

SUBJECT

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
101 Oak Street
Milford, Michigan
EGLE Facility ID No. 6300095

TO

Brandon Alger
Michigan Department of Environment,
Great Lakes, and Energy

DATE

June 28, 2023

PROJECT NUMBER

30136112

DEPARTMENT

Environment

FROM

John McInnis
248-994-2285/john.mcinnis@arcadis.com

Overview

On behalf of ZF Active Safety US Inc., Arcadis of Michigan, LLC (Arcadis) has prepared this Technical Memo to summarize the activities conducted for the abandonment of compromised well OW-16D2 (Compromised Well) in accordance with the Compromised Well OW-16D2 Abandonment Work Plan dated May 8, 2023 (Work Plan). The Compromised Well was located at the Central Park Playground at 159 Main Street in Milford, Michigan. The location is shown on **Figure 1**.

Pursuant to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Second Modification of the Administrative Order for Response Activity for Former Kelsey-Hayes Company, 101 Oak Street, Milford, Oakland County, Michigan, EGLE Docket No. AORRD-22-001, dated April 20, 2023, EGLE determined that the Compromised Well was no longer an effective monitoring well and should be removed from the ground.

The Work Plan identified several complicating factors associated with attempting to remove the Compromised Well, including its age (25 years), galvanized steel materials, and deteriorated condition, as well as the fact that it was installed with hollow-stem augers in an area of challenging lithology that is likely to have resulted in auger "deflection." As noted in the Work Plan, wells that are not perfectly plumb could result in an unsuccessful removal. Therefore, the Compromised Well casing was pre-grouted prior to the removal attempt. A copy of the Compromised Well log is included in **Attachment 1**.

The Compromised Well abandonment was performed under the oversight of Arcadis and EGLE. Prior to abandonment, a down-hole camera survey of the Compromised Well was conducted. Cascade Drilling of Flint, Michigan (Cascade) performed the abandonment of the Compromised Well. Arcadis performed the camera survey and completed the abandonment documentation.

Compromised Well Camera Survey

The down-hole camera survey was completed to collect additional visual documentation of the condition of the Compromised Well immediately prior to the abandonment. The camera survey was conducted with a Laval SC-350 camera system, which was equipped with an SC-166 water well camera. The camera was lowered into the Compromised Well and the entire length of its casing and screen was recorded. Still images from the video are included in **Attachment 2**. Starting above the screen at approximately 94 feet below ground surface (bgs), the casing exhibits discoloration to approximately 96 feet bgs (Photos 3 and 4) and apparent corrosion at the joint where the casing connects to the screen (Photo 5). The inside of the screen (Photos 6 through 10) shows

evidence of material build-up. An irregular pattern of material accumulation can also be seen at the bottom of the Compromised Well in Photo 10. Significant turbidity was observed on the video when raising and lowering the camera within the screen.

Compromised Well Abandonment

The Compromised Well abandonment work occurred May 30 through June 1, 2023, in accordance with ASTM International Standard D5299/D5299M-18. Brandon Alger (EGLE) and Jason Armstrong (WSP USA for the Village of Milford) were in attendance onsite during the abandonment. Arcadis personnel provided oversight and documentation of the abandonment process performed by Cascade. Photo documentation of the abandonment process is included in **Attachment 3**.

As described in the Work Plan, there was a potential for the Compromised Well to be cut during over drilling by the sonic tooling or to be sheared off when the drill rig pulled on it. Therefore, the casing and screen were first filled with bentonite grout (i.e., pre-grouted) before attempting to remove the Compromised Well. Prior to introducing the grout, Cascade pumped the Compromised Well dry. Approximately 15 gallons of water were removed and stored in a 55-gallon drum. Subsequently, only a small amount of water was pushed out of the Compromised Well during the grouting process.

Cascade removed the concrete pad and aboveground protective casing cover and then removed the first 2.5 feet of the casing (consisting of 2-inch galvanized steel). Cascade then over drilled the 2-inch casing with an 8-inch drill casing to the final depth of 100 feet bgs. An initial check for the top of the casing using a “bottle gauge” (a 1-gallon water jug fastened to a tremie pipe) indicated that the upper portion of the casing disconnected from the Compromised Well at approximately 32 feet bgs. A borehole survey with the camera system could not confirm the top of casing because the water was too cloudy. However, the camera could not be lowered beyond 52 feet, where it was stopped at an obstacle. A plan was formulated onsite to acquire additional new galvanized steel pipe and fittings that would be used to attempt to retrieve the casing.

On May 31, 2023, Cascade, EGLE, and Arcadis returned to the site to complete the abandonment process.

A camera survey confirmed the top of the casing at 65 feet bgs (Photos 11 and 12 in **Attachment 2**). Cascade used new pipe with a threaded coupling to attempt to connect to the top of the casing. After lowering the additional new pipe into the hole and carefully attempting to thread onto the casing, the driller pulled on the pipe to lift the Compromised Well out of the borehole, but the threaded pipe disconnected and the Compromised Well remained in the ground.

After discussion onsite with Mr. Alger, it was agreed that a reasonable attempt was made to remove the Compromised Well in accordance with the Work Plan, and additional attempts were not likely to be successful.

As a result, Mr. Alger agreed that the Compromised Well could be abandoned in place by filling the borehole with bentonite grout in accordance with the Work Plan. After this determination, Cascade filled the 8-inch sonic casing in place from the bottom of the Compromised Well up with a bentonite slurry grout mix via tremie pipe to 63 inches bgs and let the grout cure overnight. On June 1, 2023, the grout had settled to 112 inches bgs. Cascade added four bags of bentonite chips to fill the borehole to approximately 70 inches bgs. The remaining space was filled with topsoil. Cascade then spread grass seed on the location (Photo 13 in **Attachment 3**).

Brandon Alger
Michigan Department of Environment, Great Lakes, and Energy
June 28, 2023

On June 13, 2023, Arcadis returned to the location of the former Compromised Well to inspect ground conditions. Photo 14 in **Attachment 3** shows no further settling occurred at the location and that grass is covering the site where the pad had been. The abandonment of the Compromised Well has been completed in accordance with the Work Plan. The Cascade well abandonment log is included in **Attachment 4**.

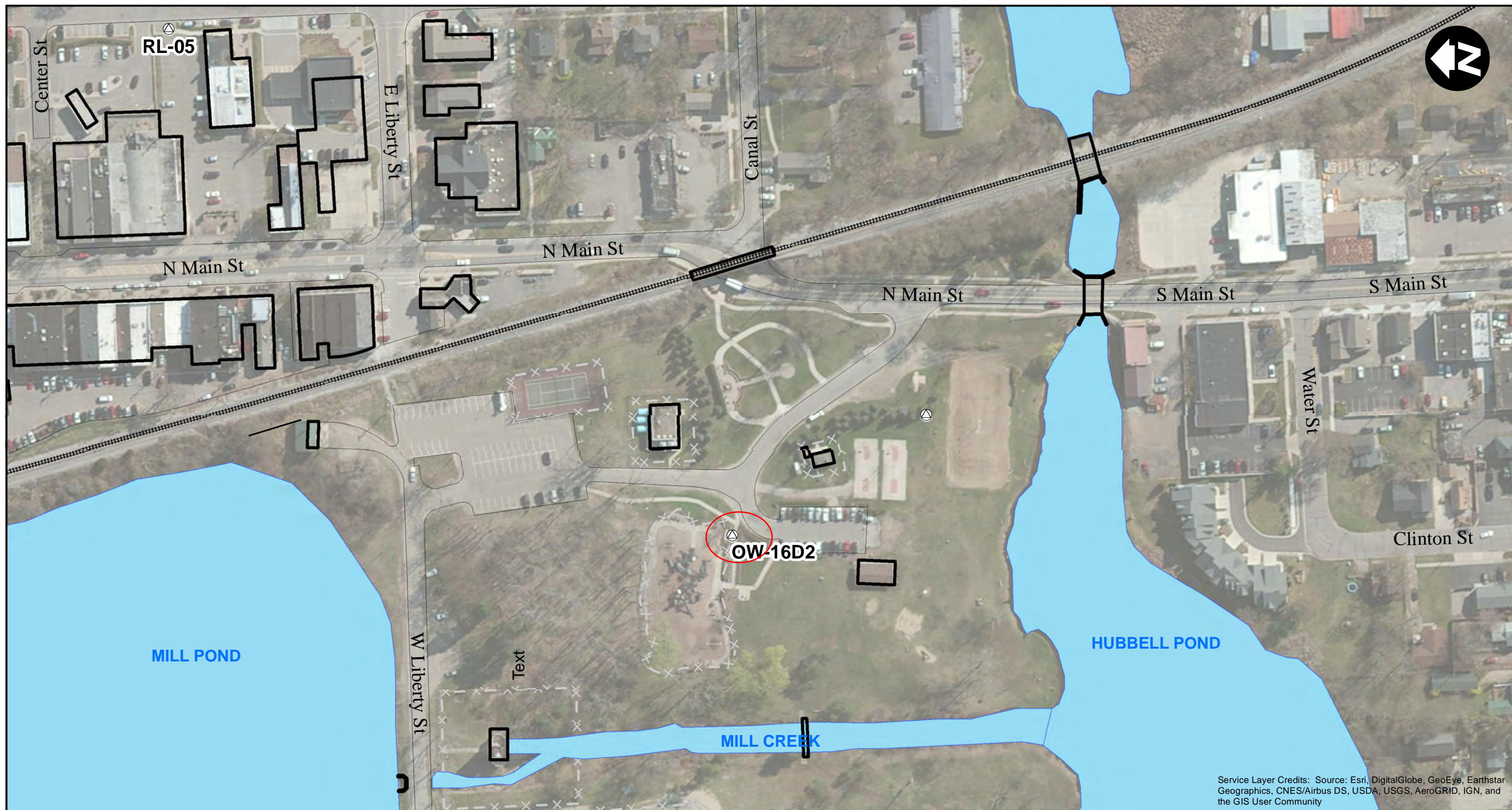
Enc. **Figure**
1 Site Layout – OW-16D2 Location

Attachments

- 1 OW-16D2 – Well Log
- 2 OW-16D2 – Well Video Survey Photograph Log
- 3 OW-16D2 – Well Abandonment Photograph Log
- 4 OW-16D2 – Well Abandonment Log







Figure 1

Site Layout – OW-16D2 Location



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

-  MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY MONITORING WELL
-  MONITORING/OBSERVATION WELL
-  ABANDONED OBSERVATION WELL
-  PUMPING WELL
-  RAILROAD TRACK
-  FENCE LINE

FORMER KELSEY-HAYES PLANT
MILFORD, MICHIGAN

COMPROMISED WELL OW-16D2 LOCATION



FIGURE

1



Attachment 1

OW-16D2 – Well Log

Techna Corporation Plymouth, Michigan			Log of Monitoring Well OW16D/D2		
PROJECT: <i>Former Lucas Varity Milford Facility</i>			LOCATION: <i>101 Oak St., Milford, MI/Village of Milford Park</i>		
PROJECT NO.: <i>A35T0-213-C02</i>			SURFACE ELEVATION:		
DATE START/FINISH: <i>11/19/97 - 12/18/97</i>			INITIAL H2O LEVEL: <i>8 Feet BGL</i>		
DRILLING METHOD: <i>4.25 inch ID Hollow Stem Auger</i>			STATIC H2O ELEV.:		
SAMPLING METHOD: <i>Screened Auger/Temporary well</i>			TOTAL DEPTH: <i>129.5 Feet</i>		
DRILLING COMPANY: <i>Carlo Environmental/Stearns Drilling</i>			LOGGED BY: <i>(124)</i>		

DEPTH feet	LAB SAMPLE NO.	BLOWS/0.5 ft.	PID (relative ppm)		GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
			VALUES	PROFILE				
			0	200		PT	PEAT	
5						SM	SAND: fine to coarse, some silt and organic material, little clay, trace gravel, moist, dark brown to black brown in cuttings. saturated 8' BGL. dark brown to light brown 10' BGL Screened auger sample from 10'-15' BGL: low water yield.	
10	OW16D-1							
15								
20	OW16D-2						SAND-SILT: fine to coarse sand, some silt, saturated, brown in cuttings.	
25								
30	OW16D-3						Screened auger sample from 30'-35' BGL: fair water yield.	
35								

Techna Corporation
Plymouth, Michigan

Log of Monitoring Well OW16D/D2

PROJECT: Former Lucas Varsity Milford Facility

LOCATION: 101 Oak St., Milford, MI/Village of Milford Park

DEPTH feet	LAB SAMPLE NO.	BLOWS/0.5 ft.	PID (relative ppm)		GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
			VALUES	PROFILE				
			0	200		SM		
40	OW16D-4					SP	SAND: coarse, some gravel, saturated, brown in cuttings. Screened auger sample from 40'-45' BGL: good water yield.	
45								
50	OW16D-5						Screened auger sample from 50'-55' BGL: very good water yield.	
55								
60	OW16D-6						Screened auger sample from 60'-65' BGL: good water yield.	
65								
70	OW16D-7						Screened auger sample from 70'-75' BGL: fair water yield.	
75								

2" dia. Galvanized Steel Casing

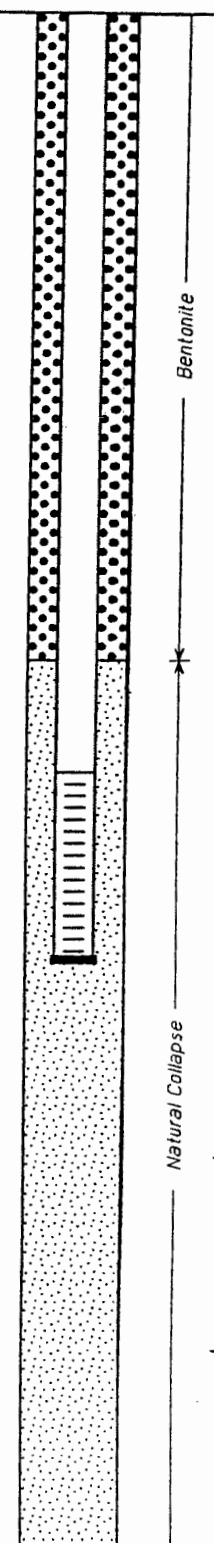
Bentonite

Techna Corporation
Plymouth, Michigan

Log of Monitoring Well OW16D/D2

PROJECT: Former Lucas Varsity Milford Facility

LOCATION: 101 Oak St., Milford, MI/Village of Milford Park


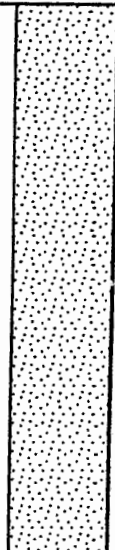

DEPTH feet	LAB SAMPLE NO.	BLOWS/0.5 ft.	PID (relative ppm)		GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
			VALUES	PROFILE				
			0	200				
80	OW16D-8					GP	<p>SAND-GRAVEL; saturated. Logged from cuttings and drilling indications.</p> <p>Screened auger sample from 80'-85' BGL: good water yield.</p>	 <p>2" dia. Galvanized Steel Casing</p> <p>0.010" Slot Galvanized Steel Screen</p> <p>Bentonite</p> <p>Natural Collapse</p>
85							<p>Screned auger sample from 90'-95' BGL: excellent water yield.</p>	
90	OW16D-9						<p>Screned auger sample from 100'-105' BGL: fair water yield (OW16D-10), Temporary well sample from 100'-105' BGL: excellent water yield (OW16D2-10).</p>	
100	OW16D-10 OW16D2-10						<p>Temporary well sample from 110'-115' BGL: excellent water yield.</p>	
110	OW16D2-11							
115								

Techna Corporation
Plymouth, Michigan

Log of Monitoring Well OW16D/D2

PROJECT: Former Lucas Varity Milford Facility

LOCATION: 101 Oak St., Milford, MI/Village of Milford Park

DEPTH feet	LAB SAMPLE NO.	BLOWS/0.5 ft.	PID (relative ppm)		GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
			VALUES	PROFILE				
			0	200				
120	OW16D2-2					GP	Temporary well sample from 120'-125' BGL: excellent water yield.	
125						CL	Cobbles CLAY: some silt, trace sand and gravel, medium plasticity, hard, moist, gray brown.	
30	OW16D2-S1						END OF BORING	
35							Note: Auger failure during screened-auger vertical profiling activities at OW16D. Approximately 95' of auger remain down hole estimated from 15' to 110' BGL. Offset 21' to east of OW16D to complete vertical profiling activities at OW16D2 using temporary well sampling methods.	
40								
45								
50								
55								

Attachment 2

OW-16D2 – Well Video Survey Photograph Log

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 1

Description:

OW-16D2 – Well
Survey; Casing
Threads at 42 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023



Photograph: 2

Description:

OW-16D2 – Well
Survey; Casing
Threads at 78.5 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 3

Description:

OW-16D2 – Well
Survey; Casing
Discoloration at
94 feet.

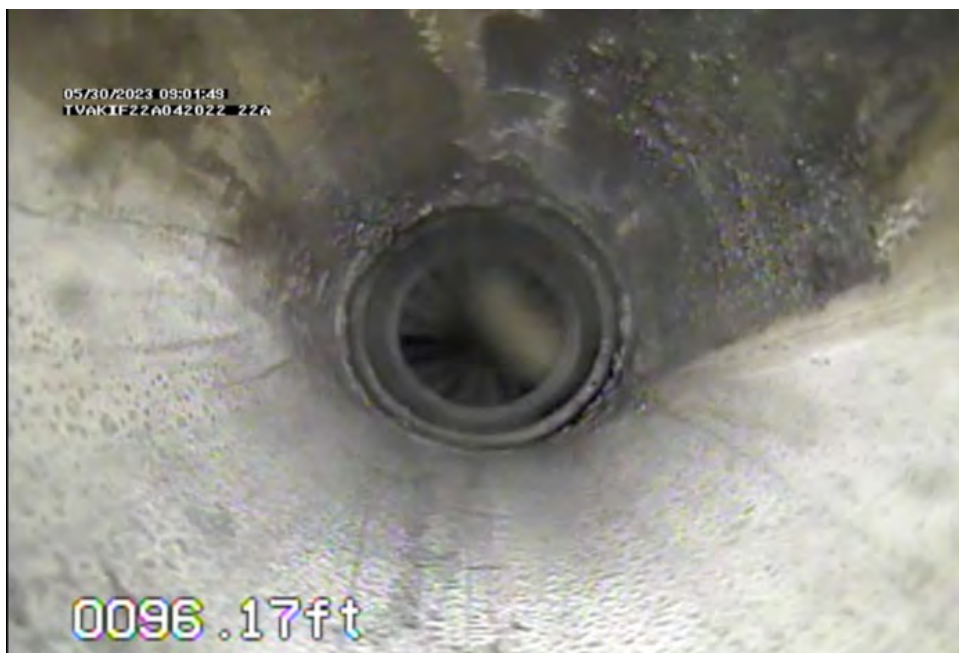
Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023



Photograph: 4

Description:

OW-16D2 – Well
Survey; Casing
Discoloration at
96 feet.

Location:

Milford, Michigan

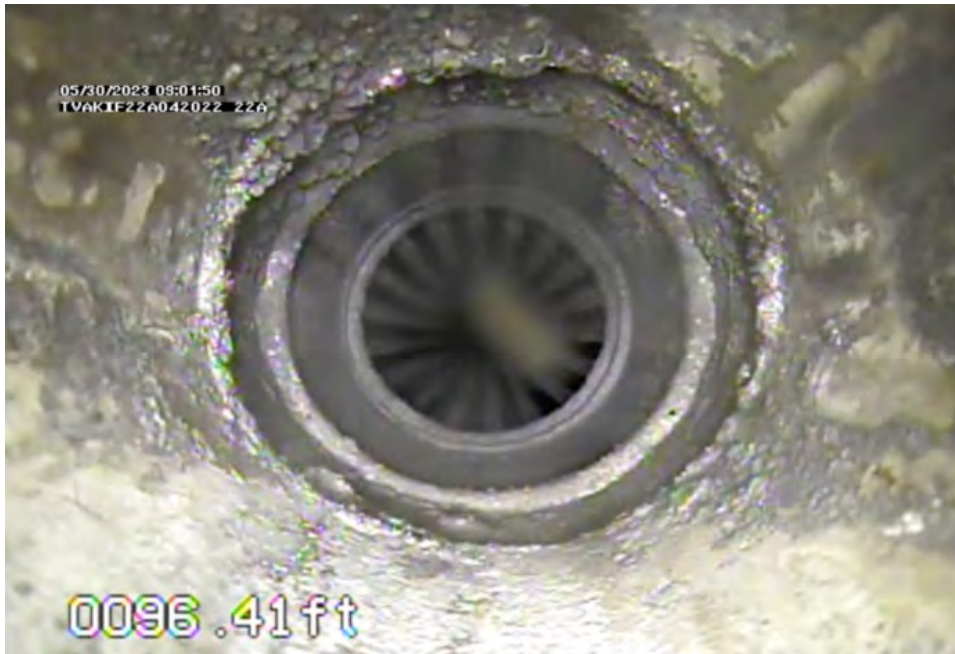
Photograph taken by:

Christian Seidel

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 5

Description:

OW-16D2 – Well
Survey; Top of Well
Screen at 96.5 feet.

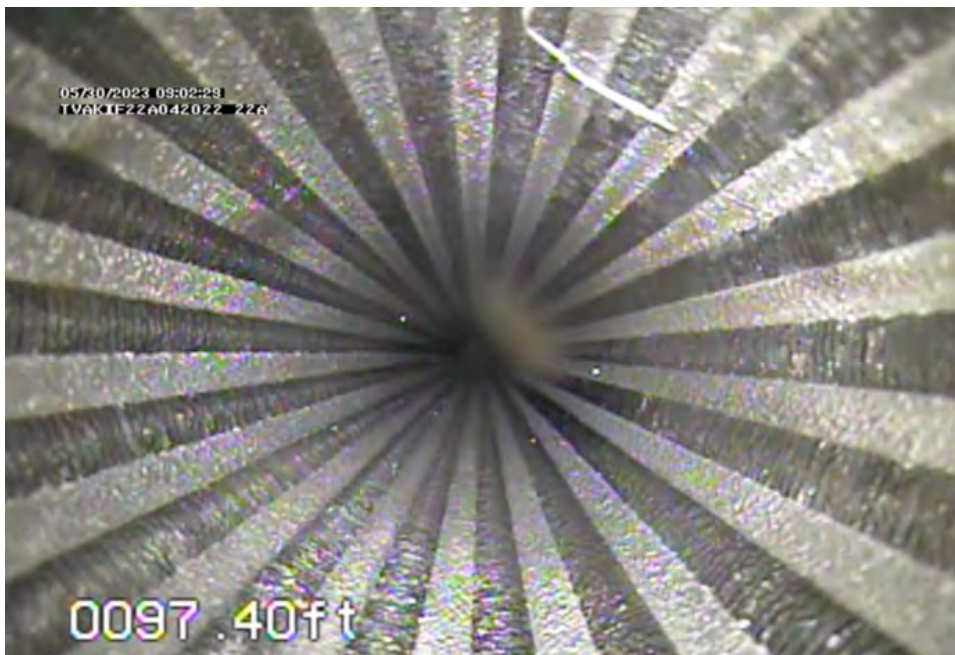
Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023



Photograph: 6

Description:

OW-16D2 – Well
Survey; Well Screen at
97.5 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 7

Description:

OW-16D2 – Well
Survey; Well Screen
at 98 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023



Photograph: 8

Description:

OW-16D2 – Well
Survey; Well Screen at
99.5 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 9

Description:

OW-16D2 – Well
Survey; Well Screen at
100.5 feet.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023



Photograph: 10

Description:

OW-16D2 – Well
Survey; Bottom of Well
Screen.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 11

Description:

OW-16D2 – Well
Survey; Disconnected
Well Casing after Over
Drilling.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/31/2023



Photograph: 12

Description:

OW-16D2 – Well
Survey; Disconnected
Well Casing after Over
Drilling.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/31/2023

Photograph Log

Compromised Well OW-16D2 Video Survey
Former Kelsey-Hayes Milford
30136112



Photograph: 13

Description:

OW-16D2 – Well
Survey; Disconnected
Well Casing after Over
Drilling.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 5/30/2023

Attachment 3

OW-16D2 – Well Abandonment Photograph Log

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 1

Description:
OW-16D2
Abandonment Process.

Location:
Milford, Michigan

Photograph taken by:
Christian Seidel

Date: 5/30/2023



Photograph: 2

Description:
OW-16D2 – Grouting
Well prior to Over
Drilling.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 3

Description:
OW-16D2
Abandonment Process.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/30/2023



Photograph: 4

Description:
OW-16D2 – Removing
Concrete Well Pad.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 5

Description:
OW-16D2 – Removing
Stick-up Well Cover.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/30/2023



Photograph: 6

Description:
OW-16D2 – Over
Drilling 2-inch Well with
8-inch casing (from
Video).

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/30/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 7

Description:

OW-16D2 – Over
Drilling 2-inch Well with
8-inch casing (from
Video).

Location:

Milford, Michigan

Photograph taken by:

Troy Sclafani

Date: 5/30/2023



Photograph: 8

Description:

OW-16D2 – Adding 2-
inch Pipe to Pull OW-
16D2 from the Ground.

Location:

Milford, Michigan

Photograph taken by:

Troy Sclafani

Date: 5/31/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 9

Description:
OW-16D2 – Attempt to
Pull 2-inch Well Casing.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/31/2023



Photograph: 10

Description:
OW-16D2 – Mixing
Bentonite Grout.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/31/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 11

Description:
OW-16D2 – 8-inch
Casing Removal.

Location:
Milford, Michigan

Photograph taken by:
Troy Sclafani

Date: 5/31/2023



Photograph: 12

Description:
OW-16D2 –Drill Rig
Removed from
Location.

Location:
Milford, Michigan

Photograph taken by:
Christian Seidel

Date: 5/31/2023

Photograph Log

Compromised Well OW-16D2 Abandonment
Former Kelsey-Hayes Milford
30136112



Photograph: 13

Description:

OW-16D2 – Backfilling
Former Well Location.

Location:

Milford, Michigan

Photograph taken by:

Christian Seidel

Date: 6/1/2023



Photograph: 14

Description:

OW-16D2 –Former
Well Location 2 Weeks
after Abandonment.

Location:

Milford, Michigan

Photograph taken by:

Scott Filipiak

Date: 6/13/2023

Attachment 4

OW-16D2 – Well Abandonment Log



Well/Boring Abandonment Form

Client Arcadis
Location Milford MI
Job Name Milford Well Abandonment
Job Number 119-23-1067
Well/Boring Number OW-16D2
Date of Abandonment 06/01/23
Reason for Abandonment Compromised by scaling and bio-fouling
Abandonment Done By Spencer Williams

Hole Type: ☒ *Monitoring Well* ☐ *Drillhole* ☐ *Pumping Well*
 Construction Type: ☐ *Drilled* ☐ *Driven* ☐ *Other* _____
 Formation Type: ☐ *Unconsolidated* ☐ *Bedrock*
 Sealing Method: ☐ *Gravity* ☐ *Pumped* ☐ *Other* _____
 Sealing Materials: ☐ *Bentonite Chips* ☒ *Cement-Bent Grout* ☐ *Other* _____

Sealing Material	From (ft)	To (ft)	Quantity	Gallon(s) Bag(s)
Clean Soil	0	7	0.5	Yards
Bentonite chips/pellets	7	9	4	bags
Bentonite Grout	9	100	8	bags

Well Information ONLY

All measurements are from ground surface

			Yes	No
Total Well Depth	100	feet		X
Casing Diameter	2	inches	X	
Casing Depth	65	feet	X	
Depth to Water	3	feet bgs	X	
Screen Removed				
Overdrilled				
Casing Left in Place				
Casing Cut Below Surface				

Comments: The monitoring well was grouted in place and an attempt to remove it from the ground via over drilling was made per request by the Department of Environment, Great Lakes, and Energy (EGLE). The well was over drilled using an 8-inch diameter roto-sonic drilling casing. In the process of over drilling, the well casing broke at a depth of approximately 65 feet below surface (confirmed by video survey) and dropped inside the drill casing. The drillers made an attempt to connect a new pipe to the existing well casing by threading it onto the remaining threads of the well casing but the pipe disconnected when pulled. The partial bore hole created by the over drilling and the broken casing were grouted in place with consent of EGLE.