ROSE PRAIRIE WATER TREATMENT PLANT

ELECTORAL AREA DIRECTORS COMMITTEE MEETING

MAY 21, 2020

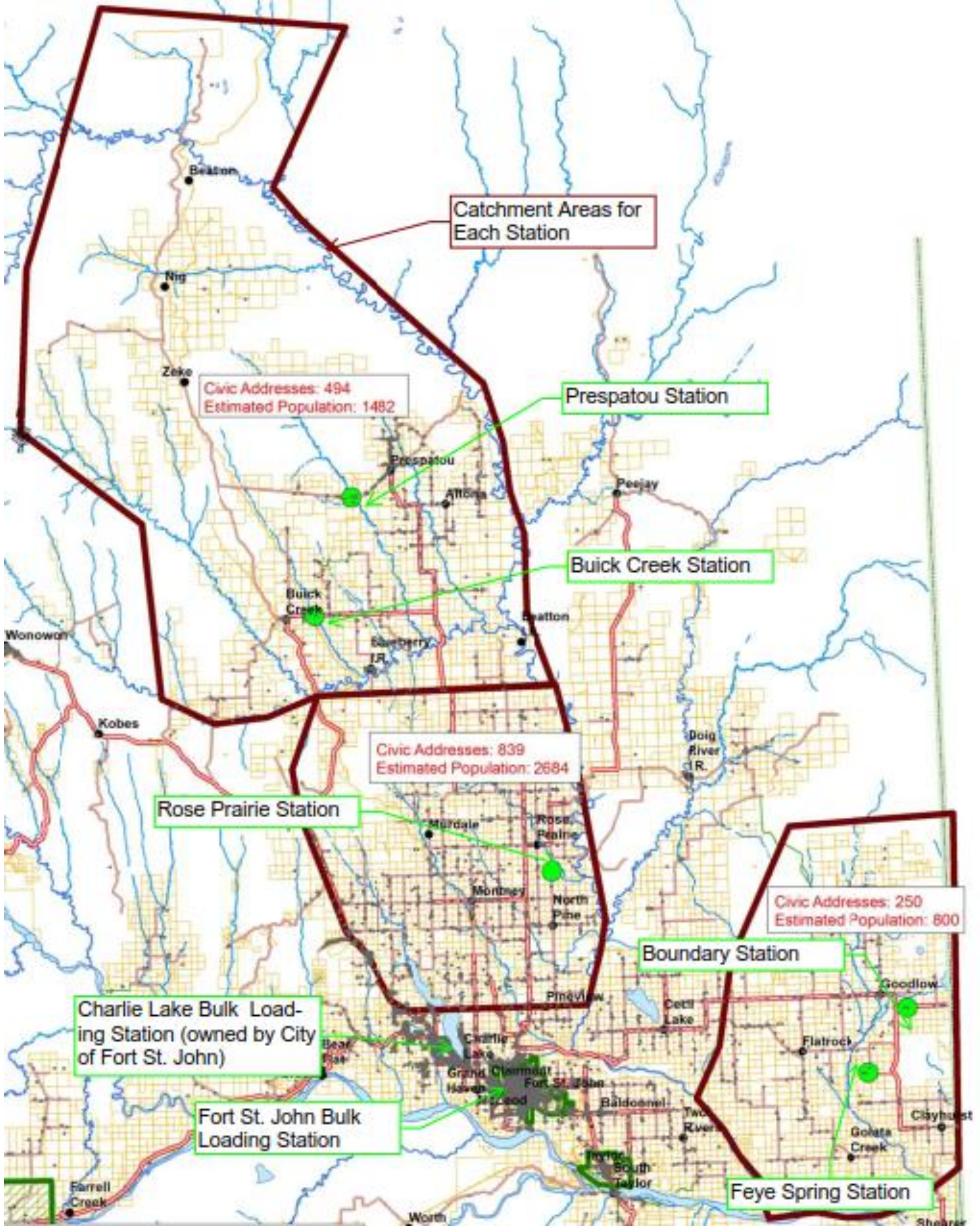
AGENDA

- Background and Timeline
- Water Treatment Challenges
- Level of Service Review
- Options Review – Water Service Delivery to Rose Prairie Area Residents
  - Modifications to Existing Well
  - Modifications to Existing Treatment Train
  - New Location and/or Alternate Source
  - Other
- Summary and Next Steps
- Discussion

BACKGROUND AND TIMELINE

AREA B WATER STRATEGY

- In fall of 2016, Director Goodings developed a Water Advisory Working Group which provided comment on:
  - Proposed Service Area
  - Water Development Plan
  - Proposed Taxation Rate
  - Public Approval Process
- Service Area (shown) identified the need for 5 potable water stations:
  - Prespatou (Upgrade Existing)
  - Buick Creek (New)
  - Boundary (Upgrade Existing)
  - Feye Spring (Upgrade Existing)
  - Rose Prairie (New)
- Four of the five stations came online in 2019, and have been providing potable water to residents



PROJECT TIMELINE

2009

Watson Spring station closed due contamination, low flows and mandate from NHA

2014

Community meetings held to discuss opportunities for water in Areas B, C and D

2015

Romedo Spring closed due to contamination

Areas B, C and D Potable Water Referendum Fails; Area B has high level of support

2016

Boil water advisory issued at Boundary and Feye Spring stations

Feasibility work for water service in Area B approved.

Electoral Area B Water Advisory Committee is Developed.

PROJECT TIMELINE

2017

May - WSP completed feasibility study

June - Area B referendum passes

August – Urban is awarded the project via competitive RFP process

October – Urban completes background review and conceptual design comments

2018

April - Detailed design is completed

Project is tendered

July - Construction began

2019

Construction continued and first four stations are completed and opened to users

Commissioning of Rose Prairie occurred, however water quality issues arose

Additional Testing occurs **May - December**

Third Party Engineer Review completed

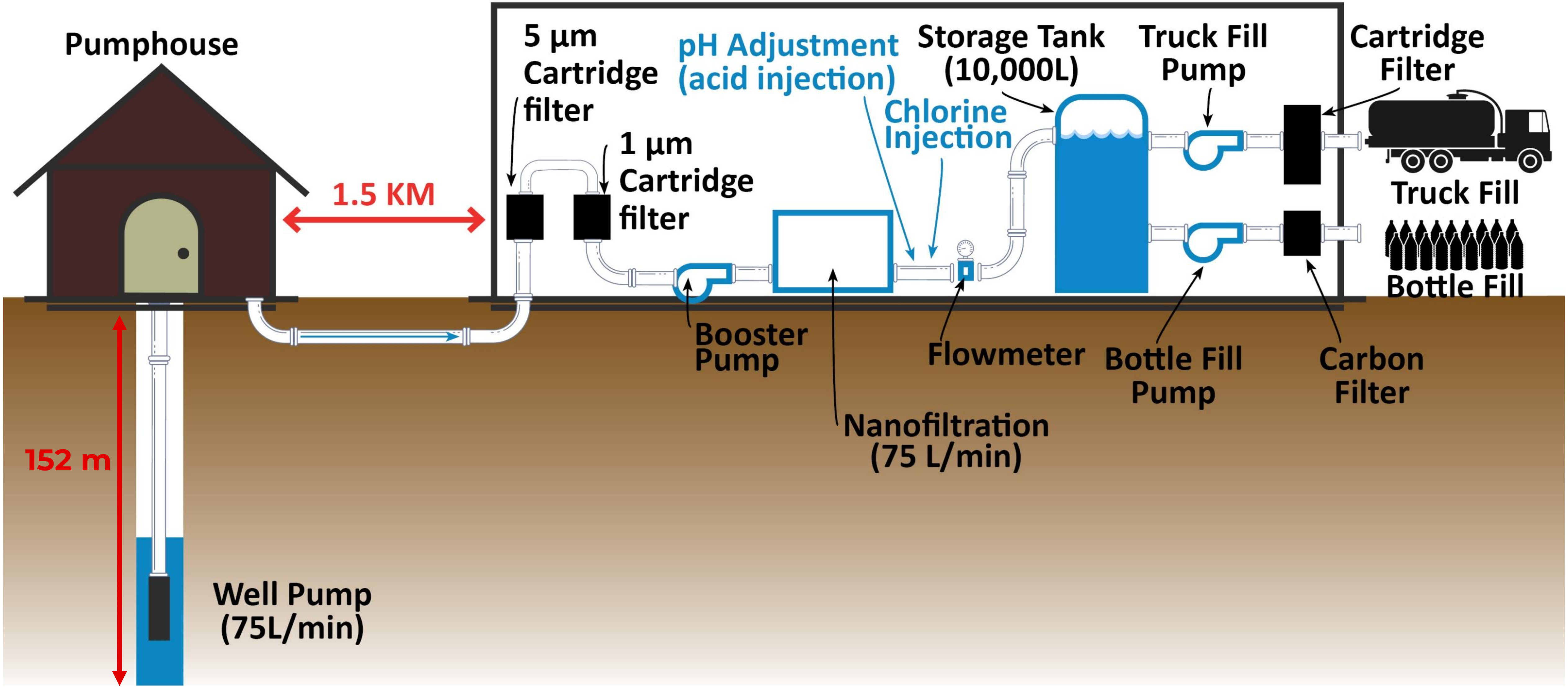
2018

January - PRRD discussed abandoned wells with Pengrowth

January - continued testing and optimization

Rose Prairie

Water Station



CHALLENGES AT THE ROSE PRAIRIE WATER STATION

KNOWN

- Sodium (Salt) and Total Dissolved Solids (dissolved minerals and organic matter) in raw water are greater than the Guidelines for Canadian Drinking Water Quality Standards.
- Upon recognition of quality issues the initial strategy was to find a solution as quickly as possible to enable station opening
- Until recently, chlorine residual (secondary disinfection) was required for risk management- this limited options available to address sulphides

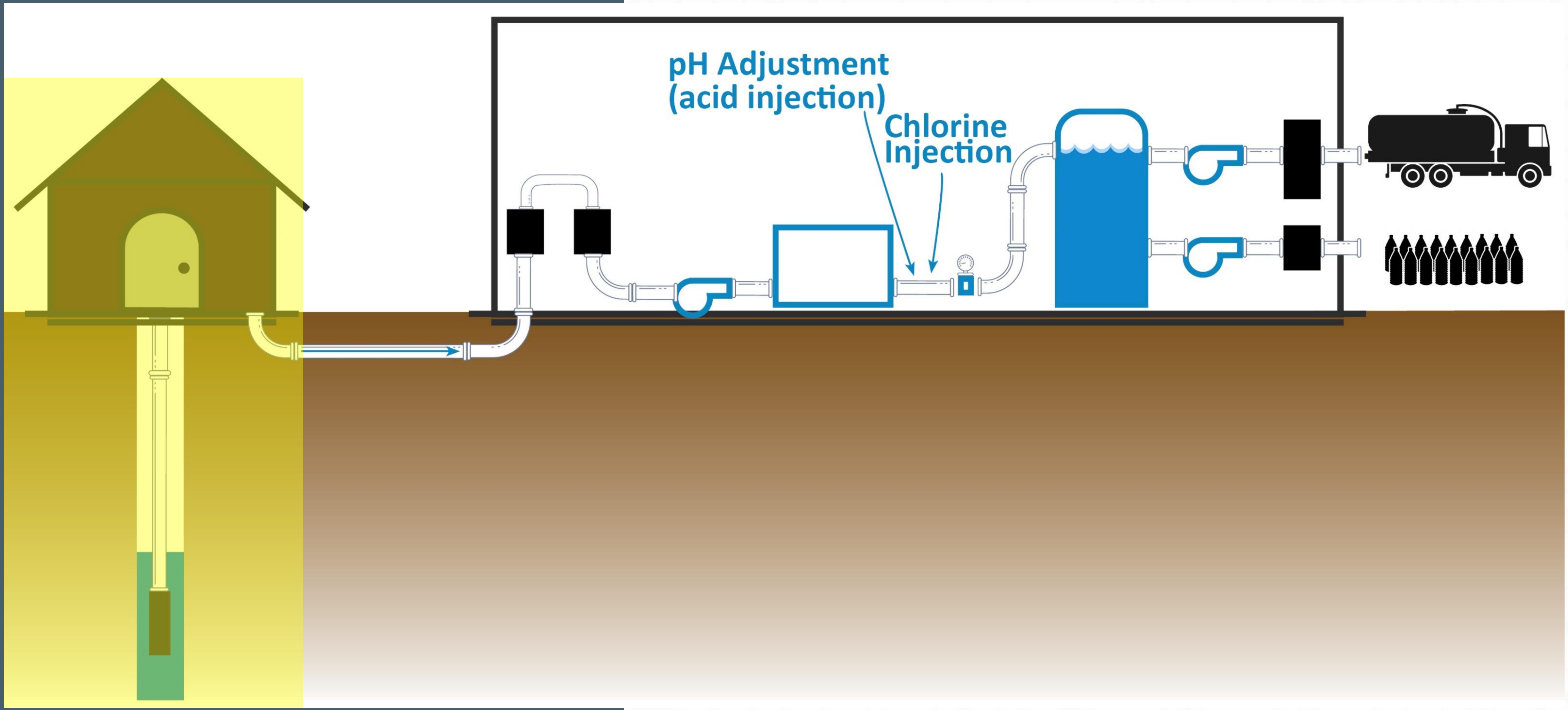
UNKNOWN

- Sulphides (H_2S) in raw water from the well
  - Sulphides are an aesthetic concern (not a health concern)
  - Cause turbidity (cloudiness) when oxidation occurs (chemical reaction with oxygen containing chemicals)
    - Such as the addition of chlorine for disinfection
  - Concentrations fluctuate based on water quality from the well
  - Primarily in the dissolved state (impacts ability to off-gas)

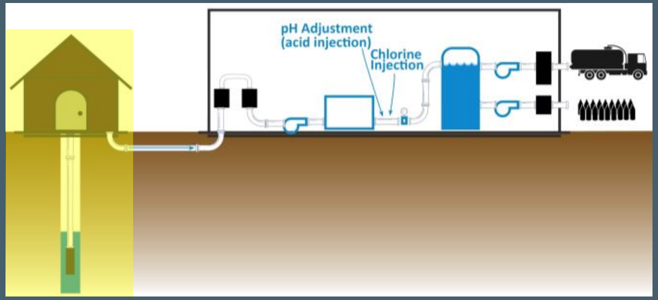
URBAN SYSTEMS

OPTIONS REVIEW - WATER SERVICE DELIVERY TO ROSE PRAIRIE AREA RESIDENTS

OPTION 1: MODIFICATIONS TO WELL



URBAN SYSTEMS



1A - WELL TREATMENT

- Well treatment could include air and acid cleaning of the screen area. This process cleans the well screen and the first 50-100 mm (2-4 inches) around the screen.
- Limited success – days to months is typical

COSTS

- The cleaning process costs approximately $25,000-$35,000 per cleaning event.
- Based on one cleaning per month (likely would need to occur more frequently)

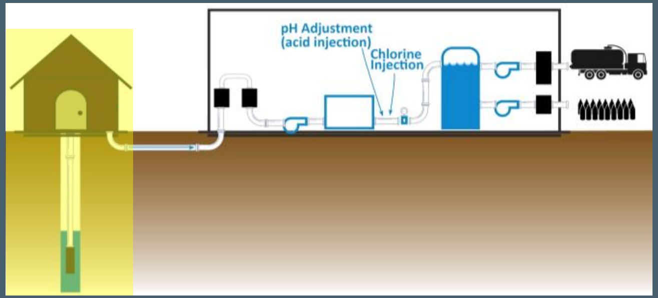
Capital: $0

Increased Annual Operations and Maintenance: $420,000

20 Year Life Cycle Costs: $8,400,000

Benefits	Drawbacks
Does not require capital upgrades	Effectiveness is unknown both immediate and long-term
	Would require the station to be out of service during cleaning (on a monthly or more frequent basis)

URBAN SYSTEMS



1A - WELL TREATMENT

PREVIOUSLY ASKED QUESTIONS

Q: Residential well owners can use tablets to clean their wells periodically, will that work?

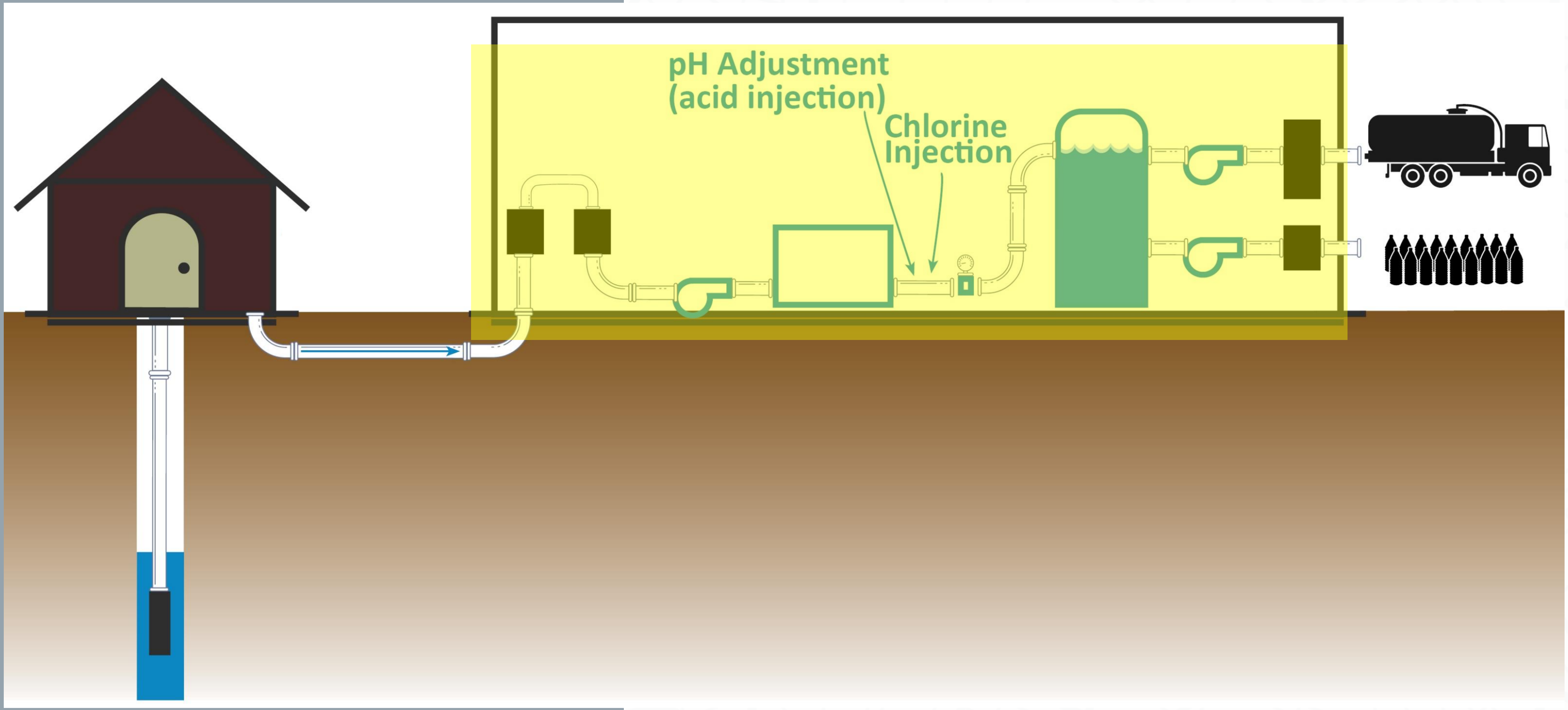
In addition to tablets, many residential well owners also dump bleach in their wells on an annual basis.

A: The tablets or bleach work at a residential scale because residential wells have less flow than is expected at a commercial system. With the flowrates expected, this would need to be done more frequently.

There are 839 civic addresses within the estimated Rose Prairie Catchment Area.

URBAN SYSTEMS

OPTION 2: MODIFICATIONS TO EXISTING TREATMENT TRAIN



URBAN SYSTEMS

PILOTING

- A pilot is recommended for all configurations in Option 2 except:
  - Option 2A: Process Optimization: Chlorination for Sulphide Removal and Filtration was effectively already piloted at full scale through testing completed
- Space is limited in the existing treatment facility. Most pilots will require a temporary building (sea can or other) to be brought to site to house the pilot equipment.
- Piloting typically lasts anywhere from 1 -3 months
- Bench scale testing is different than piloting. Bench scale testing indicates effectiveness of technology, piloting provides design parameters and long term operations and maintenance implications

REASONS TO PILOT

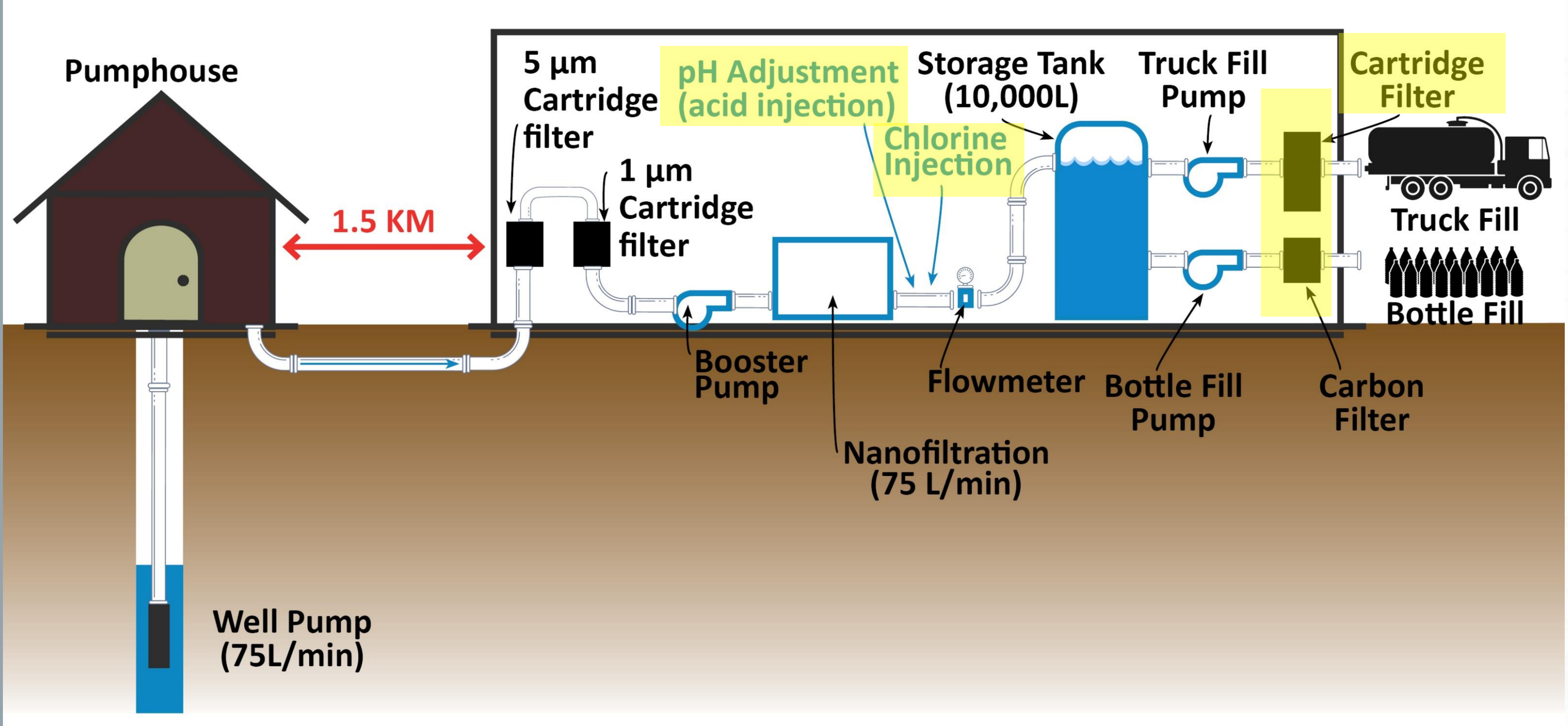
- Confirm bench scale testing results
- Balance the size of the equipment with increased/decreased operations and maintenance costs
- Understand limitations (if any) of technology prior to capital investment
- Confirm effectiveness on sulphide removal and implications to other treatment processes

EXAMPLES

- GAC: Confirm contact time and size of filter to result in media replacement every 3-5 years.
- Ozone or peroxide: Determine reaction rates (whether contact tank is needed or not) and need to remove prior to membranes.
- Pre-chlorination: Determine contact time required (and therefore the size of contact tank)

URBAN SYSTEMS

2A - PROCESS OPTIMIZATION: CHLORINATION FOR SULPHIDE REMOVAL AND FILTRATION



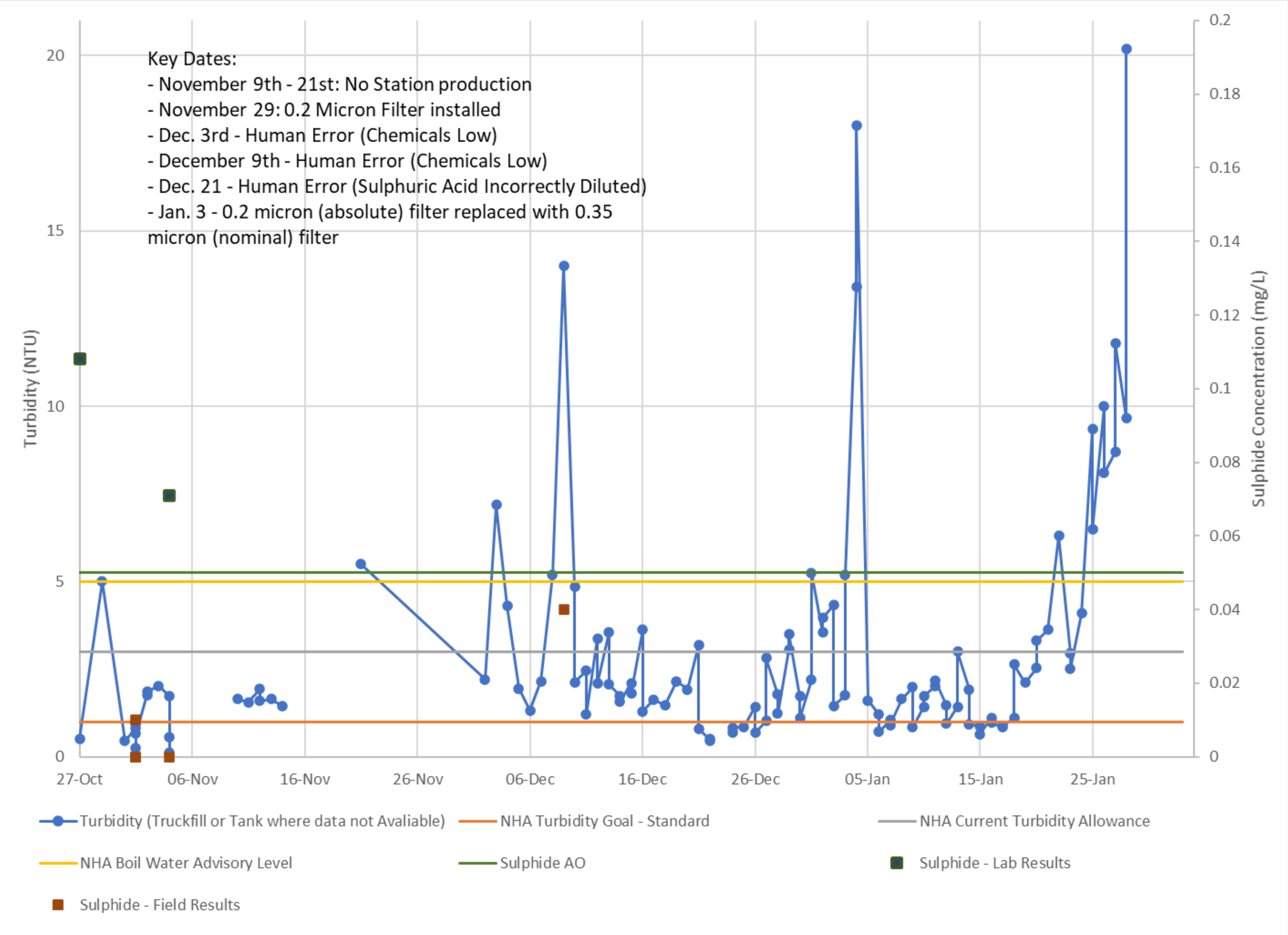
URBAN SYSTEMS

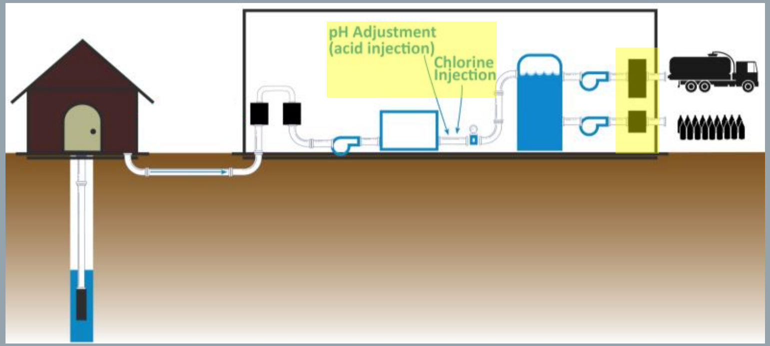
2A - PROCESS OPTIMIZATION: CHLORINATION FOR SULPHIDE REMOVAL AND FILTRATION

- Chlorine reacts with sulphides to remove them from the treated water
  - Reaction produces elemental sulphur which causes turbidity (cloudiness) to increase
- Chemical reaction requires lower pH – an acid is required to drop the pH below 7 prior to chlorination.
  - Finished water pH must be maintained above 7 for corrosion control.
- Requires filtration after the process, but sulphur is very small and challenging to remove with filtration
- If cannot keep turbidity (cloudiness) consistently low – Northern Health will not grant permit to operate

TESTING AND RESULTS

- Process optimization occurred regularly from December 2, 2019 – February 3, 2020 (testing stopped as per direction of staff) due to no further positive results.





2A - PROCESS OPTIMIZATION:
CHLORINATION FOR SULPHIDE REMOVAL AND FILTRATION

COSTS

- Costs include additional sulphuric acid to reduce pH, cartridge filters (1/month assumed), and operator time.

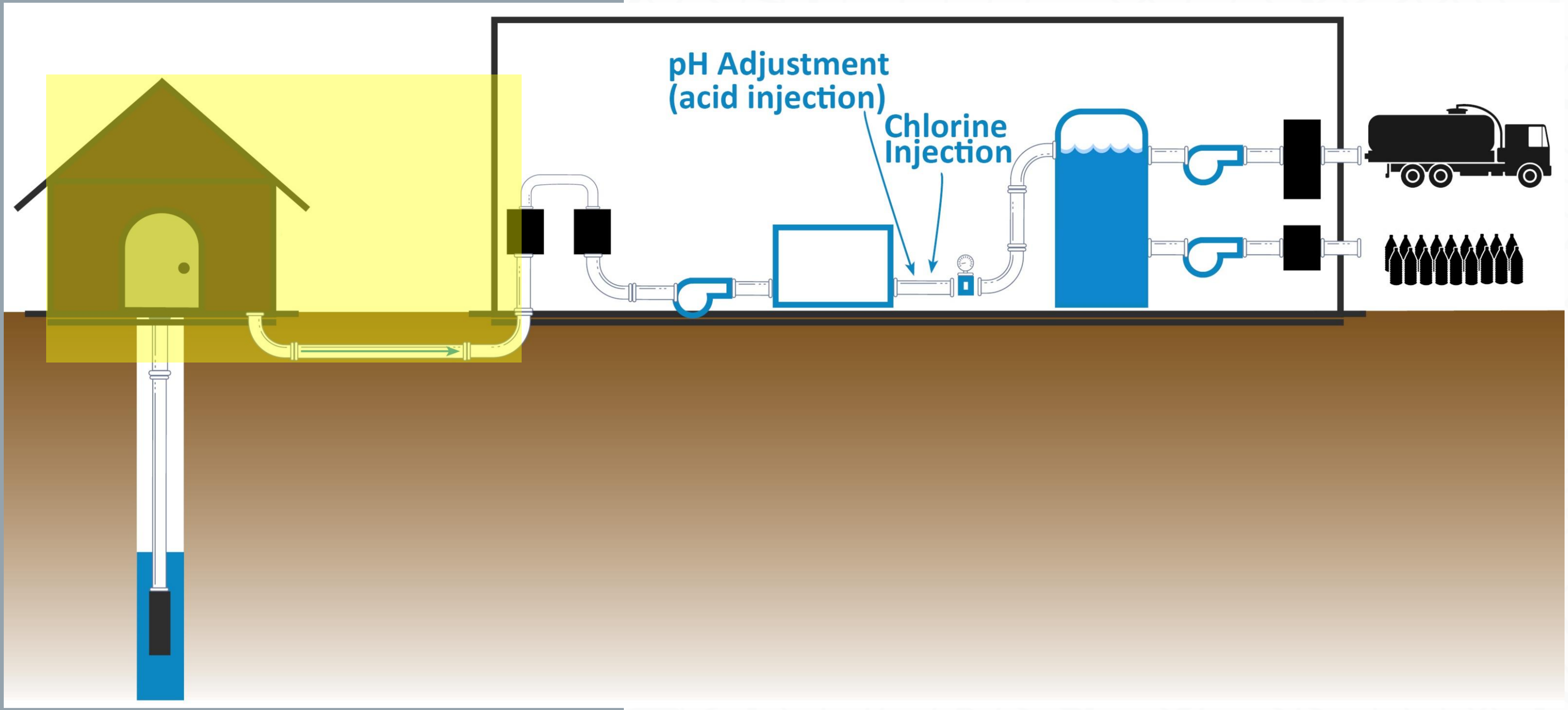
Capital: $0 (Filtration equipment has already been purchased (labour and materials approximately $9,000)

Increased Annual Operations and Maintenance: $ 12,000

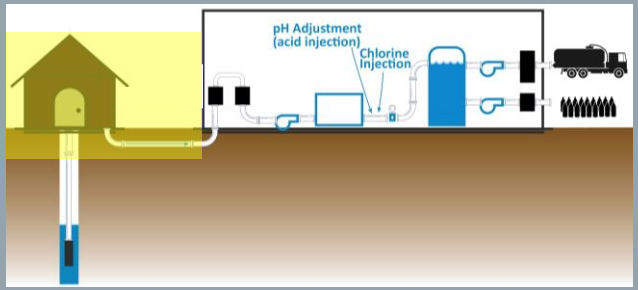
20 Year Life Cycle Costs: $240,000

Benefits	Drawbacks
Utilizes Existing Equipment (pH adjustment pump, chlorine dosing pump)	**Does not meet NHA requirements for turbidity (< 1 NTU).**
Effective at removing (oxidizing) sulphides at lower pH	Oxidation process causes cloudiness – aesthetically unappealing
	Fluctuations require constant operator adjustment to dosing rates – High O&M
	Utilizes larger amounts of chemicals than other stations (sulphuric acid, sodium hypochlorite) – High O&M
	Sulphuric acid for pH adjustment requires specialized handling by operators.

2B - PRE-TREATMENT: OXIDATION



URBAN SYSTEMS

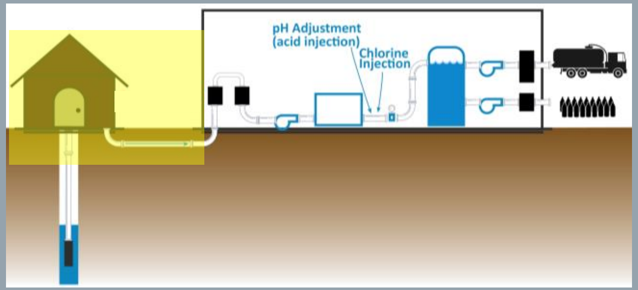


2B - PRE-TREATMENT: OXIDATION

- Oxidize (react with) the sulphides prior to the nanofiltration membranes to utilize the membranes to remove the elemental sulphur
- Oxidant could be chlorine, ozone or peroxide
- Process requirements:
  - Add oxidant
  - Allow for reaction time – reaction time varies (peroxide and ozone are quicker, chlorine is slower)
    - Will likely require a tank to facilitate
  - Remove oxidant upstream of nanofiltration membranes

Benefits	Drawbacks
Chlorine is known to be effective at removing sulphides from this source; other oxidants likely effective but will need to be piloted	Contact time significant for chlorine resulting in large storage tank
Utilizes existing membranes for turbidity removal (water becomes less cloudy)	Risk of oxidant entering membranes (damage to membranes), resulting in more maintenance, system alarms and operator callouts.
Ozone or peroxide have quicker reaction times than chlorine, and may not require a tank and/or removal of the oxidant prior to filtration via nanofiltration membranes.	Will result in poor nanofiltration membrane operation and require frequent replacement – every 3-6 months compared to every 4-6 years under normal operation.
	Raw water storage added does not improve fill times.
	Complex solution that require constant raw water quality monitoring – high O&M costs

URBAN SYSTEMS



2B - PRE-TREATMENT: OXIDATION

Oxidant Comparisons

- Chlorine is especially damaging to the membranes and chlorinated water CANNOT go through the membranes
- Peroxide is more expensive, but reacts quicker, requiring a smaller amount of contact/raw water storage. Not used very much in potable water in BC.
- Ozone is complex and requires an ozone generator, which often have high maintenance costs and complexity.

All oxidants would require additional piloting/testing (costs included) to confirm reaction time and flowrates.

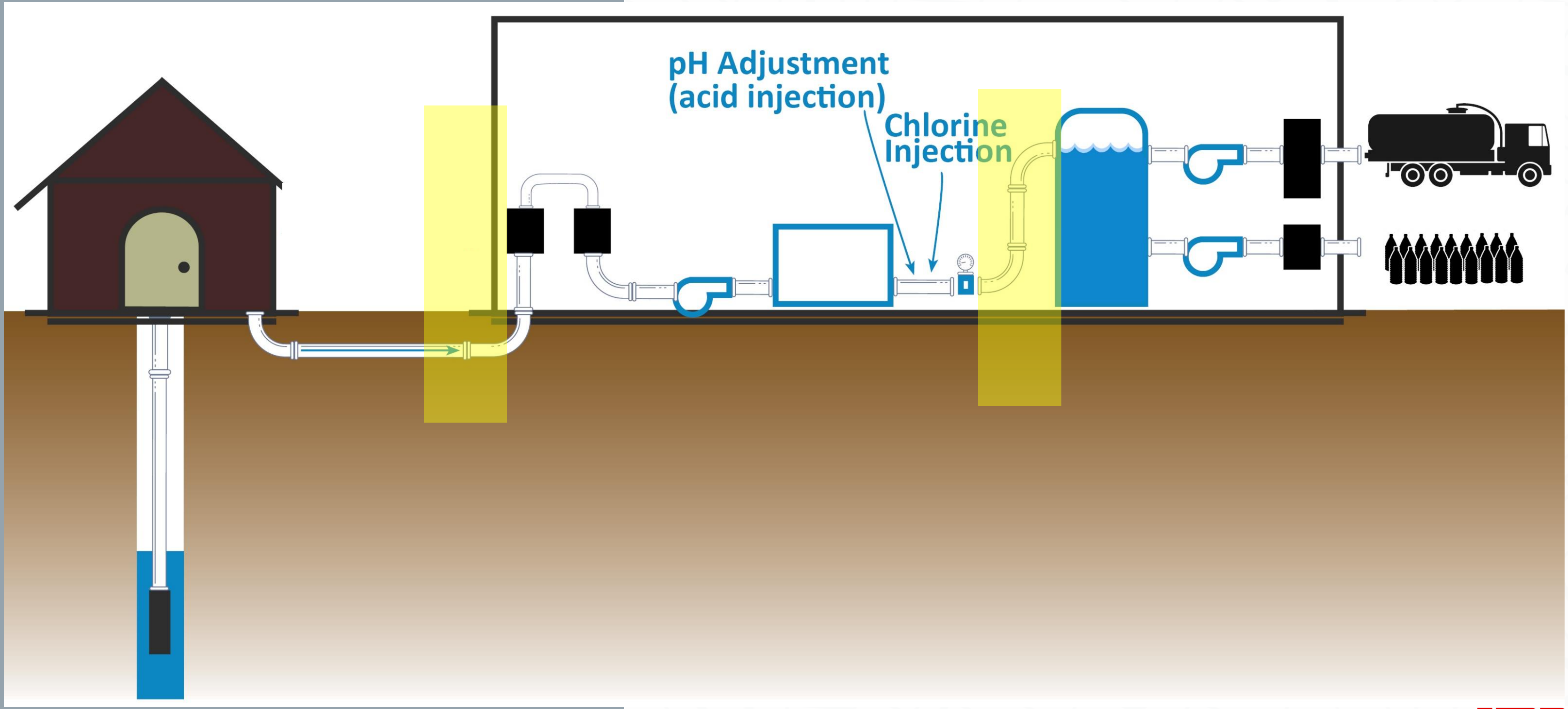
COSTS

- Configuration is different depending on the type of oxidant.
- Oxidant to be injected at pumphouse. No upgrades to electrical or communications were included in the costs (if required).
- 40 m^3 of underground storage included for peroxide and ozone options
- 100 m^3 of underground storage included for chlorine option as well as dichlorination equipment
- Membrane replacement frequency will impact annual costs significantly. Operations and maintenance costs assume membrane replacement every 6 months. If frequency increases to every 3 months, costs increase by $24,000 per year for each oxidant option (an additional life cycle cost of $480,000)

	Capital	Increased Annual Operations and Maintenance	20 Year Life Cycle Costs
Peroxide	$190,000	$30,000	$785,000
Ozone	$240,000	$35,000	$940,000
Chlorine	$495,000	$29,000	$1,100,000

2C - AERATION

Could occur pre OR post treatment



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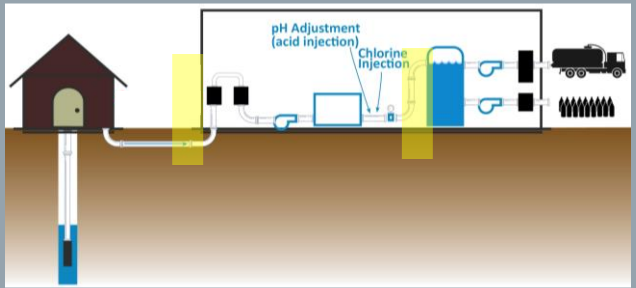
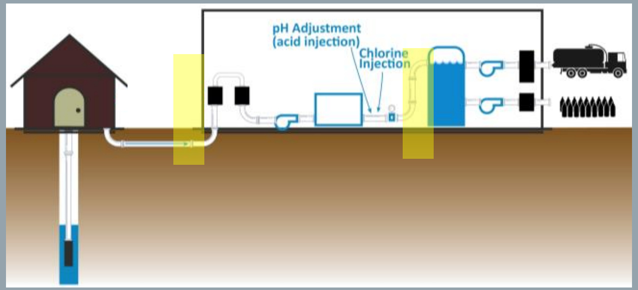


2C - AERATION

- Aeration can be used to remove sulphides in gaseous state from water.
- Two methods:
  - An aeration tower could be installed, which includes an air compressor to force aerate the water, and transfer pump to transfer into tank (aeration tower is a gravity process)
  - If very gaseous state, splash plates can be effective

Benefits	Drawbacks
Low tech option for removing sulphides	**Based on bench scale tests, will reduce sulphides, however NOT below water quality guidelines**
Can be installed downstream of the nanofiltration membranes, upstream of storage tank or upstream of the nanofiltration	Could be more effective at a much lower pH, which would require additional pH adjustment post treatment – this has not been included in the costs
	Aeration tower is taller (4.5m height, not including room for maintenance) than existing building and would require a building extension or new building
	Variable effectiveness, especially with varied incoming water quality from the well

URBAN SYSTEMS



2C - AERATION

- If aeration does not remove all sulphides, and a chlorine residual is applied, turbidity issues will still occur
- May be more effective at a lower pH, however lowering the pH may cause other minerals to precipitate out, causing turbidity issues (cloudiness)
  - pH would still need to be increased post aeration to meeting Guidelines for Canadian Drinking Water Quality

COSTS

Assumptions:

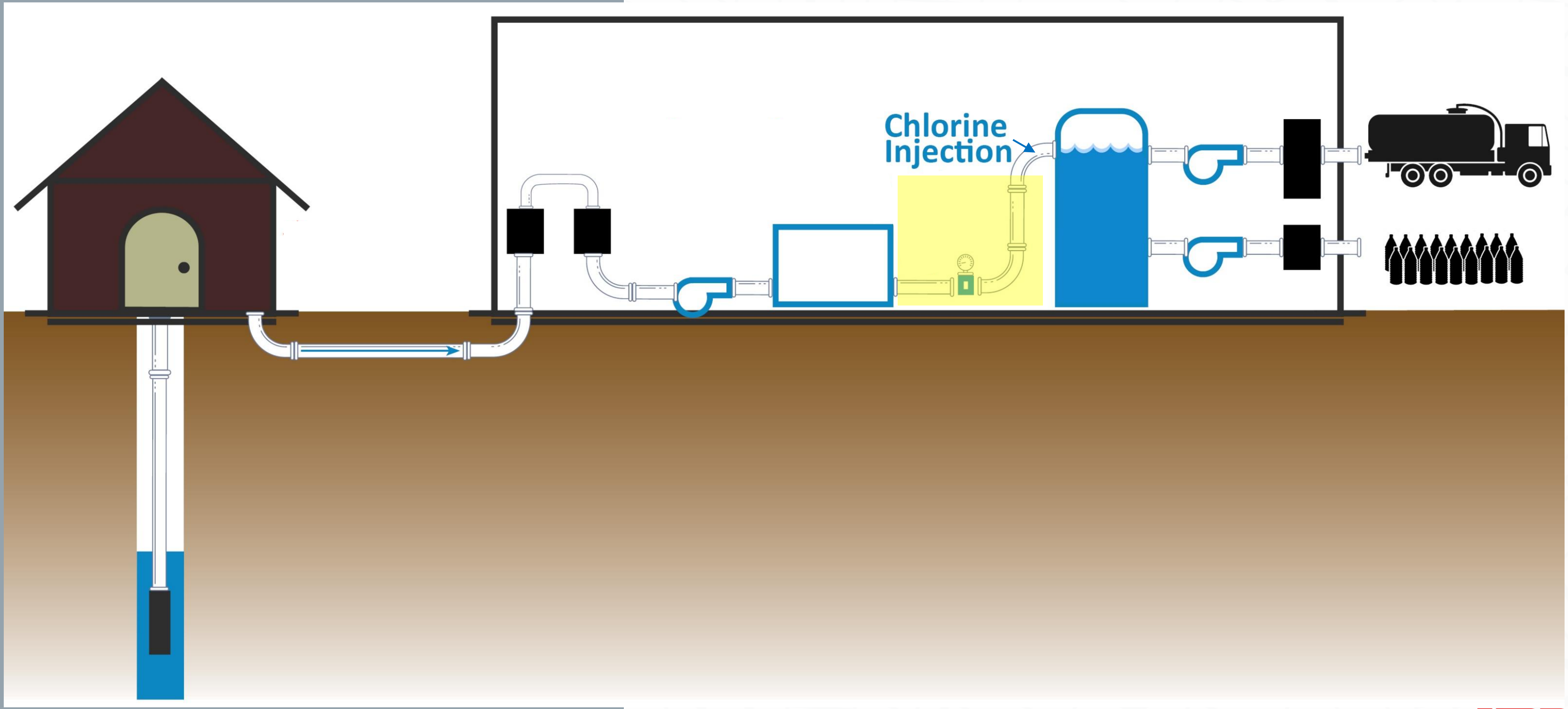
- Additional transfer pump required to pump back into treatment train.
- Building extension included
- Additional pH adjustment not included

Capital: $220,000

Increased Annual Operations and Maintenance: $7,200

20 Year Life Cycle Costs: $362,000

2D - ADSORPTION TECHNOLOGIES



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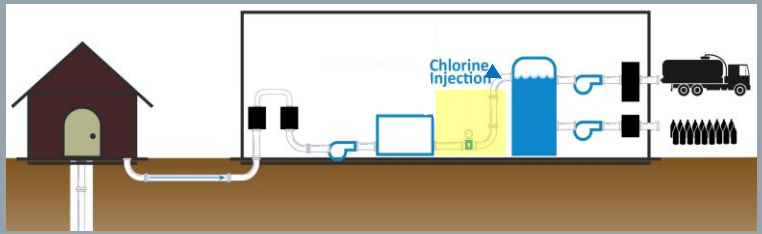


2D - ADSORPTION TECHNOLOGIES

In December, third party reviews were completed with industry water treatment experts.

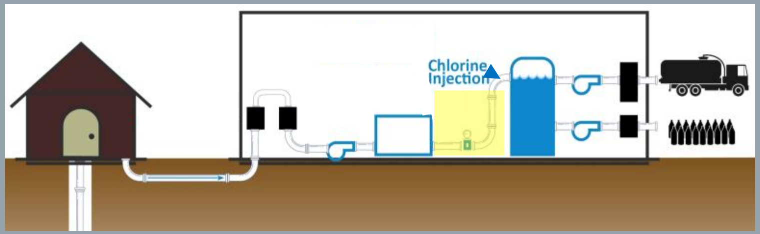
Discussions indicated:

- GAC is likely to be the most successful method of removing sulphides
- GAC would be relatively (compared to other options) easy to install in the existing treatment train

ADSORPTION PRINCIPLES

- Treated water is fed through a media column where sulphides adsorb to the media.
  - Once all of the surfaces have been consumed, the media must be replaced
- Most optimal location would be to place downstream of nanofiltration to reduce impurities in the water, and all surfaces available to be consumed by sulphides (and not turbidity or other minerals)
- Media which could be used for sulphide removal:
  - Granular Activated Carbon (GAC)
  - Catalytic Treated Carbon
  - Manganese Dioxide (Greensand)

URBAN SYSTEMS

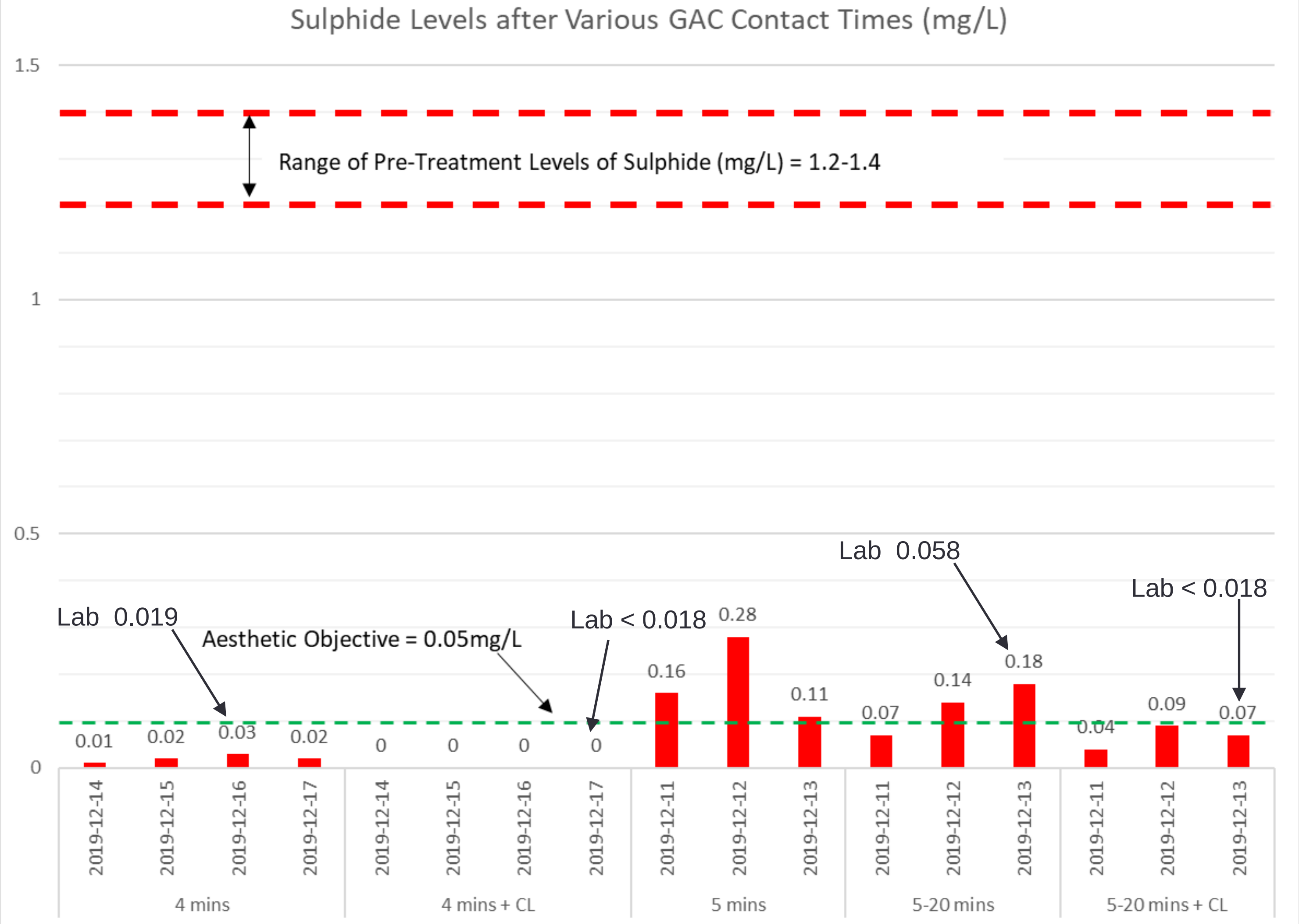


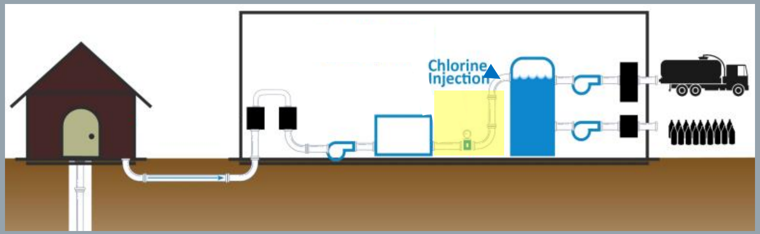
2D - ADSORPTION TECHNOLOGIES

- GAC Bench Scale Testing Results indicate:
  - 5 minute contact time is adequate to reduce sulphide levels to below 0.05 mg/L
  - Stable levels of chlorine (free and total have been achieved)

GAC TESTING RESULTS

*Different methodology used for 5 minute samples, impacting field equipment sampling results

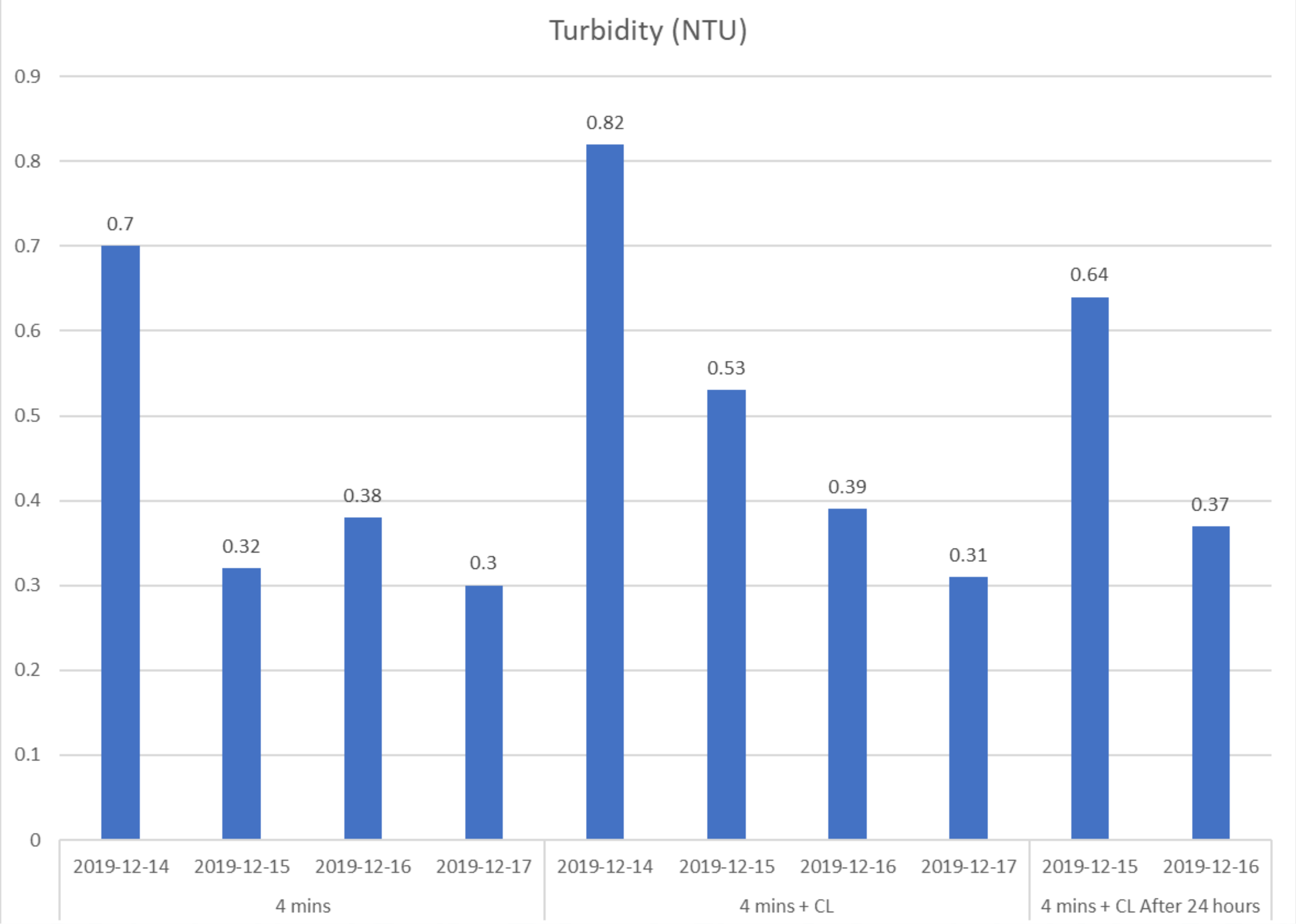




2D - ADSORPTION TECHNOLOGIES

- GAC Bench Scale Testing Results indicate:
  - Turbidity levels after 24 hours are the same or lower than turbidity levels immediately after GAC (indicating little reaction with the chlorine)

GAC TESTING RESULTS



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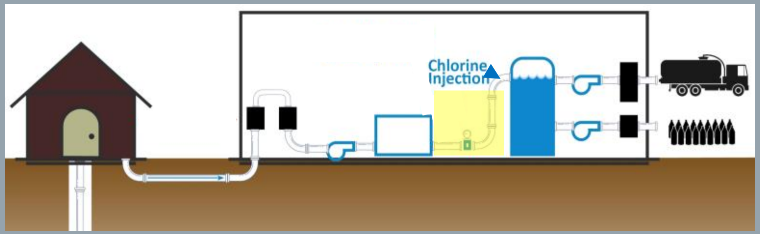


2D - ADSORPTION TECHNOLOGIES

Assumptions

- Install pilot in temporary facility to reduce costs ($100,000)
  - Previous cost estimates (December 2019 memo) included a building which was sized accommodate additional potable water storage.
  - Building size in this cost estimate reduced to accommodate only the GAC for comparison to other options
- O&M costs require a pilot to confirm. These costs are based on other regional GAC systems and estimates of labour to complete replacement of media

COSTS

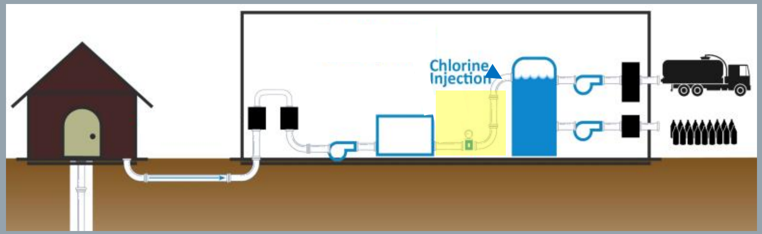
Capital: $600,000

Annual Operations and Maintenance: $4,000-6,000

20 Year Life Cycle Costs: $680,000 – 720,000

Benefits	Drawbacks
Known technology, with low operations and maintenance costs	Catalytic treated carbon is specialized and would require a high dissolved oxygen (aeration) or oxidant upstream
Bench scale tests indicate effective sulphide removals with GAC	Manganese dioxide (Greensand) filters require chemical regeneration regularly (which likely require specialized disposal and increased costs)

URBAN SYSTEMS



2D - ADSORPTION TECHNOLOGIES

PREVIOUSLY ASKED QUESTIONS

Q: What would the daily cost of production be with the GAC system in place.

A: Without piloting, it is difficult to estimate the increase O&M for this site. It would be dependant on the capital investment (volume of GAC media bed), balanced with need to replace the media. Ideally, the media replacement would be 3-5 years. Based on the O&M identified above ($19,000 per occurrence, $4,000 - $6,000 annually), it would equate to between $11 - 16/day.

Q: What is the on-going maintenance that would occur above and beyond the current operational maintenance?

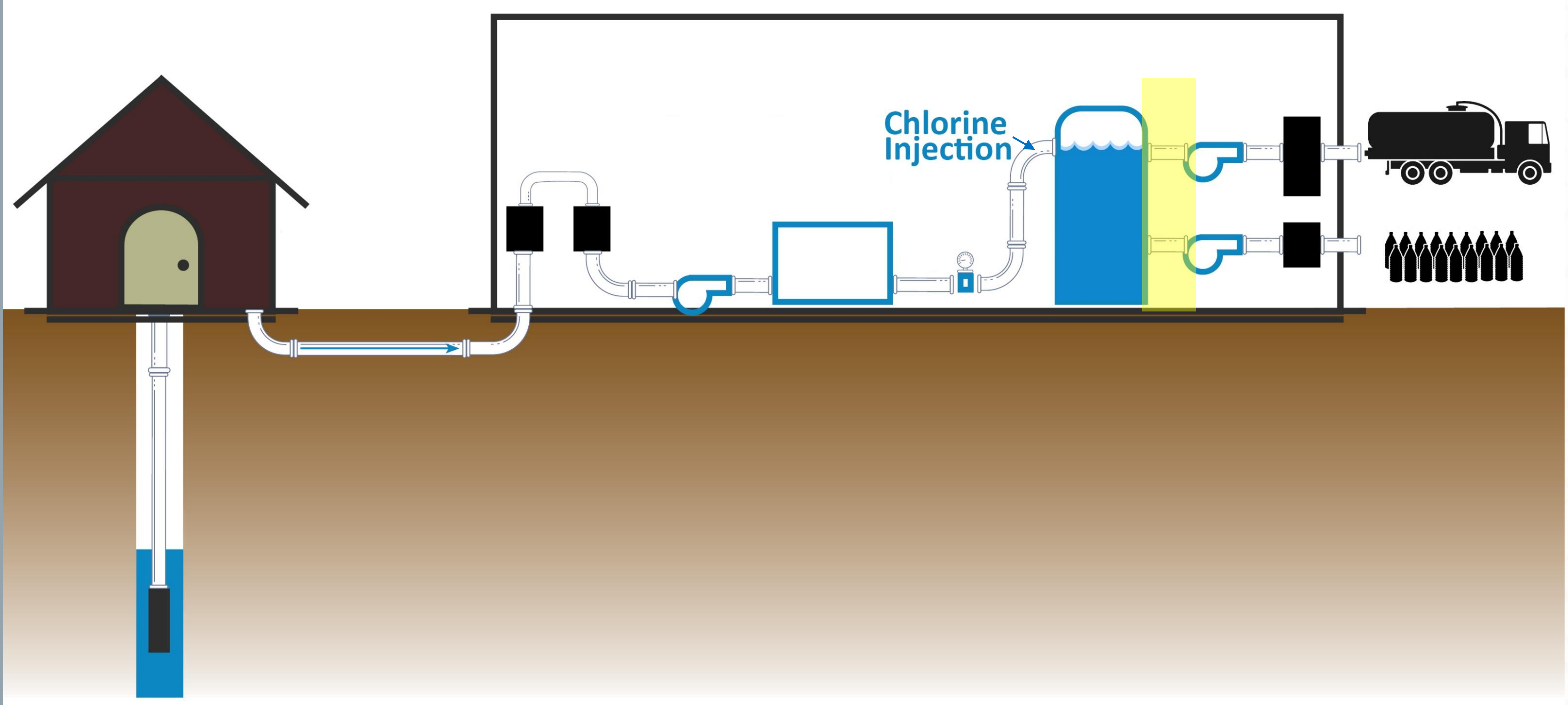
A: Daily, the additional maintenance is minimal. The primary additional maintenance would be periodical (greater than annually) replacement of the media.

Q: What would the recharge time be if the water had to first run through the GAC system.

A: The GAC would be sized to the same as the treatment system, and would not impact treatment rates.

URBAN SYSTEMS

2E – ALTERNATE DISINFECTANT



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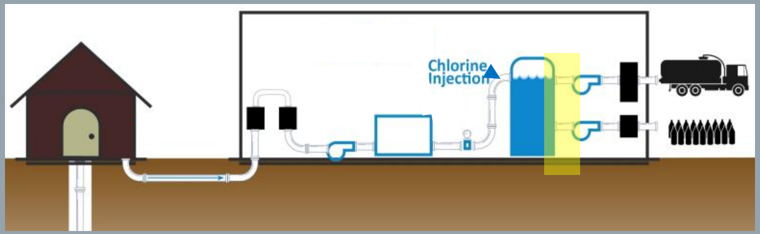


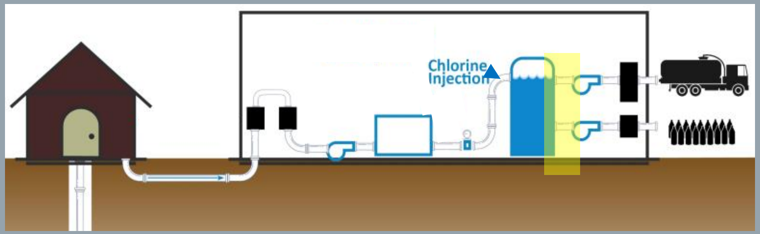
2E – ALTERNATE DISINFECTANTS

- An alternate (or no) disinfectant could be utilized, **however treatment of the sulphides is still required.**
- Alternate disinfectant could be UV (ultra-violet)

REASONS FOR DISINFECTION

- There are two types of disinfection:
  - Primary – Used to treat bacteria and viruses in the source water.
    - This site utilizes groundwater, and has been characterized as “low risk for containing pathogens”
  - Secondary – this is the chlorine residual that is maintained to prevent bacteria growth downstream of the WTP (homeowner’s cisterns).
    - To date the PRRD had required that a chlorine residual was to be maintained which limited sulphide removal options as turbidity (cloudiness) was an issue.
    - NHA has indicated that because this site has a low risk for containing pathogens, a secondary disinfectant is not required.
    - UV would not provide secondary disinfection as it does not provide a residual.

URBAN SYSTEMS



2E – ALTERNATE DISINFECTANTS

PREVIOUSLY ASKED QUESTIONS

Q: Is there another disinfectant other than Chlorine that we could use that would not cause the chemical reaction resulting in turbidity?

A: Yes, UV (Ultraviolet) could be used, however this would not maintain a chlorine residual for water that is sold and does not address the sulphides issue (which needs to be addressed to open the station according to NHA).

To date the PRRD has requested chlorine to be utilized while we investigated methods to treat the sulphides.

LEVEL OF SERVICE – PREVIOUSLY ASKED QUESTIONS

Q: Are we going to go through all of this and find that the storage capacity is not enough for demand like we have found at the Boundary station?

A: The treatment capacity of this station is 75 L/min, however the well can only sustain 56 L/min (plus reject water of 15 L/min). This is similar to the Feye Spring Station.

The potable water storage is 10,000 L (same as Buick and Feye Spring). The fill rates to the trucks is the same as all other sites (320 L/min).

The well capacity is the limiting factor at this site; it was identified during conceptual design that this would be sufficient.

Q: How long will it take for the tank to recharge?

A: For 10,000L, it will take approximately 3 hours to fill back up to full (assuming no additional loads in the interim). Additional measures have already been installed to allow for production to start if a big load is requested. Any measures to address the sulphides will not impact the recharge time as they will be designed to handle 75 L/min. The well is the limiting factor.

URBAN SYSTEMS

OTHER COMMUNITIES

- Doig River First Nation – Splash Plate (Aeration)
- Hudson's Hope – Currently in the design process and haven't confirmed what is to be used yet
- Simpcw First Nation – Two separate systems, each with sulphide issues;
  - System 1: Manganese Dioxide Filters (Greensand)
  - System 2: Splash Plate

URBAN SYSTEMS

OPTION 3
NEW LOCATION AND/OR ALTERNATE SOURCE

These options were explored in response to direction provided by PRRD staff.

THREE OPTIONS WERE EXPLORED

- Relocation of the existing station to a new well source (better water quality)
- Development of a new surface water source at the current location (Dugout)
- Relocation the existing treatment station to a new surface water source (river, creek or lake)

URBAN SYSTEMS

OPTION 3
NEW LOCATION AND/OR ALTERNATE SOURCE

PREVIOUSLY ASKED QUESTIONS

Q: Would the PRRD be able to move the existing station to another site / water source?

A: Yes the PRRD would be able to move the existing treatment facility to another site. This process could be lengthy and require significant capital investment, including the following:

- Hydrogeologist – well locating, drilling and pump testing
- Well drilling and completion
- Design Professionals – Civil, Electrical, Environmental, Geotechnical
- Topographic survey
- Geotechnical study
- Water licensing and permits (NHA, MoTI, DFO)
- Piling design and installation
- Land purchase
- Electrical connection costs
- Legal costs (including survey)
- Costs to terminate existing agreement with landowner's
- Building Relocation – disconnect and relocate
- Construction of new infrastructure on site (site access, piping, reject ponds
- Reconnection of landowner's water system for their usage

URBAN SYSTEMS

3A – RELOCATION OF THE EXISTING STATION TO A NEW WELL SOURCE

- PPRD engaged with Pengrowth on existing wells near site – determined not a viable option

Assumptions:

- 3 phase power available at property
- Reject water pond is still required and similar size to Rose Prairie site
- Current treatment would meet the Guidelines for Canadian Drinking Water Quality

COSTS

Capital: $1.3 Million

Increase to Annual Operations and Maintenance: $0

20 Year Life Cycle Costs: $1.3 Million

Benefits	Drawbacks
Would provide potable water to residents in Rose Prairie area	• May be difficult to find better quality raw water in Rose Prairie area
	• Lost investment in Rose Prairie site (infrastructure, termination of lease, reconnection of existing system)

URBAN SYSTEMS

3B – DEVELOPMENT OF A NEW SURFACE SOURCE AT CURRENT LOCATION (DUGOUT)

- NHA – Didn't say No - PRRD would need to complete a source water assessment – require dugout construction and testing prior to treatment design and NHA acceptance (concerns expressed about agricultural influence on water quality).

Assumptions:

- Will require additional treatment due to surface water source rather than groundwater source (well)
- Plan to avoid Dam Safety Regulations – berm high and volume impounded
- Catchment area is approximately 1.3km^2
- Dugout sized to accommodate 21,000m^3 (25% reject water, evaporation, precipitation)

COSTS

Capital: $1.6 Million

Increase to Annual Operations and Maintenance: $78,000

20 Year Life Cycle Costs: $3,160,000

Benefits	Drawbacks
Utilize the existing site and infrastructure	Amendments to legal contract and land purchase or agreement likely required
Would provide potable water to residents in the Rose Prairie area	Capital investment required to prove option prior to approval from NHA
	Reliant on precipitation for source
	Likely lengthy process to gain approval from NHA
	Additional capital required to make the treatment useful for surface water source

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3C - RELOCATION THE EXISTING TREATMENT STATION TO A NEW SURFACE WATER SOURCE (RIVER OR CREEK)

Assumptions:

- 3 phase power available at property
- Reject water pond is still required and similar size to Rose Prairie site
- Will require additional treatment due to surface water source rather than ground water source (wells)
- Water source is available year round and freezing is not an issue (storage for winter months is not included)

COSTS

Capital: $2.1 Million

Increase to Annual Operations and Maintenance: $78,000

20 Year Life Cycle Costs: $3.66 Million

Benefits	Drawbacks
Would provide potable water to residents in the Rose Prairie area	Additional capital required to make the treatment useful for surface water source
	Source risk – impacts from resource and oil and development, agriculture in the area (ie: oil spill or pesticides)
	High seasonal variability of water quality for most regional surface water sources

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NORTHERN HEALTH AUTHORITY DISCUSSION SUMMARY

- (October 2019) During initial testing, NHA indicated that they would approve an increase to turbidity levels to < 3 NTU (from < 1 NTU) if this could be consistently met.
  - *Even at < 3 NTU, the process optimization (Option 2A) could not meet this requirement.*
- (December 2019) Based on inconsistent test results, NHA was not willing to open station with a water quality advisory for heightened turbidity.
- (May 2020) Due to the existing source being categorized as low risk for containing pathogens, NHA would be willing to approve removing any requirements for chlorine residual (secondary disinfection).
- (May 2020) NHA willing to review a dug-out as an alternate source, however would need to have a source water assessment report completed (including water quality and treatment of those parameters)
- Any option moving forward requires:
  - Construction permit application (which includes design drawings) for approval prior to construction
  - Source Water Approval (if new source is selected)

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OPTION 4: OTHER OPTIONS

- Partnerships
- Sell and Abandon Site

4A - PARTNERSHIPS

1) Partner with another party to complete necessary upgrades to the station
2) Sell the current system to a private water provider to provide water to residents
3) Service Agreement with local water hauler for residents in Rose Prairie area (abandon station and haul from FSJ)

PARTNER WITH ANOTHER PARTY TO COMPLETE NECESSARY UPGRADES TO THE STATION

Outside partner contributes capital dollars to complete necessary capital upgrades with a portion of revenue to cover costs.

Benefits	Drawbacks
Will provide potable water to residents without further investment from the PRRD	Portion of revenue to go to partner/investor
Eliminates the need of possible losses of current investment	Ability to control price setting may be hindered due to outside partner and payback requirements
Access to additional funds to complete necessary upgrades	Legal agreement may need to be amended to include partner

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4A - PARTNERSHIPS

1) Partner with another party to complete necessary upgrades to the station
2) Sell the current system to a private water provider to provide water to residents
3) Service Agreement with local water hauler for residents in Rose Prairie area (abandon station and haul from FSJ)

SELL THE CURRENT SYSTEM TO A PRIVATE WATER PROVIDER TO PROVIDE WATER TO RESIDENTS

Sell the current treatment system to a private provider. They would be responsible for capital upgrades and keep all revenue for the site

Benefits	Drawbacks
Provides potable water to the residents of the Rose Prairie area	No control over price of water for residents
Eliminates the need for additional PRRD investments	Likely impacts to operations and /or contract with Aquatech with new ownership
Investor responsible for further system upgrades	Likely little to no return on current investment in sale

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4A - PARTNERSHIPS

1) Partner with another party to complete necessary upgrades to the station
2) Sell the current system to a private water provider to provide water to residents
3) Service Agreement with local water hauler for residents in Rose Prairie area (abandon station and haul from FSJ)

SERVICE AGREEMENT WITH LOCAL WATER HAULER FOR RESIDENTS IN ROSE PRAIRIE AREA (ABANDON STATION AND HAUL FROM FSJ)

Abandon an sell the current Rose Prairie station infrastructure and enter into an agreement with water hauler(s) to haul water at a pre-determined rate

Benefits	Drawbacks
Provides potable water to residents in the Rose Prairie Area	PRRD to likely subsidize the water costs for the area
Supports local hauling companies	Likely deemed unfair to other residents of Area 'B' utilizing other stations, or hauling their own water

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4B -SELL STATION AND ABANDON

- Total cost invested to date at this site is $1.05 Million
- Anticipate re-sale of treatment facility only
- Re-sale approx. 35% of capital investment ($81,000 of $232,000)
- Loss to PRRD $968,000

Benefits	Drawbacks
No further capital investments required by the PRRD	No potable water available for residents of the Rose Prairie area
	Loss of $968,000
	Unclear if there is a market for the treatment facility

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SUMMARY AND NEXT STEPS

AREA B WATER SERVICE

PURPOSE

- Provide potable water to promote livable and safe communities within Area B
- Meet Guidelines for Canadian Drinking Water Quality first and foremost from a health perspective, and secondary from an aesthetic perspective

GOALS

- Provide a water service that is socially, environmentally and economically sustainable
- As residents' access to water evolves and becomes more limited, we need to ensure fair access to potable water for Area B residents.

OUTCOMES

- Four operational stations servicing an estimated 2300 residents (740 residences)
- One station which requires additional consideration in order to meet the purpose as identified above

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SUMMARY OF OPTIONS REVIEWED FOR ROSE PRAIRIE

MODIFICATIONS TO EXISTING WELL	MODIFICATIONS TO EXISTING TREATMENT TRAIN	NEW LOCATION OR ALTERNATE SOURCE	OTHER OPTIONS
• Well Treatment	• Process Optimization (Chlorination for Sulphide Removal and Filtration) • Pre-Treatment (Oxidation) • Aeration • Adsorption Technologies (GAC) • Alternate Disinfectants	• New groundwater well • Dug-out • River or Creek	• Partnerships • Sell Station and Abandon

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SUMMARY OF OPTIONS – COMPARISON

- Each option has been ranked as “most favourable” (blue), “medium favourability” (orange), or least favourable (red) in the table on the next slide below
- Existing operational costs are considered to be a baseline, and costs above and beyond the existing operations contract are shown.
- Options 1 - 3 include 30% contingency and 15% engineering on capital costs.

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Option	Operational Complexity	Timelines to implementation	Capital Cost	20 Year Life Cycle Costs (Above existing O&M costs)	Ability to meet Drinking Water Quality Guidelines	Overall Suitability and Recommendation
1A - Well Treatment	Significant coordination with drillers		$0	$8.4 Million	Unknown	Not Recommended
2A - Process Optimization			$0	$240,000	No	Not Recommended
2B - Pre-Treatment (Oxidation)			$190,000 - $495,000	$790,000 – $1,570,000		Potentially viable
2C - Aeration			$220,000	$364,000		Not Recommended
2D - Adsorption (GAC)			$600,000	$680,000 – 720,000		Recommended
2E – Alternate Disinfectant			$20,000 + Sulphide Treatment	$20,000 + O&M from Sulphide treatment	Will not treat sulphides	Not recommended
3A - New Source: Groundwater Well		Lengthy	$1.3 Million	$1. 3 Million		Potentially viable
3B - Dug-Out		Lengthy	$1.6 Million	$3.2 Million	Unknown	Not recommended
3C - New Source: River or Creek		Lengthy	$2.1 Million	$3.7 Million	Unknown	Not Recommended
4A - Partnership	N/A		Unknown			Potentially Viable
4B - Sell Station and Abandon	N/A		$0	$0	No Water Produced	Not Recommended

CLOSING AND QUESTIONS?

THANK YOU

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