COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

November 9, 2017

Stephanie Francher-English
Loveland Ready-Mix Concrete, Inc.
664 N. Namaqua Road, P.O. Box 299
Loveland, Colorado 80539

RE: Knox Pit, DRMS Permit Application No. M-2017-036
Copy of Objections

Dear Mrs. Francher-English:

The Colorado Division of Reclamation, Mining, and Safety (Division or DRMS) received the following objections from the individuals or entities listed below during the public comment period.

Objector Name
Craig Greenwell
Terry Waters
Matthew and Jayme Tilley
John Gross
Jennifer Scheimann
Patty McElwaine
Leslie Patterson
Dr. Mandy Kotzman
Ruth Wallick
Pia Jensen
Nic Koontz
No Laporte Gravel Corp
Peter Waack
Amy Maddox

Chalon Kintzley
Dana Horne
Jason Allely
Kelly Kintzley
Leah Kintzley
Leah Salmans
Ray Kintzley
Sarah Allely
Erin Crowgey

A copy of their objections is enclosed in accordance with Rule 1.7.1(3). These objections can also be viewed on our website at:

http://drmsweblink.state.co.us/drmsweblink/search.aspx?dbid=0

If you have any questions feel free to contact me at (303) 866-3567, extension 8120.

Sincerely,

Jared Ebert
Environmental Protection Specialist III

Enclosures

EC: William Katz, Telesto Solutions, Inc. wkatz@telesto-inc.com
Brand Fancher, LRM bradf@lrmconcrete.com
Stephanie Fancher-English, LRM stephanieh@lrmconcrete.com

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

No Laporte Gravel Corp, Comments and Declarations, M2017036 Knox Plt

Pete Waack <chetek65@yahoo.com> Wed, Nov 8, 2017 at 3:50 PM
To: "jared.ebert@state.co.us" <jared.ebert@state.co.us>

Dear Mr. Ebert:

Please accept the attached documents from No Laporte Gravel Corp with regards to the Loveland Ready Mix, Knox Pit, application with DRMS No. M2017036.

We want to be considered an aggrieved party and request a hearing with DRMS to discuss this application.

I have attached a zipped folder with all the documents. I will also send another email with the individual documents attached in case this zip folder cannot be opened on your end.

Please confirm receipt.

Thank you,

Peter Waack
Board Member, No Laporte Gravel Corp
3116 Gold Charm Drive
Fort Collins, CO 80524
(315) 876-2512

No Laporte Comments and Declarations M2017036.zip
19578K

Declaration of Aggrieved Party
DRMS Application M2017036 The Knox Pit

1. My name is Peter Waack. I live at 3116 Gold Charm Dr., Fort Collins, CO. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp. I am also a Board member of No Laporte Gravel Corp. I hold the position of Legal Liaison in the nonprofit corporation.
3. I can see the Loveland Ready Mix property that is the subject of this permit application from the front yard of my house and as I travel to and from the hamlet of Laporte for food, entertainment, and household supplies. Especially when you consider all the other properties that Loveland Ready Mix owns and plans to mine, I am nearly completely surrounded by potential mining and processing activities.
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
    a. I am within a quarter mile of the proposed batch plant and will be subjected to poor air quality, noise, and visual pollution from the proposed plant and pits.
    b. I drive the streets surrounding the proposed plants multiple times a day and will be impacted by the increased traffic going into and out of proposed development.
    c. I own a well on my property for watering my lawn and gardens and would be impacted by a drop in the water levels and any increase in pollutants flowing into the groundwater.
    d. The Loveland Ready Mix property in question and the other properties they plan on developing will greatly negatively impact my peaceful nature of my home and neighborhood. The noise, the changing of land use from grazing to mining, and the visual pollution will have a drastic impact on my quality of life and home value.
    e. I am greatly concerned about the Loveland Ready Mix reclamation plan. In my opinion, they have not submitted a "reclamation" plan at all. They intend to leave huge craters in the ground that are not conducive to grazing or future development.
5. My greatest concern is that all the past, current, and future mining operations and their overall impact are not being considered as a whole which is a poor approach to mining analysis. I request that the whole area and especially the obvious future mineable area owned by Loveland Ready Mix be evaluated for your approval.

I swear the foregoing is true and accurate to the best of my knowledge.

Signed

11/8/17
Date

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Public Comment: LRM Proposal 16-ZONE2113

1 message

Russell Greenwell <russellgreenwell@gmail.com> Thu, Nov 2, 2017 at 11:55 AM
To: jared.ebert@state.co.us
Cc: bocc@co.larimer.co.us

Dear sir,

I am writing to protest the Loveland Ready-Mix (LRM), (#16-ZONE2113) mining and batch plant application. I oppose further expansions or extensions, in general, to all kinds of aggregate quarrying or refining in the La Porte, CO area (e.g., Hawkeye). I am against the LRM project, in full effect and purpose.

I live within the La Porte Postal Code. My young child will attend Little Cache Elementary. The quality of life in this area is based upon a rural, non-manufacturing ideology. This is why we purchased property in this location. Quantitatively: Noise and dust, traffic, as well as other forms of ambient pollution cannot be completely controlled or delimited in this area, commensurate to LRM's proposals.

The LRM application (i.e., as submitted by Tolesto) also contains several unknown assumptions used as quality control indicators and performance management criteria for environmental protection and enforcement. There are several methods in which to forecast models for air and water particulants, assess traffic and machine pollution, and none of them are factually represents in 16-ZONE2113. Instead, presumptive indicators are presented and utilized within the operators good discretion of compliance to State of Colorado standards.

Largely, the scope and stated self-enforcement strategies from Telesto are loose, theoretical, and lack efficient compliance federal guidelines; which delegate this authority to the State of Colorado. There is too much room for the operator to expand and extend operations, without concern of the local needs in this proposal. Even then, and even if the State of Colorado was able to more effectively enforce violations, they are not legally able to do so.

Similarly, neither Larimer county nor the state of Colorado has sufficient, standard or consistently applied mechanisms to quickly enforce all potential violations, (i.e., according to the cited legal article). Too much information on operations is left to the interpretation of the individual inspector, within 30 days of a complaint, and even then - there is no guarantee that an enforcement result will sufficiently undue damages accomplished per a violation within the statute of limitation and all that goes with it. There are too many beauratic hurdles to navigate in order to immediately invoke enforcements action and/or immediately cease immediate harm via an immediate violation. There are simply to many indirect effects being ignored in this application. Here is a better example, demonstrated in the following scenario:

My home and parcels are located inside a FEMA flood plain. There is a floodplain violation concerning an irrigation and drainage facility. This facility has been placed in the wrong place and it now blocks stormwater drainage. This facility is proposed to deliver an increase in irrigation water, through an increase also in duration to feed the proposed LRM batch plant. Increases in flows of this out-of-place facility causes increased flows in floodplain drainages and heights, and will negatively affect our entire six filing subdivision. Here is the unlucky reality: Larimer County will not enforce a floodplain violation under CFR for unknown reasons, the State of Colorado AG's office thinks it's FEMAs job to enforce and then the county, and FEMA believes that enforcement is a delegated authority to the State. Wrose yet, the state engineers office only controls the actual flow, and whether or not they irrigation company owns that flow - within a ditch, and the Colorado Water Conservation Board refuses to rule on the issue at all. In a nutshell: No entity State, County, or Federal entity interprets its responsibilities as anything beyond their interpreted scope. Yet, the summary effect remains the same: An increased risk in flooding due to a new mining and batch plant.

The above example only concerns water, not air or underground pollution. As is clearly shown, no regulatory agency considers themselves directly responsible, thus leaving it to individual legal actions to fill in the gaps in case of spill or pollution exceedances'. Historically, La Porte has received little if any environmental compliance, environmental justice protection. The combined effect of this proposal coupled with this lack of underachievement by regulatory parties, certainly contribute to several indirect challenges that no one will be able to stop.

Approval of any type of permit for the LRM application will directly cause increased dust, noise, water, and traffic pollution. Indirectly, there are increased risks to flood management, mental health, and property values – just to name a few.

Approving any permit without appropriate studies, quality research and defined operational parameters, including enforcement indicators – will be a violation of several federal guidelines, thus commensurately increasing legal repercussions on the State of Colorado. In my specific case and at a minimum, additional hydraulic analyses should be produced by the applicant, maintaining compliance and agreement through the public process concerning appropriate rises in flood risks, and any FEMA changes to an adopted flood map *via* the proposed water source for LRM's proposal.

Please make sure this makes it into the official record. Thank you,

Craig Greenwell

2722 McConnell Drive

La Porte, CO 80535

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

objection to Loveland Ready Mix permit application

Jayme Patrick Tilley <jayme8704@gmail.com> Mon, Nov 6, 2017 at 12:58 PM
To: Jared Ebert - DNR <jared.ebert@state.co.us>

Hi Jared,

Please accept this scan of our letter of objection. The hard copy is in the mail to you. Thanks.

Jayme

Tilley-LetterofObjection.pdf
1786K

Colorado Division of Reclamation, Mining, and Safety
Attn: Jared Ebert
RE: M-2017-036 Site Name: Knox Pit

November 6, 2017

Dear Jared:

Please accept our Objection to the permit application. We are an aggrieved party because we are directly and adversely affected. We have invested heavily in our property here in Laporte based on a long-term return and growth in our investment. We did our research and we made a well-informed buy. Gravel mining to any extent is detrimental to the character of Laporte and that is clearly stated in the Laporte Area Plan. That plan does state that mining Could exist, if demonstrated to compatible, and as a temporary short term use of the land. Yet this proposal would last for decades and would cause substantial harm to our family and our interests.

We own a rental home and a storage business on our property. The very existence of this mine, even as a proposal, is negatively impacting our economic growth potential. The setting in Laporte is of primary appeal to our tenants and customers. In particular the setting of our rental home adjacent to open areas is of great importance. The mine would directly harm the economic, aesthetic, conservational, and recreational interests of the town, which in turn will directly harm our economic interests regarding the rental home. Among the many different alternative uses for this land, a gravel mine and concrete plant are the worse possible options. Even commercial development, though we are not in favor of it, would be lesser disturbance for a shorter period of time. And development of homes and business near us would increase the value and attractiveness of our property. No one will want to rent a house or store an expensive camper next to a gravel mine, at least not at a competitive rate. Being adjacent to a mining operation will result in a major actual loss to our business investment for a long period of time.

A mine at this location is too close to town and neighborhoods. Their reclamation plan would result in terrain and water functions that are dramatically different from what they are now, which has been the historic use of this land. Their plan would cause a substantial negative impact on the local ecosystem and its resources.

LRM has purchased a number of other parcels in this immediate area which they intend to mine. This together with the Hawkeye Ranch mine would result in a mining and post-mining footprint larger than all of Laporte. No permits should be issued until the situation as a whole is thoroughly evaluated.

We've seen this result up and down N. Taft Hill Road where a number of fenced-off scars line the river. They close off recreational access and fill periodically with water just enough to support mosquitos and some geese. They serve no beneficial use to the public.

LRM is now having to re- reclaim their land along the Big Thompson River because of the 2013 flood. This was only a 100 year flood and the fact that the reclaimed riparian area failed presents a substantial risk and concern that hydrology management in the Laporte area will also fail. These plans need a much closer look to ensure the local environment and community will not be harmed.

Please do not issue this permit as it will directly harm our family.

Thank you for your consideration.

Sincerely,

Jayme L Patrick
Matthew A. Tilley

Matthew and Jayme Tilley
2902 Park Avenue (PO Box 657)
LaPorte, CO 80535

November 7, 2017

M. Leslie Patterson
223 Linden St. Ste. 204
Fort Collins, CO 80524
970-556-0994

Mr. Jared Ebert
1313 Sherman St. Rm 215
Denver, CO 80203

Dear Mr. Ebert,

My name is Leslie Patterson, my husband and I own the property located at 3393 Orchard Drive, Laporte, Colorado. We purchased this property in May of 2010, and truly consider ourselves lucky and fortunate daily to be able to live in a 'rural-urban' community. Tom (my husband) and I had been residents of Fort Collins since the 1980's…we fell in love with Laporte due to the laid-back community-oriented atmosphere Laporte offers. Laporte is a 'throw-back' town, a relaxed, beautiful area close to urban Fort Collins but far enough away to offer the opportunities of rural living. On this property, I am the proprietor of a small farm called Bella Daisy Farm. We raise meat chickens and turkeys for our family, friends and a group of customers. We also have a couple of neighborhood co-ops we provide eggs to during the summer. As well as raising poultry and poultry products, we have dairy goats that provide milk/cheese for our family. We also raise pigs and beef, albeit in small amounts. Along with these protein sources, we have a quarter acre garden that provides vegetables for our family and friends. Not least, we bale our own hay to feed to our livestock.

We are distraught at the potential inclusion of Laporte Gravel into our community. The addition of Laporte Gravel on 54G will completely change the look and feel of our community, as well as have detrimental environmental effects on our farm. Our farm is located less than one mile from the proposed Laporte Gravel site; particulate pollution from the gravel pit will impact our agricultural outputs, coating the fauna in our gardens and crops with dust from the gravel mine, as well as impact our water that we use to irrigate our hay field, our garden, and water our livestock. Our customers love to visit our farm, to see where the food they eat is coming from, enjoy the sites, smells and experience of rural living. This rural living environment and atmosphere does not include a gravel pit less than a mile away. Since we have lived in Laporte for 7 years, we are aware of the effects of a gravel mine on the environment, as well as the impact it makes on transportation, since we often travel along Taft to and from home by the *other* gravel pit. Often there are large trucks pulling out into traffic and impeding normal traveling speeds on Taft. It is our understanding the by-pass was created between 54G and 287 to relieve Laporte of said traffic; adding a gravel pit will increase this traffic to what it was before and then some.

Finally, the aesthetic damage this business will cause is immeasurable. The citizens and residents of Laporte should decide what industry, if any, get to be a part of our community, we were here first!!! Laporte is a wonderful community, nestled in the northwest foothills of Fort Collins, and is a RESIDENTIAL community... **not industrial**. We enjoy the natural gifts offered by the Poudre River; the trees, the water, the wild life... these will be irreparably damaged by allowing this gravel industry to trespass into our community. Please listen to the residents of our town, realize the incredibly negative impact this will have on Laporte, and STOP the progression of Laporte Gravel in our area!

Sincerely,

M Leslie Patterson

M. Leslie Patterson
Bella Daisy Farm, LLC

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Objection to Permit # M2017036, Knox Pit

Mandy Kotzman <Mandy@creativepursuits.net> Tue, Nov 7, 2017 at 12:20 PM
To: jared.ebert@state.co.us

To: The Colorado Division of Reclamation, Mining, and Safety

Attention: Jared Ebert (jared.ebert@state.co.us)

1313 Sherman St, Room 215

Denver, CO 80203

From: Dr. Mandy Kotzman

(970) 581-4982

P.O. Box 1084 (mail)

3400 Orchard Drive (street)

LaPorte, CO 80535-1084

Mandy@CreativePursuits.net

7 November 2017

RE: Objection to Permit # M2017036, Knox Pit

I wish to lodge a formal objection to the proposal described in Permit #M2017036 known as the Knox Pit, filed by Loveland Ready-mix (Construction Materials Regular 112 Operation Reclamation Permit).

I live in LaPorte, about 1/3 mile from the western edge of the proposed gravel pit, and will be directly and adversely affected by the proposed mining operations. Since I will suffer actual loss economically, aesthetically, recreationally and in regards to conservation interests, I am an Aggrieved Party with regard to this application.

I request that the Mined Land Reclamation Board reject this application on the basis of unacceptable impacts and demonstrable losses to neighboring residents and the LaPorte community at large. The proximity of the to the 'town' of LaPorte makes its impacts unacceptable and 'unmitigatable'.

Economic losses:

I co-own a residential property ~0.3 mile from the west boundary of the proposed site of the Knox Pit. Research suggests that I could expect my property value to depreciate by at least 22% in perpetuity if this gravel pit is allowed to proceed. For many LaPorte residents, their home is their single most valuable asset.

From: An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township - George A. Erickcek (2006) W.E. Upjohn Institute for Employment Research. A report completed for the City of Kalamazoo, the City of Hastings, the City of Battle Creek, the City of Grand Rapids.

Furthermore, declining property values will decrease the property tax revenue collected by the County and State, resulting in less money for other County and State Programs from which I would benefit.

In addition, it is well documented that the heavier the vehicles, the greater the damage they cause to roads (e.g., Dr. W. James Wilde, 2014, Minnesota Department of Transportation Research Services & Library, **Assessing the Effects of Heavy Vehicles on Local Roadways**). The proposed gravel extraction project would add literally hundreds trips each day of heavy trucks (>23 tons) which are “noisy, dirty, polluting, unsafe, tear up the road and make it hard to cross the street” (Center for Spatial Economics, CAO Report 2009-001, **Property value losses from quarrying operations**) or to ride bikes on the road shoulders made uneven and slippery with drag out. Aside from danger and inconvenience caused by this traffic, the increased maintenance costs would also reduce the County’s ability to support citizen services – a direct negative financial impact on me.

Aesthetically:

The eastern entrance to LaPorte has always had a low-key rural feel. The community’s intention to preserve and enhance this valuable asset is explicitly enshrined in LaPorte Area Plan commissioned and accepted by Larimer County in 2004. I have had direct personal experience of how ugly gravel pits are to look at, how unpleasant they are to listen to, and how ugly the inevitable dust plumes are on windy days (to say nothing of the health impacts year round) – it has all happened here before, but fortunately further away.

Depression of ground water by as little as 3 ft can cause death to up to 90% of the adjacent trees (M.L. Scott, P.B. Shafroth and G.T. Auble, 1999, Environmental Management Vol. 23, No. 3, pp. 347–358 **Responses of Riparian Cottonwoods to Alluvial Water Table Declines**). The Knox pit would depress groundwater by at least 5’ to 9’ and would kill many of the old cottonwood trees near the site (as has happened adjacent to nearby gravel excavation sites), destroying wildlife habitat and being aesthetically unappealing. My past experience is that promises of amelioration of vegetation damaged by mining have been laughably inadequate and totally ineffective – a mockery and complete insult.

Recreationally and with regard to conservation:

I currently enjoy a lot of outdoor recreation in this area: riding my bike on roads and trails, walking, running and bird/mammal watching on nearby trails and in reserves along the Cache La Poudre River (<0.5 mi from the proposed mine site). Heavy, threatening truck traffic and its inevitable associated drag out on to the County Road would make bike riding on the road hazardous and undesirable. The noise and dust from the mining activity would diminish the desirability and quality of the recreational experience, and the loss of trees (from dewatering) would negatively impact bird and other animal life.

The LaPorte area has always been pretty quiet, with nighttime background noise levels below 40 decibels. Recent legitimate daytime rural activities producing 75 decibels (at the property boundary) were noticeable and irritating, but fortunately temporary. Recent research by the World Health Organization (WHO) deduced that healthy noise levels should not exceed 55 decibels during the day and 40 at night (https://nhc.com.au/the-impact-of-city-sounds-on-your-health). They state that exposure to high and medium-high levels of noise almost doubles the rates of irritability, mood swings, nervousness and worry in people, and almost doubled the rate of reported insomnia and sleep disorders, concentration problems and headaches. Excessive sound levels do create a real “noise sickness.” These impacts not only constitute a health risk, but also potential loss of economic productivity.

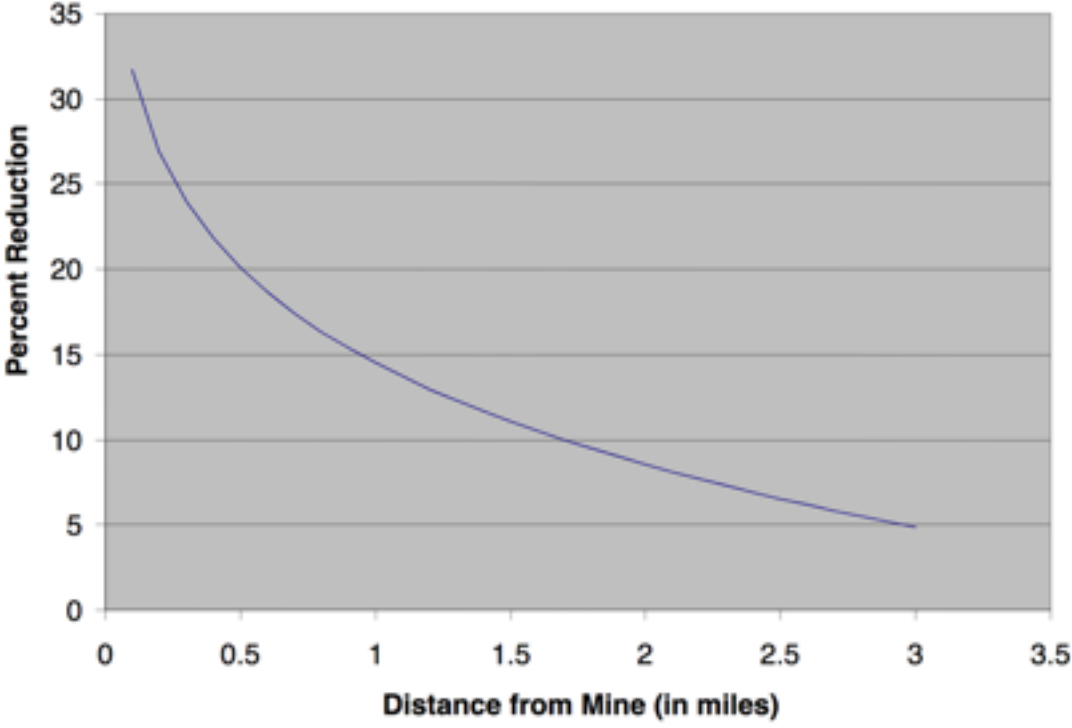
It is too late to seriously consider mining this site now that it sits adjacent to the ‘town’ of LaPorte. Its combined impacts on me, and other, nearby residents are unacceptable and unreasonable. Please deny Loveland Ready-Mix Permit #M2017036 known as the Knox Pit.

Sincerely,

Mandy

PastedGraphic-1.pdf
36K

Figure 1: Impact of Gravel Pit on Residential Property Values:
(Percent Reduction by Distance from Mine)



STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Declaration of aggrievement

Ruth Wallick <ncstainedglass@gmail.com> Tue, Nov 7, 2017 at 5:22 PM
To: jared.ebert@state.co.us

Colorado Division of Mining & Reclamation
Attn: Jared Ebert
RE: M-2017-036
Site Name: Knox Pit

Attached please find my Declaration of Aggrievement.
I will mail a signed copy tomorrow.

Thank you.

Ruth Wallick

Declaration of Aggrievement.docx
16K

Declaration of Aggrievement

1. My name is Ruth Wallick, of 3000 and 2912 North Overland Trail, Laporte, CO. I am over 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp. I am also a board member, and hold a position as advisor in the non-profit corporation.
3. I can see the Loveland Ready Mix property that is the subject of this permit application from the bridge between my properties. I also drive past it when I go into Ft. Collins.
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
5. I will be able to see the mining activity when I go to town on 54 G. I am used to the calming sight of cows in the pasture. That sight will be transformed into an industrial zone.
6. Depending on the weather conditions, I will be impacted by the dust and pollution from the site. On some mornings I can even smell asphalt from the Martin Marietta plant on Taft Hill Road, which is further away.
7. Each property has a registered irrigation well. If the water level in the wells were to drop I might not be able to water my property. If the water table were to drop it could affect my trees. A higher water table, combined with intense summer storms, might result in an increased chance of flooding.
8. Mining on the property might upset the local herd of mule deer that travel along the Little Cache irrigation ditch, which is between my two properties, and the smaller ditch to the south of 2912. We also have Great Horned Owls that live in the area, and a variety of other large birds that might be affected.
9. I am absolutely certain I will be able to hear the mining activity. This summer I could hear the rock crushing between Taft Hill and Overland Trail, and this will be much closer. This is usually a peaceful community. I love being outside or on the porch in the morning, and the thought of so much noise so much closer is really disturbing to me. The noise from increased truck traffic will also negatively impact my quality of life.
10. I am very concerned about the reclamation plan. They plan to put finings and topsoil into the mined out pit and try to grow pasture grass. I am concerned that there will not be enough soil quality and depth to grow pasture. I am afraid it will end up full of weeds, with standing, stagnant water that will breed mosquitoes. I would like to see a reclamation plan that includes natural looking ponds surrounded by unmined pasture.
11. I am very concerned about safety issues caused by the increased heavy truck traffic on Hwy 54 G. I am worried that some of that traffic is going to end up going through the main intersection in Laporte , 54G & Overland Trail. This will create a serious hazard for those of us who regularly walk to the post office, grocery or hardware store. I worry about the safety of my friends and neighbors children, and the children on the school busses.

I swear the forgoing is true and accurate to the best of my knowledge.

Signed Ruth Wallick Date 11-7-17

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Fwd: Comment RE: Permit # M2017036 Site Name: Knox Pit

Mojar - DNR, Camille <camille.mojar@state.co.us> Thu, Nov 9, 2017 at 8:18 AM
To: Jared Ebert - DNR <jared.ebert@state.co.us>

---------- Forwarded message ----------
From: **Erin Crowgey** <ercrowgey@gmail.com>
Date: Wed, Nov 8, 2017 at 11:25 PM
Subject: Comment RE: Permit # M2017036 Site Name: Knox Pit
To: DMG_web@state.co.us

Please see the attached letter commenting on Permit # M2017036 Site Name: Knox Pit.

Thank you,

Erin Crowgey
3300 Tharp Dr.
Laporte, CO

--
Camille Mojar
Executive Assistant/MLRB Secretary
Division of Reclamation, Mining and Safety
Department of Natl Resources

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

P 303.866.3567 x 8136 | F 303.832.8106
1313 Sherman Street, Suite 215
Denver, CO 80203

http://mining.state.co.us

CO Division of Reclamation Letter.docx
14K

Erin Crowgey
3300 Tharp Dr.
Laporte, CO
(434) 284-1479
ercrowgey@gmail.com

CO Division of Reclamation, Mining, and Safety
1313 Sherman St., Room 215
Denver, CO 80203

RE: Permit # M2017036 Site Name: Knox Pit

To Whom It May Concern:

My name is Erin Crowgey, and I live approximately 2 blocks from the proposed Knox Pit. I am an attorney and a member of No Laporte Gravel.

I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:

1. The proposed mining activity is just 2 blocks from my house. I will see the mining activities every time I travel to and from my home. I cannot avoid viewing these activities, as they are on the main street leading into Laporte. All visitors to my house will also see the proposed mining activity.

2. From my backyard, I will be able to see air pollution emitted from the concrete production and any dust from the mining activity/equipment. I will be forced to breathe air that is polluted by mining equipment and project traffic. A strong odor of gasoline will be present. Additionally, though the prevailing wind blows from my house to the pit, there is often a countervailing wind that blows from the pit to my house. This often occurs before snow and rain storms. When the wind is blowing to the west, my yard will fill with dust and we will breathe more polluted air because of the mining equipment. The dust and air pollution will enter my house during summer months and hot days, when we have to keep the windows open and fans blowing air in to cool our house.

3. Our yard backs to an irrigation ditch. We expect that the mining activity will reduce the amount of water in the ditch and reduce the water quality, affecting our landscaping, our garden, and our general health.

4. One primary reason for moving to our home was our access to the river and to open spaces, which allow us to enjoy wildlife including deer, raccoons, birds of prey, geese, foxes, and other wildlife. The proposed mining activity will significantly reduce the

availability habitat for these animals and will reduce their numbers as well as their quality of life.

5. Another central reason we chose to live in this area was the quietude of our neighborhood. My nine-month-old son stays at home during the day. The mining project will significantly impact the quietude of our house and yard during the day. The noise will be ever-present during normal operating hours, the hours that we use our house to care for our son. Noises at the level proposed by the mining activities are well-documented to cause migraines and ADD/ADHD in children. This will affect my son on a daily basis, potentially for the rest of his life. We will not be able to avoid the noise by entering the house, particularly during the months that it is necessary to keep windows open to keep the house cool.

For all of these reasons, I am an aggrieved party, and I ask you to deny the permit for Knox Pit.

Sincerely,

Erin Crowgey

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

objection to application M-2017-036, Knox Pit

Nic Koontz <nic@nativehillfarm.com> Wed, Nov 8, 2017 at 3:39 PM
To: jared.ebert@state.co.us
Cc: Katie Slota <katie@nativehillfarm.com>, Terry Waters <terrywaters125@msn.com>, Rob Helmick <helmicrp@co.larimer.co.us>, Terry Gilbert <gilberrt@co.larimer.co.us>

Mr. Ebert,

My wife and I would like to register our strong objection to the loveland ready mix(LRM) proposal in laporte colorado called the knox pit.

Please read the entire email and take into consideration, I have not found another or shorter way to convey our objection to this project as it has already had massive impacts upon our lives.

We appreciate your time and consideration.

As a resident whom lives and farms(organic produce) only a couple hundred feet from their(LRM) properties we have already been severely impacted by their presence in the area, both economically and emotionally, and they haven't even been approved for operations in the area yet! Their mere presence and pending application with you and the county have put severe economic pressures on our family and our family farming operation.

Our objections from being residents of the neighborhood:

Katie and I and our two year old son live only a couple hundred feet downwind from LRM sites and proposed plants. Once they started buying up properties in the area, significant emotional stress has been put on our family about the safety, specifically the health of our new home on farview dr being impacted by the particulates, noise, and traffic implications, groundwater issues of the LRM proposal, just to name a few. We love our house and have had severe emotional strain with thinking about how to move, when, even the decreased home value, let alone the health implications of staying here, with a large mining operation upwind from us. My wife Katie has a Masters degree(CSU) in Environmental Health and Safety,specializing in Epidemiology and I have a degree in Biosystems Engineering(Clemson Univ) so we are not uneducated about the associated risks to our health, groundwater etc etc etc, one could go on and on. This proposal is too close to residences and businesses and would have and already has had a substantial impact on the quality of life of residents. It is not in harmony with the neighborhood or community and would decrease home values for many many residents simply to create profit for one single company. If you approve this you would basically be allowing LRM to steal wealth from our tight knit community in the form of home equity and health, to name a few. I personally dont know how you could sleep at night with that decision. Secondly from a broader community perspective, this type of operation does not add value to our community, but only detracts, in order to profit one single family(the LRM owners). The changing groundwater situation would have horrible impacts upon homes, wells, landscaping, and septic systems in the area. The area has a notoriously high water table and we have all been able to exist with the conditions as they are now, but a massive multi hundred acre(if all permits and properties are taken into account) would have a huge impact on the groundwater situation, which could cause serious damage to homes, landscaping, etc etc. I honeslty don't know why anyone would accept "results" from an engineering study done by a company(Telesto Solutions) who was hired by the applicant!! This should be done by a neutral third party company whom has the public's best interest in mind and can be unbiased in their study.

From the perspective of an agriculturual business owner and operator within a couple hundred feet of the site:

LRMs presence in the area has already had significant economic and emotional impact upon our farming operation. We have been growing organic produce(for nearly 10 years) which is all sold within a 3 mile radius of the farm, we feed thousands of people locally with good organic food, and provide jobs. First lets talk about our current operation(locations are below). Our irrigation water runs through the entirety of the LRM site,little cache la pourde ditch, it is an 1868 decree, very senior water right, which we depend upon both in quality and quantity for our livelihoods and our employees. We have serious concerns about the impact of LRMs proposal on our irrigation water and quality as well as the changing groundwater conditions on our farming operations. I cannot imagine a scenario where we are not negatively impacted by

this operation in terms of our irrigation water and groundwater conditions. Any raising or lowering of groundwater would injure our farming operations.

With regards to LRMs impact upon our farming operations, we have already, even with the limited public knowledge of the project, been told by our customers that they would think twice before buying produce from our farm due to its potential proximity to the LRM sites(all of them, which they are not disclosing, approx 280 acres in the immediate vicinity, as well as the 200 acres which is directly north of the LRM sites under the Timberline resources pit name). We have also asked our employees if they would be willing to work next to such an operation as LRM is proposing, and they would not, due to health concerns and the quality of the work environment. As farmers, we are working outside ALL the time, much more than even any of the LRM employees would be! I am afraid that this proposal if approved would put our farm out of business.

Lets also touch on the impact LRM has already had on the expansion of our organic farming business as well as a national model for land conservation. We were under contract to purchase and put a conservation easement on 50 acres of prime farmland with senior water rights(Parcel: 9828400002) directly east(downwind) of the properties which LRM started to purchase. This multi year project, financially backed by the community, the county and city governments was to be a model for land conservation, as it would have been a first for the nation for a model where the community would cooperatively own farmland(www.farmland.coop), which would then be leased back long term to organic farmers. We had secured all funding and backing for the conservation easement(though Great Outdoors Colorado and Larimer County Open Space) and had also received a sizeable grant from NRCS(Natural Resource Conservation Service) for installing efficient irrigation as well as creating wildlife habitat. As a business we had already begun the process of buying the equipment we would need to farm a larger acreage, we leased the 50 acres and had begun cover cropping and the organic transition on the farmland. All of this funding and investment(totaling over 2 million $, 2-3 years of effort, and thousands of hours of volunteer time) came to crashing hault when LRM began buying all the land in the area, and submitting their proposal for mining and a permanent concrete batch plant and crusher operation which would be located only 500 ft upwind from fields which were about to start growing organic food for human consumption. Having a gravel pit and LRMs proposed operations only a couple hundred feet upwind from our farm, is unacceptable and incompatible,. The impacts, as discussed above to our product, business, the groundwater, employees, and irrigation water are severe. We were forced to cancel the purchase contract, the conservation easement, and the NRCS grant 10 days before closing, subsequently LRM came in and has purchased said property. As a business the large investment we had made in employees and equipment in order to scale up, we have been saddled with.

We could go on and on. As a business owner, our business is very welcome in the neighborhood and increases residents home values, quality of life, and health I cannot see how this proposal would be in the best interest of the public in any manner. It has already had significant impact on our family's health and put severe financial stress on our family farming business, We simply cannot imagine the further impact that this proposal would have on us and our community. It is unacceptable.

Thanks for your time and consideration,

Nic Koontz, Katie Slota, and Henry, Native Hill Farm LaPorte, CO

let us know if you have any questions.

phone 970-217-8964
email nic@nativehillfarm.com

Residence
2930 Farview Dr Laporte, CO 80524

Farms
2100 CR 54g
and
2320 west CR 54G

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Fwd: Permit # M2017036 Site Name: Knox Pit (Loveland Ready-Mix 17-ZONE2113)

Mojar - DNR, Camille <camille.mojar@state.co.us> Wed, Nov 8, 2017 at 2:17 PM
To: Jared Ebert - DNR <jared.ebert@state.co.us>

---------- Forwarded message ----------
From: **Pia Jensen** <jensen.pia39@gmail.com>
Date: Wed, Nov 8, 2017 at 2:08 PM
Subject: Permit # M2017036 Site Name: Knox Pit (Loveland Ready-Mix 17-ZONE2113)
To: DMG_Web@state.co.us

TO: **CO Division of Reclamation, Mining, and Safety,**

1313 Sherman St, Room 215, Denver, CO 80203

CC: Lew Gaiter III (Larimer County Commissioner- Dist 1) lgaiter@larimer.org

CC: Steve Johnson (Larimer County Commissioner- Dist 2) swjohnson@larimer.org

CC: Tom Donnelly (Larimer County Commissioner- Dist 3) tdonnelly@larimer.org

From: Pia Jensen

Laporte, CO 80535

RE: Permit # M2017036 Site Name: Knox Pit

(Loveland Ready-Mix 17-ZONE2113)

The proposed Loveland Ready-Mix Plant (17-ZONE2114) (also known as the Knox Pit) under permit #M2017036 will have detrimental impact on the quality of life in Laporte (a small rural town north/west of Fort Collins) especially with regards to health and safety (noise, air quality, traffic). Maintaining the rural outdoor way of life will also be negatively impacted.

The plant will be located in close proximity to residential areas, Native Hill Organic Farm, the Plantorium Green House, several small restaurants and shops and the CLP school (elementary/junior high) with its many School Bus Stops along CR54G.

Laporte submitted the Laporte Area Plan which was commissioned and adopted by Larimer County in 2004. Some important items in the Vision and Goals Statement of the plan shows how incompatible the LRM mining and concrete plant is to Laporte. Some examples follows:

Page 7. - The Laporte Area will preserve the best of its exiting character and atmosphere.

- It will maintain its “small town” village core, surrounded by rural areas.
- Planned growth and responsible development will characterize the area

- Codes and development standards will enhance rather than detract from the rural character of Laporte

- The community will take pride in its appearance and enhance its image as a small, pleasant community

Page 8. - Country Road 54G on either end of the community core will present an attractive entrance to the Laporte area.

- New development will preserve the character of the area and be compatible with the existing residential uses.

- Transportation in the Laporte area will be will be safe and efficient.

- Air quality will be maintained or improved and new industrial uses will not be allowed to degrade existing air quality.

These are just some of the goals and visions which are not compatable with the approval of the mining permit. It would greatly impact the quality of life in Laporte and surrounding area, and also property values in Laporte.

I hereby request that Permit # M2017036 Site Name: Knox Pit (Loveland Ready-Mix # 17-ZONE2113) be ***rejected outright*** on the grounds that it is inappropriate and unreasonably disruptive in this location, close to Laporte Center and inconsistent with multiple goals of the Laporte Area Plan.

Sincerely,

Pia Jensen

--
Camille Mojar
Executive Assistant/MLRB Secretary
Division of Reclamation, Mining and Safety
Department of Natl Resources

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

P 303.866.3567 x 8136 | F 303.832.8106
1313 Sherman Street, Suite 215
Denver, CO 80203

http://mining.state.co.us

Declaration of Opposition to Application M-2017-036 Knox Pit

My Name is Amy Maddox. I live at 3012 West Ave in Laporte, Colorado. I am over the age of 18 and of sound mind to make this declaration.

I am a member of No Laporte Gravel Corp and am also a board member of No Laporte Gravel Corp. I hold the position of Secretary in the non-profit corporation.

I can see the Loveland Ready Mix property from my house and on my daily travels to work and to the store. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:

1) I live approximately 500 feet from the western edge of the property. I moved to Laporte 3 years ago from Fort Collins so that I could enjoy the quiet and peaceful nature of the small town of Laporte. Gravel mining to any extent will be detrimental to the character of Laporte as clearly stated in the Laporte area plan. As we are unincorporated, we have no city council or mayor to fight for what is right for our city. This proposal is not temporary as it will have substancial long term negative effects to our town.
2) I currently suffer from asthma. As any studies show, there is no safe level of dust or silica. There will be substantial pollution form the trucks, increased traffic as well as the constant digging and mining. Many of my neighbors also suffer from respiratory illnesses.
3) There are numerous studies that show the impact of mining on water levels of wells. There is a ditch that runs across the property that could also be affected.
4) Numerous endangered and threatened birds of prey potentially can also be affected as there are areas in and dear that land for nesting. The constant level of noise and back up alarms are detrimental to humans as well as wildlife.
5) I currently am able to hear the noise from the Martin Marietta gravel/asphalt plant and it is 3-4 miles away. It is a constant droning noise for hours on end. The noise from this proposed plant will be unbearable. Most of my neighbors do not have air conditioning and leave their windows open during the summer. Our peaceful way of living will be lost. Not to mention the health hazards that are associated with the constant noise.
6) The reclamation plan states that the land will be covered with grass seed. This will leave a pit that can collect low levels of runoff water that will be breeding grounds for mosquitos. We are already surrounded by "reclaimed" gravel pits that are fenced off ugly water storage areas. These were promised to be reclaimed. These eyesores are all along the bike path from Taft Hill to Overland Trail.
7) Once the approval is given, any promises regarding traffic, dust, hours of operation ect. are not enforced. No one will hold them accountable for any infractions of these rules.
8) LRM has purchased other parcels of land surrounding Laporte. In addition, Hawkeye Investments has land already and is seeking access onto North Overland Trail. These should be looked at together as this amount of land and gravel pits in the town of Laporte with have detrimental effects. No permits should be granted until all of these proposed or current projects can be looked at as a whole.

Please do not issue this permit as it will impact all of the citizens of our town of Laporte.

Thanks for your consideration. I swear the foregoing is true and accurate to the best of my knowledge.

Amy Maddox

Amy Maddox

Declaration of Aggrievement for M201-7036 Knox Pit

1. My name is Chalon Kintzley. I live at 2709 W. County Rd. 54G, Fort Collins, CO 80524. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No LaPorte Gravel Corp and can see the Loveland Ready Mix property that is the subject of this permit application from my house as well as from my place of business. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
3. I am located directly across 54G, to the South, from the proposed mining site.
4. My wife and 4 children will see and breathe the air pollution from the mining, concrete production, mining equipment, and project traffic.
5. I am concerned with the high water tables currently in the area and the possibility of them being negatively affected by the mining operations.
6. I also own rental properties within view of the proposed mining site and will expect a decrease in the interests to rent in these areas due to the site and expect my investments to be negatively impacted.
7. The noise from a fully operational mine and batch plant will cause an enormous drop in the quality of life for my wife, 4 young children, and myself.
8. I am concerned that the reclamation plan does not restore the project site to its original contours and conditions.

I swear the foregoing is true and accurate to the best of my knowledge.

Signed

11-8-17
Date

Declaration of Aggrieved Party DRMS

Application M2017036 The Knox Pit

To the DMRS;
My name is Dana Horne and I live at 3240 Sunrise Drive in Laporte. I am over the age of 18 and of sound mind to make the following declaration.

I am a member of the No Laporte Gravel group and hold the position of Creative Director and Web Designer with this group. I am strongly aggrieved by the Loveland Ready Mix permit application in Laporte. I am writing to present my basis of aggrievance for the following reasons;

I live within 500 feet of the proposed site and will have to see, hear and feel mining activity from my home if the permit is allowed to go through:

- Out my back door is a wide-open view where I currently witness open skies and fields which breed wildlife (foxes, rabbits and hawks) as well as domesticated animals (horses, llamas and donkeys, and dogs and cats). I would be aggrieved by this mining proposal as it would (unfairly) destroy my peace and quality of life as I have known for 25 years at my home.

- In addition to fracturing my quality of life, I am aggrieved by this mining proposal as the certain (proven) effects of air quality and pollution (from the proposed concrete production and mining equipment) would greatly affect the quality of my health (not to mention my pet's health)

- The proposed reclamation plan does not include restoration of the project site to its original conditions, and in fact, leaving the land of the proposed site in an unsightly, environmentally unfavorable landscape that no one would want to live near (not with the proposed mining or in the future, post this "reclamation" plan). I will no longer be able to live in such an environment and I don't know who would.

I swear that all the provided information herein is true and accurate.

Signed; *Dana Horne* Date; 11-8-17

Thank you for your time,
Dana Horne
970.481.8798

Declaration of Aggrievement for M201-7036 Knox Pit
Submitted to DRMS

1. My name is Jason Allely. I live at 3701 Settlers Road, Laporte, CO 80535. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp and I own a home .6 mile from the Loveland Ready Mix property.
3. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
    a. My family will be able to hear and breathe the operations from the Knox Pit. We do not have air conditioning in our home and leave our windows open for cooling in the warmer months. My wife suffers from asthma and the noise and dust created from the pit will prevent us from opening our windows. We have heard from other communities next to aggregate pits that is very difficult to get action taken by the authorities when the mines are in violation of environmental and safety regulations. We have the right to quiet enjoyment of our home and this pit would destroy our ability to exercise that right.
    b. My family will be able to hear the mining activities and the right to quiet of this beautiful community that was a primary reason for purchasing a home in this community will be destroyed.
    c. Research has shown that home values in close proximity to gravel pits lose 15-20% of their resale value. I will lose between $50,000 – $75,000 off the value of my home if this pit is allowed.
    d. My family and community will be endangered by the increase of traffic from the project. Our trails and roads are extremely popular with bicyclists (myself included), who contribute to our local small businesses. If this pit is approved, the bicyclists will not feel safe sharing the roads with the large rock trucks and increased traffic, negatively affecting our small businesses. Since the transporters will likely be contractors, we community members have to work very hard to determine how to contact the truck owner when there is a safety violation. We have very little recourse to deal with these issues. If this pit were to be approved, I request that the company is required to work with a community advisory committee made up of community-chosen representatives to address community issues.
    e. The reclamation plan is inadequate and does not add any value to our community.

I swear the foregoing is true and accurate to the best of my knowledge.

Jason Allely
Signed

11-8-17
Date

To:
CO Division of Reclamation, Mining, and Safety
Attn: Jared Ebert
1313 Sherman St, Room 215
Denver, CO 80203

From:
John Gross
POB 1084
LaPorte, CO 80535
(physical address: 3400 Orchard Drive, LaPorte, CO)

RE: Objections to Permit Application: M-2017-036, Knox Pit

Loveland Ready-Mix Concrete, Inc. LaPorte Operations, Knox Pit Construction Material Application 112

By this letter, I am registering my objection to the Loveland Ready-Mix Application M-2017-036 for a "Construction Materials Regular 112 Operation Reclamation Permit". I live less than ½ mile from the proposed operation, and I will be hugely impacted should the quarry commence operations. I am clearly an **Aggrieved Party** with regard to this application.

I request the Mined Land Reclamation Board fully consider the very considerable, demonstrable economic, ecological, and human health issues that will certainly result from this operation. Here I focus on issues for which there is substantial, published, and peer-reviewed literature and evidence for impacts, but I should mention there are other technical issues with the application (a very notable one is the omission of Exhibit C).

Three major and specific issues:

1. **Property values will be reduced**: Prior research has clearly and unequivocally demonstrated that quarries reduce property values up to 3 miles away. The reduction in property values is proportional to proximity to the quarry, and nearby properties can anticipate having their value reduced by 25-30%. These results are consistent across locations in the U.S. and Canada. The application needs to fully account for the major economic impact on property values and subsequent tax losses to Larimer County.
2. **Truck traffic will be costly to the community**: There is a very considerable and established body of evidence demonstrating the negative financial, social, and health impacts of heavy truck traffic. An outstanding example of this is the fact that the City of Ft. Collins has prohibited truck leaving the nearby Martin Marietta quarry to exit south on Taft Hill, the road on which the quarry is located. Heavy trucks are noisy, stinky, unsafe, dirty, they spill load, impede traffic, make it hard to cross the road, and they cause rapid road degradation. A huge increase in truck traffic will clearly reduce economic, aesthetic, and environmental values in areas near the quarry and cement plant. The application and associated studies need to much more thoroughly evaluate the impact of heavy truck traffic and design necessary road improvements to accommodate this.

3. **Water impact assessments are inadequate**: Prior Loveland Ready-Mix application studies (cited in Section 22.0 as Telesto 217b) projected groundwater depletions of more than 9 feet in the quarry, and of five feet or more in properties adjacent to and near the quarry. The application addressed potential (but inconvenient) remediation of shallow wells, but it did not assess impacts to the many trees and other vegetation. The impacts of groundwater depletion will be seasonal, and they vary with differences in natural rainfall.

   In the LaPorte area, we have observed tree death long distances (100's of yards) from past gravel pits that occurred when the pits were constructed and dewatered. Evidence of tree death can still be seen at the nearby Stegner, Timberline Resources, and Martin Marietta pits (all three within 3 miles of the proposed quarry). Many of the existing tree species are known to be shallow rooting, and they are very likely to die with a sudden reduction in ground water level. The application needs to include a much more comprehensive assessment of the environmental impacts of groundwater reduction, and include a realistic mitigation plan for existing trees and other vegetation in the impacted area, including effects during average and drought years. This is completely absent in the current application

Declaration of Aggrievement for M201-7036 Knox Pit
Submitted to DRMS

1. My name is **Kelly Kintzley**. I live at **584 W DOUGLAS RD**. I am over the age of 18 and of sound mind to make this declaration.
2. I packed up my wife and two children and moved here from Arvada. This is where I plan to live and call our home, forever. I have grave concerns for the health of everyone breathing the silica particulates that will be flooding the air in any given direction given the wind conditions. The Kintzley Apartments, a stone's-throw from the proposed pit itself, will be at the total mercy of a dirt-moving company. The lower and middle school a mile away - the children will be subject to constant air quality. We have enough to worry about, let's keep our kids healthy!
3. Laporte is the beautiful connection between Ft.Collins and the mountains. Hundreds more trucks will be required on the already-congested roadways. Nobody living in this vicinity wants more dust, more noise, more pollution, and more trucks.
4. I am a member of No Laporte Gravel Corp and I manage Kintzley Apartments, an apartment and retail complex that is 100 yards from the Loveland Ready Mix proposed mine and batch plant.
5. We can literally see the Loveland Ready Mix property that is the subject of this permit application from my place of business. If this application is allowed to go through, tenants of 32 apartments and about 20 businesses will cancel their leases and go elsewhere. Please do not allow this blatant intrusion that will totally wipe out our business!!
6. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
    a. My tenants will be able to see, hear, and breathe the operations from the Knox Pit.
    b. This natural grazing field is a major reason why many of my tenants chose to live or work on in my buildings and this plan will disrupt the peaceful nature of their tenancy including the peace and quiet and enjoyment of the wildlife that lives and migrates across the land.
    c. My tenants and will be able to hear the mining activities and be endangered by the increase of traffic from the project
    d. The reclamation plan submitted by LRM is wholly inadequate. By no means is leaving 5 huge craters in the ground "reclamation."
7. Please remember us lowly peons who have no power or sway in the decisions that impact *us* the most.

I swear the foregoing is true and accurate to the best of my knowledge.

KELLY KINTZLEY — ***11/8/2017***

Kelly Kintzley — 11/8/17

Signed — Date

Declaration of Aggrievement for M201-7036 Knox Pit

1. My name is Leah Kintzley. I live at 2709 West County Road 54G. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp.
3. I can see the Loveland Ready Mix property that is the subject of this permit application from my house.
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
5. My property is located on the south side of 54G across the street from the proposed site.
6. My family and I will be breathing the air pollution from the plant on a daily basis. We will see the plant from our backyard and we will be dealing with the increased traffic as we leave our property every day.
7. My belief is that our water quality will be harmed by the concrete plant.
8. We currently enjoy many different types of wildlife which I am concerned we may no longer be able to enjoy due to the concrete plant occupying much of the farmland they currently have to roam on.
9. We can see the proposed site from our front window and we will hear the noise from it on our front porch. The increase in traffic we will endure everyday leaving and returning to our home.
10. I am concerned about the quality of life for my family. We enjoy living close to the city in a country setting. This project will ruin all of this.

I swear the foregoing is true and accurate to the best of my knowledge.

Leah Kintzley 11-8-2017
Signed Date

Declaration of Aggrieved Party
DRMS Application M2017036 The Knox Pit

1. My name is Leah Salmans. I live at 2904 Tharp Dr. Laporte, CO. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp. I am also a Board member of No Laporte Gravel Corp. I hold the position of Treasurer in the non profit corporation.
3. I can see the Loveland Ready Mix property that is the subject of this permit application from my house, on my daily travels and my exercise routes via biking and running
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:

- My home is within less than a quarter mile of the proposed Loveland Ready Mix Property
- Air pollution from the mining operations along with hundreds of diesel trucks per day will affect my quality of health and ability to safely ride my bike and exercise without physical harm. (could the water quality or water quantity be harmed by the mining activity? If so, describe).
- The mining project will obstruct my view of the sunrise and seasonal migration of the Catartes aura that roost in the trees that line my property.
- As previously mentioned above my home is within close proximity to the proposed mining operation and noise from mining activities plus additional mining operation traffic will mentally and spiritually impact my quality of health, and wellness. I am also concerned for the our older, at risk, and youngest citizens in and around the proposed mining site for their health and wellbeing. Lastly, my sole investment and financial wellbeing for myself and my family is at stake. Therefore, I am requesting that the area under review be reviewed and concerns that I have outlined be directly addressed.

I swear the foregoing is true and accurate to the best of my knowledge.

Leah Salmans
Signed

11/8/2017
Date

NO LAPORTE GRAVEL.ORG

nolaportegravel@gmail.com

November 8, 2017

By email: jared.ebert@state.co.us -

Jared Ebert
Colorado Division of Reclamation, Mining and Safety
1313 Sherman Street
Denver, Colorado 80303

Re: Loveland Ready Mix Permit Application # M-2017-036.

Dear Mr. Ebert:

No Laporte Gravel Corp and the undersigned individuals submit the following objections on the Section 112 permit application submitted by Loveland Ready Mix ("LRM") for gravel mining in the so-called Knox Pit property located in Laporte, Colorado. As detailed more fully below, LRM's permit application fails to comply with the requirements of the Colorado Land Reclamation Act for the Extraction of Construction Materials, C.R.S. 34-32.5-101 et seq. and the implementing regulations. As such, we request that LRM's permit application be denied. In the event the Division does not deny the permit application outright, we also request a hearing before the Mined Land Reclamation Board. We also request party status before the Board in any such hearing.

No Gravel Laporte and its members are aggrieved

No Laporte Gravel Corp is a Colorado non-profit corporation. The corporate address is P.O. Box 523, Laporte, Colorado 80535 (970) 490-1776 (nolaportegravel@gmail.com). The addresses for the undersigned individuals are provided below. No Laporte Gravel Corp, its board members, its supporting members, and the undersigned individuals will be aggrieved if the permit application is approved. Our members live, work, and recreate in Laporte. Many of our members can see the proposed mining property from their residences. The proposed mining project would adversely impact our members by creating noise, dust, and traffic in the Laporte area. In addition, some of our members may suffer a depletion of groundwater well water as a result of the mining activities. The following residents of Laporte have already submitted Objections as private citizens: Matthew and Jayme Tilley, Ruth Wallick, and Terry Waters. We incorporate their previous submissions into this Objection letter. In addition, Declarations from some aggrieved residents and/or members of No Laporte Gravel Corp are attached hereto.

Objections

1. The public notice is deficient

The newspaper notice of this application is defective. The Regulations require that the newspaper notice of the application contain the "final date for submitting statements of support or objections with the Office." Regulation Section 1.6.2(1)(D)(vi). LRM's notice fails to contain the final date for submitting objections. Instead, the notice only provides the method for calculating the final date by stating that comments must be submitted "not more than twenty (20) calendar days after the last date for the newspaper publication." September 28, 2017 Fort Collins Coloradoan. The notice fails to contain the information necessary to calculate the final date, which would include the "last date for the newspaper publication." LRM was in possession of the last date for the newspaper publication at the time it published its initial newspaper notice and could have easily included the actual final date in its notice. Instead, LRM published a vague and deficient notice. In order to determine the final date, the reader would be forced to conduct additional research to determine the last date for newspaper publication. LRM's deficient notice is contrary to both the letter and spirit of the regulation because it fails to contain the final date or all information necessary to calculate the final date. According to Regulation Section 1.6.6 "[i]f a notice is in error…the Applicant shall be required to publish and mail a new notice of the application. In the event that the Applicant is required to issue a new notice, all applicable deadlines shall begin to run anew." While the members of No Laporte Gravel Corp were able to obtain the information necessary to calculate the final date prior to the submission deadline, other concerned citizens may not have been so lucky. We asked that you order LRM to resubmit its notice in the newspaper along with the actual final date for filing objections.

2. The water quality analysis is deficient

Attached is the expert report of Robert Havis, a licensed Colorado civil and environmental engineer.[1] Mr. Havis reviewed the permit application and found numerous deficiencies with regard to potential water quality problems associated with the proposed mining. For example, Section 7.3.2 of the application claims that "ground water quality is not anticipated to be an issue" but no data is provided. The applicant should be required to conduct groundwater quality testing and allow public comment on the results as part of the application process. It is likely that the groundwater contains high levels of sulphate and manganese, exceeding water quality standards. Additionally high concentrations of selenium (Se) and uranium (U) are found in the Pierre Shales of the Niobrara Formation. Elevated surface and groundwater concentrations, exceeding primary and secondary water quality standards for Se and U were found in surface and groundwater influenced by outcrops of this Formation (Berna and Stogner, 2017; Miller et al. 2010, Sares, 2000). Exposed Pierre Shale bedrock in pit bottoms would provide a good oxidizing environment for mobilizing Se and U from the Shale, and the mechanical mixing caused by mining activities would be an efficient mechanism for extracting high concentrations into pit water. This could contaminate otherwise high quality surface water on the project site.

In addition, Mr. Havis noted that Telesto (2017) shows significant drawdown from dewatering operations (Fig. 17) inducing flow from the Poudre River and surrounding area. The mining plan calls for dewatering into an on-site 80 acre-ft water management pond, and there could be risk from overflowing the pond and contaminated water flowing off site. The mine pumping rates are not provided. The applicant should be required to provide the mine pumping rates and allow public comment as part of the application process. Mr. Havis approximated the mine pumping rates from the predicted draw down in Figure 17 of the groundwater study (Telesto, 2017), and using the Dupuit Equation (Civil Engineering Reference Manual, 1992 Ch. 6. Sec. 6). The range of alluvium permeabilities K= 40 to 260 ft/day measured by Telesto (2017, Sec 2.3.2) gives a dewatering rate range of 114 to 730 acre-ft/year using the Dupuis Equation and the data from Figure 17. However Table 2 of Section 9.5 of the application shows a project consumptive use of only 92 acre-ft/year. Since the estimated dewatering rate exceeds water consumptive use, there is a potential for uncontrolled discharge of contaminated water from the water management pond. The risk of uncontrolled discharges would be exacerbated in the event of high precipitation events. This discrepancy must be addressed by the applicant.

The application states that stormwater contacting processing equipment and the access road will be kept separate from other stormwater falling on site. What are the potential contaminates from the processing equipment? How will water be treated before discharge to surface flow or allowed to seep into groundwater? These issues should be addressed in the application and the public should be allowed to comment.

[1] Exhibit 1 hereto.

We request that the application be denied for failure to properly analyze impacts to water quality. In the event the permit is issued, we request that the permit include a requirement for water quality monitoring both on site and in neighboring wells offsite. Prior to commencement of any operations, baseline on and offsite groundwater quality sampling must be conducted and analyzed for all likely analytes (including but not limited to selenium, TDS, sulfate, manganese, and uranium). The baseline groundwater well sampling should be conducted quarterly for 1 year prior to commencement of any operations. Then, the groundwater quality sampling should continue through the life of the operation and for 10 years after reclamation is complete. All sampling results should be posted to a publicly accessible website and maintained through the life of the project and for 10 years after conclusion of reclamation. The website should compare all water quality sampling results with the Colorado Basic Standards for Groundwater (and any applicable site specific standards) for each analyte so that the public can easily determine whether there has been an increase in analyte concentrations over the life of the operation and whether any analyte exceeds groundwater standards.

3. The Reclamation plan is deficient

Mr. Havis' expert report also identifies deficiencies associated with the applicant's reclamation plan. For example, the reclamation plan proposes keying in a low-permeability barrier into the bedrock. How will the key be excavated into bedrock? This should be addressed in the plan and the public should be allowed to comment.

A perforated drain is proposed outside of the keyed barrier to serve as a "high permeability conduit to pass groundwater around the pit to mimic pre-pit groundwater hydraulics". This statement implies that the perimeter drains would compensate for the effect of replacing porous alluvium with impermeable pits in the groundwater regime of the project area. The pressure gradient along the perforated conduit approximates the pressure gradient in the surrounding alluvium because they experience the same hydrostatic pressure and are hydraulically connected. Therefore flow velocity is not affected. Only the increased cross sectional area of flow in the conduit, compared to the alluvium, would affect volumetric flow rates. Assuming four 1-foot diameter perforated conduits, the additional flow area provided is insignificant (about 0.04%) compared to the pre-mining interstitial flow area, so the effect of the conduits on the post-reclamation groundwater flow is insignificant.

The presence of the proposed pits would significantly affect groundwater flow in the vicinity of the project. The proposed reclamation pits would reduce the alluvial material cross section in the project area by approximately 80%. Assuming that sources and sinks of groundwater flow are the same in the post- and pre-mining groundwater flow regime in the project area, then approximately 80% of the pre-mining groundwater flow would be diverted around the project area through additional cross sectional areas of flow and groundwater mounding. Identification of the location of potential ground surface and home basement flooding requires additional modeling to include modeling of the post-

reclamation groundwater flow. This modeling should be conducted and the public allowed to comment on the results.

If pits were not lined and allowed to fill with groundwater after mining, there would be evaporative loss from the free-water surface but the groundwater flow regime in the project area would more closely approximate the pre-mining conditions.

The assumptions made in the application plan appear to be unsupported. DMRS should require the applicant to revise the reclamation plan, state all assumptions made in the plan, and provide scientific support for the conclusions.

3. The wildlife analysis is deficient

Regulation 3.1.8. states, "[a]ll aspects of the mining and reclamation plan shall take into account the safety and protection of wildlife on the mine site, at processing sites, and along all access roads to the mine site with special attention given to critical periods in the life cycle of those species which require special consideration (e.g., elk calving, migration routes, peregrine falcon nesting, grouse strutting grounds)." For the following reasons, LRM's application fails to protect wildlife and therefore must be denied.

As noted in Mr. Havis' expert report, the plan to use the empty pits as rangeland would risk poisoning wild and domestic animals with accumulated Se (McDowell, et al., 2005) in vegetation growing above the Se-rich Pierre Shale pit bottoms. This should be addressed in the plan and the public should be allowed to comment.

Section 10.2.3. of the applications states, "[n]o raptor nests exists within the project area due to close proximity of suitable trees to the adjacent road activity and existing industrial activity in the surrounding areas." First, the project area is not an industrial area. It is a rural undeveloped area. Second, the applicant failed to hire a trained ornithologist to conduct a survey of raptor sites in the area. Such a survey should be performed and the results presented for public review and comment before approving the application. As noted in Terry Waters' Objections filed November 5, 2017, Ms. Waters states that she has seen from her yard (within 500 feet from proposed site) Ferruginous hawks, Peregrine Falcons, and Bald Eagles (juvenile and adult). Ms. Waters adds, "I have seen these birds on the ditch willows that are within 200 feet of the site, and photographed a falcon eating a pigeon in our front yard." Ms. Waters also states, "[b]ird watching and identifying birds is one of the top recreational activities in Laporte due to the large variety of birds that can be seen and heard singing in Laporte's rural environment. There are numerous suitable trees for raptor nests (e.g., over 80 feet tall) to the west of the site and to the south of site (especially along the Cache La Poudre river). I know of at least one raptor nest that exists within a ½ mile radius of the project area."

Ms. Waters also noted that Table 3, Sensitive Plants and Animals, of the application is missing birds that were identified in the City of Fort Collins Checklist of Local Birds, including:

a. Brown Pelican (Federal Endangered) – migrates through area
b. Bald Eagle (State Threatened) – migrates through and winters in area
c. Ferruginous hawk (State Species of Concern)- migrates through and winters in area
d. Peregrine Falcon (State Species of Concern) - migrates through area
e. Snowy Plover (State Species of Concern) - migrates through area
f. Long-billed Curlew (State Species of Concern) - migrates through area

Ms. Waters also notes in her comments:

"Section 10.2.4 [of the Telesto Report], Winter Night Roost, states "Due to the absence of raptors nests in the project area, it is unlikely this project would be impacted by adjacent wintertime night roosts" implies that the writer is more concerned about the raptor nests impacting the project, rather than the project impacting the nests. Please note that the wintertime night roosts will be impacted by the project's noise and light. Laporte is very quiet at night and has very few light sources. The applicant then states that "This facility is unlikely to be in operation during night time hours, during the winter months" which is also incorrect. The noise from the Natural Gas Compressors (76.2 dBA) at the proposed batch plant will operate throughout the night and lighting from the proposed batch plant will occur during all months of the year. These impacts must be professionally evaluated.

Ms. Waters also comments that "Section 10.4, Effects on Existing Wildlife, states 'Potential impacts to wildlife from the proposed mine are expected to be minimal due to the preexisting disturbed nature of the project area'. What preexisting nature of the project area – it is currently grazing for cattle and farm land both of which are attractive and readily support wildlife. What happens if mining occurs at Timberline Resources and Knox Pit occur at the same time? Where would wildlife go that is undisturbed? Might the wildlife attempt to cross 54G or the 287 bypass and endangering both the animals and automobiles? The application also states 'Wildlife habitat should be improved by providing additional shelter'. It seems unlikely that wildlife would be attracted to nest and or forage in the reclaimed pits." Accordingly, Ms. Waters requests that "[t]he reclamation plan should contain the same as what the applicant originally proposed in their Sketch Plan 'the landform will be reclaimed to natural agricultural conditions, with the former pit areas reclaimed for water storage, lakes or enhanced wetlands. The presence of these reclaimed features will create open space that will preserve a more rural character, helping to maintain a sense of separation between the LaPorte community and the urban density of Fort Collins.' We agree with Ms. Water's comments and her request.

In addition, we request a professional field survey for prebles mouse and the results submitted for public review and comment.

In summary, the application's identification of raptors, wildlife, and migratory birds is incomplete. The application reaches unverified and false conclusions regarding the existence of raptors, wildlife, and migratory birds. The applicant failed to hire trained scientific experts to conduct field surveys. The application fails to protect peregrine falcons and other wildlife from ***all*** aspects of the proposed mining and reclamation as required by Regulation 3.1.8 and thus should be denied.

4. A cumulative environmental impacts analysis should be performed

The permit application admits, "currently, there are 10 active or historic gravel operations in the vicinity of the proposed Knox pit." Telesto Report at p. 30. This statement underscores the need for a comprehensive cumulative environmental impact analysis of all historic, current, and future gravel mining prior to approval of the application. Gravel mining is an over-intensive land use in the vicinity of Laporte. A map highlighting the historic, current, and proposed gravel mining operations in the vicinity of Laporte is attached.[2] The numerous gravel mining operations have cumulative impacts on wildlife, groundwater flow, surface water, flooding, noise, dust, and other impacts. Moreover, the application should include all the parcels that the applicant has recently purchased near Laporte (the proposed site is less than half the total acreage that LRM has purchased), so that the proposed mining operations, batch plant activities, and reclamation can holistically evaluate the impacts to propose operations with the least amount of negative impact. We request that LRM's permit application either be denied or tabled until a comprehensive cumulative environmental impacts analysis is undertaken and produced for public review and comment.

5. Inconsistent designation of future use of the site

The permit application offers inconsistent designations for the future post-mining use of the site. For example, on page 4, paragraph 12 of the Construction Materials Regular (112) Operation Reclamation Permit Application Form, LRM checks the box marked "Pastureland" in designating the "primary future (post-mining) land use." The "wildlife" box was not checked on page 4, paragraph 12 of the application itself. However, the remainder of the application opens the possibility that the future use of could be for wildlife alone without grazing. For example, the Telesto report states that the "post-mining land use" could be "grazing and/**or** shelter and ground cover for wildlife." Telesto Report at pp. 11 and 12. Thus, by use of the term "or" the future use of the land may be "shelter and ground cover for wildlife" alone without any grazing. Thus, the narrative language supporting the permit application discussing wildlife as the primary future use of the property is inconsistent with LRM's designation of the primary use as "pastureland." This discrepancy is important because the vegetation needed for cattle grazing is quite different from the vegetation that would be planted to support wildlife.

[2] Exhibit 2 attached hereto.

LRM's permit application should be denied for this inconsistency. LRM should be required to identify either wildlife or cattle grazing as the primary future use and the reclamation plan should be tailored to support that use. LRM's vague and inconsistent identification of the future use of the property undermines its own reclamation plan.

6. The proposed 3:1 grade for pits is unsuitable for cattle grazing

LRM proposed to grade the pits to a 3:1 contour. This contour is too steep for cattle grazing—which is the primary future use according to page 4, paragraph 12 of its application form. As support, the attached research paper by the Texas Cooperative Extension states, "[c]attle seldom use areas with greater than 10 percent slope."[3] Similarly, the attached Oberlie research paper states that slopes greater than 30% receive 60% less grazing capacity.[4] LRM's proposed slopes of greater than 30% are inconsistent with its stated future use of the property. As such, LRM's permit application should be denied. In the alternative, the Division should require LRM to restore the site to its original contours after mining is complete.

7. Produce the Draft Stormwater Management Plan

Page 21 of the Telesto Report refers to a draft Stormwater Management Plan. We request that the plan be produced for public review and comment prior to approval of the application.

Thank you for the opportunity to submit these Objections and Petition for Hearing. We ask that the Division deny the permit application for the reasons stated herein. In the event the Division does not deny the permit application, we request a hearing before the Board and request that No Laporte Gravel Corp and the undersigned individuals be granted party status in such hearing.

Sincerely,

s/ Patty McElwaine

Patty McElwaine
Submitted as Co-President of No Laporte Gravel Corp
and as an individual local resident
2920 Schaefer Drive
LaPorte, CO 80535
(970) 490-1776

[3] Exhibit 3 hereto at p. 3.
[4] Exhibit 4 hereto at p. 6.

s/ Peter Waack

Peter Waack
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and as an individual local resident
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s/ Amy Maddox
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s/ Chalon Kintzley
Submitted as a Member of No Laporte Gravel Corp
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Fort Collins, CO 80524

/s Ruth Wallick
2912 North Overland Trail
Laporte, CO 80535
Submitted as a Board Member of No Laporte Gravel Corp

s/ Leah Kintzley
Submitted as Member of No Laporte Gravel Corp
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Fort Collins, CO 80524

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Submitted ad a Member of No Laporte Gravel Corp
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Laporte, CO 80534

s/ Leah Salmans
Submitted as Treasurer of No Laporte Gravel Corp.
2904 Tharp Drive

Laporte, CO 80535

s/ Kelly Kintzley
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s/ Jason Allely
Submitted as a Member of No Laporte Gravel Corp
3701 Settlers Road
Laporte, CO 80535

s/ Sarah Allely
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Air and Water Quality

Engineering Services

November 8, 2017

RE: Review of Loveland Ready Mix Application for Colorado Division of Mining, Reclamation and Safety (DMRS) Permit

I have a PhD in Civil and Environmental Engineering and am a Registered Professional Civil Engineer in the State of Colorado. My resume is attached to this letter. I was asked by No Laporte Gravel Corp to review the gravel mining application submitted by Loveland Ready Mix to the DMRS and render a professional opinion on certain aspects of the content of the application. My review of the application has identified several areas of concern, which are discussed below.

Permit Application Section 6.3 All Water Diversions and Impoundments.

The Application states "Stormwater that flows onto the site will be captured and contained in the pit and incorporated into the water management system." Section 7.3.2 claims that "ground water quality is not anticipated to be an issue" but no data is provided. The applicant should be required to conduct groundwater quality testing and allow public comment on the results as part of the application process. It is likely that the groundwater contains high levels of sulphate and manganese, exceeding water quality standards. Additionally high concentrations of selenium (Se) and uranium (U) are found in the Pierre Shales of the Niobrara Formation. Elevated surface and groundwater concentrations, exceeding primary and secondary water quality standards for Se and U were found in surface and groundwater influenced by outcrops of this Formation (Berna and Stogner, 2017; Miller et al. 2010, Sares, 2000). Exposed Pierre Shale bedrock in pit bottoms would provide a good oxidizing environment for mobilizing Se and U from the Shale, and the mechanical mixing caused by mining activities would be an efficient mechanism for extracting high concentrations into pit water. This could contaminate otherwise high quality surface water on the project site. Uncontrolled discharge of contaminated water could also occur from the water management pond as described below.

Telesto (2017) shows significant drawdown from dewatering operations (Fig. 17) inducing flow from the Poudre River and surrounding area. The mining plan calls for dewatering into an on-site 80 acre-ft water management pond, and there could be risk from overflowing the pond and contaminated water flowing off site. The mine pumping rates are not provided. The applicant should be required to provide the mine pumping rates and allow public comment as part of the application process. I approximated the mine pumping rates from the predicted draw down in Figure 17 of the groundwater study (Telesto, 2017), and using the Dupuit Equation (Civil Engineering Reference Manual, 1992 Ch. 6. Sec. 6).

$Q = pi*K*(y_1^2-y_2^2)/\ln(r_1/r_2)$

Where

Q= flow rate (ft^3/day)
K= alluvium permeability (ft/day)
y_1,y_2 = piezometric surfaces (ft)
r_1, r_2= radial distances to corresponding piezometric surfaces (ft)

In Figure 17, radial flow in a cylinder is assumed with the following approximate dimensions.

y_1= 10 ft, r_1= 2,000 ft representing the 5 ft drawdown contour
y_2= 5 ft, r_2= 1,000 ft representing the 10 ft drawdown contour

The range of alluvium permeabilities K= 40 to 260 ft/day measured by Telesto (2017, Sec 2.3.2) gives a dewatering rate range of 114 to 730 acre-ft/year using the Dupuis Equation and the data from Figure 17. However Table 2 of Section 9.5 shows a project consumptive use of only 92 acre-ft/year. Since the estimated dewatering rate exceeds water consumptive use, there is a potential for uncontrolled discharge of contaminated water from the water management pond. This risk of uncontrolled discharges would be exacerbated in the event of high precipitation events.

The application states that stormwater contacting processing equipment and the access road will be kept separate from other stormwater falling on site. What are the potential contaminates from the processing equipment? How will water be treated before discharge to surface flow or allowed to seep into groundwater? These issues should be addressed in the application and the public should be allowed to comment.

Section 7.3 Reclamation Plan Implementation

The reclamation plan proposes keying in a low-permeability barrier into the bedrock. How will the key be excavated into bedrock? This should be addressed in the plan and the public should be allowed to comment.

A perforated drain is proposed outside of the keyed barrier to serve as a “high permeability conduit to pass groundwater around the pit to mimic pre-pit groundwater hydraulics”. This statement implies that the perimeter drains would compensate for the effect of replacing porous alluvium with impermeable pits in the groundwater regime of the project area. The pressure gradient along the perforated conduit approximates the pressure gradient in the surrounding alluvium because they experience the same hydrostatic pressure and are hydraulically connected. Therefore flow velocity is not affected. Only the increased cross sectional area of flow in the conduit, compared to the alluvium, would affect volumetric flow rates. Assuming four 1-foot diameter perforated conduits, the additional flow area provided is insignificant (about 0.04%) compared to the pre-mining interstitial flow area, so the effect of the conduits on the post-reclamation groundwater flow is insignificant.

The presence of the proposed pits would significantly affect groundwater flow in the vicinity of the project. The proposed reclamation pits would reduce the alluvial material cross section in the project area by approximately 80%. Assuming that sources and sinks of groundwater flow are the same in the post- and pre-mining groundwater flow regime in the project area, then

approximately 80% of the pre-mining groundwater flow would be diverted around the project area through additional cross sectional areas of flow and groundwater mounding. Identification of the location of potential ground surface and home basement flooding requires additional modeling to include modeling of the post-reclamation groundwater flow. This modeling should be conducted and the public allowed to comment on the results.

The plan to use the empty pits as rangeland would risk poisoning wild and domestic animals (McDowell, et al., 2005), with accumulated Se in vegetation growing above the Se-rich Pierre Shale pit bottoms. This should be addressed in the plan and the public should be allowed to comment.

If pits were not lined and allowed to fill with groundwater after mining, there would be evaporative loss from the free-water surface but the groundwater flow regime in the project area would more closely approximate the pre-mining conditions.

The assumptions made in the application plan appear to be unsupported. DMRS should require the applicant to revise the reclamation plan, state all assumptions made in the plan, and provide scientific support for the conclusions.

Robert N. Havis, PhD, PE

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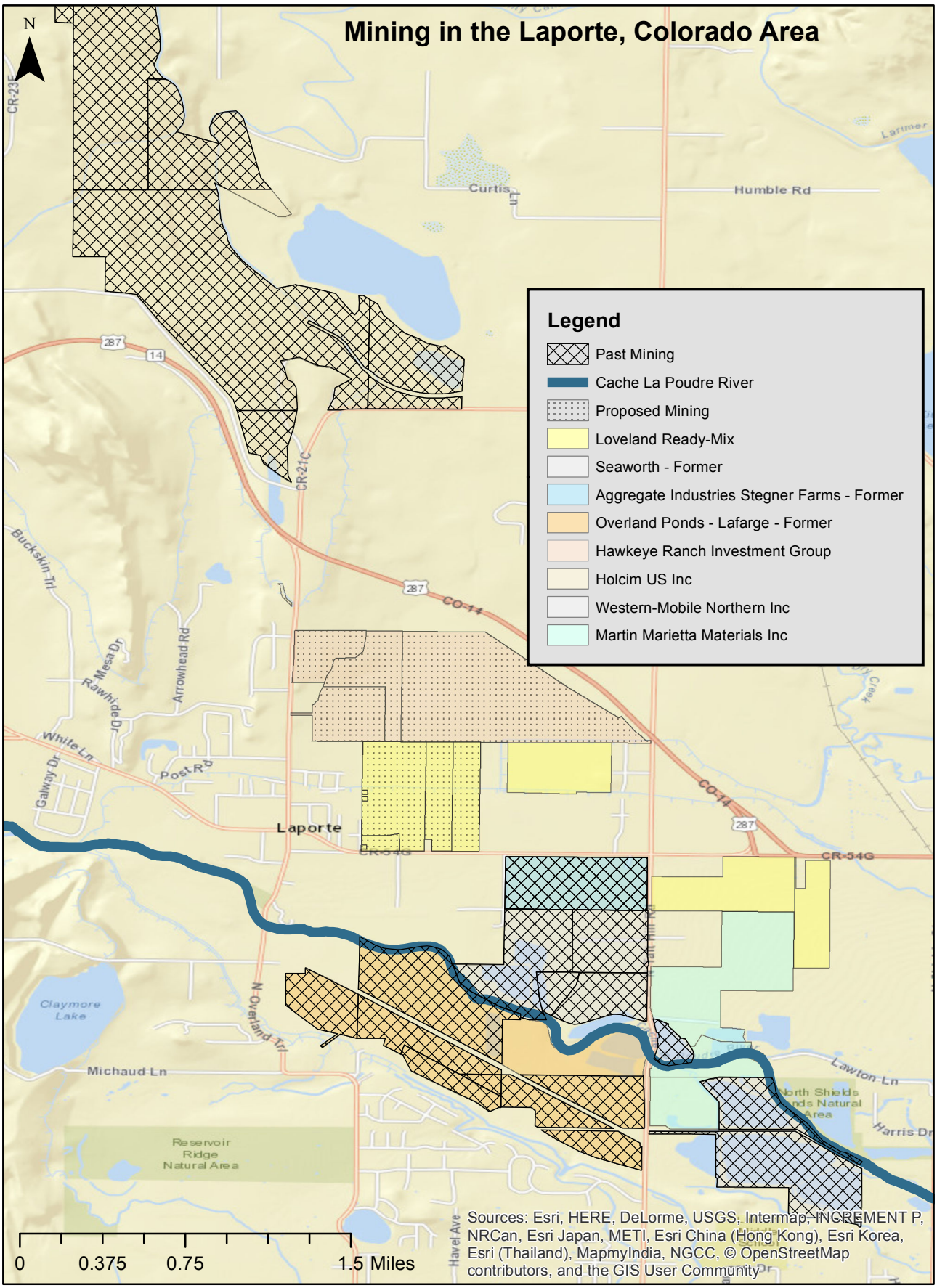
Mining in the Laporte, Colorado Area
N
Legend
Past Mining
Cache La Poudre River
Proposed Mining
Loveland Ready-Mix
Seaworth - Former
Aggregate Industries Stegner Farms - Former
Overland Ponds - Lafarge - Former
Hawkeye Ranch Investment Group
Holcim US Inc
Western-Mobile Northern Inc
Martin Marietta Materials Inc
Laporte
Curtis Ln
Humble Rd
CR-21C
CO-14
287
14
Buckskin Trl
Mesa Dr
Rawhide Dr
Arrowhead Rd
White Ln
Galway Dr
Post Rd
CR-54G
Claymore Lake
Michaud Ln
N Overland Trl
Reservoir Ridge Natural Area
Lawton Ln
Harris Dr
Havel Ave
0
0.375
0.75
1.5 Miles
Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

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Texas Cooperative EXTENSION
The Texas A&M University System

RangeDetect Series

Livestock Grazing Distribution: Considerations and Management

Robert K. Lyons and Richard V. Machen*

Grazing distribution is a major concern for livestock managers. Livestock do not graze randomly—they often prefer some grazing sites over others. This tendency can cause grazing distribution to be uneven over the range.

If undetected or uncorrected, grazing distribution problems increase grazing pressure on areas that are used. In managing grazing, ranchers should aim for the greatest safe use over as much of a pasture or ranch as possible.

Livestock preference for some sites over others is influenced by a number of factors, both living and nonliving. Living factors that influence grazing preferences include plant types (grasses, forbs, and woody plants), plant species, forage quantity, forage quality and/or palatability, shade and shelter, animal behavior, insect pests, predators, and human activity, among others.

Nonliving factors include weather, soil, topography, water, salt, mineral, and other feed supplements, and fencing, among others. The greater the differences among areas (vegetation, topography, etc.), the more likely animals are to concentrate on some areas and avoid others.

Solutions to grazing distribution problems may be relatively straightforward, but they may not be easily achieved. For example, although it may be easy to identify apparent water distribution problems, those problems may be difficult to correct because of cost or water availability.

Causes of other distribution problems may be harder to identify. For example, distribution problems may be harder to pinpoint if they are associated with forage preferences or human activities.

Grazing Distribution Considerations

When making decisions about grazing distribution, there are several factors to consider: animal behavior, distance to water, topography, vegetation type, and weather.

Animal Behavior

Animals decide where to graze based on their perceptions of an area, their knowledge of plants consumed in the past, and their memory of potential choices. Cattle studies suggest that livestock quickly explore a new pasture and develop map-like representations of the locations of different areas within that pasture.

It appears that this information is stored in the animal's long-term memory. Based on their long-term memory, animals may return to areas previously grazed to search for forage. Their expectations of an area based on long-term memory change more slowly than changes in forage quality and quantity. In other words, animals may revisit areas where forage has been exhausted, but where they have found forage in the past, until they learn that forage is no longer available.

Grazing animals appear to use their short-term memory to recall which areas they have recently visited. They will use this memory in the near future to avoid or return to these areas. For periods of up to 8 hours, cattle can vividly remember areas where they have recently foraged.

Observations and research have documented that an animal's previous experience strongly influences which plants it eats and which areas it grazes. If it is introduced to a range that is sharply different from the one it is accustomed to, it will spend more time grazing, but eat less than animals familiar with the range. Therefore, intro-

*Associate Professor and Extension Range Specialist and Associate Professor and Extension Livestock Specialist, The Texas A&M University System

ducing animals from one type of vegetation and/or topography to a very different type of range can reduce animal performance until the animals learn the new environment, which can take up to a year.

Distance to Water

Livestock need free-choice access to water. When their water intake is restricted, milk production drops, feed intake is lowered, and gain in offspring is reduced.

Several factors influence the amount of water that grazing animals require. More water is needed as increases occur in live weight, lactation, physical activity, air temperature, salt intake, and dry matter intake. Less water is required when the forage has a high water content and for animal species and breeds that use water more efficiently.

When animals are forced to travel great distances between forage and water, they use more energy. Young suckling animals are most susceptible to lack of water availability because they are affected by the reduced milk production of the mother, and they are less likely to travel all the way to water with their mothers on hot days.

Water availability is a major cause of poor grazing distribution (Table 1). Water is the central point of grazing activities. Near water, plants are often used heavily and forage production drops.

The location and number of watering points are the main factors in determining movement, distribution, and concentration of grazing animals. The influence of watering location is affected by vegetation type, topography, season, and kind, class, and age of the grazing animals.

Table 1. An example of the effect of distance to water on forage use.

Distance from Water, miles	% Use
0-0.5	50
0.5-1	38
1-1.5	26
1.5-2	17
2-2.5	12

Work with cows fitted with Global Positioning System (GPS) collars (Figure 1) has demonstrated that grazing distribution is affected by both topography and distance to water. These collars were used to determine the locations of cows within pastures on a 24-hour basis. When cows were only given access to water at the north end of the pasture close to a preferred grazing site (Figure 2), they grazed mostly within 6/10 mile of the watering point. There was little use of the south end of the pasture, which included rougher terrain.

However, when given access only to water close to the rougher terrain in this pasture (Figure 3), the cattle grazed more evenly across the pasture.

Figure 1. Cow fitted with a GPS collar to determine areas of use and non-use within pastures.

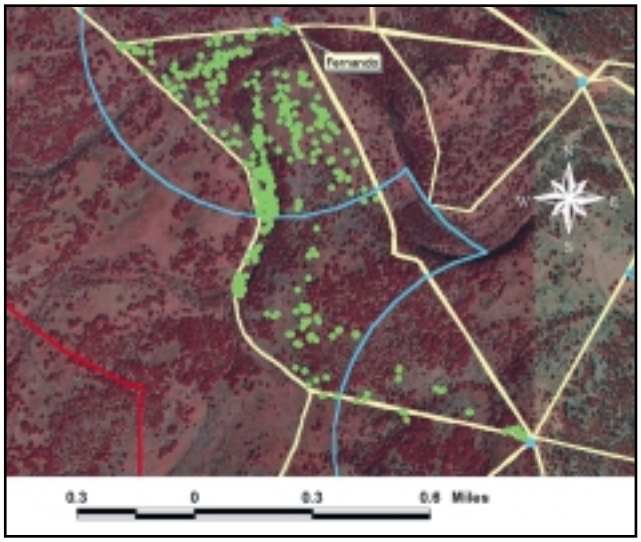

Figure 2. GPS locations (green dots) for cows show that cows avoided the south end of this pasture where the rockiest terrain was located when given access to water only at the north end. Concentric rings indicate 0.5 and 1 mile distances to water.

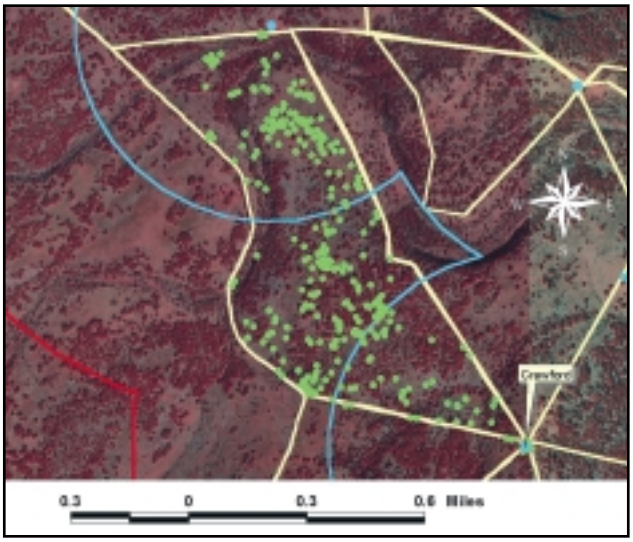

Figure 3. GPS locations (green dots) for cows show a more even grazing distribution when cows were given access to water only at the south end of this pasture where the rockiest terrain was located. Concentric rings indicate 0.5 and 1 mile distances from the water source.

Topography

The second most important cause of poor grazing distribution is topography. Cattle seldom use areas with greater than 10 percent slope (slope is the percentage of vertical drop over a surface distance of 100 feet). On the other hand, sheep make good use of areas with up to 45 percent slope.

Topography is more important in the hilly or mountainous parts of the state. The effect of topography varies with the kind of grazing animal. For example, cattle prefer easily accessible areas (Figure 4) that are flat and gently rolling, including valley bottoms, low areas between drainages, level benches, or mesas.

Figure 4. Cattle make little use of areas with greater than 10 percent slope. They prefer flat, gentle to rolling terrain.

The fact that cattle, horses, and bison will graze on slopes during some seasons of the year suggests that they may be more unwilling than unable to graze steeper slopes. Cattle will cross steeper slopes if they have easy access to the slope and contours that cross the slopes.

Sheep and goats, which are smaller, more agile, and more surefooted, can make more use of steeper and rougher topography. Yearling cattle are also more agile than mature cows and will travel further and use more rugged areas.

However, because even smaller, more agile livestock have their limitations, rugged terrain can still limit use. For example, sheep have been reported to use slopes up to 45 percent fairly evenly, but reduce use by as much as 75 percent on steeper areas.

The studies with cows fitted with GPS collars mentioned above have demonstrated that cattle prefer some range sites over others because of the terrain. On a ranch with predominantly two range sites (Figure 5), cattle strongly preferred the Gravelly Redland site over the Low Stony Hill site. This preference appears to be related to the presence of loose and imbedded rock on the Low Stony Hill range site (Figure 6).

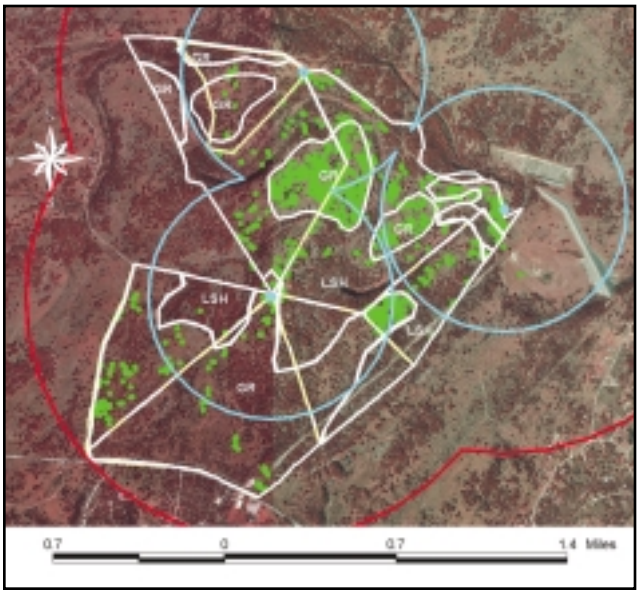

Figure 5. Site preference exhibited by cows (green dots) fitted with GPS collars. Cows showed a strong preference for the Gravelly Redland range site (GR) over the Low Stony Hill range site (LSH). Range sites are delineated by the irregular white lines. Concentric rings indicate 0.5 and 1 mile distances from water sources.

Figure 6. Loose and embedded rock discourage use of areas by cows.

In this study, preliminary results indicate that use of areas by cows declined steadily as rock cover increased and almost no use occurred with more than 30 percent rock cover (Figure 7). As a practical guide, if rock makes walking difficult for a person, it will also be difficult for cows. For example, with more than 30 percent rock cover, it is difficult for a person to walk without twisting an ankle, and running is almost impossible.

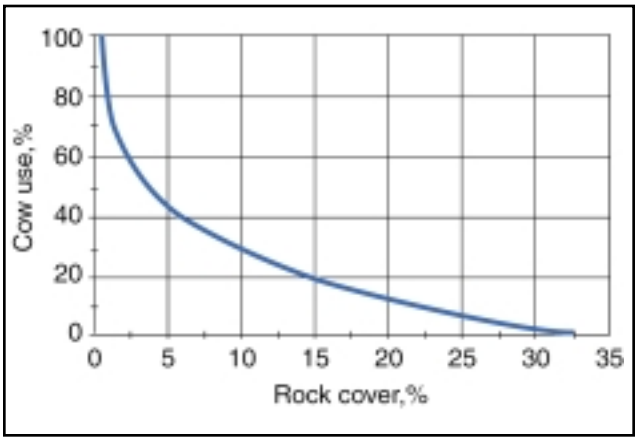

Figure 7. The effect of rock cover on use of areas by cows in the GPS collar study. Preliminary results indicate that cows avoided areas with more than 30 percent rock cover.

Vegetation Type

Forage preferences of different livestock species have a strong influence on grazing distribution. For example, cattle, with their strong preference for grasses, tend to avoid dense brushy areas (Figure 8). As brush becomes more dense, cattle grazing decreases.

Figure 8. Dense brush creates a barrier to livestock movement and usage.

Forage species play a major role in grazing distribution. Although different plant communities may be located next to each other, they may receive different grazing pressure because they contain different kinds of plants. Plants may differ in palatability or in the amount of leaf material available. These differences greatly influence where animals choose to graze.

However, even in a grass monoculture, pasture use may not be uniform (Figure 9). Plants often produce succulent new growth after having been grazed. Because they prefer this new growth, grazing animals sometimes revisit plants and patches previously grazed and avoid plants and patches with older growth not previously grazed or areas where feces have been deposited.

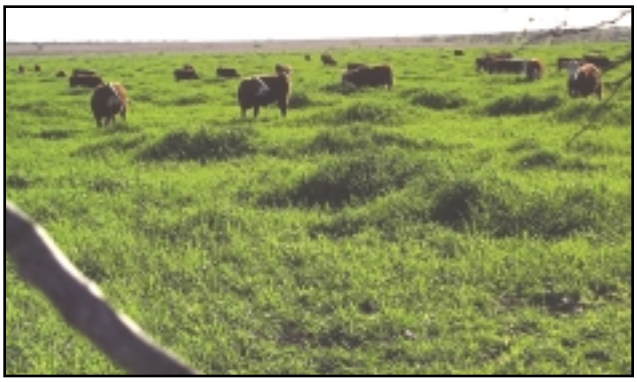

Figure 9. Even with a monoculture such as ryegrass, uniform use may not be easily achieved.

Riparian areas (the banks of rivers, lakes, and ponds) are favorite grazing sites of many livestock and wildlife species. These sites offer a variety of high-quality forage plants that are highly palatable.

Riparian areas tend to stay green longer than those in adjacent areas. When forage nearby is succulent, riparian areas are not as inviting. However, grazing pressure within riparian areas increases as adjacent areas dry out and forages mature.

Weather

Grazing may also be limited by temperature changes, snow, and excessive rainfall. Across Texas, high temperatures are the most consistent weather factor affecting grazing distribution. When temperatures exceed 85 degrees F, both cattle and sheep seek shade and may walk far to find it.

Distribution tools and recommendations

Water

To improve grazing distribution, water sources can be developed in a number of ways, including drilling wells and building drinking troughs, earthen reservoirs, or pipelines to transport water to new locations.

An effective way to draw animals to desired areas without additional fencing is to control and change their access to watering points (Figures 2 and 3). When taking this approach, however, use fencing that does not exclude wildlife.

To make the most efficient use of water sources, use temporary water when available and permanent water in dry periods. As a last resort or temporary measure, water can be hauled to poorly used locations.

In general, do not require cattle to travel more than $^1/_4$ to $^1/_2$ mile from forage to water ($^1/_2$ to 1 mile between watering points) in steep, rough terrain; or more than 1 mile (2 miles between watering points) on level or gently rolling ground. Spacing for sheep and horses can be wider. Generally, plan for no more than 50 cattle and 300 sheep, or 50 to 75 animal units, per watering facility.

Fencing

Fencing is a direct way to alter grazing distribution. Fences can separate areas that need different grazing management: riparian areas, irrigated pastures, or areas subject to seasonal use. Fences can also be used to subdivide large pastures into more manageable sizes.

When establishing fencing, make the best use of existing or projected watering points. Permanent water facilities should serve more than one pasture. Make sure that each fenced area has enough watering points. Consider the range site and potential forage production where possible.

However, it is usually impractical to fence individual plant communities because of their small size and random distribution across the landscape. If multiple livestock species are to be grazed, use the appropriate fencing materials for the species.

Supplemental Feeding

Because livestock tend to go from water to grazing to salt, it is not necessary to place salt at watering points. Salt consumption tends to stimulate the appetite of grazing animals. To encourage grazing in areas where livestock need to be drawn, place salt where it is accessible within those areas.

Purposely locate salt, minerals, and other supplements not less than 580 yards ($^1/_3$ mile) from water on pastures of 640 acres or more. On smaller pastures, place them no less than about 350 yards ($^2/_{10}$ mile) from water. Because bed grounds are already being used, locate salt and other supplements away from them. Move salt and supplements frequently except during birthing seasons.

Reports vary concerning whether salt is an effective tool for altering grazing distribution. It does not appear to overcome the influence of water, favored forages, favorable terrain, protective cover, or shade. In addition, salt is less useful where naturally salty vegetation or salt licks are present.

Move creep feeders away from watering and concentration areas as soon as calves, lambs, and kids learn to eat.

Protein and energy supplements or salt-meal mixes are more likely to be effective in influencing grazing patterns than salt alone. Place pelleted or cubed supplements on the ground or in movable bunks to encourage animals to move from feed grounds to poorly used areas.

Grazing behavior and distribution are also affected by the feeding interval for supplements. In a Texas study, cows fed a protein supplement daily or three times a week came readily to feed when called; however, cows fed once a week did not come to feed quickly when called. Less than daily feeding of equivalent amounts of protein supplement appears to reduce the time spent at feeding areas and to encourage a wider grazing distribution.

Kind of Livestock

Match the livestock species to the vegetation. Place cattle in a habitat where grass is readily available. Consider using goats in areas that have a high proportion of woody (browse) plants.

Some classes of livestock fit the terrain better than others. For example, yearling cattle are more agile and tend to travel farther than cows with calves, and, therefore, make better use of rugged terrain.

Animals may have difficulty adjusting to new foraging environments even if the new location has abundant forage. Previous grazing experience affects the kinds of plants, plant parts, and grazing sites the animals select. New locations with toxic plants are potentially dangerous.

Naive animals tend to spend more time grazing but eat less, walk greater distances, suffer more weight loss, and are more likely to eat toxic plants. Although animals can make the transition to new locations, it usually takes about a year to adjust. This transition can be eased if the food and terrain in the new location are similar to what the animals already know.

Shade

Shade influences grazing distribution on hot summer days. Livestock have been observed to travel considerable distances to reach shade on hot days.

Cattle and sheep routinely seek shade around midday on summer days when temperatures exceed 85 degrees F. *Bos indicus* (Brahman and similar breeds) influenced cattle are less likely to seek shade during the hot midday and more likely to rest in open areas. Cattle with dark hair coats tend to seek shade earlier and for longer periods.

Cattle are more likely to stay around water if shade is available. In comparison, sheep are less likely to rest and loaf near water.

Providing shade has been shown to increase summer-long weight gain in yearling steers. On desert or prairie ranges that have few trees or tall shrubs, artificial shade may help attract animals to undergrazed areas. However, results have been inconsistent with using artificial shade and cover to improve distribution.

Improving Palatability

Some treatments can improve the palatability of forages and/or increase the length of the green period. These treatments act by removing unpalatable species or old growth or stimulating palatable growth. The theory is that improving palatability could attract grazing animals into previously unused or underused areas.

For example, nitrogen fertilization is known to lengthen the green period. Nitrogen can also improve the palatability of some species. However, the economics of fertilizing native grasses only to improve grazing distribution is questionable. Justification for this practice must be based

on the potential to increase forage production and ultimately to increase profit.

Prescribed burning can be used to improve palatability. Burning improves palatability by removing old growth, thus making new growth more accessible. However, be careful to avoid too much grazing pressure by removing less than 50 percent of the new growth. Probably the best approach is flash grazing—grazing for a short period in the spring after a winter burn and then allowing the burned areas 3 to 6 months or longer to recover to a point where normal grazing is feasible without damaging the plants.

Applying herbicides has been suggested as a means to improve palatability. Many weed species are more palatable to grazing animals after herbicide treatment. However, several weed species can be toxic. A management recommendation for these toxic weeds is to avoid grazing after herbicide treatment. Like the use of fertilizers, the use of herbicides to improve grazing distribution is seldom economically feasible.

Recommendations

Each ranch is unique regarding grazing distribution problems. Ranchers should try to solve those problems that are feasible to solve. For problems with no feasible solution, the rancher should understand that these problems exist and adjust stocking rates to account for the reduced carrying capacity they cause so that grazed areas are not overused.

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The authors wish to acknowledge Lew Hunnicut, Bryan Davis, and Clay Nicklas for their support and cooperation during the GPS collar study mentioned in this publication.

Support for this publication was provided by Texas Cooperative Extension Risk Management initiative.

Produced by Agricultural Communications, The Texas A&M University System
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5M, New

Determining rangeland suitability for cattle grazing based on distance-to-water, terrain, and barriers-to-movement attributes

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ABSTRACT

There are methods developed for determining the suitability of rangelands for cattle grazing based on slope and distance-to-water. Current methods do not account for the distance cattle must travel around steep terrain (barriers-to-movement) to reach water. Failure to adjust grazing suitability for terrain issues and travel distances to water can result in rangeland degradation.

The project goal was to develop a grazing suitability model and test it for the Lander Field Office of the Bureau of Land Management (BLM) in Wyoming. The primary objective was to develop a GIS Model that creates a systematic process to calculate areas suitable for grazing using slope and distance-to-water that accounts for terrain barriers. This project compared GIS-based calculations with previous hand-generated suitability calculations to check their validity. Finally, the project documented the methodology and data used for calculations. This would allow for modification of the model to local conditions and the addition of supplementary attributes.

This project tested the model on nine pastures having three different terrain types within the Lander Field Office. The model uses elevation data to calculate slope and determine terrain-based movement barriers. The water source layer is a combination of streams, wetlands, and water well locations. The BLM provided the pasture boundary layer.

The importance of the barriers-to-movement modification increases as steepness of the terrain increases. The accuracy of the model improves with complete water well or stock pond data, which requires local knowledge. The terrain classification categories can be changed based on knowledge of cattle use within a pasture. The model can reflect seasonal and long-term changes in water availability by adjusting the water source layer. The model can adjust predicted forage production in combination with the NRCS Grazing Land Spatial Analysis Tool and the USDA Soil Data Viewer. In addition, the model can be used to evaluate the need and location of additional water sources and fencing. An important use of this model is to predict areas of grazing use intensity, which would aid in establishing rangeland monitoring.

The barriers-to-movement layer has a limited effect on total number of suitable areas. The barriers-to-movement does represent the areas suitable for cattle grazing. The model depends on the knowledge of range specialists to accurately create and modify the water source layers.

INTRODUCTION

A commonly argued issue between biologists and range specialists is the deterioration of wildlife and fisheries habitat caused by overgrazing along streams and riparian areas. There is a need to determine grazing suitability to limit land degradation caused by cattle staying in one place for long periods. Determining suitability leads to determining the appropriate number of cattle and the timing of grazing.

This capstone project developed a methodology that uses ESRI's Geographic Information System (GIS) software package to determine rangeland grazing suitability for cattle. I based this work on two existing methods developed by Holechek (1988) and Guenther et al. (2000) to determine cattle grazing suitability and estimate rangeland use by cattle, and I analyzed additional suitability criteria.

The Bureau of Land Management (BLM) in Wyoming is in the process of updating Resource Management Plans (RMP) for all of its Field Offices. The RMP is the planning document that guides land management decisions on public lands administered by the BLM. Livestock grazing is a major use of public rangelands throughout the west. Due to the variability in types of grazing land, the number of animals each grazing allotment can support must be determined. The identification of rangelands suitable for cattle grazing occurs during the RMP revision process. Areas far from water with steep slopes are usually unsuitable for cattle grazing. Due to the effort it takes to account for terrain conditions, the majority of lands are typically deemed suitable for cattle grazing (BLM 1986). Failure to adjust grazing for terrain issues and travel

distances to water can result in rangeland degradation, as grazing will occur only on suitable areas of the allotment.

There are limited opportunities outside the RMP revision process to evaluate lands available for grazing (BLM 1997, 2005). Generally, re-evaluations are performed if grazing permits are voluntarily relinquished or if the grazing allotment does not meet Rangeland Health Standards and cannot achieve the standards under any level of livestock management (BLM 1997, 2005). Seldom are grazing allotments voluntarily relinquished, so it is important to re-evaluate the grazing suitability during the RMP revision process.

A major objective of grazing management is to achieve uniform livestock use across rangelands. Cattle tend to congregate on flat areas, such as stream bottoms, riparian zones, and ridge tops in rough terrain as they avoid grazing in areas having steeper slopes (Holechek et al. 1999). These steeper areas should not be included when determining the acres available for grazing. In areas with diverse topography, cattle will over-utilize the level areas adjacent to water sources (Pinchak 1991). Grazing concentrated on the easily accessed sites having flat terrain near water sources leads to overgrazing and land degradation, resulting in an eventual decline in rangeland health, even though the forage supply is adequate over the entire pasture.

The BLM Land Use Planning Handbook (BLM 2005) identifies the following factors for consideration when determining availability of land for livestock grazing:

other uses for the land;

terrain characteristics;

soil, vegetation, and watershed characteristics;

presence of undesirable vegetation, including significant invasive weed infestations; and presence of other resources that may require special management or protection, such as special status species, special recreation management areas or Areas of Critical Environmental Concern.

Because cattle grazing is a predominate use of public lands and can affect other uses of the lands, determining the appropriate number of cattle an area can support is important in order to balance resource allocations.

Methods for adjusting grazing suitability for terrain (slope) and distance-to-water are developed. Holechek (1988) describes one method to adjust the grazing capacity of a pasture for slope and water distribution. Omitted from grazing are areas with slopes greater than 60 percent, which receive little to no use by cattle (Holechek 1988). Areas having slope greater than 10 percent receive a reduced level of grazing. In addition, several studies have shown that cattle seldom use areas greater than 3.2 km (2 miles) from water (Valentine 1947; Holechek et. al 1998). Adjustments for percent slope reduction used by Holechek (1988) are summarized in Table 1. Holechek (1988) also developed an adjustment for reducing grazing capacity considering distance-to-water, summarized in Table 2.

Table 1. Percent reduction in grazing capacity based on percent slope. (Holechek et al. 1998)

Percent Slope	**Percent Reduction in Grazing Capacity**
0 - 10	None
11 - 30	30
31 - 60	60
Over 60	100 (ungrazable)

Table 2. Percent reduction in grazing capacity based on distance-to-water. (Holechek et al. 1998)

Distance-to-Water Miles	**Distance-to-Water** Kilometers	**Percent Reduction in Grazing Capacity**
0 - 1	0 - 1.6	None
1 - 2	1.6 - 3.2	50
2	Over 3.2	100 (ungrazable)

The second grazing adjustment method also predicts suitability of an area for cattle grazing based on slope and distance-to-water. Guenther et al. (2000) developed an "Expected Use Model" using the IDIRIS GIS/Analysis system (The IDIRIS Project, Clark University, Worcester, MA.) that combined slope and distance-to-water to predict expected levels of forage utilization. Factors dealing with terrain and water currently have digital data sources that make it possible to use this method. The model requires three map layers: slope as derived from a digital elevation model, a manually digitized map identifying water sources, and a layer delineating pasture boundaries. The expected use maps developed by Guenther et al. (2000)

categorized the expected forage use into five classes, similar to the four categories in Holechek (1988). The expected use classes developed are:

Incidental use areas: Areas expected to receive 0-5% use,

Slight use areas: Areas expected to receive 5-20% use,

Light use areas: Areas expected to receive 20-40% use,

Moderate use areas: Areas expected to receive 40-60% use, and

Concentrated areas: Areas expected to exceed 60% use.

Areas of incidental use are underutilized and thus are considered unsuitable for grazing. Summarized in Table 3 and Table 4 are adjustments developed Guenther et al. (2000) for slope and distance-to-water respectively.

Table 3. Percent suitable for cattle grazing using percent slope (Guenther et al. 2000).

Percent Slope	Percent Suitability Grazing Capacity
0 – 6	100%
> 6 to 60	> 0 to < 100%[1]
Greater 60	0%

[1]Intermediate slopes are given intermediate values with a slope of 30% considered 50% suitable (50% reduction)

Table 4. Percent suitable for cattle grazing using distance-to-water (Guenther et al. 2000)

Miles	Kilometers	Percent Suitability Grazing Capacity
0 - 0.14	0 - 0.29	100%
> 0.14 – 2	0.29 – 3.2	> 0 to < 100%[1]
2	Over 3.2	0%

[1]Intermediate distances are given intermediate values with a distance of 1 mile (1.6 km) considered 50% suitable (50% reduction)

Guenther el al. (2000) combined the suitability for slope and distance-to-water to create a total grazing suitability or expected use map. The computer model allows for an infinite number of values between 0 and 100%. Comparison of the values derived using both methods is shown in Table 5. The percent suitable concept by Guenther et al. (2000) is the inverse of the percent reduction developed by Holechek (1988).

Table 5. Comparison of percent reduction and percent suitable categories.

Use Type	Percent Suitable (Guenther et al. 2000)	Percent Reduction (Holechek et al. 1998)
Incidental	0 - 5	95 - 100
Slight	5 - 35	65 - 95
Light	35 - 70	30 - 65
Moderate	70 - < 100	> 0 - 30
Concentrated	100	0

In summary, Holechek (1988) developed his method during the infancy of GIS and divided the slope and distance-to-water into four major categories to allow for easier calculations. Most of the current grazing suitability calculations used Holechek's methodology with paper maps before

GIS was available to most land management agencies. Guenther et al. (2000) expanded the method using a continuous gradient of grazing suitability, instead of discrete categories, and incorporated GIS technology.

There is a desire on the part of rangeland managers to develop a systematic computer-based methodology to determine grazing suitability (J. Kelly, BLM LFO Field Manager, personal communication, June 2005). Most federal and state agencies have limited to no access to the IDRISI GIS/Analysis software needed to run the Expected-Use Model developed by Guenther et al. (2000), however, most government agencies currently have access to ESRI's ArcGIS software (C. Breckinridge, BLM LFO GIS Specialist, personal communication, June 2006). There is a need to develop an integrated GIS method to complete the necessary steps for any method.

GOALS / OBJECTIVES

The goal of this capstone project was to develop and test a model using ESRI's ArcGIS Model Builder Tools to determine the grazing suitability of rangeland in the Lander Field Office (LFO) of the BLM.

Objective: Develop a GIS methodology using ESRI Model Builder Tools to create a systematic process to calculate areas suitable for cattle grazing, using slope and distance-to-water around slope barriers for selected pastures with various terrain types.

Objective: Compare the GIS based analysis with and without the barrier layer to previous (paper map) calculations of suitable acres. Verify the derived calculations are reasonable and validate the modifications with local range specialists.

Objective: Develop a summary to explain the methodology and data required for the grazing suitability model.

METHODS

The project area was limited to nine pastures within the LFO planning area that have a diversity of topography. The areas tested were the Sweetwater Canyon and Lewiston Lakes pastures of the Silver Creek Allotment, the North, East, West, and Upper Rock Creek pastures of the Rim Pasture Allotment, the East and West pastures of the Shoshoni Road Allotment, and the Haybarn Hill Allotment (Figure 1). The Sweetwater Canyon and Lewiston Lakes pastures have steep sided canyons, Rim Pasture Allotment pastures have foothill terrain, and Shoshoni Road pastures and Haybarn Hill Allotment have relatively flat terrain. Table 6 lists basic terrain characteristics for the test pastures.

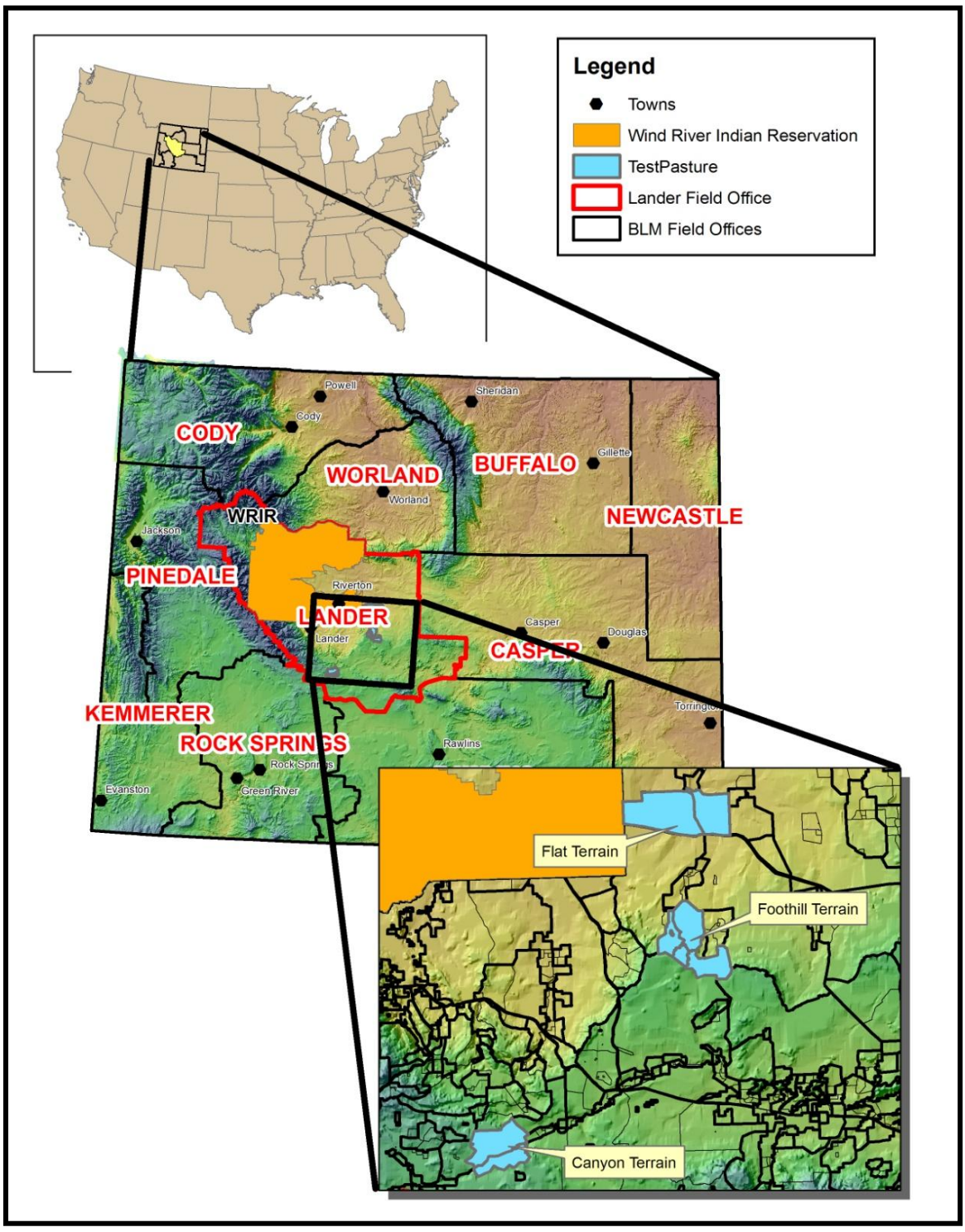

Figure 1. The study area is highlighted in yellow (top map). The Lander Field Office, study area, is outlined in red with selected towns and the Wyoming BLM Field Offices labeled (middle map). The test pastures are shown in blue (bottom map).

Table 6. Summary of the elevation characteristics in meters (m) and feet (ft) and the sizes of the nine test pastures in hectares (ha) and acres (ac).

Pasture	Max. Elevation	Min. Elevation	Elevation Difference	Size
FLAT TERRAIN				
West Shoshoni Road	1691 m 5548 ft	1568 m 5144 ft	123 m 404 ft	5232 ha 12,926 ac
East Shoshoni Road	1672 m 5486 ft	1599 m 5246 ft	73 m 240 ft	3807 ha 9408 ac
Haybarn Hill	1697 m 5568 ft	1579 m 5180 ft	118 m 388 ft	4804 ha 11,872 ac
FOOTHILL TERRAIN				
East Rim	2222 m 7290 ft	1874 m 6148 ft	348 m 1142 ft	3308 ha 8174 ac
West Rim	2176 m 7139 ft	1760 m 5774 ft	416 m 1365 ft	2028 ha 5011 ac
North Rim	2133 m 6998 ft	1734 m 5689 ft	399 m 1309 ft	3829 ha 9461 ac
Upper Rock Creek	2228 m 7309 ft	1962 m 6437 ft	266 m 872 ft	785 ha 1939 ac
CANYON TERRAIN				
Sweetwater Canyon	2319 m 7608 ft	2045 m 6709 ft	274 m 899 ft	2583 ha 6382 ac
Lewiston Lakes	2325 m 7628 ft	2056 m 6745 ft	269 m 883 ft	5178 ha 12,795 ac

The LFO planning area is located in central Wyoming (Figure 1) and encompasses 6.6 million acres. Of these 6.6 million acres, approximately 2.5 million (35 percent) are public lands managed by BLM. In the middle of the LFO planning area is the Wind River Indian Reservation, which comprises 2 million acres. There are approximately 700,000 acres of privately owned lands and 300,000 acres of Wyoming state lands (BLM 1986) in the planning area.

The LFO planning area has a semi-arid climate with a diverse topography. The Wind River Mountains block the moist air currents from the Pacific Coast, causing most of the moisture to fall on the western slope of the mountains and less on the eastern slopes where the LFO is located. This has resulted in the high desert, semi-arid rangelands that cover most of the LFO. These rangelands have a limited number of natural water sources, with many being only available on a seasonal basis.

The initial step for this project was to acquire data from various public sources and check it for accuracy. I removed extraneous features outside the LFO to expedite the data analyses. The Wyoming Geographic Information Science Center is the spatial data clearinghouse for the State of Wyoming and stores some of the base GIS data used for this project. A summary of the data used is in Table 7. The software needed to complete this project was ESRI's ArcMap software with the Spatial Analyst Extension (ESRI 2006).

Table 7. Data used for range suitability model.

Spatial Data	Data Sources
Grazing allotment and pasture boundaries	Available from LFO BLM, and http://www.blm.gov/wy/st/en/resources/public_room/gis/datagis/office/allot/lander.html
BLM Lander Field Office boundary	Available from LFO BLM and ftp://piney.wygisc.uwyo.edu/data/boundary/blm_districts.zip
Fences for Southwest Wyoming	Spatial Data and Visualization Center, 200102, Fences of Southwest Wyoming, 1990-1992: University of Wyoming Spatial Data and Visualization Center, Laramie, WY
Digital Elevation Data	USGS Seamless Data Site, downloaded 1/3 degree (10 meter) National Elevation Data (NED) http://seamless.usgs.gov/website/seamless/viewer.php
Stream Layers	USGS (1:24,000 scale) flow lines. National Hydrography Dataset (NHD), http://nhdgeo.usgs.gov/viewer.htm
National Wetland Inventory (NWI)	Available from LFO BLM and http://wetlandsfws.er.usgs.gov/imf/imf.jsp?site=NWI_CONUS
Permitted water wells	Wyoming State Engineers' Office, buffered by 10 meters and converted to polylines ftp://seoftp.wyo.gov/geolibrary_data/SEO_wells08.zip

The conceptual diagram (Figure 2) summarizes the steps used for this range suitability model. Combining allotment boundary and fence maps created the pasture boundaries, and each pasture boundary was then saved as a separate layer. The models used the pasture boundary as an analysis mask to eliminate the time consuming process of clipping the data each time the models ran. The models summarized the classifications using the 10-meter cell size of the original digital elevation data.

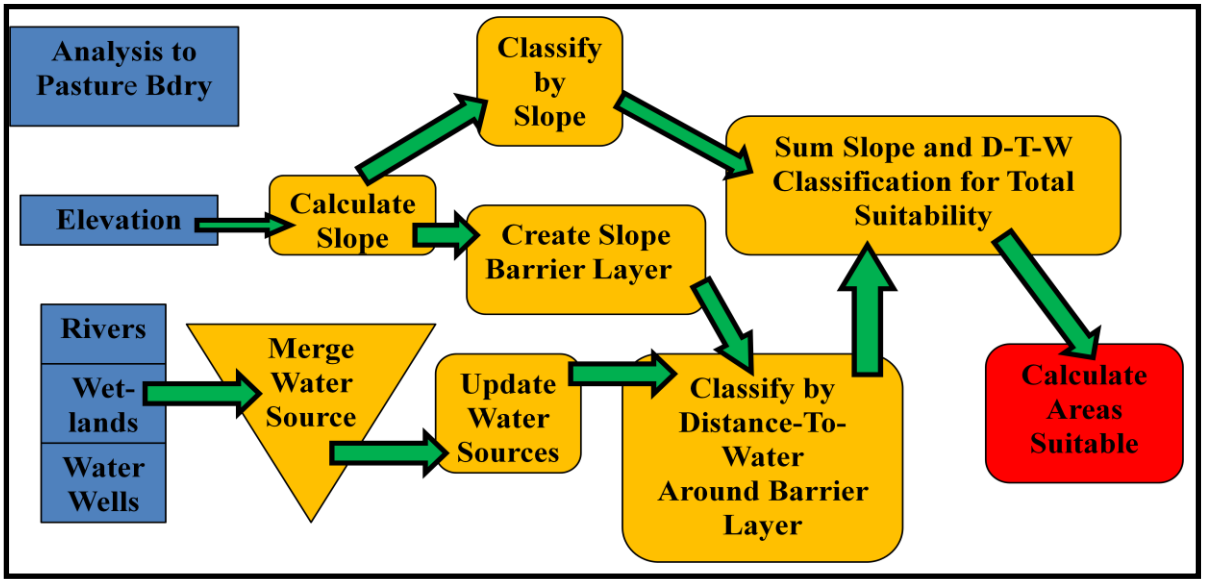

Figure 2. Conceptual diagram of steps used to determine suitable areas for grazing. The blue boxes are model inputs and the red box is the final output.

A model created the percent slope layer from the 1/3-degree (10 meter) National Elevation Data (NED). The percent slope layer covered an area larger than the individual pasture and once created, the models used this layer multiple times. This sped up the process and saved disk storage space without the need to store the derived percent slope layers each time the model was ran.

The classification of the percent slope layer created the slope-reduction categories using 10 percent slope groupings following Holechek et al. (1998) and Guenther et al. (2000) as presented in Table 8. The selection of areas with slopes greater than 60% and 45% created the terrain boundary layer treated as Barriers-To-Movement (B-T-M).

Table 8. The percent slope and distance-to-water with the corresponding percent reduction and percent suitable by 10 percent categories.

Percent Slope	Distance-to-Water (m)	Percent Reduction Categories	Percent Suitable Categories
0 - 6	0 - 290	0	100
6 - 12	290 - 613	10	90
12 - 18	613 - 937	20	80
18 - 24	937 - 1260	30	70
24 - 30	1260 - 1583	40	60
30 - 36	1583 - 1907	50	50
36 - 42	1907 - 2230	60	40
42 - 48	2230 - 2553	70	30
48 - 54	2553 - 2887	80	20
54 - 60	2877 - 3200	90	10
60 - 300	3200 - 14000	100	0

Three water source sub-models were prepared to create a seasonal water source layer by selecting water sources by type, seasonality, and beneficial use. Seasonal water models were developed for late spring (May 1- May 30), early summer (June 1- July 15), and late summer (July 15 - September 15). The dates of seasonal adjustments were for the specific areas analyzed. All water source sub-models selected permitted water wells for stock use. The late spring model selected all National Hydrography Dataset (NHD) streams and all wetlands. The early summer model selected named NHD streams that are not intermittent, and selected National Wetland Inventory (NWI) areas that were emergent and plaustrine. The late summer

model selected named perennial streams and emergent wetland areas. The sub-models merged the water sources into one layer. The models allowed for modifications of the water source layer at this step. The method allowed for checking the layer for accuracy and modification, based on local knowledge of the pasture. If needed, the additional water sources were mapped as linear features to complete the water source layer.

Three range suitability models (60% slope B-T-M, 45% slope B-T-M, and No B-T-M) determined the shortest distance to seasonal water around the various B-T-M layers. The cost distance analysis tool calculated the least accumulative distance from each cell to the nearest water source around the B-T-M (cost) layer. The range suitability models then classified the distance-to-water into 10 percent reduction categories following Holechek et al. (1998) and Guenther et al. (2000) as presented in Table 8. At this point, both the distance-to-water and slope-reduction categories were calculated.

The three range suitability models summed the slope-reduction categories and the distance-to-water categories to calculate the final reduction categories. It is important to stress that the final reduction in grazing suitability is both cumulative and additive. For example, a 10 percent reduction for slope added to a 30 percent reduction for distance-to-water would result in a total reduction of 40 percent. A 40 percent reduction is considered 60 percent suitable. (J. L. Holechek, Professor of Range Science New Mexico State University, personal communication, January 2009). The model reclassified areas with a combined reduction greater than 100 percent to 100 percent, areas could not have a reduction greater than 100 percent.

The final steps mapped the areas suitable for grazing and calculated the acres suitable by 10 percent suitability categories. Lastly, summing the areas suitable for grazing determined the total acres suitable.

Shown in Figure 3 is the range suitability model for the 60% slope B-T-M as represented in the ESRI Model Builder Tool. The inputs are grazing pasture boundary, percent slope, and water sources calculated in separate sub-models. The final output is the acres suitable summarized by 10 percent suitability categories.

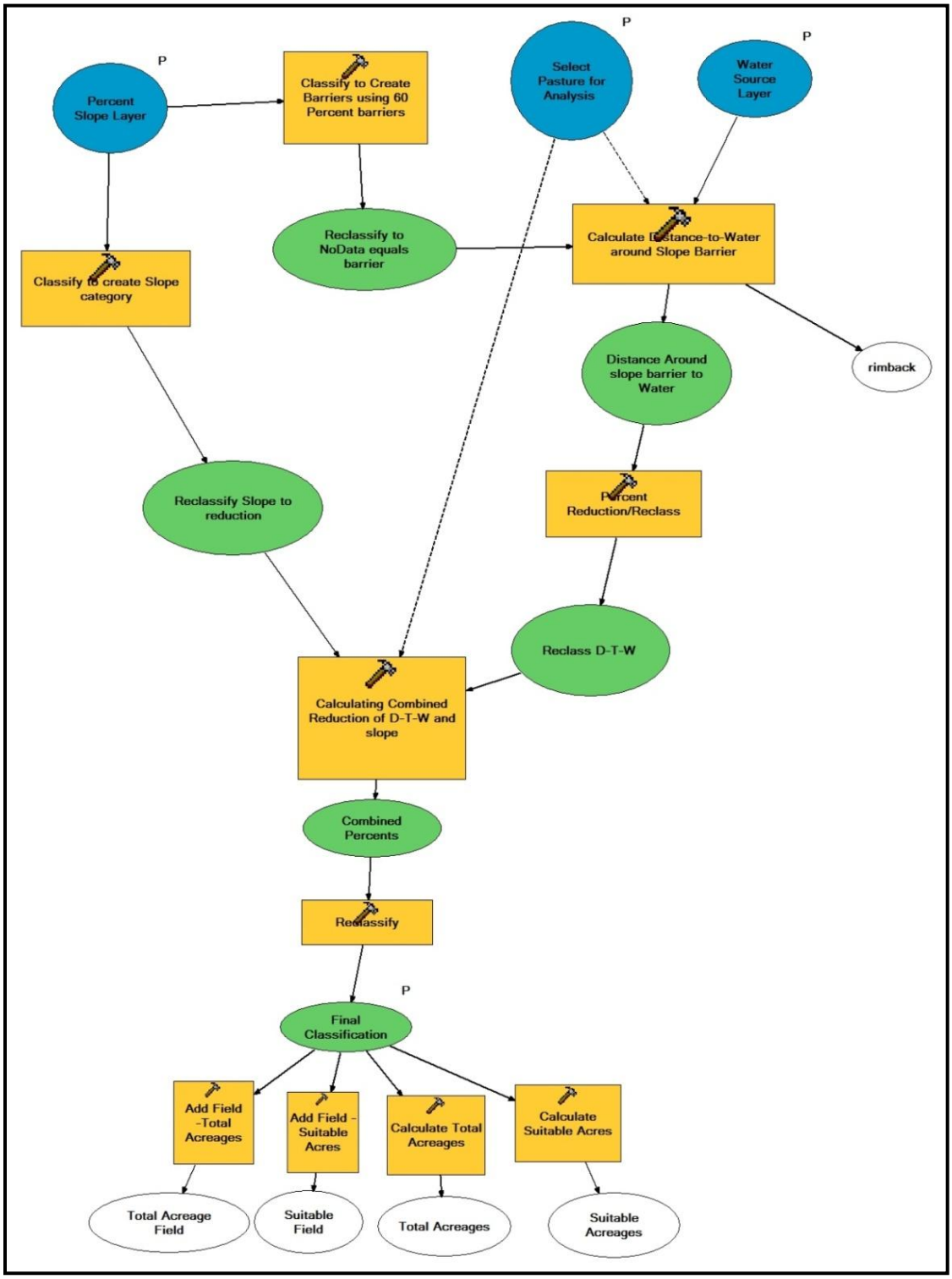

Figure 3. Steps used to determine suitable areas for grazing with inputs of the pasture boundary, percent slope, and water sources.

RESULTS

I measured the distance around the B-T-M layers to water sources and compared these distances to the GIS calculated distances using the cost distance analysis tool. These two distance measurements were within 10 meters of each other, which was the same as the 10-meter cell size of the original elevation data.

The GIS derived calculations are reasonable compared to the previous manual calculations of total acres suitable for grazing. The suitable acres calculated by the model was consistently smaller than previous calculations, but were well within expected values (BLM LFO personnel, personal communication, January 2009). The LFO range specialists, wildlife biologists, and soil scientist reviewed the model to determine the validity of the slope-barrier modifications. Suitable acre calculations were reasonable when the water source layer was accurate. I modified the water source layer based on the LFO range specialist's knowledge of the pasture, which improved the results.

Based on discussions (BLM LFO personnel, personal communication, January 2009), I changed the method to have separate steps (sub-models) derive the percent slope and seasonal water source layers. Once created, the models used the percent slope layer multiple times to analyze adjoining pastures. These sub-models allowed for the creation of a basic water source layer, based on the seasonal availability of water, which I modified using based on specific knowledge of the pasture.

I created three range suitability models for 60% slope B-T-M, 45% slope B-T-M, and No B-T-M. The inputs for the range suitability models are the grazing pasture boundary, percent slope, and seasonal water source layer. The output of these models was the final classification of suitability acreages summarized in 10 percent reduction categories.

A summary of the final calculations of suitable acres for the nine test pastures using the early summer water layer and the three B-T-M range suitability models are shown in Table 9. The B-T-M layer affected areas of four pastures, three in the foothill terrain and one in the canyon terrain. The outcome was a 0 to 4 percent change in total suitability, not considered significant. The model calculates the shortest distance to the nearest water source, so it is sometimes closer to another water source then going around the barrier to reach the original water source.

Table 9. Summary of the acres suitable for grazing by No B-T-M, 60% Slope B-T-M and 45% Slope B-T-M range suitability models using early summer water sources.

PASTURE	Pasture Size	No Slope Barrier	Percent Suitable	60% Slope Barrier	Percent Suitable	45% Slope Barrier	Percent Suitable
FLAT TERRAIN							
West Shoshoni Road	12,928 ac / 5232 ha	7654 ac / 3097 ha	59	7663 ac / 3101 ha	59	7654 ac / 3097 ha	59
East Shoshoni Road	9408 ac / 3807 ha	5508 ac / 2229 ha	59	5509 ac / 2230 ha	59	5508 ac / 2229 ha	59
Haybarn Hill	11,872 ac / 4804 ha	8159 ac / 3302 ha	69	8167 ac / 3305 ha	69	8159 ac / 3302 ha	69
FOOTHILL TERRAIN							
East Rim	8174 ac / 3308 ha	5300 ac / 2145 ha	65	5308 ac / 2148 ha	65	5281 ac / 2137 ha	65
West Rim	5011 ac / 2028 ha	2634 ac / 1066 ha	53	2611 ac / 1057 ha	52	2497 ac / 1011 ha	50
North Rim	9461 ac / 3829 ha	4896 ac /1981 ha	52	4902 ac / 1984 ha	52	4864 ac / 1968 ha	51
Upper Rock Creek	1939 ac / 785 ha	1063 ac / 430 ha	55	1063 ac / 430 ha	55	1049 ac / 424 ha	54
CANYON TERRAIN							
Sweetwater Canyon	6382 ac / 2583 ha	3847 ac / 1557 ha	60	3796 ac/ 1536 ha	59	3550 ac / 1437 ha	56
Lewiston Lakes	12,795 ac / 5178 ha	9492 ac / 3841 ha	74	9501 ac / 3845 ha	74	9439 ac / 3820 ha	74

While the total acres stayed similar using the different B-T-M range suitability models, the range suitability pattern differed. The Sweetwater Canyon (Figure 4) and West Rim pastures (Figure 5) show this change in pattern. The 100 percent suitable areas along the river in the center of map (inset map) are absent in the 45 percent terrain barrier for Sweetwater Canyon pasture (Figure 4). There was an increase in suitable areas in the north part of the West Rim pasture (outlined in white), which is balanced with a decrease in the suitable areas in the west central section of the pasture. The terrain barriers had limited effects on the total acres suitable, but did affect the suitability pattern.

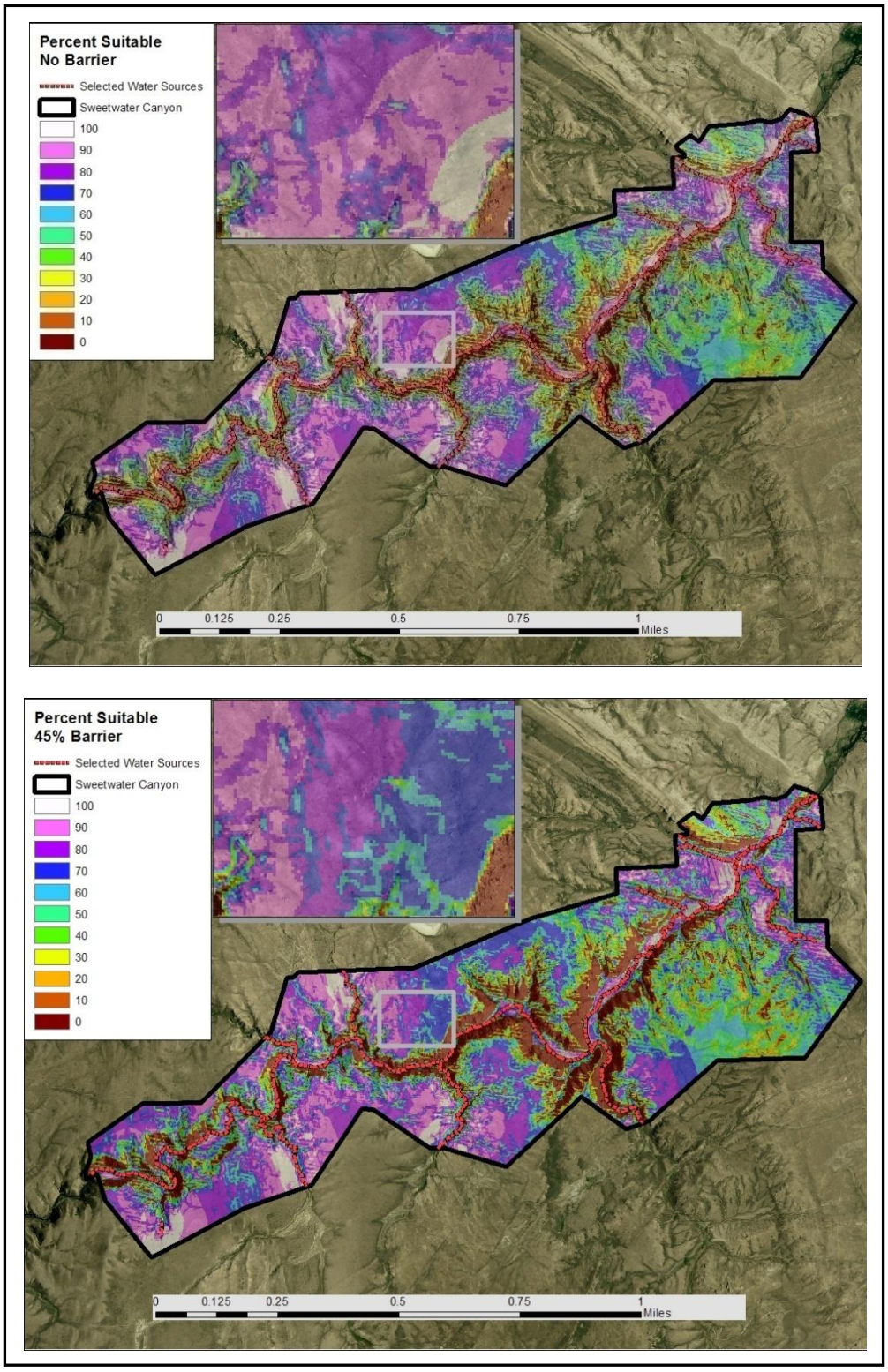

Figure 4. Comparison of range suitability for the Sweetwater Canyon pasture for No B-T-M (top) and 45% slope B-T-M (bottom) range suitability models using early summer water sources.

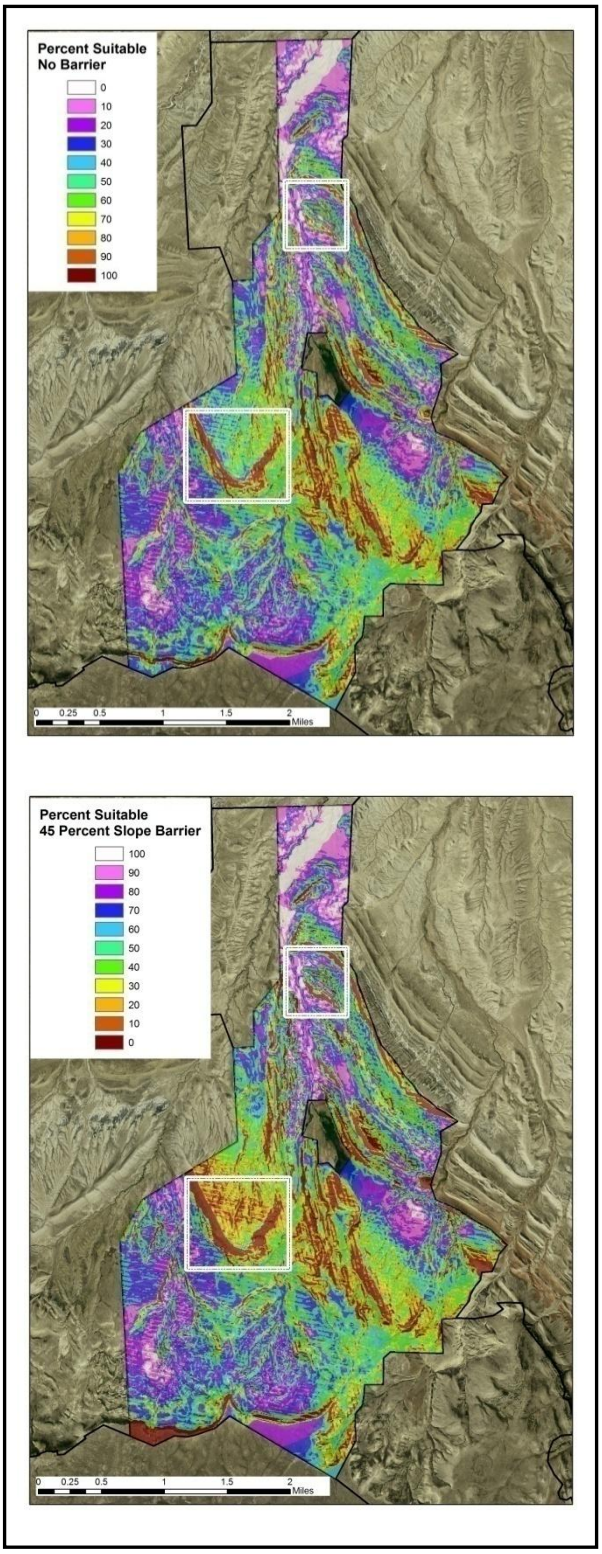

Figure 5. Comparisons of the suitability for the West Rim pasture for No B-T-M (top) and 45 percent slope B-T-M (bottom) range suitability models using early summer water sources.

A summary of the analysis of the three different seasonal water source sub-models on acres suitable for grazing are shown in Table 10. This evaluated the utility of the water source sub-models. The range specialists (BLM LFO personnel, personal communication, February 2009) reported the late-spring model over-estimated suitable acres because it selected nearly all water sources. Although range specialists reported water in all areas represented at least once during the last few years, they had not seen water at all locations at the same time in the spring. The early and late summer water source models still over-estimated water availability, but suitable acres were reasonable using early and later summer water sources (BLM LFO personnel, personal communication, February 2009).

Table 10. Summary of the acres suitable for grazing using seasonal water sources selection sub-models. This analysis was completed using the 60 percent range suitability model.

PASTURE	Pasture Size	Late Spring	Percent Suitable	Early Summer	Percent Suitable	Late Summer	Percent Suitable
FLAT TERRAIN							
West Shoshoni Road	12,928 ac / 5232 ha	11,598 ac / 4694 ha	90	7662 ac / 3101 ha	59	6744 ac / 2729 ha	52
East Shoshoni Road	9408 ac / 3807 ha	8071 ac / 3266 ha	86	5509 ac / 2229 ha	59	4931 ac / 1996 ha	52
Haybarn Hill	11,872 ac / 4804 ha	10,679 ac / 4322 ha	90	8167 ac / 3305 ha	69	6920 ac / 2800 ha	58
FOOTHILL TERRAIN							
East Rim	8174 ac / 3308 ha	6179 ac / 2501 ha	76	5307 ac / 2148 ha	65	5190 ac / 2100 ha	65
West Rim	5011 ac / 2028 ha	3210 ac / 1299 ha	64	2611 ac / 1057 ha	52	2309 ac / 934 ha	46
North Rim	9461 ac / 3829 ha	7458 ac /3018 ha	79	4902 ac / 1984 ha	52	4902 ac / 1984 ha	52
Upper Rock Creek	1939 ac / 785 ha	1296 ac / 524 ha	67	1063 ac / 430 ha	55	1063 ac / 430ha	55
CANYON TERRAIN							
Sweetwater Canyon	6382 ac / 2583 ha	4003 ac / 1620 ha	63	3796 ac/ 1536 ha	59	3767 ac / 1524 ha	59
Lewiston Lakes	12,795 ac / 5178 ha	10,901 ac / 4411 ha	85	9501 ac / 3845 ha	74	9070 ac / 3671 ha	71

The East Shoshoni Road pasture (Figure 6) and North Rim pasture (Figure 7) are representative of the effects that the separate water source models had on the pattern of areas suitable for grazing. By the end of the grazing season, the East Shoshoni Road pasture had over 6000 less acres suitable for grazing. The North Rim pasture had a large change in suitable areas from late spring to early summer (4144 acres), but no change from early summer to late summer. This was due to the limited number of spring water sources in this pasture.

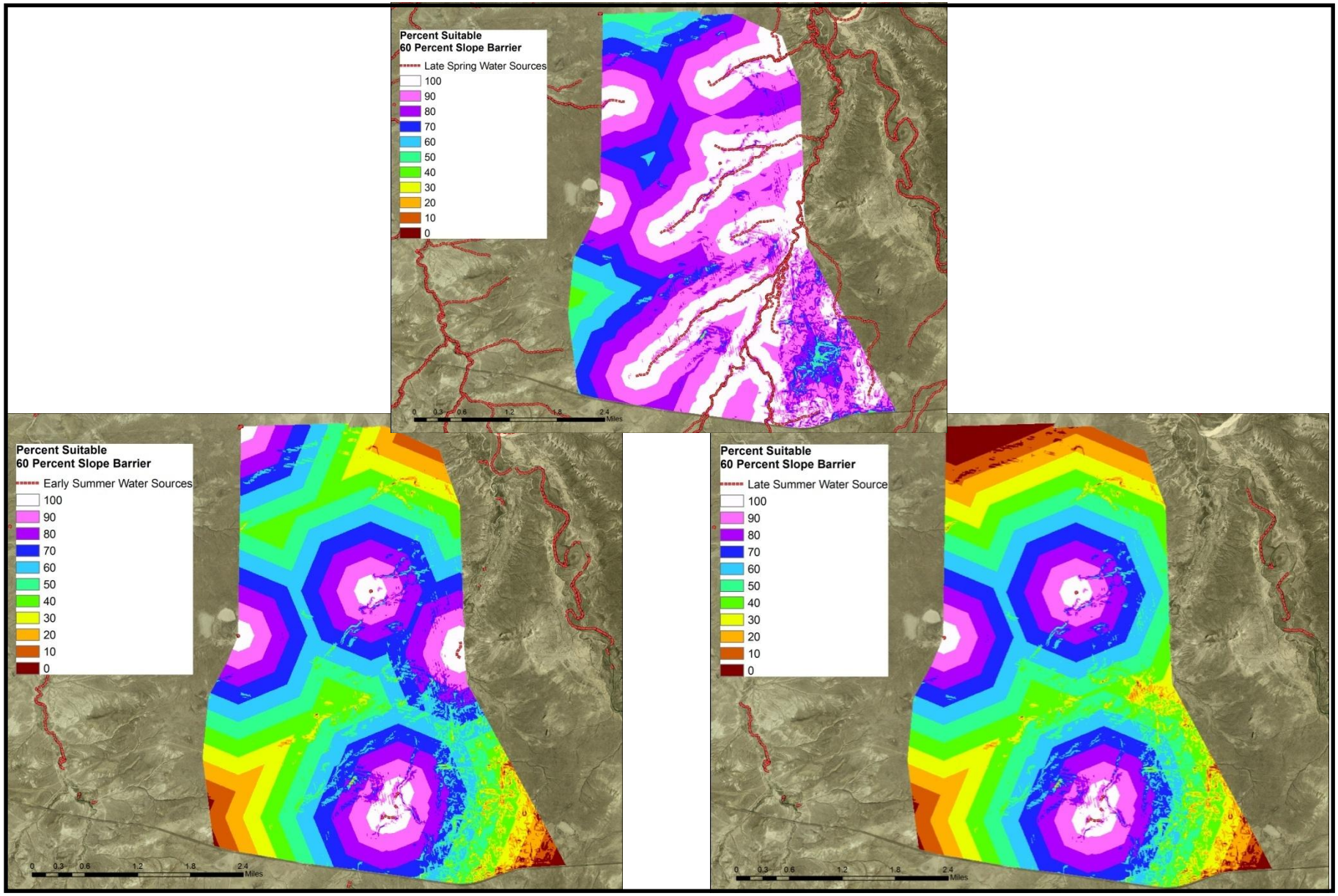

Figure 6. Maps of the grazing suitability for the East Shoshoni Road pasture for late spring (top), early summer (left), and late summer (right) water sources using the 60% slope B-T-M range suitability model.

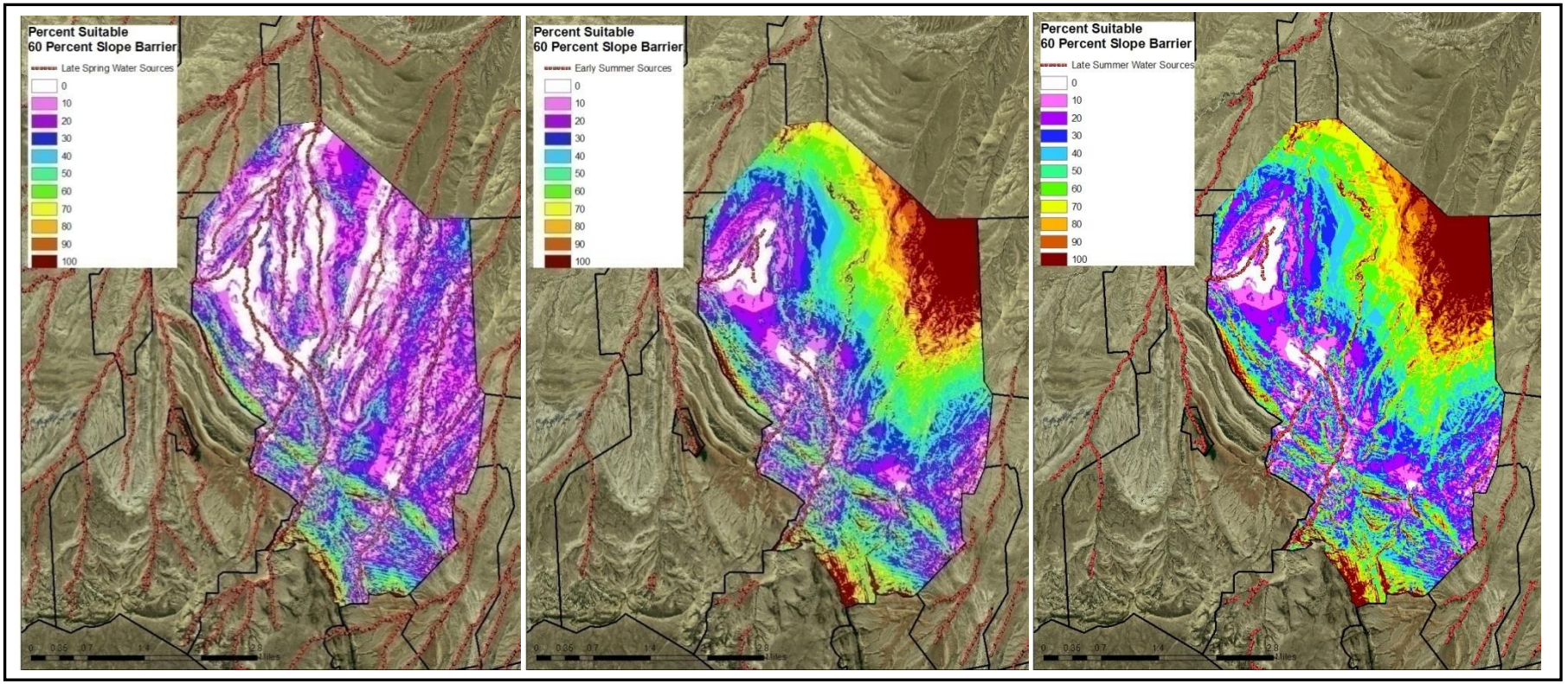

Figure 7. Maps of the grazing suitability of the North Rim pasture for late spring (left), early summer (middle), and late summer (right) seasonal water availability using the 60% B-T-M range suitability model.

ESRI's model documentation tools accomplished the final objective of summarizing the data needs and model methodology. The model documentation tools explained the individual steps in the sub-models, provided usage tips, and summarized the purpose of the sub-models. The documentation tools provided contact information, explanation of the parameters used for models and use constraints of these models. The completion of this report further explains and discusses applications of these models.

DISCUSSION

I presented results of a trial project for the Sweetwater Canyon pasture to the BLM LFO range specialists in 2005 (BLM LFO personnel, personal communication, June 2005). They expressed concerns with the current methods of calculating range suitability, as these methods did not address other criteria they felt should be considered. One concern focused on when the water source (river) was inside steep-sided canyons (S. Fluer, BLM LFO Range Specialist, personal communication, June 2005). Both models, Holechek et al. (1998) and Guenther et al. (2000), assume cattle can move directly across the steep slopes to reach suitable grazing areas. In reality, cattle may have to travel more than 1/4 mile to exit the canyon to reach suitable grazing areas. Areas above the steep-sided canyon should have a reduced grazing suitability due to the actual distance cattle must travel to water. A second concern presented was that models do not account for soil and bedrock features that limit vegetation production (G. Bautz, BLM LFO Soil Scientist, personal communication, June 2005). Including areas not capable of producing

vegetation would over-estimate the availability of forage. It was felt that both terrain barriers and soil suitability should also be considered when determining rangeland suitability.

The trial project used both Holechek et al. (1998) and Guenther et al. (2000) methods and calculated the distance-to-water by using GIS to create a buffer around water sources. Both methods used a straight line distance to calculate the distance-to-water and did not account for the additional distance around the terrain barriers. These methods used slope categories in their range suitability methods. This project created a B-T-M layer using the slope greater than 60 and 45 percent respectively and calculated the additional distance around terrain barriers to obtain the distance-to water.

I presented the range suitability analyses of the nine test pastures using the new GIS model to the LFO personnel for review (BLM LFO personnel, personal communication, January 2009). There was agreement that the methodology accurately accounted for increased distance around terrain barriers. The results were reasonable when water sources were predominantly perennial streams in the canyon areas. The results for the flat terrain pastures were incorrect due to the absence of two water wells and a stock pond in the water source layer, and over-estimating water availability due to using a named intermittent stream. I modified the water source layer by adding water wells and a stock pond, deleted part of the intermittent stream, and ran the model again. The local range specialist (BLM LFO personnel, personal communication, January 2009) confirmed the results as reasonable with the modified water source layer. This demonstration reinforced the advantage of models that would systematically recalculate rangeland suitability when improved (corrected) water source data or pasture boundary data becomes available.

If needed, the range specialist can modify the results of the three sub-models that created the base layer for seasonal water sources. The three seasonal water source models often over-estimated water availability. Reviewers did not perceive this to be a major flaw of the water source selection process, since it was easier to have the range specialist delete features than it was to add water sources. The BLM has a list of range improvements, including water development projects, which could be used to update the water source layer. This data was not complete at the time of this project.

The documentation tools with ESRI Model Builder were effective to document the data and methods used during the development of this method. There is a need to develop a detailed guide to assist new users in operating this tool in the future.

I noted there were gaps in the GIS modeled B-T-M layer that allowed cattle movement through the perceived terrain barrier that requires further field investigation. These gaps could be due to the accuracy or errors in the 10-meter elevation data. A 10-meter buffer around the terrain barriers would close most gaps.

One use of this range suitability model is to determine optimal placement of additional water sources to increase cattle distribution. Expected grazing suitability maps will identify areas over two miles from water and classified as 100 percent unsuitable for grazing. The placement of new water sources in these previous “unsuitable” areas could increase acres available for grazing.

Another use of the model is determining the impact of dividing a pasture or grazing allotment with cross fencing. Dividing a pasture without accounting for water availability and terrain could concentrate cattle in heavily used areas, resulting in deterioration of grazing lands. Splitting a pasture with fencing could isolate cattle away from adequate water sources, making some areas unsuitable for grazing.

It is recommended (Guenther et al. 2000; Holechek et al. 2000) that livestock grazing use be monitored in areas of moderate use. This model predicts what level of grazing use a particular area might receive and could assist cattle ranchers and BLM personnel in selecting areas for grazing monitoring. Knowing the expected use of an area would improve the interpretation of the monitoring data. Presented are examples of expected use maps for the East Shoshoni Road (Figure 8) and Sweetwater Canyon (Figure 9) pastures. The East Shoshoni Road pasture has a large percentage of the pasture in moderate use (green) areas, while the Sweetwater Canyon pasture has a small percentage of the pasture in moderate use areas.

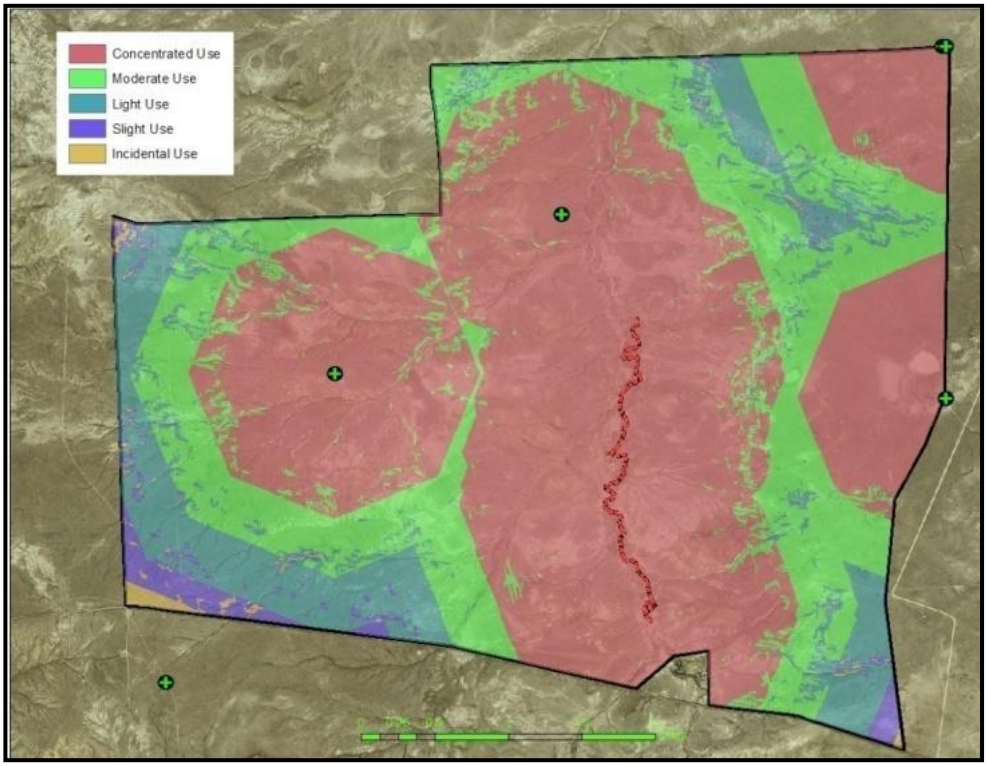

Figure 8. Expected use map for the East Shoshoni Road pasture using 60% slope B-T-M range suitability and late summer water source model.

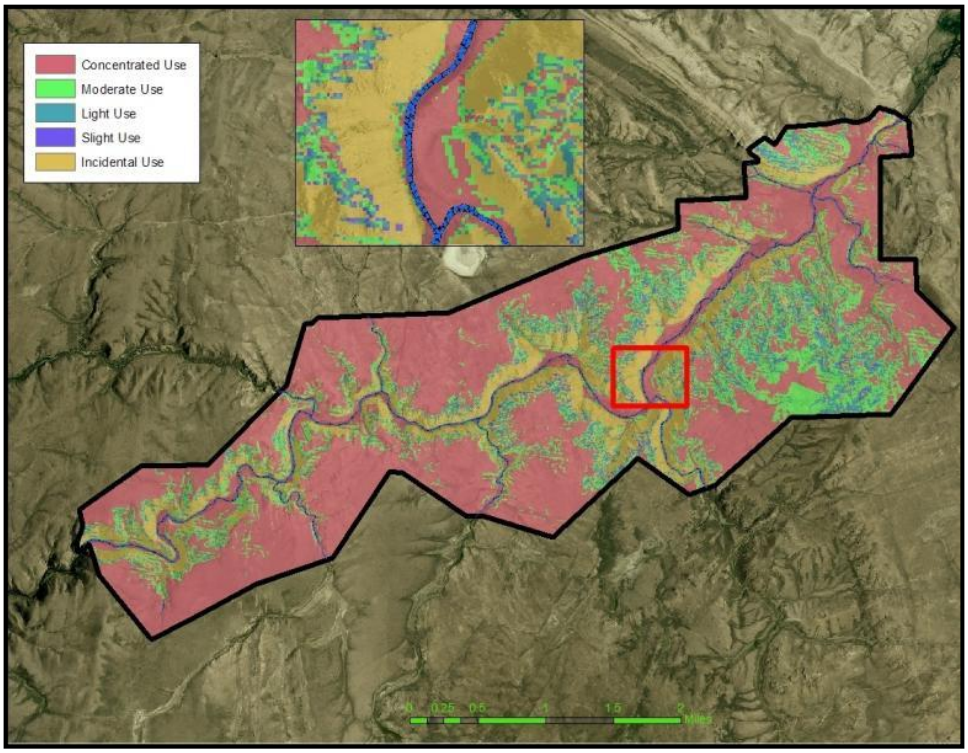

Figure 9. Expected use map for the Sweetwater Canyon pasture using 60% slope B-T-M range suitability and late summer water source model.

The model could be used in conjunction with the Natural Resources Conservation Service (NRCS) Soil Data Viewer (NRCS 2007b), which summarizes range production by pasture in pounds of forage produced per acre for favorable, normal, and unfavorable years. Suitable acres calculated by this model multiplied by the pounds of forage produced per acre will determine a range of animal unit months (AUMs) available for grazing. The ability to calculate available AUMs has been the most requested upgrade of this model. It would be worthwhile to investigate the possibility of integrating this method with the NRCS Soil Data Viewer, but elevation data and water sources layer are currently not part of the Soil Data Viewer basic dataset (NRCS 2007b).

The NRCS has developed the Grazing Land Spatial Analysis Tool, which is a stand-alone decision support tool utilized to inventory both grazing resources and animal use (domestic and wild) (NRCS 2007). This tool balances forage supply in relationship to animal demand. The tool depends on inventory data and analysis of grazing lands to balance supply and demand. Limited knowledge of its existence (Wyoming Game and Fish Dept. Aquatic Habitat Biologists, personal communication, January 2009) and the need for multiple pastures inventory sites that are often not available has limited the use of this tool. The tool does not integrate streams as linear features, slope of the pasture, or travel distances around barriers to water. Water sources (i.e., springs and streams) must be hand digitized as a series of points, which is a time consuming process and often not completed. Models created for this project can be integrated into this decision support tool.

During project development other factors were identified that could improve the model. The most commonly mentioned factor was the addition of a vegetation layer (K. Spence, Wyoming

Game and Fish Dept. Habitat Biologist, personal communication, June 2008). While vegetation maps are available in digital format, the resolution is currently too coarse to be usable for this project. There are on-going efforts to map vegetation communities due to concerns related to greater sage-grouse habitat in Wyoming. The model could be expanded to include vegetation attributes once mapping efforts are completed.

Another factor mentioned for inclusion in evaluating grazing suitability is the significant invasive weed infestations in the LFO. Fremont County Weed & Pest District is developing a comprehensive map of weed infestations for both private and public lands in the LFO. The LFO encompasses other Weed & Pest Districts in neighboring counties that do not have a comprehensive map at this time. Using a weed layer in this model is currently not possible due to the lack of complete data, but could be included in the future.

This model can factor in conflicting land uses that affect grazing such as mines, oil/gas fields, and roads that are significant impacts. There is currently no agreement on methods to adjust grazing suitability to account for these impacts. For example, is the impact of roads on grazing suitability the road surface or does it could include the barrow areas adjacent to the road, which might double the width of the road footprint? With little agreement on how to adjust grazing suitability for a seemingly straightforward example for roads, getting agreement on methods to adjust grazing suitability due larger impacts such as oil/gas fields and mines, will be difficult.

CONCLUSIONS

These models introduce a level of complexity when the B-T-M layers are included that has a limited effect on the total suitable acres for cattle grazing. With the barriers added, the models more accurately represent the distribution of rangeland suitability.

The success of the range suitability models depends on the knowledge of range specialists to accurately create and modify the water source layers. Water availability is an important issue due to the seasonal nature of water throughout the western United States. There are no consistent records of the seasonal availability of water, making it difficult to automate the water source selection process. Range specialists often know the water sources for the pastures they manage. The range specialists could add and delete water sources, as needed, if provided with a basic water source layer. It is "easier" to delete water sources than to add new water sources.

The GIS-modeled suitable acres for grazing were reasonable when compared to current hand generated suitability calculations. The LFO rangeland specialists determined the validity of the modifications of the range suitability models. I modified the model based on input from the local experts to have sub-models to create percent slope and water source layers. The experts determined that this model was faster than using paper map methodology.

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STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

M2017036 Knox Pit

Front-Desk <front-desk@int-mech.com> Tue, Nov 7, 2017 at 12:36 PM
To: jared.ebert@state.co.us

Hi Jared,
Please see the attached scan.

Thanks,
Patty McElwaine

-----Original Message-----
From: Scan [mailto:Josh-M@int-mech.com]
Sent: Tuesday, November 07, 2017 12:36 PM
To: Patty-M
Subject:

scan.pdf
978K

Declaration of RE: Objection to Permit # M2017036, Knox Pit Statement of Aggrievement)

1. My name is Patricia McElwaine. I live at 2920 Schaefer Drive. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp. I am also a Board member of No Laporte Gravel Corp. I hold the position of Co-President in the non profit corporation.
3. I can see the Loveland Ready Mix property that is the subject of this permit application on my daily travels to work.
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
5. Every time I come and go to LaPorte, I will see this gravel pit and the scars it will leave. Our primary source of recreation is having backyard get-togethers in Spring, Summer and Fall. We have a tight group of friends where we have pot luck dinners and play horse shoes or croquet. This is a typical type of entertainment in this area which would be compromised by the noise, and air pollution resulting from Loveland Ready Mix turning an agriculture property into an industrial sight. In conclusion, we adamantly oppose this proposed gravel pit which will have negative impacts on the health of school children with particles in the air.
6. It will decrease the amount of water in our wells that people use to grow their food. It will increase traffic and lower the values of our homes. Everything we love about LaPorte will disappear.
7. We moved here from Denver for the beautiful Poudre River, the trees, and the small town atmosphere. We watch the birds in our back yard, and the deer in our front yard. This is a peaceful residential area with good schools and strong community bonds. This gravel pit will create a massive amount of traffic and I fear will injure bicyclists, dog walkers, and children walking to and from school. The location of this proposed mine is at the very beginning entrance of LaPorte. This historical community does not want to appear like a town from the dust bowl era. We want to continue the agricultural, rural, and open space aesthetic that Antoine Janis saw when he settled here in 1844.
8. We will hear the noise from this mining pit morning, noon, and night. Not what we envisioned in our retirement years.
9. Martin Marietta on 54G and Taft Hill promised to do a great job on reclamation and it is simply a fence with no vegetation or trees. It resembles a prison yard. The Stegner gravel pit took 10 years longer than they promised and still is not reclaimed. How do these mining companies get away with it. Who is responsible for making them keep their commitments?
10. Our home is located at 2920 Schaefer Drive and is approximately 1.5 miles from the proposed site. This is the main inheritance our children will receive when my husband and I depart. Last year at this time Zillow had our house valued at $294,000.00 on September 30, 2016. Today, November 7, 2017 our house is appraised at $261,000.00. This 13% decline is a direct result from the application proposed by Loveland Ready Mix. At a time when property is exploding in Colorado our values have gone down.

I swear the foregoing is true and accurate to the best of my knowledge.

Patricia McElwaine
Signed

11-7-17
Date

November 7, 2017

Patty McElwaine
Co-President No Laporte Gravel.org
PO Box 523
2920 Schaefer Drive
LaPorte, CO 80535

970.490.1776

Mr. Jared Ebert
1313 Sherman St. Rm. 215
Denver, CO 80203

Re: Objection to Application M-2017-036, Knox Pit -Loveland Ready-Mix Concrete, Inc.

Laporte Operations, Knox Pit Construction Material Application 112

Dear Mr. Ebert,

My husband and I moved to LaPorte, Colorado in 1979 and have owned property and operated a business in this community for the past 38 years. The proposal for another gravel pit in LaPorte would adversely affect us in the following areas.

Business& Economic

Our home is located at 2920 Schaefer Drive and is approximately 1.5 miles from the proposed site. This is the main inheritance our children will receive when my husband and I depart. Last year at this time Zillow had our house valued at $294,000.00 on September 30, 2016. Today, November 7, 2017 our house is appraised at $261,000.00. This 13% decline is a direct result from the application proposed by Loveland Ready Mix. At a time when property is exploding in Colorado our values have gone down.

We have owned and operated Sunwater Plumbing since 1981. In recent years the request for both repair work and remodel work in LaPorte and the surrounding area has increased dramatically. This is largely due to the increased real estate values in northern Colorado. After years from the 2008 recession, people have finally started doing home improvements again. Our research shows that property values decline between 10% to 40% depending on the distance to the gravel sight. The people in LaPorte will be reluctant to invest in their homes if their property values decline. This gravel mine would negatively impact our plumbing and remodel business.

Aesthetic

We moved here from Denver for the beautiful Poudre River, the trees, and the small town atmosphere. We watch the birds in our back yard, and the deer in our front yard. This is a peaceful residential area with good schools and strong community bonds. This gravel pit will create a massive amount of traffic and I fear will injure bicyclists, dog walkers, and children walking to and from school. The location of this proposed mine is at the very beginning entrance of LaPorte. This historical community does not want to appear like a town from the dust bowl era. We want to continue the agricultural, rural, and open space aesthetic that Antoine Janis saw when he settled here in 1844.

Recreational

Our primary source of recreation is having backyard get-togethers in Spring, Summer and Fall. We have a tight group of friends where we have pot luck dinners and play horse shoes or croquet. This is a typical type of entertainment in this area which would be compromised by the noise, and air pollution resulting from Loveland Ready Mix turning an agriculture property into an industrial sight. In conclusion, we adamantly oppose this proposed gravel pit which will have negative impacts on the health of school children with particles in the air. It will decrease the amount of water in our wells that people use to grow their food. It will increase traffic and lower the values of our homes. Everything we love about LaPorte will disappear.

Sincerely,

Patricia McElwaine M.A. Patricia McElwaine

Co-President No Laporte Gravel. Org

Declaration of Aggrievement for M201-7036 Knox Pit
Submitted to DRMS

1. My name is Raymond Kintzley. I live at **2601 WCR 54G**. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp and I own Kintzley Apartments, an apartment and retail complex that is 100 yards from the Loveland Ready Mix proposed mine and batch plant.
3. I can literally see the Loveland Ready Mix property that is the subject of this permit application from my place of business. If this application is allowed to go through, tenants of 32 apartments and about 20 businesses will cancel their leases and go elsewhere. Please do not allow this blatant intrusion that will totally wipe out my business.
4. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
    a. My tenants will be able to see, hear, and breathe the operations from the Knox Pit.
    b. This natural grazing field is a major reason why many of my tenants chose to live or work on in my buildings and this plan will disrupt the peaceful nature of their tenancy including the peace and quiet and enjoyment of the wildlife that lives and migrates across the land.
    c. My tenants and will be able to hear the mining activities and be endangered by the increase of traffic from the project
    d. The reclamation plan submitted by LRM is wholly inadequate. By no means is leaving 5 huge craters in the ground "reclamation."

I swear the foregoing is true and accurate to the best of my knowledge.

RAYMOND KINTZLEY ***11/8/2017***

_____ _____

Signed Date

Declaration of Aggrievement for M201-7036 Knox Pit
Submitted to DRMS

1. My name is Sarah Allely. I live at 3701 Settlers Road, Laporte, CO 80535. I am over the age of 18 and of sound mind to make this declaration.
2. I am a member of No Laporte Gravel Corp and I own a home .6 mile from the Loveland Ready Mix property.
3. I am aggrieved by the Loveland Ready Mix permit application and will be aggrieved if the project is allowed to move forward for the following reasons:
    a. My family will be able to hear and breathe the operations from the Knox Pit. We do not have air conditioning in our home and leave our windows open for cooling in the warmer months. I suffer from asthma and the noise and dust created from the pit will prevent us from opening our windows. We have heard from other communities next to aggregate pits that is very difficult to get action taken by the authorities when the mines are in violation of environmental and safety regulations. We have the right to quiet enjoyment of our home and this pit would destroy our ability to exercise that right.
    b. My family will be able to hear the mining activities and the right to quiet of this beautiful community that was a primary reason for purchasing a home in this community will be destroyed.
    c. Research has shown that home values in close proximity to gravel pits lose 15-20% of their resale value. I will lose between $50,000 – $75,000 off the value of my home if this pit is allowed.
    d. My family and community will be endangered by the increase of traffic from the project. Our trails and roads are extremely popular with bicyclists (myself included), who contribute to our local small businesses. If this pit is approved, the bicyclists will not feel safe sharing the roads with the large rock trucks and increased traffic, negatively affecting our small businesses. Since the transporters will likely be contractors, we community members have to work very hard to determine how to contact the truck owner when there is a safety violation. We have very little recourse to deal with these issues. If this pit were to be approved, I request that the company is required to work with a community advisory committee made up of community-chosen representatives to address community issues.
    e. The reclamation plan is inadequate and does not add any value to our community.

I swear the foregoing is true and accurate to the best of my knowledge.

Sarah Allely
Signed

11/8/17
Date

November 5, 2017

From: Terry Waters <terrywaters125@msn>
Mailing Address:
Terry Waters
PO Box 291
Laporte, CO 80535

Residence Address and Phone:
3200 Tharp Drive
Laporte, CO
970-482-4462

To: Jared Ebert jared.ebert@state.co.us - CO Division of Reclamation, Mining and Safety

Re: Objection to Application M-2017-036, Knox Pit
Loveland Ready-Mix Concrete, Inc. Laporte Operations, Knox Pit Construction Material Application 112

This letter is to register my objection to Application M-2017-036, Knox Pit. I respectively request that the Colorado Mined Land Reclamation Board consider the following issues regarding Loveland Ready-Mix Concrete, Inc. Laporte Operations, Knox Pit Construction Material Application 112:

1. Exhibit B, Index Map shows residences by dots. The map used appears to be a map that was last photo-revised in 1978 by the US Geologic Survey and is misleading since it is approximately 40 years old and does not accurately reflect new residences and businesses adjacent to the site and in the vicinity.

   Requested Action: Applicant should resubmit the application with a current map.

2. The application repeatedly references exhibits (e.g., Exhibit C and Exhibit G) that could not be found in the document or the material posted to Laserfiche imaged document system making it difficult to review and verify that the statements relating to these exhibits were correct. Page 88 was the cover page for Exhibits B, C, and F and was followed by three pages showing Figures 1, 2, and 3. Pages 90 and 91 contained some Exhibit C information, however were missing the following Exhibit C information required by Section 6.4.3 subsections (b) names of roads, buildings, power and communication lines, (c) topography of area with contour lines, (d) areas to be mined and affected lands, (e) type of present vegetation covering affected lands, and (g) show where owners, type of significant structures within 200 feet are located.

   Requested Action: Ensure that all exhibits are clearly labeled and able to be located based upon the Application's Table of contents so that compliance to the DMRS requirements can be verified.

3. Section 7.4.2, Table 1 shows the four different wheat grasses and one wild rye seed mixture, which is proposing a low diversity of types of ground cover. Since the plan does not include watering of the planted seed, the species may not germinate if there is a dry growing season. This low diversity,

simple grass/forb species does not create an "enhanced wildlife habitat". Additionally, the applicant at the neighborhood meeting stated that the post-mining pits would be lined and precipitation inputs would fill them with water (with no other outside inputs). Pan-evaporation (output) in this region is approximately three times precipitation (input). However, a wet spring or a well above average precipitation year would leave standing water, which would be a breeding ground for mosquitoes that could harbor West Nile Virus and would eventually kill any existing terrestrial vegetation, leaving bare soil to be blown to surrounding properties and a period of weed seed sources.

Requested Action: Improve the reclamation plan to ensure that it provides an attractive entryway to Laporte with a wide variety of healthy plants and no obnoxious weeds. The plan should ensure that the seeds are properly watered and reseed areas where plants are not reestablished. An irregular natural meandering border around reclaimed pit may improve the reclaimed pit's appearance. Additionally, the pits could include a friendly wildlife entry/exit 50-foot wide 10:1 ramp.

4. Table 3, Sensitive Plants and Animals, is missing birds that were identified in the City of Fort Collins Checklist of Local Birds. I have seen from my yard (within 500 feet from proposed site) Ferruginous hawks, Peregrine Falcons, and Bald Eagles (juvenile and adult). I have seen these birds on the ditch willows that are within 200 feet of the site, and photographed a falcon eating a pigeon in our front yard.
    a. Brown Pelican (Federal Endangered) – migrates through area
    b. Bald Eagle (State Threatened) – migrates through and winters in area
    c. Ferruginous hawk (State Species of Concern)- migrates through and winters in area
    d. Peregrine Falcon (State Species of Concern) - migrates through area
    e. Snowy Plover (State Species of Concern) - migrates through area
    f. Long-billed Curlew (State Species of Concern) - migrates through area

    Requested Action: Modify Table 3 to include additional endangered species from the federal and state lists and add state species of concern.

5. Section 10.2.3, Raptor Nest sites, states "No raptor nests exists within the project area due to close proximity of suitable trees to the adjacent road activity and existing industrial activity in the surrounding areas." Please note that the proposed site is not in an industrial area. It is beside quiet residential areas that have a large quantity of wildlife (e.g., deer) and birds. Bird watching and identifying birds is one of the top recreational activities in Laporte due to the large variety of birds that can be seen and heard singing in Laporte's rural environment. There are numerous suitable trees for raptor nests (e.g., over 80 feet tall) to the west of the site and to the south of site (especially along the Cache La Poudre river). I know of at least one raptor nest that exists within a ½ mile radius of the project area (note: I am not a trained ornithologist).

    Requested Action: The applicant should hire a trained ornithologist to identify raptor nests within a ½ mile radius of project.

6. Section 10.2.4, Winter Night Roost, states "Due to the absence of raptors nests in the project area, it is unlikely this project would be impacted by adjacent wintertime night roosts" implies that the writer is more concerned about the raptor nests impacting the project, rather than the project impacting the nests. Please note that the wintertime night roosts will be impacted by the project's noise and light. Laporte is very quiet at night and has very few light sources. The applicant then states that "This facility is unlikely to be in operation during night time hours, during the winter months" which is also incorrect. The noise from the Natural Gas Compressors (76.2 dBA) at the proposed batch plant will operate throughout the night and lighting from the proposed batch plant will occur during all months of the year.

   Requested Action: The application should include all the parcels that the applicant has recently purchased near Laporte (the proposed site is less than half the total acreage that LRM has purchased), so that the proposed mining operations, batch plant activities, and reclamation can holistically evaluate the impacts to propose operations with the least amount of negative impact. If this requested action is not implemented, then recommend that DRMS add a condition that LRM cannot increase the acreage in the future with a Technical Revision that would impact the edge (limit) of the mining preventing LRM from adding additional parcels to this application.

7. Section 10.4, Effects on Existing Wildlife, states ""Potential impacts to wildlife from the proposed mine are expected to be minimal due to the preexisting disturbed nature of the project area". What preexisting nature of the project area – it is currently grazing for cattle and farm land both of which are attractive and readily support wildlife. What happens if mining occurs at Timberline Resources and Knox Pit occur at the same time? Where would wildlife go that is undisturbed? Might the wildlife attempt to cross 54G or the 287 bypass and endangering both the animals and automobiles? The application also states "Wildlife habitat should be improved by providing additional shelter". It seems unlikely that wildlife would be attracted to nest and or forage in the reclaimed pits. According to the EPA, effects of particulate matter deposition include increased acidity of lakes and streams, reduced levels of nutrients in soil, and reduced diversity in ecosystems, and therefore does not seem to improve wildlife habitat.

   Requested Action: The reclamation plan should contain the same as what the applicant originally proposed in their Sketch Plan "the landform will be reclaimed to natural agricultural conditions, with the former pit areas reclaimed for water storage, lakes or enhanced wetlands. The presence of these reclaimed features will create open space that will preserve a more rural character, helping to maintain a sense of separation between the LaPorte community and the urban density of Fort Collins."

8. In Section 18, Municipalities within Two Miles, the statement "the unincorporated community of LaPorte is within two miles of the site" is misleading. The site is located near the center of Laporte. The majority of LaPorte's residences exist within ½ mile of the site. No other LRM sites exists so close to so many residences. In Boulder and Johnstown, LRM sites exist in industrial zones and in Loveland, the newer houses were built after LRM's site was in operation. The majority of the

Laporte residents do not want this mining operation (refer to my September 29, 2017 letter for specific citizen concerns). To date, we have collected 2,641 signatures from people who want the Larimer County Planning Commission and County Commissioners to deny Loveland Ready Mix's proposal for a LaPorte Pit, Concrete Batch Plant, and Concrete Crushing facility.

Requested Action: The application should accurately describe how close the proposed site is to residential neighborhoods and the center of Laporte.

9. Exhibit K – Climate contains information about climate in Fort Collins. The proposed site is not in Fort Collins and the weather is different in Laporte since Laporte is closer to the foothills. Climate information exists for Laporte.

   Requested Action: Application should be resubmitted to replace Exhibit K information with climate information for the site's location (i.e., Laporte)

10. Section 7.3.2. Groundwater, references an Exhibit G that could not be found in the document or the material posted to Laserfiche imaged document system making it difficult to comment on its contents (since I was unable to access this information, I have included the 9/22/17 letter that I sent to the Larimer County Planning office regarding LRM's Groundwater Knox Pit Study for 17-ZONE-2113). Groundwater is an important issue for Laporte since the ground water is very high and there are many shallow wells. The groundwater study submitted to the Larimer County did not account for the different phases, seasonal changes and or impacts from other adjacent mining sites (Al's Stegner Farms (Permit Number M1999-021) and Timberline Resources (M2003-069)). Laporte residents have been negatively impacted by two mining operations (Aggregate Industries –Stegner Farms and Overland Ponds). The applicant states that they will "work to mitigate unacceptable changes caused by dewatering or reclamation". What is the definition of "unacceptable"? What happens if crawl spaces or trees die beyond the 200 feet perimeter?

    Requested Action: Ensure that all exhibits are clearly labeled and able to be located based upon the Application's Table of contents so that compliance to the DMRS requirements can be verified. Provide further clarification regarding what "unacceptable changes" means, whether it pertains to properties beyond 200 ft from the property, and what potential mitigation measures would be taken.

NOTE: Please add this email to the 17-ZONE2113 Project File

All,

Thank you in advance for reading this email regarding Loveland Ready Mix's Proposed LaPorte Operations, Knox Pit Groundwater Study (File Name: Additional_20170814_GroundWater Study). This email contains three sections providing:

- Review comments of the Groundwater Study
- My personal perspective
- Summary of initial citizens' comments that pertain to Groundwater

I. Groundwater Study Review Comments

1. Page 1, Section 1.1 Project Description: The applicant, as in other documents, describes the operations in context to Taft Hill Road (i.e., "approximately one-half mile west of Taft Hill Road") instead of in context to Laporte.
    a. Recommend that the applicant provide additional description of the project location (e.g., "less than one-quarter mile east of Overland Trail/the center of Laporte).
2. Page 1, Section 1.1 Project Description states "The Project lies approximately 4,000 feet north of the Cache la Poudre River"
    a. The southern border of project is approximately 2,200 feet north of the river and the northern border of the project is approximately 4,200 feet north of the river. If 4,000 feet was used in any of the groundwater modeling simulations, the simulations should be rerun with an accurate number.
3. The Groundwater Study incorrectly refers to "Figure 1" in multiple places(should be Figure 2)
    a. See Page 1, Section 1.1 Project Description
    b. See Page 4, Section 2.0 Background
4. Page 3, Section 1.2 Objectives states: "predict impacts to groundwater and its users"
    a. Statement needs clarification regarding impacts of what:
        i. Impacts of proposed mining and different phases?
        ii. Impacts of dewatering?
        iii. Impacts of reclamation?
5. Some descriptions in the document appear unnecessary to the study since they provide information that is not relevant to the proposed site:
    a. Page 5: Section 2.2.2: How does the "municipal wastewater plant charges" (I assume that the study is referring to Fort Collins) impact this study?
6. Page 7 Laporte Area Wells section:
    a. Incorrectly states that Telesto sent questionnaires in the early summer. Page 49 of the Groundwater study shows that the questionnaires were sent "April 14, 2017"
    b. Page 49: Shows the letter the Telesto mailed on April 14, 2017 that contained the following statement "The measurement results will be provided to you and used in the groundwater analysis."
        i. Telesto measured my well, but did not provide me the measurement results.
    c. The statement "Copies of the questionnaires and field notes are included in Appendix A" is incorrect. Appendix A is named "Neighborhood Well Questionnaire and Notes". However,

Appendix A only contains the questionnaires completed by the well owners. The applicant should:

- Include the field notes in Appendix A
- Provide the actual measurements to the well owners as promised in the letter
- Include the measurements (total depth, the water level and the pumping rate) in the study.

7. Page 8, Section 2.2.5 Groundwater Flow Patterns
    a. States that the neighborhood water level measurement campaign started during the early summer is not accurate. My well was measured in May.
    b. States "LRM will measure depth to groundwater in the same wells (with owner's permission) during the winter (i.e., non-irrigation season) when irrigation infiltration, rainfall, and irrigation ditch flows have ceased allowing the water table to drop."
        i. Why should the well owners let LRM measure our wells again, when they did not provide us the results from the original measurement as originally promised and then their Groundwater Study states in Section 4.1 that the original measurements that they conducted "were not professionally surveyed"?
8. Page 9. Section 2.3.1 Boundary Conditions, the groundwater flow model used the "staff gauge height/flow measurements taken at USGS gauging station 06752260".
    a. The reader is unclear why the model would use the Fort Collins gauge that is farther away from the site and is down river from the site. Wouldn't USGS Gauging Station 06752000, Cache La Poudre River at Mouth, provide more meaningful parameters to the model? If so, the groundwater flow model should be rerun using Gauging Station 06752000 height/flow measurements.
9. Page 14, Section 4.1 Calibration Targets states "Because the neighbor's wells were not professionally surveyed, more weight is given to the Site monitoring wells as measurements from the monitoring wells are of higher accuracy."
    a. Why did the applicant not professionally survey the 18 neighborhood wells?
10. Page 14, Section 4. Calibration Results states "Once the model was running, adjustments were made to boundary conditions and model parameters within ranges as defined previously that represented the early irrigation season (May-July)."
    a. The reader assumes that the early irrigation season would be when the irrigation ditches are first turned on raising the groundwater levels. Our personal logs show the Taylor and Gill Ditch is turned on in April.
11. Page 16, Section 5.0 Model Predictions states "The first model prediction was to estimate the late off-irrigation season timeframe. This was accomplished by setting the water elevations in the ditches equal to the ditch bottoms (representing a dry-ditch), and **lowering the River stage by approximately 6 fee**t"
    a. The phrase "lowering the River stage by approximately 6 feet" does not make sense. It is unclear what is being lowered by 6 feet. Shouldn't the model have used average recorded heights of the USGS Gauging Station 06752000 (Poudre River at Canyon mouth, not Fort Collins) during winter months?
12. Page 16, Section 5.0 Model Predictions states "The overall mine plan related to groundwater is to excavate a dewatering sump and remove groundwater to the water management pond."
    a. The applicant did not include the dewatering sump as a source of noise in their Noise Study. The Groundwater Study mentions "a dewatering sump" and then in the conclusion states that there will be multiple dewatering sumps "Groundwater flow paths were shown to be towards the dewatering sumps". Based on Figures 14 -16, there appear to be six dewatering sumps.

b. Applicant should evaluate the impacts to Noise in the Noise Study. Are the dewatering sumps running 24 hours a day? Do they use generators? How loud are the sumps and generators?
c. Based on Section 5.3, it appears that dewatering will continue until the Reclamation Phase.
d. Recommend that the applicant label the Water Management Pond in Figures 14 -16 of the Groundwater Study.
e. It is unclear to the reader how the Water Management Pond can hold all the dewatering ground water year round. Where would the excess water go?
f. The Groundwater Study does not show a Storm Water Management Pond that other studies (e.g., Noise Study) show on the southwest corner of proposed site.

13. The Groundwater Study is based on four phases and a reclamation phase whereas other portions of the application describe more than 4 phases of mining. Does the Groundwater Study need to account for these additional phases of mining? How long are the different phases expected to take?
14. Page 17, Section 5.1 Mining Plan – Phases 1 -3 - Why does the Groundwater Study only simulate conditions associated with the end of Phase 3 mining (e.g., maybe 6 years after the proposed mine is in operation)? The reader would like to see the results during all phases.
15. Page 17, Section 5.1 Mining Plan – Phases 1 -3 states "Although the Plantorium Greenhouse and Nursery did not respond to Telesto's questionnaire, we know that they have an irrigation well used to water their greenhouse plants. The Plantorium is inside the five-foot impact zone. These three wells may require mitigation."
    a. Only the Plantorium's three wells were mentioned as requiring mitigation in this section. Scanning through Appendix A, it appears that there are approximately 29 other owners at residences within the five-foot drawdown impact zone (most have active wells). The applicant should describe in detail how they will mitigate the negative impacts of their proposed operations to wells.
    b. Neighbor's trees have been impacted by other mining operations. The Groundwater Study should evaluate the impact to trees of reducing the groundwater by five feet or more. Negatively impacting the health of the trees in Laporte is one of the neighbors' top concerns.
16. Page 17, Section 5.2 Mining Plan – Phases 4 -5 states" The same wells are predicted to be impacted during the Phase 4 mining period as during the Phase 3 mining period"
    a. Report needs to describe all the impacted wells, not just a few impacted wells.
    b. Laporte has many shallow wells (some of which are within 600 feet of the site) that could be adversely impacted by the dewatering. Will the applicant monitor these wells before the mining and at least quarterly throughout the proposed mining operation?
    c. Will the applicant share with the county and the neighbors all monitoring results?
17. Page 17, Section 5.3 Mine Plan – Reclamation states that "the perturbation in the groundwater is essentially zero. This is because the drains supply adequate hydraulic capacity to mimic pre-mining aquifer conditions"
    a. More description is needed regarding the reclamation phase. Other documents state that the pits will be lined after mining is completed. What happens if the perimeter drain becomes clogged? Who is responsible for maintaining the perimeter drain? Houses in Laporte that are near reclaimed mine sites with lined pits have been negatively impacted by the water table rising.
    b. The applicant should have included in the report the impacts to the groundwater output from the model.

18. Page 18 states “Due to the perimeter drain’s ability to mimic the pre-mining groundwater hydraulics, no increased water levels are predicted up-gradient of the mining area. Thus, there are no concerns for flooded basements in neighboring structures.”
    a. What happens if the applicant’s prediction is wrong and mounding of groundwater does occur? The applicant should include the mitigation that they would take.
    b. The applicant has been told multiple times, that the neighbors do not have basements that could flood. Instead the neighbors have crawl spaces with furnaces. There is no room for predictions to be wrong since the water table is so high.
19. Page 21, Section 7.1.4 Data Collection states “LRM proposes, with neighbors permission, to monitor elevations in these neighboring wells semi-annually prior to and throughout mine dewatering.”
    a. Will these elevations be determined by a professional?
    b. Will these measured elevations hold the same weight in modeling as the monitoring well data?
20. Page 22, Section 8.0 Conclusions states “LRM is committed to maintaining communication with neighbors, and has taken steps to share the results of this study with adjacent well owners as practical.”
    a. LRM did not maintain communication and provide well owners the results of their well measurements as promised in the questionnaire letter.
    b. LRM has not agreed to provide the Laporte community with extra copies of the printed application (the Timberline Application provided two printed copies to post in Laporte businesses).
21. Page 21. Section 7.1.5 Water Quality section states “Groundwater quality is not expected to be impacted by mining at the Site. Thus no formal groundwater quality monitoring is recommended”.
    a. Even though the applicant does not expect to impact the quality of groundwater, the Department of Health and Environment’s review of the sketch plan in January 2017 stated: “This poses a public health concern given the removal of the natural buffer/filtration substances above the groundwater table, and the potential exposure of groundwater to contaminants including those associated with sand/gravel mining and batch plant operations.” The applicant should include additional analysis of the impacts to groundwater quality.
22. The Groundwater Study does not include
    a. Contain how high the groundwater is in relation to the elevation of the land.
    b. Monitoring measures that will be taken to verify the accuracy of estimated draw downs
    c. A description of the actions that will be taken if groundwater flooding occurs (which properties will be addressed and which will be ignored); some statements from LRM have indicated that LRM will only address those impacted structures within 200 feet)
    d. A description of mitigation procedures that may be taken if a neighbor (without a well) complains (e.g., vegetation/tree(s) dying, ponds drying up)
    e. Procedures to follow for processing citizen’s complaints regarding groundwater
    f. A simulation of the scenario of a concurrent operation (i.e., Timberline/Hawkeye)
    g. Figure 19 that is referenced in the study
    h. Appendix F, Miscellaneous Calculations and Model Documentation, contains twelve occurrences of “See next page”. However, the appendix is missing the next page.
23. Timberline’s Groundwater Study had the following information that was not present in the applicant’s Groundwater Study or any other parts of the applicant’s application that would be useful for the community to know:
    a. Estimated amount of sand and gravel resources on proposed site
    b. Quality of resources on proposed site

c. The estimated rate of mining (e.g., between 500,000-750,000 tons per year depending on market conditions) – this will help the community to understand how many years they may be impacted by.

24. Recommend defining all acronyms used in report (e.g., SEO) so that reviewers can understand/verify information in report and figures.

II. My Personal Perspective

Having formal documentation to show the water level in my well was promised by Telesto and never provided. When Telesto measured my well, I mentioned that our crawl space was approximately 4.5 feet deep and any rise in the ground water would cause my crawl space to flood and destroy my furnace. I am very sensitive to noise, and therefore do not want to be forced to use a pump to mitigate rising groundwater. However, the Groundwater Study stated that there will be no mounding of water to the west of the site, and instead the water table will be decreased by over five feet. This information, causes me to worry about my trees and also many other trees in Laporte. I find it very difficult to write about the impacts of my trees and other Laporte trees dying, because there are too many negative impacts to even begin describing. I have not had time to perform research regarding whether studies exist to evaluate the impacts of sand/gravel mining to trees – what happens to trees if the groundwater is reduced by five feet or when the natural top soil filtration is removed.

III. Summary of Groundwater Concerns Mentioned in Citizen Letters

The below table shows the number of citizen letters that were written from January 2017 to April 2017 that included groundwater concerns. The last three columns show how three of the six review criteria used to approve a special review application have not been met.

Citizen Comments Regarding Negative Groundwater Impacts	Number of Comments	A. Compatible with existing uses and in Harmony with Neighborhood	B. Consistent with the LaPorte Area Plan	D. Will Not Result in Substantial Adverse Impact on Vicinity Property
Negative water impacts (water pollution)	64		No	No
Water table lowers to east (impacts wells, trees)	43	No	No	
Polluted water runoff from cement crushing	36		No	
Water intensive operation	34		No	
Negatively impacts trees (water table changes/crusher vibration)	33	No	No	No
Water table raises to west of site (impacts crawl spaces, furnaces)	13	No	No	No
Impacts Irrigation (water quality)	11		No	
Causes unreasonable offsite impacts	10	No	No	No

STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Objection to Application M-2017-036, Knox Pit

Terry Waters <terrywaters125@msn.com> Sun, Nov 5, 2017 at 12:57 PM
To: "jared.ebert@state.co.us" <jared.ebert@state.co.us>
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Jared,

Below (and attached) is my letter of objection to Application M-2017-036, Knox Pit.

November 5, 2017

From: Terry Waters <terrywaters125@msn>

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970-482-4462

To: Jared Ebert jared.ebert@state.co.us - CO Division of Reclamation, Mining and Safety

Re: Objection to Application M-2017-036, Knox Pit

Loveland Ready-Mix Concrete, Inc. Laporte Operations, Knox Pit Construction Material Application 112

This letter is to register my objection to Application M-2017-036, Knox Pit. I respectively request that the Colorado Mined Land Reclamation Board consider the following issues regarding Loveland Ready-Mix Concrete, Inc. Laporte Operations,

Knox Pit Construction Material Application 112:

1. Exhibit B, Index Map shows residences by dots. The map used appears to be a map that was last photo-revised in 1978 by the US Geologic Survey and is misleading since it is approximately 40 years old and does not accurately reflect new residences and businesses adjacent to the site and in the vicinity.

Requested Action: Applicant should resubmit the application with a current map.

2. The application repeatedly references exhibits (e.g., Exhibit C and Exhibit G) that could not be found in the document or the material posted to Laserfiche imaged document system making it difficult to review and verify that the statements relating to these exhibits were correct. Page 88 was the cover page for Exhibits B, C, and F and was followed by three pages showing Figures 1, 2, and 3. Pages 90 and 91 contained some Exhibit C information, however were missing the following Exhibit C information required by Section 6.4.3 subsections (b) names of roads, buildings, power and communication lines, (c) topography of area with contour lines, (d) areas to be mined and affected lands, (e) type of present vegetation covering affected lands, and (g) show where owners, type of significant structures within 200 feet are located.

Requested Action: Ensure that all exhibits are clearly labeled and able to be located based upon the Application's Table of contents so that compliance to the DMRS requirements can be verified.

3. Section 7.4.2, Table 1 shows the four different wheat grasses and one wild rye seed mixture, which is proposing a low diversity of types of ground cover. Since the plan does not include watering of the planted seed, the species may not germinate if there is a dry growing season. This low diversity, simple grass/forb species does not create an "enhanced wildlife habitat". Additionally, the applicant at the neighborhood meeting stated that the post-mining pits would be lined and precipitation inputs would fill them with water (with no other outside inputs). Pan-evaporation (output) in this region is approximately three times precipitation (input). However, a wet spring or a well above average precipitation year would leave standing water, which would be a breeding ground for mosquitoes that could harbor West Nile Virus and would eventually kill any existing terrestrial vegetation, leaving bare soil to be blown to surrounding properties and a period of weed seed sources.

Requested Action: Improve the reclamation plan to ensure that it provides an attractive entryway to Laporte with a wide variety of healthy plants and no obnoxious weeds. The plan should ensure that the seeds are properly watered and reseed areas where plants are not reestablished. An irregular natural meandering border around reclaimed pit may improve the reclaimed pit's appearance. Additionally, the pits could include a friendly wildlife entry/exit 50-foot wide 10:1 ramp.

4. Table 3, Sensitive Plants and Animals, is missing birds that were identified in the City of Fort Collins Checklist of Local Birds. I have seen from my yard (within 500 feet from proposed site) Ferruginous hawks, Peregrine Falcons, and Bald Eagles (juvenile and adult). I have seen these birds on the ditch willows that are within 200 feet of the site, and photographed a falcon eating a pigeon in our front yard.

a. Brown Pelican (Federal Endangered) – migrates through area

b. Bald Eagle (State Threatened) – migrates through and winters in area

c. Ferruginous hawk (State Species of Concern)- migrates through and winters in area

d. Peregrine Falcon (State Species of Concern) - migrates through area

e. Snowy Plover (State Species of Concern) - migrates through area

f. Long-billed Curlew (State Species of Concern) - migrates through area

Requested Action: Modify Table 3 to include additional endangered species from the federal and state lists and add state species of concern.

5. Section 10.2.3, Raptor Nest sites, states ”No raptor nests exists within the project area due to close proximity of suitable trees to the adjacent road activity and existing industrial activity in the surrounding areas.” Please note that the proposed site is not in an industrial area. It is beside quiet residential areas that have a large quantity of wildlife (e.g., deer) and birds. Bird watching and identifying birds is one of the top recreational activities in Laporte due to the large variety of birds that can be seen and heard singing in Laporte’s rural environment. There are numerous suitable trees for raptor nests (e.g., over 80 feet tall) to the west of the site and to the south of site (especially along the Cache La Poudre river). I know of at least one raptor nest that exists within a ½ mile radius of the project area (note: I am not a trained ornithologist).

Requested Action: The applicant should hire a trained ornithologist to identify raptor nests within a ½ mile radius of project.

6. Section 10.2.4, Winter Night Roost, states “Due to the absence of raptors nests in the project area, it is unlikely this project would be impacted by adjacent wintertime night roosts” implies that the writer is more concerned about the raptor nests impacting the project, rather than the project impacting the nests. Please note that the wintertime night roosts will be impacted by the project’s noise and light. Laporte is very quiet at night and has very few light sources. The applicant then states that “This facility is unlikely to be in operation during night time hours, during the winter months” which is also incorrect. The noise from the Natural Gas Compressors (76.2 dBA) at the proposed batch plant will operate throughout the night and lighting from the proposed batch plant will occur during all months of the year.

Requested Action: The application should include all the parcels that the applicant has recently purchased near Laporte (the proposed site is less than half the total acreage that LRM has purchased), so that the proposed mining operations, batch plant activities, and reclamation can holistically evaluate the impacts to propose operations with the least amount of negative impact. If this requested action is not implemented, then recommend that DRMS add a condition that LRM cannot increase the acreage in the future with a Technical Revision that would impact the edge (limit) of the mining preventing LRM from adding additional parcels to this application.

7. Section 10.4, Effects on Existing Wildlife, states ““Potential impacts to wildlife from the proposed mine are expected to be minimal due to the preexisting disturbed nature of the project area”. What preexisting nature of the project area – it is currently grazing for cattle and farm land both of which are attractive and readily support wildlife. What happens if mining occurs at Timberline Resources and Knox Pit occur at the same time? Where would wildlife go that is undisturbed? Might the wildlife attempt to cross 54G or the 287 bypass and endangering both the animals and automobiles? The application also states “Wildlife habitat should be improved by providing additional shelter”. It seems unlikely that wildlife would be attracted to nest and or forage in the reclaimed pits. According to the EPA, effects of particulate matter deposition include increased acidity of lakes and streams, reduced levels of nutrients in soil, and reduced diversity in ecosystems, and therefore does not seem to improve wildlife habitat.

Requested Action: The reclamation plan should contain the same as what the applicant originally proposed in their Sketch Plan “the landform will be reclaimed to natural agricultural conditions, with the former pit areas reclaimed for water storage, lakes or enhanced wetlands. The presence of these reclaimed features will create open space that will preserve a more rural character, helping to maintain a sense of separation between the LaPorte community and the urban density of Fort Collins.”

8. In Section 18, Municipalities within Two Miles, the statement “the unincorporated community of LaPorte is within two miles of the site” is misleading. The site is located near the center of Laporte. The majority of LaPorte’s residences exist within ½ mile of the site. No other LRM sites exists so close to so many residences. In Boulder and Johnstown, LRM sites exist in industrial zones and in Loveland, the newer houses were built after LRM’s site was in operation. The majority of the Laporte residents do not want this mining operation (refer to my September 29, 2017 letter for specific citizen concerns). To date, we have collected 2,641 signatures from people who want the Larimer County Planning Commission and County Commissioners to deny Loveland Ready Mix’s proposal for a LaPorte Pit, Concrete Batch Plant, and Concrete Crushing facility.

Requested Action: The application should accurately describe how close the proposed site is to residential neighborhoods and the center of Laporte.

9. Exhibit K – Climate contains information about climate in Fort Collins. The proposed site is not in Fort Collins and the weather is different in Laporte since Laporte is closer to the foothills. Climate information exists for Laporte.

Requested Action: Application should be resubmitted to replace Exhibit K information with climate information for the site's location (i.e., Laporte)

10. Section 7.3.2. Groundwater, references an Exhibit G that could not be found in the document or the material posted to Laserfiche imaged document system making it difficult to comment on its contents (since I was unable to access this information, I have included the 9/22/17 letter that I sent to the Larimer County Planning office regarding LRM's Groundwater Knox Pit Study for 17-ZONE-2113). Groundwater is an important issue for Laporte since the ground water is very high and there are many shallow wells. The groundwater study submitted to the Larimer County did not account for the different phases, seasonal changes and or impacts from other adjacent mining sites (Al's Stegner Farms (Permit Number M1999-021) and Timberline Resources (M2003-069)). Laporte residents have been negatively impacted by two mining operations (Aggregate Industries –Stegner Farms and Overland Ponds). The applicant states that they will "work to mitigate unacceptable changes caused by dewatering or reclamation". What is the definition of "unacceptable"? What happens if crawl spaces or trees die beyond the 200 feet perimeter?

Requested Action: Ensure that all exhibits are clearly labeled and able to be located based upon the Application's Table of contents so that compliance to the DMRS requirements can be verified. Provide further clarification regarding what "unacceptable changes" means, whether it pertains to properties beyond 200 ft from the property, and what potential mitigation measures would be taken.

September 22, 2017

NOTE: Please add this email to the 17-ZONE2113 Project File

All,

Thank you in advance for reading this email regarding Loveland Ready Mix's Proposed LaPorte Operations, Knox Pit Groundwater Study (File Name: Additional_20170814_GroundWater Study). This email contains three sections providing:

- Review comments of the Groundwater Study
- My personal perspective
- Summary of initial citizens' comments that pertain to Groundwater

I. Groundwater Study Review Comments

1. Page 1, Section 1.1 Project Description: The applicant, as in other documents, describes the operations in context to Taft Hill Road (i.e., "approximately one-half mile west of Taft Hill Road") instead of in context to Laporte.

   a. Recommend that the applicant provide additional description of the project location (e.g., "less than one-quarter mile east of Overland Trail/the center of Laporte).

2. Page 1, Section 1.1 Project Description states "The Project lies approximately 4,000 feet north of the Cache la Poudre River"

   a. The southern border of project is approximately 2,200 feet north of the river and the northern border of the project is approximately 4,200 feet north of the river. If 4,000 feet was used in any of the groundwater modeling simulations, the simulations should be rerun with an accurate number.

3. The Groundwater Study incorrectly refers to "Figure 1" in multiple places(should be Figure 2)

   a. See Page 1, Section 1.1 Project Description

   b. See Page 4, Section 2.0 Background

4. Page 3, Section 1.2 Objectives states: "predict impacts to groundwater and its users"

   a. Statement needs clarification regarding impacts of what:

i. Impacts of proposed mining and different phases?

ii. Impacts of dewatering?

iii. Impacts of reclamation?

5. Some descriptions in the document appear unnecessary to the study since they provide information that is not relevant to the proposed site:

a. Page 5: Section 2.2.2: How does the "municipal wastewater plant charges" (I assume that the study is referring to Fort Collins) impact this study?

6. Page 7 Laporte Area Wells section:

a. Incorrectly states that Telesto sent questionnaires in the early summer. Page 49 of the Groundwater study shows that the questionnaires were sent "April 14, 2017"

b. Page 49: Shows the letter the Telesto mailed on April 14, 2017 that contained the following statement "The measurement results will be provided to you and used in the groundwater analysis."

i. Telesto measured my well, but did not provide me the measurement results.

c. The statement "Copies of the questionnaires and field notes are included in Appendix A" is incorrect. Appendix A is named "Neighborhood Well Questionnaire and Notes". However, Appendix A only contains the questionnaires completed by the well owners. The applicant should:

- Include the field notes in Appendix A
- Provide the actual measurements to the well owners as promised in the letter
- Include the measurements (total depth, the water level and the pumping rate) in the study.

7. Page 8, Section 2.2.5 Groundwater Flow Patterns

a. States that the neighborhood water level measurement campaign started during the early summer is not accurate. My well was measured in May.

b. States "LRM will measure depth to groundwater in the same wells (with owner's permission) during the winter (i.e., non-irrigation season) when irrigation infiltration, rainfall, and irrigation ditch flows have ceased allowing the water table to drop."

i. Why should the well owners let LRM measure our wells again, when they did not provide us the results from the original measurement as originally promised and then their Groundwater Study states in Section 4.1 that the original measurements that they conducted "were not professionally surveyed"?

8. Page 9. Section 2.3.1 Boundary Conditions, the groundwater flow model used the "staff gauge height/flow measurements taken at USGS gauging station 06752260".

a. The reader is unclear why the model would use the Fort Collins gauge that is farther away from the site and is down river from the site. Wouldn't USGS Gauging Station 06752000, Cache La Poudre River at Mouth, provide more meaningful parameters to the model? If so, the groundwater flow model should be rerun using Gauging Station 06752000 height/flow measurements.

9. Page 14, Section 4.1 Calibration Targets states "Because the neighbor's wells were not professionally surveyed, more weight is given to the Site monitoring wells as measurements from the monitoring wells are of higher accuracy."

a. Why did the applicant not professionally survey the 18 neighborhood wells?

10. Page 14, Section 4. Calibration Results states "Once the model was running, adjustments were made to boundary conditions and model parameters within ranges as defined previously that represented the early irrigation season (May-July)."

a. The reader assumes that the early irrigation season would be when the irrigation ditches are first turned on raising the groundwater levels. Our personal logs show the Taylor and Gill Ditch is turned on in April.

11. Page 16, Section 5.0 Model Predictions states "The first model prediction was to estimate the late off-irrigation season timeframe. This was accomplished by setting the water elevations in the ditches equal to the ditch bottoms

(representing a dry-ditch), and **lowering the River stage by approximately 6 fee**t"

a. The phrase "lowering the River stage by approximately 6 feet" does not make sense. It is unclear what is being lowered by 6 feet. Shouldn't the model have used average recorded heights of the USGS Gauging Station 06752000 (Poudre River at Canyon mouth, not Fort Collins) during winter months?

12. Page 16, Section 5.0 Model Predictions states "The overall mine plan related to groundwater is to excavate a dewatering sump and remove groundwater to the water management pond."

a. The applicant did not include the dewatering sump as a source of noise in their Noise Study. The Groundwater Study mentions "a dewatering sump" and then in the conclusion states that there will be multiple dewatering sumps "Groundwater flow paths were shown to be towards the dewatering sumps". Based on Figures 14 -16, there appear to be six dewatering sumps.

b. Applicant should evaluate the impacts to Noise in the Noise Study. Are the dewatering sumps running 24 hours a day? Do they use generators? How loud are the sumps and generators?

c. Based on Section 5.3, it appears that dewatering will continue until the Reclamation Phase.

d. Recommend that the applicant label the Water Management Pond in Figures 14 -16 of the Groundwater Study.

e. It is unclear to the reader how the Water Management Pond can hold all the dewatering ground water year round. Where would the excess water go?

f. The Groundwater Study does not show a Storm Water Management Pond that other studies (e.g., Noise Study) show on the southwest corner of proposed site.

13. The Groundwater Study is based on four phases and a reclamation phase whereas other portions of the application describe more than 4 phases of mining. Does the Groundwater Study need to account for these additional phases of mining? How long are the different phases expected to take?

14. Page 17, Section 5.1 Mining Plan – Phases 1 -3 - Why does the Groundwater Study only simulate conditions associated with the end of Phase 3 mining (e.g., maybe 6 years after the proposed mine is in operation)? The reader would like to see the results during all phases.

15. Page 17, Section 5.1 Mining Plan – Phases 1 -3 states "Although the Plantorium Greenhouse and Nursery did not respond to Telesto's questionnaire, we know that they have an irrigation well used to water their greenhouse plants. The Plantorium is inside the five-foot impact zone. These three wells may require mitigation."

a. Only the Plantorium's three wells were mentioned as requiring mitigation in this section. Scanning through Appendix A, it appears that there are approximately 29 other owners at residences within the five-foot drawdown impact zone (most have active wells). The applicant should describe in detail how they will mitigate the negative impacts of their proposed operations to wells.

b. Neighbor's trees have been impacted by other mining operations. The Groundwater Study should evaluate the impact to trees of reducing the groundwater by five feet or more. Negatively impacting the health of the trees in Laporte is one of the neighbors' top concerns.

16. Page 17, Section 5.2 Mining Plan – Phases 4 -5 states" The same wells are predicted to be impacted during the Phase 4 mining period as during the Phase 3 mining period"

a. Report needs to describe all the impacted wells, not just a few impacted wells.

b. Laporte has many shallow wells (some of which are within 600 feet of the site) that could be adversely impacted by the dewatering. Will the applicant monitor these wells before the mining and at least quarterly throughout the proposed mining operation?

c. Will the applicant share with the county and the neighbors all monitoring results?

17. Page 17, Section 5.3 Mine Plan – Reclamation states that "the perturbation in the groundwater is essentially zero. This is because the drains supply adequate hydraulic capacity to mimic pre-mining aquifer conditions"

a. More description is needed regarding the reclamation phase. Other documents state that the pits will be lined after mining is completed. What happens if the perimeter drain becomes clogged? Who is responsible for maintaining the perimeter drain? Houses in Laporte that are near reclaimed mine sites with lined pits have been negatively impacted by the water table rising.

b. The applicant should have included in the report the impacts to the groundwater output from the model.

18. Page 18 states “Due to the perimeter drain’s ability to mimic the pre-mining groundwater hydraulics, no increased water levels are predicted up-gradient of the mining area. Thus, there are no concerns for flooded basements in neighboring structures.”

a. What happens if the applicant’s prediction is wrong and mounding of groundwater does occur? The applicant should include the mitigation that they would take.

b. The applicant has been told multiple times, that the neighbors do not have basements that could flood. Instead the neighbors have crawl spaces with furnaces. There is no room for predictions to be wrong since the water table is so high.

19. Page 21, Section 7.1.4 Data Collection states “LRM proposes, with neighbors permission, to monitor elevations in these neighboring wells semi-annually prior to and throughout mine dewatering.”

a. Will these elevations be determined by a professional?

b. Will these measured elevations hold the same weight in modeling as the monitoring well data?

20. Page 22, Section 8.0 Conclusions states “LRM is committed to maintaining communication with neighbors, and has taken steps to share the results of this study with adjacent well owners as practical.”

a. LRM did not maintain communication and provide well owners the results of their well measurements as promised in the questionnaire letter.

b. LRM has not agreed to provide the Laporte community with extra copies of the printed application (the Timberline Application provided two printed copies to post in Laporte businesses).

21. Page 21. Section 7.1.5 Water Quality section states “Groundwater quality is not expected to be impacted by mining at the Site. Thus no formal groundwater quality monitoring is recommended”.

a. Even though the applicant does not expect to impact the quality of groundwater, the Department of Health and Environment’s review of the sketch plan in January 2017 stated: “This poses a public health concern given the removal of the natural buffer/filtration substances above the groundwater table, and the potential exposure of groundwater to contaminants including those associated with sand/gravel mining and batch plant operations.” The applicant should include additional analysis of the impacts to groundwater quality.

22. The Groundwater Study does not include

a. Contain how high the groundwater is in relation to the elevation of the land.

b. Monitoring measures that will be taken to verify the accuracy of estimated draw downs

c. A description of the actions that will be taken if groundwater flooding occurs (which properties will be addressed and which will be ignored); some statements from LRM have indicated that LRM will only address those impacted structures within 200 feet)

d. A description of mitigation procedures that may be taken if a neighbor (without a well) complains (e.g., vegetation/tree(s) dying, ponds drying up)

e. Procedures to follow for processing citizen’s complaints regarding groundwater

f. A simulation of the scenario of a concurrent operation (i.e., Timberline/Hawkeye)

g. Figure 19 that is referenced in the study

h. Appendix F, Miscellaneous Calculations and Model Documentation, contains twelve occurrences of “See next page”. However, the appendix is missing the next page.

23. Timberline’s Groundwater Study had the following information that was not present in the applicant’s Groundwater Study or any other parts of the applicant’s application that would be useful for the community to know:

a. Estimated amount of sand and gravel resources on proposed site

b. Quality of resources on proposed site

c. The estimated rate of mining (e.g., between 500,000-750,000 tons per year depending on market conditions) – this will help the community to understand how many years they may be impacted by.

24. Recommend defining all acronyms used in report (e.g., SEO) so that reviewers can understand/verify information in report and figures.

II. My Personal Perspective

Having formal documentation to show the water level in my well was promised by Telesto and never provided. When Telesto measured my well, I mentioned that our crawl space was approximately 4.5 feet deep and any rise in the ground water would cause my crawl space to flood and destroy my furnace. I am very sensitive to noise, and therefore do not want to be forced to use a pump to mitigate rising groundwater. However, the Groundwater Study stated that there will be no mounding of water to the west of the site, and instead the water table will be decreased by over five feet. This information, causes me to worry about my trees and also many other trees in Laporte. I find it very difficult to write about the impacts of my trees and other Laporte trees dying, because there are too many negative impacts to even begin describing. I have not had time to perform research regarding whether studies exist to evaluate the impacts of sand/gravel mining to trees – what happens to trees if the groundwater is reduced by five feet or when the natural top soil filtration is removed.

III. Summary of Groundwater Concerns Mentioned in Citizen Letters

The below table shows the number of citizen letters that were written from January 2017 to April 2017 that included groundwater concerns. The last three columns show how three of the six review criteria used to approve a special review application have not been met.

Citizen Comments Regarding Negative Groundwater Impacts	Number of Comments	A. Compatible with existing uses and in Harmony with Neighborhood	B. Consistent with the LaPorte Area Plan	D. Will Not Result in Substantial Adverse Impact on Vicinity Property
Negative water impacts (water pollution)	64		No	No
Water table lowers to east (impacts wells, trees)	43	No	No	
Polluted water runoff from cement crushing	36		No	
Water intensive operation	34		No	
Negatively impacts trees (water table changes/crusher vibration)	33	No	No	No
Water table raises to west of site (impacts crawl spaces, furnaces)	13	No	No	No
Impacts Irrigation (water quality)	11		No	
Causes unreasonable offsite impacts	10	No	No	No

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