SCS ENGINEERS

Transmittal

West Des Moines, IA

PROJECT:	Hawarden,FY26 Env Comp & On-Call,IA 27224422.26	DATE:	4/23/2026
SUBJECT:	City of Hawarden Sanitary (C&D) Landfill - 84-SDP-02-75 - Ending Post-Closure Review	TRANSMITTAL ID:	00001
PURPOSE:	For your approval	VIA:	Info Exchange

FROM

NAME	COMPANY	EMAIL	PHONE
Sean Marczewski West Des Moines, IA	SCS Engineers	SMarczewski@scsengineers.com	+1-515-631-6152

TO

NAME	COMPANY	EMAIL	PHONE
Mike Smith 502 East 9th Street Des Moines IA 50319-0034 United States	Iowa, State of	mike.smith@dnr.iowa.gov	515-725-8200

REMARKS:

Mike -

SCS Engineers, on behalf of the City of Hawarden, is submitting the Ending Post-Closure Review for the City of Hawarden Sanitary (C&D) Landfill. If you have any questions or comments regarding this review, please contact me at the number below.

Thanks,

Sean A. Marczewski
Senior Project Professional
SCS Engineers
1690 All-State Court, Suite 100
West Des Moines, Iowa 50265
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Transmittal

DATE: 4/23/2026
TRANSMITTAL ID: 00001

DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	4/23/2026	20260423_City of Hawarden Sanitary (C&D) Landfill_Ending Post-Closure Review_v1.0.pdf	

COPIES:

Becky Jolly	
Travis Waterman	(City of Hawarden)
Tim Buelow	(SCS Engineers)
Sean Marczewski	(SCS Engineers)

April 23, 2026
File No. 27224422.26

Mr. Mike Smith, P.E.
Iowa Department of Natural Resources
Land Quality Bureau
6200 Park Avenue
Des Moines, Iowa 50321

Re: Ending Post-Closure Review
City of Hawarden Sanitary (C&D) Landfill
Permit No. 84-SDP-02-75

Dear Mike:

SCS Engineers, on behalf of the City of Hawarden, has completed a review of the applicability of ending post-closure care for the City of Hawarden Sanitary (C&D) Landfill. Please find attached a copy of the City of Hawarden Sanitary (C&D) Landfill Ending Post-Closure Review.

Should you have any questions or need clarification, please contact Tim Buelow at (515) 415-9216.

Sincerely,

Sean Marczewski
Senior Project Professional
SCS Engineers

Timothy C. Buelow, P.E.
VP, Senior Project Advisor
SCS Engineers

SAM/TCB

copy: Mr. Travis Waterman, City of Hawarden Public Works Director

Ending Post-Closure Review

City of Hawarden Sanitary (C&D) Landfill
Permit No. 84-SDP-02-75
Hawarden, Iowa

Prepared for:

City of Hawarden

SCS ENGINEERS

27224422.26 | April 2026

1690 All-State Ct, Ste 100
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Table of Contents

Section Page

Tables

Figures

Attachments

1.0 INTRODUCTION

The City of Hawarden (City) C&D Landfill (Landfill) was permitted on March 18, 1975 (Doc #17989). Waste acceptance reportedly ceased on May 1, 1988 (Doc #18002). A closure permit was issued on March 17, 1993 (Doc #17983).

Groundwater sampling has been a significant challenge at the Landfill due to the majority of the monitoring wells frequently being dry or containing insufficient water to sample. Minor groundwater quality impact has been measured on the south side of the Landfill. A statistically significant level above the groundwater protection standard for cobalt was measured in monitoring well MW-3 in 2018. Monitoring well MW-3 was last sampled during the 1st 2021 semi-annual sampling event. This was the last event during which sufficient water was available for sampling. Monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-5 were replaced with deeper wells in 2022 due to the original wells having little to no water and, therefore, unable to be sampled consistently. Following the installation of the deeper wells, monitoring wells MW-1R and MW-3R have not produced samples.

The DNR issued Permit Amendment No. 7 on December 16, 2024 (Doc #111493), which extended the date of the closure permit expiration from March 17, 2023, to December 16, 2029, to allow collection of at least eight sets of samples to evaluate trends. However, because MW-3R has not produced a sample since installation, it appears that collecting eight samples is unlikely. A meeting was held on December 11, 2025, between SCS Engineers, Travis Waterman (City of Hawarden Public Works Director), and DNR representatives to discuss a path forward for the Landfill to end post-closure care under the current SDP permit. In correspondence dated December 11, 2025 (Doc #114817), the DNR stated that the City should begin the process for drafting an Environmental Covenant and that a site inspection would be required, preferably in the spring of 2026. This document provides a review of the justification and rationale for proceeding with the enactment of an Environmental Covenant and recission of Permit No. 84-SDP-02-75.

1.1 BACKGROUND

Site Location

The Landfill property is depicted in **Figure 1**. The Landfill is located approximately 5 miles north of the City of Hawarden and is described as being in Section 23, Township 95 North, Range 48 West; NE NETR IN (Parcel C), in Sioux County, Iowa.

Facility

The Landfill was agricultural farmland prior to being developed as a landfill in approximately 1975. The northern portion of the Landfill property is currently used for cropland. The Landfill served the City of Hawarden until the City consolidated sanitary landfill activities with the Northwest Iowa Area Solid Waste Agency in 1979. City of Hawarden household and commercial solid waste collections were then directed to the Northwest Iowa Area Sanitary Landfill near Sheldon, Iowa. The City of Hawarden Landfill served as a C&D disposal site, serving only the City of Hawarden from 1979 until 1988. The Landfill actively received waste until May 1988. Use of the Landfill was quite limited toward the end of the period of active filling, with reportedly less than 200 tons per year being disposed of in 1986 and 1987, and less than 100 tons in 1988 (Doc #17994).

Geology and Hydrogeology

The 2010 Water Quality Testing Report dated September 28, 2010 (Doc #60608) for the City of Hawarden Closed Construction and Demolition Landfill, prepared by Five States Engineering, provided the following geological description:

> *The Closed Hawarden Construction and Demolition site is located in the northern area of the loess hills region of Iowa. The site varies in elevation between 1285 near monitoring well 7 and 1345 at the high point of fill at approximately 2+00 N, 8+50E. No solid waste is landfilled below an elevation of 1310. There is no runoff to the fill area of the site from adjacent properties or adjacent areas of the site property. The site is located at the high point of the surrounding terrain. The site is well graded to promote surface runoff from the final cover of the fill areas.*
>
> *The geology of the site is typical for the loess hills region. Aeolian sand and loess soils overlay underlying glacial clay till. The sand and loess soils are relatively high permeability soils as compared to the very low permeability glacial clay till. The site soils investigations conducted in 1978 and 1991 identified the locations of various soils and the resultant surface of the glacial clay till soil. The principal discharge of groundwater was identified as the area of well site 3. Soil borings and topography indicate that this is a concave area with discharge in a southwest direction. It was estimated that up to 30 - 50% of the groundwater discharge may pass this well site based on a review of the glacial till elevations and cell base grades in areas not incised into the glacial clay. The base of the landfill is graded to the west towards well site 7. The landfill was not constructed with a compacted cell base. It was reported that all sand encountered in the cell base or cut slopes was removed and replaced with compacted soils as a normal operational procedure. Laboratory analysis of soils at well site 3 indicated that the permeability of underlying glacial clay till soils was 6 x 10^{-8} cm/sec (less than 1-inch/year). A 2-foot-thick layer of sand located immediately above the glacial till demonstrated a permeability of 7.8 x 10^{-3} cm/sec (22 ft/day). The loess surface soils of the area typically demonstrate a permeability of 1 x 10^{-5} to 2 x 10^{-5} cm/sec (0.3 to 0.6 ft/day). Dry surface soils were encountered during the site borings. No saturated soils were encountered at any boring location. No static free water was observable in piezometers established in soil borings. Monitoring wells were incised 3 to 5 feet into the glacial clay to allow collection of water samples from the thin layer of groundwater that existed immediately above the glacial clay till layer.*

The 1993 Permit Renewal Documentation prepared by Five States Engineering provided the following additional hydrogeological description:

> *The loess and sand materials are highly permeable. The underlying glacial clay till has a very low permeability. The groundwater table is located in a thin layer of materials located directly above the glacial clay till. The thickness of the saturated zone may vary from several inches in areas where sand is the lower permeable material to two feet where loess soil is the lower permeable material. The relatively thin layer of saturated material requires the use of monitoring wells which are partially inset in the glacial clay till. An inset of 2 to 3 feet is generally used to allow accumulation of sufficient volumes of water to allow a groundwater sample*

collection. Well stabilization and recovery periods are generally very long and increase as well locations are made near the upper regions of a groundwater flow zone.

The above citations indicate that sufficient groundwater for sampling was expected to be limited and would require somewhat artificial means in the form of "sumping" the bottoms of the wells into the glacial till layer to allow for the accumulation of a column of groundwater for sampling. Sampling data indicates that even this configuration was frequently not sufficient to allow for sample collection.

Water Supply Wells

A review of the DNR GP6 Well Siting Tool, the Iowa Geological Survey (IGS) GeoSam database, the USGS Core Research Center, and the DNR Iowa Well Information System (IWIS), indicate that there are no documented public water supply or private water use wells within the vicinity of the Landfill. The closest household well (DNR IWIS Well Number 2087824) is located approximately 4,100 feet northwest of the northwest corner of the Landfill property boundary, and the closest public water supply well (PWS ID IA8434201), which was owned by the Wig Wam Drive In Theater, is inactive and is located approximately 5,080 feet southwest of the southwest corner of the Landfill property boundary. A municipal well, located within the Landfill property boundary, was installed in 1979 and is identified in the IGS GeoSam database as Well Number IGS 25503. This well was incorporated into the Landfill's monitoring network and designated as monitoring well MW-7, serving as a supplemental monitoring well. The well is depicted as MW-7 in **Figure 1** and as IGS 25503 in **Attachment A,** which is sheet 7 of 11 (Doc #8086) in the Hawarden Sanitary Landfill Closure Plans 1988, revised on March 4, 1992 (Doc #8079). Additionally, the nearest surface water body is located more than 2,000 feet from the Landfill.

1.2 APPROVED MONITORING NETWORK

The Landfill property and Hydrological Monitoring System Plan (HMSP) monitoring network is depicted in **Figure 1**. **Figure 1** indicates the locations of each monitoring well and its respective monitoring program. Groundwater monitoring for the Landfill consists of samples from one monitoring well along the east side (MW-1R, upgradient), one monitoring well along the west side (MW-5R), and three monitoring wells along the south side (MW-2R, MW-3R, MW-4R).

2.0 REVIEW OF ENDING POST-CLOSURE

This review of ending post-closure requirements under the current SDP permit consists of four components: 1) the occurrence of groundwater in the vicinity of the Landfill, 2) the quality of groundwater, 3) the presence of landfill gas migration, and 4) the integrity of the final cover.

2.1 GROUNDWATER OCCURRENCE

Groundwater monitoring at the Landfill is conducted using one upgradient monitoring well located along the eastern boundary (MW-1R), one monitoring well along the western boundary (MW-5R), and three downgradient monitoring wells along the southern boundary (MW-2R, MW-3R, and MW-4R). These wells were installed in 2022 to replace the original monitoring wells, which consistently yielded insufficient water for sampling despite being inset below the sand layer and into the underlying glacial till to promote groundwater accumulation. As documented in the 1993 Permit

Renewal Documentation prepared by Five States Engineering, site stratigraphy consists of higher permeable loess and sand deposits overlying a low-permeability glacial till, resulting in a thin and discontinuous saturated zone above the till surface. As a consequence of the original monitoring wells not producing a sufficient volume of groundwater for sampling, the installation of adjacent but deeper replacement wells was proposed in the 2021 Annual Water Quality Report (Doc #101572). Documentation of the deeper replacement wells was provided in correspondence dated June 24, 2022 (Doc #103483). During drilling, a much thicker sand layer was encountered approximately 30 feet below the loess/till interface across which the original monitoring wells were screened. The deeper sand layer was encountered in all but one (MW-5R) of the replacement monitoring wells. The glacial till between the screened intervals of the original monitoring wells and the replacement monitoring wells generally included oxidized till underlain by unoxidized till. A summary of the installation depths and formations of the original wells and deeper replacement wells is included in **Table 1**. The replacement monitoring wells (with the exception of MW-5R) were installed approximately 20 feet into the sand layer and were drilled approximately 43 to 65 feet deeper than the original monitoring wells.

Table 1. Monitoring Well Installation Summary

Monitoring Well	MW-1	MW-1R	MW-2	MW-2R	MW-3	MW-3R	MW-4	MW-4R	MW-5	MW-5R
Depth (feet)	28.4	90.0	22.6	85.5	22.5	65.0	15.7	80.6	22.5	51.7
Formation	Glacial Clay	Sand	Glacial Clay	Sand	Glacial Clay	Sand	Glacial Clay	Sand	Glacial Clay	Clay, Trace Gravel

The Closure Plan dated April 8, 1992 (Doc #18003), prepared by Five States Engineering, provided the following groundwater recharge description:

> *The landfill site is located near an apparent high area of surface and subsurface drainage. Runoff velocities on the surface of the site vary from 6 fps to over 10 fps. The amount of infiltration of precipitation is nearly negligible when allowances are made for plant cover growth and surface evaporation. The soils examined from borings as close as 8 feet from the waste boundary indicated no stains from leachate moving away from the fill area thru subsurface soils. Primary recharge for the wells will come from a small area of row crop agricultural property located east of the landfill site.*

Based on the descriptions of the hydrogeology in the Iowa Department of Natural Resources (DNR) Electronic Document Retrieval system for Permit No. 84-SDP-02-75 and the observations of groundwater over time in the original and replacement monitoring wells, it does not appear that the installation of additional, deeper monitoring wells is likely to provide data useful for monitoring the Landfill. Additionally, water level measurements have been collected in the original monitoring wells during methane monitoring events, as those wells are used to monitor subsurface methane. The original monitoring wells, which have not been sampled since the installation of the replacement wells in 2022, should have had sufficient time to recharge if groundwater was present. However, most of the wells have been consistently dry except for the supplemental monitoring well MW-7. **Table 2** provides a

summary of groundwater occurrence in the monitoring wells since 2015. Data for the original wells, after installation of deeper replacement wells in 2022, were collected during the methane monitoring events.

Table 2. Monitoring Well Groundwater Occurrence

Monitoring Well	MW-1	MW-1R	MW-2	MW-2R	MW-3	MW-3R	MW-4	MW-4R	MW-5	MW-5R	MW-7
11/2015	S	NI	S	NI	S	NI	NM	NI	NM	NI	S
5/2018	S	NI	S	NI	S	NI	NM	NI	NM	NI	S
10/2018	S	NI	S	NI	S	NI	NM	NI	NM	NI	S
2/2019	S	NI	S	NI	S	NI	D	NI	S	NI	S
6/2019	S	NI	S	NI	S	NI	S	NI	S	NI	S
2/2020	S	NI	S	NI	S	NI	S	NI	S	NI	S
8/2020	S	NI	S	NI	S	NI	D	NI	IW	NI	S
5/2021	S	NI	IW	NI	S	NI	IW	NI	IW	NI	S
9/2021	S	NI	IW	NI	IW	NI	IW	NI	IW	NI	S
6/2022	Y	IW	N	S	N	IW	N	S	N	S	Y
9/2022	Y	IW	N	S	N	IW	N	S	N	S	Y
3/2023	Y	NM	N	NM	N	NM	N	NM	N	NM	Y
4/2023	NM	IW	NM	S	NM	IW	NM	IW	NM	S	S
10/2023	N	IW	N	IW	N	IW	N	S	N	S	S
3/2024	N	IW	N	IW	N	IW	N	S	N	S	S
8/2024	N	IW	N	IW	N	IW	N	S	N	S	S
5/2025	N	D	N	D	N	D	N	S	N	S	S

D: Dry – Water was not measured during the monitoring event. The cell is highlighted in red.
IW: Insufficient Water – Water was measured during the monitoring event, but there was not enough volume to produce a sample. The cell is highlighted in grey.
S: Sampled – The monitoring well had sufficient water to produce a sample. The cell is highlighted in blue.
Y: Yes – Water was measured during the methane monitoring event with a water column of ≥ 1 foot. The cell is highlighted blue.
N: No – Water was measured during the methane monitoring event with a water column of ≤ 1 foot or dry. The cell is highlighted red.
NM: Not measured.
NI: The monitoring well was not installed.

Since the installation of the deeper replacement monitoring wells in 2022, monitoring wells MW-1R and MW-3R have not produced samples, and monitoring well MW-2R has only produced three samples. Additionally, water level measurements in the original monitoring wells collected during methane monitoring events since 2022 indicate that water was present only in monitoring well MW-1. Monitoring wells MW-5R and MW-7 have consistently had sufficient water to collect a sample. Groundwater is largely absent within the screened intervals of the original wells and most of the deeper replacement wells, making sample collection extremely challenging. When enough water is present to obtain a sample, the resulting samples typically exhibit elevated total suspended solids concentrations, as described in Section 2.2.

2.2 GROUNDWATER QUALITY

With regard to groundwater quality, one statistically significant level (SSL) above the groundwater protection standard (GWPS) for cobalt was measured in monitoring well MW-3 in 2018. Monitoring well MW-3 was last sampled during the 1st 2021 semi-annual sampling event. Replacement monitoring well MW-3R, installed in 2022, has not produced samples despite being more than 40 feet deeper than the original monitoring well MW-3. During the reporting periods from 2018 to 2025, the following monitoring well constituent pairs were measured above their respective GWPS (not at statistically significant levels, with the noted MW-3 cobalt exception) in at least two monitoring events.

- Arsenic in monitoring wells MW-2 and MW-3.
- Barium in monitoring well MW-3.
- Cobalt in monitoring wells MW-3, MW-4, MW-5, and MW-7.
- Lead in monitoring well MW-4.
- Nickel in monitoring well MW-3.

Total suspended solids (TSS) samples were collected and analyzed starting in 2018. It should be noted that the measured total suspended solids (TSS) concentrations are consistently elevated across monitoring wells and sampling events, likely due in part to the very limited water in the wells. Elevated TSS concentrations likely have an impact on the measured metal concentrations, making the sample results potentially not representative of the groundwater quality below the Landfill. The measured TSS concentrations are frequently between 20 mg/L and 300 mg/L, while the highest measured concentration was 5,160 mg/L in supplemental monitoring well MW-7 during the February 2020 sampling event. The range of measured TSS concentrations in the monitoring wells since 2018 is provided in Table 3.

Table 3. Total Suspended Solids Concentrations

Monitoring Well	MW-1	MW-1R	MW-2	MW-2R	MW-3	MW-3R	MW-4	MW-4R	MW-5	MW-5R	MW-7
Minimum (mg/L)	28.6	NM	2.63	34.8	25.1	NM	110	216	109	6.0	3.0
Maximum (mg/L)	639	NM	184	186	281	NM	301	3,470	425	52.5	5,160
Average (mg/L)	231.6	NM	66.7	95.0	172.1	NM	205.5	949.1	276.7	23.2	1,486

NM: Not Measured – The monitoring well has not produced a sample since installation in 2022.

There have been very limited volatile organic compound (VOC) detections above the laboratory reporting limit outside of monitoring well MW-3 throughout the site's monitoring history. A summary of the detections above the laboratory reporting limit in comparison to the respective GWPS is provided below.

MW-1 (Upgradient Original Monitoring Well)

- cis-1,2-Dichloroethene: A detection in 2021 was measured at a concentration of 3.01 µg/L, which is approximately 4% of the GWPS of 70 µg/L.
- Trichloroethene: A detection in 2021 was measured at a concentration of 2.85 µg/L, which is 57% of the GWPS of 5 µg/L.

MW-1R (Upgradient Replacement Monitoring Well)

- No samples.

MW-2

- No detections.

MW-2R

- No detections.

MW-3

- 1,1-Dichloroethane: Five detections, between 2015 and 2021, were measured with the highest concentration at 2.39 µg/L, which is approximately 2% of the GWPS of 140 µg/L.
- 1,2-Dichloroethane: Three detections, between 2010 and 2012, were measured, with the highest concentration at 2.73 µg/L, which is approximately 55% of the GWPS of 5 µg/L.
- 1,4-Dichlorobenzene: Five detections, between 2008 and 2019, were measured with the highest concentration at 3.02 µg/L, which is approximately 4% of the GWPS of 75 µg/L.
- 2-Butanone: Three detections, between 2012 and 2019, were measured with the highest concentration at 103 µg/L, which is approximately 3% of the GWPS of 4,000 µg/L.
- 4-Methyl-2-Pentanone: A detection in 2012 was measured at 25.4 µg/L, which is approximately 5% of the GWPS of 560 µg/L.
- Acetone: Three detections, between 2012 and 2019, were measured with the highest concentration at 238 µg/L, which is approximately 4% of the GWPS of 6,300 µg/L. It should be noted that the other two detections were below 40 µg/L. Acetone is a common laboratory contaminant (US EPA, 2014), and the detections may not be representative of groundwater quality in monitoring well MW-3.

- **Benzene**: Multiple detections, between 2006 and 2021, were measured with the highest concentration at 4.65 µg/L, which is 93% of the GWPS of 5 µg/L. However, the majority of the detections were below 2 µg/L.
- **Carbon Disulfide**: A detection in 2011 was measured at 1.98 µg/L, which is less than 1% of the GWPS of 700 µg/L.
- **cis-1,2-Dichloroethene**: Multiple detections, between 2013 and 2021, were measured with the highest concentration at 15 µg/L, which is approximately 21% of the GWPS of 70 µg/L. However, the majority of the detections were below 7 µg/L.
- **Ethylbenzene**: Five detections, between 2012 and 2020, were measured with the highest concentration at 26.6 µg/L, which is approximately 4% of the GWPS of 700 µg/L.
- **Toluene**: Multiple detections, between 2012 and 2021, were measured with the highest concentration at 569 µg/L, which is approximately 57% of the GWPS of 1,000 µg/L. However, the majority of the detections were below 2 µg/L.
- **Trichloroethene:** Multiple detections, between 2008 and 2021, were measured with the highest concentration at 2.3 µg/L, which is 46% of the GWPS of 5 µg/L.
- **Vinyl Chloride**: Three detections, between 2019 and 2021, were measured with the highest concentration at 4.12 µg/L, which was the only detection higher than the GWPS of 2 µg/L. Vinyl chloride has not been measured at an SSL

  Xylenes: Five detections, between 2012 and 2020, were measured with the highest concentration at 99.8 µg/L, which is less than 1% of the GWPS of 10,000 µg/L.

MW-3R
- No samples.

MW-4
- No detections.

MW-4R
- No detections.

MW-5
- **cis-1,2-Dichloroethene**: Three detections, between 2019 and 2021, were measured with the highest concentration at 3.47 µg/L, which is approximately 5% of the GWPS of 70 µg/L.

MW-5R
- **Acetone**: A detection in 2022 was measured at 28.3 µg/L, which is less than 1% of the GWPS of 6,300 µg/L. However, acetone is a common laboratory contaminant (US EPA, 2014), and the detections may not be representative of groundwater quality in monitoring well MW-4.

MW-7
- No detections.

In monitoring well MW-3, the highest trichloroethene (TCE) concentration was measured in 2008 at 2.3 µg/L, which was 56% of the GWPS of 4 µg/L. The highest cis-1,2-dichloroethene (cis-1,2-DCE) concentration was measured in 2019 at 15 µg/L, which was approximately 21% of the GWPS of 70 µg/L. Time series analysis indicates a generally decreasing trend for TCE and an increasing concentration trend for cis-1,2-DCE, neither of which was statistically significant. Under the influence of biodegradation, cis,1-2-DCE is the more common intermediate, followed by trans-1,2-dichloroethene (trans-1,2-DCE), with 1,1-dichloroethene being the least prevalent when the three

isomers are present as daughter products. It has been reported that if the cis-1,2-DCE isomer is >80% of the total DCE, it is likely a daughter product of TCE biodegradation. Cis-1,2-DCE has been the only isomer detected in the monitoring history at the Landfill, which indicates that natural attenuation through biodegradation is likely occurring at the Landfill. Time series graphs of TCE and cis,1-2,-DCE are provided in **Attachment B**.

A single detection of vinyl chloride exceeding the GWPS was measured in monitoring well MW-3 during the 2nd semi-annual 2020 sampling event. During the subsequent 1st semi-annual 2021 sampling event, vinyl chloride was detected below the GWPS. Vinyl chloride was not detected in monitoring well MW-3 prior to 2019. The highest concentration of toluene was measured in 2012 at 569 µg/L, which was approximately 57% of the GWPS of 1,000 µg/L. However, five of the eight detections measured between 2012 and 2021 were below 2 µg/L, indicating that the elevated 2012 concentration was likely anomalous. Likewise, the majority of the measured benzene concentrations were below 2 µg/L compared to the GWPS of 5 µg/L.

Very limited VOC detections were measured in monitoring wells MW-1, MW-5, and MW-5R, with the detections in monitoring wells MW-5 and MW-5R being 5% or less than the respective GWPSs. No VOC detections were measured in monitoring wells MW-2, MW-2R, MW-3R, MW-4, MW-4R, and MW-7 throughout the history of groundwater monitoring at the Landfill.

2.3 LANDFILL GAS

The methane monitoring network is depicted in **Figure 3**. Landfill gas monitoring during the post-closure period has been conducted at six subsurface points and one outdoor point near the access road, beginning in 2017. One indoor monitoring point inside the shed was added in 2019. In correspondence dated December 3, 2020 (Doc #99065), the DNR approved semi-annual site methane monitoring in lieu of quarterly monitoring. Only one methane detection was recorded during the site's monitoring history. This detection occurred during the 2020 monitoring event, when methane was measured at 2% of the lower explosive limit in monitoring well MW-3. Methane was not detected during any other monitoring events.

2.4 FINAL COVER

Semi-annual inspections conducted in accordance with the Landfill DNR Sanitary Disposal Project Permit, applicable permit amendments, and the IAC have consistently documented a stable final cover characterized by well-established vegetation, no evidence of erosion, and no evidence of leachate seeps. The most recent inspection was conducted on March 13, 2025 (Doc #112551).

3.0 SUMMARY AND RECOMMENDATIONS

The following summary presents the justification and rationale for ending the post-closure under Permit No. 84-SDP-02-75for the City of Hawarden Sanitary C&D Landfill. The review focuses on groundwater levels, groundwater quality, landfill gas, and final cover conditions based on historical records, post-closure monitoring data, and site inspections.

- **Groundwater Levels**: Site geology indicates a thin, discontinuous saturated zone, and long-term monitoring shows that shallow groundwater is largely absent. The majority of the original and deeper replacement monitoring wells are consistently dry or yield insufficient

water for sampling, and ongoing water-level checks during methane monitoring events confirm a lack of recharge.

- **Groundwater Quality**: Groundwater quality data show limited VOC detections outside of monitoring well MW-3. Elevated metals are likely influenced by high total suspended solids caused by limited in-well water volumes and are likely not representative of actual groundwater quality conditions below the Landfill.
- **Landfill Gas**: Methane monitoring over the post-closure period identified only one low-level detection in 2020, and methane was not detected prior to that monitoring event and has not been detected during subsequent monitoring events.
- **Final Cover**: Semi-annual inspections have documented a stable, well-vegetated final cover with no evidence of erosion or leachate seeps.

Based on the findings and conclusions presented herein, it is recommended that the City proceed with the development of an Environmental Covenant and request recission of Permit No. 84-SDP-02-75 following recording of the Environmental Covenant.

Figure 1

Approved Monitoring Network

Monitoring Well	Monitoring Program
MW-1R	Upgradient
MW-2R	Downgradient
MW-3R	Downgradient
MW-4R	Downgradient
MW-5R	Downgradient

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environmental consultants and contractors

Approved Monitoring Network

Legend

- Monitoring Well
- HMSP Monitoring Well
- Approximate Waste Boundary
- Approximate Property Boundary

City of Hawarden C&D Landfill (Closed)
Hawarden, IA
Project No: 27224422.26
Drawing Date: April 2026

Figure 1

N W E S

0 30 60 120 180 240 Feet

Figure 2

Methane Monitoring Network

Point No.	Sample Point	Type	Description
1	MW-1	Subsurface	Subsurface MW-1
2	MW-2	Subsurface	Subsurface MW-2
3	MW-3	Subsurface	Subsurface MW-3
4	MW-4	Subsurface	Subsurface MW-4
5	MW-5	Subsurface	Subsurface MW-5
6	MW-7	Subsurface	Subsurface MW-7
7	North on Acess Road to Grass	Outdoor	Near Access Road to Grass
8	Shed	Indoor	Inside Shed

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Methane Monitoring Network

Legend

- Approximate Location of Methane Monitoring Point
- Monitoring Well
- Approximate Waste Boundary
- Approximate Property Boundary

City of Hawarden C&D Landfill (Closed)
Hawarden, IA
Project No: 27224422.26
Drawing Date: April 2026

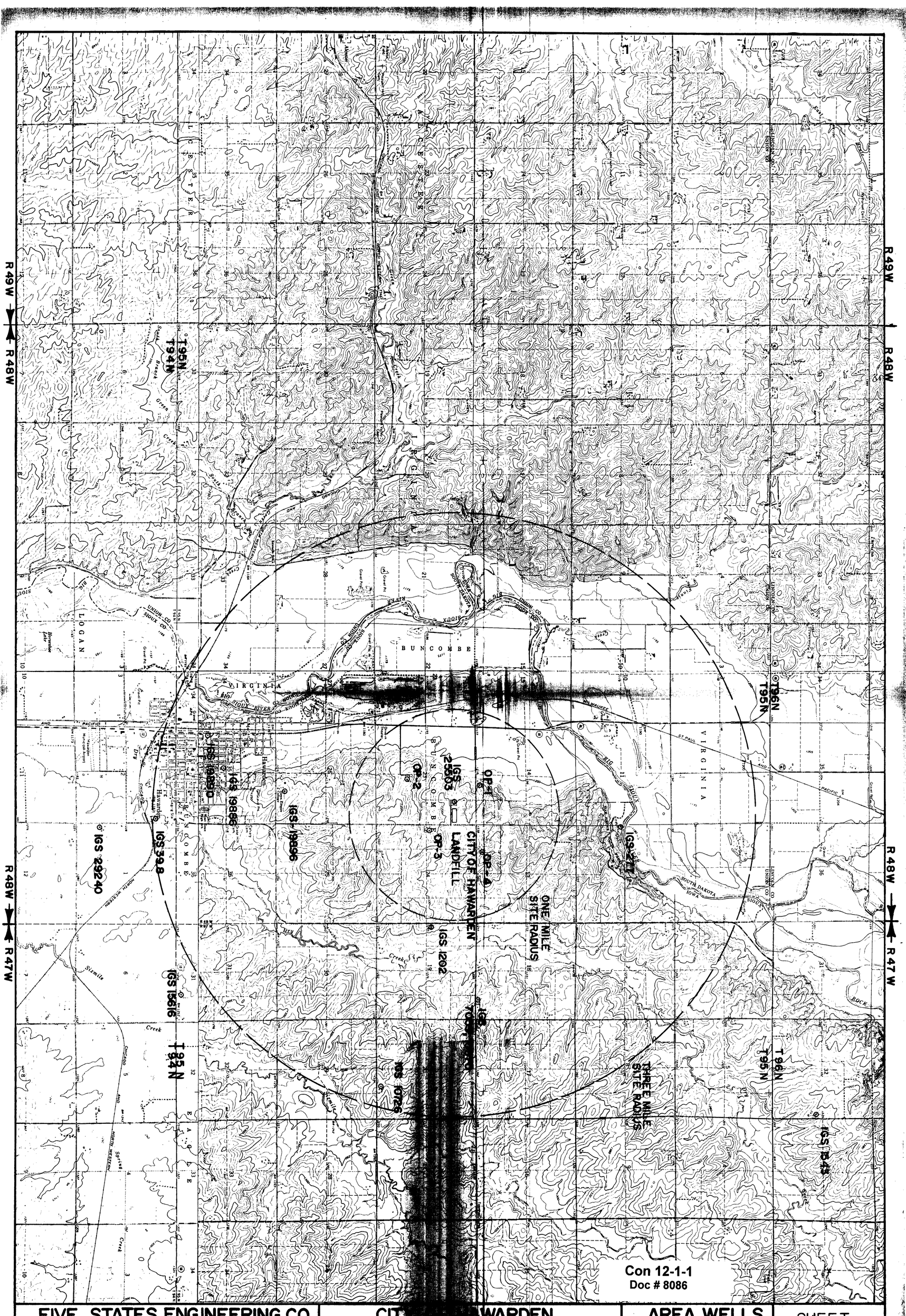
Figure 2

N
W E
S

0 30 60 120 180 240
Feet

Attachment A

Area Wells (Doc #8086)

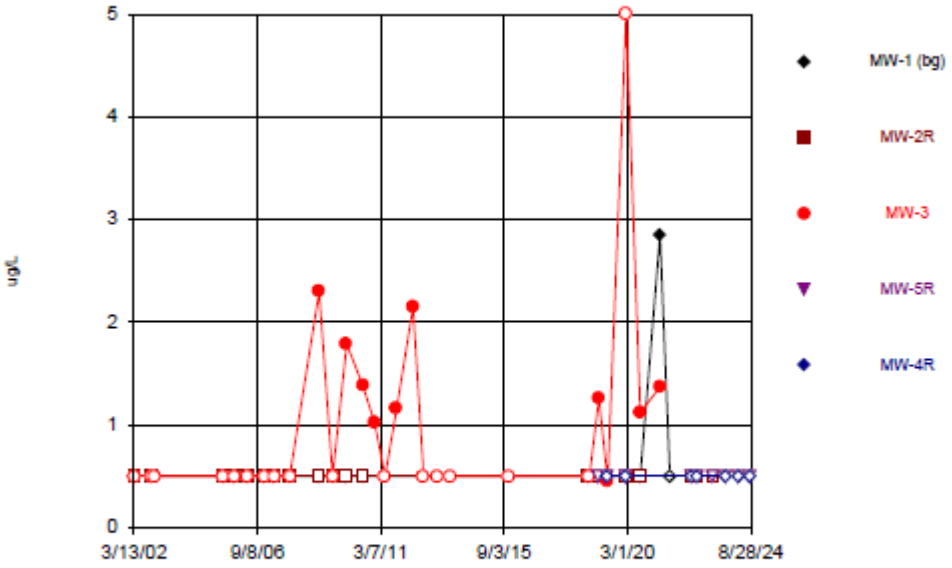


FIVE STATES ENGINEERING CO. RT. 1 BOX 23A WESTFIELD IA. PH. (712) 568-2494	CIT[illegible] AWARDEN LA[illegible] CLOSURE	AREA WELLS, USGS TOPOGRAPHY	SHEET 7 OF 11

Attachment B

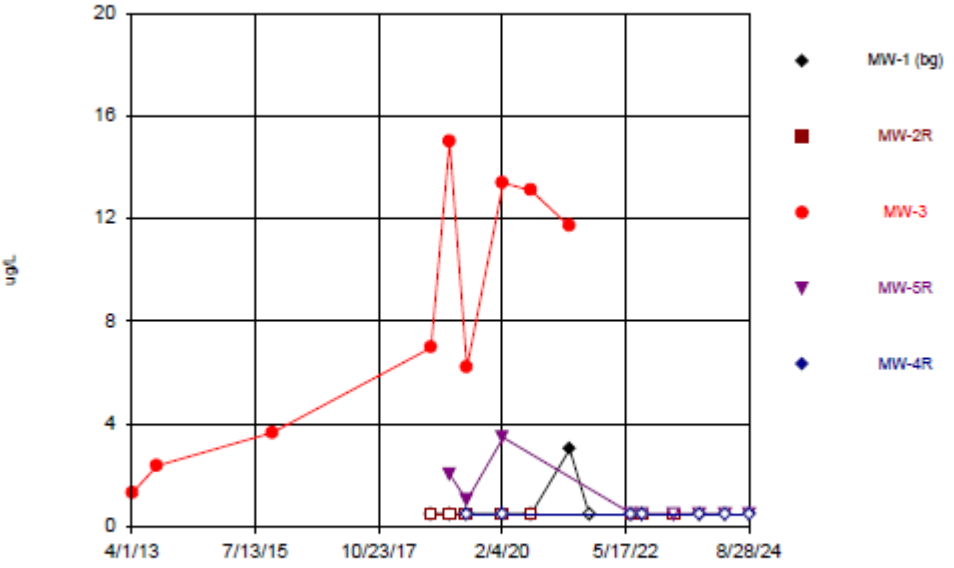
TCE and cis,1-2,-DCE Time Series Graphs

Time Series



Constituent: Trichloroethene Analysis Run 11/7/2024 4:06 PM View: 2024AWQR - Time Series
City of Hawarden C&D Landfill Client: SCS Engineers Data: HWRDN HMSP Sanitas

Time Series



Constituent: Cis-1,2-Dichloroethene Analysis Run 11/7/2024 4:06 PM View: 2024AWQR - Time Series
City of Hawarden C&D Landfill Client: SCS Engineers Data: HWRDN HMSP Sanitas