February 9, 2022

Submitted electronically to DEQWPBPublicComments@mt.gov

Dept. of Environmental Quality
Water Quality Division
Water Protection Bureau
Groundwater Discharge Permit Section
PO Box 200901, Helena MT 59620

Re: Comments on Proposed Permit No: MTX000274, R Bar N Estates Subdivision

To Whom It May Concern:

Please accept this comment letter on behalf of Upper Missouri Waterkeeper and its supporting membership concerning the proposed groundwater discharge permit for the R Bar N Estates Subdivision in Gallatin County, MT.

Upper Missouri Waterkeeper (Waterkeeper) is a membership-based not-for-profit water advocacy organization dedicated to protecting and restoring fishable, swimmable, drinkable water and healthy rivers across the 25,000 sq. miles of Montana's Upper Missouri River Basin. Our members fish, swim, recreate, and enjoy the aesthetic values of the E. Gallatin River and many of its tributaries, including Hyalite and Baxter creeks. As part of our mission Waterkeeper examines proposals with the potential to affect local water resources and reviews natural resource decisionmaking to ensure compliance with the law.

Executive Summary

We are concerned that the proposed groundwater discharge permit fails to adequately examine the cumulative or direct impacts of authorizing new nutrient pollution to the project area or larger Hyalite Creek and E. Gallatin watersheds. The proposed new discharge would be from

a septic system and appears to support a new major subdivision, adding to the existing subdivisions north and south of E Valley Center Road. DEQ's Fact Sheet and Environmental Analysis, however, do not discuss the project's potential to, cumulatively or synergistically in concert with other septic pollution, degrade ground and surface water. In fact, the EA fails to disclose that the project would discharge nutrient pollutants of concern into a subwatershed – Hyalite Creek and the E. Gallatin River - that are already impaired for excessive nutrient pollution.

There is also no discussion of alternative methods or means of wastewater treatment or disposal, and a general assumption that septic discharges satisfying mixing zone requirements are per se nonsignificant, when in fact additional regulatory requirements apply to DEQ's decisionmaking including but not limited to taking a hard look at cumulative impacts and surface water impacts. Elevated nitrate levels across the region, and in particular as evidenced by well log data from the Gallatin Local Water Quality District and Montana Bureau of Mines and Geology, indicate that cumulative septic loading is demonstrably affecting local water resource quality. DEQ should perform a cumulative impacts analysis assessing the project and other existing and proposed nutrient discharges within the E Gallatin watershed, assess assumptions of applicable surface water TMDLs, and examine the likelihood that the proposed discharge will affect water quality in downgradient surface water and reconsider its significance determination and exemption of the project from nondegradation review.

The Proposed Permit

The proposed discharge is designed for 44,250 gpd, serving 177 residences, and disposing of wastes to Class I groundwater. Predicted nitrogen concentrations in effluent will range between 7.5 – 15 mg/L according to the Fact Sheet. The project is directly upgradient of

Baxter Creek, a primary tributary of Hyalite Creek, which is itself a tributary of the E. Gallatin River.

Comments

As a preliminary matter we note that the Fact Sheet fails to discuss the contextual significance of ambient background groundwater nitrogen concentrations ranging between 3.59 and 5.33 mg/L. These high levels indicate the existing degraded quality of local groundwater due to other nutrient discharges, including the likely cumulative effects of nearby other subdivision septic systems. Although class I groundwater and the Fact Sheet note that the discharge should not trigger the 10 mg/L TN human health criteria and is, based upon mixing zone dilution, likely to satisfy the regulatory 7.5 mg/L mixing zone concentration limit, there is no discussion of the broader context of sprawl development within this subwatershed and related nutrient pollution discharges. The EA simply fails to identify these issues. Gallatin County is experiencing an unprecedented development boom[1] and many new residential and commercial projects, like the one at-hand, are being built without a hard look at the carrying capacity of the local watershed to accept increased and continued new nutrient pollution inputs.

These geographic and social contexts are also important for DEQ to identify and rationalize in the instant permit application given the presence of downgradient Hyalite Creek. Hyalite Creek is a primary tributary of the E. Gallatin River and primary tributaries thereof include Baxter and McDonald creeks, both of which are directly downgradient of the project. Hyalite Creek and the E. Gallatin are impaired waters on DEQ's Integrated Report with TMDLs for nitrogen. According to the EPA-approved Lower Gallatin TMDL Planning Area documents,

[1] https://www.bozemandailychronicle.com/news/state/bozeman-tops-50-000-people-gallatin-county-leads-montana-in-population-growth/article_b35b5427-be32-5a19-b7ce-85b6c277e31e.html ; https://nbcmontana.com/newsletter/population-estimates-show-gallatin-co-grew-by-30-in-last-decade ;

nitrogen discharges from subsurface wastewater disposal are a leading cause of nutrient pollution in Hyalite and other geologically-similar waters in the Lower Gallatin watershed. Despite this information being available to DEQ, there is no discussion of how the project might exacerbate the existing pollution impairment of Hyalite Creek and/or violate applicable load allocations.

We are also concerned by the expert report submitted by the discharge applicant in support of its permit insofar as its conclusions do not reflect long-established scientific findings in the Gallatin Valley, including the Bozeman and Belgrade alluvial fans, which show that ground and surface water resources are in fact hydrologically connected. A primary conclusion of DEQ and the applicant's report is that downgradient Hyalite, McDonald, and Baxter Creeks are "perched" above the water table and, *ipso facto*, hydrologically disconnected. Waterkeeper retained the services of an expert geologist to evaluate the scientific and modeling assumptions of the applicant's expert report and found, in short, that they do not hold water. A memorandum detailing flaws in the applicant's report and DEQ's conclusions is attached to this comment letter.

Contrary findings that undermine DEQ's conclusions and permit decision are summarized below:

- The applicant's report incorrectly characterizes groundwater flowing 20-30' below a surface water as hydrologically disconnected when best available scientific literature from the Montana Bureau of Mines and Geology, hydrogeologic thesis studies on groundwater in the Gallatin Valley, and the seminal Hackett study all stand for the proposition that ground and surface water is connected in the Gallatin Valley, including within and downgradient of the project area.

- The proposed discharge sits at the northern margin of the Bozeman fan where it tapers and connects to the Belgrade fan. The Belgrade fan, which underlies the downgradient surface waters of Hyalite, McDonald, and Baxter Creeks, is prone to high transmissivity between the two mediums, where surface water within the Belgrade sub-area broadly represents gaining streams receiving groundwater inputs.

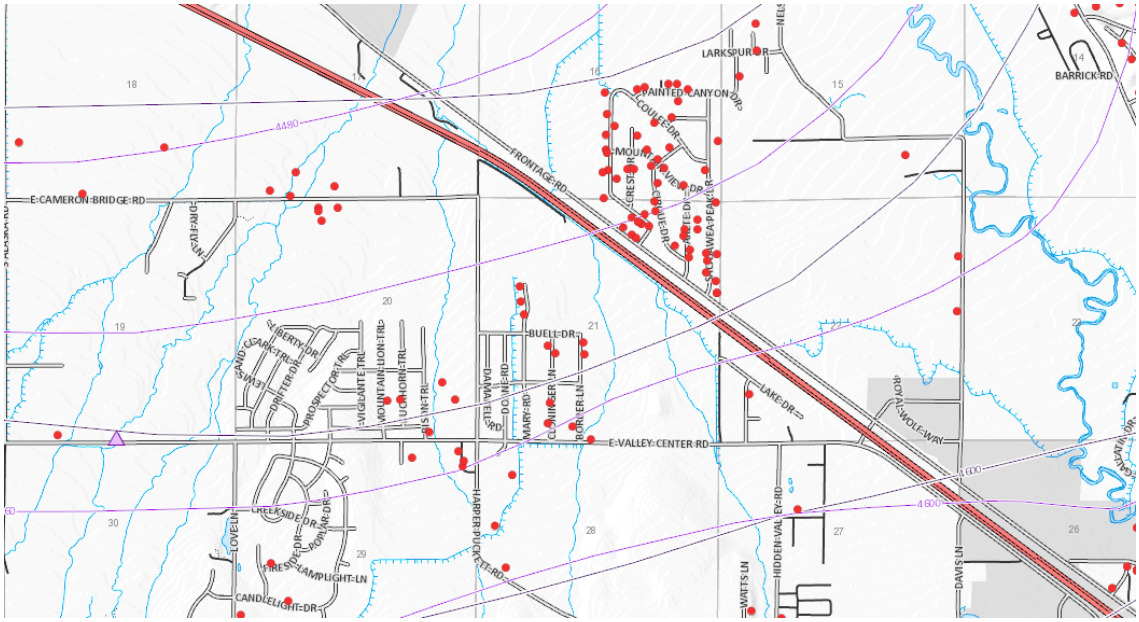
- The Hackett study supports a conclusion of hydrologic connectivity in the project area, where despite distance between surface and ground water, percolation and transmissivity between the two mediums is both present and changes – and increases in transmissivity – as groundwater flows closer to the E Gallatin.

- The applicant's expert model presumes that elevational differences between surface and groundwater creates an impermeable confining layer, when the geologic strata documented within and downgradient of the project area are the exact opposite, and become increasingly transmissive with high flow rates and connectedness. There is no evidence to support the conclusion that Baxter, Hyalite, and McDonald Creeks are isolated or disconnected from groundwater in and downgradient of the proposed discharge.

- The expert report and Fact Sheet do not support a conclusion that the proposed discharge will not exacerbate ongoing and apparently increasing nitrate concentrations in local groundwater, and do not support a conclusion that downgradient streams will not receive nitrogen discharges from the project.

DEQ should first identify and recognize the cumulative nature of nutrient pollution and the significance of adding a substantial new nutrient pollution input of poorly treated septic to a water resources system already stressed by nutrient pollution. In particular we direct DEQ's attention to aggregated well data accessible on the Gallatin Local Water Quality District's interactive web portal, and cited to by Waterkeeper's expert, indicating the prolific sprawl development surrounding the proposed permit and datapoints showing nitrate concentrations increasing at and downgradient of the project area.

GLWQD Map of Groundwater Contours, Subdivisions, and Groundwater Data Points Surrounding the Project Area



DEQ should assess the cumulative and synergistic impacts of the proposed discharge in connection with the other existing and known nutrient pollution sources discharging to the same watershed. This is particularly important given, as demonstrated by the Hackett, English, and Schaeffer studies cited herein, and Waterkeeper's expert report, that ground and surface water are interconnected in and downgradient of the project area, and that water gains and loses from surface and ground waters throughout the Gallatin Valley, including the Bozeman and Belgrade alluvial fans proximate to the project area. The fact that downgradient surface waters are nutrient-impaired heightens the urgency to perform these analyses and reconsider the propriety of the proposed permit and its effluent limits.

DEQ should perform a nondegradation analysis probing direct, indirect, and cumulative impacts of the discharge on downgradient groundwater and surface waters including but not limited to Baxter Cr, McDonald Cr, and Hyalite Cr., to adequately assess the significance of authorizing new septic pollution to the impaired Hyalite and E. Gallatin watersheds respectively. The applicant's own expert report suggests that the new discharge will likely elevate nitrogen

concentrations by at least 2.0 mg/L outside the mixing zone, where average existing concentrations exceed 4 mg/L TN, and as explained above scientific literature strongly suggests increased nutrient loading will in fact enter into downgradient surface water systems.

Applicable trigger levels for violations of water quality standards in wadeable surface waters of the Gallatin Valley are contained in DEQ Circular 12-A, and generally correspond to .3 mg/L TN. If, as discussed herein, ground and surface waters are hydrologically connected downgradient of the proposed discharge, and knowing that nitrogen is a cumulative pollutant whose effects can be geographically and temporally attenuated in watersheds, it appears likely that the discharge itself or in conjunction with other nutrient sources cumulatively or synergistically has the propensity to cause or contribute to violations of surface water standards. Contrary to the Fact Sheet, best available science does not "convincingly" demonstrate that nitrate in groundwater will not result in degradation of surface water; available science demonstrates that the two resources are hydrologically connected, especially downgradient of the proposed discharge. DEQ must rationally consider and evaluate impacts to surface waters. Findings from these analyses should update DEQ's Environmental Analysis, which fails to identify much less discuss any of these salient ecological or social considerations, and its consideration of alternatives, whether that be requiring higher treatment, land disposal strategies, developing a decentralized treatment system strategy for this high-development and nutrient impaired region, or considering nearby centralized treatment facilities.

Conclusion

While the applicant and DEQ's EA notes that the purpose and need of this proposed permit is to facilitate residential housing needs, market demand is not a valid reason to fail to identify or reasonably evaluate the likely pollution impacts of the discharge on the human

environment, or to appropriately condition a project to adequately protect local water resources. The fact that other developments and discharges have already been approved does not remove the responsibility from DEQ to take a hard look at the water resource impacts of its decisionmaking. In fact, the unprecedented nature of new development and proliferation of septic discharges in the Gallatin Valley, including upgradient and proximate to the proposed discharge, means DEQ should precisely reconsider this permit and its flawed conclusions.

There is no right to pollute water in Montana, and DEQ has an obligation to be preventative and anticipatory in safeguarding water resources and exercising its delegated authority under the Montana Water Quality Act as a steward implementing the constitutional imperatives of Montana citizens to a clean and healthful environment. We urge DEQ to carefully consider our comments, perform the requested analyses and revisions, and reconsider its proposed permit for the R Bar N Estates subdivision with another public comment opportunity.

Respectfully submitted-

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Citations to Resources Considered (all may be accessed through this open Google Drive Folder hyperlink)

Stroock, Betty, Memorandum to Upper Missouri Waterkeeper re: R Bar N Estates Subdivision Groundwater Conclusions

MGM Open-File Report 698, 'Evaluation of High-Yield Groundwater Development in the Gallatin Valley", April 2018.

MGM Open-File Report 735, "Hydrogeologic Investigation of the Four Corners Area" November 2020.

MGM Open-File Report 652, "Hydrogeologic Investigation of the Four Corners Study Area", Groundwater Modeling Report, 2014.

Geological Survey Paper, Hackett et al, "Geology and Ground Water Resources of the Gallatin Valley Gallatin County Montana" 1960.

Masters' Thesis, 'Ground-water discharge and aquifer recharge zones near Four Corners, Gallatin County, Montana', Mark Schaffer, May 2011

SWEETWATER CONSULTING
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To: Guy Alsentzer, Executive Director, Upper Missouri Waterkeepers
From: Betty Stroock, Geologist
Date: February 9, 2022
Re: Hydro-Geologic Evaluation of Proposed Groundwater Discharge Permit for Proposed R-Bar-N Estates Subdivision, Gallatin County, Montana

OVERVIEW OF GEOLOGY AND HYDROLOGY OF GALLATIN VALLEY AND PROPOSED R-BAR-N ESTATES DEVELOPMENT SITE:

The near-surface geology of the Gallatin Valley is composed of Tertiary and Quaternary sedimentary rocks. The Tertiary rocks are predominantly of two types; [1] well-stratified lacustrine sandstone, limestone, siltstone, and volcanic ash and tuff; and [2] poorly stratified fluvial siltstone, clay-stone, sandstone and conglomerate. The younger Quaternary rocks are primarily alluvial fan deposits of cobble and gravel intermixed with sand, silt and clay (Hacket, et al, 1960, p. 39-43).

The principal aquifer in the Gallatin Valley is the Tertiary and Quaternary alluvium which is relatively poorly consolidated (Hacket, et al, 1960, p. 2).

Five hydrologic sub-areas have been delineated within the Gallatin Valley (Hacket, et al, 1960, p. 136). The proposed R-Bar-N Estates subdivision is situated at the northern margin of the Bozeman Fan sub-area where it tapers and inter fingers with the Belgrade sub-area (Nicklin, et al, 2021, Figure 1, p. 16; and Hacket, et al, 1960, p. 153).

The alluvium of the Belgrade sub-area consists of cobbles and coarse gravels intermixed with varying amounts of sand, silt and clay deposited by the Gallatin River and its tributaries. It is the principal groundwater reservoir in the Gallatin Valley (Hacket, et al, 1960, p. 140). Alluvial fan deposits derived from the Gallatin Range of the Bozeman Fan sub-area also contribute to groundwater resources in the vicinity of the proposed subdivision (Hacket, et al, 1960, p. 153).

Groundwater migration patterns in much of the Gallatin Valley, and specifically in the area surrounding the proposed subdivision, are toward the north-northwest (Hacket, et al, 1960). The aquifer is characterized by generally high coefficients of transmissibility (100,000 to 300,000 gpd per foot) (Hacket, et al, 1960, p. 3).

"In most of the area between the Gallatin and East Gallatin Rivers the water table is within 30 feet of the land surface throughout the year, and within much of the area it is within 10 feet of the surface" (Hacket, et al, 1960, p. 3). In many places, the water table is less than 5 feet below the land surface (Hacket, et al, 1960, p. 155-156).

INTERCONNECTIONS BETWEEN GROUNDWATER AND SURFACE WATERS:

The significant inter-connectedness between groundwater and surface waters has been recognized in the Gallatin Valley since the first hydrologic surveys were conducted in the 1950's (Hackett et al., 1960), and is now codified into Montana law (Trout Unlimited v. Montana Department of Natural Resources, 2006). Interactions between groundwater and surface waters in the Gallatin Valley are complex and variable, both spatially and temporally. They fluctuate based upon numerous factors, including the porosity, permeability and transmissivity of strata at any specific location, seasonal precipitation, snowpack and weather patterns, rates of recharge and/or discharge and upon human water extractions for irrigation or domestic use.

Numerous studies document the inter-connectedness between groundwater and surface waterways in the Gallatin Valley. A few salient excerpts include:

"The shallow aquifer system is hosted in the upper few hundred feet of Quaternary and Tertiary sediments in the valley, and interacts with rivers, streams, irrigation ditches, and other surface-water bodies" (English, 2018, p. 5).

"The river and aquifer share a complex hydrologic connection ….. Water moved back and forth between the river and aquifer through a variety of hydrologic pathways" (Shaffer, 2011, p. X). Shaffer has described in considerable detail the many complex spatial and temporal interactions between surface water and groundwater within the Gallatin River system. Although Shaffer's specific study area is located a few miles southwest of the proposed R-Bar-N subdivision development, the hydrologic dynamics delineated apply to the subdivision site as well as the valley as a whole (Shaffer, 2011).

"Discharge of ground water from the Bozeman fan is by effluent seepage to streams [and] by underflow to adjacent areas downvalley" (Hacket, et al, 1960, p. 155).

"The quality of surface water is closely related to that of the ground water because infiltration of surface water is a principal source of ground-water recharge in the upper part of the valley, and because seepage into streams is a major source of surface water in the lower part of the valley" (Hacket, et al, 1960, p. 167).

PROPOSED DISCHARGE PERMIT FOR R-BAR-N ESTATES SUBDIVISION:

A memorandum by the consulting firm WET (Water and Environmental Technologies) describes a simulated model that was conducted of groundwater flow in the vicinity of the proposed R-Bar-N Estates subdivision (Nicklin, et al, 2021). The document acknowledges that "it is always the case that groundwater models represent simplifications of complex natural systems" (Nicklin, et al, 2021, p. 11). It also makes reference to the inter-connectedness between groundwater and surface waterways in acknowledging that "Water applied to the land surface, that is not consumptively used, infiltrates as recharge to the underlying groundwater" (Nicklin, et al, 2021, p. 8). However, it claims that: "The creeks downgradient of the facility – Hyalite, McDonald, and Baxter Creeks – are perched above the water table. The simulated groundwater head from WET (2021) places the water levels of these creeks 20-50 ft above the water table, demonstrating that they are hydrologically disconnected" (Nicklin, et al, 2021).

Such conclusions apparently rely on a difference measured between the elevation of the surface streams and the elevation of the underlying water table at some unspecified point in time. Remote Lidar data are used to suggest separations of 33 feet for Baxter Creek, 22 feet for McDonald Creek and 23 feet for Hyalite Creek from underlying groundwater (Nicklin, et al, 2021, p. 11). The memorandum provides no evidence of any impermeable or confining layer in the alluvium beneath the proposed subdivision site capable of maintaining separation between the groundwater and the three above named surface streams.

The conclusions of the memorandum run counter to the existing body of rigorous scientific literature which documents significant hydrologic connectivity between surface and subsurface waters in the Gallatin Valley (Hacket, et al, 1960; Shaffer, 2011; and English, 2018, p. 5). Even if it could be conceded that some degree of hydrologic separation may exist at certain times of the year (possibly in winter when such elevation differences can be expected to be at their maximum), it is highly unlikely that the surface waters remain perched or hydrologically disconnected year-round.

The memorandum makes reference to a "Layer 5" in simulating "the confined component of the Tertiary aquifer" that was "continuous within the entire active model domain" (Nicklin, et al, 2021). The only mention of confined groundwater within the Gallatin Valley to be found in the scientific literature is to a single test well dug approximately 3 miles northeast of Four Corners that encountered confined groundwater in Tertiary sediments at a depth of 240-250 feet, far deeper than anything under discussion for the proposed R-Bar-N Estates subdivision, as well as passing reference to confining cemented gravel layers that are found in Quaternary gravels in the Belgrade area (English, 2018, p. 5). Such layers are likely discontinuous and limited in lateral extent. English surmises that "There are likely other confined aquifer zones deeper in the Tertiary basin-fill sediments within the valley that have yet to be discovered." But nowhere in the literature is there any documentation of perched surface waters or permanent separations between surface streams and the aquifer within 100 feet of the land surface in the Gallatin Valley.

The WET memorandum states that "Downgradient surface water will not receive nitrate-nitrogen impacts from loading at R-Bar-N Estates Subdivision" because "total nitrogen groundwater concentration will not increase by more than 2.0 mg/L at the downgradient boundary of the R-Bar- N Estates Subdivision" (Nicklin, et al, 2021, p. 11).

GROUNDWATER QUALITY - BRIEF REVIEW OF WELL DATA:

In order to obtain a rough estimate of background concentrations of nitrogen in the vicinity of the proposed subdivision site, a brief review was undertaken to identify groundwater wells situated in open fields away from any developed structures and located within a reasonable radius (approximately one mile) of the site. (Data were obtained from the Gallatin Local Water Quality District interactive map, http://gis.gallatin.mt.gov/webmap/?map=glwqd&lat=45.73236&lon=111.0771&scale=38939). No housing units or subdivisions were situated within another 1 mile radius up-gradient of the sampling wells. This separation helps minimize contamination of the data from already existing septic systems. Four such

groundwater wells were identified, all located in Section 28, Township 1 South, Range 5 East, to the south and southeast of the proposed site. They include the following:

Well ID # 982 - total nitrogen concentrations = 1.3 ml/L, sampled in June 2006;
Well ID #7895, - 1.35 mg/L, sampled August 2013;
Well ID #8295 - 1.54 mg/L, sampled in August 2013;
Well ID #8296 - 1.6 mg/L, sampled in August 2013 (along Harper-Puckett Road).

Average nitrogen concentrations from the above four wells was 1.4 mg/L.

This number most likely represents a nitrogen concentration somewhat higher than pristine groundwater conditions, since existing septic systems have been discharging nutrients into the groundwater up-gradient of this area for many years. Nevertheless, it represents at least rudimentary approximation of background nitrogen concentrations in the vicinity surrounding the proposed subdivision.

Three wells located immediately up-gradient (south) of the proposed subdivision site, and at the down-gradient (northern) end of an existing small subdivision in Section 21, T1S, R5E, showed the following concentrations of nitrate:

Well ID # 197 - 3.9 mg/L, sampled in July 1997, and 4.4 mg/L, in May 1998);
Well ID #7904 - 5.32 mg/L, sampled in September 2013;
Well ID #8311 - 3.07 mg/L, sampled in September 2013.

Average nitrogen concentrations from the above three wells was 4.2 mg/L.

This level of nutrient concentration is 300%, or three times higher, than the background estimate calculated above.

Nitrogen concentrations greater than 3mg/L are generally know to indicate contamination (Madison and Brunett, 1985). According to the EPA, maximum contaminant levels (MCL) for nitrogen concentrations to protect against blue-baby syndrome are 10 mg/L (or ppm) in groundwater, or o.3 mg/L in surface water. Concentrations above this level are considered hazardous to human health (EPA, Estimated Nitrate Concentrations in Groundwater Used for Drinking, https://www.epa.gov/nutrient-policy-data/estimated-nitrate-concentrations-groundwater-used-drinking)

Nitrogen levels in the groundwater immediately up-gradient of the proposed R-Bar-N Estates subdivision are already elevated. Addition of yet another septic system, especially as large as the one proposed to accommodate more than 177 homes, will only exacerbate an already existing problem that is rapidly becoming more acute. The addition of 2.0 mg/L (or more) down-gradient of the proposed subdivision will bring nitrogen levels up into the range of 6 mg/L or more.

CONCLUSIONS AND RECOMMENDATIONS:

Assurances to the effect that surface streams down-gradient of the proposed R-Bar-N Estates subdivision are perched and/or hydrologically disconnected from the underlying groundwater

are questioned here as unproven, untested and contrary to the considerable body of scientific knowledge about the hydrology of the Gallatin Valley.
Any discharge permit issued on the basis of such assurances would therefore be of suspect scientific validity.

The population of Gallatin Valley in the first two decades of the 21st century has grown dramatically, and the pace of growth is accelerating. One inevitable consequence of such growth is an ever increasing number and density of septic systems, each contributing incrementally to the leaching of nitrogen and other pollutants into the groundwater, and eventually into down-gradient surface waterways. Harmful and unsightly algal blooms are already proliferating in some local streams.

The need for the Montana DEQ to conduct a rigorous non-degradation study of the cumulative impacts of nitrogen and other nutrient pollution components into the groundwater and surface waters of the Gallatin Valley is long overdue, and increasingly urgent. A full analysis of potential and direct impacts is needed before ever more discharge permits are issued.

REFERENCES:

English, A. R., 2018, Evaluation of Potential High-Yield Groundwater Development in the Gallatin Valley, Gallatin County, Montana, Montana Bureau of Mines and Geology Open File Report 698, 16 p.

Hacket, O. M., Visher, F. N., McMurtrey, R. G., and Seinhilber, W. L, 1960, Geology and Ground-water Resources of the Gallatin Valley, Gallatin County, Montana, Geological Survey Water Supply Paper 1482, 282 p.

Nicklin, M. E., and Rutherford, B., 2021, Groundwater Flow and Transport Simulations for Evaluating Nitrate Transport at R-Bar-N Estates Subdivision, WET Memorandum (Water and Environmental Technologies), 30 p.

Schaffer, M. A., 2011, Ground-water Discharge and Aquifer Recharge Zones Near Four Corners, Gallatin County, Montana, M.S. Thesis, Montana State University, 91 p.