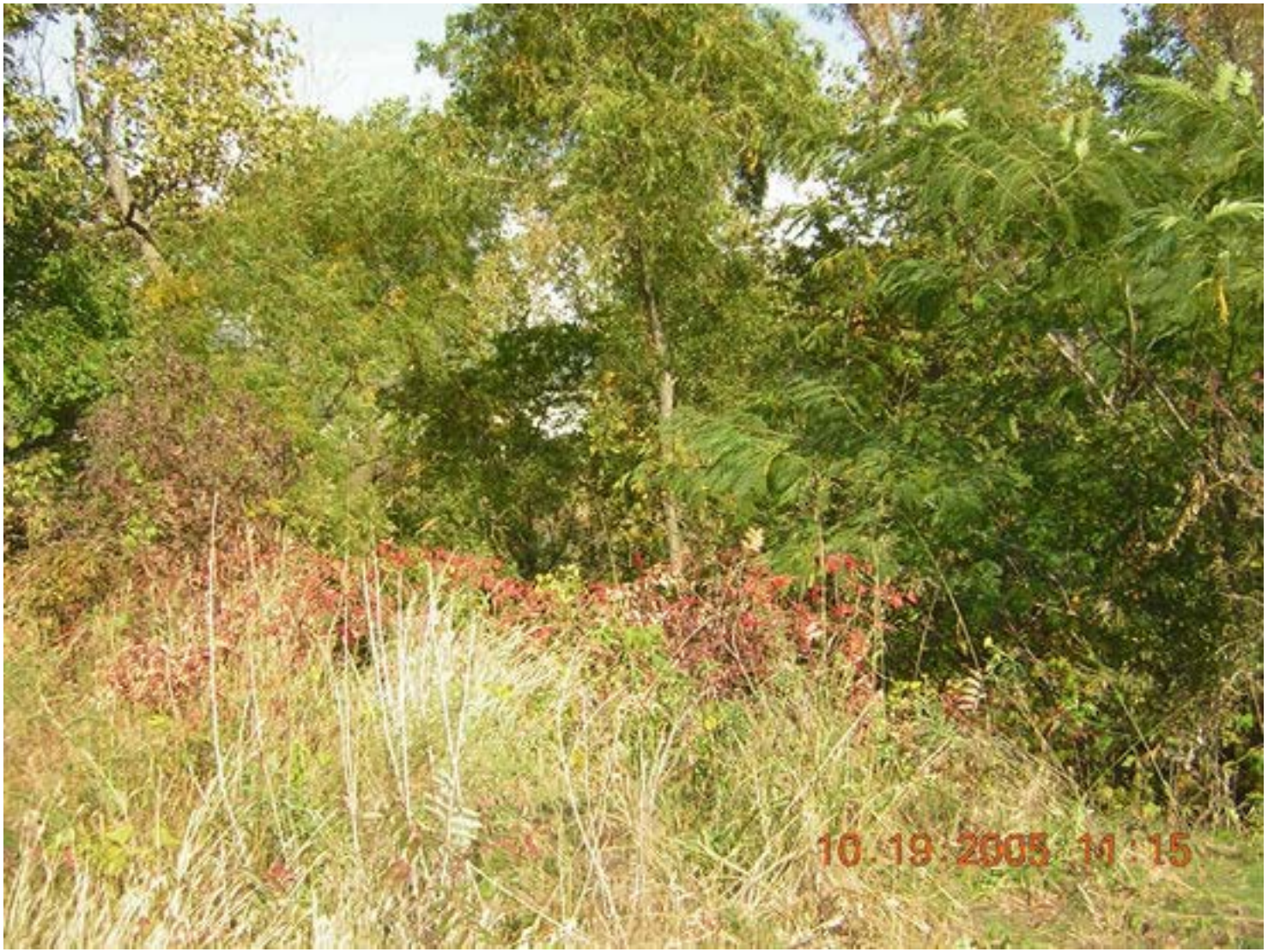


Photo 33: Heavy vegetation northwest of the landfill along top of bluff above the Arkansas River.

Photo 34: View southeast across landfill cover.

Photo 35: Vent #7 (refer to Figure 4 for locations of site vents).

Photo 36: Vent #6 (refer to Figure 4 for locations of site vents).

Photo 37: Facing north across landfill cover.

Photo 38: Facing north across landfill cover.

Photo 39: Facing north toward restricted access sign on north side of landfill along top of bluff above Arkansas River.

Photo 40: Close-up view of restricted access sign on north side of landfill along top of bluff above Arkansas River (landfill cover is in the background).

Photo 41: Vent #5 (refer to Figure 4 for locations of site vents).

Photo 42: View west across landfill cover.

Photo 43: Vent #4 on northeast side of landfill (refer to Figure 4 for locations of site vents).

Photo 44: View west across landfill cover, between Site Vents #4 and 3 (refer to Figure 4 for locations of site vents).

Photo 45: View east toward eastern perimeter fence and restricted access sign.

Photo 46: Vent #3 (refer to Figure 4 for locations of site vents).

Photo 47: Vent #2 (refer to Figure 4 for locations of site vents).

Photo 48: View northwest across eastern area of landfill cover.

Photo 49: View north across eastern area of landfill cover.

[This page intentionally left blank.]

Attachment 5

Notices to the Public Regarding the Five-Year Review

[This page intentionally left blank.]