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July 3, 2019

Mr. Darren Parkin
Water Management Specialist
Community Development Department
City of Laramie
P.O. Box C
Laramie, WY 82073

Re: Technical Review of: *Addendum to SSI for Premier Bone and Joint Addition – Laramie Surgery Center, June 7, 2019; Trihydro Corporation*

Dear Mr. Parkin:

As requested by the City of Laramie, Wyoming Groundwater performed a technical review of the above referenced Addendum to the Site Specific Investigation (SSI) Report. This is the third Addendum to the original SSI submitted in 2010. The current Addendum is for a proposed “stand alone” surgery center at the north end of the property between Vista Drive and Grand Avenue. The proposed facility expansion includes a 21,216 ft² building, parking area expansion, drive-through round-a-bout with temporary parking, and three detention ponds. This proposed expansion represents the largest expansion of the Premier Bone and Joint facility (formerly Gem City Bone and Joint).

Original SSI and Past SSI Addendums

The original SSI was submitted in 2010 regarding a proposed expansion of the south side of the existing building to house an MRI machine. The first SSI Addendum was submitted in 2011 regarding a proposed 100 ft² façade at the main entrance on the north side of the existing building. A second SSI Addendum was submitted in 2015 regarding a proposed 48 ft² oxygen storage facility at the southwest part of the existing building. The original SSI and subsequent Addendums were prepared by Trihydro Corporation and SSI/Addendum reviews were prepared by Wyoming Groundwater. Wyoming Groundwater’s review documents dated June 10, 2010, August 30, 2011, and April 21, 2015, are provided as attachments to this Addendum review. Comments and information provided in these reviews are still relevant as background information to the current Addendum.

Technical Comments on Current SSI Addendum

Trihydro provides general observations regarding site geology/hydrogeology used to support of their conclusion that “...the proposed development likely poses a low risk to

the Casper Aquifer.” Trihydro’s geologic and hydrogeologic observations are not well-connected to this conclusion.

The following are statements of fact based on information at the nearby Triangle Well and the on-site well (Bone and Joint #1) that was plugged and abandoned sometime between 2010 and 2015.

- The thickness of the alluvium, which consists of loose sand and rock fragments, may be up to 25 feet in the proposed area of expansion. (Source: Bone and Joint #1 well log). The alluvium is not an organic-rich “soil” as is often assumed for the term.
- The depth to the Satanka Shale is approximately 25 feet in the proposed area of expansion. (Source: Bone and Joint #1 well log)
- The thickness of the Satanka Shale in the proposed area of expansion will range from 5 to 24 feet as indicated in the Triangle and the Bone and Joint #1 well logs.
- The depth to water is approximately 60 feet in the area of proposed expansion. This depth to water represents the first occurrence of saturated conditions in the Casper Formation and occurs in the middle portion of the epsilon sandstone (i.e. upper-most sandstone) of the Casper Formation.
- The alluvium, Satanka Shale, and the upper 30 feet of the epsilon sandstone are unsaturated in the area of proposed expansion. The epsilon sandstone at this location is an example of a local “unconfined” water table condition in the Casper Aquifer. Confined conditions in the epsilon sandstone eventually occur further to the west.
- The epsilon and delta members of the Casper Formation are fractured (i.e. conduit flow) in the area of expansion as documented in the Triangle Well and by “lost circulation” that occurred while drilling the Bone and Joint #1 well.

The Casper Aquifer is especially vulnerable to contamination at this location by virtue of the sandy alluvium, thin Satanka Shale, and fractured sandstone in the Casper Formation. At this location, the Satanka Shale and 100-foot offset from mapped faults provide very limited protection of the Casper Aquifer to contamination.

With respect to contaminants stored at and generated by the facility, Trihydro states, “The proposed development is relatively benign in terms of potential types and quantities of contaminants generated and stored on site.” What does this statement, and the phrase “relatively benign”, actually mean? Trihydro should provide more specificity regarding this statement.

Trihydro recognizes that the primary source of contaminants from the proposed expansion will likely be hydrocarbons (e.g. motor oil, antifreeze) on parking lot surfaces from leaky automobiles. The proposed stormwater detention ponds that receive runoff from the parking lots “may be areas where contaminants accumulate over time”. Trihydro states, “As a best management practice, periodic (every 5 – 10 years) soil sampling and analysis for hydrocarbon contamination may be recommended for

monitoring contamination in the detention ponds.” This “may be” recommendation is too vague and undeveloped to be of any real benefit to aquifer protection. Why 5 to 10 years? Five to ten years is too vague and too long a duration to be a viable mitigation plan. Who will perform, interpret, and respond to the soil sample collection effort? What contaminants will be analyzed? At what level of contamination is “action” required? What would detention pond soil mitigation consist of? What does the detention pond bottom “soil” consist of and how effective is this material at filtering/adsorbing urban runoff contaminants? Should the ponds be lined?

Detention Pond Suggestions

Wyoming Groundwater provides the following suggestions regarding the proposed detention ponds on the subject property.

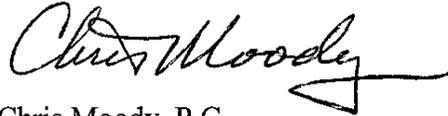
- The developer/Trihydro should provide a definitive plan regarding detention pond design, monitoring, and mitigation as it relates to aquifer protection.
- As development in the east side of Laramie continues and detention ponds are used as a preferred method to manage stormwater flows, the City should consider how to design and monitor detention ponds for aquifer protection.
- The Triangle Well is a monitor well (i.e. water quality sample point) within the City’s Casper Aquifer Monitoring Network. Since the Triangle Well is immediately downgradient of the proposed detention ponds (i.e. as close as 180 feet) and completed in the epsilon sandstone, the City should consider including the analysis of total petroleum hydrocarbons, copper, lead, and zinc (i.e. common contaminants of urban runoff from paved surfaces) to the current list of water sample parameters. Detects of any of these parameters should initiate more comprehensive sample analysis and detention pond evaluation.
- In addition to the collection of soil samples from detention pond bottoms, the City should consider the periodic collection and analysis of water samples from a detention pond(s) (i.e. standing water in the pond) for selected urban runoff parameters. (See *Urban Stormwater Preliminary Data Summary – EPA; //ww3.epa.gov/npdes/pubs/usw_b.pdf*)

Trihydro Conclusion Regarding Risk to Casper Aquifer

Trihydro states, “For the reasons described above, and with the attached site design, engineering controls, and management practices, the proposed development likely poses a low risk to the Casper Aquifer.” The term “likely” suggests uncertainty in the low risk conclusion and the management practices are described as a “may be” recommendation. In view of the special vulnerability of the Casper Aquifer at this location, an undefined detention pond design, monitoring, and mitigation plan, and concerns regarding contaminants in runoff into the detention ponds, Wyoming Groundwater does not agree with Trihydro’s assessment of low risk to the Casper Aquifer.

The City should recognize that Wyoming Groundwater's expertise is in hydrogeology and not contaminant evaluation, mitigation, or facility design.

Sincerely,



Chris Moody, P.G.
Wyoming Groundwater, LLC

Attachments





710 Garfield, Suite 211, Laramie, WY 82070 307-760-3790 cmooody@bresnan.net

June 10, 2010

Ms. Carrie Wiese
Water Resources Specialist
City of Laramie, Community Development Department
P.O. Box C
Laramie, WY 82073

Re: Technical Review of: *SSI Report Gem City Bone and Joint Expansion, Gem City Properties, Laramie, Wyoming. May 24, 2010, by Trihydro Corporation*

Dear Ms. Wiese:

As requested by the City of Laramie, Wyoming Groundwater performed a technical review of the above referenced Site Specific Investigation (SSI) Report. Wyoming Groundwater's technical review focused on the accuracy of report information regarding site geology/hydrogeology and provides the City a professional opinion regarding the conclusion by Trihydro Corporation that the proposed building expansion would be expected to pose a minimal risk to the Casper Aquifer.

The proposed expansion on the south side of the existing medical facility is located in the SW ¼ of the NW ¼ of Section 1, Township 15 North, Range 73 West. This area was included in the Aquifer Protection Overlay (APO) zone as a result of Enrolled Ordinance No. 1527 of the Laramie Municipal Code.

Technical Review of Report Information

The following is a brief discussion of information presented in the SSI report that warrants correction or clarification.

- Page 2-1, Item 2, Site-Specific Investigation Data: This section should mention the existence of an existing adjudicated water well (Bone and Joint #1; U.W. 39294) and its current use. Attached to this document is well information obtained from the State Engineer's Office.
- Page 2-2, Item 3, Site-Specific Investigation Data: The site plan should show the location of the existing water well. The attached well completion form (UW 6) indicates that the well may be located about 48 feet north of the medical clinic building.
- Page 2-2, Item 4, Site-Specific Investigation Data: The proposed expansion will house an MRI machine. The potential contaminants that may be stored,

handled, or generated by the operation of the MRI machine should be identified and listed.

- Page 2-2, Item 5, Site-Specific Investigation Data: The nearest well to the subject property is not SHMWE (U.W. 99779) but rather, it is Bone and Joint #1 located on the subject property. The driller's log of Bone and Joint #1 indicates "lost circulation" from 36 to 140 feet (see attached UW 6 form). Lost circulation occurs when drilling fluids (i.e. air or mud) migrate into the rock rather than coming up the drilled hole. Lost circulation usually indicates the presence of cavities or fractures in the rock that provide a high permeability pathway for fluid migration. Lost circulation is a reasonable indicator that the well has penetrated a conduit flow feature. The well completion form does not specify the materials and placement intervals of the annular seal.
- Wyoming Groundwater Comment: In recognition of lost circulation and the lack of information on the annular seal, it is Wyoming Groundwater's opinion that the Bone and Joint #1 well should be considered a vulnerable feature. If the well is located about 48 feet north of the medical facility, as stated in the well completion form, then the well will be over 100 feet from the area of the proposed expansion on the south side of the existing building.
- Page 2-3, Item 6, Site-Specific Investigation Data: The thickness of the Satanka Shale at the subject property is estimated by Trihydro Corporation to be 75 feet. Wyoming Groundwater's estimate of the thickness of the Satanka Shale at the subject property is approximately 62 feet. The well log indicates the depth to the first water bearing formation (which is typically the Casper Formation) is 70 feet. Regardless of which estimate is closer to the actual thickness of the Satanka Shale, the thickness is close enough to the 75 feet criterion to recognize the uncertainty.
- Page 2-4, Item 9, Site-Specific Investigation Data: The stated depth to water of 25 feet is incorrect. As calculated from the potentiometric surface map and the ground elevation of the subject property, the estimated depth to water in a well that penetrates the Casper Aquifer is approximately 50 feet. This estimate is closer to the stated depth to water of 64 feet in the Bone and Joint #1 well as measured in October 1977.

Professional Opinion Regarding Risk to Casper Aquifer

Trihydro Corporation states that "Based on the site-specific investigation data, the building expansion would be expected to pose a minimal risk to the Casper Aquifer." A suggestion is to use the term "low risk" rather than "minimal risk" because minimal implies least possible risk which is not necessarily true.

Wyoming Groundwater agrees with the conclusion provided by Trihydro Corporation that the proposed building expansion poses a *low* (Wyoming Groundwater terminology) risk of contamination to the Casper Aquifer. This concurrence of professional opinion is based on the following observations:

1. Proposed expansion conforms to the required 100 foot setback from vulnerable features as identified by Trihydro Corporation and by Wyoming Groundwater.
2. Proposed expansion is of an existing facility with a proposed use that appears to be similar to the existing use. However, the potential contaminants associated with the MRI machine should be identified.
3. Proposed expansion will be on City water and sewer.

The City should recognize that Wyoming Groundwater's expertise is in hydrogeology and not contaminant evaluation, mitigation, or project design.

Sincerely,

Chris Moody, P.G.
Wyoming Groundwater, LLC

Enclosure



WYOMING
GROUNDWATER, LLC

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August 30, 2011

Mr. Jerry Dudgeon, AICP
Senior Planner
City of Laramie, Community Development Department
P.O. Box C
Laramie, WY 82073

Re: Technical Review of: *Addendum to SSI Investigation for Gem City Bone and Joint, Gem City Properties, Laramie, Wyoming. August 9, 2011, by Trihydro Corporation*

Dear Mr. Dudgeon:

As requested by the City of Laramie, Wyoming Groundwater performed a technical review of the above referenced Addendum to the Site Specific Investigation (SSI) Report submitted on May 24, 2010. The Addendum addresses proposed subject property modifications involving a 100 square foot façade at the main entrance, canopies, and parking lot resurfacing. The façade improvement is within the 100 feet setback from the original facility water well (Bone and Joint #1) which was identified as a vulnerable feature in the June 10, 2010, SSI review by Wyoming Groundwater.

As described in the Addendum, Trihydro directed the plugging and abandonment of the water well, thereby eliminating the vulnerable feature from further consideration. Plugging and abandonment of the well is an acceptable approach to dealing with this issue.

Based on the June 10, 2010, SSI review and the review of the Addendum, Wyoming Groundwater agrees with the conclusion provided by Trihydro that the proposed renovations present a low risk to the Casper Aquifer. Other issues identified in the June 10, 2010, SSI review that are not related to the on-site water well may still be relevant to the City's permit review process.

The City should recognize that Wyoming Groundwater's expertise is in hydrogeology and not contaminant evaluation, mitigation, or project design. Wyoming Groundwater's opinion does not address proposed parking lot resurfacing.

Sincerely,

Chris Moody, P.G.
Wyoming Groundwater, LLC



710 Garfield, Suite 211, Laramie, WY 82070 307-760-3790 cmoody@bresnan.net

April 21, 2015

Mr. Darren Parkin
Water Management Specialist
Community Development Department
City of Laramie
P.O. Box C
Laramie, WY 82073

Re: Technical Review of: *Addendum to SSI Report: Premier Bone and Joint for Gem City Properties, LLC, March 17, 2015; Trihydro Corporation*

Dear Mr. Parkin:

As requested by the City of Laramie, Wyoming Groundwater performed a technical review of the above referenced Addendum to the Site Specific Investigation (SSI) Report. The Addendum addresses a proposed subject property modification involving a 48 ft² oxygen storage facility addition at the southwest part of the existing building. Excavation for the addition is anticipated to involve a 10-inch thick concrete slab and associated footer.

The proposed modification is beyond the 100 feet setback from the original facility water well (Bone and Joint #1) which was identified as a vulnerable feature in the June 10, 2010 SSI review by Wyoming Groundwater. The water well has since been plugged and abandoned, thus eliminating the vulnerable feature from further consideration.

Wyoming Groundwater agrees with the conclusion provided by Trihydro that the proposed addition presents no additional risk to the Casper Aquifer.

In an effort to document the best available geologic information at the facility, the estimated occurrence and thickness of the Satanka Shale at the facility should be updated. The original SSI report and review in 2010 stated that the estimated bottom (and assumed thickness) of the Satanka Shale at the facility was at 62 to 75 feet. The City's recent installation of a monitor well on property immediately north-northwest of the Premier Bone and Joint facility indicates that the Satanka Shale occurs from 6 to 29 feet (i.e., 26 feet thick) below ground surface at that nearby location. Data from the monitor well are in close agreement with the bottom of the red shale (i.e., Satanka Shale) at 30 feet documented in the drilling log of the Bone and Joint #1 well located north of the facility building. Consequently, original estimates of the thickness of the Satanka Shale on the subject property as stated in the 2010 SSI and review are not accurate (i.e., too high). The probable occurrence of the bottom of the Satanka Shale on the subject property is approximately 30 feet below ground surface and the thickness of the Satanka Shale is on

the order of 5 to 30 feet depending on the thickness of the alluvial material that overlies the Satanka Shale. This correction does not alter past or present conclusions regarding a low risk to the Casper Aquifer as a result of proposed modifications to the facility building.

The City should recognize that Wyoming Groundwater's expertise is in hydrogeology and not contaminant evaluation, mitigation, or facility design.

Sincerely,

Chris Moody, P.G.
Wyoming Groundwater, LLC