



November 3, 2011

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Ms. Pebbles Clark  
Reclamation Specialist  
Montana Department of Environmental Quality  
Abandoned Mine Lands Program  
P.O. Box 200901  
Helena, MT 59620-0901

Subsidence Maintenance Investigation – Phase 1 Summary  
512 Adams Avenue South  
Red Lodge, Carbon County, MT

Dear Ms. Clark:

The following memorandum summarizes the subsidence investigation activities performed by DOWL HKM during August and September 2011 for the above referenced property located in Red Lodge, Montana. This work was completed as outlined in Task Order No. 19, which was issued pursuant to DEQ Contract No. 407033 between DOWL HKM (Contractor) and the Montana Department of Environmental Quality (DEQ). The purpose of Task Order No. 19 is for review of existing data related to the subsidence complaint by Mr. Andy VanOrnum for his property located at 512 Adams Avenue South (the abandoned Hymer Mine Shaft is located on this property) and performing a site survey and inspection.

If you have any questions regarding this project, please contact me at (406) 869-6372 or email to [cpeterson@dowlhkm.com](mailto:cpeterson@dowlhkm.com).

Sincerely,

DOWL HKM

A handwritten signature in black ink, appearing to read "Charles L. Peterson".

Charles L. Peterson, PG  
Project Manager

A handwritten signature in blue ink, appearing to read "Carla Van Sicken".

Carla Van Sicken, PG  
Geologist/GIS Specialist

Encl. Memorandum Report and CD

## MEMORANDUM

**TO:** Ms. Pebbles Clark, Reclamation Specialist  
Montana Department of Environmental Quality  
Abandoned Mine Lands Program

**FROM:** Charles L. Peterson, PG, Project Manager  
Carla Van Siclen, PG, Geologist/GIS Specialist

**SUBJECT:** Subsidence Maintenance Investigation – Phase 1 Summary  
512 Adams Avenue South  
Red Lodge, Carbon County, MT

**DATE:** November 3, 2011

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### PROJECT DESCRIPTION

The Montana Department of Environmental Quality - Abandoned Mine Lands Program (DEQ-AML) was contacted on August 1, 2011 by Mr. Andy VanOrnum, the owner of the property at 512 Adams Avenue South regarding continued subsidence at his residence. The location of the subject property is shown on Figure 1 in Appendix A. Previous investigations have identified that the abandoned Hymer Mine Shaft is located on this property. According to Mr. VanOrnum, he purchased the property in 1982 and has had continued subsidence ever since that time. He indicated that over the years, fill was imported and added to the subsiding portion of the back yard. Between 1982 and 1998, Mr. VanOrnum added on to the existing house creating a larger footprint which now encroaches on the subsidence area associated with the Hymer Mine Shaft. Mr. VanOrnum originally contacted the Montana Department of Environmental Quality – Mine Waste Cleanup Bureau (DEQ-MWCB) in 1998 regarding the subsidence. A grouting program was initiated and completed in 1998. A 1998 report prepared by Spectrum Engineering for the Montana Department of Environmental Quality, Mine Waste Cleanup Bureau summarizes the site history and the drilling and grouting program conducted in 1998 (Spectrum, 1998).

During August 2011 DOWL HKM personnel conducted three site visits and performed a spot elevation survey of the subject property. Charlie Peterson, a Professional Geologist with DOWL HKM, and DEQ personnel Pebbles Clark (Project Manager), Nick Kujawa, and Devin Clary made an initial site visit on August 4<sup>th</sup>, 2011. The purpose of the initial site visit was to meet the property owner and assess current conditions at the site. On August 22<sup>th</sup>, 2011 DOWL HKM Professional Geologist, Carla Van Siclen, and Licensed Surveyor, Bob Rux, conducted a site inspection and performed a spot elevation survey. Pebbles Clark was on site during the site inspection and survey work. Photos were taken during the August 4<sup>th</sup> and 22<sup>th</sup> site visits (See Appendix B). On August 30<sup>th</sup> Charlie Peterson and Carla Van Siclen performed a third site inspection of the subject property to review the surveyed locations and observations made during the previous visits. The following sections provide the results of the survey and site inspection.

## BACKGROUND

### Local Geologic Setting

Red Lodge, Montana is located on the northern edge of the Beartooth Mountain Range along the Rock Creek valley. Quaternary alluvial terraces and recent alluvium overlie the Tertiary Fort Union Formation in the area. Figure 2 in Appendix A is a geologic map of the Red Lodge area (Lopez, 2005). A thick Quaternary alluvial terrace deposit (Qat2) forms the west edge of the valley and is referred to as the West Bench. Thinner deposits of Quaternary alluvium (Qat3 and Qat4) overlie the Fort Union which has been eroded to form the east edge (East Bench) of the valley. The town of Red Lodge is underlain by Quaternary terrace deposits and recent alluvium (Qat1 and Qal).

Based on a review of published material and well logs, the thickness of the alluvium appears to vary from a few feet to over 100 feet in the valley bottom. As part of a preliminary study of the potential for subsidence in the Red Lodge and Bearcreek Areas, Chen-Northern (1987) advanced a drill hole (DH-3) to 450.5 feet approximately three blocks northeast of the subject property (Figure 3 in Appendix A). The base of the alluvium was encountered at a depth of 108 feet. At least 85 feet of alluvium was encountered in drill hole DH-4 at the subject property (Spectrum, 1998). However, during well log research of the Montana Bureau of Mines and Geology (MBMG) Groundwater Information Center (GWIC) website several well logs along the central and east sides of town noted encountering relatively shallow (less than 25 feet) bedrock (Figure 3 in Appendix A). Note that the Object ID listed near each well can be used as a cross reference with Table 1 in Appendix C. Table 1 presents additional well information obtained directly from the GWIC website, with the exception of the “Depth to Bedrock” information which was added by DOWL HKM after review of the well logs. There is some indication that the exploration holes referenced in Campbell (1906) also encountered bedrock at a shallow depth. Well logs near the subject property indicate that the alluvium is at least 40 to 60 feet thick but these wells did not fully penetrate the alluvium and bedrock was not encountered. Based on existing information at and near the site the alluvium is at least 85 feet thick and may be over 100 feet thick.

The Fort Union Formation is readily exposed along the east bench and consists of mainly shale, siltstone, sandstone, and coal deposits. The bedrock in the Red Lodge area dips approximately 25 degrees to the south-southwest toward the Beartooth Mountains (Lopez, 2005). The coal deposits are part of the Red Lodge-Bearcreek Coal Field, formerly the Red Lodge Coal Field (Roberts, 1999 and Woodruff, 1909). The coal deposits are present on the east and west benches as well as below the town of Red Lodge.

### Groundwater

As previously mentioned; groundwater well information was retrieved from the MBMG GWIC database and reviewed. Well locations were plotted in ArcGIS using the latitude and longitude coordinates provided in the GWIC database and are shown on Figure 3 in Appendix A. Note that the accuracy of the coordinate locations provided by GWIC can vary substantially depending on the method used to locate the wells. According to the GWIC metadata, some wells were located using a more accurate Global Positioning System (GPS) and a site visit has been conducted. However, most of the wells were located by contract drillers and landowners using a township, range, section, and tract description and substantial errors in location are possible. Additional well information is provided in Table 1 in Appendix C.

The depth of groundwater below the surface near the subject property appears to be in the range of 2 to 23 feet. Drill hole DH-9 drilled on the Subject Property in 1998 was drilled to a depth of 34 feet and completed as an irrigation well (Spectrum, 1998). A water level of 19 feet was measured after the well was completed. Mr. VanOrnum stated that the well has had water in it this year but does go dry. The water level in the well was not verified during the August 2011 site visits.

According to the MBMG GWIC website 15 long term monitoring stations exist in Carbon County. However, only one well (Object ID 32) is located in the valley bottom. This well is located approximately eight or nine blocks northeast of the subject property and is completed at a depth of 38 feet in alluvium. Static water level readings have been collected at this site since 2002. Water level readings were relatively consistent from 2002 through 2010 and ranged from about 12 to 14 feet below ground surface. However, in 2011 the range in water level readings varied from about 9 feet to 15.6 feet below the ground surface. Review of the United States Geological Survey (USGS) National Water Information System Mapper website, no long term groundwater monitoring sites maintained by the USGS are located in the town of Red Lodge. No additional water level information was reviewed for this study.

### Mining History

Coal was first discovered along the east side of the Rock Creek drainage in the mid-1860's (Spectrum, 1989 and Anderson, 1983). There was no accessible market at the time, but with the completion of the Laurel to Red Lodge railroad in 1889, commercial mining commenced (Spectrum, 1989 and Anderson, 1983). The Red Lodge mining district consisted of two mines, the Sunset and Red Lodge Mines, referred to on the Carbon County Historical Society website as the West Side or Sunset Mine and the East Side or Sunrise Mine, respectively.

Campbell (1906) identifies eleven coal beds in the Red Lodge area and notes that additional thin beds of coal occur lower down in the rock section. Roberts (1999) states that "in the Red Lodge district, at least seven coal beds, originally designated as coal beds 1 through 7, were identified in the coal-bearing interval of the Fort Union." Two additional beds were later discovered which are referred to as beds Number (No.) 1½ and 4½ (Roberts, 1999 and Woodruff, 1909). According to Combo (1949), eight beds of coal (No. 1, 1½, 2, 3, 4, 4½, 5, and 6) are known to have been worked in the vicinity of Red Lodge.

Hard copies of the historic mine maps and information related to a project conducted by MSU-B College of Technology which took the historical mine maps and converted them to a three dimensional electronic format was provided to DOWL HKM by DEQ-AML. The MSU-B information indicates that maps for coal beds No. 1½, 2, 3, 4, 5, and 6 were located and converted to a digital format. A preliminary summary memo for the MSU-B project indicates that they were not able to locate any records for beds No. 4½, 7, or 8. There is also no information on coal bed No. 1 in the data from the MSU-B project. Although they may exist, it appears that historic mine maps for these four beds have not been located. Also, based on review of the Chen-Northern (1987) report, another map showing mining of the No. 2 bed below the town of Red Lodge exists. Historical mine maps exist for six of the eight beds known to be worked in the vicinity of Red Lodge (No. 1½, 2, 3, 4, 5, and 6). It is the understanding of DOWL HKM that no maps have been located for beds No. 1 or 4½ or beds No. 7 or 8, which may indicate these beds were not mined extensively in the Red Lodge area.

Mine workings underlie the East and West Benches as well as portions of the town of Red Lodge. Preliminary review of the Chen-Northern (1987) report, historical maps, and the data developed by MSU-B show that the No. 1 ½ bed was mined approximately a block and half to the south of the subject property at a depth of about 450 feet (Exhibit 1 in Appendix A). Chen-Northern (1987) show that the No. 2 bed was mined to within approximately ½ block south of the subject property at a depth of about 400 feet. The No. 2 bed would have had workings closest to the surface in the area of the subject property. However, no underground mine map of the No. 2 bed in this area has been located by the DEQ-AML. The No. 4 bed appears to have been mined within about a half a block north and south of the subject property. Mining of the No. 5 bed appears to have occurred within one block of the subject property to the north and east. Mining activities in the area related to the No. 4 and No. 5 beds appear to have occurred at depths greater than 500 feet. No mining appears to have occurred directly below the subject property, although the No. 4 bed mining is very close. As part of a preliminary study of the potential for subsidence in the Red Lodge and Bearcreek Areas, Chen-Northern (1987) borrowed mine maps from Meridian Minerals and developed three maps of the Red Lodge area showing depth of cover, cumulative mined thickness, and subsidence potential. Electronic versions of these maps, which were imported into ArcGIS and geo-referenced by DOWL HKM are presented in their modified form as Exhibits 1, 2, and 3 in Appendix A. The cumulative mined thickness map (Exhibit 2 in Appendix A) also shows no mining below the subject property. Chen-Northern (1987) also developed cross sections of mine limits (Exhibit 4 in Appendix A), the locations of which are shown on these exhibits. However, note that cross section A-A' and C-C' are mislabeled and should be reversed when comparing the cross sections to the maps.

Note that the original mine maps and any maps interpreted from the original mine maps may have some level of inaccuracy associated with them. Reasons for these inaccuracies could range from original survey errors to assumptions made during conversion to an electronic format. The location of the pillars, voids, tunnels, and any below grade features should be considered approximate.

The coal production in 1889 was 6,000 tons and in 1920 production was over a million tons (Spectrum, 1989 and Anderson, 1983). In 1924, coal production began in Colstrip, Montana, forcing a cut back in production at Red Lodge (Spectrum, 1989 and Anderson, 1983). The West Side Mine closed July 31, 1924 and the East Side Mine closed June 30, 1932 (Zupan and Owen, 2000). According to the Mining Artifacts & History website, "The Great Depression forced more mines to close, and in 1943 an underground explosion killed 74 men at the Smith Mine in Bearcreek four miles east of Red Lodge, devastating the community and effectively ending coal mining in Carbon County."

Subsidence related to the mining activities has been documented east of Red Lodge and in the Bear Creek Area (Spectrum, 1989). Chen-Northern (1987) only identified two small areas of moderate subsidence potential on the east side of town (Exhibit 3, Appendix A). It has been approximately 70 to 80 years since mining ceased in the Red Lodge area. Although subsidence related to mining could have occurred in that time, based on the information reviewed by DOWL HKM, it appears that the Hymer Mine Shaft subsidence is the only documented active subsidence within the town of Red Lodge.

### History of the Subject Property

According to the Spectrum (1998) Report, during the early 1900's surface facilities and what is thought to be a vertical mine shaft were located on the subject property. The subject property was owned by a Mr. Hymer, and the mine shaft is referred to as the Hymer Mine Shaft. The Spectrum

(1998) report indicated that virtually no documented history exists on the project site except for Sanborn Fire Insurance maps (Sanborn maps). DOWL HKM reviewed the Sanborn Fire Insurance maps of the property from 1891, 1896, 1901, 1907, 1912 and 1927 at the Carbon County Historical Society in Red Lodge, Montana. There is no Sanborn map coverage of the property in 1891 or 1986. Nothing is shown on the property in 1901, but the 1907 and 1912 maps show a mine shaft was located on the property. There is also a reference to the Red Lodge Coal Companies Hoisting Works and associated facilities on the 1907 and 1912 Sanborn Maps. These maps also state “not in operation” and “no watchman”. By 1927, the surface facilities are gone and a house occupies the western portion of the lot.

Additional information regarding the Red Lodge Coal Company and the land owner, W. E. Hymer was located during research by DOWL HKM at the Carbon County Historical Society. Two articles in the paper archives of the Historical society dated April 7, 1904 and August 25, 1904 provided additional mine and shaft construction details (Appendix D). The April 7, 1904 article indicates that the “Red Lodge Coal Company Awards Contract for Sinking a Double compartment Shaft”. The article also states “Red Lodge is soon to have another big coal mine”. The location of the shaft is described as the southwest quarter of Block 38 of the Hymer addition. This description matches the legal description of the subject property. According to the article, the plan was to sink a perpendicular, double compartment, shaft 200 feet deep to vein No. 1. The shaft was to be eight feet eight inches by sixteen feet two inches and the shaft was to be timbered with “10 x 10 stuff, with 3 x 12 lagging. All the timbers and lumber were to be of fir and furnished by the company.” The August 25, 1904 article stated that the shaft was being put down at a rate of two feet a day and “a depth of fifty feet has now been attained.”

Spectrum (1998) states that “according to old timers in Red Lodge, the Red Lodge Coal Company Mine or Hymer Mine was started because Mr. Hymer felt the major coal companies were stealing his coal... He supposedly started the mine to prevent theft. Apparently his son got killed in the mine and the property was then abandoned.” According to Stout (1921) W.E Hymer’s son Clarence was killed in a mining accident in June of 1905. It is not known if construction of the Hymer mine shaft ceased after this time.

Based on additional research by DOWL HKM it does appear that that the Hymer Shaft is a separate feature and was not related to the two major mines in the area. However, it is still unclear if the shaft was completed to a final depth of 200 feet as planned or if it was terminated prior to reaching total depth. It is also not known whether coal mining in the No. 1 bed was initiated. According to Spectrum (1998), “the actual shaft closure method was unknown; but, it was at least partially backfilled prior to 1917”. It is unclear where Spectrum got this information, except that the shaft is not shown on the 1927 Sanborn maps. Additional information regarding the progress of the shaft construction or status after August 25, 1904 may be available in the archives at the Carbon County Historical Society in paper or micro fiche format. Information on the 1907 Sanborn map indicates that the Hymer mine shaft/facilities were not in operation at that time so archive research should focus on the time period from August of 1904 to 1907.

Apparently, the house was built in 1917 and subsidence at this property was first noticed in 1959 (Spectrum, 1998). According to an adjacent neighbor of the subject property, there was a major collapse (several feet deep) over the shaft area in 1959 which was backfilled (Spectrum, 1998). Although there is no mention in the 1998 Spectrum Report of the exact date, the collapse may have been associated with ground shaking caused by the Hebgen Lake Earthquake which occurred on August 17, 1959. According to an article published in the Billings Gazette on August 18, 2011,

“Mrs. J.H Patton said in Red Lodge she felt two tremors in a “good shaking” ” (Colorado-West, 2011). Spectrum (1998) states that the original house was smaller and far enough away from the shaft that no subsidence would have affected it and DOWL HKM concurs with this statement after reviewing the house footprint on the 1927 Sanborn map.

In 1998, the DEQ-MWCB was apparently contacted by Mr. VanOrnum and made aware of the continued subsidence near his house. The DEQ-MWCB contracted with Spectrum Engineering to conduct an investigation and grouting project of the Hymer Mine Shaft. The 1998 Spectrum report states that “the current landowner added onto the original house (within the past 15 years) and added a deck. A hairline crack was observed in the house foundation and about 3-inches of settling was observed in the deck in the last four years”. Spectrum (1998) also states that “roughly 30 to 40 cubic yards of fill has been dumped into this subsidence area within the past four years”. Prior to the grouting project, the subsidence depression was about 25 feet in diameter and had a 1 foot depression (Spectrum, 1998). The Spectrum (1998) report indicates that due to active subsidence the DEQ-MWCB initiated a grouting project to prevent continued subsidence.

During August of 1998, Spectrum Engineering and Bush Drilling performed drilling and installed 329 feet of casing, 62.2 cubic yards of grout placed in the ground and 156 bags of neat cement mixed and placed and surface restoration consisting of hauling in 6 cubic yards of gravel for alley repair and 32 yards of topsoil hauled and placed for yard restoration (Spectrum, 1998). It appears that 10 drill holes were advanced of which nine were two depths of 35 feet or less and one drill hole (DH-4) was advanced to 85 feet. No information was provided for DH-6. The location of the drill holes is shown in Figure 4 in Appendix A. Pieces of wood, voids, and coarse-grained alluvium were encountered during drilling. However, it is still unclear how deep the original shaft was and whether the wood supports were installed the entire length of the shaft. Spectrum (1998) states that “from 78 to 85 feet it was a solid, native compacted sand and gravel mixture which was almost impossible to drill through. Conclusion reached that over the last 80 years the gravel aquifer has deposited (washed) sand and gravel down the shaft to wherever the bottom truly is and built up the shaft to a very solid and stable base at 78 feet depth.”

Spectrum (1998) states it “believes that the void associated with the shaft has been eliminated... No further settling should occur on the deck and certainly not in the house foundation” but that some minor settling of the placed topsoil may happen over time. A geophysical survey of the area near the shaft indicated that the “subsurface materials appear to be uniform in structure” and “the structural integrity or the ballast indicates no major structural weaknesses in the area of the reclaimed void.” In August 2011, Mr. VanOrnum reported continued subsidence to the DEQ-AML. According to Mr. VanOrnum, approximately 1 foot of additional subsidence (a subsidence rate of approximately 1 inch per year) has occurred near the back deck of the residence since the grouting program was complete.

In 1999, Gradient Geophysics conducted a ground penetrating radar (GPR) survey of area in and near the shaft for Spectrum Engineering. There results indicated that there was no structural failure of the grout.

## FIELD INVESTIGATION

### Site Inspection

The site inspection included visual inspection of the property and the southern exterior of the house at 512 Adams Ave. S. and taking photographs of pertinent features (See Appendix B). The residence at 512 Adams Ave. S. is a two story wooden framed house built upon a concrete foundation. As previously mentioned, the original house was thought to be constructed in 1917 and sometime between 1982 and 1998, Mr. VanOrnum added on to the existing house creating a larger footprint which now encroaches on the subsidence area associated with the Hymer Mine Shaft.

The house is provided with city water and sanitary sewer service, underground natural gas and overhead electric service. The yard surrounding the house consists of manicured lawn and a few trees and ornamental bushes. A wood fence has been installed around the back yard. It is the understanding of DOWL HKM that Mr. VanOrnum has had to jack up the southernmost three posts holding up his roof as well as shim the wood fence that extends across the subsidence area. Mr. VanOrnum also pointed out that the concrete sidewalk in the backyard has developed cracks. Based on photographs taken by Spectrum (1998) and Gradient (1999) the sidewalk was installed sometime after the 1998 grouting project was completed and prior to June 3, 1999.

The shims below the wood posts holding up his roof are visible when the decking is removed and the shims below the fence are also visible. The cracks in the concrete sidewalk are visible and appear to be offset down to west which was consistent with the survey results.

The back yard of 518 Adams Avenue South, just south of the approximate shaft location was also inspected and photographed. Open cracks with what appeared to be a “down to the north” component were observed on the ground approximately 8 to 10 feet south of the fence line. The cracks were oriented east-west to slightly southeast-northwest. A small green-house located in the back yard of 518 Adams Ave. S. obscures the ground southeast of the shaft.

### Spot Elevation Survey

Spot elevation measurements of the ground surface were collected in the back yard of subject property on August 22<sup>nd</sup>, 2011. Survey locations are shown on Figure 4 in Appendix A. The vertical survey data collected for 512 Adams Ave. S. was collected using an optical, survey grade Sokkia B-1 level. The horizontal positions for these points were measured using a Trimble R-6 dual frequency survey grade GPS receiver in RTK mode. The high level of horizontal accuracy that the survey grade GPS receiver provided will enable the same spot elevation locations to be re-established in the future. However, because there was a concern that the GPS unit may have some multi-path interference that would cause vertical inaccuracies due to the close proximity of some of the locations to the house, a differential survey of these positions was also conducted. Control for the vertical survey was National Geodetic Survey (NGS) benchmark “R 215”. A separate level loop was run from NGS benchmark “Red Lodge” through “R215” on August 25<sup>th</sup>, 2011. The vertical datum for this survey is North American Vertical Datum (NAVD) 88. The horizontal datum is North American Datum (NAD) 83. Horizontal coordinates are Montana Zone 2500 State Plane. Horizontal units are International Feet and vertical units are U.S. Survey Feet.



Several survey transects were made across the yard, including across the approximate shaft location, and some additional spot elevation locations of the yard were surveyed. One spot elevation measurement was collected on the top of the third concrete pier from the south side of the house which supports the roof of the house. According to Mr. VanOrnum, this pier has seen the most settlement.

This initial survey shows a low spot exists near the deck where the greatest amount of house jacking has taken place, and just north of the approximate shaft location. However, significant landscaping has occurred in the back yard and a more appropriate way to identify the location of the greatest subsidence is to compare these elevations with a future survey. If a consistent rate of subsidence occurs in the future, (approximately 1 inch per year based on information provided by the land owner) it should be detectable through the survey methods utilized for this project within 6 months to a year.

### CONCLUSIONS

- It appears that the area near the Hymer Mine Shaft is still subsiding at what the property owner describes as a relatively consistent rate.
- The 1998 grouting program appears to have failed to stop the subsidence.
- The total depth of the shaft and amount of wood used to support the shaft is still unknown. Because of this, it is hard to determine whether the continued subsidence is from the decomposition and break down of the wood structure, or if there are still voids in the shaft, or if there is some conduit or connectivity of the Hymer Mine Shaft/Mine to the other mine workings in the area that may facilitate migration of the alluvium and fill.

### RECOMMENDATIONS

Based upon review of the information supplied by DEQ-AML, published information, the site inspection, and survey results, the following recommendations are made:

- It is recommended that periodic site inspections and surveys be completed to monitor and document any continued subsidence. The survey should include repeating the initial survey to document the location, rates, and magnitude of any subsidence. It is recommended that a survey be conducted before winter (November) and again in the spring after the snow melts.
- Safety may be an issue at the site and DEQ-AML may have to develop a site safety plan while monitoring continues.
- DEQ-AML should keep in touch with the land owner and adjacent property owner on regular basis to monitor the situation.
- An attempt should be made to locate any additional mine maps or mine related information, particularly any information referenced in the Chen-Northern (1987) report specific to the Red Lodge area mining as well as any additional information regarding how vertical mine

shafts, such as the Hymer Mine Shaft, may have been constructed. As previously mentioned, additional information regarding the progress of the shaft construction or status after August 25, 1904 may be available in the archives at the Carbon County Historical Society in paper or micro fiche format. This information could be very useful in determining the depth of the shaft and whether mining had commenced. Gathering this type of data is the most cost effective way to gain additional knowledge of the Hymer shaft.

- Additional instrumentation could potentially be installed to gauge the rate at which subsidence is occurring below the deck supports.
- There are methods of stabilization that could be utilized to protect the house from continued subsidence, however, these methods are expensive and may be cost prohibitive and do not address the subsidence of the ground near the house but may be worth consideration.
- DEQ-AML should continue to evaluate why the original grouting program failed to stop the subsidence. As mentioned in the conclusions, it is hard to determine whether the continued subsidence is from the decomposition and break down of the wood structure in the shaft, if there are still voids in the shaft, or if there is some conduit or connectivity of the Hymer Mine Shaft/Mine to the other mine workings in the area that may facilitate migration of the alluvium and fill. Research in the archives at the Carbon County Historical Society may aide significantly to our understanding of the final shaft depth and status of the mine when it was abandoned.
- Some research regarding the rate of decay and volume loss of wood timbers would also help understand potential volume changes.
- Additional information regarding the shaft, if located, combined with the information collected by Spectrum (1998) would be beneficial when designing a sub-surface investigation program to assess and characterize existing sub-surface conditions.
- Any sub-surface investigation should be designed with the objective of development a conceptual model of the subsidence which would allow development of an appropriate remedy.
- Additional instrumentation could potentially be installed, such as settlement monuments, to help determine the mode and depth at which the subsidence is occurring.
- The objectives of any sub-surface exploration program are recommended to include establishing basic geologic and shaft conditions including determining depth to groundwater, soil/fill types and thicknesses, condition of the grout, presence of voids, depth to bedrock, and total depth of the shaft.
- There are numerous types of drill rigs and drilling contractors that can penetrate the coarse alluvium and bedrock to the depths required by any drilling program.

## LIMITATIONS AND CONCERNS

- Very little sub-surface information exists near the subject property. Only one hole out of 10 drilled at the site in 1998 went deeper than 35 feet.
- Mr. VanOrnum indicated that the subsidence has been relatively consistent with time. However, although rare, a seismic event such as the Hebgen Lake Earthquake which may have been the cause of the previous “major collapse” could potentially cause another major collapse in the future.
- The grouting project may have changed the dynamics of the subsidence.
- The presence of a plug of grout at the top of the shaft may complicate a second grouting project.

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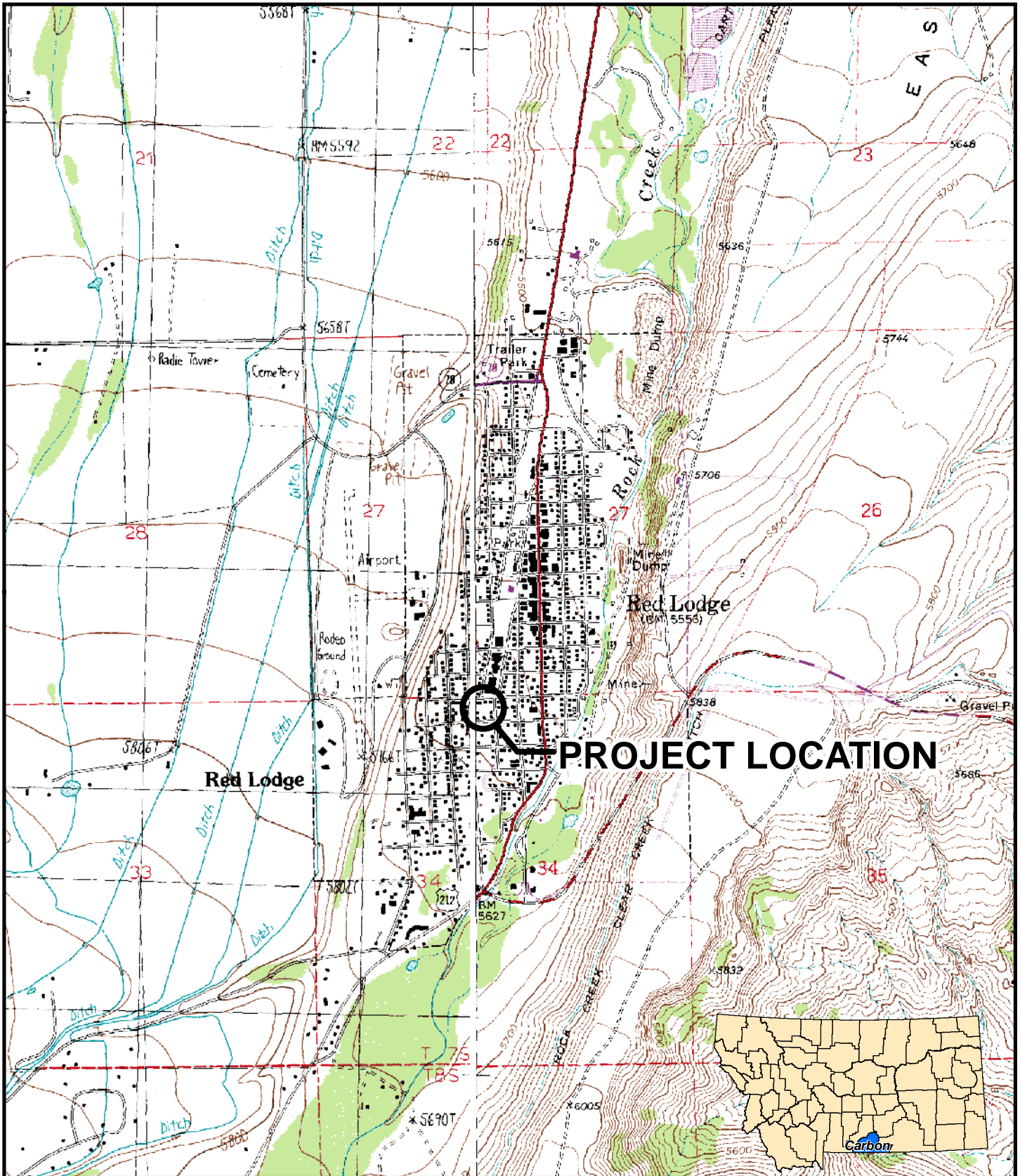
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**APPENDIX A**

**FIGURES AND EXHIBITS**



**Figure 1 - Vicinity Map**  
**512 Adams Avenue South**  
**Block 38, Lots 12-13, Red Lodge Hymer Addition**  
**Red Lodge, Montana**

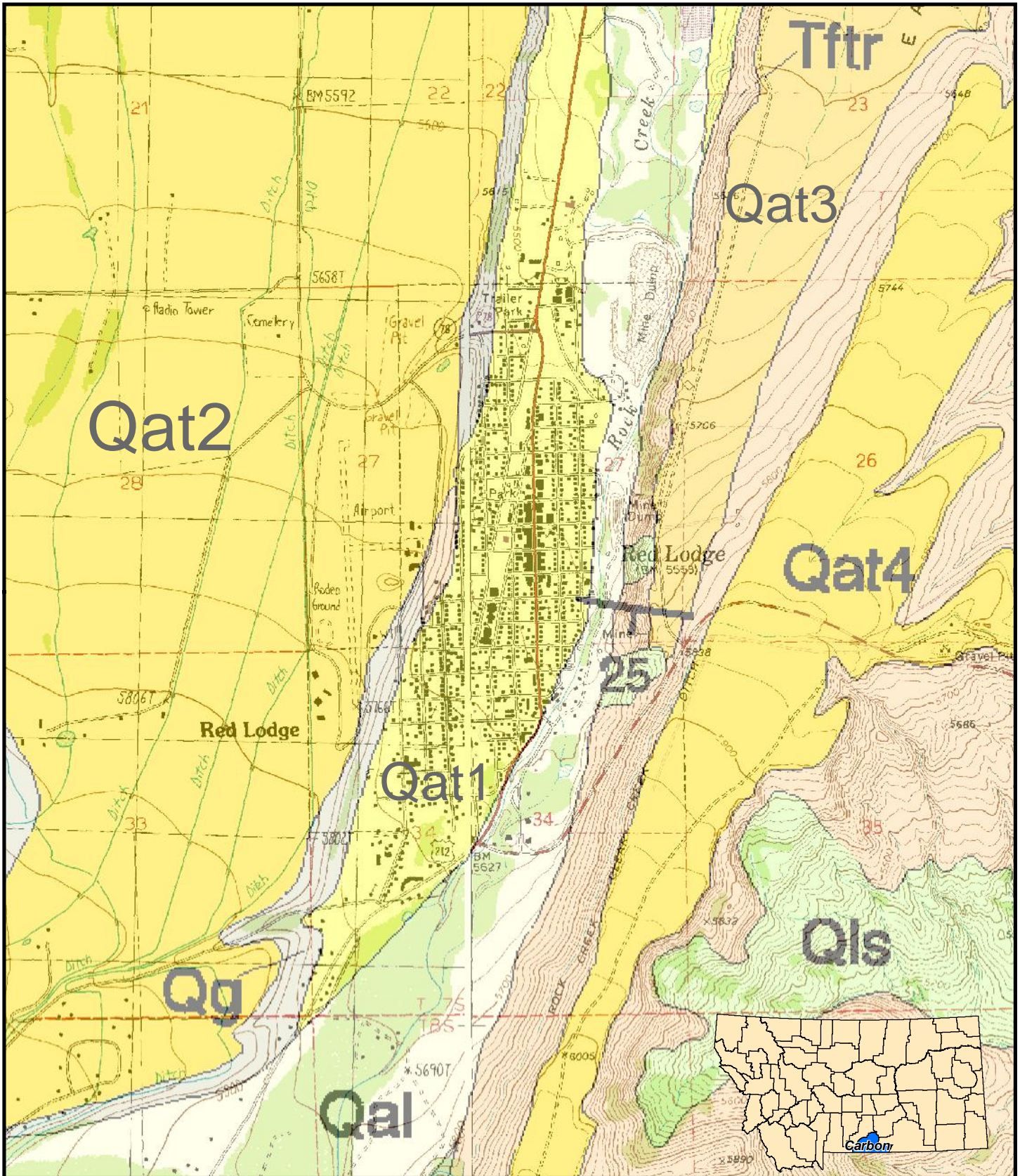
Map Source: USGS 7.5 Minute Topographic Map Series  
 Red Lodge East and Red Lodge West Quadrangles



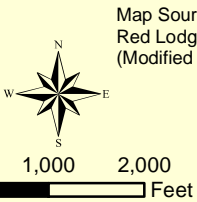
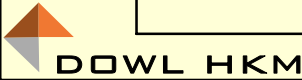
0 1,000 2,000  
 Feet

Job #: 4031.20281





**Figure 2 - Geologic Map  
Red Lodge, Carbon County Montana**





**Figure 3 - Area of Potential Shallow Bedrock**

**Legend**

**Select GWIC Wells**

- ▲ 9 (56) Depth to Bedrock in feet

**Drill Holes**

- ▲ USGS Bulletin 316, 1906
- ▲ Chen-Northern, 1987
- ▲ Spectrum Engineering Inc., 1998

□ House of interest

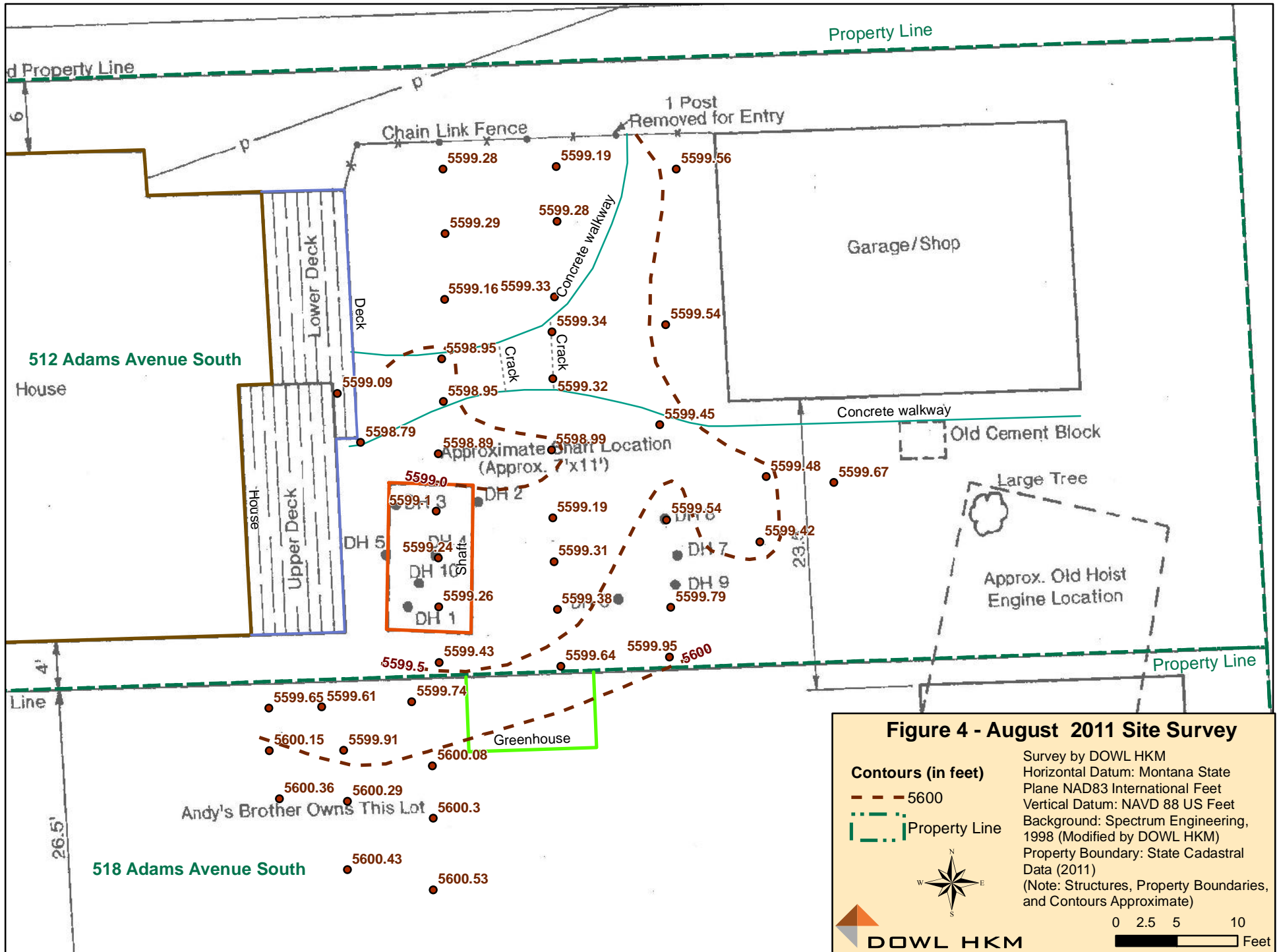
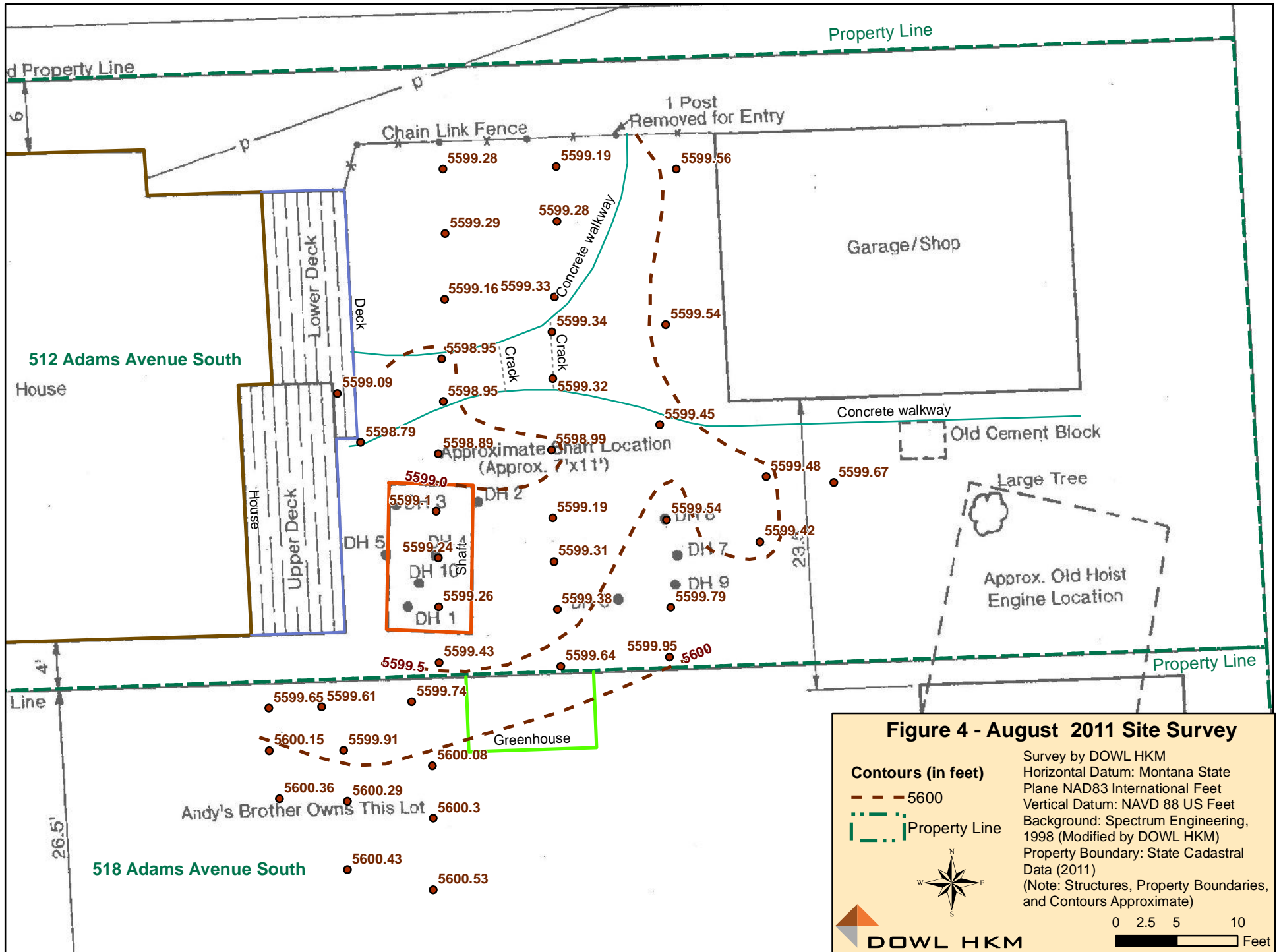
■ Possible Shallow Bedrock (<25 feet) and (Object ID) See Table 1  
[>38 = greater than 38 feet]

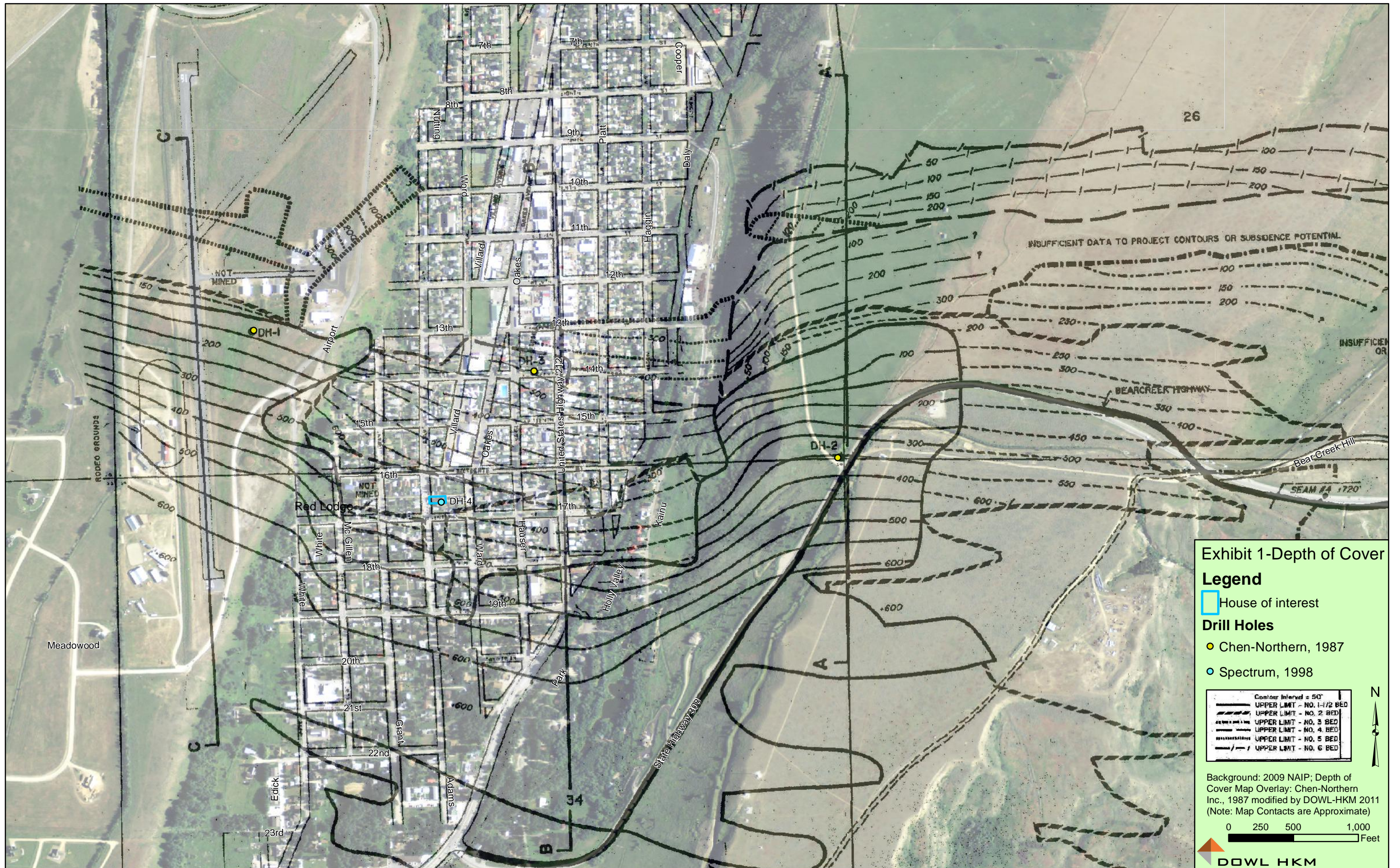
Background: 2009 NAIIP; Note that well locations are approximate and based on data provided on the MBMG GWIC Website

0 200 400 800 Feet

**DOWL HKM**







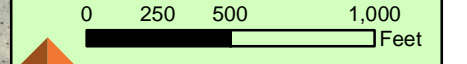
**Exhibit 1-Depth of Cover**

**Legend**

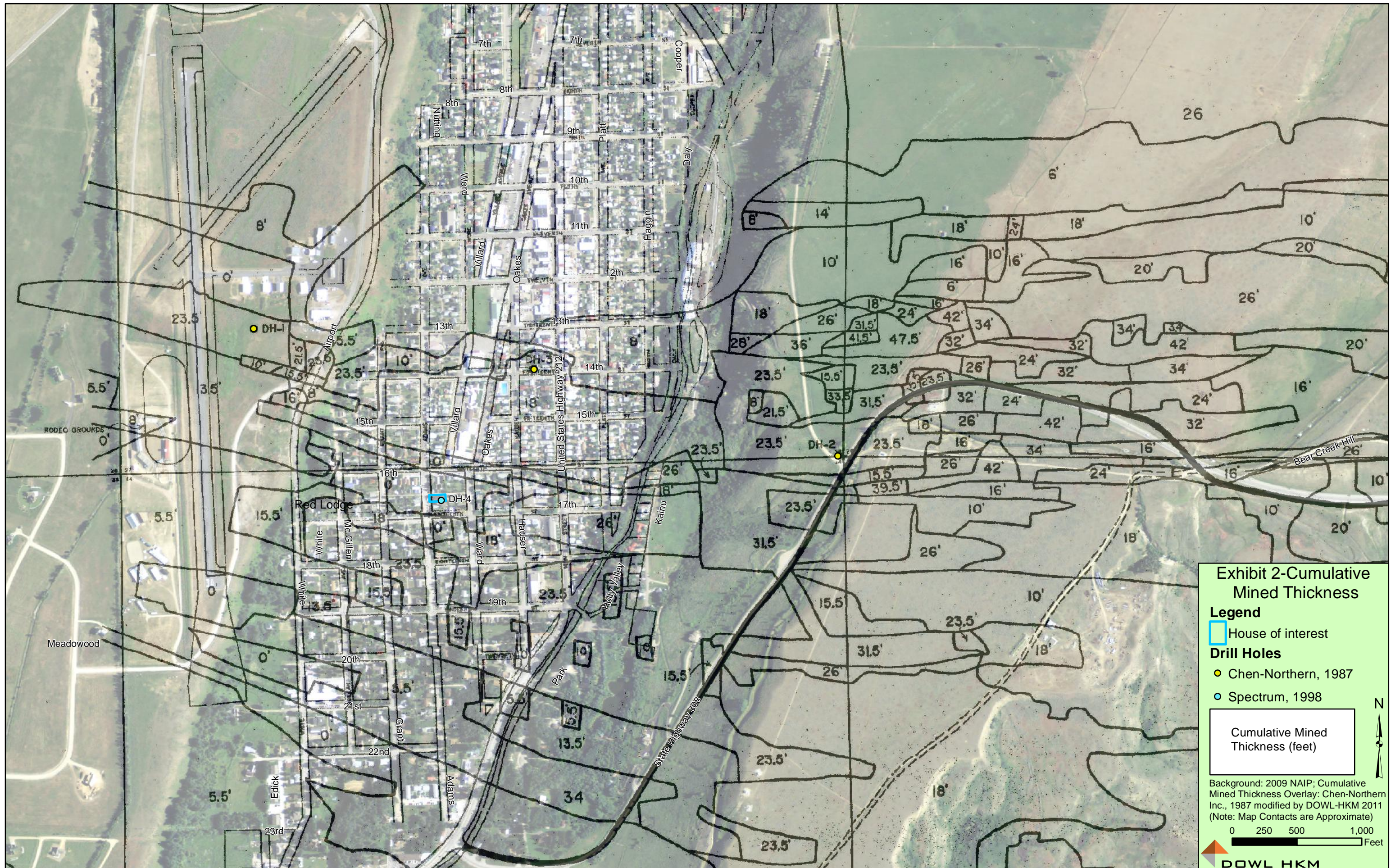
- House of interest
- Drill Holes**
- Chen-Northern, 1987
- Spectrum, 1998

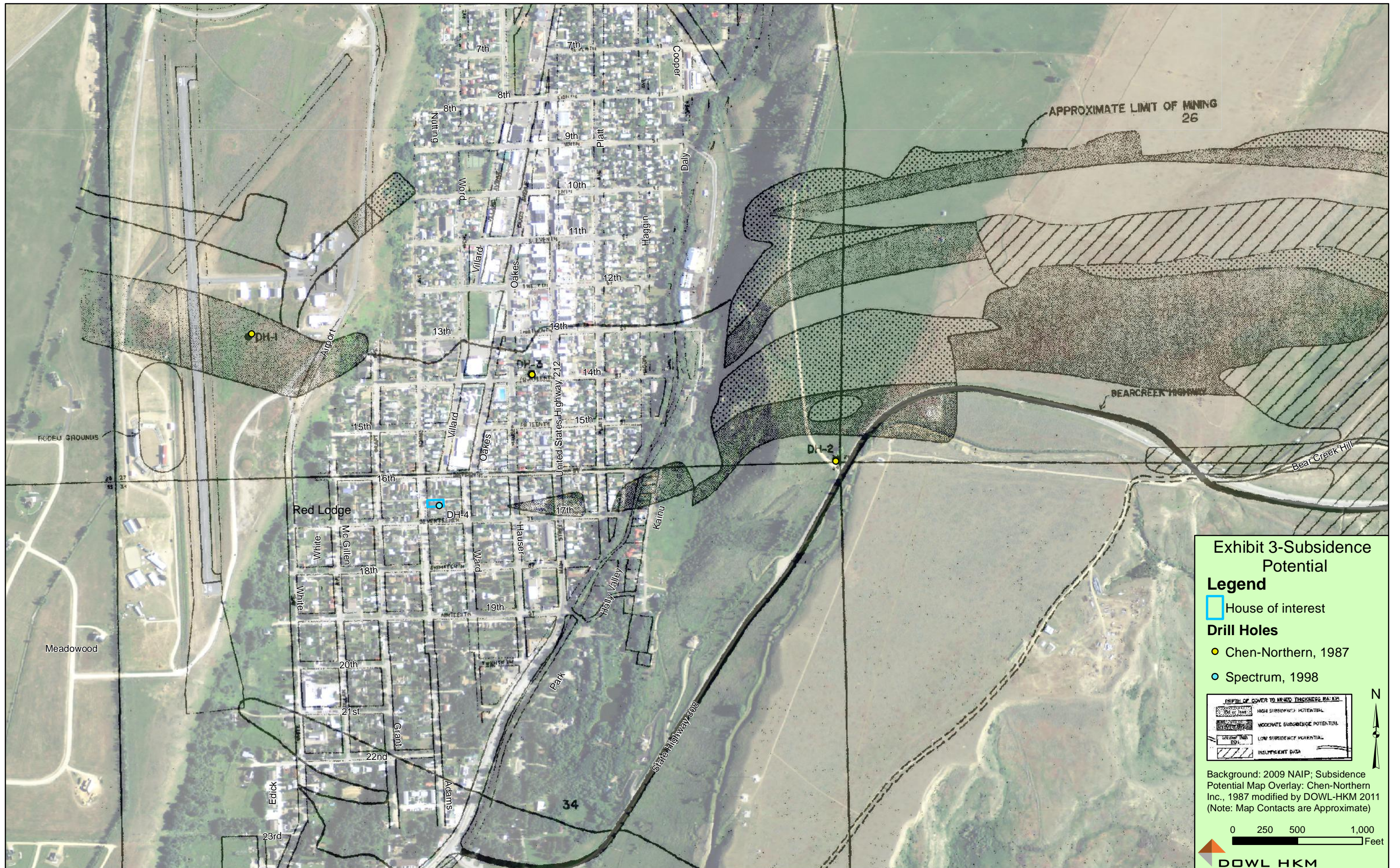
Contour Interval = 50'
UPPER LIMIT - NO. 1-1/2 BED
UPPER LIMIT - NO. 2 BED
UPPER LIMIT - NO. 3 BED
UPPER LIMIT - NO. 4 BED
UPPER LIMIT - NO. 5 BED
UPPER LIMIT - NO. 6 BED

Background: 2009 NAIP; Depth of Cover Map Overlay: Chen-Northern Inc., 1987 modified by DOWL-HKM 2011 (Note: Map Contacts are Approximate)



**DOWL HKM**





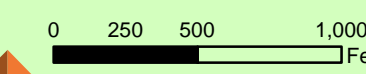
**Exhibit 3-Subsidence Potential**

**Legend**

- House of interest
- Drill Holes**
- Chen-Northern, 1987
- Spectrum, 1998

DEPTH OF COVER TO MINED THICKNESS RATIO	
	HIGH SUBSIDENCE POTENTIAL
	MODERATE SUBSIDENCE POTENTIAL
	LOW SUBSIDENCE POTENTIAL
	INSUFFICIENT DATA

Background: 2009 NAIP; Subsidence Potential Map Overlay: Chen-Northern Inc., 1987 modified by DOWL-HKM 2011 (Note: Map Contacts are Approximate)



**DOWL HKM**

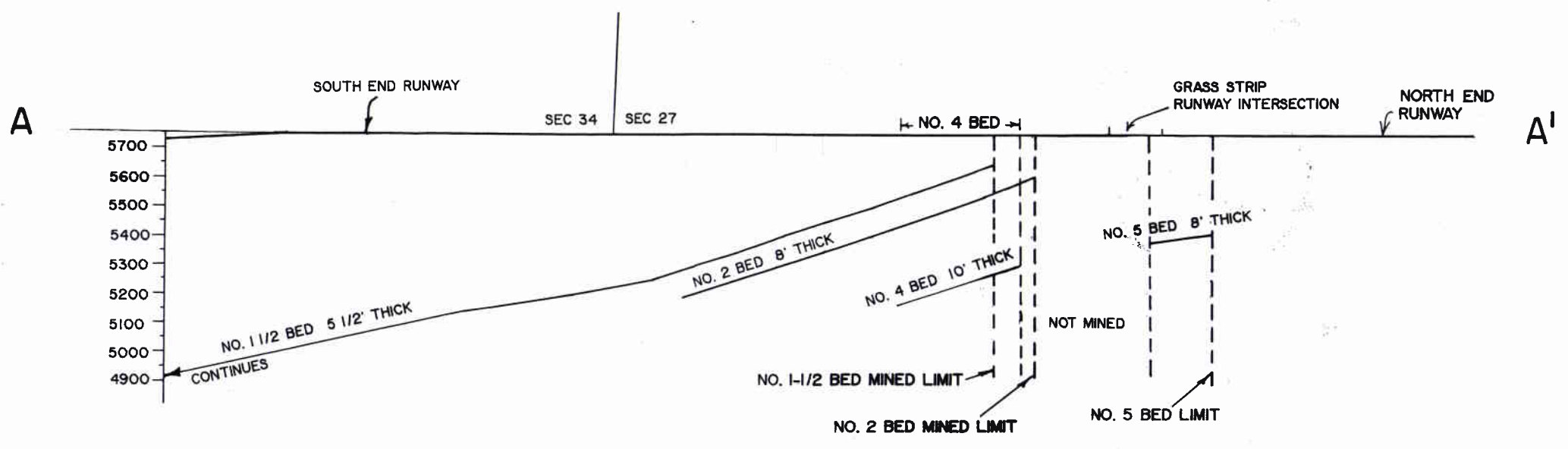
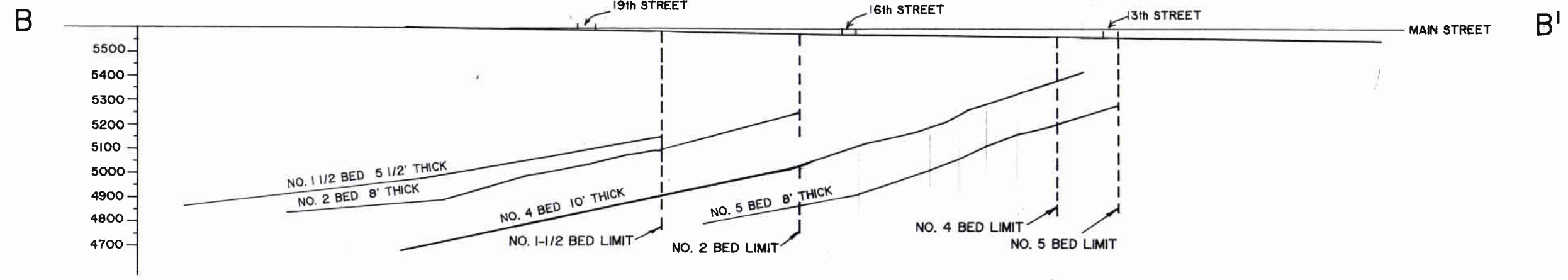
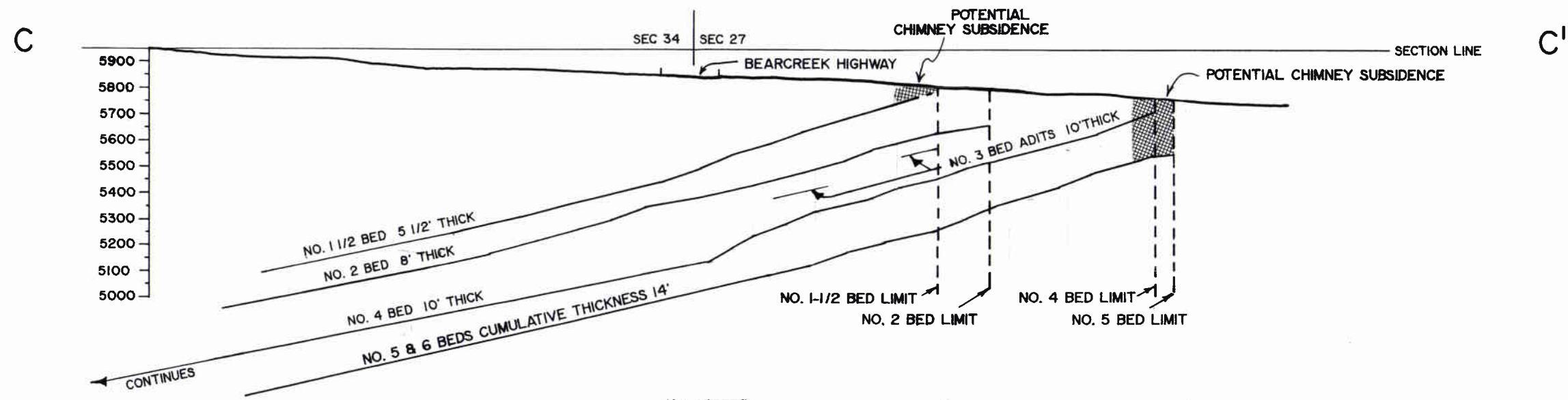



Exhibit - 4 Cross Sections

STATE OF MONTANA DEPARTMENT OF STATE LANDS HELENA, MONTANA BEARCREEK/RED LODGE SUBSIDENCE STUDY CROSS SECTIONS OF MINE LIMITS	
 <b>Northern</b> Engineering and Testing, Inc.	Drawn: LNR Checked: JMP Scale: 1" = 500' Date: 10/29/87
	DRAWING NO. 87-3001D-7

**APPENDIX B**

**PHOTOGRAPHS**



View of concrete pier and wood shim below the back deck along east side of house. Photo by DEQ-AML  
512 Adams Avenue South, Red Lodge, MT  
512 Adams St.\_8-4-11 004.jpg



View of concrete block and wood shim below the back deck along east side of house. Photo by DEQ-AML  
512 Adams Avenue South, Red Lodge, MT  
512 Adams St.\_8-4-11 002.jpg



View of concrete block and wood shim below the back deck along east side of house. Photo by DEQ-AML  
512 Adams Avenue South, Red Lodge, MT  
512 Adams St.\_8-4-11 006.jpg



View of concrete block and wood shim below the back deck along east side of house. Photo by DEQ-AML  
512 Adams Avenue South, Red Lodge, MT  
512 Adams St.\_8-4-11 005.jpg



View west of porch, backyard and east end of house  
512 Adams Avenue South, Red Lodge, MT  
100\_2682.JPG



View north west of porch, backyard and east end of house  
512 Adams Avenue South, Red Lodge, MT  
100\_2683.JPG



View northeast of porch, backyard and east end of house  
512 Adams Avenue South, Red Lodge, MT  
100\_2684.JPG

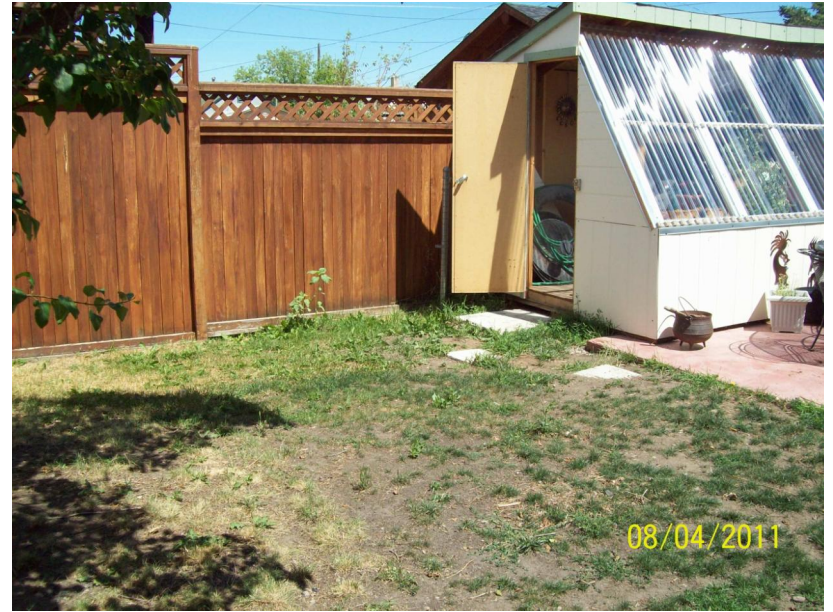


View west of porch, backyard and east end of house  
512 Adams Avenue South, Red Lodge, MT  
100\_2685.JPG

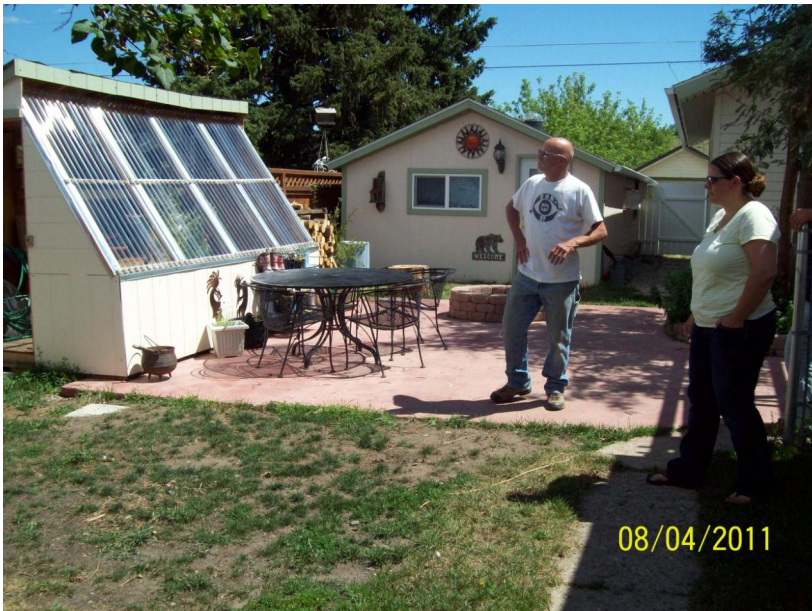




View northeast of porch, backyard and east end of house  
512 Adams Avenue South, Red Lodge, MT  
100\_2686.JPG



View northeast of backyard and green house  
518 Adams Avenue South, Red Lodge, MT  
100\_2687.JPG



View east of backyard, green house, and building along east end of property  
518 Adams Avenue South, Red Lodge, MT  
100\_2688.JPG



View west of fence between properties and green house  
518 Adams Avenue South, Red Lodge, MT  
100\_2689.JPG



8/22/2011 2:56:08 PM  
View southeast of temporary benchmark on fire hydrant  
Street corner, Red Lodge, MT  
2011-0057.JPG



8/22/2011 3:12:45 PM  
View West of benchmark at school  
519 Broadway Avenue South, Red Lodge, MT  
2011-0058.JPG



8/22/2011 3:28:31 PM  
View northeast of house  
512 Adams Avenue South, Red Lodge, MT  
2011-0059.JPG



8/22/2011 3:59:40 PM  
View northeast of house  
512 Adams Avenue South, Red Lodge, MT  
2011-0060.JPG



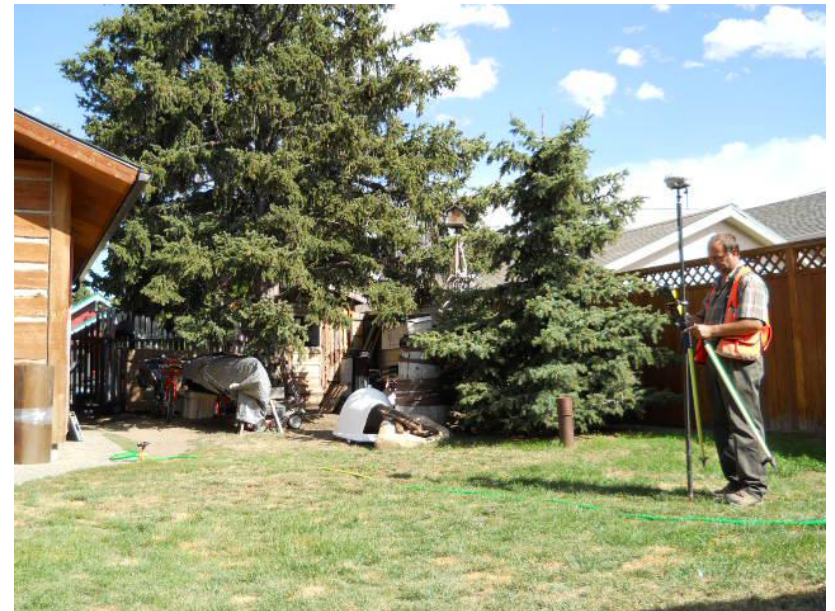
8/22/2011 4:00:54 PM  
View northwest of porch and east side of house  
512 Adams Avenue South, Red Lodge, MT  
2011-0061.JPG



8/22/2011 4:01:00 PM  
View north of backyard; surveyor standing near area of settlement  
512 Adams Avenue South, Red Lodge, MT  
2011-0062.JPG



8/22/2011 4:01:12 PM  
View northeast garage at east end of property  
512 Adams Avenue South, Red Lodge, MT  
2011-0063.JPG



8/22/2011 4:08:59 PM  
View east of yard; note well right side of photo near pine tree  
512 Adams Avenue South, Red Lodge, MT  
2011-0064.JPG



8/22/2011 4:16:57 PM

View northwest of yard, porch and east side of house; surveyor near area of settlement  
512 Adams Avenue South, Red Lodge, MT  
2011-0065.JPG



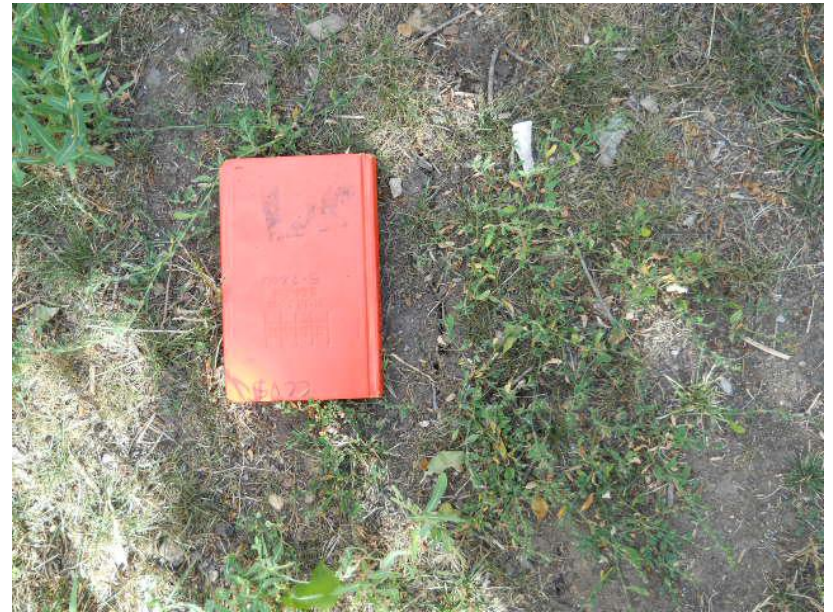
8/22/2011 4:24:53 PM

View northeast of green house; note surveyor near area of settlement  
518 Adams Avenue South, Red Lodge, MT  
2011-0066.JPG



8/22/2011 4:25:07 PM

Open crack observed just right of field book  
518 Adams Avenue South, Red Lodge, MT  
2011-0067.JPG



8/22/2011 4:26:23 PM

Open crack observed just right of field book  
518 Adams Avenue South, Red Lodge, MT  
2011-0068.JPG

## **APPENDIX C**

### **TABLE 1 – WELL INFORMATION**



Table 1 - Well Information

67	161385	45.17932	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAC	WELL	0	WISE JEFF	0	40	25	32	35	15	PUMP	1				B & H	8/21/1996	DOMESTIC	44
68	173022	45.18122	-109.246011	TRS-SEC	NAD83	7S	20E	34	ABA	WELL	0	BROWN VERNETTA	0	25	7	25	0	60	AIR	0		7	0.2	AAQUA DRILLING INC	8/6/1996	IRRIGATION	>25
69	239572	45.18122	-109.246011	TRS-SEC	NAD83	7S	20E	34	ABA	WELL	0	COLT COMMUNICATIONS L.L.P.	0	40	6	39	0	75	AIR	1	39	6	0.08	AAQUA DRILLING INC	8/8/2007	DOMESTIC	>40
70	247582	45.19592	-109.243573	TRS-SEC	NAD83	7S	20E	27	AAB	WELL	0	CITY OF RED LODGE	0	49	21	49	0	80	AIR	1	50	21	5	AAQUA DRILLING INC	7/14/2008	PUBLIC WATER SUPPLY	>49
75	189953	45.1884	-109.249036	TRS-SEC	NAD83	7S	20E	27	DBB	WELL	0	RAY JUDD FORD INC	0	20	15	10	0	0	OTHER	0				B & H	4/26/2001	MONITORIN G	>20
76	126442	45.17743	-109.248766	TRS-SEC	NAD83	7S	20E	34	ACB	WELL	0	WHITTEN R.P.	0	28	11	28	28	20	AIR	1		11	0.1	ROCK CREEK DRILLING INC	10/4/1991	DOMESTIC	>28
78	919820	45.18652	-109.243573	TRS-SEC	NAD83	7S	20E	27	DAC	PETWELL	0	DIAMOND DRILL -2	0	0	0	0	0	0		0							Unk
79	243803	45.19122	-109.24767	TRS-SEC	NAD83	7S	20E	27	AC	WELL	0	O'NIEL GREG	0	60	30	22	0	10	AIR	1	60	30	0.07	DOUGLAS DRILLING	12/5/2007	UNKNOWN	50
80	183507	45.18122	-109.246011	TRS-SEC	NAD83	7S	20E	34	ABA	WELL	0	MOUNTAIN LOG Y SEDOR	0	50	14.5	38	0	11	AIR	1	50		0.17	AAQUA DRILLING INC	5/27/2000	DOMESTIC	14
81	192991	45.17932	-109.251521	TRS-SEC	NAD83	7S	20E	34	BAD	WELL	0	EDWARDS KEITH	0	38	14	38	0	100	AIR	2	34	14	0.25	B AND H	6/15/2001	IRRIGATION	>40
83	214190	45.17648	-109.252899	TRS-SEC	NAD83	7S	20E	34	BD	WELL	0	DOWNING GALE	0	40	6	40	0	60	AIR	1.5	40	6	0.03	DOUGLAS DRILLING	7/23/2002	IRRIGATION	>40
85	243804	45.17648	-109.252899	TRS-SEC	NAD83	7S	20E	34	BD	WELL	0	KYNER JAMES	0	40	8	40	0	20	AIR	1	40	8	0.05	DOUGLAS DRILLING	8/25/2006	IRRIGATION	>40
87	155408	45.18122	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAB	WELL	0	HUDAK EXCAVATION & CONSTRUCTION	0	180	57	80	175	8	AIR	1.5		57	1	B & H	4/1/1996	DOMESTIC	53
88	157948	45.18934	-109.250401	TRS-SEC	NAD83	7S	20E	27		WELL	0	RED LODGE SCHOOL DISTRICT NO 1	0	60	0	0	0	0	OTHER	0				AMERICAN DRILLING & SUPPLY	8/14/1996		>60
89	219745	45.18027	-109.247389	TRS-SEC	NAD83	7S	20E	34	AB	WELL	0	CLARKS BUS SERVICE *WELL 2	0	8	5	0	0	0	OTHER	0				DOUGLAS DRILLING	6/2/2005	MONITORIN G	>8
90	104764	45.1837	-109.24767	TRS-SEC	NAD83	7S	20E	27	DC	WELL	0	RED LODGE SCHOOL DISTRICT NO 1	0	60	22	59	40	90	PUMP	8				B & H	1/1/1983	IRRIGATION	>60
92	164285	45.18122	-109.251521	TRS-SEC	NAD83	7S	20E	34	BAA	WELL	0	TIMONEN SIGRID S.	0	24	6	24	0	40	AIR	1		6	0.16	AAQUA DRILLING INC	8/5/1997	IRRIGATION	>24
94	223129	45.18746	-109.24767	TRS-SEC	NAD83	7S	20E	27	DB	WELL	0	SALLADE CHARLES	0	40	26	40	0	30	AIR	2	40	26	0.1	DOUGLAS DRILLING	11/22/2005	IRRIGATION	>40
95	201857	45.1837	-109.24767	TRS-SEC	NAD83	7S	20E	27	DC	WELL	0	RONNING TRACY	0	40	6	20	0	40	AIR	1.5	39	6	0.02	DOUGLAS DRILLING	12/6/2002	IRRIGATION	35
98	128247	45.18122	-109.248766	TRS-SEC	NAD83	7S	20E	34	ABB	WELL	0	SLANTZ RUSSELL	0	28.5	11	28	28	30	AIR	1		11.5	0.1	ROCK CREEK DRILLING INC	10/7/1991	DOMESTIC	>28.5
100	219742	45.17459	-109.250144	TRS-SEC	NAD83	7S	20E	34		WELL	0	LEFEBVRE JOE	0	40	0	40	0	60	AIR	1.5	40		2	DOUGLAS DRILLING	6/2/2005	IRRIGATION	>40
101	158424	45.18464	-109.251767	TRS-SEC	NAD83	7S	20E	27	CDA	WELL	0	RED LODGE SCHOOL DISTRICT	0	58	20	0	55	50	AIR	2		20	0.5	B & H	8/23/1996	IRRIGATION	>60
102	243777	45.1837	-109.24767	TRS-SEC	NAD83	7S	20E	27	DC	WELL	0	JORDEN LINDA	0	37	10	20	0	30	AIR	1	37	10	0.03	DOUGLAS DRILLING	3/31/2008	IRRIGATION	35
104	187291	45.17932	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAC	WELL	0	MARCELLO GUIDO/ MARY	0	33	14	33	33	30	AIR	0		12	0.03	DOUGLAS DRILLING	8/11/1999	IRRIGATION	>33
106	161390	45.18122	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAB	WELL	0	PILATI MICHAEL	0	38	17	38	35	40	AIR	1		17	0.5	B & H	10/1/1996	IRRIGATION	>40
107	211966	45.18746	-109.24767	TRS-SEC	NAD83	7S	20E	27	DB	WELL	0	BERTRAM KELLY	0	40	22	0	0	60	OTHER	1	40	22	0.2	DOUGLAS DRILLING	5/3/2004	DOMESTIC	>40
108	243779	45.1837	-109.24767	TRS-SEC	NAD83	7S	20E	27	DC	WELL	0	JORDAN LINDA	0	40	15	20	0	20	AIR	1	40	15	0.03	DOUGLAS DRILLING	3/31/2008	IRRIGATION	15
111	212138	45.17932	-109.251521	TRS-SEC	NAD83	7S	20E	34	BAD	WELL	0	JAQUITH PHILLIP	0	40	20	0	0	50	AIR	1	36	20	0.25	B AND H	5/14/2004	IRRIGATION	>40
112	201873	45.17648	-109.252899	TRS-SEC	NAD83	7S	20E	34	BD	WELL	0	NEARPASS BAYARD	0	40	6	40	0	40	AIR	1.5	39	6	0.03	DOUGLAS DRILLING	7/9/2002	IRRIGATION	>40
113	219749	45.18027	-109.247389	TRS-SEC	NAD83	7S	20E	34	AB	WELL	0	FINSTAD ERIC *PILATI MIKE	0	40	0	40	0	38	AIR	1.5	36			DOUGLAS DRILLING	6/5/2005	IRRIGATION	>40

Table 1 - Well Information

114	251942	45.1837	-109.24767	TRS-SEC	NAD83	7S	20E	27	DC	WELL	0	SCHUBERT DIANA	0	40	12	20	0	25	AIR	1	40	12	0.03	DOUGLAS DRILLING	4/8/2008	IRRIGATION	38?	
116	222195	45.17743	-109.251521	TRS-SEC	NAD83	7S	20E	34	BDA	WELL	0	MEIER RYAN AND JONI	0	77	41	57	0	20	AIR	1	77	41	0.08	AAQUA DRILLING INC	8/8/2005	DOMESTIC	62?	
117	258470	45.17648	-109.252898	TRS-SEC	NAD83	7S	20E	34	BD	WELL	0	BRYNGELSON MARY	0	40	6	40	0	40	AIR	1.5	40	6	0.03	DOUGLAS DRILLING	7/29/2009	IRRIGATION	>40	
118	124993	45.17743	-109.251521	TRS-SEC	NAD83	7S	20E	34	BDA	WELL	0	FORMANACK ROBERT W.	0	39	12	39	38	50	AIR	1				B & H	1/20/1983	DOMESTIC	>39	
124	158425	45.17932	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAC	WELL	0	JURKOVICK RAY	0	38	27	38	30	18	AIR	1				B & H	9/23/1996	DOMESTIC	40	
125	158426	45.17932	-109.251521	TRS-SEC	NAD83	7S	20E	34	BAD	WELL	0	THOKE WILLIAM P.	0	38	16	38	35	40	AIR	1		16	0.5	B & H	10/1/1996	IRRIGATION	>40	
129	253522	45.18212	-109.24908	NAV-GPS	NAD83	7S	20E	27	DCC	WELL	0	GREER RICK	0	40	18	0	0	50	AIR	1	39	18	0.08	AAQUA DRILLING INC	10/20/2009	GEOTECH	>39	
130	122490	45.18746	-109.24767	TRS-SEC	NAD83	7S	20E	27	DB	WELL	0	KANE JAMES	0	35	20	35	0	25	AIR	1				ROCK CREEK DRILLING INC	5/27/1977	DOMESTIC	>35	
132	132672	45.18122	-109.254276	TRS-SEC	NAD83	7S	20E	34	BAB	WELL	0	NOGLICH MIKE VIRGINIA K. & PATRICK	0	39	18	39	39	35	AIR	1		18	0.1	ROCK CREEK DRILLING INC	9/1/1992	IRRIGATION	>39	
133	144140	45.19122	-109.242207	TRS-SEC	NAD83	7S	20E	27	AD	WELL	0	THAYER BETTY	0	30	14	28	25	40	AIR	1		14	1	B & H	8/3/1991	IRRIGATION	>30	
137	211991	45.17648	-109.252899	TRS-SEC	NAD83	7S	20E	34	BD	WELL	0	GRIBBLE KANDACE	0	40	23	0	0	45	AIR	1.5	40	23	0.2	DOUGLAS DRILLING	4/7/2004	IRRIGATION	>40	
138	216524	45.18027	-109.247389	TRS-SEC	NAD83	7S	20E	34	AB	WELL	0	SOMMERFELD ANTHONY	0	60	10	20	0	20	AIR	1.5	60	10	0.03	DOUGLAS DRILLING	11/2/2004	DOMESTIC	15	
139	226280	45.18276	-109.246304	TRS-SEC	NAD83	7S	20E	27	DCD	WELL	0	MICHEAL JEFF	0	19	9	18	0	30	AIR	1	18	9	0.08	AAQUA DRILLING INC	5/11/2006	DOMESTIC	18?	
140	192990	45.1786	-109.2514	NAV-GPS	NAD27	7S	20E	34	BAD	WELL	0	WESTER MIKE AND NANCY	0	38	12	38	0	100	AIR	2	36	14	0.25	B AND H	6/15/2001	IRRIGATION	>40	
141	207153	45.1802	-109.2534	NAV-GPS	NAD27	7S	20E	34	BAB	WELL	0	WISE JEFF	0	48	29	48	0	36	AIR	2	44	29	0.5	B AND H	9/5/2003	DOMESTIC	46	
142	212293	45.1941	-109.2443	NAV-GPS	NAD27	7S	20E	27	ABD	WELL	0	BEAM CRAIG	0	32	10	32	0	35	AIR	2	30	10	0.25	B AND H	3/31/2004	IRRIGATION	>32	
143	212299	45.176	-109.2492	NAV-GPS	NAD27	7S	20E	34	BDD	WELL	0	DOUTHIT BERT	0	40	12	38	0	60	AIR	2	35	12	0.25	B AND H	4/26/2004	IRRIGATION	>40	
144	132671	45.18	-109.2513	MAP	NAD27	7S	20E	34	BAACC	WELL	0	CITY OF RED LODGE - WELL 1 SOURCE 2	0	74	20	0	0	900	OTHER	0					9/17/1961	PUBLIC WATER SUPPLY	Unk	
145	173024	45.1783	-109.2481	NAV-GPS	NAD27	7S	20E	34	BDA	WELL	0	PARK BRETTNER	0	38	9	38	0	70	AIR	0		9	0.25	B & H	9/23/1998	DOMESTIC	>40	
146	187237	45.1796	-109.2517	NAV-GPS	NAD27	7S	20E	34	BAC	WELL	0	ENGLER ED	0	58	18	58	0	75	AIR	1	56	18	0.25	B & H	12/6/2000	IRRIGATION	>60	
147	247616	45.18328	-109.2441	SUR-GPS	NAD27	7S	20E	27	DDC	WELL	0	SWENSON RANDY	0	22	7	10	0	25	AIR	1	22	7	0.08	AAQUA DRILLING INC	7/10/2008	DOMESTIC	13	
148	189172	45.1792	-109.2531	NAV-GPS	NAD27	7S	20E	34	BAC	WELL	0	MCBRIDE BARBRA	0	40	22	39	0	0	AIR	1	36	22	1	B & H	4/25/2001	IRRIGATION	>40	
150	244817	45.18598	-109.24775	NAV-GPS	WGS84	7S	20E	27	DBC	WELL	0	PORTH ARCHITECTS	0	40	20	39	0	60	AIR	1	39	20	0.08	AAQUA DRILLING INC	5/28/2008	DOMESTIC	>40	
151	244816	45.186	-109.247867	NAV-GPS	WGS84	7S	20E	27	DBD	WELL	0	PORTH ARCHITECTS	0	40	20	39	0	60	AIR	1	39	20	0.08	AAAA WATER WELL DRILLING INC	5/28/2008	DOMESTIC	>40	
152	247579	45.18347	-109.249333	NAV-GPS	WGS84	7S	20E	27	CDD	WELL	0	RED LODGE PUBLIC SCHOOL	0	44	22	43	0	50	AIR	1	43	22	0.08	AAQUA DRILLING INC	8/4/2008	PUBLIC WATER SUPPLY	>44	
153	252187	45.18257	-109.251833	NAV-GPS	WGS84	7S	20E	27	DDC	WELL	0	RUTHERFORD CHARLES AND LINDA	0	43	23	43	0	50	AIR	1	43	23	0.08	AAQUA DRILLING INC	5/27/2009	DOMESTIC	>43	
155	241643	45.17648	-109.247389	TRS-SEC	NAD83	7S	20E	34	AC	WELL	0	DOEDEN KATHY	0	40	10	40	0	30	AIR	1	40	10	0.03	DOUGLAS DRILLING	1/2/2008	IRRIGATION	>40	
156	104811	45.17648	-109.247389	TRS-SEC	NAD83	7S	20E	34	AC	WELL	0	KARAS BENJAMIN K.	0	110TRRC	30	8	30	0	200	OTHER	0				β	8/1/1959	DOMESTIC	>30
157	231468	45.17743	-109.246011	TRS-SEC	NAD83	7S	20E	34	ACA	WELL	0	COLT COMMUNICATIONS LLC MPPP	0	25	6	25	0	60	AIR	1	25	6	0.08	AAQUA DRILLING INC	9/11/2006	DOMESTIC	>25	
158	173023	45.1794	-109.2439	NAV-GPS	NAD27	7S	20E	34	ABD	WELL	0	MARTIN DON	0	100	14	60	0	18	AIR	0		14	0.5	B & H	7/16/1998	DOMESTIC	16	
162	124990	45.18746	-109.242207	TRS-SEC	NAD83	7S	20E	27	DA	WELL	0	JARVI TAIMI	0	30	11	0	25	40	AIR	1		11	1	B & H	8/12/1991	IRRIGATION	>30	
163	251765	45.18746	-109.242207	TRS-SEC	NAD83	7S	20E	27	DA	WELL	0	DANE, ELIZABETH	0	40	9	40	0	30	AIR	1.5	40	9	0.03	DOUGLAS DRILLING	1/8/2009	IRRIGATION	>40	
164	247545	45.19462	-109.24093	SUR-GPS	NAD27	7S	20E	27	AAD	WELL	0	RED LODGE PUBLIC SCHOOL	0	65	25	64	0	300	AIR	1	64	25	0.08	AAQUA DRILLING INC	7/12/2008	DOMESTIC	64	
165	231524	45.19592	-109.240841	TRS-SEC	NAD83	7S	20E	27	AAA	WELL	0	BEARTOOTH NATURE CENTER	0	88	33	87	0	125	AIR	1	88	33	0.08	AAQUA DRILLING INC	9/14/2006	DOMESTIC	>88	



**APPENDIX D**

**CARBON COUNTY HISTORICAL SOCIETY  
ARCHIVED ARTICLES**

## READY TO BEGIN WORK

*R. L. Pickett 4/7/04*  
Red Lodge Coal Company Awards  
Contract for Sinking a Double  
Compartment Shaft.

## SIX BIDS ARE SUBMITTED

Definite Plans for Development Follow Council's Action in Granting Right of Way.

That Red Lodge is soon to have another big coal mine is practically an assured fact. Following the action of the city council Saturday night in granting to the Red Lodge Coal company a right of way through certain streets and alleys for the building of a railroad spur to the tippie site, the company on Monday night let a contract for the sinking of a double compartment shaft.

There were six bids submitted and all but one were by local parties. Thomas Milburn of this city was the successful bidder and the contract was awarded to him. This contract calls for the sinking of a perpendicular double compartment shaft, 200 feet deep, eight feet eight inches by sixteen feet two inches in the clear; to be timbered with 10x10 stuff, with 3x12 lagging. All the timbers and lumber are to be of fir and to be furnished by the company.

The shaft will be sunk on vein No. 1 in the southwest quarter of block thirty-eight of the Hymer addition. This is the block in which the old Millis store is located. The shaft will accommodate two cages and one pump and air-way.

Under the terms of the contract Mr. Milburn is to begin work not later than April 15 and diligently prosecute sinking operations continuously with three shifts a day. The company has ordered a steam hoist and pump and an engine capable of developing 100 horse power. The contractor expects to be able to sink 100 feet a month and hopes to have the shaft completed on or about June 15. In the meantime it is expected that the Northern

Pacific will put in a spur. Indeed, Manager W. E. Hymer states that Division Superintendent Boyle of Livingston has agreed to begin work on the spur whenever he is notified by the company to do so.

Former State Senator Orlando Tefft of Lincoln, Neb., who is the president of the company and who has been in the city for the past two weeks with Manager Hymer, is quite enthusiastic over the proposition. He says that the company is acting in perfect good faith and intends to open up the big body of coal on an extensive scale.

If the present plans of the company are carried to fruition another big coal mining industry will be added to Red Lodge, ultimately giving employment to several hundred men and creating a payroll second in importance only to that of the Northwestern Improvement company.

## THINGS ARE MOVING RIGHT ALONG AT THE NEW RED LODGE COAL MINE

*R. L. Pickett 4/25/04*

Under the management of W. E. Hymer the work of sinking the double-compartment shaft in the development of the Red Lodge Coal company's mine in the Hymer addition is proceeding with all possible speed. The new hoisting plant, consisting of a hundred-horsepower boiler and engine, was installed the first of the week and the switch made from the old, crude outfit that did duty to

The plant is housed in a new building 24x46 and it and the shaft are now lighted with electricity. New tram cars have been put into commission and a general air of substantiality and activity is noticeable about the works. The force, inside and out, now numbers twenty-eight men, three eight-hour shifts are employed and the shaft is being put down at the rate of over two feet per day. A depth of fifty feet has now been attained.

# **APPENDIX E**

**ELECTRONIC FILES  
(REPORT, FIGURES AND EXHIBITS, GIS  
FILES FOR SURVEY DATA)**