

From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: Aquatic Center of Great Falls
Date: Monday, May 17, 2021 8:54:42 AM

From: Lita Sharone <lrsharone@gmail.com>
Sent: Sunday, May 16, 2021 10:52 PM
To: commission <commission@greatfallsmt.net>
Subject: Aquatic Center of Great Falls

Dear Commissioners,

When the Natatorium was built in the 70s my late mother was able to take swimming lessons for the first time in her life. It was a special opportunity she had never had. She and her friend were so pleased they were able to finally learn to swim. The Natatorium was also popular with so many families hosting birthday swim parties and for kids swimming lessons through the winter. The swimming facility was very important for Great Falls residents. Then suddenly, rumors that it was going to close, became a reality. It was a shock and very sad event, unbelievable that this could ever happen.

Soon it became known that the pool was damaged because of the type of soil it was built on and repairing it would not help. There was no way to make it safe. There was so much anger and disappointment from folks about the failure of the city to properly plan for the structure. People felt that choosing a suitable site after investigating and testing the soil thoroughly, was not done. As a result millions of dollars of their tax money was wasted. All this because of poor planning and short sightedness. I do not think it is fair to the community to make the same mistakes again with a new Aquatic Center.

Because of this, there must be foresight for this structure to be sound and economically operable for many, many years into the future. The plans need to incorporate alternative energy systems from the outset. It may cost extra to install solar, wind or geothermal systems, or all three, but in the long run the extra costs will be offset in about 5 years or so.

Solar, wind and geothermal energy systems are presently available and becoming cheaper. We cannot construct a building with energy options that will be obsolete or cost-prohibitive a few years from now. The energy required to heat such a large facility and that amount of water 24/7 all year, is huge. To Not use cheaper, cleaner energy would be a mistake. In addition, trust would be lost in the City Commissioners to make good decisions. Another event like the Natatorium is unacceptable.

Please choose what is best for the community. Thank you.

Sincerely,
Lita Sharone
Great Falls

From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: Aquatic center solar component
Date: Monday, May 17, 2021 8:54:50 AM
Attachments: [commision letter life cycle.docx](#)

From: KEN KAREN Thornton <kkmithornton@msn.com>
Sent: Sunday, May 16, 2021 11:33 PM
To: commission <commission@greatfallsmt.net>
Subject: Aquatic center solar component

Dear Commissioners,

I am concerned that a solar energy component is not being included in the HVAC life cycle analysis of the aquatic center design. Standard engineering practice would include a life cycle analysis of the Heating Ventilation Air Conditioning (HVAC) systems. This would include cost of the components, all material involved in the installation of these components, the operating expenses of the systems; including maintenance, replacement components and especially ENERGY COSTS. This type of analysis usually considers costs over a 15 to 25 year period.

Over a 25 year life cycle of the HVAC components, it is very likely your largest expense is going to be the energy cost. The simple fact is that including solar energy in the HVAC analysis brings the largest cost (energy) down substantially. This would likely make the system that includes solar the best choice economically speaking. Because solar energy is so cost effective now, it truly would not be good engineering or economic practice not to fully explore as many solar options as possible.

As a soon to be grandfather, I am incredibly fearful of leaving a dire climate crisis to my grandchildren. This future, the scientific community is promising us if we do not drastically switch to clean energy is reversible, if we make appropriate decisions now. Any solar or wind energy we add to this aquatic center will pay for itself, and it will help give our grandchildren some hope for a decent future.

Thank you for your consideration,
Ken Thornton
799-7873
kkmithornton@msn.com

From: [Lisa C. Kunz](#)
To: [Greg Doyon](#); [Charles Anderson](#); [Steve Herrig](#); [Krista Artis](#)
Subject: FW: Aquatics Center RE: Solar Planning and Design
Date: Monday, May 17, 2021 1:34:57 PM

FYI a similar email from Mr. Palisin that was previously provided.

Lisa
City Clerk/Records Manager
406.455.8451

-----Original Message-----

From: Ken Palisin <kenpalisin@gmail.com>
Sent: Monday, May 17, 2021 11:52 AM
To: City Commissioners <CityCommissioners@greatfallsmt.net>
Subject: Aquatics Center RE: Solar Planning and Design

Dear Commissioners:

Resources and comments related to aquatics center:

- 1.) See: Solar United Neighbors (google)
Then go to: Solar for Municipalities for a model.
- 2.) Use municipal bond market for solar.
Since DOD funds can't be used, why not use city bonds?
- 3.) Payback on solar upfront investments probably 10 yrs or less.!!!
* Plastic panels on roof to warm swimming pools.
- 4.) An ENERGY SAVINGS SLAM DUNK:
 - Do solar during initial construction.
 - Show public stewardship, all kind of savings can be realized as aquatics is energy intensive.
 - Consultant's conservative PRO FORMA CAN OUTLINE THE COST AND SAVINGS.
WHY NOT SAVE MONEY???
- 5.) Energy savings on the building envelope/HVAC helps.
But real savings in solar and other renewables. wind, geo.

* Conversation with LWP'S Tim And Tom with Ken Thornton (who as 30 plus years solar experience).

From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: May 18, 2021, Public Hearing Considerations for the Aquatics Recreational Center
Date: Monday, May 17, 2021 8:54:15 AM

From: cheryl reichert <montanapathdoc@gmail.com>
Sent: Friday, May 14, 2021 4:43 PM
To: commission <commission@greatfallsmt.net>
Cc: Susan Effertz / Charles Kuether <seffertz@holmanonline.com>
Subject: May 18, 2021, Public Hearing Considerations for the Aquatics Recreational Center

Dear Mayor Kelly and City Commissioners:

I enthusiastically support plans for the Aquatics Recreation Center at its newly proposed & more accessible location in Lions Park, and I urge the City Commission to proceed with the Special Use Permit.

I predict the facility is going to be very popular with the community and MAFB. To avoid traffic bottlenecks, I agree with those folks who have lobbied for direct access to and from Tenth Avenue South, in addition to the planned entrance and exit from 29th St. South. Although the current plans do not provide for direct Tenth Avenue access, it is my hope that the final plans for the facility will not permanently foreclose this vital option.

I would also like to urge the City Commission to incorporate as much solar and geothermal energy as possible into construction of this facility. We have been very pleased with the photovoltaic panels that were installed for our home in 2005. We have been doing net-metering ever since, and besides savings on our monthly power bill our battery backup has saved us from episodic power shortages. Such panels are much less expensive and more efficient today and could be installed on the roof of the facility and/or upon a parking shade canopy.

Dr. Susan Effertz and Charles Kuether have brought to our attention some excellent information on geothermal energy. Their information prompted me to contact Bob Quinn, who besides being Montana's best known organic farmer was also the inspiration behind Montana's first wind farm at Judith Gap. Several years ago Bob gave us a tour of a ranch home he was building for his parents. We remembered seeing the impressive geothermal heat and cooling system, so I recently wrote to him asking the following questions: Have you been pleased by this innovative technology? Have you saved money beyond the cost of this investment? Has it given you any maintenance issues? Do you have deep or relatively superficial wells?

I would like to share with you his response:

.... "I remember your visit and must say we are very happy with our ground source heat pump - I am not sure when the payoff comes but the monthly cost remains the same - about \$22 for electricity to run the pumps and condenser (compared to a couple thousand to heat with propane in the winter and of course extra \$\$ to run the AC in the summer - we have had no maintenance issues - 1 or 2 visits and routine issues over all the years we have had it - it is not

a deep well but a long run about 10 feet beneath the surface of the ground - I wish we had one for our house.

I have no expertise about using a ground source heat pump to heat a pool - but those that build them should be able to answer your questions about that - that might be a tall order for that technology to heat a large pool - so here are a couple other ideas -

*1. if you have 20 million, why not take 2-3% of it and drill a deep well looking for artesian hot water - contact Tyrel Hlavnicka, at Aquasource Drilling, the deep well drilling guy in Ulm for an estimate of your chance of success there in Great Falls. He can be reached at 406-466-2980 or email at aquasourcemt@gmail.com ****

2. Why not heat the pool using waste oil donated by all the fry houses and fast food places in Great Falls - would add a sense of community and a recycling of resources

3. you could put solar panels over the parking lot as shade for the cars and heat the water directly with solar - might be better than using solar energy to make electricity although if you did that, you might be able to sell the electricity all year to help pay for pool expenses"

****<https://www.aquasourcemt.com>*

North Central Montana Drilling Contractor specializing in:
Water Wells (Residential, Municipal, & Stock) including Geothermal & Test Holes and Complete Pump Systems. Examples of their geothermal work include Montana State Hospital Warm Springs, MT - 18 Geothermal Loop Wells - Set 18 geothermal loops through sand and gravel to a depth of 300' and Metlakatla School Metlakatla, Alaska - 44 Geothermal Loop Wells - Set 44 geothermal loops through hard rock to a depth of 350'.

In conclusion, I urge the City Commission to be forward thinking on providing "green" energy for this once-in-a-generation opportunity. The US is experiencing an era of energy uncertainty as we transition away from fossil fuels. Within the last year we have witnessed rolling energy blackouts in California and massive power outages during February's Snowmageddon in Texas. Let's make a longterm investment in the energy future and resiliency of our community by building an ultramodern facility that will make Great Falls even prouder and greater.

Sincerely,

Cheryl Reichert, MD, PhD
Founder and member, Citizens for Clean Energy Inc.

From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: Public Hearing re: Aquatic Recreation Center
Date: Monday, May 17, 2021 8:54:21 AM

From: Charles Bocock <fishdoc70@gmail.com>
Sent: Saturday, May 15, 2021 1:20 PM
To: commission <commission@greatfallsmt.net>
Subject: Public Hearing re: Aquatic Recreation Center

Dear Mayor & City Commissioners:

My name is Charles Bocock and I reside at #51 Prospect Drive, Great Falls, MT 59405. I hope that you will vote in favor of the conditional use permit to build the Aquatic Recreation Center at Lion's Park.

As a master gardener, I would like to add my voice to those who are advocating the use of geothermal energy to heat the facility. At a depth of ten feet the ground temperature in our area hovers around 55 degrees F. Homesteaders took advantage of this phenomenon to build root cellars. I hope that in modern times we will be able to take advantage of this energy source to install ground source heat pump for the Aquatic Recreation Center.

The proposed site has a large grassy field to the south off the current parking lot at Lion's Park (please see attached photo). This area is currently devoid of trees and structures and could therefore be an ideal place to install a series of shallow (8-10 feet deep) horizontal geothermal pipes beneath the ground surface before any additional parking is built.

I have also appended a link to background information on geothermal heating that you may find to be of interest:

<https://www.remodelingimage.com/geothermal-heating-and-cooling-cost/>

Respectfully yours,

Charles Bocock

Photo: View of Lion's Park immediately south of parking lot



From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: Aquatics Center RE: Solar Planning and Design
Date: Monday, May 17, 2021 1:27:24 PM

-----Original Message-----

From: Ken Palisin <kenpalisin@gmail.com>
Sent: Monday, May 17, 2021 11:43 AM
To: City Commissioners <CityCommissioners@greatfallsmt.net>
Subject: Aquatics Center RE: Solar Planning and Design

Commissioners:

Please note below resources and comments related to tomorrow's meeting:

- 1.) Please go to Solar United Neighbors:
Then go to: 'Solar for Municipalities' as a resource.
- 2.) Use municipal bond market for solar. Solar Bonds.
Since DOD funds can't be used why not use city bonds?
- 3.) Payback period on solar upfront investments can generally be 10 yrs or less. For example * impact of inexpensive plastic panels on roof to warm the swimming pools lower costs.
- 4.) Note this is an ENERGY SLAM DUNK project.
-Do solar installation during initial construction.
-Commissioners show the public "stewardship" of project funds. (You are using citizen's taxpayer funds). Especially for this project which is 'energy use intensive.'
- 5.) A simple conservative PRO FORMA OUTLINE can show:
COST AND SAVINGS.
WHY NOT SAVE BIG MONEY over the life of the building?
- 5.) Note that energy savings on the building envelope/HVAC helps.
BUT, real savings comes from solar and other renewables. wind, geo.

* Conversation between LWP'S Tim And Tom with Ken Thornton (who as 30 plus years solar experience).

From: [Lisa C. Kunz](#)
To: [Bob Kelly](#); [Mary Sheehy Moe](#); [Owen Robinson](#); [Rick Tryon](#); [Tracy Houck](#)
Cc: [Greg Doyon](#); [Charles Anderson](#); [Steve Herrig](#); [Craig Raymond](#); [Krista Artis](#)
Subject: FW: Reducing Annual Energy Costs at the Aquatics Center
Date: Monday, May 17, 2021 8:26:49 AM

Good Morning – Agenda Item 12: see comments below from David Saslav.

Lisa
City Clerk/Records Manager
406.455.8451

-----Original Message-----

From: Lisa C. Kunz
Sent: Monday, May 17, 2021 8:25 AM
To: 'David Saslav' <dsaslav@gmail.com>
Cc: Tim <timothy@lpwarchitecture.com>; Tom R. Coburn <tcoburn@m-m.net>; Rich Liebert <wwranch@3rivers.net>; Shannon <montanametalgirl@gmail.com>; Steve Herrig <sherrig@greatfallsmt.net>
Subject: RE: Reducing Annual Energy Costs at the Aquatics Center

Good Morning Mr. Saslav – thank you for your comments that will be shared with the Commission and appropriate staff for consideration of Item 12 on tomorrow evening’s Commission meeting agenda.

Best regards,

Lisa Kunz
City Clerk/Records Manager
City of Great Falls
P.O. Box 5021
Great Falls, MT 59403
406.455.8451

-----Original Message-----

From: David Saslav <dsaslav@gmail.com>
Sent: Sunday, May 16, 2021 10:26 AM
To: commission <commission@greatfallsmt.net>
Cc: Tim <timothy@lpwarchitecture.com>; Tom R. Coburn <tcoburn@m-m.net>; Rich Liebert <wwranch@3rivers.net>; Shannon <montanametalgirl@gmail.com>; Steve Herrig <sherrig@greatfallsmt.net>
Subject: Reducing Annual Energy Costs at the Aquatics Center

Dear Commissioners,

Following discussions on the Aquatics Resource Center’s Energy Panel, comprised of LPW’s Tim Peterson, Tom Coburn of Morrison-Maierle, members of Great Falls Parks and Rec, and others on the City Staff; Neighborhood Council 9’s Shannon Wilson; and the Great Falls-based Citizens for Clean Energy — I would like to share the growing consensus that requiring anything short of fully-renewable energy sources for a power-intensive project like the ARC would amount to a major financial mistake, and a dereliction of duty on the part of this Commission.

Specifically, Ken Thornton of Citizens for Clean Energy has met several times with Tom Coburn and Tim Peterson to outline several of the more affordable options available to LPW for shovel-ready implementation starting this Fall. All are in agreement that the only barrier standing in the way of proper energy efficiency is the willingness of our City Commission to fund the necessary up-front costs for these affordable, readily-available energy technologies.

Failing to analyze and understand the running energy costs of the Aquatics Center up front (and invest in the right

mix of energy technology which would minimize these costs) will saddle our City with unnecessary annual expenditures at the Center, for every year it operates, in perpetuity, at an unacceptable cost to Great Falls' future balance sheet.

We estimate that within 5-10 years, the costs of installing 50 KW solar panels and one or two geothermal wells at the site would pay for themselves in annual energy savings. Beyond that timeframe, of course, ongoing cost reductions would constitute net savings over the lifetime of the Center, adding significantly to the City's future ability to fund new infrastructure projects.

The people of Great Falls know how important it is to explore every opportunity to save money; being as energy efficient as possible from day one at the new Aquatics Center will serve to control energy costs, reducing a potentially huge expense burden on future Great Falls budgets, year after year.

To that end, the maximum amount of solar, wind, and/or geothermal must be included in the initial LPW design plans approved by the Commission.

Not planning for renewable energy would be "penny wise, pound foolish" — tantamount to building a new home without modern insulation in the walls and roof, just to save a few dollars during initial construction.

Sincerely,

David Saslav
Great Falls, MT

From: [Lisa C. Kunz](#)
To: [Krista Artis](#)
Subject: FW: Solar Energy for Aquatic Center
Date: Monday, May 17, 2021 8:54:35 AM

From: Dorothy Starshine <starshine1200@gmail.com>
Sent: Sunday, May 16, 2021 5:25 PM
To: commission <commission@greatfallsmt.net>
Subject: Solar Energy for Aquatic Center

It is time to make healthy decisions for ourselves and our environment. As a Great Falls citizen, I support renewable energy for the Aquatic Center because it is the right thing for us to do even if it costs more.
Starshine; 1200 32nd St S, Great Falls, MT 59405; 788-2299

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[Love is all there is.](#)

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[Love is all there is.](#)

From: [Lisa C. Kunz](#)
To: [Bob Kelly](#); [Mary Sheehy Moe](#); [Owen Robinson](#); [Rick Tryon](#); [Tracy Houck](#)
Cc: [Greg Doyon](#); [Charles Anderson](#); [Steve Herrig](#); [Craig Raymond](#); [Krista Artis](#)
Subject: FW: Comment on Resolution 10400 during 18 May 2021 City Commission Meeting
Date: Tuesday, May 18, 2021 11:18:56 AM

See Shannon Wilson's written comments.

Thank you.

Lisa

City Clerk/Records Manager
406.455.8451

From: Lisa C. Kunz
Sent: Tuesday, May 18, 2021 11:18 AM
To: 'Shannon Wilson' <montanametalgirl@gmail.com>
Subject: RE: Comment on Resolution 10400 during 18 May 2021 City Commission Meeting

Hi Shannon – your comments will be shared with the Commission and appropriate staff.

Thank you.

Lisa Kunz

City Clerk/Records Manager
City of Great Falls
P.O. Box 5021
Great Falls, MT 59403
406.455.8451

From: Shannon Wilson <montanametalgirl@gmail.com>
Sent: Tuesday, May 18, 2021 10:53 AM
To: commission <commission@greatfallsmt.net>
Subject: Comment on Resolution 10400 during 18 May 2021 City Commission Meeting

Dear Honorable Mayor and City Commissioners,

I would like to provide comment on Resolution 10400 for the public hearing being held this evening at the City Commission meeting. I have worked as a research engineer for the Heritage Group in Indianapolis for many years, working with North American companies to

improve their processes to eliminate waste and make their operations 'greener.' I focused on recovering metals of value from industrial waste, with my background in Environmental Engineering and Metallurgical Engineering. The main thing I learned from the many companies I dealt with was they were interested in doing better for the planet, to save resources and recycle as much as possible, even though it may cost them more. By committing to making renewable energy sources integral to the new aquatic center's design, the city will be showing industry that we are in line with their values. It is a popular concept and it is necessary to do better with the resources we have and conserve.

The architects did a fine job on the concept, but barely scratched the surface of renewable energy. Although they say the facility will be 'solar ready,' the facility will be only ready for approximately one fifth of the energy demand of the facility. I encourage more forward thinking before a final design is accepted. Renewable energy options should not be considered as "extras" for the project, they should be forefront. If the city feels the project can't spare the funds for solar panels, why not lease them? Solar panels are dropping in price and make it competitive with other energy sources though, so outright purchase would be wise. Payoff would be relatively quick. How about passive solar heating for pool water? Passive design has been used for years in many phases of construction. Albuquerque, New Mexico heats their five city pools with passive solar methods and saves \$100,000 a year. It's not really just a 'green' thing, it's an economic thing.

Utilization of renewable energy sources makes sense economically and will raise the reputation of the City of Great Falls to other industries that care about these issues.

Thank you for your consideration of these comments.

Shannon Wilson
1201 6th Ave. South, Apt. 7
Great Falls, MT 59405
(406) 750-1390

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“You have enemies? Good. That means you've stood up for something, sometime in your life.”

-Winston Churchill

From: [Lisa C. Kunz](#)
To: [Bob Kelly](#); [Mary Sheehy Moe](#); [Owen Robinson](#); [Rick Tryon](#); [Tracy Houck](#)
Cc: [Greg Doyon](#); [Charles Anderson](#); [Steve Herrig](#); [Craig Raymond](#); [Krista Artis](#)
Subject: FW: City Commission Email Address for Public Comment on Agenda Items
Date: Tuesday, May 18, 2021 10:11:26 AM
Attachments: [Comments for Ground Source Heat Pump in Aquatics and Recreation Center.docx](#)

Good Morning – see attached written comments from Susan Effertz.

Lisa

City Clerk/Records Manager
406.455.8451

From: Lisa C. Kunz
Sent: Tuesday, May 18, 2021 10:10 AM
To: 'Susan Effertz' <seffertz0@gmail.com>
Subject: RE: City Commission Email Address for Public Comment on Agenda Items

Hi Sue – thank you for your written comments for Commission consideration of Agenda Item 12 during this evening’s meeting. Your comments will be shared with the Commission and appropriate staff and so noted in the official minutes.

Best regards,

Lisa Kunz

City Clerk/Records Manager
City of Great Falls
P.O. Box 5021
Great Falls, MT 59403
406.455.8451

From: Susan Effertz <seffertz0@gmail.com>
Sent: Tuesday, May 18, 2021 10:05 AM
To: Lisa C. Kunz <lkunz@greatfallsmt.net>
Subject: Re: City Commission Email Address for Public Comment on Agenda Items

Hi, Lisa!

I have attached here my comments advocating for a ground source heat pump geothermal system in the new Aquatic and Recreation Center. The conditional use permit is under discussion, and these comments are meant as affirmative of the permit but with the intention of requesting further development of the Center’s design.

Lisa, on the phone yesterday I told you I had sent comments to each of the Commissioners, also to the Mayor and City Manager. The comments I am attaching here are not the same as what I emailed to each of those persons. So I am grateful if you will distribute these pages

also to the mayor and to each of the commissioners, as was your stated intention.

Thank you very much for your help.

On May 18, 2021, at 10:00 AM, Lisa C. Kunz <lkunz@greatfallsmt.net> wrote:

Hi Sue – Yes 😊

Lisa Kunz

City Clerk/Records Manager
City of Great Falls
P.O. Box 5021
Great Falls, MT 59403
406.455.8451

From: Susan Effertz <seffertz0@gmail.com>

Sent: Tuesday, May 18, 2021 10:00 AM

To: Lisa C. Kunz <lkunz@greatfallsmt.net>

Subject: Re: City Commission Email Address for Public Comment on Agenda Items

Lisa:

Did you get this reply?

Sue Effertz

On May 18, 2021, at 9:54 AM, Lisa C. Kunz
<lkunz@greatfallsmt.net> wrote:

Good Morning Susan – please email your public comments for
consideration of agenda items to: commission@greatfallsmt.net.

Thank you.

Lisa Kunz

City Clerk/Records Manager
City of Great Falls
P.O. Box 5021

Great Falls, MT 59403
406.455.8451

City of Great Falls e-mails may be subject to Montana's Right To Know law (Article II Sec 9, Montana Constitution) and may be a Public Record (2-6-1002, M.C.A.) and available for public inspection.

City of Great Falls e-mails may be subject to Montana's Right To Know law (Article II Sec 9, Montana Constitution) and may be a Public Record (2-6-1002, M.C.A.) and available for public inspection.

Comments advocating for Ground Source Heat Pump Geothermal system in Aquatic and Recreation Center

We want our new Aquatic and Recreation Center to be the most cost efficient it can be. Many people are not aware of **geothermal energy** as a practical application for both heating and cooling of such a complex, and for heating the water in the Center's pools.

Ground source heat pump is the name of the geothermal technology available for this project. Although "geothermal" might bring to mind thermal baths at Fairmont or White Sulphur Springs, this is an entirely different concept.

Ground source heat pump as a source of energy takes advantage of the fact that below the frost line the ground temperature is at nearly a constant temperature year-round. In the winter a ground source heat pump takes a few degrees of temperature off of water that is circulated in deep wells and runs it through heat exchangers using a freon equivalent and a compressor to capture heat energy. The system acts in the reverse direction in warm weather. You might say that in the summer the system works like a refrigerator, and in the winter it cools by the opposite use of the same system.

To those of you who, like me, still puzzle, after that explanation, how the system takes in 39-degree water and pushes out 29-degree water and by this means heats your house to 72 degrees, that's okay. It's genius, or it's a miracle, or it's magic. In any case, it works.

The cost of installation of such a system is higher than that of a conventional system because it requires drilling multiple wells, or boreholes, so one can run a long pipe down and back up in each borehole to equilibrate the water temperature in the pipes with the temperature of the surrounding ground. The boreholes are all drilled to a specific depth—200 feet or more. These wells are not water wells. Although the pipes in the wells will have water in them with a mixture of antifreeze to prevent sludging at low temperatures, this is not connected to the domestic water in the building. The wells, or boreholes, would not be supplying water to the Center. The Center will have a conventional water supply from Great Falls' city water system.

What is different is the monthly and annual costs of operating the system. With implementation of ground source heat pump technology, the cost of cooling and heating the new Aquatic Center—and the cost of heating the water in the pools—would be hugely decreased. Monthly HVAC costs would be expected to be between 1/4 and 1/2 the cost of running a conventional HVAC system.

The cost of installing the wells and the conduits from the wells into the Center is a one-time cost. This is in order to capture "free" energy for the lifetime of the Center, for the one-time purchase price of installation. One could think the decision to install such a cost-saving system up front as similar to the question of whether to use 6" insulation instead of 4" insulation in a new building. No Montanan would prefer to cheap out on construction that would cause a permanent commitment to higher costs of operation. In most instances buildings employing ground source heat pump systems have recouped the costs in fewer than 10 years.

In this case, if the cost of installation of ground source heat pump is a million dollars, that would be only 5% of the cost of the twenty-million-dollar building, shared with the Federal government, for lifetime operating cost savings.

Some of you may know of the elegant work Montana State University is doing on campus in Bozeman. MSU has already converted many of their buildings to geothermal using ground

source heat pump technology. There are publications available about how they are going about this, even creating HVAC districts to maximize use of geothermal throughout the campus.

This technology is being installed in schools, churches, commercial buildings, and homes with great success. Once you know of the existence of ground source heat pump technology, it is easy to find information on the technology and examples of its use. If you google this topic, you will find diagrams and YouTubes and monographs to your satisfaction.

I believe our new Center should have ground source heat pump geothermal as its cooling and heating system. That is not to say the building should not also have modern solar panels and other energy efficiency installations in place as well. I would like to contend that the advantages of this system for cooling and heating, and for heating the Center's domestic water, are so clear that the architectural firm for the project will want to offer this technology.

Just to state where I am coming from regarding this issue—My own interest in ground source heat pump for cooling and heating started because of a relative who has this system in his 3670 square foot home. His system has 6 wells, each 200 feet deep. His heat bill during a bitter North Dakota winter runs \$75 to \$100, and his air conditioning in summer runs about \$35 to \$50. The cost of installing his system was recouped in a few years. The system has been trouble-free.

I don't have any additional connections or motivations in this matter. I am a local citizen interested in our getting the best bang for our buck for Great Falls and for my fellow taxpayers.

Thank you for your attention to these ideas.

Attached below are links for a few YouTube videos regarding residential use of ground source heat pump geothermal systems, followed by several links relating to how MSU Bozeman is employing this technology, and a few references to general information on the topic.

YouTube Videos as introduction to ground source heat pump geothermal systems

1) Advertisement for Kensa Engineering, but a nice short introductory video—3:07 minutes
<https://www.youtube.com/watch?v=KE3SvNRmwcQ>

2) Hoffmann Brothers—St. Louis Geothermal Heating & Cooling Company—3:26 minutes
This is an advertisement and a little slick, but gets the idea going. He is putting 200-foot pipes underneath some houses with tiny yards!
<https://www.youtube.com/watch?v=IMO9jvwIHFg>

3) Geothermal ground source heat pumps—Heating your home from your own back yard!—**just have a think teaching series**—13:35 min—October 4, 2020 Teacher cites Sweden, including issues of increased grid demand for backup. Fossil fuel lobby against this worldwide, it seems. England incentives and paybacks to home builders.
<https://www.youtube.com/watch?v=1jCHYUuEDZ>

4) Understanding Geothermal Heating and Cooling with GeoComfort—8:49 minutes
This is an advertisement, but look past that and you can appreciate the explanations and diagrams are helpful. The system we would use would be the vertical loops installed in boreholes. The system heats and cools and heats domestic water as well.
One borehole(i.e., one well) per ton of capacity needed.

<https://www.youtube.com/watch?v=Nlj5tZ4QLjE>

5) This Old House—for a residential development or for a single house—13:28 min
This house in New York will have two 300 foot wells. This was a retrofit into this home. Nice illustration of how grouting is done in boreholes. Domestic water heating preheat tank. Cost estimate given for wells and for whole system.

<https://www.youtube.com/watch?v=IMO9jywlHFg>

6) The narrator is a Canadian man who talks like a Montanan. Nice explanations and diagrams—6:31 minutes
Explains how to strip 3 degrees centigrade off the underground water. Illustrates how to estimate needed of capacity of system in cubic feet. <https://www.youtube.com/watch?v=d85FgaFin2A>

7) Why don't we all just use Geothermal Energy?—Global view, fascinating!—**just have a think teaching series** 14:38 minutes

https://www.youtube.com/watch?v=-Ss_wHCS1Aw

MSU Bozeman campus energy master plan

1) Reinventing energy—informative introduction to what's going on at MSU Bozeman—evolution of building technology, creation of energy districts on campus—July 18, 2019
<https://www.montana.edu/news/18845>

2) MSU featured as case study in report highlighting innovative energy efficiency strategies—December 17, 2020 <https://www.montana.edu/news/20701/msu-featured-as-case-study-in-report-highlighting-innovative-energy-efficiency-strategies>

3) Construction to begin on \$2.5 million geothermal system at MSU—February 27, 2020
https://www.bozemandailychronicle.com/news/montana_state_university/construction-to-begin-on-2-5-million-geothermal-system-at-msu/article_7cffa27a-0c15-5975-834a-f05a69582a88.html

4) New geothermal system for Romney Hall to be one of MSU's biggest energy conservation projects—February 5, 2020 <https://www.montana.edu/news/19588>

5) A Guide to Energy Master Planning of High-Performance Districts and Communities, published by National Renewable Energy Laboratory (NREL) of the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, November 2020
<https://www.nrel.gov/docs/fy21osti/78495.pdf>

In this well-illustrated and colorful manual, Montana State University is presented on pages 132-133 as a case study of a high-performance energy district.

General introduction to the topic of ground source heat pump technology, or geothermal use for heating of homes and commercial buildings:

1a) Wikipedia introduction to this topic:
https://en.wikipedia.org/wiki/Geothermal_heat_pump

1b) Montana DEQ introductory information on this topic:
<https://deq.mt.gov/portals/112/Energy/EnergizeMT/Renewables/Geothermal%20Pub/5%20HeatPumps.pdf>

and <http://deq.mt.gov/Energy/renewableenergy/Geothermal/heatpump>

Attached here are two pages of brief explanation on this topic from the Montana DEQ



Geothermal/Ground Source Heat Pumps

FACT SHEET SWP-108

April, 2016

What are Geothermal Heat Pumps?

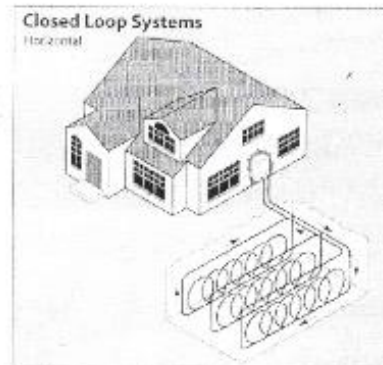
Geothermal heat pumps, also known as ground source heat pumps, are a highly efficient renewable energy technology. Geothermal heat pumps are used for space heating and cooling, as well as water heating. The greatest advantage is that it works by concentrating naturally existing heat, rather than producing heat through combustion of fossil fuels. For cooling, the reverse process occurs.

Types of Geothermal Heat Pumps

Ground source heat pumps are categorized as having either closed or open loops. The three types of closed loop system installations include: horizontal, vertical, and pond/lake. The fourth type of ground source heat pump is the open-loop system. To determine which option is the best, you must look at the climate, soil conditions, available land, and local installation costs at your site. All of these types of systems can be used for residential and commercial building applications. Read on for more detailed descriptions of the types of closed and open loop systems.

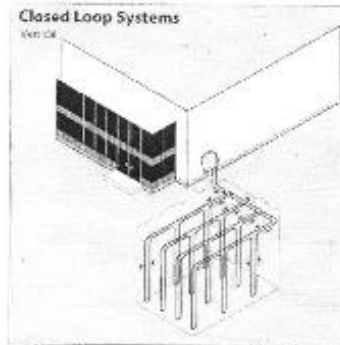
Closed-Loop System - Horizontal

Horizontal ground source heat pump installation is generally most cost-effective for residential installations, particularly for new construction where sufficient land is available. It requires trenches at least four feet deep. The most common layouts either use two pipes, one buried at six feet, and the other at four feet, or two pipes placed side-by-side at five feet in the ground in a two-foot wide trench. The method of looping pipe allows more pipe in a shorter trench, which cuts down on installation costs and makes horizontal installation possible in areas it would not be with conventional horizontal applications.



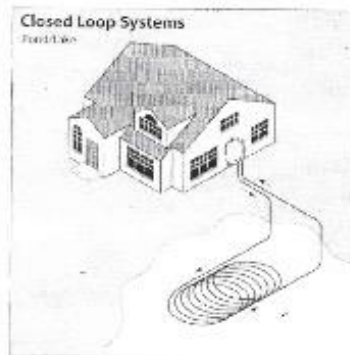
Closed Loop System - Vertical

Vertical systems are often used for large commercial buildings and schools because the land area required for horizontal loops would be prohibitive. Vertical loops are also used where the soil is too shallow for trenching, and they minimize the disturbance to existing landscaping. For a vertical system, holes (approximately four inches in diameter) are drilled about 20 feet apart and 100 to 400 feet deep. Into these holes go two pipes that are connected at the bottom with a U-bend to form a loop. The vertical loops are connected with horizontal pipe (i.e., manifold), placed in trenches, and connected to the heat pump in the building.



Closed Loop System - Pond/Lake

If your site has an adequate water body, this may be the lowest cost option. A supply line pipe is run underground from the building to the water and coiled into circles at least eight feet under the surface to prevent freezing. The coils should only be placed in a water source that meets minimum volume, depth, and quality criteria.



Open-Loop System

An open loop system uses a well or surface water body such as a pond or lake as the heat exchange fluid that circulates directly through the ground source heat pump system. Once the water has circulated through the system, it returns to the ground through the well, a recharge well, or surface discharge. This option is only practical where there is an adequate supply of relatively clean water, and all regulations regarding groundwater discharge are met.

