C4-023-00009-2

FINAL

EXPLANATION OF SIGNIFICANT DIFFERENCE
FORMER FARMLAND INDUSTRIES, INC. – NITROGEN FERTILIZER PLANT SITE
LAWRENCE, DOUGLAS COUNTY, KANSAS

Kansas
Department of Health and Environment

2022

Prepared by

The Kansas Department of Health and Environment
Topeka, Kansas

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FIGURES

LIST OF ACRONYMS

CAD	Corrective Action Decision
CAP	Corrective Action Plan
CAS	Corrective Action Study
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
EUC	Environmental Use Control
KDHE	Kansas Department of Health and Environment
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
NPDES	National Pollution Discharge Elimination System
PRG	Preliminary Remediation Goals
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RSK	Risk-Based Standards for Kansas

GLOSSARY OF TERMS

Administrative Record – The body of documents that forms the basis for selection of a particular response at a site. An Administrative Record is available at or near the site to permit interested individuals to review the documents and to allow meaningful participation in the remedy selection process.

Ammonia – A compound of nitrogen which often used as fertilizer in row-crop agriculture. The most common formulation that is sold is Anhydrous Ammonia, which is free of water. In the context of remediation, ammonia exists as a contaminant or pollutant to be addressed.

Aquifer – An underground geologic formation that contains and is capable of transmitting or yielding water in sufficient quantities that can be extracted for beneficial purposes.

Best Management Practice – The use of a constructed intervention or institutional practice to reduce or stop the spread of a contaminant, i.e., plume migration. This may include impermeable caps, groundwater recovery and treatment, and controls on infiltration incorporated into new construction.

Corrective Action Decision (CAD) – The decision document in which KDHE selects the remedy and explains the basis for selection for a site.

Exposure - Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

Groundwater – Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Impermeable Cap – A paved surface or installed ground layer (typically of clay) that prevents infiltration of rainwater or stormwater runoff into a contaminated zone, thus minimizing plume migration.

Institutional Controls – Institutional controls are defined broadly as legal measures that limit human exposure by restricting activity, use, and access to properties with residual contamination. Institutional controls may include zoning, regulations, and common law instruments such as restrictive covenants or easements.

Maximum Contaminant Levels (MCLs) – The maximum permissible level of a contaminant in water that is delivered to any user of a public water system. **Monitoring** – Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. For example, monitoring wells drilled to different depths at the site would be used to detect any migration of the plume.

Nitrates – Compounds of the element Nitrogen, chiefly NO_2 and NO_3. They are highly soluble in water and are therefore highly mobile in a groundwater plume. They are contaminants or pollutants that can become dangerous to human health in concentrations above the MCL.

Phytoremediation – The use of plantings (usually trees or deep-rooted native plants) to reduce the concentration of a contaminant or to slow or stop the spread of a contaminant.

Plume – A body of contaminated groundwater flowing from a specific source.

Risk – The probability of adverse health effects resulting from exposure to an environmental agent or mixture of agents.

1.0 INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

The Kansas Department of Health and Environment (KDHE) is issuing this Explanation of Significant Difference (ESD) for the former Farmland Industries, Inc. - Nitrogen Fertilizer Plant Site (Site) in Lawrence, Douglas County, Kansas. This ESD documents a significant change to the Corrective Action Decision (CAD) issued on March 3, 2010.

The Site (KDHE Project No. C4-023-00009) is located at 1608 North 1400 Road, between E 1500 Road and Highway 10, Lawrence, Douglas County, Kansas. The Site extends into Sections 4 and 5 of Township 13 South, Range 20 East, and covers approximately 467 acres. The property is bounded by 15th Street and a rail line to the north, Highway K-10 to the south, O'Connell Street with mixed commercial and residential areas beyond to the west, and East Hill's Business Park to the east. The land use within the Site is zoned for commercial and industrial use. Most of the southern portion of the Site was parceled out and is in the process of redevelopment into the Lawrence VenturePark. The northern portion of the Site is currently being considered by the City for redevelopment as a Site for field operations for their Municipal Services and Operations Department.

1.1 Original Remedy

The remedy addresses nitrogen contaminants in soil, sediment, groundwater, surface water, and stormwater, which are primarily ammonia, nitrates, nitrites, as well as areas of chromium and arsenic contamination. The current remedy consists of extraction and hydraulic containment of contaminated groundwater and impacted storm water runoff with temporary onsite storage of the extracted groundwater followed by land application for agriculture by local producers (as dictated by demand), targeted soil excavations with off-site disposal, targeted soil and pond sediment excavation with on-site internment beneath an impermeable vegetative cap, as well as land use restrictions in the form of restrictive covenants and Environmental Use Controls (EUCs).

Prior to issuance of the 2010 CAD, numerous interim remedial measures took place. The Catalyst Landfill in the northern portion of Area D of the Site was found to contain waste material contaminated with chromium; 815 cubic yards of material was removed and disposed offsite in 2006. The area was backfilled and seeded with native grasses. The Spill and Oil Ponds, which contained residual petroleum hydrocarbons, were also backfilled, and seeded with native grasses after dewatering and transfer of the water to the Effluent Pond system.

In 2006, 1,300 cubic yards of nitrogen impacted soil were removed from the Central Ponds area and relocated to East Lime Pond. Seepage of nitrogen-impacted groundwater from Sandstone Hill re-impacted the Central Ponds area. Soil contamination near historical Plant A is mostly capped with a combination of asphalt, concrete pavement, and remnants of old building and process equipment foundations.

Impacts to the Bag Warehouse area soil are also covered with an impermeable cap (the warehouse and supplemental paving); groundwater from Sandstone Hill flows below the warehouse and carries dissolved nitrogen north toward PW-9. KDHE requested improvements to the surface water drainage system in 2006; in 2007, a 10-foot portion of the existing berm between AST 5 and

AST 6 was excavated, removed, and graded to direct surface water runoff to the main storm water drainage ditch.

Water that was contained in the East Lime Sludge and West Lime Sludge ponds was transferred to the East Effluent Pond and blended with storm water for discharge to the Kansas River under the existing National Pollutant Discharge Elimination System (NPDES) permit.

In 2007, 15,155 cubic yards of accumulated sediments were removed from Overflow Pond and placed into the Rundown Pond along the length of the existing dike separating the Overflow Pond and Rundown Pond. The bottom of the Overflow Pond was shaped to provide a gentle sloping grade toward the southwest corner to facilitate future water removal.

In 2006, approximately 2,750 cubic yards of nitrogen-impacted sediment was excavated from West Pond and placed in the East Lime Pond after dewatering; the West Pond was excavated to bedrock and filled in with clean material. Piping modifications were made to reduce and reroute storm water runoff entering the West Pond; a sump was installed with drain lines to allow discharge into the sump, with the water ultimately being pumped to the above-ground storage tanks (ASTs) for on-site storage. In addition, 450 feet of discharge pipe was connected to the sump and extended to Krehbiel Pond for transfer to the East Effluent Pond.

In 2006, approximately 4,200 cubic yards of impacted sediment was excavated from Krehbiel Pond and placed in the East Lime Pond. The pond was filled in with backfill material and graded for proper surface water flow and erosion control. Any surface water that accumulated to Krehbiel Pond was then transferred to the East Effluent Pond.

Additional interim remedial measures include: the emptying and infilling of a 500-gallon septic tank, the cleanout of the 39,000 gallon Imhoff Tank, plugging and abandonment of subsurface lime sludge lines, the flushing and capping of out-of-service water and industrial process lines, the removal of some Asbestos-containing materials, the inspection and repair of a large AST to prepare it to accept land application program water, the abandonment of 57 monitoring wells, installation of 5 monitoring wells, and the repair and rehabilitation of 6 monitoring wells.

The hydraulic containment system consists of a recovery well network within the alluvial aquifer, along with subsurface drainage structures known as interceptor trench drains to capture and recover perched groundwater. The recovered groundwater is stored on-site in ASTs and pumped through an underground pipeline to agricultural fields north of the Site to be land-applied or routed to the onsite treatment ponds (Overflow and Rundown Ponds). Alluvial groundwater recovered from wells PW-9, PSW-3B3, PSW-6B4 and PSW-7B2 is pumped directly into a drainage channel in compliance with a NPDES permit. In 2014 a shallow French drain system was installed along the access road in the Central Ponds area to address sheet flow runoff from Sandstone Hill that percolates into the alluvial aquifer; runoff and water that seeps from the Central Ponds area currently flows to Overflow Pond and pumped to the sanitary sewer. Previously, water collected in the French drain system was sometimes pumped into the ASTs. These measures were implemented to achieve the Remedial Action Objectives (RAOs) for impacted groundwater, soil and sediment, and surface and storm water. This remedy also incorporates land use controls, in the form of EUCs and Restrictive Covenants (deed restrictions), to restrict future use of the property,

exposure to groundwater, and exposure to subsurface soil in the vicinity of the former fertilizer plant site.

1.2 Modified Remedy

This ESD describes and explains a modification to the 2010 CAD The modification proposed by City of Lawrence is described in a document prepared by GHD titled *Proposed Changes to Farmland Remedial Alternatives, Former Farmland Nitrogen Plant Site, Lawrence Kansas*, dated June 15, 2022, and approved by KDHE on July 26, 2022. The Alternative Remedy combines groundwater recovery via recovery wells, offsite treatment at the City of Lawrence municipal wastewater treatment facility after the appropriate upgrades are made to handle increased nitrogen loading and continue groundwater best management practices during site redevelopment. These management practices include impermeable barriers in some areas (to prevent human exposure and limit rainwater infiltration) and other areas with deep-rooted vegetated cover (to promote evapotranspiration and plant uptake of excess nutrients). As with the original remedy, groundwater monitoring and EUCs/Restrictive Covenants will remain in place.

The differences between the 2010 CAD and the modification described in this ESD are shown in Table 2.

1.3 Administrative Record File

The ESD will be made available to the public in the administrative record file located at the KDHE office at 1000 SW Jackson Street, Suite 410, Topeka, Kansas, and at the Local Information Repository, Lawrence City Hall located at 6 East Sixth Street in Lawrence, Kansas. The local contact for the City of Lawrence is Jeff Scott, Environmental Remediation Manager, Municipal Services & Operations, who can be contacted by phone at (785) 764-1090; or by email at jscott@lawrenceks.org. The KDHE offices are open 8:00 a.m. to 5:00 p.m. and the administrative record file may be reviewed by appointment by contacting the Project Manager Brian Willard by phone at (785) 296-3866 or email at brian.willard@ks.gov.

2.0 SITE HISTORY, CONTAMINATION, AND IMPLEMENTED REMEDY

2.1 Site History

The nitrogen fertilizer plant facility was constructed in 1954 by the Cooperative Farm Chemical Corporation, which became Farmland Industries This industrial plant manufactured a range of nitrogen-based fertilizers in both a granular and liquid state, and later other fertilizer products, including anhydrous ammonia, nitric acid, granular urea, ammonium nitrate, and urea ammonium nitrate solution. The production areas consisted of structures and buildings devoted to the operation of boilers, wastewater treatment, waste disposal units, and facility maintenance. Wastes generated as a result of plant operations included sludge and wastewater that were released to soil, groundwater and surface water on and near the property.

Environmental contamination was identified, and remedial action taken starting in the late 1970s, in which groundwater interception trenches around the northern storm water and wastewater ponds

were implemented. In1987, when the Chrome Reduction System (CRS) ceased operation, it was identified as a hazardous waste management unit subject to regulation under the Resource Conservation and Recovery Act (RCRA); contaminated soil associated with the surface impoundment was then removed, and that area continued to undergo groundwater cleanup under a KDHE permit.

A RCRA Facility Assessment was performed in 1990. This assessment established 21 instances of contamination which need remediation, known as Solid Waste Management Units, or SWMUs. In 1993, a Consent Agreement (Case No. 92-E-27) was entered into by Farmland and KDHE to conduct a Comprehensive Investigation and Corrective Action Study. In 1997 a Corrective Action Plan (CAP) was approved by KDHE for Farmland to install a French drain system and recovery wells in the northern part of the Site, with plans to reuse and/or recycle contaminated groundwater in plant processes. RCRA Post-Closure Permits were issued to address these 21 SWMUs. The CAP approved in 1997 led to the construction of a hydraulic containment system which is described in Section 1.1, above.

All operations ceased at the facility in 2002 due to a worsening market for fertilizers. In 2003, Farmland Industries, Inc. filed for bankruptcy, which led to a reorganization that concluded in 2004 with the formation of the FI Kansas Remediation Trust (a governing body formed to remediate the Site). KDHE was designated the primary beneficiary of the Remediation Trust, subject to the limitations of the Remediation Trust in 2004. The bankruptcy case was terminated with a Final Order by the Bankruptcy Court in 2009. In 2010, responsibility for the Farmland Site was assumed by the City of Lawrence by their purchase of the property and receipt of the remaining balance of the trust funds. Remediation is performed under KDHE oversight by the City of Lawrence Municipal Services & Operations Department, with contractor support according to the June 28, 2010 Consent Order between KDHE and the City of Lawrence (Case No. 10-E-94). Previous and recent groundwater studies have found Nitrates/Nitrites and Ammonia compounds above KDHE's Tier 2 Risk-based Standards for Kansas (RSK) levels and the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) shown in Table 1. In addition, soil, surface water, storm water, and sediment continue to be impacted by nitrogen contamination above the RSKs.

The site is currently under remediation via the existing recovery and monitoring well network and is within a larger redevelopment area which is zoned for commercial and light industrial uses. The City of Lawrence supplies drinking water to most of the surrounding homes and businesses, obtained from its municipal water utility.

Wells are not used as drinking water sources onsite; all wells identified are used for groundwater monitoring or remediation purposes. As part of the Consent Order between KDHE and the Site , the City samples a private well located to the northeast of the Site on the same schedule as the monitoring well network (Kitsmiller Well). The City provides bottled water to the residence.

2.2 Contamination

The historical maximum concentrations, via an early Site Characterization in 2006, have shown nitrates/nitrites and ammonia impact the perched groundwater unit and alluvial aquifers, with

concentrations detected in groundwater at 33,300 milligrams per Liter (mg/L) and 51,640 mg/L, respectively. Maximum concentrations from the most recent sampling event (June 2022) are 18,700 mg/L for nitrates and 22,500 mg/L for ammonia. These contaminant plumes are generally stable due to the recovery well remediation system currently in place, as well as the impermeable capping of contaminated soil by asphalt, concrete, and building structures. Various interim measures have removed the bulk of the soil contamination, however residual contamination remains in the former detention ponds and in Sandstone Hill.

2.3 Implemented Remedy

The Final CAD for the Site was issued on March 3, 2010. RAOs addressed by the CAD include:

Groundwater:

- Prevent ingestion of on- or off-site groundwater having nitrate contamination in excess of the federal drinking water standard for public water supplies of 10.0 milligrams per Liter (mg/L).
- Contain nitrate and ammonia-contaminated groundwater onsite to prevent degradation of the downgradient Kansas River alluvial aquifer.

Soil and Sediment:

- Prevent ingestion, inhalation, or direct contact with sediment contaminated with total chromium in excess of relevant RSK goals.
- Prevent migration of contaminants that would result in groundwater contamination in excess of 10.0 mg/L nitrate or surface water contamination in excess of background quality for nitrate and ammonia.
- Soil and Sediment: Prevent inhalation of fugitive vapors from surface and subsurface soil contaminated with ammonia in excess of the Site-specific Preliminary Remediation Goals (PRGs).
- Prevent ingestion, inhalation, or direct contact with soil contaminated with arsenic in excess of relevant RSK goals.
-

Surface and Storm Water:

- Prevent ingestion of contaminated surface or storm water contaminated with nitrate in excess of the federal drinking water standard for public water supplies of 10.0 mg/L.
- Restore surface water and storm water quality leaving the Site to background quality for nitrate and ammonia.

The remedial goals for soil contamination are based on the KDHE Tier 2 Level for Soil-to-Groundwater pathways (nitrogen), RSK levels for the Soil pathway (metals), and EPA's calculated PRGs for ammonia in soil. Remedial goals for groundwater contamination are based on the EPA's

MCL of 10.0 mg/L nitrate. Remedial goals for surface and storm water leaving the Site are 10.0 mg/L of nitrate and 2.0 mg/L of ammonia. The RAOs in this ESD remain unchanged from the 2010 CAD.

2.3.1 Remedy Components

The remedy identified in the CAD includes the following components:

Enhancement of the Groundwater Monitoring Network – Continued operation of the groundwater containment system, disposal of impacted water through land application, and continued monitoring using the groundwater monitoring network with several additional monitoring locations. Proposed enhancements include the installation of an interceptor trench in the Central Ponds area, a sump/pump system associated with the Dam Pond, and an alluvial aquifer pumping well north of the Bag Warehouse.

Land Use Restrictions – Institutional controls, which help to prevent human exposure to contaminants, include restrictions on site use to prevent exposure to groundwater and exposure to contaminated soil, as well as soil management plans for the restricted areas.

Land Application Program – Continued land application of recovered groundwater and storm water runoff to offsite farm fields.

CRS Unit Monitoring and Closure – Continue CRS Unit closure activities including paying the annual Hazardous Waste Monitoring Fee associated with the Post-Closure Permit, Post-Closure monitoring and reporting for pH until pH conditions return to between 6 and 9.

Storm Water Management and NPDES Permit Monitoring Program/Surface Water Management Infrastructure – Desludging of the East and West Effluent Ponds with conversion into one new detention basin, construction of a new storm water drainage ditch, berm, weir structure, and detention basin, and continued storm water monitoring and NPDES permit monitoring as outlined in the 2006 Storm Water Management Plan.

Soil Contamination Source Removal – Soil excavation over much of the soil source area. De-watering and sludge/sediment removal in all contaminated ponds. Potential soil contamination under those concrete foundations that will remain in place during redevelopment that could not be removed will be addressed in the EUCs. Backfill excavated areas with clean soil and seed with native grasses.

2.3.2 Remedy Implementation

The groundwater remedy consists of practices discussed under Original Remedy (Section 1.1) and EUCs/Restrictive Covenants restricting exposure to groundwater and soil. As per the CAD, groundwater is monitored quarterly. The locations of the monitoring wells are shown on Figure 2.

The City of Lawrence is performing redevelopment of the southern portion of the Site into the Lawrence VenturePark Business Park. City of Lawrence plans to reuse much of the northern

portion of the former plant site for city facilities, with proposed measures in place to prevent or limit human exposure to contaminated soil or groundwater.

In 2017, the City informed KDHE that accumulations of recovered groundwater and storm water were exceeding onsite storage capacity, as well as the demand for off-site fertilizer and irrigation by area farmers. The City obtained a temporary authorization from KDHE to discharge nitrogen impacted groundwater and storm water to the Kansas River. Currently, recovered groundwater is discharged directly to a drainage way that connects the Site with the Kansas River. In 2018, the City requested permission to turn off the interception trench drains, as well as postpone the excavation and onsite landfarming that was approved for implementation in 2010, while their contractor (GHD) assisted them with completing a Cost Benefit Analysis Report (C-BA) to assess an alternate remediation strategy for the Site. In the C-BA (GHD, 2020, approved with comments by KDHE on July 1, 2020), GHD updated the Conceptual Site Model as follows: groundwater and soil impacted by ammonia and nitrate requiring corrective action are present at Sandstone Hill, Central Ponds, Bag Warehouse, Western Ponds, Former Plant A and Eastern Ponds, and East Lime Pond; precipitation recharge of groundwater under Sandstone Hill flows vertically downward along fractures impacting surface soil, subsurface soil, and sandstone bedrock within Sandstone Hill, eventually percolating nitrogen contaminated water into the alluvial aquifer; shallow groundwater and storm water runoff occurs along the slopes of Sandstone Hill during heavy precipitation; and groundwater within the perched and alluvial aquifers along the northwest side of the Site is migrating to the east/northeast. In addition, the condition of the ASTs that formerly served as onsite water storage for land application were in poor condition and unsuitable for continued use.

3.0 BASIS FOR THE DOCUMENT

The City of Lawrence proposes the Modified Remedy in the above Section 1.2. The City of Lawrence proposal is described in the *Proposed Changes to Remedial Alternatives*, dated June 15, 2022. The City of Lawrence indicates this remedy could potentially reduce the time and long-term financial cost required to meet the RAOs, given that continued land application of nitrogen-bearing water is not sustainable. The City of Lawrence estimates the cost of implementing the proposed remedy to be $15,250,000. This includes remedial design, side-stream design consistent with waste-water treatment plant (WWTP) upgrades, on-site design, demolition & disposal, nitrogen side-stream, on-site construction, phytoremediation, and contingency measures if deemed necessary.

4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

The differences between the 2010 CAD and the modification described in the ESD are shown in Table 2. The ESD will result in a change to the remedial design and remedial construction including the implementation of groundwater recovery via recovery wells, offsite treatment at the City of Lawrence municipal wastewater treatment facility after the appropriate upgrades are made to handle increased nitrogen loading and new groundwater best management practices during site redevelopment. These management practices include impermeable barriers in some areas (to

prevent human exposure and limit rainwater infiltration) and other areas with deep-rooted vegetated cover (to promote evapotranspiration and plant uptake of excess nutrients). This implemented remedy will provide direct protection of human health and the environment through the irreversible reduction of nitrates and ammonia in groundwater. The City of Lawrence will evaluate changes in contaminant concentrations. Continued enforcement of EUCs for restricted areas for soils and for groundwater will further provide protection for human health and the environment.

5.0 PUBLIC PARTICIPATION COMPLIANCE

KDHE will publish a notice of the availability of the ESD in the *Lawrence Journal-World.* The ESD will be made available to the public at the Local Information Repository, Lawrence City Hall, 6 E 6th Street, Lawrence, Kansas, and the KDHE offices at 1000 SW Jackson Street, Suite 410 Topeka, Kansas. The ESD will also be made available online at the KDHE website.

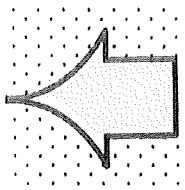
6.0 AUTHORIZING SIGNATURES

Kansas Department of Health and Environment's Acceptance of Explanation of Significant Difference

Janet Stanek

Janet Stanek
Secretary
Kansas Department of Health and Environment

10-28-2022
Date



7.0 References and Background Documents

1. *Consent Order Case No.10-E-94-BER, In the Matter of: Pollution at Former Farmland Industries, Inc. Nitrogen Manufacturing Plant, Lawrence, Kansas,* June 28, 2010.
2. KDHE, 2010, *Final Corrective Action Decision, Former Farmland Industries Nitrogen Plant Site*, dated February 2010
3. *Environmental Use Control Agreement No. 11-EUC-0014*, February 5, 2013.
4. City of Lawrence & GHD, 2010 - 2022, *Performance Evaluation Reports (groundwater monitoring) 1 – 96, Former Farmland Industries Nitrogen Plant Site*
5. GHD, 2020. *Data Gap Study Report, Former Farmland Industries Nitrogen Plant, 1608 N 1400 Road, Lawrence, Kansas 66046,* dated February 24, 2020, Approved with Comments on March 6, 2020.
6. GHD, 2020. *Cost-Benefit Analysis Report, Former Farmland Industries Nitrogen Plant, 1608 N 1400 Road, Lawrence, Kansas 66046*, dated April 6, 2020, Approved with Comments on July 1, 2020.
7. GHD, 2022. *Request for Agency Concurrence, Proposed Changes to Farmland Remedial Alternatives, Former Farmland Nitrogen Plant Site, Lawrence, Kansas*, dated June 15, 2022, Approved July 26, 2022.

TABLES

Table 1. Historical Maximum, Current Maximum, and KDHE Tier 2 RSK Levels of Contaminants in Groundwater

Analyte	Historical Maximum Groundwater Concentration (mg/L)	Current Maximum Groundwater Concentration (mg/L), June 2022	KDHE Tier 2 RSK Residential Groundwater[1] (mg/L)
Nitrate	33,300	18,700	10
Ammonia	51,640	22,500	NE

[1] KDHE's Risk-based Standards for Kansas (RSK) Manual, July 2021.
µg/L = microgram per liter or parts per billion (ppb)
NE = Not Established

Table 2. Comparison of Remedy Components between the 2010 CAD and the ESD

Remedy Components in the 2010 Corrective Action Decision	Change to the Remedy Component
Enhanced groundwater monitoring. Land Application. Contaminated soil extraction. CRS unit monitoring and closure. Stormwater management pursuant to NPDES permit. Subsurface drains connected to sump pumps into detention basins. Groundwater recovery/extraction wells. Provision of bottled water to impacted community members.	Diversion of impacted groundwater and stormwater recovered in containment ponds to City of Lawrence WWTP Modification to WWTP for new pollutant loading. Impermeable caps. Phytoremediation. Discontinued use of land application, subsurface drainage, and sump pumps.
Land Use Controls	No change.
Contingency	No change.

FIGURES

Figure 1. Site Location

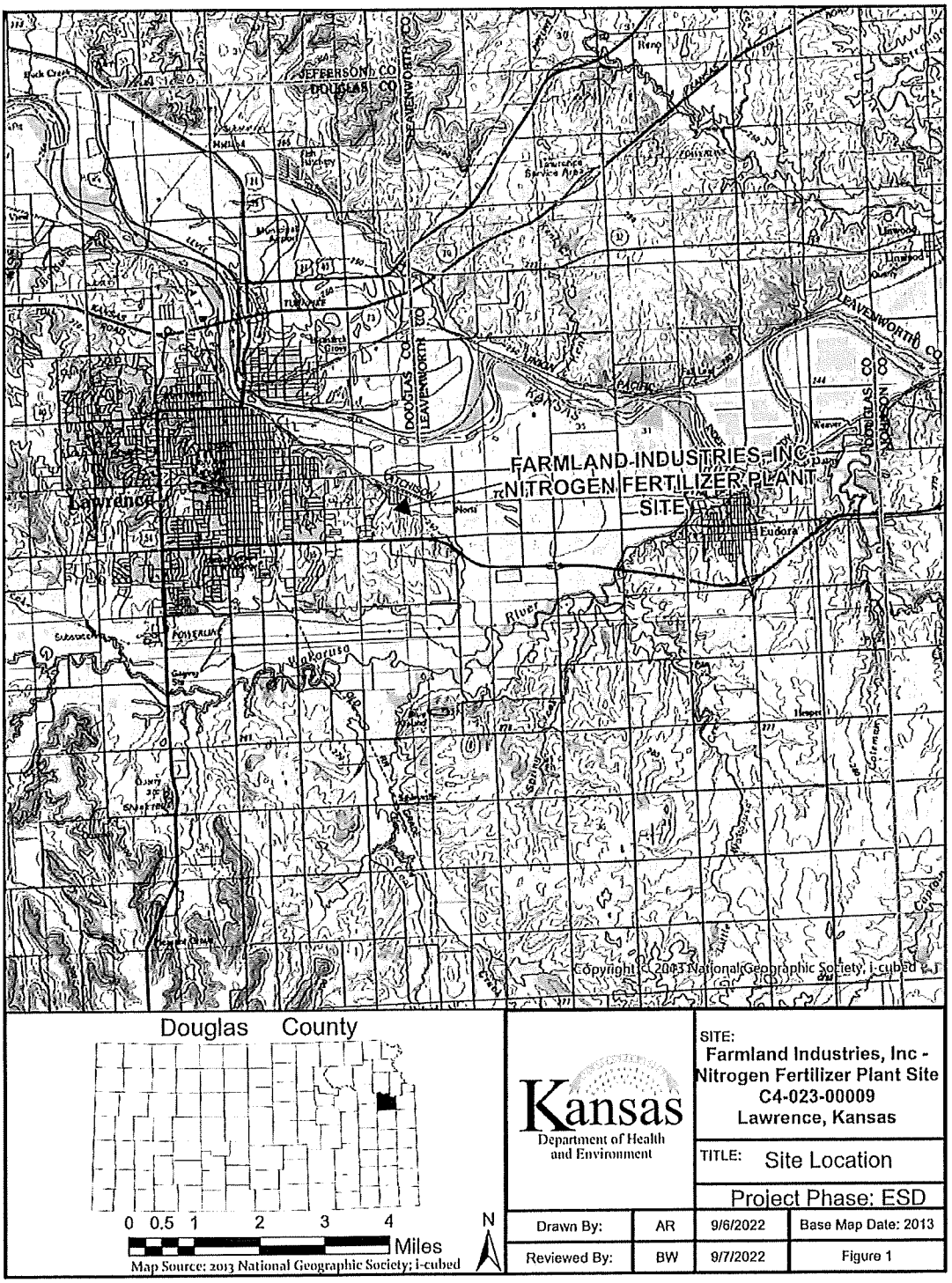
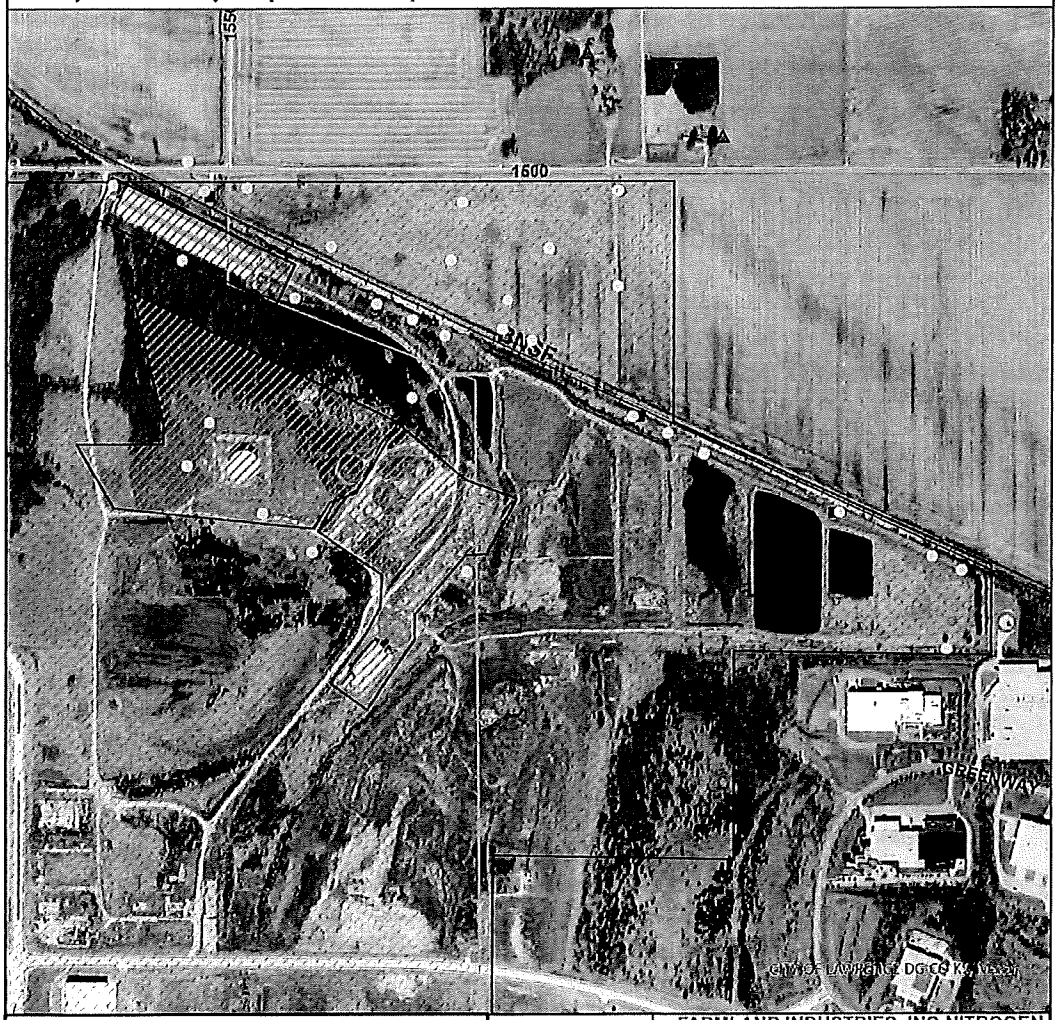


Figure 4. Proposed Remedy Layout

Notes:
1. Layout is preliminary in nature and will be updated as the remedy is implemented.
2. Monitoring well locations and other boundaries are approximate.
3. Piping and sumps (existing and proposed) are not shown.
4. Phytoremediation may be implemented in multiple areas site-wide.



EUC Area
Impermeable Cover & Vegetative Cover
Maintained Structure
Phytoremediation Area
Monitoring Wells
Recovery Wells
Domestic Wells
City of Lawrence Sanitary Sewer Lift Station #25
N
0 500 1,000 US Feet
Map Source: ESRI World Imagery

Kansas Department of Health and Environment

SITE:	FARMLAND INDUSTRIES, INC-NITROGEN FERTILIZER PLANT SITE C4-023-00009 Lawrence, Kansas			
TITLE:	Proposed Remedy Layout			
PROJECT PHASE:	ESD			
DRAWN BY:	AR	9/9/2022	BASEMAP DATE:	2022
CHECKED BY:	BW	9/9/2022	Figure 4	

Figure 2. Site Areas

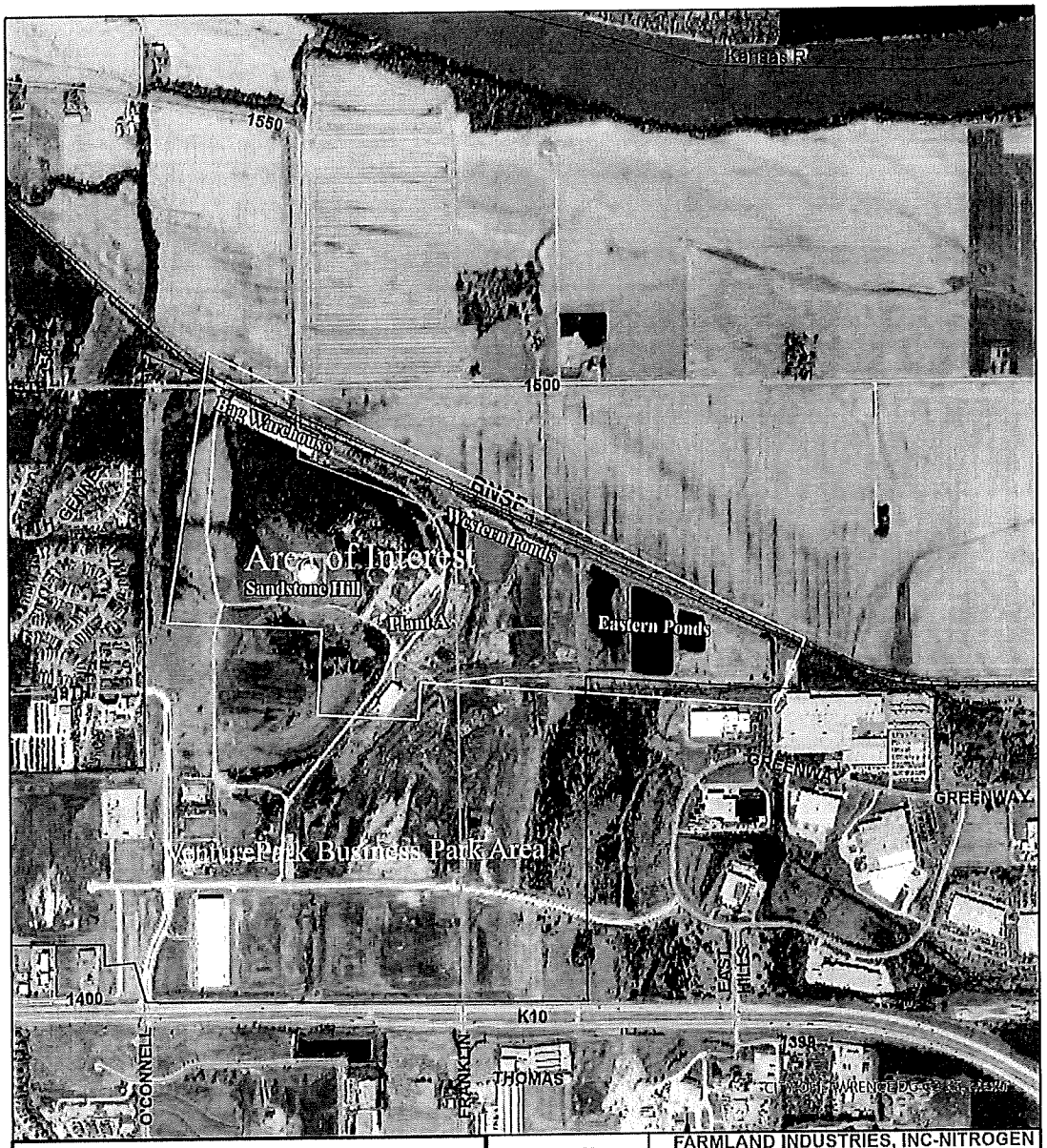
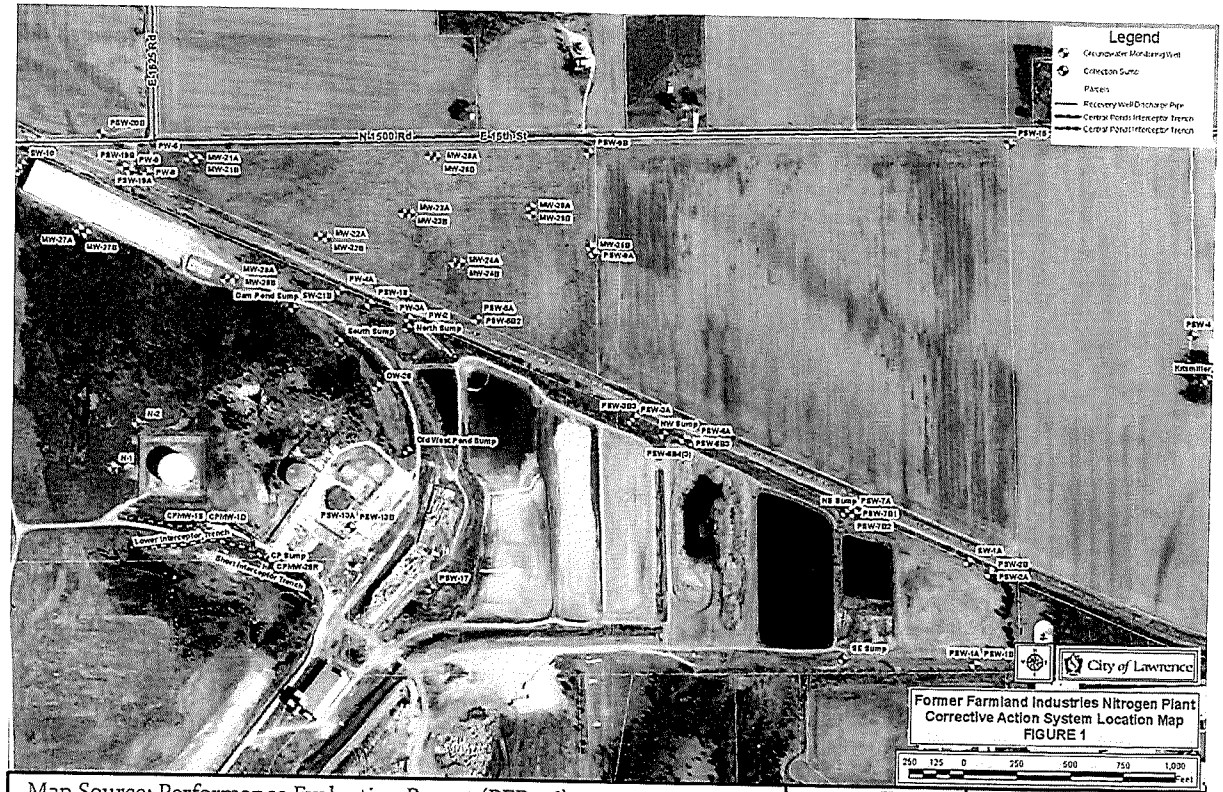


Figure 3. Site Monitoring Wells, Sumps, and Trenches, May 2022



Map Source: Performance Evaluation Report (PER 96)
Period Ending 5/31/2022
Former Farmland Nitrogen Plant, Lawrence, Kansas
June 28, 2022
City of Lawrence Municipal Services & Operations
Approved by KDHE on July 28, 2022

Kansas Department of Health and Environment		SITE: Farmland Industries, Inc - Nitrogen Fertilizer Plant Site C4-023-00009 Lawrence, Kansas	
		TITLE: Site Monitoring Wells, Sumps, and Trenches, May 2022	
		PHASE: ESD	
Drawn By:	AR	9/9/2022	Base Map Date: 2022
Reviewed By:	BW	9/9/2022	Figure 3