

Strawberryfields Estates, Inc.

Clean-up Plan Fact Sheet

Warwick, Rhode Island

Fact Sheet No. 2

December 2000

Introduction

This Fact Sheet provides an overview of historical site investigations and the proposed clean-up plan for impacted soil and groundwater at the Strawberryfields Estate, Inc. property (the Site) located at 333 Strawberry Field Road in Warwick, Rhode Island.

Past investigations of soil and groundwater at the Site have been conducted in accordance with the State's Remediation Regulations. All Site activities have been, and continue to be, overseen by the Rhode Island Department of Environmental Management (RIDEM), Office of Waste Management. Investigations have confirmed that a number of chemical compounds, commonly associated with metal cleaning and degreasing, are present in soil and groundwater beneath the Site as a result of past manufacturing operations. These chemicals are classified as volatile organic compounds (VOCs) and petroleum hydrocarbons. Since the early 1990s, RIDEM has required the Responsible Parties (RPs) to investigate the extent of chemicals in soil and groundwater and develop and implement plans to clean up the Site.

Groundwater beneath the Site has been classified by the State of Rhode Island as GB and is therefore not used as drinking water. According to the State's regulations, "groundwater which is classified as a GB area is presumed not suitable for use as a current or potential source of drinking water" (RIDEM Remediation Regulations, 1996).

The Site consists of a 77-acre parcel with one main single-story industrial building encompassing 16 acres. From 1960 to present, the property usage included various light-industrial manufacturing processes. Operations within the building included equipment manufacturing, metals finishing, industrial painting, rust proofing, warehousing, and office space.

The current Site owner, Strawberryfields Estates Inc. (Strawberryfields), was not responsible for this historical contamination, however, they have actively worked with RIDEM to investigate the Site and are currently working with RIDEM to clean-up the Site at Strawberryfields' expense. Strawberryfields, a subsidiary of Kvaerner US Inc., became responsible for Site clean-up through the acquisition of John Brown Inc., the named RP for the Site. John Brown Inc. inherited the clean-up responsibility when they purchased Leasona Corp., the original owners and operators of the Site. Strawberryfields leases the property to the Lares Group, whom manage the property and sublease it to various tenants.

Site Investigations

Beginning in the early 1990s, RIDEM has overseen several soil and groundwater investigations at the Site. All reports documenting these investigations are of public record and are available for review upon request. Environmental Site activities have consisted of

subsurface investigations of specific areas of the Site that were considered to be potential areas of environmental concern. Investigations revealed that soil and groundwater beneath the Site are impacted by VOCs, primarily trichloroethene (TCE), and TPH (total petroleum hydrocarbons, consisting predominantly of cutting oils). Collectively, selected VOCs and TPH are considered the Constituents of Concern (COCs) at the Site. In addition, these investigations found that the contaminated groundwater was slowly moving in several directions away from the Site building. However, contamination is currently contained within Site property boundaries, with an exception of a small area located adjacent to the Former Truk-Away Landfill.

A Risk Assessment has been completed for the Site pursuant to a RIDEM approved Risk Assessment Work Plan. The risk assessment approach conformed to the U.S. Environmental Protection Agency Guidance for Baseline Risk Assessments. Results concluded that residual concentrations of all the COCs in the Site subsurface do not pose a cumulative direct contact risk to human health. Regardless of these findings, Strawberryfields still intends to implement a clean-up plan to mitigate the contamination.

The Site investigation phase of the project has been completed. A Fact Sheet, documenting the completion of the Site investigation phase of the project, was made available in May 2000. A Site clean-up plan (otherwise known as a Remedial Action Work Plan [RAWP]), which provides the strategy for clean-up of impacted soil and groundwater at the Site, has been submitted to RIDEM for their review. This second Fact Sheet provides an overview of the clean-up plan. The two Fact Sheets have been provided to fulfill public notice requirements pursuant to State law. A copy of the RAWP is on file at RIDEM and is accessible to the public for their review.

Clean-up Plan

The clean-up approach for the Site includes the following technologies: bioremediation, soil vapor extraction, air sparging, vertical mixing wells, chemical oxidation, and groundwater monitoring. The proposed remedial alternatives for the impacted soil and groundwater in each area of the Site were determined based on a detailed screening of appropriate clean-up technologies. The overall Site clean-up approach proposed in the RAWP has been preliminarily approved by RIDEM, contingent upon this public notice and upon Strawberryfields responding to comments generated during the review of the RAWP by the Department and the public. The following is an overview of the various clean-up technologies that are proposed for implementation at the Site.

Bioremediation

Bioremediation is a treatment process that uses naturally occurring microorganisms (i.e. bacteria) to break down, or degrade, hazardous substances into less toxic or nontoxic substances. Microorganisms,

just like humans, eat and digest organic substances for nutrients and energy. In chemical terms, "organic" compounds are those that contain carbon and hydrogen atoms. Certain microorganisms can digest organic substances such as fuels or solvents that are hazardous to humans. The microorganisms break down the organic contaminants into harmless products, mainly carbon dioxide and water. Once the contaminants are degraded, the microorganism population is reduced because they have consumed their food source. Dead microorganisms or small populations in the absence of food pose no contamination risk. Bioremediation can be implemented on excavated or in-place (in-situ) impacted soil. In-situ bioremediation using existing beneficent microorganisms will be used to degrade TPH in one area of the Site.

Soil Vapor Extraction

Soil vapor extraction (SVE), a commonly used soil clean-up technology, is a relatively simple process that physically separates contaminants from soil. As the name suggests, SVE extracts contaminants from the soil in vapor form. Therefore, SVE systems are designed to remove contaminants that have a tendency to volatilize or evaporate easily, such as VOCs which exist at the Site. By applying a vacuum through a system of underground wells, contaminants are pulled to the surface as vapor or gas and then collected for appropriate disposal. An added benefit of pulling air through the soil is that it can stimulate bioremediation of some contaminants. SVE is proposed to be used, in conjunction with air sparging and vertical recirculating wells (discussed below), to clean up impacted soil and groundwater in two areas of the Site.

Air Sparging

Used alone, SVE cannot remove contaminants in the saturated zone of the subsurface (the water-soaked soil that lies below the water table). When contamination exists in the saturated zone, a process called air sparging may be used along with the SVE system to clean up impacted groundwater. Air sparging involves pumping air into the saturated zone to help flush (bubble) the contaminants up into the unsaturated zone where SVE extraction wells can remove them. As with SVE, an added benefit of air sparging is that it provides an oxygen source that helps stimulate the bioremediation of some contaminants. Air sparging can be a quick and effective treatment for groundwater impacted with VOCs. Air sparging, in conjunction with SVE, is proposed for the clean-up of impacted soil and groundwater in one area of the Site.

Vertical Mixing Wells

Vertical mixing wells use air injected into the groundwater well to strip contaminants from the water and to induce an upward flow of groundwater within the well. Treated groundwater that has been lifted upward in the well is then discharged directly back into the ground without ever coming to the ground surface. Contaminants removed from the water as vapor are then collected for appropriate disposal. Extraction of impacted groundwater from the lower portion of the well and discharge of treated water in the upper portion of the well generate a zone of groundwater recirculation, resulting in

multiple treatment passes of the impacted groundwater. Vertical recirculation wells, in conjunction with SVE and addition of chemical oxidation agents (discussed below) will be used to treat impacted soil and groundwater in one area on Site.

Chemical Oxidation

Chemical oxidation is based on delivery of chemical oxidants to contaminated media in order to destroy the contaminants by converting them to innocuous compounds commonly found in nature. Oxidants that will be used are primarily composed of hydrogen peroxide, a non-toxic chemical that breaks down in nature. Oxidants will be applied to impacted groundwater by means of vertical recirculating wells to treat impacted groundwater at the Site. Chemical oxidants will also be applied to impacted soil after it has been excavated from specific areas of the Site. Soil treated by chemical oxidation at the Site, once determined to be clean, will be placed back in the temporarily open excavations. Back-filled excavations will be capped with asphalt.

Groundwater Monitoring

In addition to the technologies discussed above, ongoing groundwater monitoring will continue. The groundwater monitoring well network will provide a means of evaluating the effectiveness of the various clean-up technologies proposed for the Site.

For More Information

RIDEM encourages the exchange of information with interested members of the community. If you wish to comment on the proposed clean-up plan, or would like more information, please contact:

RIDEM Office of Waste Management

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Copies of Site-related documents are available at RIDEM's offices. Please call RIDEM's file review coordinator at (401) 222-2797 to schedule an appointment to review the Site documentation.

Glossary of Terms

COC	Constituents of Concern
RAWP	Remedial Action Work Plan
RP	Responsible Parties
RIDEM	Rhode Island Dept. of Environmental Management
SVE	Soil Vapor Extraction
TPH	Total Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds