Comprehensive Site Investigation Report, Remediation Objectives Report, and Remedial Action Plan

LIMESTONE BUILIDING PROPERTY
200 WEST 1ST STREET
ROCK FALLS, WHITESIDE COUNTY, ILLINOIS 61071
PINS: 11-28-252-008-0000
11-28-252-009-0000
LPC Number 1950455120
May 18, 2018
Terracon Project No. 11147067

Prepared for:
City of Rock Falls
Rock Falls, Illinois
Prepared by:
Terracon Consultants, Inc.
Naperville, Illinois

Terracon

May 18, 2018

Illinois Environmental Protection Agency
Bureau of Land
Remedial Project Management Section
Site Remediation Program
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Attn: Andrew Catlin

Re: Comprehensive Site Investigation Report, Remediation Objectives Report, and Remedial Action Plan
Limestone Building Property
200 West 1st Street
Rock Falls, Whiteside County, Illinois 61071
LPC Number 1950455120
Site Remediation/Technical Report
Terracon Project No. 11147067

Dear Mr. Catlin:

Terracon Consultants, Inc. (Terracon) is pleased to submit this Comprehensive Site Investigation Report, Remediation Objectives Report, and Remedial Action Plan for the Limestone Building Property, located at 200 West 1st Street, Rock Falls, Whiteside County, Illinois. The site is currently owned by the City of Rock Falls. Terracon previously completed a Phase I Environmental Site Assessment (ESA) for the site, dated August 8, 2014. A copy of the Phase I ESA Report is enclosed for your reference. The DRM-2 form is included in Appendix A. Throughout the report, the section headers reference the corresponding rule sections in Title 35 Illinois Administrative Code Part 740 Site Remediation Program. We appreciate your review, and please contact us if you have any questions.

Sincerely,
Terracon Consultants, Inc.

Michael Lawrence, P.E
Senior Environmental Engineer

Linda Yang, P.G.
Senior Principal

cc: Ms. Robbin Blackert, City of Rock Falls

TABLES

APPENDICES

bgs ..... below ground surface
CFR ..... Code of Federal Regulations
City ..... City of Rock Falls
cm/sec ..... centimeters per second
COCs ..... Contaminants of Concern
C_{sat} ..... Soil Saturation Limit
CSIR ..... Comprehensive Site Investigation Report
CWS ..... Community Water Supply
ESA ..... Environmental Site Assessment
f_{oc} ..... Fraction of Organic Carbon
g/g ..... grams per gram
GPRS ..... Ground Penetrating Radar Systems, Inc.
GRO ..... Groundwater Remediation Objective
IAC ..... Illinois Administrative Code
IEPA ..... Illinois Environmental Protection Agency
ISGS ..... Illinois State Geological Survey
K ..... Hydraulic Conductivity
LEL ..... Lower Explosive Limit
mg/kg ..... milligrams per kilogram
mg/L ..... milligrams per liter
MOU ..... Memorandum of Understanding
MSA ..... Metropolitan Statistical Area
MS/MSD ..... Matrix Spike/Matrix Spike Duplicate
NELAP ..... National Environmental Laboratory Accreditation Program
NFR ..... No Further Remediation
NRCS ..... Natural Resources Conservation Service
PCB ..... Polychlorinated Biphenyl
PID ..... Photoionization Detector
PINs ..... Permanent Index Numbers
PNAs ..... Polynuclear Aromatic Hydrocarbons
ppm ..... part(s) per million
PVC ..... Polyvinyl Chloride
QA ..... Quality Assurance
QAPP ..... Quality Assurance Project Plan
QC ..... Quality Control
RA ..... Remediation Applicant
RACR ..... Remedial Action Completion Report
RAP ..... Remedial Action Plan
RCRA ..... Resource Conservation and Recovery Act
REC ..... Recognized Environmental Condition
RO ..... Remediation Objective
ROR ..... Remediation Objectives Report
SPLP ..... Synthetic Precipitation Leaching Procedure
SRO ..... Soil Remediation Objective
SRP ..... Site Remediation Program
SSL ..... Soil Screening Level
STAT ..... STAT Analysis Corporation
SVOC ..... Semi-Volatile Organic Compound
TAL ..... Target Analyte List
TACO ..... Tiered Approach to Corrective Action Objectives
TCL ..... Target Compound List
TCLP ..... Toxicity Characteristic Leaching Procedure
USEPA ..... United States Environmental Protection Agency
USGS ..... United States Geological Survey
VOC ..... Volatile Organic Compound

COMPREHENSIVE SITE INVESTIGATION REPORT, REMEDIATION OBJECTIVES REPORT, AND REMEDIAL ACTION PLAN
LIMESTONE BUILDING PROPERTY SITE
ROCK FALLS, WHITESIDE COUNTY, ILLINOIS

Terracon Project No. 11147067
May 18, 2018

1.0 SITE INVESTIGATION [740.425]

1.1 Executive Summary [740.425(b)(1)]

1.1.1 Objective

The objective of the site investigation was to identify and evaluate Recognized Environmental Conditions (RECs) and related contaminants of concern (COCs) at the Limestone Building Property located at 200 West 1st Street in Rock Falls, Whiteside County, Illinois (the remediation site). As the site owner and Remediation Applicant (RA), the City of Rock Falls intends to seek a Comprehensive No Further Remediation (NFR) letter for the remediation site in accordance with Title 35 Illinois Administrative Code (IAC) Part 740: *Site Remediation Program*.

The remediation site consists of two contiguous parcels totaling approximately 0.84 acres of land located along the south side of the Rock River at 200 West 1st Street in Rock Falls, Whiteside County, Illinois (identified by Whiteside County Parcel Identification Numbers [PINs] 11-28-252-008 and 11-28-252-009). The site formerly contained a 13,670-square-foot (footprint) four-story dilapidated building commonly referred to as the "Limestone Building" with the remainder of the site consisting of gravel drives and grassed areas. The Limestone Building was historically utilized for various manufacturing purposes including painting, paint grinding, sawing and planning, and the operation of wood working machinery.

The Limestone Building was constructed as two separate portions of the former Keystone Manufacturing complex in 1867. The two portions of the Limestone Building were connected by 1897. The warehouse and industrial buildings were no longer on site by 1966 and the former mill race had been filled in by this time. The material used to fill the former mill race is unknown. The site has remained in a similar configuration through the present; however, the on-site water tower was demolished in approximately 2012 and the Limestone Building was demolished in 2017.

The City enrolled the site into the Illinois Environmental Protection Agency (IEPA) Site Remediation Program (SRP) on November 2, 2017. An IEPA SRP DRM-2 form is presented in Appendix A.

1.1.2 Technical Approach

Terracon previously completed a Phase I Environmental Site Assessment (ESA) in accordance with ASTM International E 1527-13: *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* and 35 IAC Section 740.420(a), for the site, dated August 8, 2014. RECs for the site were identified in the Phase I ESA, which are described in Section 1.1.3. The identified RECs provided the basis for the intrusive investigation. A Sampling and Analysis Work Plan (Work Plan), dated September 18, 2017, was submitted to and approved by the United States Environmental Protection Agency (USEPA). The Work Plan was developed to investigate the RECs. A Quality Assurance Project Plan (QAPP) was also submitted to the USEPA and was approved by the USEPA.

1.1.3 Recognized Environmental Conditions

The Phase I ESA identified the following RECs associated with the remediation site:

- The historical on-site industrial operations from 1884 through 1945 including the use of a paint storage room located on the western portion of the (now former) on-site building. Records also indicated that a naphtha line historically ran across the western portion of the site towards the western “paint room area” of the former on-site building;
- The rail spur located on the southern portion of the site;
- The source of the fill material used to fill the former mill race located on the northern portion of the site is unknown;
- During the site reconnaissance, Terracon observed evidence of an empty 55-gallon drum located on the western site boundary;
- The former Keystone Manufacturing / International Harvester complex operations to the south of the site across West 1st Street from at least 1884 through 1961 (operations included blacksmithing, painting, paint dip tanks, machining, assembling, grinding, and heavy industrial operations);
- The former multi-tenant industrial building / Fort Dearborn Manufacturing Company / Flexonics Corporation operations on the eastern adjoining property (currently Lower Dam Park) from at least 1897 through 1959 (operations included dipping and hardware manufacturing); and

- The former Eureka Carriage Company operations on the western adjoining property from at least 1891 through 1916 (operations included blacking, painting, and varnishing).

1.1.4 Limitations

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Terracon makes no warranties, express or implied, regarding the findings, conclusions, or recommendations. Terracon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report.

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable, or not present during these services. We cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this investigation. Subsurface conditions may vary from those encountered at specific borings or wells or during other surveys, tests, assessments, investigations, or exploratory services. The data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

1.2 Site Characterization [740.425(b)(2)]

1.2.1 Sources Consulted [740.425(b)(2)(A)]

Terracon used the following reference documents in completing the site investigation.

- Phase I Environmental Site Assessment
  Limestone Building Property, Rock Falls, Illinois
  Prepared by: Terracon Consultants, Inc.
  Terracon Project No.: 11147752
  Dated: August 8, 2014

- Sampling and Analysis Work Plan
  Limestone Building Property, Rock Falls, Illinois
  Prepared by: Terracon Consultants, Inc.
  Terracon Project No.: 11147067
  Dated: September 18, 2017

Information from these previous reports is utilized in various sections of this report.

1.2.2 Site History [740.425(b)(2)(B)]

For a detailed site history, please refer to the Phase I ESA report prepared by Terracon and dated August 8, 2014. The approximately 0.84-acre remediation site consists of two contiguous parcels, which formerly contained a 13,670-square-foot (footprint) four-story dilapidated building commonly referred to as the "Limestone Building". The Limestone Building was historically utilized for various manufacturing purposes including painting, paint grinding, sawing and planning, and the operation of wood working machinery. The remainder of the site consists of gravel drives and grassed areas.

The Limestone Building was constructed as two separate portions of the former Keystone Manufacturing complex in 1867. By 1884, a warehouse and additional industrial buildings were present on the western portion of the site. At this time, the northern portion of the site included a mill race and wheel house structures for generating hydro-electric power along the Rock River and a railroad spur on the southern portion of the site. The two portions of the Limestone Building were connected by 1897. The site remained in a similar configuration through 1927. By 1945, the western portion of the warehouse structure was no longer present and a water tower was constructed on the southern portion of the site. The warehouse and industrial buildings were no longer on site by 1966 and the former mill race had been filled in by this time. The material used to fill the former mill race is unknown. The site has remained in a similar configuration through the present; however, the on-site water tower was demolished in approximately 2012 and the Limestone Building was demolished in 2017.

1.2.3 Site Description [740.425(b)(2)(C)]

Regional Location

The remediation site is located within Section 28, Township 21 North, and Range 7 East of the Fourth Principal Meridian in Rock Falls, Whiteside County, Illinois (refer to Exhibit 1). The site is identified by the following Whiteside County PINs: 11-28-252-008 and 11-28-252-009.

Pertinent Boundary Features

The site is located in a mixed-use area. Properties in the vicinity of the site are depicted on Exhibit 2 and a site base map is included as Exhibit 3. The remediation site is bounded to the north by a parking lot associated with the Lower Dam Park, followed by the Rock River; to the east by the Lower Dam Park, followed by CGH Rock Falls Health Center (100 West 1st Street); to the south by the southwest-northeast orientated West 1st Street followed by vacant land, Kapp's Banquet Facility (201 West 1st Street), Micro Industries, Inc. (200 West 2nd Street), and

other commercial properties; and to the west by vacant land followed by Mazel and Co. (400 West 1st Street).

Physiography and Geology

Physical Setting Information		Source
Topography (Refer to Exhibit 1 for the Topographic Map)		
Site Elevation	Approximately 640 feet (NGVD)	USGS Topographic Map, Sterling, Illinois Quadrangle, 1983
Surface Runoff/ Topographic Gradient	To the north-northwest	
Closest Surface Water	The Rock River is located approximately 120 feet to the northwest of the site.	
Soil Characteristics		
Soil Type	Urban Land (533)	Whiteside County, Illinois United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Web Soil Survey issued 2012.
Description	Materials that consist of man-made materials and earthy fill.	
Geology/Hydrogeology		
Formation	Ordovician	USGS Groundwater Atlas of the U.S. (HA 70K) dated 1995.
Description	Stratified sequence of confining units dolomite, limestone	
Estimated Depth to First Occurrence of Groundwater	During the 2017 site investigation, groundwater was identified at approximately 3 to 17 feet bgs.	Comprehensive Site Investigation (September - October 2017)
Hydrogeologic Gradient	To the southwest	Refer to Exhibits 5A and 5B

Soil boring logs and monitoring well construction diagrams from Terracon's investigation are included in Appendix B. The topography of the remediation site slopes downward from south to north. Based on ground surface elevations, the difference of the ground surface elevation from south to north ranges from approximately 9 to 13 feet bgs. Specifically, the general soil profile encountered at the higher elevations of the site consisted of an urban fill material mixed with sand, gravel and silty clay to approximately 8.5 to 12.5 feet bgs underlain by a layer of sand to depths of 19 to 20 feet bgs followed by silty clay, to a depth of 25 feet bgs, the maximum depth of the soil borings (SB-1, SB-4, SB-7, and SB-8) explored at the higher elevations of the site. The general soil profile encountered for borings at the lower elevations

of the site (SB-2, SB-3, SB-5, and SB-6) consisted of an urban fill material mixed with sand, gravel, silts, and clays to approximately 4.5 to 9 feet bgs underlain by silty clay to depths of 14 to 15 feet bgs followed by gravel to termination depth ranging from 10 to 15 feet bgs. A sand layer was encountered below the fill from 9.0 to 12.2 feet bgs followed by silty clay in boring SB-5. Within soil boring SB-6, the fill material was encountered from ground surface to the termination depth of the boring at approximately 15 feet bgs. Groundwater was observed while drilling at depths of approximately 9.0 to 19.8 feet bgs. After stabilizing, the water level measurements recorded from two groundwater monitoring events, October 5 and 31, 2017, ranged from 5.64 to 20.05 feet below the top of casing of the monitoring wells (note that the wells are installed within a stick-up protective cover). Based on the two groundwater monitoring events, overall groundwater flow direction is generally towards the southwest (refer to Exhibits 5A and 5B).

Hydrogeology

Terracon converted soil borings SB-1 through SB-5 into 2-inch diameter groundwater monitoring wells with corresponding MW designations, MW-1 through MW-5, to collect groundwater samples and to evaluate hydrogeology at the remediation site. Terracon calculated the horizontal hydraulic conductivity of the saturated soils at the remediation site using slug test data obtained from all five monitoring wells in order to obtain information on hydraulic conductivity across the site. Terracon used AQTESOLV Standard for Windows Version 4.0 to evaluate the data. Appendix C contains software printouts of the results. Table 1-1 summarizes the results of the hydraulic conductivity evaluation.

Table 1-1 Hydraulic Conductivity Values (cm/sec)

Well ID	Date of Test	Hydraulic Conductivity (cm/sec)
MW-1	10/6/2017	1.92E-02
		4.39E-03
		5.28E-03
MW-2	10/5/2017	3.08E-04
		3.22E-04
MW-3	10/5/2017	3.54E-03
		2.24E-03
MW-4	10/6/2017	9.96E-03
		1.09E-02
MW-5	10/5/2017	6.77E-04
	10/5/2017	9.59E-04

Average for the Monitoring Wells	**5.25E-03 cm/sec**
Geometric Mean for the Monitoring Wells	**2.51E-03 cm/sec**

As described in 35 IAC Section 620.210, Class I Groundwater is defined as follows:

"Groundwater located 10 feet or more below the land surface and within:

1. The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;
2. Unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less of fines (i.e., fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2487-06, incorporated by reference at Section 620.125);
3. Sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or
4. Any geologic material which is capable of a:
    a. Sustained groundwater yield, from up to a 12-inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or
    b. Hydraulic conductivity of $1x10^{-4}$ centimeters per second (cm/sec) or greater using one of the following test methods or its equivalent:
        i. Permeameter;
        ii. Slug test; or
        iii. Pump test."

For the October 5, 2017 groundwater monitoring event, groundwater depths ranged from 6.71 to 20.05 feet below top of casing and from 5.64 to 19.9 feet below top of casing during the October 31, 2017 groundwater event in the monitoring wells. The remediation site is not located within a setback zone of a potable water supply (see below). The native geologic materials are sands and silty clays. The average and geometric mean hydraulic conductivity values for the tests completed at the remediation site are greater than $1x10^{-4}$ cm/sec.

Based on the site's characteristics described above, the groundwater at the site is properly classified as Class I Groundwater. Terracon viewed the USGS topographic map depicting the remediation site to determine the location of the nearest surface water body. According to the map, the closest surface water body is the Rock River, which is approximately 120 feet to the northwest of the remediation site.

<u>Potable Water Supply and Well Survey</u>
Potable water in the area is supplied by the City of Rock Falls. Additionally, the City of Rock Falls has an ordinance in place that prohibits the installation and use of potable water supply wells throughout the city. The City utilizes three active community water supply (CWS) wells, well #2 (WL11917), well #5 (WL00716), and well #7(WL02067). The wells are located at the Rock Falls water department, approximately 7,400 feet (1.4 miles) southwest of the remediation site. There are also two additional CWS wells, well #3 (WL11918), and well #4

(WL11919), in the vicinity of the water department but they are currently abandoned. There is one CWS, well #6 (WL01276), approximately 1,100 feet northeast of the site, but it also currently abandoned. Information pertaining to these CWS wells are included in Appendix D.

Terracon conducted a water well survey utilizing the Illinois State Geologic Survey (ISGS) ILWATER Interactive Mapping Service, the IEPA's Source Water Assessment Program (SWAP) ArcIMS Mapping Tool well survey database, and the Illinois State Water Survey (ISWS) Domestic Well Database (via the internet). The search included the following sources:

- IEPA, Division of Public Water Supplies;
- Illinois State Geological Survey (ISGS);
- Illinois State Water Survey (ISWS);
- Illinois Department of Public Health (IDPH); and
- City of Rock Falls City Administration.

This included a review for the following with respect to the remediation site: CWS wells located within 2,500 feet of the site; potable wells (i.e., private, semi-private and non-community water system [Non-CWS]) located at the site or within 200 feet of the site; and, setback zones and regulated recharge areas.

The search indicated that the following were not present at the site:

- CWS wells
- Potable wells (i.e., Private, Semi-private and Non-CWS)
- Adopted Maximum Setback Zones[1]

The search indicated that there are no wells within the 200 feet (the minimum setback zone of a well) of the site. There are 26 wells within 2,500 feet of the site. The nearest well is located approximately 263 feet northeast of the site. This well is an engineering test well. There is one well listed as an irrigation well, 20 wells listed as water wells, and the remaining five wells are listed as engineering test wells. A summary of the wells is provided in the following table.

[1] *The minimum setback zone in Illinois is 200 feet, unless the well is a Community Water Supply well (either 200 or 400 feet) or an alternative setback zone has been otherwise designated.*

Table 1-2 Summary of Well Records

API Well Number	Distance/Direction from Remediation Site		Direction with Respect to Groundwater Flow	Total Depth (feet)	Owner ID	Status
121950000300	2,485 feet	North	Upgradient	794	Miami Hotel	Water Well
121950001700	2,311 feet	Southeast	Upgradient	1,550	Russell Burdsall W	Water Well
121950009100	1,756 feet	Southwest	Downgradient	1,014	Rock Falls	Water Well
121950009200	1,756 feet	Southwest	Downgradient	150	Chapman Bros	Water Well
121950009300	1,756 feet	Southwest	Downgradient	88	Frank Samuel	Water Well
121950009400	1,842 feet	Northwest	Upgradient	1,580	Il. Northern Utility	Water Well
121950009500	1,237 feet	Northeast	Upgradient	1,646	Lawrence Bros Mfg	Water Well
121950009600	1,756 feet	Southwest	Downgradient	110	Longfellow E L	Water Well
121950009700	2,069 feet	Northwest	Upgradient	760	Northwestern Steel & Wire Co.	Water Well
121950009800	405 feet	West	Upgradient	815	Parish-Alford F & M	Water Well
121950009900	1,756 feet	Southwest	Downgradient	50	Smith Harry	Water Well
121950027700	2,066 feet	Southeast	Cross-gradient	16	C H 3	Engineering Test Well
121950027900	263 feet	Northeast	Upgradient	25	Northwestern Steel & Wire Co.	Engineering Test Well
121952284800	1,827 feet	Southwest	Downgradient	Unknown	Angelo's Pizzeria	Water Well
121952284900	1,827 feet	Southwest	Downgradient	Unknown	National Manufacturing	Water Well for Business
121952285000	1,827 feet	Southwest	Downgradient	Unknown	Northwestern Steel & Wire Co.	Water Well for Business
121952285100	1,827 feet	Southwest	Downgradient	Unknown	Northwestern Steel & Wire Co.	Water Well for Business
121952285200	1,827 feet	Southwest	Downgradient	Unknown	Northwestern Steel & Wire Co.	Water Well for Business
121952285300	1,105 feet	Northeast	Upgradient	Unknown	Rock Falls, Town of	Municipal Water Supply

API Well Number	Distance/Direction from Remediation Site		Direction with Respect to Groundwater Flow	Total Depth (feet)	Owner ID	Status
121952288700	1,744 feet	Northwest	Upgradient	Unknown	Lawrence Park Pool	Non-Community Water Well
121952288800	1,744 feet	Northwest	Upgradient	Unknown	Lawrence Park Pool	Non-Community Water Well
121952316200	2,147 feet	Northwest	Upgradient	32	Sterling Fire Dept.	Engineering Test Well
121952316300	2,147 feet	Northwest	Upgradient	17	Sterling Fire Dept.	Engineering Test Well
121952316800	1,272 feet	Northeast	Upgradient	19	Northwestern Steel & Wire Co.	Engineering Test Well
121952384400	2,066 feet	Southeast	Cross-gradient	24	Seidel, Paul Jr	Water Well
121952393600	1,827 feet	Southwest	Downgradient	21	Wyckhuys, Lois	Irrigation Well

Terracon also contacted the IDPH for a search for non-community public supply wells in the area of the site. The response from the IDPH included no non-community public water supply (PWS) wells at the remediation site and one PWS well located approximately 6,000 feet (1.1 mile) northeast of the site in Sterling, Illinois.

Based on our review, the site does not fall within the setback zone of the wells identified in this well survey. The water well survey information is included in Appendix D.

Migration Pathways and Exposure Routes

The RA is seeking a comprehensive NFR letter conditioned on residential land use. As such, the following are the applicable exposure routes for evaluation.

- Residential Soil Ingestion
- Residential Inhalation
- Construction Worker Ingestion
- Construction Worker Inhalation
- Soil Component of the Class I Groundwater Ingestion Route
- Class I Groundwater Ingestion
- Residential Indoor Inhalation

Current and Post-Remediation Land Use

As shown in Exhibit 2, current land use of the remediation site and the vicinity is mixed use residential and industrial/commercial. The future development of the site is currently

undetermined; but, it is assumed in this report that the site will be developed as a green space, office, and/or commercial property in the future.

1.2.4 Site Base Map(s) [740.425(b)(2)(D)]

The Site Base Map was prepared in accordance with 35 IAC Section 740.210(a)(7) and is included as Exhibit 3.

1.2.5 Legal Description [740.425(b)(2)(E)]

The following PINs are included for the remediation site:

- **11-28-252-008-0000 (Parcel No. 2)**
- **11-28-252-009-0000 (Parcel No. 1)**

The legal description for the remediation site is as follows:

PARCEL NO. 1: That part of Block "B" of the City of Rock Falls, Whiteside County, Illinois, described as follows: Beginning at a point on the North line of said Block "B" 90 feet 4 inches Westerly from the East side of the Southeast post in the Bulkhead in the race along and by said Block "B", thence Westerly along the North line of said Block “B” a distance of 100 feet; thence Southerly on a line at a right angle to said North line of Block "B" a distance of 80 feet; thence Easterly on the North line of River Street, now known as First Street, a distance of 100 feet; thence Northerly to the place of beginning; ALSO, that portion of said Block “B" bounded and described as follows: Beginning on the North side of the South wall of the main race at a point 19 feet 6 inches Easterly from the East side of the Southeast post of the Bulkhead: thence running Westerly 110 feet; thence Southerly at a right angle 80 feet to River Street; thence Easterly on River Street 110 feet: thence Northerly 80 feet to the place of beginning. AND ALSO, the North 30 feet of River Street, now known as First Street, lying south and adjoining the premises described above; EXCEPTING therefrom the Easterly 8 feet of the above described premises as previously conveyed by the Deed dated December 15, 1960, recorded as Document 286377.

PARCEL NO. 2; That part or Block "B" or the City of Rock Falls, Whiteside County, Illinois, described as follows: Beginning at a point on the North line of said Block "B" 190 feet 4 inches Westerly from the East side of the Southeast post in the Bulkhead in the main race of Augustus P. Smith as it was on November 1, 1869; thence running Southerly and at right angles with said North line of Block "B" 80 feet to River Street; thence Westerly along the Northerly line of River Street (now First Street), 132 feet, more or less, to a point on said North line of River Street, which lies East, 634.5 feet, from a point on the North line of River Street, which point is 158 feet Easterly from the intersection of said North line of River Street with the West line

of Fifth Avenue (formerly Grove Street): thence Northerly and at right angles to said Northerly line of River Street 80 feet to the said North line of Block "B"; thence Easterly along said North line of Block "B" to the place of beginning; ALSO all that part of the North 30 feet of River Street (now known as First Street in the City at Rock Falls) lying South of the above described tract, situated between the Southerly extension of the East and West line of the above described tract.

1.3 Site-Specific Sampling Plan [740.425(b)(3)]

Terracon developed a Sampling and Analysis Work Plan dated September 18, 2017, which was submitted to the USEPA, to investigate the impacts at the remediation site associated with the RECs identified in the Phase I ESA. The Work Plan was subsequently approved by the USEPA. Soil borings were advanced and groundwater monitoring wells were installed at the remediation site to further investigate the extent of potential contamination. The following sections further describe the physical and chemical methods used during Terracon's investigation.

1.3.1 Contaminant Source Investigation

According to the Terracon Phase I ESA dated August 2014, the Limestone Building was constructed at the remediation site as two separate portions of the former Keystone Manufacturing complex in 1867. The Limestone Building was historically utilized for various manufacturing purposes including painting, paint grinding, sawing and planning, and the operation of wood working machinery. The Terracon Phase I ESA noted that a previous Phase I ESA report, dated February 10, 1994, was prepared by Missman, Stanley and Associates (MSA) for the area located between 2nd Avenue and 4th Avenue along the north and south sides of West 1st Street in Rock Falls, Illinois. The area of the assessment included the remediation site.

A Phase II subsurface investigation was conducted in March 1994 by MSA as a follow-up to the Phase I ESA findings. As a part of Phase II investigation, four soil borings and two monitoring wells were installed at industrial properties along W. 1st Street in Rock Falls, Illinois. The site was one of the properties included in the Phase II investigation. The results of the investigation are summarized in Terracon's 2014 Phase I ESA.

The Limestone Building was demolished in 2017 and the site remains vacant. The historical use and site assessments conducted at site, and adjoining properties are considered a REC for the site.

To comply with 35 IAC Section 740.425 for a comprehensive site investigation, the site was assessed for the COCs appropriate to the identified RECs. In order to address a wider range

of potential contaminants consistent with the objectives of a comprehensive site investigation, ten of the sixteen soil samples and each groundwater sample, for a total of five, were analyzed for the constituents listed on the Target Compound List (TCL) as identified in Appendix A of the SRP regulations (35 IAC Part 740). The TCL consists of VOCs, Semi-Volatile Organic Compounds (SVOCs), Pesticides, PCBs, and target analyte list (TAL) inorganics. Additional analyses included PNAs, RCRA total metals, pH, TCLP and synthetic precipitation leaching procedure (SPLP) metals, fraction of organic carbon (f_{oc}), and waste characterization analyses including reactive cyanide and reactive sulfide.

1.3.2 Soil Investigation

Location of Underground Utilities

For safety, utility protection, and to identify potential preferential migration pathways, before beginning subsurface investigation activities, Terracon contacted JULIE (the State of Illinois One-Call Utility Locate system) and requested location and markings of subsurface utilities.

Soil Boring Activities

In September and October 2017, Terracon conducted soil sampling to investigate impacts at the remediation site. CS Drilling of Hinsdale, Illinois, performed the direct-push (Geoprobe®) drilling services as subcontractor to Terracon for these sampling events. On September 19 and 20, 2017, eight soil borings (SB-1 through SB-8) were advanced to depths ranging from 10 to 25 feet bgs as part of the subsurface investigation activities. On October 31, 2017, two soil borings were advanced immediately near previous boring locations (SB-1 and SB-4), to collect deeper soil samples for vertical delineation. The locations of each soil boring are depicted on Exhibit 4. Soil borings were selected to characterize the nature and extent of the contamination. The field investigation and sampling activities were performed under the direction of Terracon personnel who logged the lithology of the recovered material. The soil boring logs, presented in Appendix B, detail the subsurface lithology encountered during the investigation activities.

Field Screening

Terracon field screened the soil samples recovered from each soil boring for organic vapors using a PID. This device provides a direct reading in parts per million (ppm) isobutylene equivalents and was calibrated daily using 100-ppm span gas in accordance with the manufacturer's recommendations. Upon removal of the sample liner from the borehole, Terracon sealed samples in 2.5-foot intervals of each core in a Ziploc® bag. After a brief stabilization period, Terracon screened the headspace above the soil in each bag using the PID equipped with an approximate 10.6 electron-volt ultraviolet lamp source. In general, no measurable PID readings were observed in the borings except for SB-2 that had a PID reading of 10.1 ppm in the surface soil (i.e., approximately 0 to 2.5 feet bgs). The soil boring logs in Appendix B summarize the PID screening results from each boring.

Soil Sample Collection and Handling

Soil samples were collected from the surface (1 to 3 feet bgs) and subsurface (below 3 feet bgs) at the site. The subsurface soil samples were selected based on indications of environmental impact, as determined by elevated PID readings, visual and olfactory observations, and/or the apparent interface with the groundwater table. The VOC portions of the samples were field preserved immediately using laboratory-supplied pre-weighed vials containing the sodium bisulfate and methanol Method 5035 preservatives (pre-weighed vials containing sodium bisulfate and methanol). The soil sampling equipment was cleaned with Alconox® detergent and rinsed with deionized water, prior to commencing sampling as well as between each sampling point. Soil borings were backfilled with soil cuttings and bentonite chips. QA/QC samples for soil included one field duplicate for every twenty samples, one matrix spike and matrix spike duplicate (MS/MSD) for every 20 samples, and one trip blank per shipping container containing soil samples for analysis of VOCs. The QA/QC samples were collected in the same manner as the sample, except for the trip blank (prepared and provided by the laboratory) that was included in one of the coolers containing VOC samples for soil that were delivered to the laboratory.

After packaging each sample in laboratory-prepared containers, Terracon recorded the sample time on each container label in permanent ink and placed the filled containers in an ice-filled cooler for transport to the laboratory. The cooler was transported by Terracon personnel to STAT Analysis Corporation (STAT) in Chicago, Illinois, a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory, under standard Chain-of-Custody procedures.

Analytical Methods for Soil Investigation

Table 1-3 summarizes the analytical methods used by the laboratory to analyze soil samples. Laboratory reports for soil analyses are provided in Appendix E.

Table 1-3 Soil Laboratory Analytical Methods

Sample Location	Sample Date	Total Depth	Interval Analyzed	Analyses
SB-1	09/20/2017	20’	1-3’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C
			5-7’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C
	10/31/2017		11-13’	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-c,d)pyrene 8270C
			13-15’	Dibenzo(a,h)anthracene 8270C
SB-2	09/19/2017	15’	1-3’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, SPLP Iron 1312/6020
			5-7’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, and F_{oc} by D2974
SB-3	09/19/2017	10’	1-3’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, SPLP Aluminum, Cobalt, and Iron 1312/6020 and F_{oc} by D2974
			5-7’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, SPLP Aluminum, Cobalt, and Iron 1312/6020
SB-4	09/20/2017	25’	1-3’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, and SPLP Arsenic, Aluminum, Cobalt, Iron and Manganese 1312/6020
			6-8’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, SPLP Aluminum, Antimony, Cobalt, Iron and Manganese 1312/6020 and F_{oc} by D2974

Sample Location	Sample Date	Total Depth	Interval Analyzed	Analyses
SB-4 (cont.)	10/31/2017	25’	10-12’	Aluminum 6020
SB-5	09/19/2017	15’	1-3’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C, SPLP Lead and Iron 1312/6020
			6-8’	VOCs 5035/8260B, SVOCs 8270C, Pesticides 8081, PCBs 8082, TAL Metals 6020, Mercury 7471A, Total Cyanide 9012A, pH 9045C
SB-6	09/19/2017	15’	1-3’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C, TCLP Lead 1311/6010
			9-11’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C
SB-7	9/20/2017	16	1-3’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C, TCLP RCRA Metals 6010/7470/1311
	10/31/2017		1-3’	Reactive Cyanide/Sulfide 7.3.3.2 and 7.3.4.2
SB-7/ SB-7DUP	09/20/2017	16’	5-7’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C
			5-7’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C
SB-8/SB-8DUP	09/20/2017	16’	1-3’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C, SPLP Lead 1312/6020
			1-3’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C, SPLP Lead 1312/6020
			5-7’	VOCs 5035/8260B, PNAs 8270C, RCRA metals 6020, Mercury 7471A, and pH 9045C

During the subsurface investigation in September 2017, Terracon collected soil samples from SB-3, SB-2, and SB-4 at depths of 1 to 3 feet bgs, 5 to 7 feet bgs, and 6 to 8 feet bgs, respectively, for the analysis of organic carbon content using analytical method ASTM D2974. Table 1-4 summarizes the results of the f_{oc} analyses and the summed total of the reported organic compound concentrations. The f_{oc} values were obtained by multiplying the organic matter results by the 0.58 corrective factor per 35 IAC Section 742.215. The samples were

also analyzed for organic compounds (VOCs and SVOCs). There were no VOCs or SVOCs detected in these samples, with the exception of 0.097 milligrams per kilogram (mg/kg) acetone in SB-3 (1-3 feet bgs). The 0.097 mg/kg of acetone represents less than one ten thousandth of a percent and does not change the f_{oc} result reported to one significant digit.

Table 1-4 Organic Carbon Content Results

Sample	Organic Carbon Content
SB-3 (1-3)	(1.04%)
SB-2 (5-7)	(0.12%)
SB-4 (6-8)	(1.35%)

Based on these results, the appropriate f_{oc} values for use in determining ROs for surface (within the top meter bgs) and subsurface (below one meter bgs) soils are 1.04% and 0.12% using the most conservative (i.e., lowest) values for f_{oc} for surface and subsurface.

1.3.3 Hydrogeological Investigation

Monitoring Well Construction

Terracon converted soil borings SB-1 through SB-5 into 2-inch diameter permanent groundwater monitoring wells with corresponding MW designations (e.g., MW-1, MW-2, etc.). The screened section of each monitoring well consisted of a 10-foot section of 0.01-inch slotted polyvinyl chloride (PVC) pipe installed to intersect the water table, except for MW-3, where refusal was encountered at 10 feet bgs, so a 5-foot section of 0.01-inch slotted PVC pipe was installed. Fine-grained sand filter pack was placed into each well's annulus from the bottom to approximately 1.5 to 2 feet above the screened section. A bentonite product (approximate ⅛-inch diameter chips) was hydrated with potable water and placed in the annulus from above the filter pack to within two feet of the ground surface. For the construction of the permanent wells, a 4-inch diameter steel protector pipe was inserted into the grout and set with concrete. Each permanent monitoring well internal PVC casing was fitted with an expansion cap and lock, and equipped with a stick-up outer protector pipe with a lock. Combined boring logs and well construction diagrams are provided in Appendix B. The soil cuttings from the installation of the monitoring wells were containerized in 55-gallon drums.

Following installation of the monitoring wells, Terracon developed each well by removing at least three well volumes of water with a peristaltic pump, and placed all purged water into a drum for proper disposal.

Water Level Measurements

The depth to water level was measured by lowering an electric water tape into each well casing. The electric water tape broadcasted an audible signal upon reaching the water table. Once contact with the groundwater was established, the measurement on the tape at the

reference point (top of the well casing [TOC]) was recorded to the nearest 0.01 foot. The relative elevations of the ground surface and the TOC at each well were surveyed by Willett Hofmann & Associates, Inc., of Sterling, Illinois, a licensed surveyor.

Table 1-5 Groundwater Elevation Data

Monitoring Well Number	Top of Casing Elevation (feet)	Depth to Water (feet) (10/05/2017)	Groundwater Elevation (feet)	Depth to Water (feet) (10/31/2017)	Groundwater Elevation (feet)
MW-1	644.55	17.20	627.35	17.05	627.50
MW-2	636.81	9.21	627.60	9.05	627.76
MW-3	634.45	6.71	627.74	5.64	628.81
MW-4	647.61	20.05	627.56	19.90	627.71
MW-5	638.30	10.81	627.49	10.65	627.65

Hydraulic Conductivity Testing

Terracon measured in-situ hydraulic conductivity at the five monitoring wells (MW-1 to MW-5) using a "bail-down" method. At least two bail-down tests were performed at each monitoring well. The general principle when conducting this type of test is to stress the water-bearing formation near the monitoring well by lowering the head pressure in the well. The recovery of the water level in the well following the induced stress was recorded using an electronic pressure transducer and an estimate of the hydraulic conductivity of the formation was calculated.

On October 5 and 6, 2017, hydraulic conductivity tests were conducted. During the test, water from monitoring wells MW-1 through MW-5 was removed using disposable PVC bailers. Throughout the bail-down and recovery periods, the water level in the monitoring wells was measured using a pressure transducer connected with direct-read cables to a laptop. Terracon used the Bouwer-Rice[2] method implemented by AQTESOLV software to calculate the hydraulic conductivity of the formation at each monitoring well location. Table 1-1 summarizes the results of the hydraulic conductivity evaluation. The average and geometric mean hydraulic conductivity values for the remediation site are approximately 5.25 $x10^{-3}$ cm/sec and 2.51 $x10^{-3}$ cm/sec, respectively. Based on the hydraulic conductivity and other conditions stated in 35 IAC Section 620.210, groundwater at the remediation site is properly classified as Class I. The slug test data and hydraulic conductivity calculations for the monitoring wells are provided in Appendix C.

Groundwater Sample Collection and Handling

Groundwater samples were collected at the remediation site on October 5 and 31, 2017. Monitoring wells were gauged prior to sampling. Upon removal of the well cap, the distance

[2] *Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.*

to the static water level was measured using an electronic water level indicator. The electronic water level indicator was cleaned between each monitoring well by washing in an Alconox® and water solution followed by rinsing in deionized water.

The groundwater samples for VOCs were collected using new disposable bailers with new nylon string, and the groundwater samples for all other analyses were collected using disposable tubing and a peristaltic pump at a pumping rate less than one gallon per minute. Terracon filled the laboratory-prepared containers directly from the discharge end of the tubing. QA/QC samples for water included one field duplicate for every twenty samples, one MS/MSD for every 20 samples, and one trip blank per shipping container containing water samples for analysis of VOCs. The QA/QC samples were collected in the same manner as the sample, except for the trip blank (prepared and provided by the laboratory) that was included in one of the coolers containing VOC samples for water that were delivered to the laboratory.

After packaging each sample in laboratory-prepared containers, the sample time was recorded on each container label in permanent ink and the filled containers were placed in an ice-filled cooler for transport to the laboratory. The cooler was transported to the laboratory by Terracon personnel under standard Chain-of-Custody procedures.

Analytical Methods for Hydrogeological Investigation

Table 1-6 summarizes the analytical methods used by the laboratory to analyze groundwater samples. Laboratory reports for groundwater analyses are provided in Appendix E.

Table 1-6 Groundwater Laboratory Analytical Methods

Sample Location	Sample Date	Analyses
MW-1	10/05/2017	VOCs 8260B, SVOCs 8270C(-SIM), Pesticides 8081B, PCBs 8082A, TAL Metals 6020A, Mercury 7470A, Total Cyanide 9012A
	10/31/2017	TAL Metals 6020A, Mercury 7470A
MW-2	10/05/2017	VOCs 8260B, SVOCs 8270C(-SIM), Pesticides 8081B, PCBs 8082A, TAL Metals 6020A, Mercury 7470A, Total Cyanide 9012A
	10/31/2017	TAL Metals 6020A, Mercury 7470A
MW-3	10/05/2017	VOCs 8260B, SVOCs 8270C(-SIM), Pesticides 8081B, PCBs 8082A, TAL Metals 6020A, Mercury 7470A, Total Cyanide 9012A
	10/31/2017	TAL Metals 6020A, Mercury 7470A

Sample Location	Sample Date	Analyses
MW-4	10/05/2017	VOCs 8260B, SVOCs 8270C(-SIM), Pesticides 8081B, PCBs 8082A, TAL Metals 6020A, Mercury 7470A, Total Cyanide 9012A
	10/31/2017	TAL Metals 6020A, Mercury 7470A
MW-5	10/05/2017	VOCs 8260B, SVOCs 8270C(-SIM), Pesticides 8081B, PCBs 8082A, TAL Metals 6020A, Mercury 7470A, Total Cyanide 9012A
	10/31/2017	TAL Metals 6020A, Mercury 7470A

1.3.4 Surface Water Investigation

According to the USGS Sterling 7.5-minute series topographic quadrangle, the closest surface water body to the site is the Rock River, which is approximately 120 feet to the northwest of the remediation site. In accordance with 35 IAC Section 742.810, concentrations of COCs in groundwater detected above the Tier 1, Class I GROs will be modeled using Equation R26 and site-specific data to evaluate whether the concentration of any COC in groundwater potentially discharging into a surface water body will meet the applicable surface water quality standard per 35 IAC Part 302. Based on the groundwater elevations measured in monitoring wells on October 5 and 31, 2017, the groundwater flow direction is measured generally to the southwest. Therefore, the surface water TACO modeling evaluation is not warranted.

1.3.5 Potential Receptor Investigation

During field activities, Terracon observed the remediation site and nearby vicinity for indications of potential receptors. Terracon did not observe basements or other below-grade inhabitable structures. The City of Rock Falls marked the location of a subsurface sewer line that runs in the north-south direction across the remediation site. The Rock River is approximately 120 feet to the northwest of the remediation site. Based on the measured groundwater flow direction (southwest), the Rock River is not a potential receptor from the site. Based on the completed characterization of the horizontal and vertical extents of impacts in the subsurface (refer to Section 1.5 and Table 1-7), an appropriate investigation of potential receptors was completed for the site.

1.4 Documentation of Field Activities [740.425(b)(4)]

1.4.1 Narrative Description [740.425(b)(4)(A)]

Terracon completed the following site investigation activities.

- On September 19 and 20, 2017, eight soil borings (SB-1 through SB-8) were advanced at the site as part of the subsurface investigation activities. Five of these soil borings were converted into groundwater monitoring wells. Exhibit 4 depicts the locations of these borings and wells. Terracon submitted the soil samples to STAT for laboratory analyses.

- On October 5, 2017, Terracon collected groundwater samples from the five monitoring wells (MW-1 through MW-5) installed at the remediation site. Terracon submitted the groundwater samples to STAT for laboratory analyses.

- Terracon conducted slug tests at groundwater monitoring wells MW-1 through MW-5, on October 5 and 6, 2017. Results are included in Appendix C.

- On October 31, 2017, two soil borings were advanced immediately near previous boring locations (SB-1 and SB-4), to collect deeper soil samples for vertical delineation. An additional round of groundwater levels was collected from each of the monitoring wells and also an additional groundwater sample was collected from each well monitoring well for TAL metal analyses. During the prior (October 5, 2017) groundwater sampling event, it was observed that the groundwater appeared turbid during sampling. Based on the TAL metal results, the results appeared to indicate a turbidity-related high bias in the groundwater metal analytical results. Therefore, the wells were purged and an additional metal sample was collected from each well using low-flow sampling procedures.

1.4.2 Quality Assurance Project Plan [740.425(b)(4)(B)]

Terracon performed work on this project in accordance with the Sampling and Analysis Work Plan dated September 18, 2017, the QAPP as approved by the USEPA, and the methodology described in this report. These methods were used so that the information, data, and resulting decisions for the project are technically sound, statistically valid, and properly documented. Terracon used STAT Analysis Corporation of Chicago, Illinois, an IEPA-accredited laboratory (#100445), for chemical analyses, and the laboratory performed the analytical tests in accordance with this accreditation. The laboratory conducted the required level of quality assurance/quality control, and qualified the analytical results as necessary. The laboratory

qualifiers were reviewed and Terracon did not observe conditions that would adversely affect the project decisions. The laboratory reports in Appendix E describe the qualifiers.

1.4.3 Presentation of Data [740.425(b)(4)(C)]

The SRP regulations require that the data from the investigation be presented such that the information is organized and presented logically, and that relationships between the different investigations for each medium are apparent. Separate tables for soil and groundwater analytical data are provided as Tables 1 through 10.

1.5 Endangerment Assessment [740.425(b)(5)]

1.5.1 RECs and Exposure Routes [740.425(b)(5)(A)]

Section 1.1.3 discusses the RECs associated with the remediation site. Section 1.5.5 discusses the applicable exposure routes for the remediation site.

1.5.2 De Minimis Conditions [740.425(b)(5)(B)]

The Phase I ESA did not identify de minimis conditions.

1.5.3 Contaminants of Concern [740.425(b)(5)(C)]

The COCs investigated to assess the RECs were those on the TCL in 35 IAC Part 740, Appendix A. Tables 1 through 10 summarize the concentrations of the COCs. Section 1.5.5 presents a summary of the sample locations where the concentrations of one or more contaminants exceeded the Tier 1 SROs and/or GROs.

1.5.4 Physical Features of the Site [740.425(b)(5)(D)]

Terracon did not observe significant physical features (e.g., preferential pathways due to buried conduits, etc.) of the remediation site and vicinity that could affect contaminant transport and risk to human health, with the potential exception of the subsurface sewer that runs in the north-south direction across the site as depicted in Exhibit 4. However, based on the completed characterization of the horizontal and vertical extents of impacts in the subsurface (refer to Section 1.5 and Table 1-7), an appropriate investigation of preferential pathways was completed for the site.

1.5.5 Tier 1 Comparison [740.425(b)(5)(E)]

Comparisons of the compounds tested to TACO Tier 1 ROs are shown on Tables 1 through 10. Values exceeding the ROs on the tables are highlighted. Table 1-7 summarizes the compounds that exceed the Tier 1 SROs and/or GROs.

Table 1-7 Compounds Requiring Further Evaluation

Group	Compound	Exposure Routes						
		Residential Occupants			Construction Workers		Groundwater Ingestion	
		Soil Ingestion	Outdoor Inhalation	Indoor Inhalation	Soil Ingestion	Outdoor Inhalation	Soil Component	Ingestion
VOCs	Trichloroethene							MW-3
	Xylenes (total)					SB-8 (1-3)		
PNAs	Benzo(a) anthracene	SB-1 (5-7), SB-5 (1-3), SB-6 (1-3) SB-8 (1-3), SB-8DUP (1-3)					SB-1 (5-7), SB-5 (1-3), SB-6 (1-3), SB-7 (1-3), SB-8 (1-3), SB-8DUP (1-3)	
	Benzo(a)-pyrene	SB-1 (5-7), SB-2 (1-3), SB-5 (1-3), SB-6 (1-3), SB-7 (1-3), SB-8 (1-3), SB-8DUP (1-3)					SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)	
	Benzo(b)-fluoranthene	SB-1 (5-7), SB-5 (1-3), SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)					SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)	
	Benzo(k)-fluoranthene	SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3						
	Carbazole						SB-5 (1-3)	

Group	Compound	Exposure Routes						
		Residential Occupants			Construction Workers		Groundwater Ingestion	
		Soil Ingestion	Outdoor Inhalation	Indoor Inhalation	Soil Ingestion	Outdoor Inhalation	Soil Component	Ingestion
	Dibenzo(a,h)-anthracene	SB-1 (5-7), SB-1 (11-13), SB-4 (1-3), SB-5 (1-3), SB-6 (1-3), SB-7 (1-3), SB-8 (1-3), SB-8DUP (1-3)					SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)	
	Indeno(1,2,3-c,d)pyrene	SB-1 (5-7), SB-5 (1-3), SB-6 (1-3), SB-8 (1-3)					SB-6 (1-3)	
	Naphthalene					SB-6 (1-3), SB-8 (1-3) SB-8DUP (1-3)		
Metals	Mercury					SB-7 (1-3)		
	Lead	SB-6 (1-3), SB-7 (1-3)					~~SB-5 (1-3)~~* SB-6 (1-3), SB-7 (1-3), ~~SB-8 (1-3)~~* SB-8DUP (1-3)	
	Arsenic	SB-4 (1-3), SB-7 (1-3) SB-8 (1-3), SB-8DUP (1-3)					~~SB-4 (1-3)~~*	
	Chromium[3]						~~SB-7 (1-3)~~*	
	Aluminum						SB-4 (6-8)**	MW-2, MW-3, MW-5
	Antimony						~~SB-4 (6-8)~~*	
	Iron						SB-4 (6-8)**	MW-3
	Manganese							MW-1, MW-2, MW-4, MW-5

*Sample result exceeded the pH-specific RO but its SPLP or TCLP result was below the Class I GRO
**Sample result exceeded the background concentration and its SPLP or TCLP result exceeded the Class I GRO

Exhibits 6 through 10 depict the areas of the remediation site where reported concentrations were above the Tier 1 ROs.

Several samples indicated concentrations of inorganic constituents that are over the non-Metropolitan Statistical Area (MSA) background concentrations, but are under Tier 1 SROs or

[3] *Chromium concentrations above the Tier 1, Class I SRO for the soil component of the groundwater ingestion exposure route are based on total chromium concentrations.*

the Tier 1 SRO is not established. Specifically, calcium, magnesium, sodium, and potassium were detected over background in several soil samples, but are considered nutrients in soil, and given the site setting, generally do not require further consideration.

Samples displaying the highest concentrations for specific chemicals at the site above non-MSA background concentrations and/or outside of a pH-specific Tier 1 RO range were analyzed for SPLP or TCLP to determine if the maximum chemical concentrations would leach to the groundwater at levels above the established Tier 1 GROs for Class I groundwater. SPLP aluminum and cobalt were analyzed for SB-3 (1-3), SB-3 (5-7), SB-4 (1-3), and SB-4 (6-8). SPLP iron was analyzed for SB-2 (1-3), SB-3 (1-3), SB-3 (5-7), SB-4 (1-3), SB-4 (6-8), and SB-5 (1-3). SPLP lead was analyzed for SB-5 (1-3), SB-8 (1-3), and SB-8 DUP (1-3) and TCLP lead for SB-6 (1-3). SPLP antimony was analyzed for SB-4 (6-8). SPLP arsenic was analyzed for SB-4 (1-3). SPLP manganese was analyzed for SB-4 (1-3) and SB-4 (6-8). TCLP RCRA Metals were analyzed for SB-7 (1-3). All constituents analyzed for SPLP or TCLP, with the exception of aluminum, cadmium, lead, and iron indicated results below the applicable Tier 1 GROs. Sample SB-7 (1-3) exhibited a TCLP cadmium concentration that exceeded the Tier 1, Class I GRO, but was below the pH-specific Tier 1 SRO. Therefore, cadmium does not require further consideration. Sample SB-7 (1-3) also exhibited a TCLP lead concentration that exceeded the Tier 1, Class I GRO, and was above the pH-specific Tier 1 SRO. Aluminum, lead, and iron exceedances are further evaluated in Section 2.5.5 of this report.

For the groundwater samples collected, the concentration of the VOC, trichloroethene was above the Tier 1, Class I GRO in one monitoring well (MW-3). Based on the results of the October 31, 2017 groundwater sampling event, aluminum, iron, and/or manganese concentrations were above the Tier 1, Class I GROs in each of the monitoring wells; therefore, these constituents in groundwater are further addressed in Section 2.5. No groundwater samples exhibited volatile chemicals exceeding the Tier 1 GROs for the residential indoor inhalation exposure route.

1.6 Conclusion [740.425(b)(6)]

Terracon has conducted a site investigation of the remediation site known as the Limestone Building Property site, located at 200 West 1st Street, in Rock Falls, Whiteside County, Illinois. Terracon performed the investigation in accordance with the USEPA-approved Sampling and Analysis Work Plan, dated September 18, 2017. The site investigation data is sufficient to evaluate current conditions, develop ROs, and recommend future activities.

Chemical impact to soil identified at the remediation site consists of xylenes (total), benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene, carbazole, naphthalene, aluminum, iron, arsenic, lead, and mercury at reported concentrations above the Tier 1 SROs.

Chemical impact to groundwater identified at the remediation site consists of trichloroethene, aluminum, iron, and manganese at reported concentrations above the Tier 1 GROs for Class I groundwater.

2.0 REMEDIATION OBJECTIVES [740.445]

The proposed ROs for the soil ingestion and inhalation exposures routes are the Tier 1 residential SROs. The proposed ROs for the soil component of the Class I groundwater ingestion route, where the Tier 1 ROs were exceeded, are Tier 2 Site-Specific Objectives in accordance with the protocols set forth in 35 IAC Part 742.

This section presents information supporting the exclusion of the Groundwater Ingestion (including Soil Component), Soil Ingestion, and Inhalation exposure routes. A Remedial Action Plan for remaining COCs is included in Section 3.0.

2.1 Requirements for All Exposure Routes [742.305]

The following sections support the general requirements for pathway exclusion as defined by 35 IAC Section 742.305.

2.1.1 Soil Attenuation Capacity [742.305(a)]

As set forth in 35 IAC Section 742.305(a), the soil attenuation capacity is not exceeded if the sum of the organic contaminant residual concentrations, at each discrete sampling point, is less than the natural organic carbon fraction of the soil. Based on the f_{oc} values provided in Section 1.3.2, the most conservative f_{oc} values for surface and subsurface soils at the remediation site are 10,400 mg/kg (or 1.04 percent) and 1,200 mg/kg (or 0.12 percent), respectively.

Terracon substituted the laboratory reporting limit for non-detect values when calculating the sums of the organic residual concentrations. The sample with the highest concentration of organic chemicals was SB-6 (1-3), which had an organic chemical concentration of 429.28 mg/kg. The sums of the organic residual concentrations are below the f_{oc} value for surface soils. This requirement is met.

2.1.2 Soil Saturation Limit [742.305(b)]

As set forth in 35 IAC Section 742.305(b), for any organic contaminant that has a melting point below 30°C, the concentrations of any COCs remaining in soil shall not exceed the soil saturation limit (C_{sat}) values for the outdoor inhalation exposure route or the soil component of the groundwater ingestion exposure route as determined under 35 IAC Section 742.220. Values for C_{sat} are listed in 35 IAC Part 742, Appendix A, Table A.

No concentrations of organic contaminants in-place at the site have been detected which exceed the C_{sat} values listed in 35 IAC Part 742, Appendix A, Table A. This requirement is met.

2.1.3 Hazardous Waste Reactivity Characteristics [742.305(c)]

As set forth in 35 IAC Section 742.305(c), soil containing COCs shall not exhibit any of the characteristics of reactivity for hazardous waste as determined under 35 IAC Section 721.123. According to 35 IAC Section 721.123, solid waste that exhibits the characteristic of reactivity has the USEPA Hazardous Waste Number of D003 and/or has any of the following properties.

- It is normally unstable and readily undergoes violent change without detonating.
- It reacts violently with water.
- It forms potentially explosive mixtures with water.
- When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5 can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
- It is a forbidden explosive as defined in 49 Code of Federal Regulations (CFR) 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88, incorporated by reference in 35 IAC Section 720.111.

Based on field observations, site history, and results of the analyses conducted, the type and quantity of COCs present at the site do not constitute a hazardous waste as defined above relative to potential reactivity. Additionally, soil sample SB-7 (1-3') was analyzed for reactive sulfide and reactive cyanide, with no detections reported. This requirement is met.

2.1.4 pH of Soil [742.305(d)]

As set forth in 35 IAC Section 742.305(d), soil that contains COCs shall not exhibit a pH less than or equal to 2.0 or greater than or equal to 12.5. Each soil sample analyzed for pH at the site did not exhibit a pH less than or equal to 2.0 or greater than or equal to 12.5. This requirement is met.

2.1.5 Hazardous Waste Toxicity Characteristics [742.305(e)]

As set forth in 35 IAC Section 742.305(e), soil that contains arsenic, barium, cadmium, chromium, lead, mercury, selenium, or silver as COCs shall not exhibit the characteristics of toxicity for hazardous waste as determined by 35 IAC Section 721.124. Sample SB-7 (1-3') from the remediation site was analyzed for TCLP RCRA metals. The reported concentrations did not exceed those listed in 35 IAC Section 721.124. This requirement is met.

2.1.6 Polychlorinated Biphenyls [742.305(f)]

As set forth in 35 IAC Section 742.305(f), if the COCs include PCBs, then the concentration of any PCBs in the soil shall not exceed 50 mg/kg. The PCB values in the samples from SB-1 through SB-5 were below the laboratory reporting limits. This requirement is met.

2.1.7 Lower Explosive Limit [742.305(g)]

As set forth in 35 IAC Section 742.305(g), the concentration of any COC in soil gas shall not exceed 10% of its LEL as measured by a hand-held combustible gas indicator as calibrated to manufacturer specifications. A field LEL meter was used at each borehole and monitoring well and no detections were observed. This requirement is met.

2.2 Outdoor Inhalation Exposure Route [742.310]

2.2.1 Requirements of 742.300 and 742.305 [742.310(a)]

As indicated in Section 1.5 and Table 1-7, the site investigation data is sufficient to characterize the extent and concentrations of COCs at the remediation site. The requirements of 35 IAC Section 742.300 are met.

2.2.2 Engineered Barrier [742.310(b)]

No exceedances of the Tier 1 SROs for the outdoor inhalation exposure route for residential properties were identified at the remediation site, as shown in Table 1-7. Therefore, no engineered barriers are required to exclude the outdoor inhalation exposure route. Laboratory results for soil samples obtained at the remediation site are summarized in Tables 1 through 6.

2.2.3 Safety Precautions for Construction Workers [742.310(c)]

A Construction Worker Safety Plan is required to address construction worker exposure issues. The Safety Plan will remain in effect upon completion of site development for future construction activities, and will address the potential exposure issues related to inhalation of xylenes, naphthalene, and mercury.

Laboratory analysis reported no concentrations of analytes in soil that exceeded the construction worker inhalation Tier 1 SROs except for total xylenes in sample SB-8 (1-3), naphthalene in samples SB-6 (1-3), SB-8 (1-3) and SB-8DUP (1-3), and mercury in sample SB-7 (1-3).

Laboratory analytical data compared to construction worker inhalation exposure route ROs for soil results are summarized in Tables 1 through 3, and 6. Exhibit 8 depicts the estimated horizontal extent of impacts extending to the nearest sample meeting the Tier 1 SRO or property boundary. Impacts extend to approximately 5 to 9 feet bgs. A site-specific construction worker safety plan will be required for site work in the affected area.

2.2.4 Institutional Control [742.310(d)]

An institutional control stipulating that a site-specific construction worker safety plan be in effect during future work conducted in the affected area will be required.

2.3 Indoor Inhalation Exposure Route [742.312]

2.3.1 Contaminants of Concern – Volatile Chemicals [742.312(a)]

COCs at the remediation site include volatile chemicals, as defined in 35 IAC Section 742.200. Therefore, the requirements of 742.312(b) must be met.

2.3.2 Requirements of Indoor Inhalation Exclusion [742.312(b)]

The volatile chemical concentrations identified in site soils and groundwater require further evaluation of the indoor inhalation exposure route. The volatile chemicals detected in the soil and groundwater are summarized in Table 2-1.

Table 2-1 Volatile Chemical Evaluation

Volatile Chemical	Soil Sample Detections	Maximum Soil Concentration (mg/kg)	Groundwater Samples Analyzed	Maximum Groundwater Concentration (mg/L)	Indoor Vapor Intrusion Remediation Objective [1] (mg/L)
Acetone	3	0.12	All 5 existing monitoring wells	<0.020	1,000,000
Ethylbenzene	1	2.9	All 5 existing monitoring wells	<0.0050	0.37
Naphthalene	6	6.7	All 5 existing monitoring wells	<0.0010	0.075
Trichloroethene	1	0.0047	All 5 existing monitoring wells	0.0089	0.34
Xylenes (Total)	2	23	All 5 existing monitoring wells	<0.015	30
Mercury	13	0.23	All 5 existing monitoring wells	<0.0002	0.053

Notes:

1. Groundwater data compared to conservative Indoor Vapor Intrusion Remedial Objectives (Advection & Diffusion) from 35 IAC 742 Appendix B, Table H for Residential Properties.
2. Groundwater data is based on the October 31, 2017 groundwater sampling event.

The volatile chemicals acetone, ethylbenzene, and trichloroethene were detected in some of the soil samples at the site, but at concentrations below the Tier 1 SROs. Groundwater wells were placed throughout the remediation site to collect representative samples for analysis of volatile chemicals. The existing groundwater data were compared to the Tier 1 residential GROs for the indoor inhalation exposure route provided in 35 IAC Part 742, Appendix B, Table H. The Tier 1 ROs in Appendix B, Table H consider both diffusion and advection, and are the most stringent. The results indicated that groundwater samples did not exhibit Tier 1 GRO ingestion exceedances, except for trichloroethene, which was detected in a groundwater sample from monitoring well MW-3 but at a concentration below the Tier 1 GRO for the indoor inhalation exposure route. Based on this information, no further evaluation of these chemicals is required.

The total xylenes concentration in soil sample SB-8 (1-3) was above the Tier 1 SRO for the outdoor inhalation exposure route (construction worker). However, total xylenes were not detected in the groundwater wells on site which indicates compliance with the Tier 1 residential GRO for the indoor inhalation exposure route; therefore, no further evaluation of this COC is required.

Naphthalene and mercury were detected in several soil samples but the concentrations of these COCs only exceeded their respective Tier 1 SROs for the outdoor inhalation exposure route for construction worker populations. Based on the groundwater analytical results, there were no detections of naphthalene (October 5, 2017 sampling event) or mercury (October 31, 2017 sampling event) above the laboratory reporting limits in the groundwater monitoring wells; therefore, no further evaluation of these COCs is required.

2.3.3 Building Control Technology [742.312 (b)(1)(A),(B),and(C)]

No exceedances of the residential indoor inhalation exposure route were identified at the remediation site. Therefore, no building control technologies are planned to address this exposure route.

2.3.4 Requirements of 742.300 and 742.305 [742.312(b)(2)]

As indicated in Section 1.5 and Table 1-7, the site investigation data is sufficient to characterize the extent and concentrations of COCs at the remediation site. The requirements of 35 IAC Section 742.300 are met. Section 2.1 shows that the requirements of 742.305 have been met.

2.3.5 Institutional Control [742.312(b)(3)]

Tier 1 groundwater ROs for the indoor inhalation exposure route were relied on to assess the potential for impact of volatile chemicals at the site. No exceedances of these Tier 1 ROs were identified. Use of the Tier 1 ROs requires an institutional control for any future enclosed structures or buildings to have full concrete slabs and no sump pits that could allow sub-slab vapors to enter occupied space.

2.4 Soil Ingestion Exposure Route [742.315]

2.4.1 Requirements of 742.300 and 742.305 [742.315(a)]

As indicated in Section 1.5 and Table 1-7, the site investigation data is sufficient to characterize the extent and concentrations of COCs at the remediation site. The requirements

of 35 IAC Section 742.300 are met. Section 2.1 shows that the requirements of 742.305 have been met.

The site is currently vacant land. Based on the current redevelopment plan for a public greenspace, office, or commercial facility, the RA proposes to install engineered barriers meeting the requirements of 35 IAC 742 Subpart K to exclude the areas exceeding the Tier 1 SROs for the soil ingestion exposure route.

2.4.2 Engineered Barrier [742.315(b)]

As identified in Table 1-7, COCs exceeding the Tier 1 SROs for the soil ingestion exposure route for residential properties are PNAs, arsenic, and lead. The soil analytical results are summarized in Tables 1 through 6. The approximate extents of PNAs and metals (arsenic and lead) above the Tier 1 residential SROs for the soil ingestion exposure route are depicted on Exhibits 6 and 7, respectively. Impacts exceeding the Tier 1 SROs for the soil ingestion exposure route for residential properties extend to approximately 13 feet bgs based on site data.

The site is currently vacant land. Based on the current redevelopment plan for a public greenspace, office, or commercial facility, the RA proposes to install engineered barriers meeting the requirements of 35 IAC 742 Subpart K to exclude the areas exceeding the Tier 1 SROs for the soil ingestion exposure route.

2.4.3 Safety Precautions for Construction Workers [742.315(c)]

No exceedances of the construction worker soil ingestion exposure route were identified at the remediation site, as shown in Table 1-7.

2.4.4 Institutional Control [742.315(d)]

Institutional controls will be required to ensure that the engineered barriers are maintained in accordance with the eventual NFR letter and the City of Rock Falls ordinance regarding the groundwater usage at the site.

2.5 Groundwater Ingestion Exposure Route [742.320]

2.5.1 Requirements of 742.300 and 742.305 [742.320(a)]

As indicated in Section 1.5 and Table 1-7, the site investigation data is sufficient to characterize the extent and concentrations of COCs at the remediation site. The requirements

of 35 IAC Section 742.300 are met. Section 2.1 shows that the requirements of 742.305 have been met. Groundwater analytical data is summarized in Tables 7 through 10.

2.5.2 Free Product [742.320(b)]

Terracon did not observe free-phase liquids on or in groundwater nor in soil/fill matrices during exploration.

2.5.3 Setback Zones and Recharge Areas [742.320(c)]

As set forth in 35 IAC Section 742.320(c), COC sources must not be located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable water supply well. Section 1.2.3 describes the potable water supply and well survey. Based on the results of the survey, contaminant sources are not located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable water supply well.

2.5.4 Ordinance [742.320(d)]

As set forth in 35 IAC Section 742.320(d), an ordinance adopted by the City of Rock Falls prohibiting the installation and use of potable water supply wells is in place throughout the city. As described in Section 1.2.3, the City has established ordinance number 2011-2454, which prohibits the installation of potable wells within the municipal limits. A certified copy of this ordinance is attached in Appendix F. The ordinance has been reviewed and accepted by the IEPA, and is sufficient to support the requirement for a local ordinance.

Exhibits 11 and 12 depict the measured and modeled extent of groundwater impact, based on the results of the following section. During the Remedial Action Completion Report, the offsite owners of properties under which groundwater is or could be located above the applicable GROs will be identified and notified. Future owners or successors in interest of the remediation site must monitor City activities relative to variance requests or changes in the ordinance relative to the use of potable groundwater at the properties shown on Exhibits 11 and 12. Future owners or successors in interest of the remediation site must notify the IEPA of any approved variance requests or ordinance changes within 30 days after the date such action has been approved.

Appendix H contains a copy of a proposed letter to be sent to the identified property owners.

2.5.5 Protection of Setback Zones and Recharge Areas [742.320(e)]

As set forth in 35 IAC Section 742.320(e), the concentration of any COC in groundwater within the minimum or designated maximum setback zone of an existing potable water supply well will meet the applicable Tier 1 GRO. A search of the ISGS water well database revealed no setback zones. This requirement is satisfied.

Table 1-7 summarizes the compounds that were detected at levels in soil that exceeded the soil component of the Tier 1, Class I groundwater ingestion route SROs or in groundwater above the Tier 1, Class I GROs.

The following table illustrates the potential concern to groundwater.

Table 2-2 Compounds of Potential Concern to Groundwater

Compound	Media	Location(s)/Sample(s)
Trichloroethene	Groundwater	MW-3
Benzo(a)anthracene	Soil	SB-1 (5-7), SB-5 (1-3), SB-6 (1-3), SB-7 (1-3), SB-8 (1-3), SB-8DUP (1-3)
Benzo(a)pyrene	Soil	SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)
Benzo(b)fluoranthene	Soil	SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)
Carbazole	Soil	SB-5 (1-3)
Dibenzo(a,h)anthracene	Soil	SB-6 (1-3), SB-8 (1-3), SB-8DUP (1-3)
Indeno(1,2,3-c,d)pyrene	Soil	SB-6 (1-3)
Aluminum	Soil	SB-4 (6-8) SPLP
	Groundwater	MW-2, MW-3, MW-5
Lead	Soil	SB-6 (1-3), SB-7 (1-3), SB-8DUP (1-3)
Manganese	Groundwater	MW-1, MW-2, MW-4, MW-5
Iron	Soil	SB-4 (6-8) SPLP
	Groundwater	MW-3

For each of the chemicals in Table 2-1, Terracon used TACO Equations as provided in 35 IAC Part 742, Appendix C, Tables A and C to evaluate the potential for future transport of contaminants.

For soil, equation S17 was used to predict a groundwater concentration resulting from soil impact above the Tier 1 SROs. This equation is used in the SSL model to calculate a soil

concentration at the source that will not leach to groundwater above a level protective of groundwater ingestion. For the purpose of this evaluation, the SSL model was also used to predict a groundwater concentration based on the maximum soil/fill concentration measured for each sample. Modifications consisted of the rearrangement of the equation terms to solve for a groundwater concentration that could leach from the soil.

Equation S17 was used to calculate the ROs assuming an infinite source of contamination. Table 2-2 summarizes the inputs for the calculations. Note that the average hydraulic conductivity (K) value of 5.25 x 10^{-3} cm/sec was utilized in the Tier 2 calculations, instead of the geometric mean K of 2.51 x 10^{-3} cm/sec, since the average K value is higher than the geometric mean K value and is, therefore, more conservative. Printouts of the S17 results are attached in Appendix G.

Table 2-3 Modeling Input Parameters: S17

Parameter	Value
ρ_b (Dry Soil Bulk Density) - TACO Default	1.5 g/cm^3
θ_a (Air-Filled Soil Porosity) - TACO Defaults	Subsurface - 0.13 cm^3_{air}/cm^3_{soil}
θ_w (Water-Filled Soil Porosity) - TACO Defaults	Subsurface - 0.3 cm^3_{air}/cm^3_{soil}
DF (Dilution Factor) - TACO Default	20
f_{oc} (Organic Carbon Content of Soil) – Most Conservative Site-Specific Values for Subsurface	Subsurface (below 1 meter) - 0.0012
K (Aquifer Hydraulic Conductivity) – Measured	Average Slug Test: 1655.64 m/yr (5.25x10^{-3} cm/sec)
i (Hydraulic Gradient) – Measured	Based on measurements in all five monitoring wells (October 31, 2017 gauging event): 0.007014 m/m (gradient calculation included in Appendix G)
L (Source Length Parallel to Groundwater Flow Direction in Horizontal Plane) - Site-Specific	Northeast corner of site à southwest corner of site: 355 feet (108.204 m) (Most conservative source length)
d (Mixing Zone Depth) – TACO Default	2 m
I (Infiltration Rate) – TACO Default	0.3 m/yr
K_{oc} (Organic Carbon Partition Coefficient) - Chemical-Specific	35 IAC Section 742, Appendix C, Table E in L/kg
H' (Dimensionless Henry's Law Constant) - Chemical-Specific	35 IAC Section 742, Appendix C, Table E

Parameter	Value
K_d (Soil-Water Partition Coefficient) – Calculated ($K_d = K_{oc} * f_{oc}$); Chemical-Specific for Inorganics	35 IAC Section 742, Appendix C, Table J in cm^3_{water}/g_{soil} for Inorganics; Benzo(a)anthracene: K_d = 480 cm^3_{water}/g_{soil} Benzo(a)pyrene: K_d = 948 cm^3_{water}/g_{soil} Benzo(b)fluoranthene: K_d = 1,260 cm^3_{water}/g_{soil} Dibenzo(a,h)anthracene:K_d=3,000cm^3_{water}/g_{soil} Indeno (1,2,3-c,d)pyrene = 3,720 cm^3_{water}/g_{soil} Carbazole: K_d = 4.068 cm^3_{water}/g_{soil} Lead: K_d = 710 cm^3_{water}/g_{soil}

Table 2-3 summarizes the results of the S17 calculations and the Tier 2 SROs.

Table 2-4 Calculation Results: S17

Chemical	Maximum Site Soil Concentration Identified (mg/kg)	Tier 2 Soil Remediation Objective (mg/kg)
Benzo(a)anthracene	**2.1**	1.2
Benzo(a)pyrene	**33**	3.8
Benzo(b)fluoranthene	**28**	4.5
Carbazole	**0.88**	0.34
Dibenzo(a,h)anthracene	10	18
Indeno(1,2,3-c,d)pyrene	19	32
Lead	**630**	106.5

Results from equation S17 produced Tier 2 SRO results greater than observed soil concentrations for dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene. Therefore, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene are eliminated as COCs for the soil samples identified in Table 2-1. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, and lead still exceed the TACO Tier 2 SROs for the soil component to Class I groundwater ingestion exposure route. Further Tier 2 analysis was conducted for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and lead to determine the distance to compliance with the Tier 1, Class I GROs using equation R26. Further Tier 2 evaluation was not conducted for carbazole, since a Tier 1, Class I GRO is not available in TACO for this chemical. It should be noted that the carbazole concentration in the SB-5 (1-3) sample only exceeded the Tier 1 RO for the soil component of the groundwater ingestion exposure route. As detailed in Section 3.0, groundwater exposure will be prevented by the City of Rock Fall's groundwater ordinance, preventing potable use of groundwater within the city limits of the City of Rock Falls.

Equation R26 was used to predict the transport of the actual and predicted groundwater concentrations. Table 2-4 summarizes the inputs for the calculations. For benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene, the S17 equation calculated the predicted groundwater concentration of the chemical still exceeding the Tier 2 SRO as a concentration in mg/L. Groundwater concentrations or TCLP and/or SPLP values of aluminum, iron, manganese and/or lead, were used as the source concentrations in equation R26 to determine the modeled extents of these COCs to their compliance point. Printouts of the S17 and R26 results are provided in Appendix G.

Table 2-5 Modeling Input Parameters: R26

Parameter	Value
θ_{as} (Volumetric Air Content in Vadose Zone Soils) - TACO Defaults	Surface - 0.28 cm^3_{air}/cm^3_{soil} Subsurface - 0.13 cm^3_{air}/cm^3_{soil}
θ_{ws} (Volumetric Water Content in Vadose Zone Soils) - TACO Defaults	Surface - 0.15 cm^3_{air}/cm^3_{soil} Subsurface - 0.3 cm^3_{air}/cm^3_{soil}
K (Aquifer Hydraulic Conductivity) – Measured	Average Slug Test: 1655.64 m/yr ($5.25x10^{-3}$ cm/sec)
i (Hydraulic Gradient) – Measured	Based on measurements in all five monitoring wells (October 31, 2017 gauging event): 0.007014 m/m (gradient calculation included in Appendix G)
S_w (Source Width Perpendicular to Groundwater Flow Direction in Horizontal Plane) - Chemical-Specific	Distance between north and south property boundaries (160 feet) running through approximately SB-6 and SB-8 (in centimeters); see Exhibits for soil boring locations.
S_d (Source Width Perpendicular to Groundwater Flow Direction in Vertical Plane) - TACO Default for Soil; Site-Specific for Groundwater	For Soil – 200 cm (6.56166 feet) For Groundwater - 305 cm (10 feet) 35 IAC Section 742, Appendix C, Table D in cm
λ (First Order Degradation Constant) - Chemical-Specific	35 IAC Section 742, Appendix C, Table E in day^{-1}, Zero for inorganics

Table 2-5 summarizes the results of the calculations. Since the direction of groundwater flow is generally to the southwest, the modeled extent for each chemical is shown emanating to the southwest from each boring/monitoring well location on Exhibits 11 and 12. According to the Tier 2 calculations, COCs have the potential to migrate off site.

Table 2-6 Calculation Results: R26

Chemical	Sample Location	Maximum Distance Required to Reach Tier 1 GRO
Trichloroethene	MW-3	107 feet
Benzo(a)anthracene	SB-1 (5-7)	67 feet
	SB-5 (1-3)	123 feet
	SB-6 (1-3)	400 feet
	SB-7 (1-3)	93 feet
	SB-8 (1-3)	290 feet
	SB-8DUP (1-3)	376 feet
Benzo(a)pyrene	SB-6 (1-3)	220 feet
	SB-8 (1-3)	135 feet
	SB-8DUP (1-3)	201 feet
Benzo(b)fluoranthene	SB-6 (1-3)	188 feet
	SB-8 (1-3)	113 feet
	SB-8DUP (1-3)	189 feet
Aluminum	SB-4 (6-8) SPLP	62 feet
	MW-2	76 feet
	MW-3	137 feet
	MW-5	46 feet
Lead	SB-6 (1-3) TCLP	767 feet
	SB-7 (1-3) TCLP	315 feet
	SB-8DUP (1-3) SPLP	42 feet
Iron	SB-4 (6-8) SPLP	32 feet
	MW-3	74 feet
Manganese	MW-1	275 feet
	MW-2	161 feet
	MW-4	249 feet
	MW-5	188 feet

As described in Section 1.2.3, the closest potentially active well is located approximately 263 feet northeast of the remediation site, but it is hydraulically upgradient from the site and it is an engineering test well. There is no setback zone for this well. As shown in Table 2-5, the greatest distance required to meet a GRO is approximately 767 feet downgradient from the site. Property owners within the modeled area will be notified of potential impact. A proposed draft notification letter is included in Appendix H.

2.5.6 Protection of Surface Water [742.320(f)]

As set forth in 35 IAC 742.320(f), the concentration of any compound in groundwater discharging into a surface water will meet the applicable surface water quality standard under 35 IAC 302 *Water Quality Standards*. As described in Section 1.2.3, the nearest surface water is the Rock River, which is approximately 120 feet northwest of the remediation site, but the calculated groundwater direction based on the groundwater levels measured in monitoring wells on October 5 and 31, 2017 is to the southwest. Therefore, no surface water exceedances are of concern.

2.6 Tier 2 Soil Component of Class I Groundwater Ingestion Exposure Route [742.305]

Tier 2 SROs were developed for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and lead using equation S17. Refer to Section 2.5.5 of this report for details regarding the Tier 2 evaluation of the soil component to Class I groundwater ingestion exposure route.

2.7 Conclusion

This section presented information supporting the exclusion of the Groundwater Ingestion (including Soil Component), Soil Ingestion, and Inhalation exposure routes. The site was evaluated based on the potential for future use as a greenspace, office, or commercial facility. Based on the evaluations included in this section, some institutional controls (e.g., a Construction Worker Safety Plan, future structures or buildings will have full concrete slabs and no sump pits), an engineered barrier, use of the City of Rock Falls groundwater ordinance, and notifications to potentially affected property owners will be required to exclude the exposure routes. As a result, a RAP is included in Section 3.0.

3.0 REMEDIAL ACTION PLAN [740.450]

3.1 Executive Summary [740.450(a)]

This section describes the various elements of the proposed RAP and how these elements will satisfy the remedial objectives under TACO. The RAP for the site will include several elements that will work together to satisfy the remedial requirements of the site in conformance with the site remediation protocols of the TACO requirements.

The goals of the remedial actions are to eliminate human exposure to the COCs at the site. The RAP is based on requirements to obtain a comprehensive NFR letter so that redevelopment of the site is not unduly constrained. Site development plans are not finalized, but future use of the site is planned for use as greenspace, office, or commercial facility.

3.1.1 Major Components [740.450(a)(1)]

Soil with concentrations exceeding the residential soil ingestion exposure route will be excluded through use of engineered barriers. Excavation necessary to complete site redevelopment, including the installation of engineered barriers, will require waste characterization for proper disposal of the spoils to be generated.

Engineered Barriers

To exclude the soil ingestion exposure route in areas planned for landscaping, soil will be excavated to a minimum depth of three feet below final grade and disposed at a licensed Subtitle D landfill. The landscaped engineered barrier areas will be backfilled with approved clean fill under environmental professional oversight. The clean soil to be utilized will have previously been sampled at a rate of 1 sample per 1,000 cubic yards and analyzed for the TCL, pH, SPLP RCRA metals, and total petroleum hydrocarbons. In order to be classified as clean for this remediation site, the analytical results must show that the reported concentrations are below the Tier 1 SROs for residential land use. The ingestion exposure route in other areas of the site will be excluded with construction of engineered barriers in the form of concrete structures, concrete foundations, concrete pavements, and asphalt pavements meeting the requirements of 35 IAC 742 Subpart K. The areas of the remediation site where an engineered barrier is required are depicted on Exhibit 13.

Construction Worker Notification

Concentrations of COCs exceeding construction worker ROs were noted at selected locations. These will be addressed through notification of the applicable contractors. A Health and Safety Plan will be prepared and implemented prior to excavation in areas where construction worker RO exceedances were noted. The areas requiring a construction worker notification are depicted in Exhibit 8.

Monitoring Wells

After the remediation activities are completed and remaining monitoring wells at the remediation site are no longer needed, they will be sealed in accordance with Illinois Department of Health regulations at 77 IAC Part 920.

3.2 Remediation Objectives [740.450(b)]

The ROs for the site are outlined in the ROR discussed in Section 2.0 of this report. The use of engineered barriers and institutional controls will be implemented to address the residential soil and groundwater ROs at the remediation site.

3.3 Remediation Technologies Selected [740.450(c)]

Based on the use of an engineered barrier, construction worker caution notification, and groundwater use restriction, active remediation is not proposed at this time.

3.4 Engineered Barriers Institutional Controls, and Groundwater Monitoring [740.450(f)]

The evaluation relies on preventing exposure to the site soil through use of engineered barriers. Groundwater exposure will be prevented by the City of Rock Fall's groundwater ordinance, preventing potable use of groundwater within the city limits of the City of Rock Falls. The potential leached contamination has been shown to have the potential to migrate off site. Property owners within the modeled area will be notified of potential impact. The proposed notification letter is included in Appendix H. Attached Exhibits 11 and 12 depict the potential extent of contamination.

3.4.1 Current and Post-Remediation Land Use [740.450(e)]

Currently the property is vacant land. The planned post-remediation use of the property will be a public greenspace, office, or commercial facility.

3.4.2 Other Requirements [740.450(f)]

Engineered Barriers

Engineered barriers will be required for the site for soils exceeding Tier 1 SROs for the soil ingestion exposure route, as depicted in Exhibit 13. These will be incorporated into the final development of the remediation site. The final development plans will incorporate three feet of approved clean fill, concrete structures, and concrete or asphalt pavements over the areas of the remediation site requiring engineered barriers.

Institutional Controls

The City's groundwater use ordinance will be an institutional control for the remediation site. Future construction work will require a Safety Plan for construction worker precaution. Maintenance requirements for the engineered barriers are required to meet the proposed ROs. The RA anticipates that the Draft and Final NFR letters for the site will incorporate these controls.

3.5 Remedial Action Plan Summary

- Site Investigation Summary – There is no defined redevelopment plan at this time, but it is assumed that the vacant site may be redeveloped into a public greenspace, office, and/or commercial property. Soil samples collected in some areas of the site were found to exceed Tier 1 SROs for the soil ingestion, construction worker, and/or soil component to groundwater exposure routes. Groundwater exceeded Class I GROs for direct ingestion.

- Construction Worker Safety – Work activities will require notification of Construction Workers of the COCs and implementation of safety measures, including appropriate level of personal protective equipment and monitoring.

- Engineered Barriers – To exclude the soil ingestion exposure route in impacted areas, engineered barriers meeting the requirements of 35 IAC 742 Subpart K will be installed.

- Groundwater & Off-Site Notification – Groundwater exceeding GROs for Class I groundwater, and soil exceeding the soil component to Class I groundwater SROs were identified on site. The groundwater ingestion exposure route will be excluded through use of the City of Rock Fall's ordinance prohibiting the use of potable water wells. Groundwater modeling was conducted to determine the potential of off-site contaminant migration until Class I GRO compliance is achieved, as depicted in Exhibits 11 and 12. Property owners within the potential migration distance will be notified.

- Institutional controls – Institutional controls will be required for the remediation site. Future construction work will require a Safety Plan for construction worker precaution. Maintenance requirements for the engineered barriers will be required. Use of the City's ordinance prohibiting potable use of groundwater will be required.