REPORT

ASBESTOS SUPPORT SERVICES

Rafter J Ranch Improvement and Service District
Water Supply System
Jackson, Wyoming

Submitted To: Rafter J Ranch Improvement and Service District
2951 West Big Trail Drive
Jackson, Wyoming 83001

Submitted By: Golder Associates Inc.
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Distribution: Mr. Gordon Gray (Rafter J ISD) – electronic copy
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Golder Associates Inc.

June 26, 2015 **Project No. 1529599**

Golder Associates

EXECUTIVE SUMMARY

The Rafter J Ranch Improvement and Service District (ISD) retained Golder Associates Inc. (Golder) to provide asbestos related field investigation and historical document evaluation services for the Rafter J Ranch ISD public water supply system located in Jackson, Wyoming. The purpose of these services was to assess the likelihood of potential exposure to asbestos within the Rafter J water supply system.

This Summary is to be used only in conjunction with Golder's Report on Asbestos Support Services, Rafter J Ranch Improvement and Service District Water Supply System, Jackson, Wyoming (Report). All definitions used in this Summary have the same meanings as in the Report, and the use of this Summary is subject to the limitations and conditions contained in the Report. The Report shall govern in the event of any inconsistency between this Summary and the Report.

The Rafter J Ranch ISD is responsible for operating and maintaining the public water supply system that currently services the Rafter J Ranch Subdivision, South Park Service Center and Adams Canyon County facilities. A large portion of the system was originally installed in the late 1970s with subsequent improvements to the original system over the years. Improvements have included service area enlargement and associated installation of additional transmission, distribution and service piping, installation of a second storage tank, installation of additional groundwater source wells and rehabilitation of select original system components.

On March 26, 2015, asbestos was identified in the cement matrix of the clear well pipe located just downstream of the chlorination building as a result of a water leak discovered on March 17, 2015. The clear well is a 252-feet long, 36-inch diameter cement pipe with steel end caps that promoted blending of water from the groundwater source wells and disinfectants (chlorine) prior to distribution to the potable water supply system. Subsequently, proactive/expedited steps were taken to evaluate the water supply and to immediately isolate the clear well pipe from the Rafter J water supply system, which occurred on March 18, 2015. The clear well pipe has not been in service since that date. Since the clear well cement pipe was found to be asbestos containing, a review of system drawings was performed to assess the potential for additional asbestos-containing pipe within the Rafter J water distribution system. A review of drawings prepared by Rendezvous Engineering identified the clear well pipe as reinforced concrete and remaining pipe material types were largely not specified. However, observations made during the 2008/2009 water service and isolation valve replacement projects (when approximately 325 water services [district portion] were replaced) indicated that "Blue Brute" C900 polyvinyl chloride (PVC) pipe was noted at all water main locations exposed. Therefore, it is unlikely that asbestos-containing pipe is present elsewhere within the Rafter J service area.

Based on the results of Golder's field investigation, historical document review and previous investigations performed by others, Golder provides the following conclusions:

- Asbestos was identified within the matrix of the clear well cement pipe at concentrations ranging from 5% to 10% chrysotile asbestos and 3% to 15% crocidolite asbestos
- No asbestos was detected in the mortar/grout located between sections of the clear well cement pipe (interior), pipe bottom sediment from within the downgradient end of the cement pipe, nor within eight water samples collected from throughout the Rafter J water distribution system
- The interior of the clear well cement pipe was observed to be in good condition with little to no fines or sediment throughout the length of the pipe
- The limited literature review regarding the historical use of asbestos-cement pipes (up to 200,000 miles to this day) in drinking water systems and possible health effects indicated that there is no consistent, convincing evidence that ingested asbestos is hazardous to health, with the World Health Organization (WHO) ultimately concluding that there is no need to establish a guideline for asbestos in drinking water
- The EPA has established an MCL of 7 MFL for asbestos in drinking water but there is no evidence of any detectable concentrations of asbestos in the Rafter J drinking water supply
- There is no evidence that downstream users were exposed to asbestos
- Golder recommends abandoning the isolated clear well pipe in-place beneath the existing four to seven feet of soil overburden

Table of Contents

List of Appendices

1.0 BACKGROUND AND SCOPE OF WORK

Based on the scope of work detailed in our Proposal, Golder provided asbestos support services for the Rafter J Ranch ISD, including a field investigation and historical document review. The scope of work was developed based on information provided to Golder in an April 14, 2015 letter from Meridian Engineering, P.C. (Meridian) and subsequent correspondence. Meridian is the District Engineer for the ISD.

The Rafter J Ranch ISD is responsible for operating and maintaining the public water supply system that currently services the Rafter J Ranch Subdivision, South Park Service Center and Adams Canyon County facilities. A large portion of the system was originally installed in the late 1970s with subsequent improvements to the original system over the years. Improvements have included service area enlargement and associated installation of additional transmission, distribution and service piping, installation of a second storage tank, installation of additional groundwater source wells and rehabilitation of select original system components.

On March 17, 2015, the ISD identified a leak in the clear well located downstream of the control/chlorination building. The clear well is a 252-feet long, 36-inch diameter cement pipe with steel end caps that promoted blending of water from the groundwater source well and disinfectants (chlorine) prior to distribution to the potable water supply system. On March 20, 2015, the source of the leak was determined to be at the steel end cap at the distal (downstream) end of the clear well where it transitions into a 12-inch diameter polyvinylchloride (PVC) pipe. During this activity, it was determined that the clear well cement pipe contained asbestos within the cement matrix. Two bulk samples of cement pipe were collected on March 24, 2015 and submitted to EMSL Analytical, Inc. (EMSL) in New York, New York for analysis by polarized light microscopy (PLM) using the Environmental Protection Agency (EPA) 600/R-93/116 Method with a reporting limit of greater than 1% asbestos. Laboratory test results (Appendix A) indicated the cement pipe consisted of between 6% and 10% chrysotile asbestos and between 3% and 15% crocidolite asbestos. Subsequently, proactive steps were taken to evaluate the water quality and the clear well was immediately isolated from the water supply system on March 18, 2015, and has not been in service since.

On April 1, 2015, eight water samples were collected from the clear well pipe leak area and various plumbing fixtures and fire hydrants located throughout the Rafter J water distribution system, which had not been disturbed since the clear well was taken out of service. The samples were submitted to Energy Laboratories, Inc. of Casper, Wyoming (and subsequently to ALS Laboratory Group in Cincinnati, Ohio) and analyzed by transmission electron microscopy (TEM) for asbestos in water using EPA Method 100.2 “Detection of Asbestos Structures >10µm in Length in Drinking Water”. Laboratory test results (Appendix A) indicated no asbestos structures were detected.

Since the clear well cement pipe was found to be asbestos containing, a review of system drawings was performed to assess the potential for additional asbestos-containing pipe within the Rafter J water distribution system. A review of drawings prepared by Rendezvous Engineering identified the clear well pipe as reinforced concrete and remaining pipe material types were largely not specified. However, observations made during the 2008/2009 water service and isolation valve replacement projects (when approximately 325 water services [district portion] were replaced) indicated that “Blue Brute” C900 PVC pipe was noted at all water main locations exposed. Therefore, it is unlikely that asbestos-containing pipe is present elsewhere within the Rafter J service area. Golder understands the ISD water storage tanks (two 200,000-gallon below grade concrete water tanks located east of Highway 89) are cleaned and inspected every five years pursuant to applicable regulations. A brief summary of the activities described above and timeline thereof is provided in Appendix A.

Meridian requested that Golder provide an evaluation of the likelihood of past exposure to asbestos fibers potentially within the water supply to downstream users and a narrative describing the historical use of asbestos-containing pipe in public water systems, current applicable State and Federal regulatory requirements, and recommendations for abandonment or removal of the clear well. The following sections detail the findings of the field investigation and historical document evaluation.

2.0 SUMMARY OF FIELD INVESTIGATION

On May 19, 2015 Golder performed a field investigation to assess the condition of the interior of the clear well cement pipe and obtain samples of residual sediment within the clear well. This included a video inspection of the interior of the approximately 252-feet long, 36-inch diameter clear well pipe. Prior to Golder's arrival, ISD's contractor removed the steel end cap from the downstream end of the pipe and dewatered the pit to facilitate video camera access. Once the end cap was removed, ISD's contractor collected two jars of bottom sediment from within the downstream end of the pipe before it was disturbed with any additional activities.

Golder retained Sanitary Systems Inc. (Sanitary Systems) of Lander, Wyoming to provide video inspection services. Sanitary Systems used a rubber-tired remote control vehicle with an articulating arm video camera and light to inspect the clear well cement pipe starting at the downstream end. The top of the clear well pipe ranged from approximately four feet below ground surface (bgs) at the upstream end to approximately seven feet bgs at the downstream end. Based on review of the video generated, the clear well cement pipe appeared to be in good condition with no visible interior degradation. During the inspection, a mortar/grout material was observed at seams between each section of cement pipe (approximately every 12 feet). In many locations this material had fallen out in chunks from the top half of the pipe. The remote control vehicle was able to travel 247.5 feet into the pipe at which point it encountered a 12 to 15-inch thick mound of apparent sand (likely generated from the groundwater supply wells that settled out when the water slowed down in the larger diameter clear well cement pipe). Several attempts to climb over and move beyond this mound of sand failed and the video inspection was ended a few feet from the upstream end of the clear well cement pipe. In general, little to no fines or sediment were observed throughout the bottom of the remainder of the clear well cement pipe.

While on-site, Golder collected three bulk samples of suspect asbestos-containing material (ACM) to further assess the potential presence of asbestos throughout the clear well system. Samples of suspect ACM were collected following accepted protocols outlined by the Asbestos Hazard Emergency Response Act of 1986 (AHERA) and the National Emission Standards for Hazardous Air Pollutants (NESHAP). Samples collected included the following:

- Exterior surface of cement pipe (upstream end)
- Mortar/grout between sections of cement pipe (interior)
- Pipe bottom sediment from within downgradient end of cement pipe (provide by ISD's contractor)

Bulk samples were submitted to EMSL in Indianapolis, Indiana for visual analysis using PLM (mortar/grout and cement pipe) and TEM (pipe bottom sediment). According to laboratory test results, there was no asbestos detected in the mortar/grout or pipe bottom sediment samples collected. The sample of clear well cement pipe contained 5% chrysotile asbestos and 5% crocidolite asbestos,

consistent with samples previously collected from the downstream end of the clear well cement pipe. Analytical report sheets are provided in Appendix B and select photographs are provided in Appendix C.

3.0 SUMMARY OF HISTORICAL DOCUMENT EVALUATION

Golder conducted a limited literature review to evaluate the historical use of asbestos-cement pipe in public water systems and findings from studies that have evaluated potential health hazards associated with the use of asbestos-cement pipe and asbestos fibers in drinking water. This limited evaluation included review of documentation and literature available from the EPA, Occupational Safety and Health Administration (OSHA), Wyoming Department of Environmental Quality (WDEQ), American Water Works Association (AWWA), the World Health Organization (WHO), Foundation for Water Research, and various articles from peer-reviewed journals.

The following sections provide a summary of our literature review of asbestos and applicable regulations, a history of asbestos-cement pipe use in drinking water systems, and the possible health risks associated with asbestos-cement drinking water pipes.

3.1 Asbestos and Applicable Regulations

Asbestos is a general term used to describe a group of naturally occurring minerals that are resistant to heat and corrosion. Asbestos has been used in products including roofing materials, brake pads and cement pipes often used to distribute drinking water. Asbestos is divided into two groups: serpentine and amphibole. Asbestos in the serpentine group is called chrysotile. The amphibole group contains five types of asbestos: amosite, crocidolite, tremolite, anthophyllite, and actinolite.

Asbestos is well-recognized as a health hazard and is regulated by OSHA, the EPA and many states. The greatest concern regarding asbestos exposure is related to breathing in or inhaling the fibers. Therefore, OSHA has established occupational airborne exposure limits and practices to be followed when the potential for asbestos exposure exists.

The EPA regulates asbestos in many facets, including asbestos in school buildings, public building activities such as operations and maintenance, renovation and demolition, clean-up sites, and training and accreditation of asbestos professionals. Training for asbestos professionals is required under the EPA Asbestos Model Accreditation Plan (MAP), which the EPA issued under AHERA. The MAP requires the use of trained and accredited asbestos professionals when conducting asbestos inspections or designing or conducting response actions at schools and public and commercial buildings. It provides guidance to states on the minimum training requirements for accrediting asbestos professionals. State training programs must be at least as stringent as the MAP.

Since 1973, the EPA has banned various asbestos-containing materials primarily associated with spray-applied and insulation materials. In 1989, the EPA issued a final rule under Section 6 of the Toxic Substances Control Act (TSCA) banning most asbestos-containing products. However, in 1991, the rule was vacated and remanded. As a result, the original ban on the manufacture, importation, processing or

distribution in commerce for the majority of the products covered in the 1989 ban was overturned. Currently, the manufacture, importation, processing, or distribution in commerce of asbestos-cement pipe is not banned in the United States (US).

The EPA also regulates asbestos in drinking water. The EPA has stated that “some people who drink water containing asbestos well in excess of the maximum contaminant level (MCL) for many years may have an increased risk of developing benign intestinal polyps”. The Safe Drinking Water Act requires that the EPA determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. The EPA has set a MCL for asbestos in drinking water of 7 million fibers per liter (MFL). This regulation became effective in 1992.

Asbestos is also regulated by many states, particularly in regards to building operations and maintenance, renovation and demolition. In the State of Wyoming, the Wyoming Asbestos Program within the Air Quality Division of the WDEQ enforces the state regulations for asbestos inspections and abatement projects. While there is no registration or licensure program for companies or individuals in the State of Wyoming, each person performing or supervising an asbestos project must have current AHERA-type training and certification.

3.2 History of Asbestos-Cement Pipes in Drinking Water Systems

Asbestos has been used in a large number of products and construction materials such as asbestos-cement sheet and pipe, electrical and thermal insulation, and brake pads. In the United States, chrysotile has been the most commonly used form of asbestos, accounting for approximately 95% of asbestos found in construction materials in the US according to the USEPA[1]. However, the amphibole asbestos forms amosite and crocidolite were used in high-temperature insulation and chemical-resistant products, including asbestos-cement pipe.

In the early 1970s, estimates indicated approximately 200,000 miles of asbestos-cement pipe existed in the US.[2] A survey (2002 Water://STATS Distribution Report) conducted by the AWWA estimated as much as 15% (approximately 150,000 miles) of the total miles of pipe in the US water distribution and transmission systems was asbestos-cement pipes; however, this data was based on a limited pool of utilities (337) mostly in the eastern US. Therefore, estimates similar to those from the 1970s (approximately 200,000 miles) may still be present in the US to this day.

Asbestos-cement pipe was first created in Italy in the early 1900s due to the need for corrosion-resistant pipe. The occurrence of asbestos in drinking water supplies received national attention in the US in the early 1970s when asbestos was found in the City of Duluth, Minnesota water supply. Two years prior to

[1] USEPA “How to Manage Asbestos in School Building: The AHERA Designated Person’s Self Study Guide”. January 1996.
[2] Olson, Harold. 1973. Asbestos in Potable-Water Supplies. *Journal of the American Water Works Association*. September 1974.

this, similar situations occurred in water supplies in Ottawa, Toronto, Montreal, and other Canadian cities. The forms of asbestos detected varied and the sources were either from natural background or industrial activities.[3] The source of asbestos in the Duluth case was from the washings of a taconite ore processing operation.

These cases led to concern about asbestos-cement pipe used in drinking water distribution systems as a source of chrysotile and crocidolite asbestos fibers. Since this concern, various governmental and non-governmental agencies and groups have evaluated the possible health risks associated with asbestos-cement drinking water pipes. A summary of these findings is provided in the following section.

3.3 Possible Health Risks Associated with Asbestos-Cement Drinking Water Pipes

After the Duluth, Minnesota water supply was found to contain asbestos, questions started being raised about the possible health impact of the ingestion of asbestos fibers in drinking water. This section provides a brief review of the current state of knowledge regarding asbestos in drinking water and its potential health risks as it relates to asbestos-cement pipe.

As stated previously, asbestos is well-recognized as a health hazard when inhaled in large enough amounts. This relationship has been seen primarily in occupational exposures. Some studies have suggested health effects related to ingestion of asbestos fibers. Selikoff et al[4] found an incidence of stomach, colon and rectum cancers in New York and New Jersey insulators at three times that expected in the general US population. Kleinfeld et al[5] found a significant increase in gastrointestinal cancer among insulating workers in New York State, but not in talc workers also exposed to asbestos fibers. This indicated that the pattern of increased gastrointestinal cancer in insulating workers was due to the swallowing of fibers which had been inhaled, caught in the respiratory tract, then ingested via mucociliary action.[1] However, of more than 20 studies, only five demonstrated a statistically significant excess of incidence of gastrointestinal tumors.[6] These and similar findings have created concern whether ingesting asbestos via drinking water has similar health concerns.

Asbestos is introduced into drinking water by dissolution of asbestos-containing materials and ores as well as from industrial effluents, atmospheric pollution and asbestos-cement pipes in water distribution systems.[7] In a study conducted in Canada, only two of 71 locations indicated that degradation of

[3] Cooper, Robert and Cooper, Clark. 1978. Public Health Aspects of Asbestos Fibers in Drinking Water. *Journal of the American Water Works Association*. June 1978.
[4] Selikoff, I.J., Hammond, E.C., and Seidman, H. 1973. Cancer Risk of Insulation Workers in the United States, Biological Effects of Asbestos. Proc. International Agency for Research on Cancer, WHO, Lyon, France.
[5] Kleinfeld, M., Messite, J. and Kooyman, O. 1967. Mortality Experience in a Group of Asbestos Workers. *Environmental Health*; 15:177.
[6] Commins, Brian. 1985. Viewpoint - Ingested Asbestos Deemed Benign. American Water Works Association.
[7] World Health Organization. 2003. Asbestos in Drinking Water, Background document for development of *WHO Guidelines for Drinking-water Quality*.

asbestos-cement piping contributed measurably to the asbestos content of the water supplies.[8] However, a study of the water system in Woodstock, New York found high levels of asbestos associated with severe deterioration of asbestos-cement pipe.[9] The Canadian study[7] found fiber concentrations of greater than 1 MFL in 25% of the water supplies, greater than 10 MFL in 5% of the water supplies and greater than 100 MFL in less than 1% of the water supplies with a median fiber length of 0.5-0.8 micrometers (µm). A study conducted in 1983 in the US, indicated that most of the population of the US consumes drinking-water with asbestos concentrations below 1 MFL.[10]

Concerns in the US regarding asbestos in drinking water and the Safe Drinking Water Act led the EPA to set a MCL for asbestos in drinking water of 7 MFL in 1992. Again, the EPA concluded that "some people who drink water containing asbestos well in excess of the MCL for many years may have an increased risk of developing benign intestinal polyps". Benign indicates non-cancerous. Benign growths may grow larger, but do not spread to other parts of the body. In 1996, the WHO published Guidelines for drinking-water quality (2nd Edition, Volume 2), which contained a section entitled *Health Criteria and other supporting information*. This publication provided the background information that led the WHO to conclude "there is no need to establish a guideline for asbestos in drinking water".[11] In addition to environmental levels and human exposure via drinking-water supplies summarized above, the WHO also evaluated research of effects on laboratory animals and *in vitro* systems as well as epidemiological research on the effects on humans. This information was further summarized in a 2003 document by the WHO entitled "Asbestos in Drinking-water, Background document for development of WHO *Guidelines for Drinking-water Quality*".

The WHO concluded that there was "little convincing evidence" of the carcinogenicity of ingested asbestos based on numerous epidemiological studies of populations with drinking water supplies with high concentrations of asbestos fibers.[11] In addition, the WHO noted that there has been considerable disagreement whether asbestos fibers ingested from drinking water can migrate through the walls of the gastrointestinal tract in sufficient numbers to cause adverse local or system effects.[11] One specific study referenced by the WHO, found no consistent evidence of a cancer risk associated with the ingestion of drinking-water in Puget Sound with levels up to 200 MFL.[12]

The WHO concluded that while asbestos is a known human carcinogen by the inhalation route, available research does not support the hypothesis that an increased cancer risk is associated with ingestion of

[8] Chatfield E.J. and Dillon, M.J. 1979. A national survey for asbestos fibres in Canadian drinking water supplies. Ottawa, Canada Department of National Health and Welfare. Environmental Health Directorate Report 79-EHD-34.
[9] Webber, J.S., Covey, J.R. and King, M.V. 1989. Asbestos in drinking water supplied through grossly deteriorated A-C pipe. *Journal of the American Water Works Association*, 81:80
[10] Millette, J.R., Clark, P.J., Stober, J. and Rosenthal, M. 1983. Asbestos in water supplies of the United States. *Environmental Health Perspectives*, 53:45-48.
[11] World Health Organization, 1996. Guidelines for drinking-water quality. 2nd Edition, Volume 2.
[12] Polissar L., Severson, R.K. and Boatman, E.S. 1984. A case control study of asbestos in drinking water and cancer risk. American Journal of Epidemiology, 119: 456-471.

asbestos in drinking water. In addition, animal studies have not demonstrated that asbestos consistently increased the incidence of tumors of the gastrointestinal tract. Therefore, the WHO ultimately concluded that “there is no consistent, convincing evidence that ingested asbestos is hazardous to health, and it is concluded that there is no need to establish a guideline for asbestos in drinking-water.”[11] The conclusions by the WHO were further supported in a summary document published by the Drinking Water Inspectorate (DWI, United Kingdom) and provided on the Foundation for Water Research (United Kingdom) website.

4.0 DISPOSITION OF EXISTING CLEAR WELL

Based upon the data collected and research conducted, there is no evidence to indicate that the existing clear well has led or will lead to any unacceptable asbestos exposure to downstream users of the Rafter J water distribution system. The clear well was bypassed on March 18, 2015 and is no longer a part of the water distribution system. Options include abandonment in place or removal. In this instance, Golder recommends abandoning the clear well in-place beneath the existing four to seven feet of soil cover (which is also below the groundwater table) where the existing asbestos cannot be disturbed, damaged or create an airborne fiber release episode.

5.0 CONCLUSIONS

Based on the results of our field investigation, historical document review and previous investigations performed by others, Golder provides the following conclusions:

- Asbestos was identified within the matrix of the clear well cement pipe at concentrations ranging from 5% to 10% chrysotile asbestos and 3% to 15% crocidolite asbestos
- No asbestos was detected in the mortar/grout located between sections of the clear well cement pipe (interior), pipe bottom sediment from within the downgradient end of the cement pipe, nor within eight water samples collected from throughout the Rafter J water distribution system
- The interior of the clear well cement pipe was observed to be in good condition with little to no fines or sediment throughout the length of the pipe
- The limited literature review regarding the historical use of asbestos-cement pipes (up to 200,000 miles to this day) in drinking water systems and possible health effects indicated that there is no consistent, convincing evidence that ingested asbestos is hazardous to health, with the WHO ultimately concluding that there is no need to establish a guideline for asbestos in drinking water
- The EPA has established an MCL of 7 MFL for asbestos in drinking water but there is no evidence of any detectable concentrations of asbestos in the Rafter J drinking water supply
- There is no evidence that downstream users were exposed to asbestos
- Golder recommends abandoning the isolated clear well in-place beneath the existing four to seven feet of soil overburden

6.0 LIMITATIONS

Services performed by Golder were conducted in a manner consistent with that level of care and skill ordinarily exercised by other members of the engineering and science professions currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services. No warranty, express or implied is made.

7.0 CLOSING

Golder appreciates the opportunity to assist Rafter J Ranch ISD and Meridian with these important asbestos support services. If you have comments or questions regarding this summary report, please do not hesitate to contact the undersigned at (636) 724-9191.

GOLDER ASSOCIATES INC.

Angela Dartt, PhD, CIH
Senior Project Industrial Hygienist

Christopher M. Redington
Associate

Mark McClain, P.E.
Principal

APPENDIX A

MERIDIAN 36” DIAMETER CLEAR WELL LEAK IDENTIFICATION/REPAIR TIMELINE

RAFTER J RANCH

36” Diameter Clear Well Leak Identification/Repair Timeline

Prepared By: Meridian Engineering, P.C.

Date	Activity
3-17-2015	Received call from Chuck regarding increase in 24-hour pumped flows (see email to ISD)
3-17-2015	Went to site and identified leak location about 36” dia. clear well
3-18-2015	Chuck isolated clear well from potable water system and increased chlorine dosage per direction from Dave Stickel (see email to ISD)
3-19-2015	Sent email to ISD regarding reduction in daily volume of water pumped from the groundwater supply wells
3-20-2015	Evans Construction Co. employed to expose/repair leaking clear well. Utility locates were requested by Evans (see email)
3-23-2015	Evans mobilized equipment to site and exposed leaking end cap on the clear well. I met with the Contractor, Gordon, and Chuck to assess damages and formulate repair options. During visit, I questioned pipe material type and suspected it may be AC pipe.
3-23-2015	Meridian Engineering contacted Steve Harrington, of Jorgensen Associates, and met with him at the site to assess pipe material type due to his expertise in AC pipe. He indicated it might be AC pipe, but recommended lab test to affirm.
3-24-2015	Jorgensen Associates directed by Meridian Engineering to obtain material samples and send to laboratory.

Date	Activity
3-24-2015	Meridian Engineering directed Evans Construction to continue dewatering excavation pit until material samples are obtained and then stop work until further notice while keeping sufficient barricades in place.
3-26-2015	Laboratory test results received affirming presence of transite material in samples (see email)
3-27-2015	Discussed chlorine contact time requirements with James Brough of DEQ. He indicated no contact time required for groundwater supply sources with no surface water influence.
3-27-2015	Held a meeting with the ISD Board members and Paul D'Amours regarding outcome of laboratory tests. Board members directed Chuck to collect water samples and test for presence of asbestos fibers. Board members also agreed to employment of a consultant that specializes in AC pipe matters.
4-1-2015	Water samples collected at various locations throughout Rafter J for testing of asbestos fibers
4-3-2015	Test results received from Energy Laboratories Inc. indicating no asbestos fibers present
4-14-2015	Meridian Engineering transmitted a proposal request to Golder Associates for specialized engineering services related to the asbestos cement clear well pipe
5-1-2015	Gordon Gray, Chairman of the ISD Board, executes the Agreement with Golder Associates for provision of engineering support services

5-18-2015	Westwood Curtis Construction removes clear well steel end cap in preparation for Golder Assoc. field investigations. Contractor obtained two samples of sediment from pipe interior upon removing end cap.
5-19-2015	Golder Assoc. representative arrives on site and performs clear well investigations. Investigations included internal video inspection and sampling of sediment, pipe joint grout, and pipe material at east end of clear well.
6-4-2015	Golder Assoc. provides a draft copy of the report on the Rafter J clear well for review and comment

APPENDIX B
LABORATORY REPORT SHEETS

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
307 West 38th Street
New York, NY 10018

Phone: (212) 290-0051
Fax: (212) 290-0058
http://www.emsl.com

Please print all information legibly. 031508748

Company:	Jorgensen Associates	*Bill To:*	Jorgensen Associates
Address1:	P.O. Box 9550	*Address1:*	P.O. Box 9550
Address2:		*Address2:*	
City, State:	Jackson, Wyoming	*City, State:*	Jackson, Wyoming
Zip/Post Code:	83002	*Zip/Post Code:*	83002
Country:		*Country:*	
Contact Name:	Steve Harrington	*Attn:*	Steve Harrington
Phone:	(307) 733-5150	*Phone:*	(307) 733-5150
Fax:	(307)733-5187	*Fax:*	(307)733-5187
Email:		*Email:*	
BMSL Rep:	Joe Frasca	*P.O. Number:*	15709
Project Name/Number:	Meridian Eng		

MATRIX			TURNAROUND			
☐ Air	☐ Soil	☐ Micro-Vac	☐ 3 Hours	☐ 6 Hours	☐ Same Day or 12 Hours*	☒ 24 Hours (1 day)
☒ Bulk	☐ Drinking Water		☐ 48 Hours (2 days)	☐ 72 Hours (3 days)	☐ 96 Hours (4 days)	☐ 120 Hours (5 days)
☐ Wipe	☐ Wastewater		☐ 144+ hours (6-10 days)			

TEM AIR, 3 hours, 6 hours, Please call ahead to schedule. There is a premium charge for 3-hour test, please call 1-800-220-3675 for price prior to sending samples. You will be asked to sign an authorization form for this service.

***12 hours (must arrive by 11:00a.m. Mon -Fri.), Please Refer to Price Quote**

PCM - Air	TEM Air	TEM WATER
☐ NIOSH 7400(A) Issue 2: August 1994	☐ AHERA 40 CFR, Part 763 Subpart E	☐ EPA 100.1
☐ OSHA w/TWA	☐ NIOSH 7402	☐ EPA 100.2
☐ Other:	☐ EPA Level II	☐ NYS 198.2
PLM - Bulk	**TEM BULK**	**TEM Microvac/Wipe**
☒ EPA 600/R-93/116	☐ Drop Mount (Qualitative)	☐ ASTM D 5755-95 (Quantitative Method)
☐ EPA Point Count	☐ Chatfield SOP - 1988-02	☐ Wipe Qualitative
☐ NY Stratified Point Count	☐ TEM NOB (Gravimetric) NYS 198.4	
☐ PLM NOB (Gravimetric) NYS 198.1	☐ EMSL Standard Addition:	**XRD**
☐ NIOSH 9002:		☐ Asbestos
☐ EMSL Standard Addition:	**PLM Soil**	☐ Silica NIOSH 7500
SEM Air or Bulk	☐ EPA Protocol Qualitative	
☐ Qualitative	☐ EPA Protocol Quantitative	**OTHER**
☐ Quantitative	☐ EMSL MSD 9000 Method fibers/gram	☐

EMSL MANHATTAN LAB
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1:54 PM

OrderID: 031508748 031508748

Chain of Custody

Asbestos Lab Services

EMSL Analytical, It
307 West 38th Stre
New York, NY 100

Phone: (212) 290-005
Fax: (212) 290-005
http://www.emsl.com

Please print all information legibly.

Client Sample # (s) MS-1 - MS-2 Total Samples #: 2

Relinquished: S Harrington Date: 3/24/15 Time: 1600

Received: Ramon Bobea Date: 3/25/15 Time: 1034Am

Relinquished: Date: Time:

Received: Date: Time:

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
MS-1P	Water Pipe	
MS-2P	Water Pipe	
		Received 3/26/15

EMSL MANHATTAN LAB
RECEIVED
15 MAR 25 AM 10:34

yc 3/26/15
1:54Pm

EMSL Analytical, Inc.
307 West 38th Street, New York, NY 10018
Phone/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com manhattanlab@emsl.com

EMSL Order:	031508748
CustomerID:	JORG50
CustomerPO:	15709
ProjectID:	

Attn: **Steve Harrington**
Jorgensen Associates, PC
P. O. Box 9550
Jackson, WY 83002

Phone:	(307) 733-5150
Fax:	(307) 733-5187
Received:	03/25/15 10:34 AM
Analysis Date:	3/26/2015
Collected:	3/24/2015

Project: **15709/ MERIDIAN ENG.**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ME-1P	WATER PIPE	Gray		30% Ca Carbonate	**6% Chrysotile**
031508748-0001		Non-Fibrous Heterogeneous		61% Non-fibrous (other)	**3% Crocidolite**
ME-2P	WATER PIPE	Gray		75% Non-fibrous (other)	**15% Crocidolite**
031508748-0002		Fibrous Heterogeneous			**10% Chrysotile**

Initial report from 03/26/2015 14:14:28

EMSL Analytical, Inc.
307 West 38th Street, New York, NY 10018
Phone/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com manhattanlab@emsl.com

EMSL Order:	031508748
CustomerID:	JORG50
CustomerPO:	15709
ProjectID:	

Attn: **Steve Harrington**
Jorgensen Associates, PC
P. O. Box 9550
Jackson, WY 83002

Phone:	(307) 733-5150
Fax:	(307) 733-5187
Received:	03/25/15 10:34 AM
Analysis Date:	3/26/2015
Collected:	3/24/2015

Project: **15709/ MERIDIAN ENG.**

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date::	3/25/2015	Sample Receipt Time:	10:34 AM
Analysis Completed Date:	3/26/2015	Analysis Completed Time:	1:55 PM

Analyst(s):

Daena Charles PLM (1)

Yolanda Chow PLM (1)

Samples reviewed and approved by:

James Hall, Laboratory Manager
or other approved signatory

Initial report from 03/26/2015 14:14:28

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
College Station, TX 888.690.2218 • Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

ANALYTICAL SUMMARY REPORT

April 03, 2015

Rafter J Improvement and Service District
2951 W Bigtail Dr
Jackson, WY 83001

Work Order: C15040068

Project Name: WY5600822

Energy Laboratories, Inc. Casper WY received the following 8 samples for Rafter J Improvement and Service District on 4/2/2015 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C15040068-001	2951 Big Trail	04/01/15 9:00	04/02/15	Drinking Water	Asbestos in Water
C15040068-002	36" Pipe	04/01/15 9:30	04/02/15	Drinking Water	Same As Above
C15040068-003	3181 Beaver Slide	04/01/15 9:10	04/02/15	Drinking Water	Same As Above
C15040068-004	3380 Appaloosa	04/01/15 9:25	04/02/15	Drinking Water	Same As Above
C15040068-005	3105 Big Trail	04/01/15 9:30	04/02/15	Drinking Water	Same As Above
C15040068-006	3405 Arabian	04/01/15 9:15	04/02/15	Drinking Water	Same As Above
C15040068-007	3315 Cow Camp	04/01/15 9:40	04/02/15	Drinking Water	Same As Above
C15040068-008	Storage Tank	04/01/15 9:50	04/02/15	Drinking Water	Same As Above

The results as reported relate only to the item(s) submitted for testing. The analyses presented in this report were performed at Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Radiochemistry analyses were performed at Energy Laboratories, Inc., 2325 Kerzell Lane, Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these test results, please call.

Report Approved By:

Kathryn Hamre
Report Proofing Specialist

Digitally signed by
Kathy Hamre
Date: 2015.04.03 11:41:12 -06:00

CLIENT: Rafter J Improvement and Service District
Project: WY5600822
Sample Delivery Group: C15040068

Report Date: 04/03/15

CASE NARRATIVE

SUB-CONTRACTED ANALYSIS
The service requested for your sample(s) was sub-contracted to ALS Laboratory Group for analysis. Enclosed is the resulting data.
Sub-lab Accreditation #: NY 11371 EPA OH00255

Sample ID: 17WX21
Laboratory ID: C15040068-001 through -008
Matrix: Drinking Water
Sampling Date/Time: 4/1/2015 9:00, 9:30, 9:10, 9:25, 9:30, 9:15, 9:40, 9:50 AM
Received Date/Time: 4/2/2015 2:28 PM
Analysis Requested: Asbestos in Water

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Submitted To:

Tessa Parke
Energy Laboratories
P.O. Box 3258 2393 Salt Creek Highway 82601
Casper WY 82602-3258

REFERENCE DATA

Asbestos in Water by TEM

Sample Type:	Drinking Water
Method Reference:	EPA Method 100.2
Client Sample No.:	C15040068-001A through C15040068-008A
Sample Location:	Rafter J. Imp. & Ser. District; Project # EPA#5600822C
PO No.:	3308
ALS Work Order No.:	1504070
ALS Sample No.:	1504070-01 through 1504070-08

The samples indicated in this report were analyzed by Transmission Electron Microscopy (TEM) for asbestos using EPA Method 100.2 "Detection of Asbestos Structures >10μm in Length in Drinking Water" dated June 1994. Sample collection is performed outside the laboratory and is the responsibility of the client. If sample collection or submission deviates from any method requirement, interpretation of the results under strict EPA guidelines cannot be made.

Upon arrival at the laboratory, each sample was ultrasonically treated in its original container for 15 minutes to suspend the solids. Aliquots of this suspension were filtered onto 0.22μm pore size ME filters. Whenever possible, a sufficient volume of sample is filtered to yield an analytical sensitivity (AS) of <0.20 MFL equivalent to counting of one confirmed asbestos fiber. However, the actual volumes filtered are based on the clarity of the sample. Portions of the filtered sample are coated with carbon and mounted on TEM grids for examination.

Analysis is performed on an FEI Tecnai Spirit G2 Twin TEM with EDAX Genesis System. Results apply only to portions of samples analyzed and are tabulated on the following page(s). Samples are disposed after sufficient filtration. Filtered portions are disposed after 1 year, and grids are archived for a minimum of 3 years.

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

NELAC accredited through New York ELAP (LAB #11371)

ALS Environmental
4388 Glendale-Millford Road, Cincinnati, Ohio 45242
Phone (513) 733 5336 Fax (513) 733 5347 www.alsenviro.com
A Campbell Brothers Limited Company

CLIENT: Energy Laboratories
SAMPLE LOCATION: Rafter J. Imp. & Ser. District; Project # EPA#5600822C

SAMPLE PREP DATA

Date Received:	4/2/2015
Date Filtered:	4/2/2015
Time Filtered:	10:30
Filter Type:	MCE, 0.22 µm
Filter Size:	47 mm
Collection Area:	1075 mm^2

ANALYSIS DATA

Date and Time Analyzed:	4/3/2015 & 9:00
Magnification:	13,500x
Calibration Constant:	1 cm = 0.74 µm
EDXA Resolution:	<170.0 eV
Accelerating Voltage:	100 keV
Camera Constant:	129.25 mm-Å

SAMPLE IDENTIFICATION				
Client Sample No.:	C15040068-001A	C15040068-002A	C15040068-003A	C15040068-004A
ALS Sample No.:	1504070-01	1504070-02	1504070-03	1504070-04
Date Sampled:	4/1/2015	4/1/2015	4/1/2015	4/1/2015
Time Sampled:	9:00	9:30	9:10	9:25
Volume Filtered (L):	0.100	0.100	0.100	0.100
No. Grid Openings Analyzed:	5	5	5	5
Average Grid Opening Area:	0.0108	0.0108	0.0108	0.0108
AS (MFL):	0.20	0.20	0.20	0.20
Asbestos Fibers ≥ 10 microns				
Chrysotile:	0	0	0	0
Amosite:	0	0	0	0
Crocidolite:	0	0	0	0
Actinolite-Tremolite:	0	0	0	0
Anthophyllite:	0	0	0	0
Total Asbestos ≥ 10 microns				
Count:	**0**	**0**	**0**	**0**
Concentration (MFL):	**<AS**	**<AS**	**<AS**	**<AS**

AS= Analytical Sensitivity *MFL= Millions of Fibers per Liter*

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

NELAC accredited through New York ELAP (LAB #11371)

ALS Environmental
4388 Glendale-Milford Road, Cincinnati, Ohio 45242
Phone (513) 733 5336 Fax (513) 733 5347 www.alsenviro.com
A Campbell Brothers Limited Company

CLIENT: Energy Laboratories
SAMPLE LOCATION: Rafter J. Imp. & Ser. District; Project # EPA#5600822C

SAMPLE PREP DATA		***ANALYSIS DATA***	
Date Received:	4/2/2015	Date and Time Analyzed:	4/3/2015 & 9:00
Date Filtered:	4/2/2015	Magnification:	13,500x
Time Filtered:	10:30	Calibration Constant:	1 cm = 0.74 μm
Filter Type:	MCE, 0.22 μm	EDXA Resolution:	<170.0 eV
Filter Size:	47 mm	Accelerating Voltage:	100 keV
Collection Area:	1075 mm^2	Camera Constant:	129.25 mm-Å

SAMPLE IDENTIFICATION				
Client Sample No.:	C15040068-005A	C15040068-006A	C15040068-007A	C15040068-008A
ALS Sample No.:	1504070-05	1504070-06	1504070-07	1504070-08
Date Sampled:	4/1/2015	4/1/2015	4/1/2015	4/1/2015
Time Sampled:	9:30	9:15	9:40	9:50
Volume Filtered (L):	0.100	0.100	0.100	0.100
No. Grid Openings Analyzed:	5	5	5	5
Average Grid Opening Area:	0.0108	0.0108	0.0108	0.0108
AS (MFL):	0.20	0.20	0.20	0.20
Asbestos Fibers ≥ 10 microns				
Chrysotile:	0	0	0	0
Amosite:	0	0	0	0
Crocidolite:	0	0	0	0
Actinolite-Tremolite:	0	0	0	0
Anthophyllite:	0	0	0	0
Total Asbestos ≥ 10 microns				
Count:	**0**	**0**	**0**	**0**
Concentration (MFL):	**<AS**	**<AS**	**<AS**	**<AS**

AS= Analytical Sensitivity *MFL= Millions of Fibers per Liter*

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

NELAC accredited through New York ELAP (LAB #11371)

ALS Environmental
4388 Glendale-Milford Road, Cincinnati, Ohio 45242
Phone (513) 733 5336 Fax (513) 733 5347 www.alsenviro.com
A Campbell Brothers Limited Company

Work Order Receipt Checklist

Rafter J Improvement and Service District C15040068

Login completed by: Corinne Wagner
Date Received: 4/2/2015
Reviewed by: BL2000\khamre
Received by: ckw
Reviewed Date: 4/3/2015
Carrier name: Next Day Air

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	3.2°C		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Contact and Corrective Action Comments:

Samples were received by ALS Laboratory Group on 4/2/15.

Chain of Custody and Analytical Request Record 1504070

Page ____ of ____

PLEASE PRINT (Provide as much information as possible.)

Company Name: Rafter J. Imp + Ser. District	Project Name, PWS, Permit, Etc.: EPA # 5600822C	Sample Origin State: WY.	EPA/State Compliance: Yes ☒ No ☐
Report Mail Address (Required): 2951 Big Trail Drive Jackson, WY. 83001 ☐ No Hard Copy Email:	Contact Name: Dave Stickel Phone/Fax: 307-880-0427 Cell:		Sampler: (Please Print) Dave Stickel
Invoice Address (Required): Rafter J. Imp. + Ser. District 2951 Big Trail Drive Jackson, WY. 83001 ☐ No Hard Copy Email:	Invoice Contact & Phone: 307-733-5262 Rafter J. Imp + Ser. District	Purchase Order:	Quote/Bottle Order:

Special Report/Formats:
☒ DW ☐ POTW/WWTP ☐ State: ____ ☐ Other: ____ ☐ EDD/EDT (Electronic Data) Format: ____ ☐ LEVEL IV ☐ NELAC

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids Vegetation Biossay Other DW - Drinking Water

ANALYSIS REQUESTED

Standard Turnaround (TAT) → RUSH

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by:
Cooler ID(s):
Receipt Temp ____ °C
On Ice: Y N
Custody Seal On Bottle Y N On Cooler Y N
Intact Y N
Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	asbestos in water	SEE ATTACHED	LABORATORY USE ONLY
1	2951 Bigtrail	4-1-15	0900	1W	X		01
2	36" Pipe	"	0930	1W	X		02
3	3180 Beaver Slide	"	0910	1W	X		03
4	3380 Appaloosa	"	0925	1W	X		04
5	3105 Bigtrail	"	0930	1W	X		05
6	3405 Arabian	"	0915	1W	X		06
7	3315 Cow Camp	"	0940	1W	X		07
8	storage Tank	"	0950	1W	X		08
9							
10							

C1504006 9

Custody Record MUST be Signed

Relinquished by (print): Dave Stickel	Date/Time: 4-1-15	Signature: D. Stickel	Received by (print):	Date/Time: Signature: C1504006 8
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time: Signature:
Sample Disposal: Return to Client: ____	Lab Disposal: X		Received by Laboratory:	Date/Time: 4/2/15 1009 Signature:

Apparent Temperature 7.2° C

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

OrderID: 161508032

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*: 161508032

PHONE:
FAX:

Company Name: Golder Associates		**EMSL Customer ID:**	
Street: 820 S. Main St. Suite 100	**City:** St. Charles		**State/Province:** MO
Zip/Postal Code: 63301	**Country:** US	**Telephone #:** 636-724-9191	**Fax #:** 636-724-9323
Report To (Name): Chris Redington		**Please Provide Results:** ☐ Fax ☑ Email	
Email Address: credington@golder.com		**Purchase Order:**	
Project Name/Number: Rafter J Ranch / 1529599		**EMSL Project ID** *(Internal Use Only)*:	
U.S. State Samples Taken:		**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt	

EMSL-Bill to: ☑ Same ☐ Different - If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour | ☐ 6 Hour | ☑ 24 Hour | ☐ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☐ 1 Week | ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NYS 198.8 SOF-V
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT** (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec 2 5

TEM – Water: EPA 100 2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite*
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0 1% sensitivity)
- ☐ TEM CARB 435 - C (0 01% sensitivity)
- ☑ TEM Qual. via Filtration Technique
- ☐ TEM Qual via Drop-Mount Technique

*Can not accept New York State Loose Fill Vermiculite Samples

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: Brett Forthaus | **Samplers Signature:** Brett Forthaus

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1	Sediment (TEM Qual.)	1	5/19/15 0945
2	Mortar (EPA 600)	2	5/19/15 1340
3	Clear Well Pipe (EPA 600)	3	5/19/15 1415

Client Sample # (s): 1 - 3 | **Total # of Samples:** 3

Relinquished (Client): Brett Forthaus | **Date:** 5/20/2015 | **Time:** 1200

Received (Lab): [signature] | **Date:** 5-21-15 | **Time:** 8:50

Comments/Special Instructions:
Run TEM for Sample #1; PLM for Samples #2 and #3

EMSL Analytical, Inc.
2001 East 52nd St., Indianapolis, IN 46205
Phone/Fax: (317) 803-2997 / (317) 803-3047
http://www.EMSL.com indianapolislab@emsl.com

EMSL Order:	161508032
CustomerID:	GOLD50
CustomerPO:	
ProjectID:	

Attn: **Chris Redington**
Golder Associates, Inc.
820 South Main Street
Suite 100
St. Charles, MO 63301

Phone:	(636) 724-9191
Fax:	(636) 724-9323
Received:	05/21/15 8:50 AM
Analysis Date:	5/22/2015
Collected:	

Project: **Rafter J Ranch/1529599**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2 *161508032-0002*	Mortar	Gray Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (other)	**None Detected**
3 *161508032-0003*	Clear Well Pipe	Gray Fibrous Homogeneous		90% Non-fibrous (other)	**5% Chrysotile** **5% Crocidolite**

Analyst(s)

Craig Nixon (2)

Richard Harding, Laboratory Manager
or other approved signatory

Initial report from 05/22/2015 12:45:15

EMSL Analytical, Inc.
2001 East 52nd St., Indianapolis, IN 46205
Phone/Fax: (317) 803-2997 / (317) 803-3047
http://www.EMSL.com indianapolislab@emsl.com

EMSL Order:	161508032
CustomerID:	GOLD50
CustomerPO:	
ProjectID:	

Attn: **Chris Redington**
Golder Associates, Inc.
820 South Main Street
Suite 100
St. Charles, MO 63301

Phone:	(636) 724-9191
Fax:	(636) 724-9323
Received:	05/21/15 8:50 AM
Analysis Date:	5/22/2015
Collected:	

Project: **Rafter J Ranch/1529599**

Test Report:Qualitative Asbestos Analysis by Transmission Electron Microscopy (TEM) and Filtration Technique

Sample	Description	TEM Result	Notes
1 *161508032-0001*	Sediment	**None Detected**	

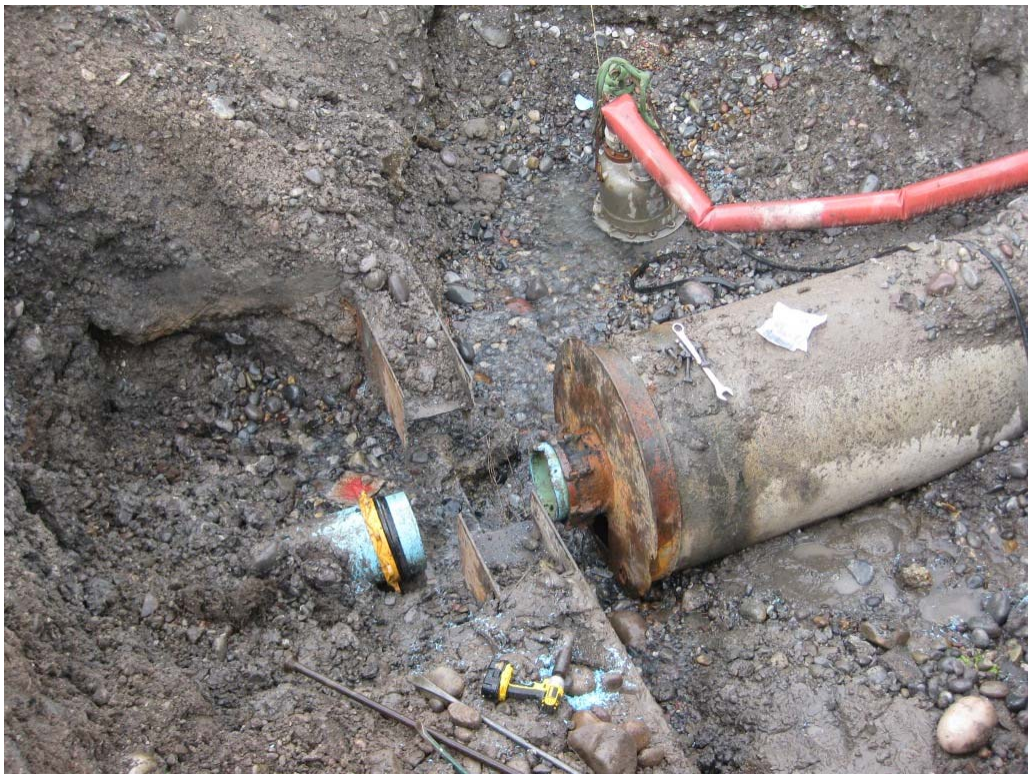
Analyst(s)

Richard Harding (1)

Richard Harding, Laboratory Manager
or other approved signatory

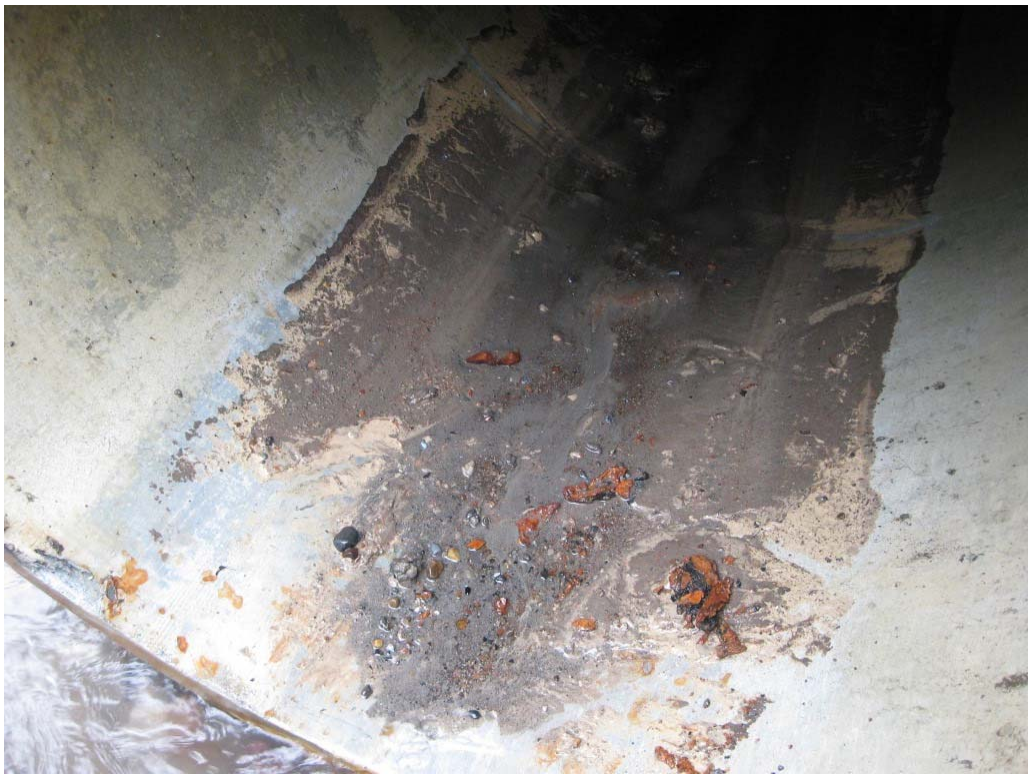
Initial report from 05/22/2015 12:45:15

APPENDIX C
SELECT PHOTOGRAPHS

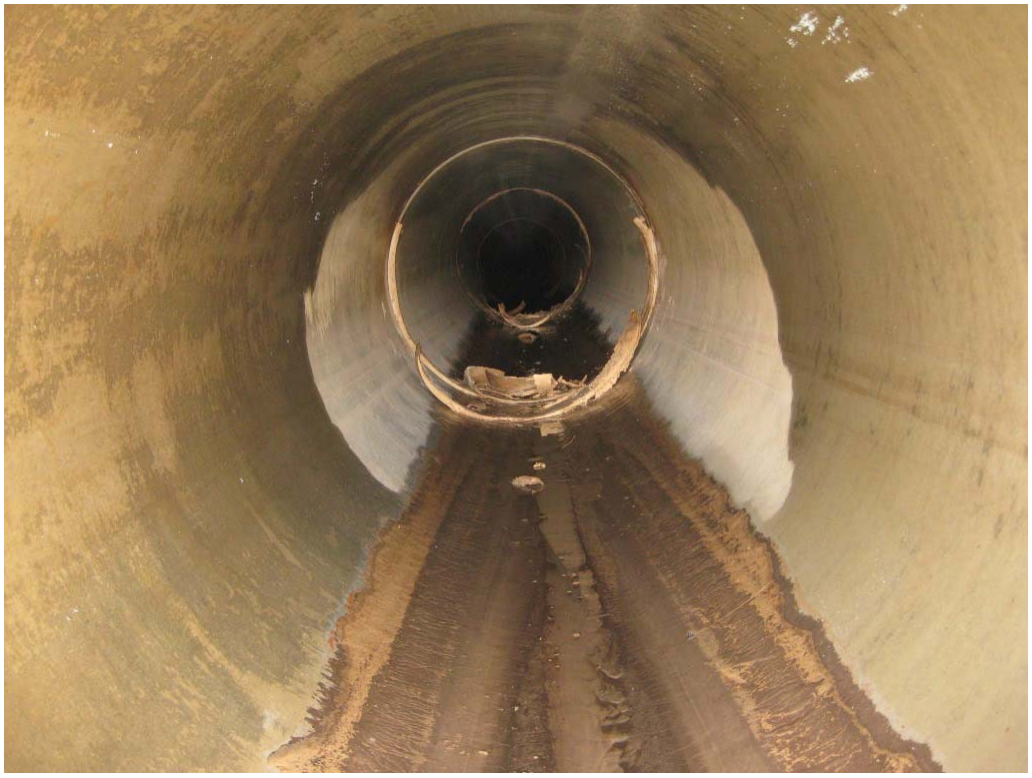


Photograph 1: View of clear well cement pipe with steel end cap intact.

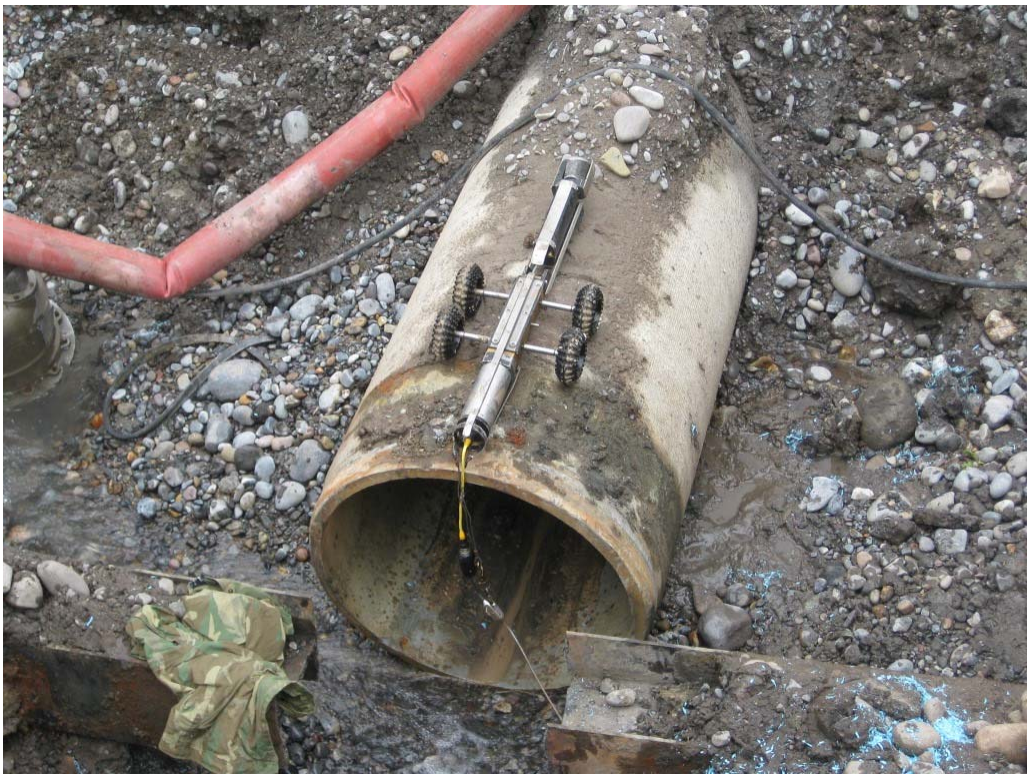
Photograph 2: View of clear well cement pipe with steel end cap removed.



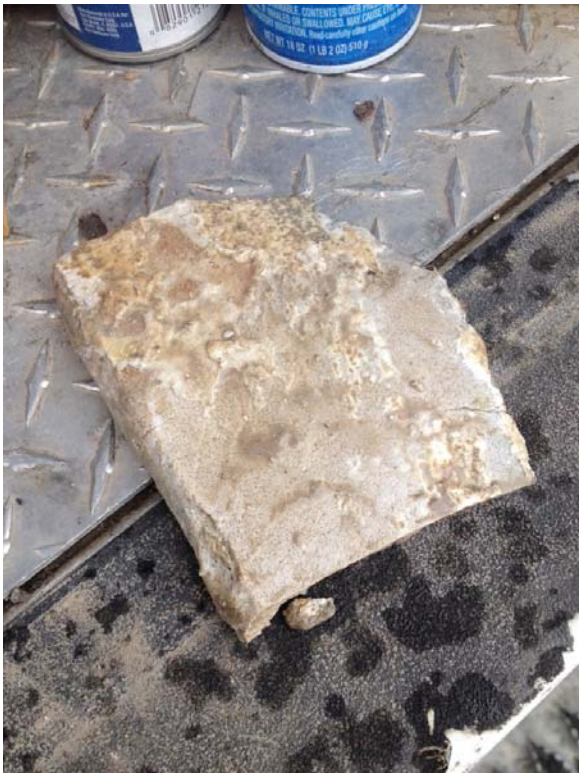
Photograph 3: View of fines, sediment and other debris inside downstream end of clear well pipe.



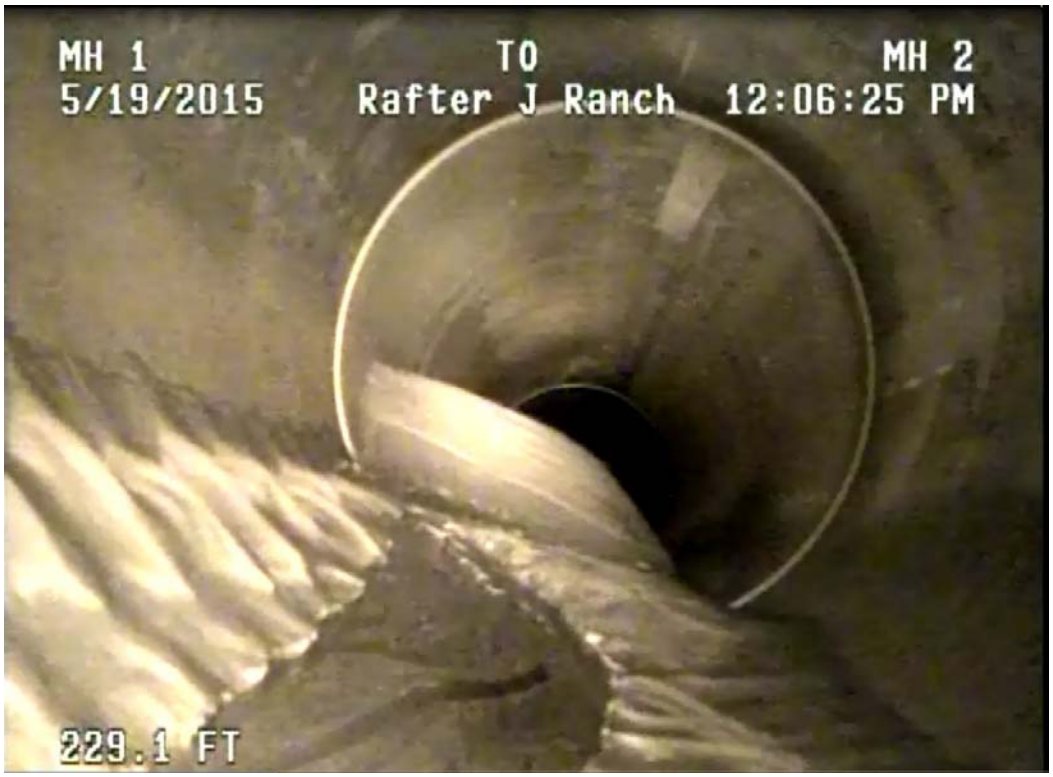
Photograph 4: View inside clear well pipe. Note mortar/grout material at pipe seam.



Photograph 5: View of remote controlled camera vehicle.



Photograph 6: View of mortar/grout from clear well interior pipe seam.



Photograph 7: View of apparent sand mound at upstream end of clear well pipe.

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Inc.
820 S. Main Street, Suite 100
St. Charles, MO 63301 USA
Tel: (636) 724-9191
Fax: (636) 724-9323

Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity