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Retrofitting a 1960s Water Treatment Plant

Glasgow, Montana

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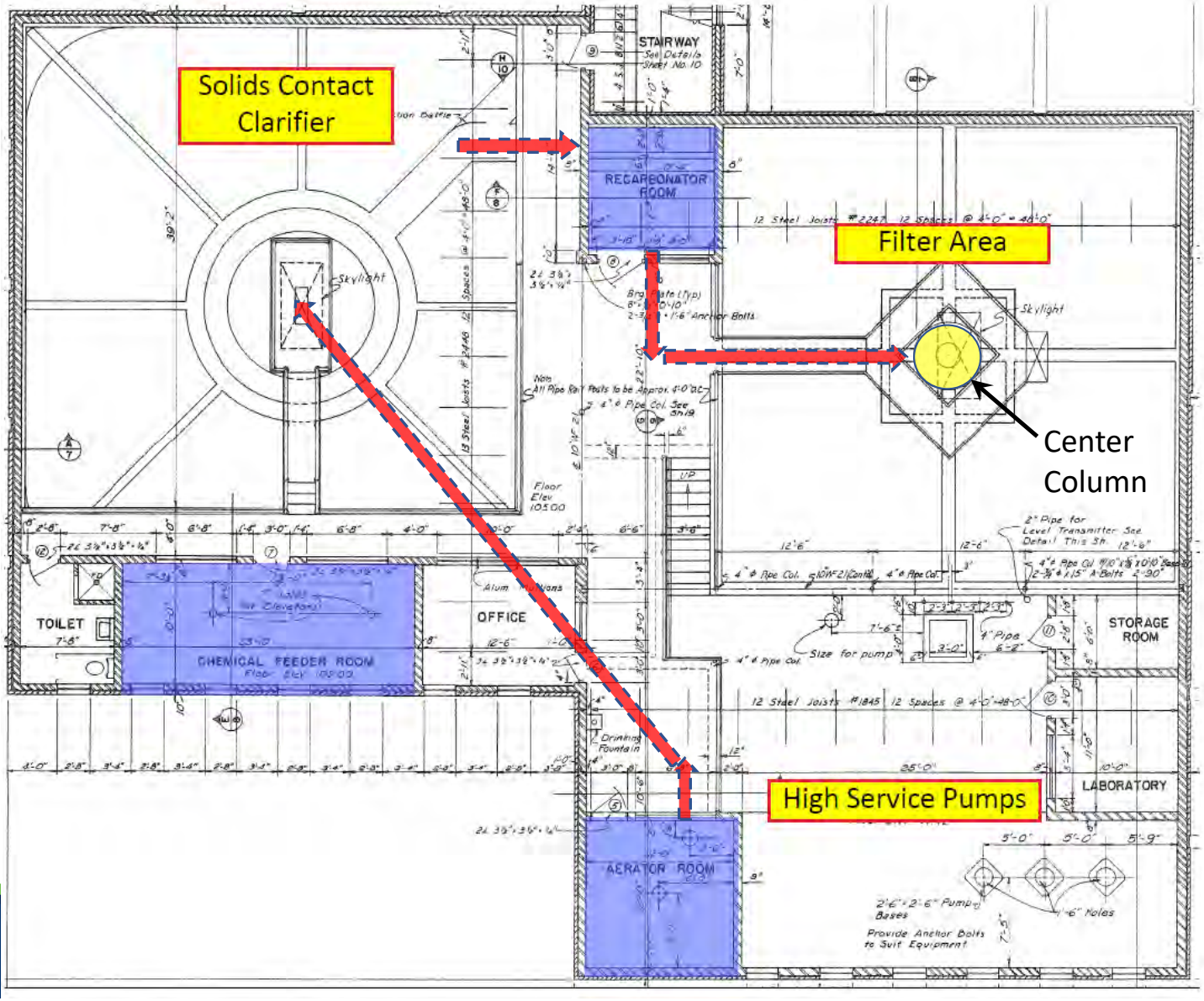
Learning Objectives

- Modern treatment technology replaced outdated equipment
- Proprietary clarifier equipment + non-proprietary filter basins = competitive bidding
- Construction sequencing plan developed in design
- Montana DEQ re-classification was required

Original Plant

- 1966 Construction, Groundwater Supply
- Lime Softening Process
  - ✓ Aeration for pH Control / Iron & Manganese
  - ✓ Solids Contact Clarifier & Recarbonation
  - ✓ Single Media (Sand) Filters



1966 Plant

1966 Population ~ 6,500

3.5 MGD Capacity

1987 Converted to Surface Water

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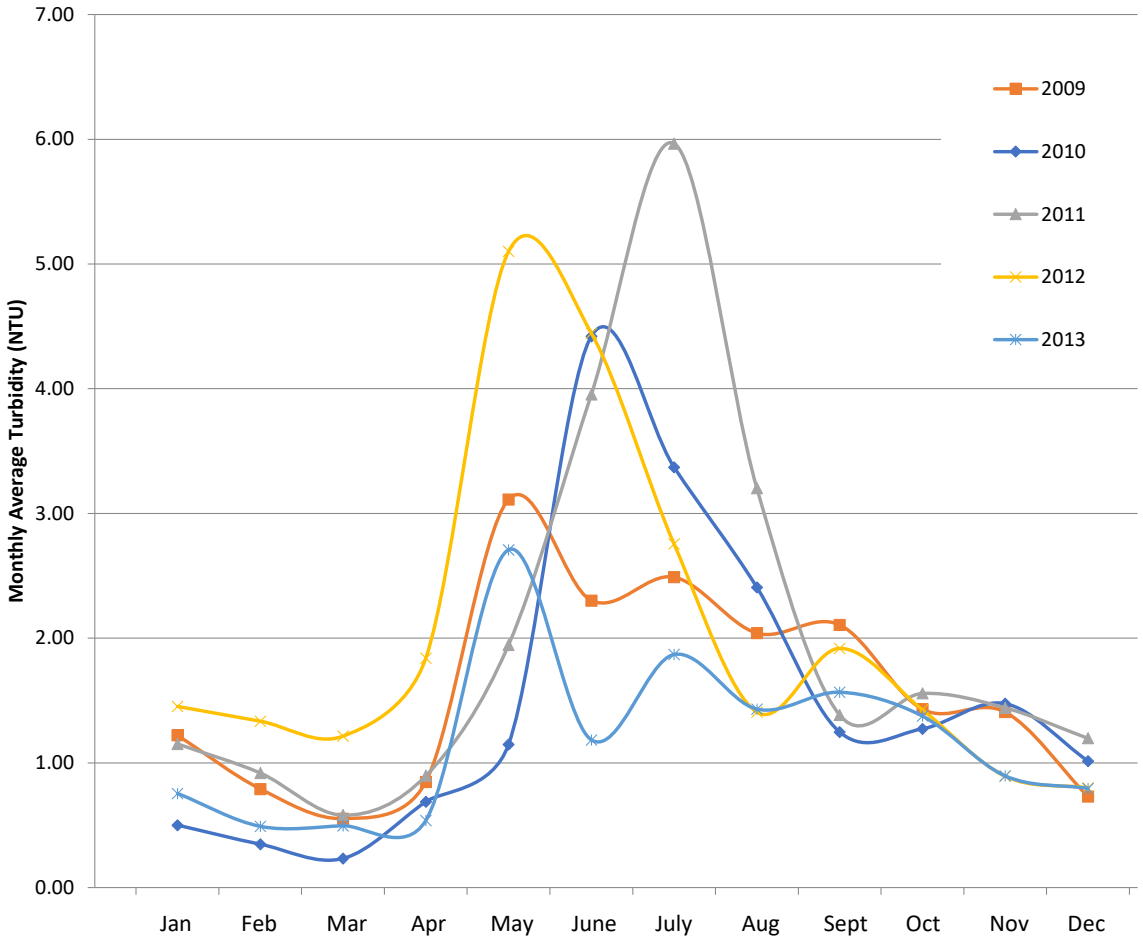
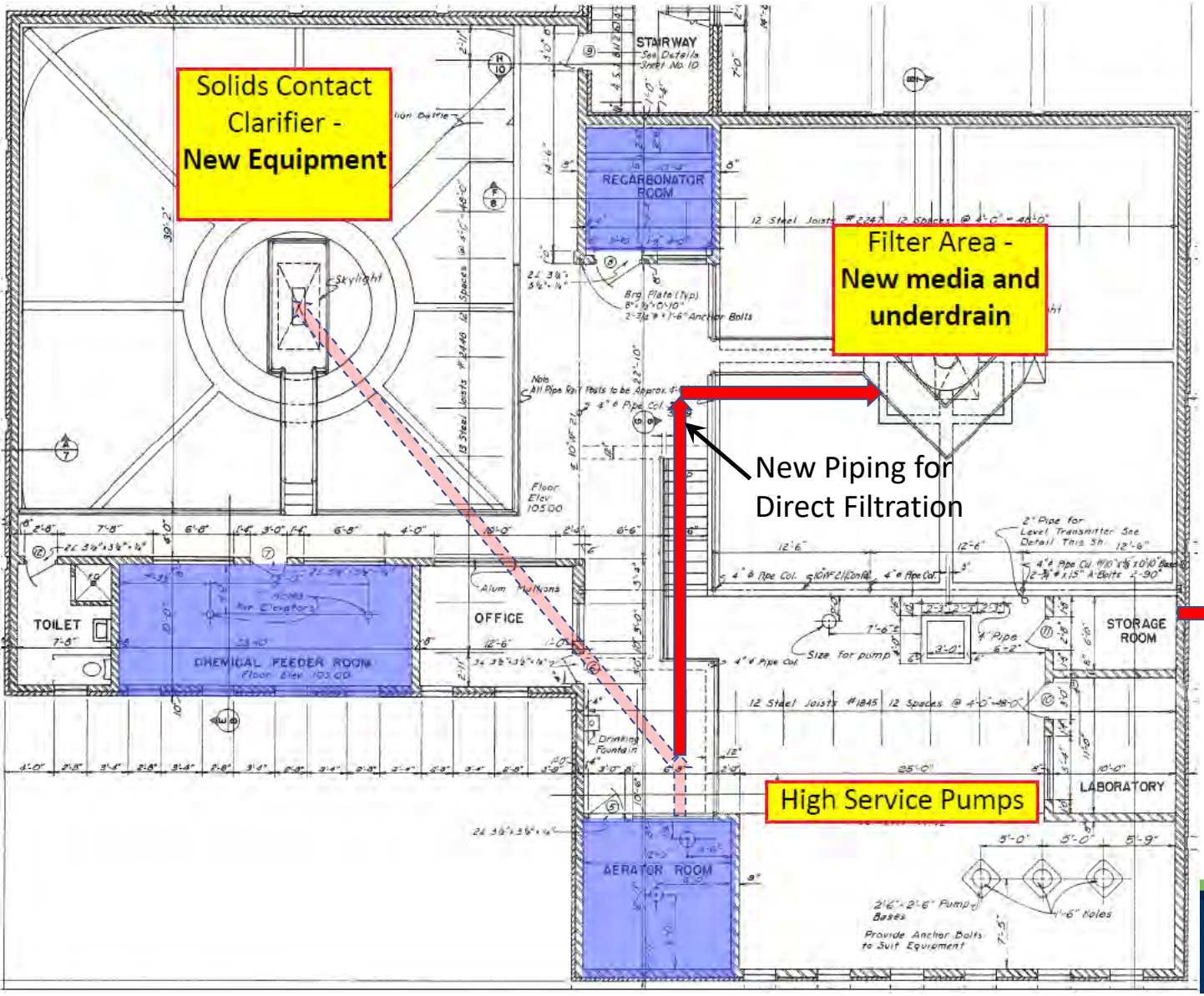
Water Quality



Missouri River Intake
Max Turbidity = 20 NTU

1987 Upgrades



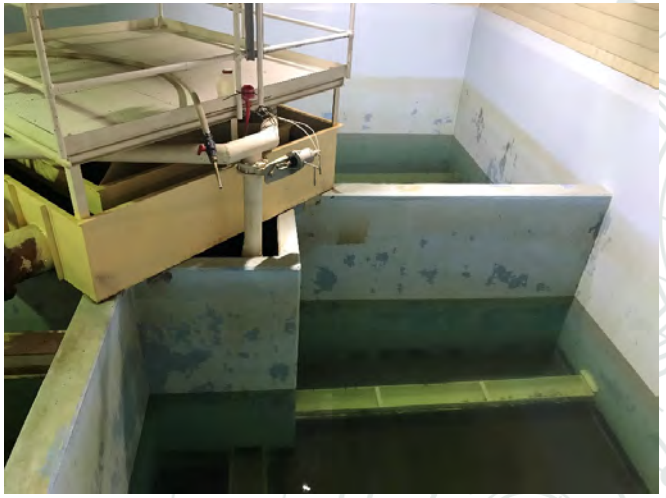
Lime softening abandoned

New chlorine contact basin

Existing Plant - 2018

Aeration - Abandoned

Recarbonation - Abandoned



Media Filters – No Change

Clarifier - Repurposed

Outdated Processes

Clarifier (Detention Basin)

- 280,000 gal
- 1.0 gpm/ft^2 max loading
- No solids
- 1987 equipment
- Maintenance issues

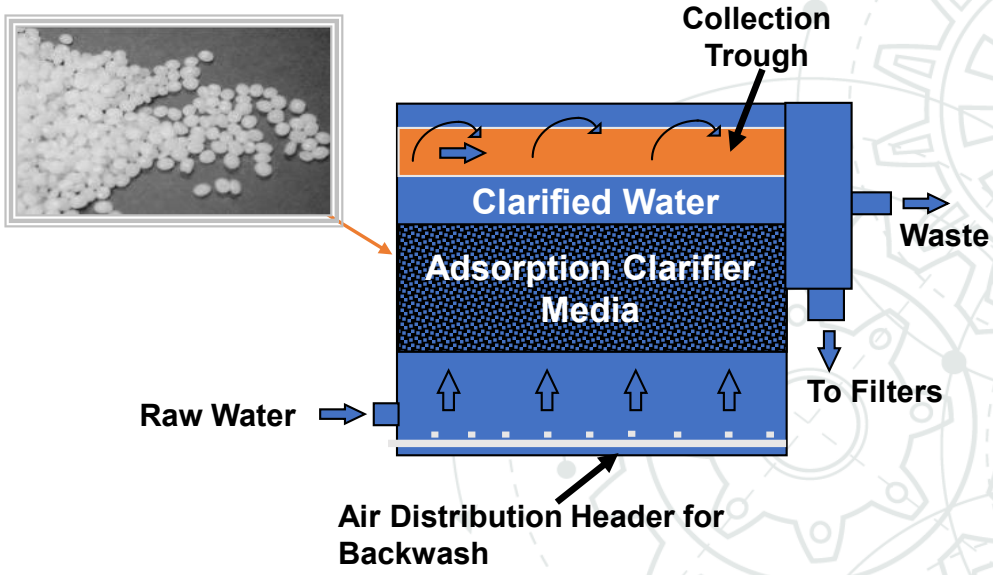
Single Media Filters

- 1987 media & underdrains
- Significant corrosion
- No filter-to-waste
- Gravity backwash (low rate)
- 1.5 gpm/ft^2 max loading

2020 Retrofit & Upgrades

Clarifier

- Contact Adsorption Clarifiers (CACs)
- Proprietary “Package” system
- Low turbidity solution



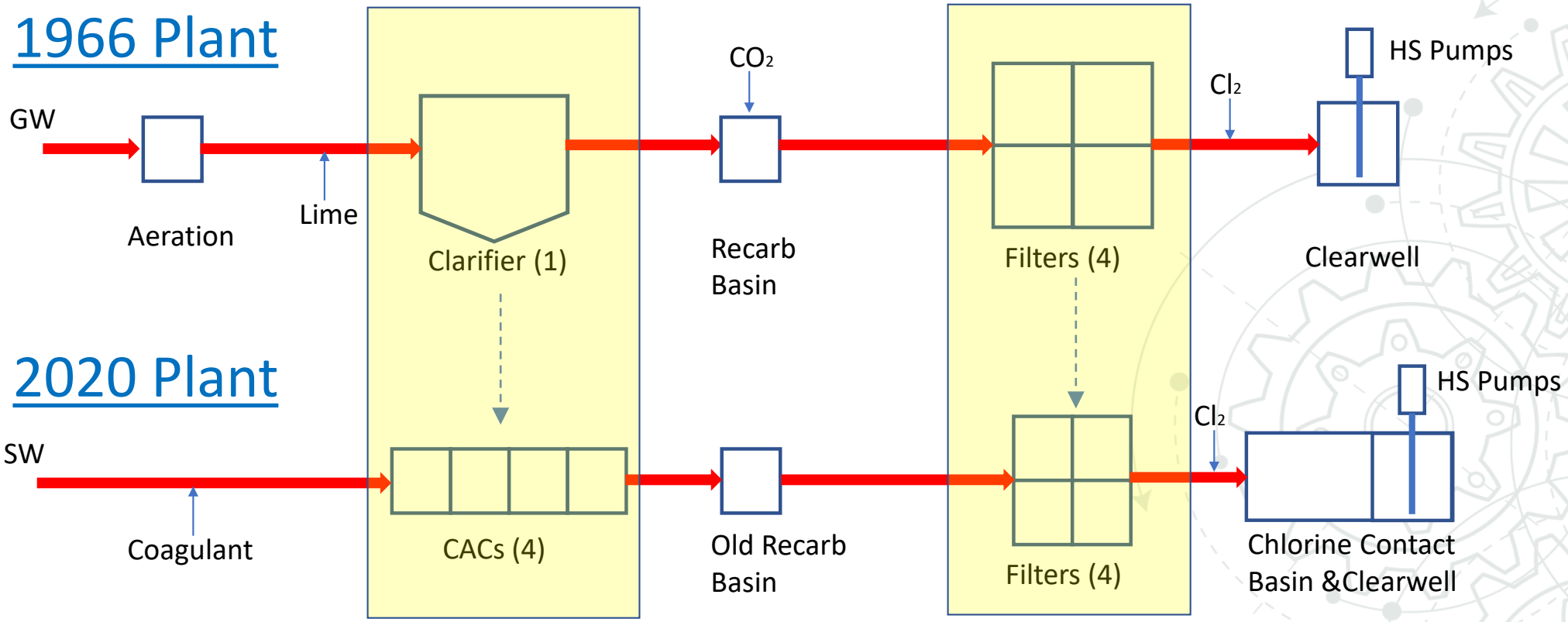
Courtesy of WesTech

2020 Retrofit & Upgrades

Media Filters

- 4 new concrete filter basins
- Dual media / plastic block underdrains
- Filter-to-waste
- Air scour & pumped backwash
- 4.0 gpm/ft^2 max loading

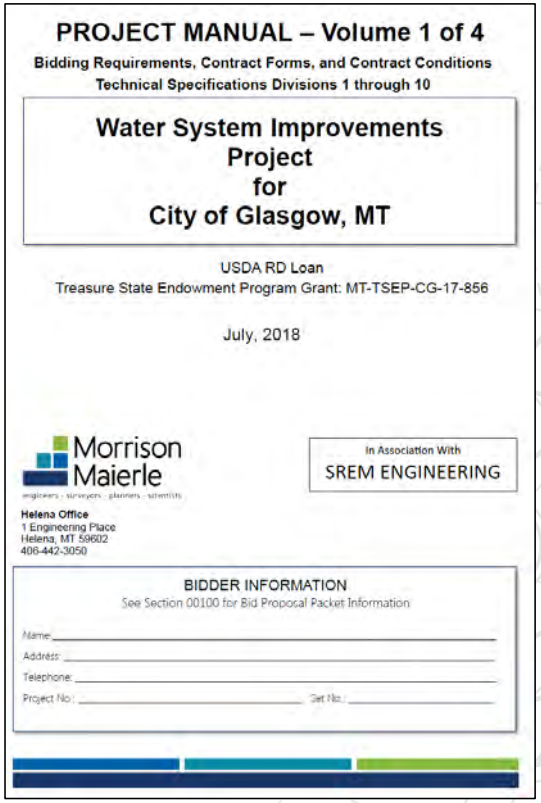
2020 Retrofit & Upgrades



2020 Retrofit & Upgrades

Bidding Process

- Design-bid-build approach
- CACs ➔ negotiated price
  - ➢ Contractor supplied
- Balance of competitive bidding



PROJECT MANUAL – Volume 1 of 4

Bidding Requirements, Contract Forms, and Contract Conditions
Technical Specifications Divisions 1 through 10

Water System Improvements
Project
for
City of Glasgow, MT

USDA RD Loan
Treasure State Endowment Program Grant: MT-TSEP-CG-17-856

July, 2018

Morrison Maierle

In Association With
SREM ENGINEERING

Helena Office
1 Engineering Place
Helena, MT 59602
406-442-3050

BIDDER INFORMATION
See Section 00100 for Bid Proposal Packet Information

Name:
Address:
Telephone:
Project No.: Set No.:

2020 Retrofit & Upgrade

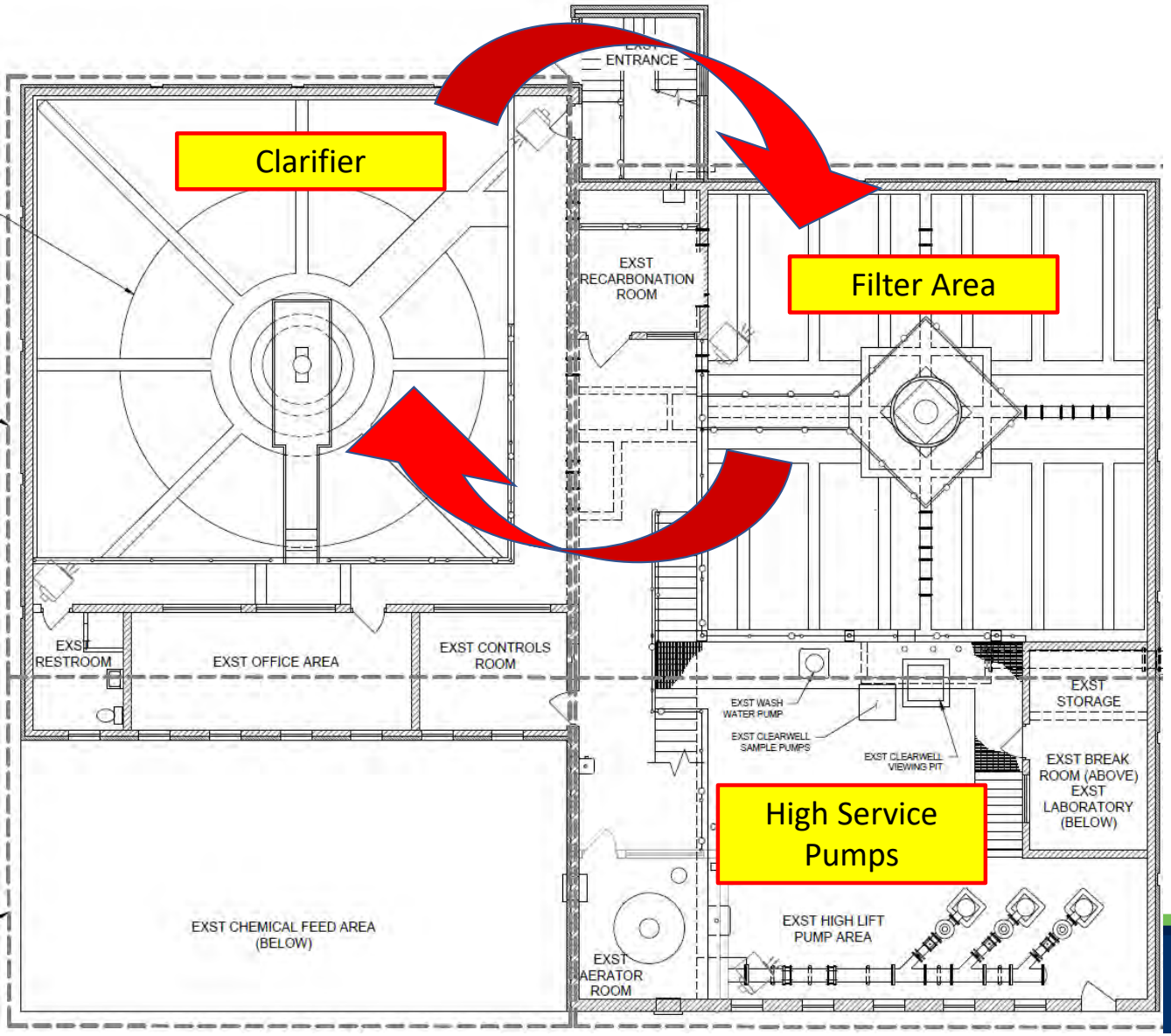
“Or Equal” Bid Items

- Filter equipment
- Backwash pumps & blower
- Gas chlorine equipment
- High service pumps
- Electrical & Control

“Sole Sourced”

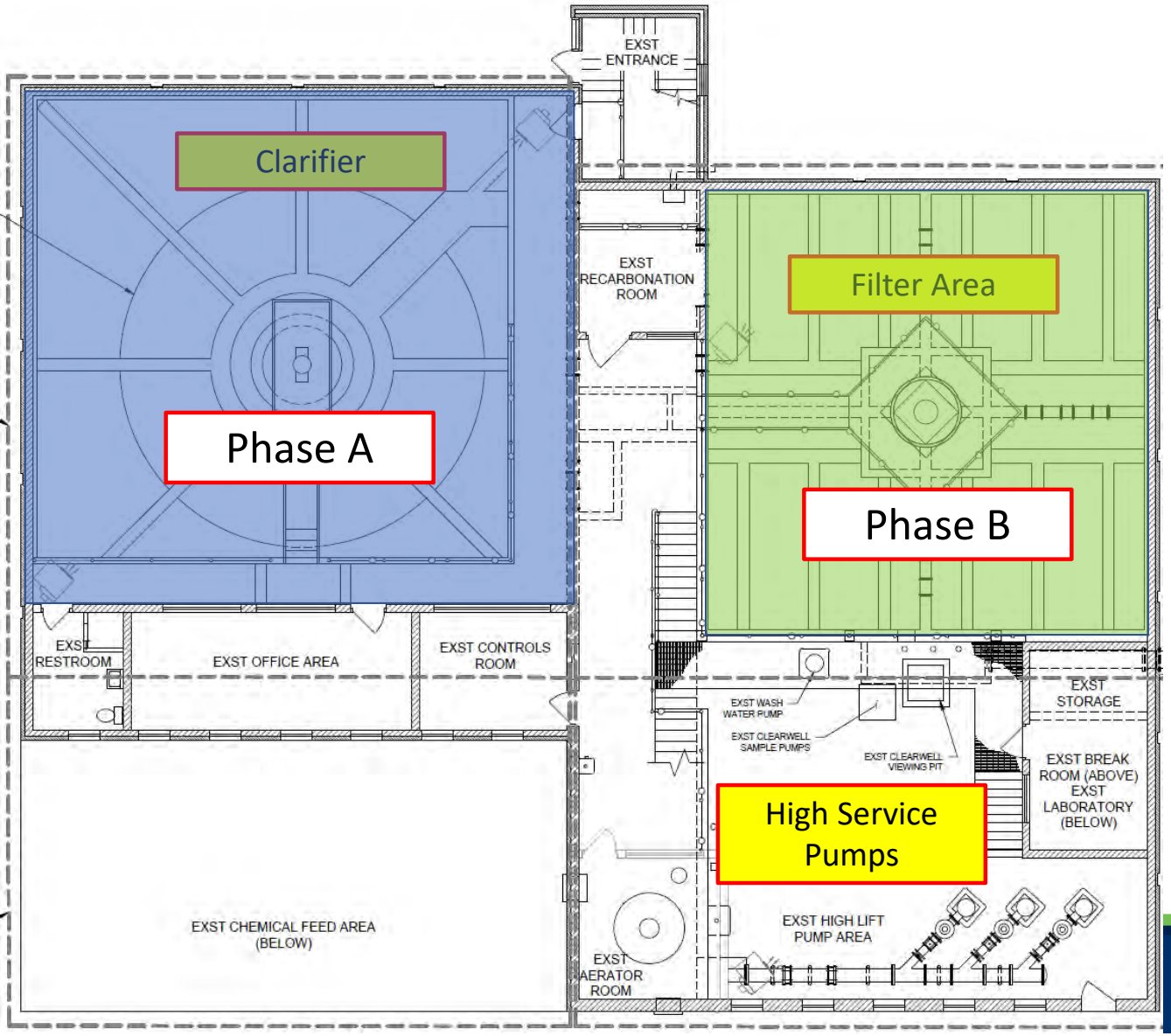
CAC equipment

- Steel tanks & internals
- Control panel & instrumentation
- Blowers



How can this be constructed?

- No building expansions
- Maintain operation
- Cost effective project
- Details in bid documents



Construction Sequencing

Phase A Construction

- Demo clarifier
- Operate plant using direct filtration
- Rehab concrete
- Construct filters
- Commissioning

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Phase A Construction

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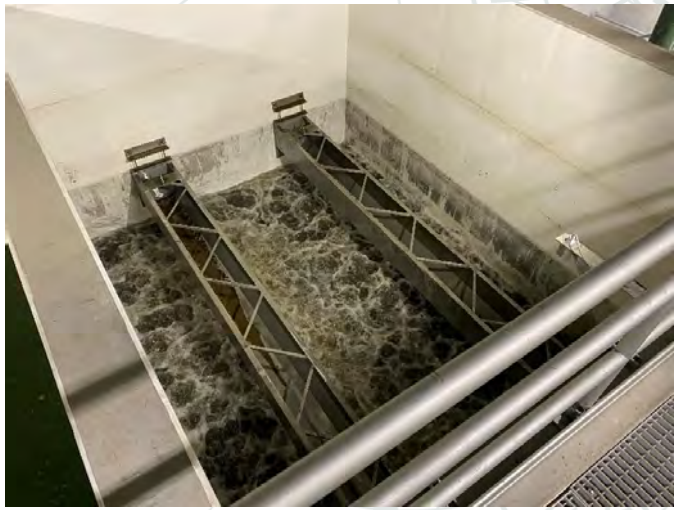
Phase A Construction



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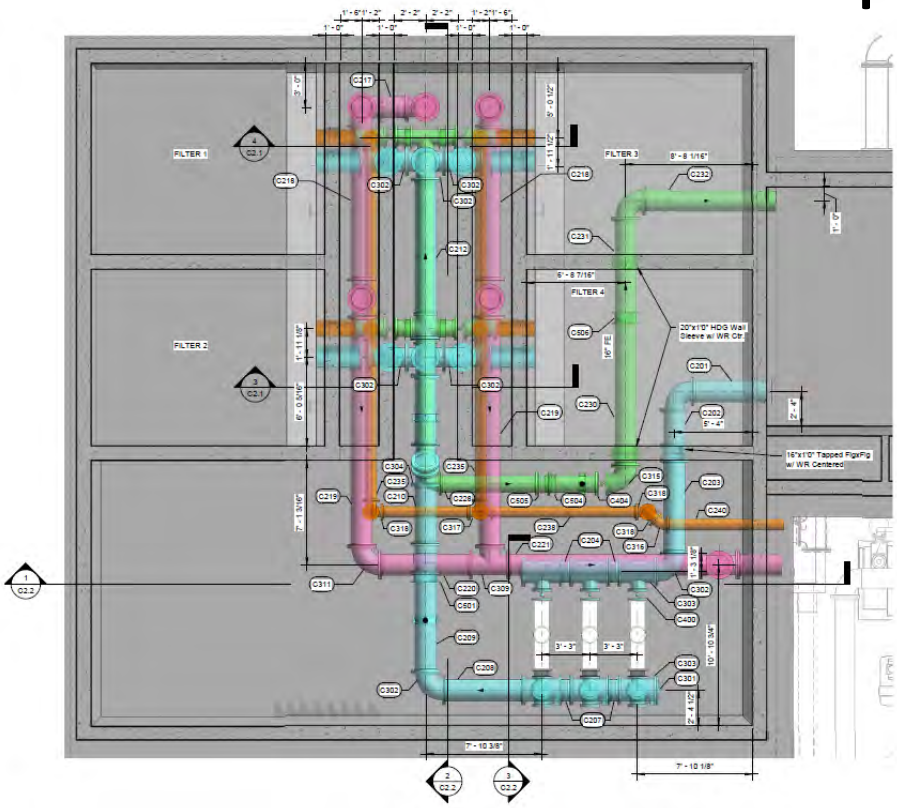
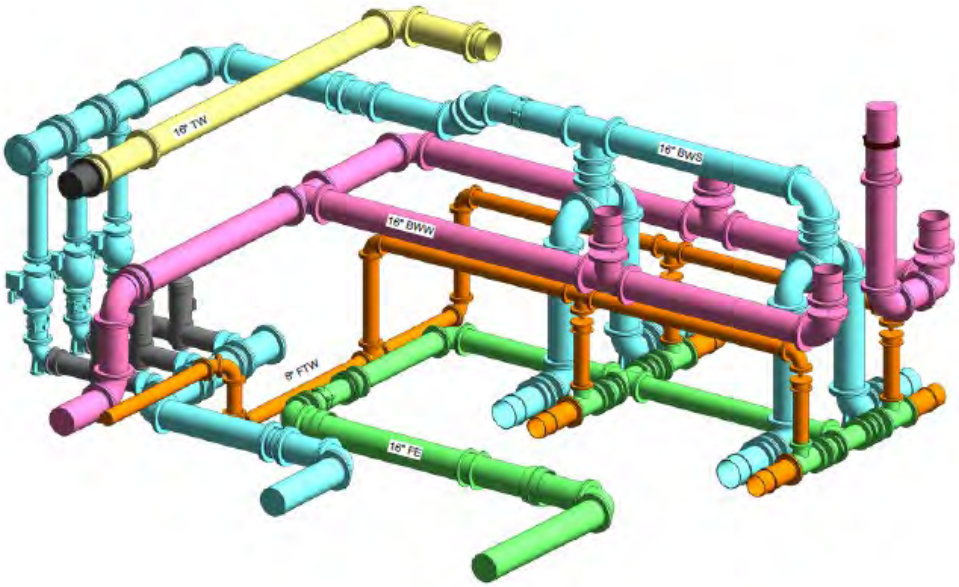
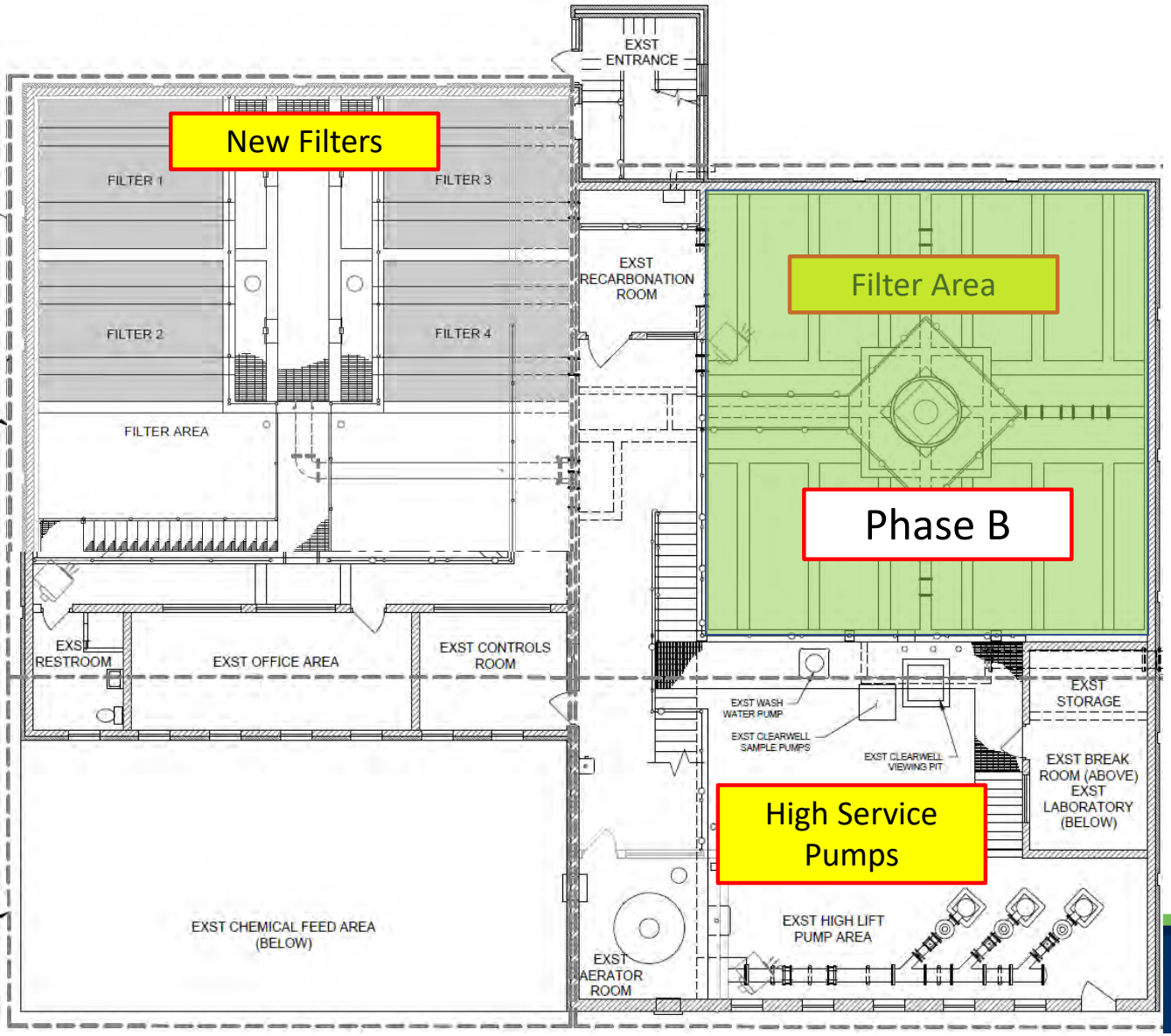
Phase A Construction

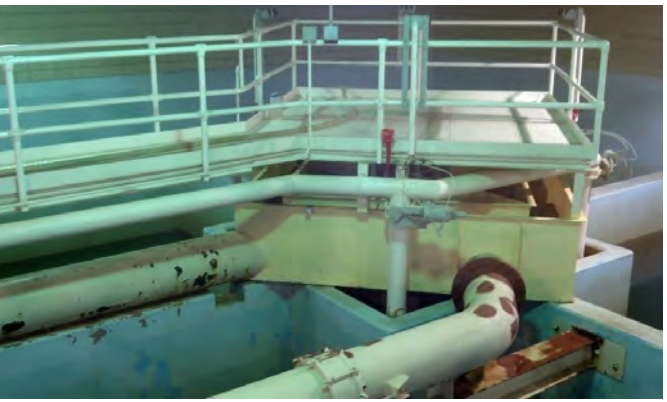






Construction Sequencing

Phase B Construction



- Demo filters
- Continue direct filtration
- Retain divider walls
- Rehab concrete
- Pour concrete slab
- Install CACs, piping & valves
- Commissioning

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Phase B Construction

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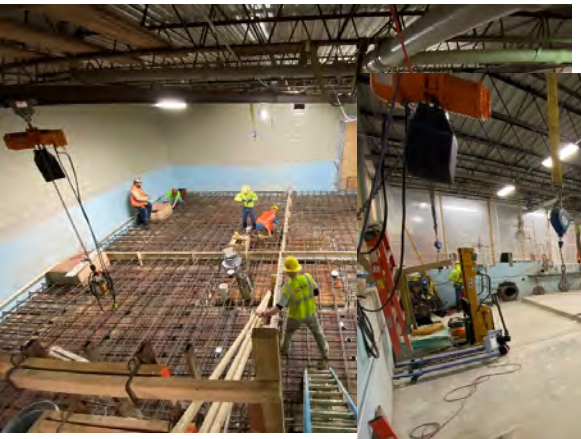
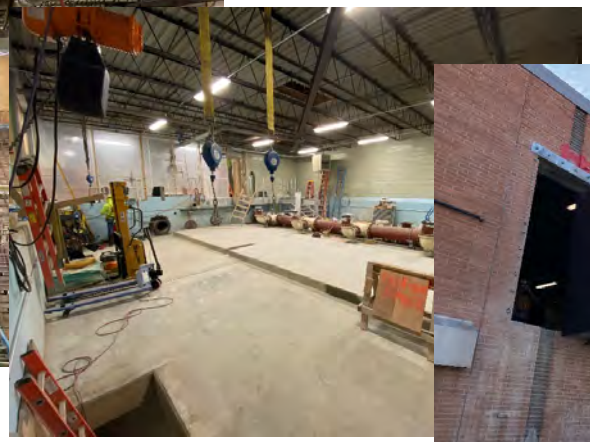
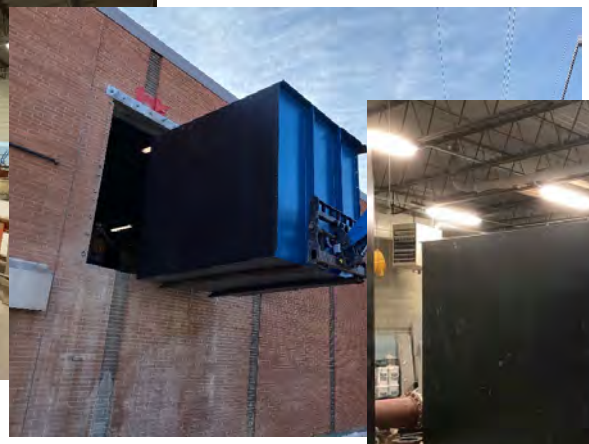
Phase B Construction

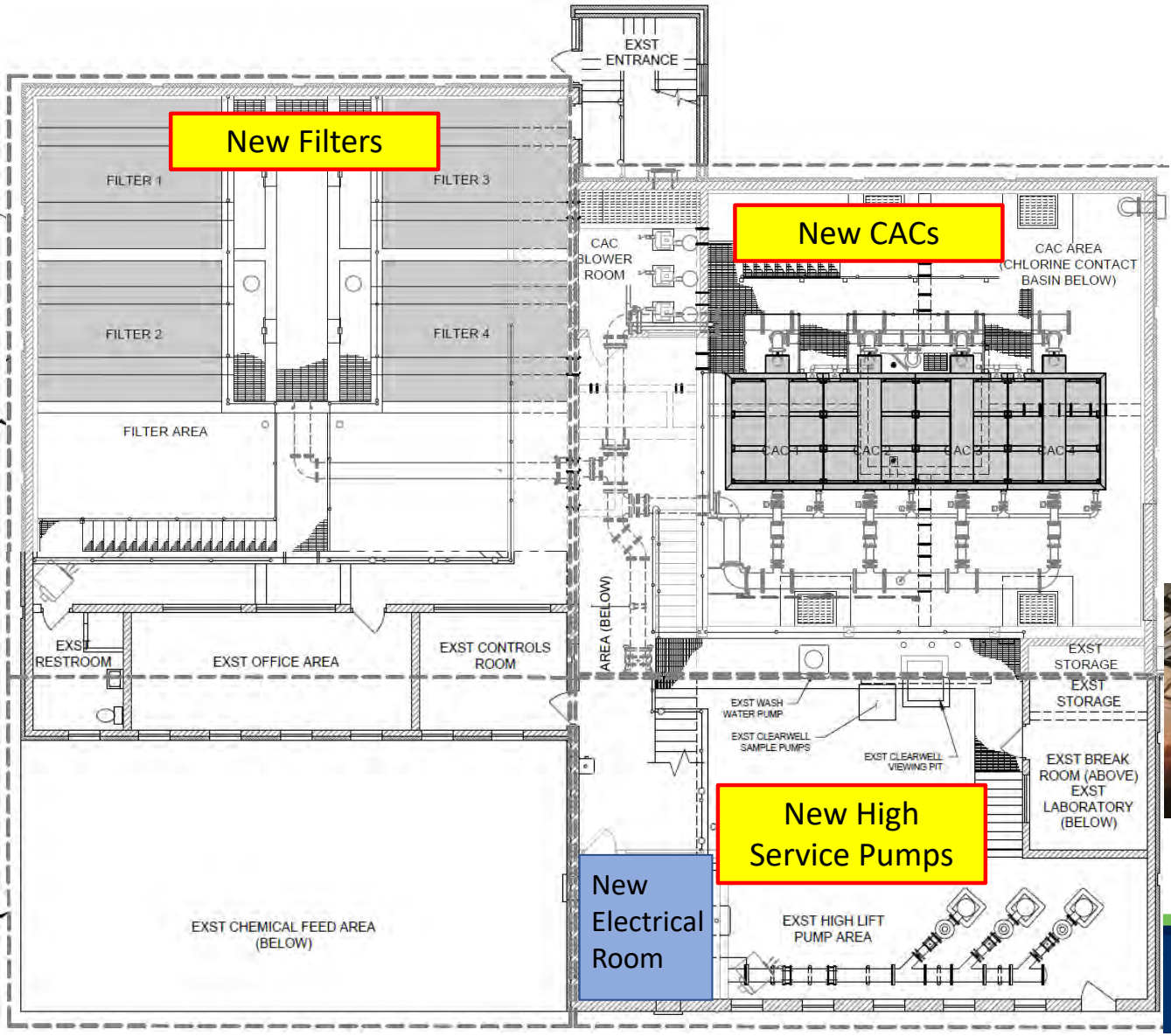






Construction Sequencing

2020 Retrofit & Upgrades



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Construction Sequencing Important Tips

- Planning and details
- Establish boundary conditions
- Operator access
- Order of commissioning
- Communication

Montana DEQ Re-classification

Conventional Filtration

"a series of processes including coagulation, flocculation, sedimentation and filtration…"

Direct Filtration

"a series of processes including coagulation and filtration but excluding sedimentation…"

Montana DEQ Re-classification

Table 1.1 Log Removal Credits for Each Type of Treatment Process

Treatment Process	Typical Log Removal Credits through Filtration			Resulting Log Inactivation Requirements through Disinfection *(excludes LT2 Requirements)*		
	Crypto-sporidium	*Giardia lamblia*	Viruses	*Crypto-sporidium*	*Giardia lamblia*	Viruses
Conventional Treatment (including Lime Softening)	2	2.5	2	0	0.5	2
Direct Filtration	2	2	1	0	1	3

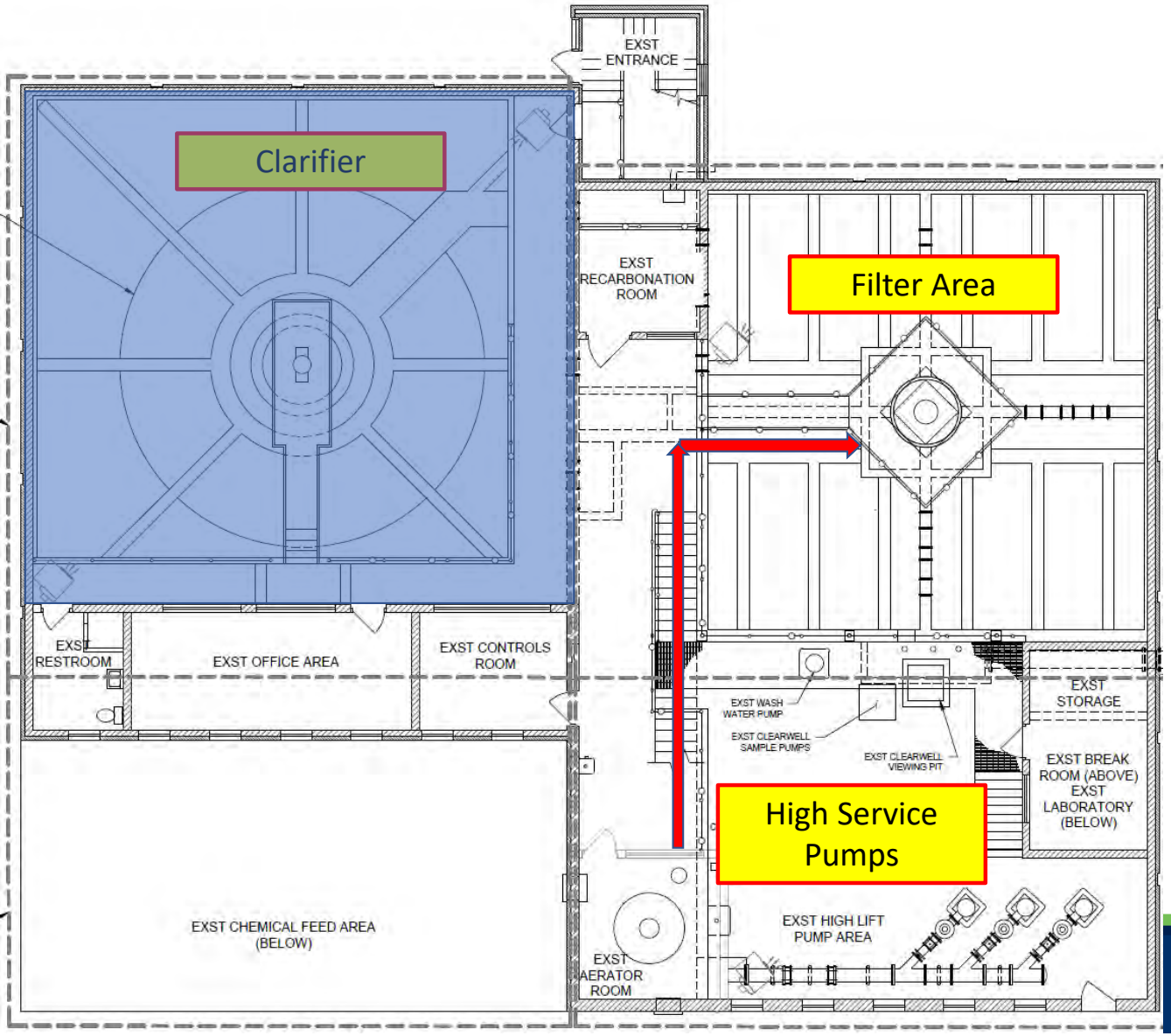
Montana DEQ Re-classification

Giardia Inactivation

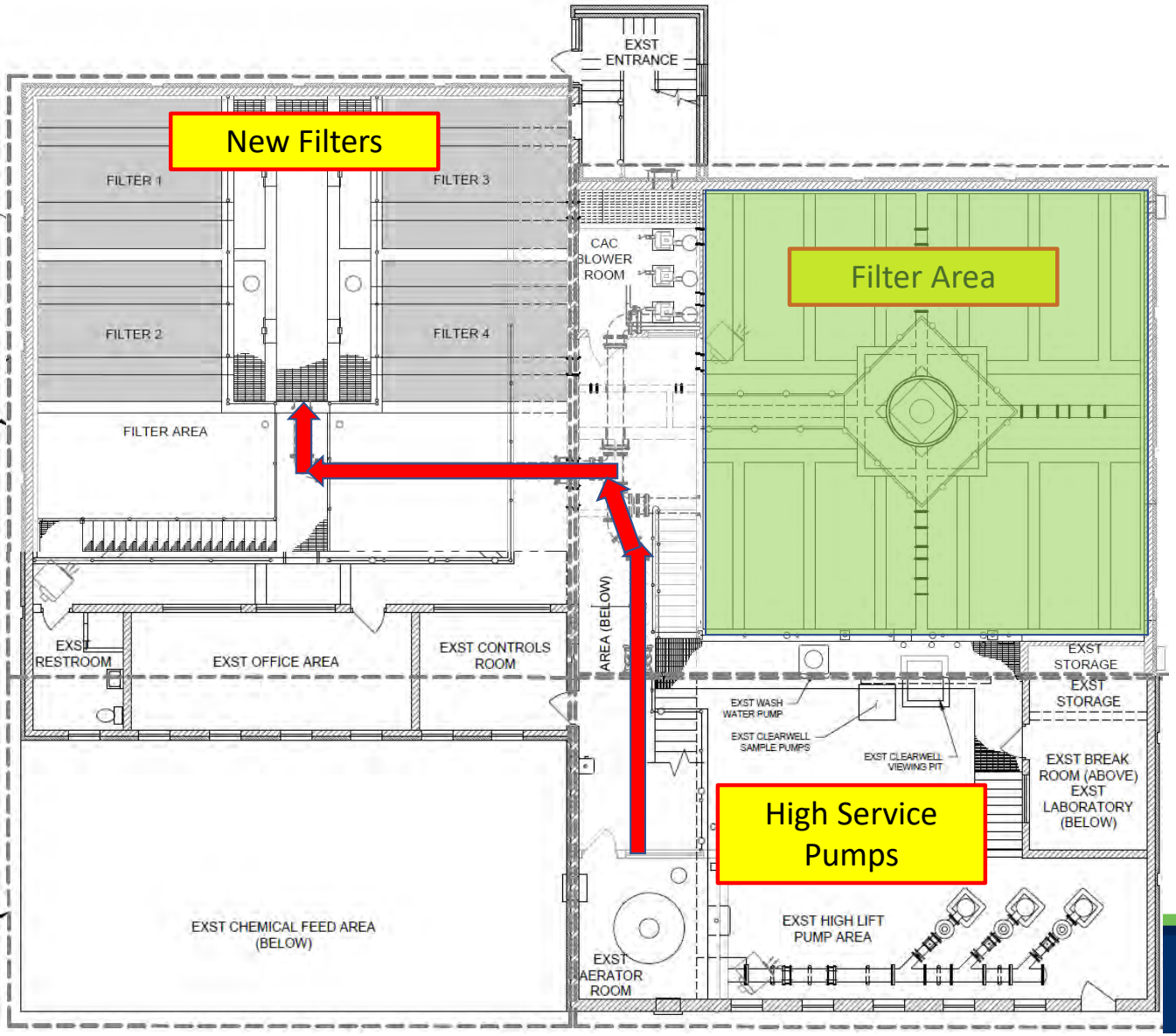
- CT Factor (C x T)
  - C = concentration
  - T = contact time

- Direct Filtration = 2 x CT

1 mg/L ➔ 2 mg/L Cl2

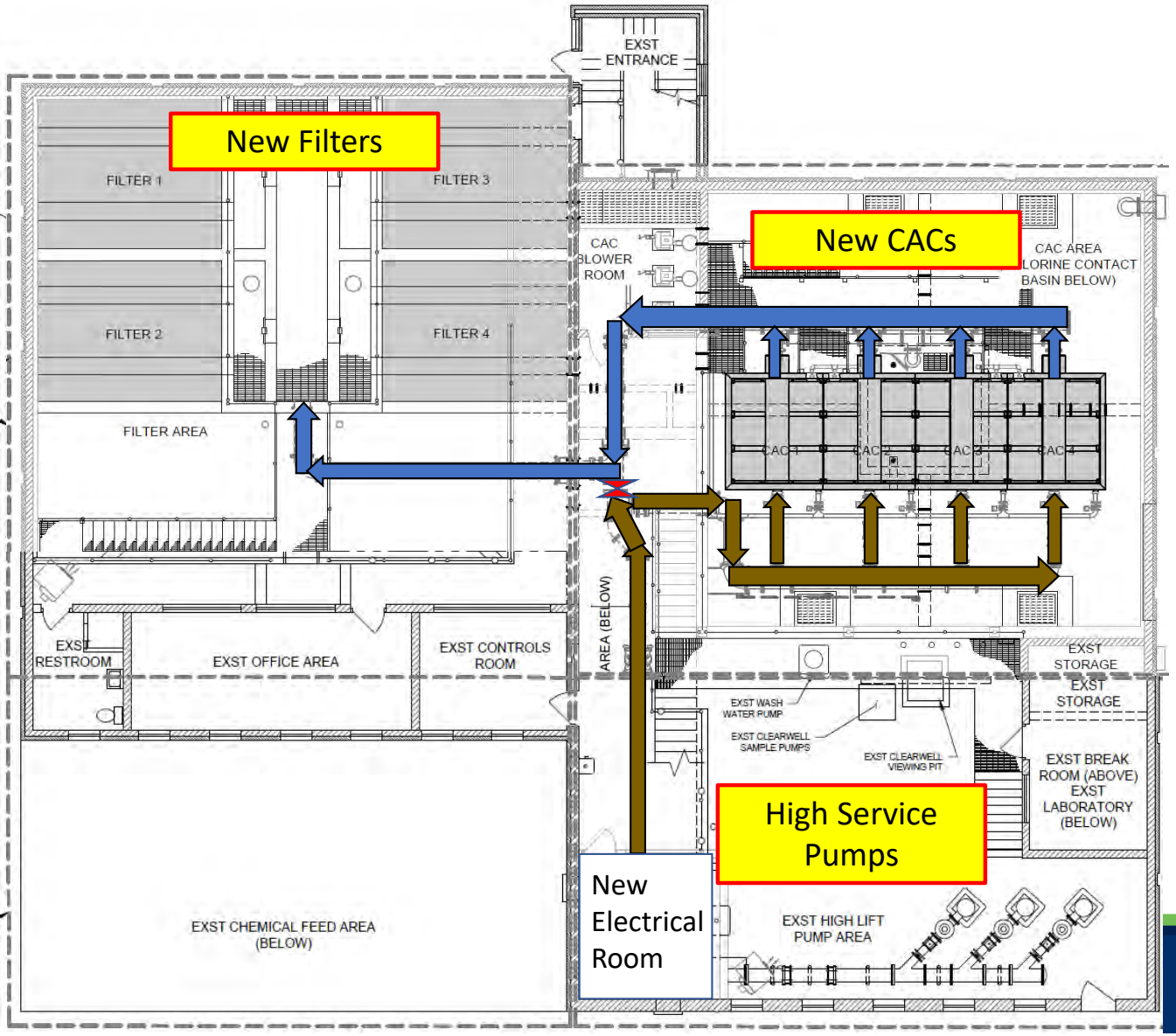


Phase A
Direct Filtration



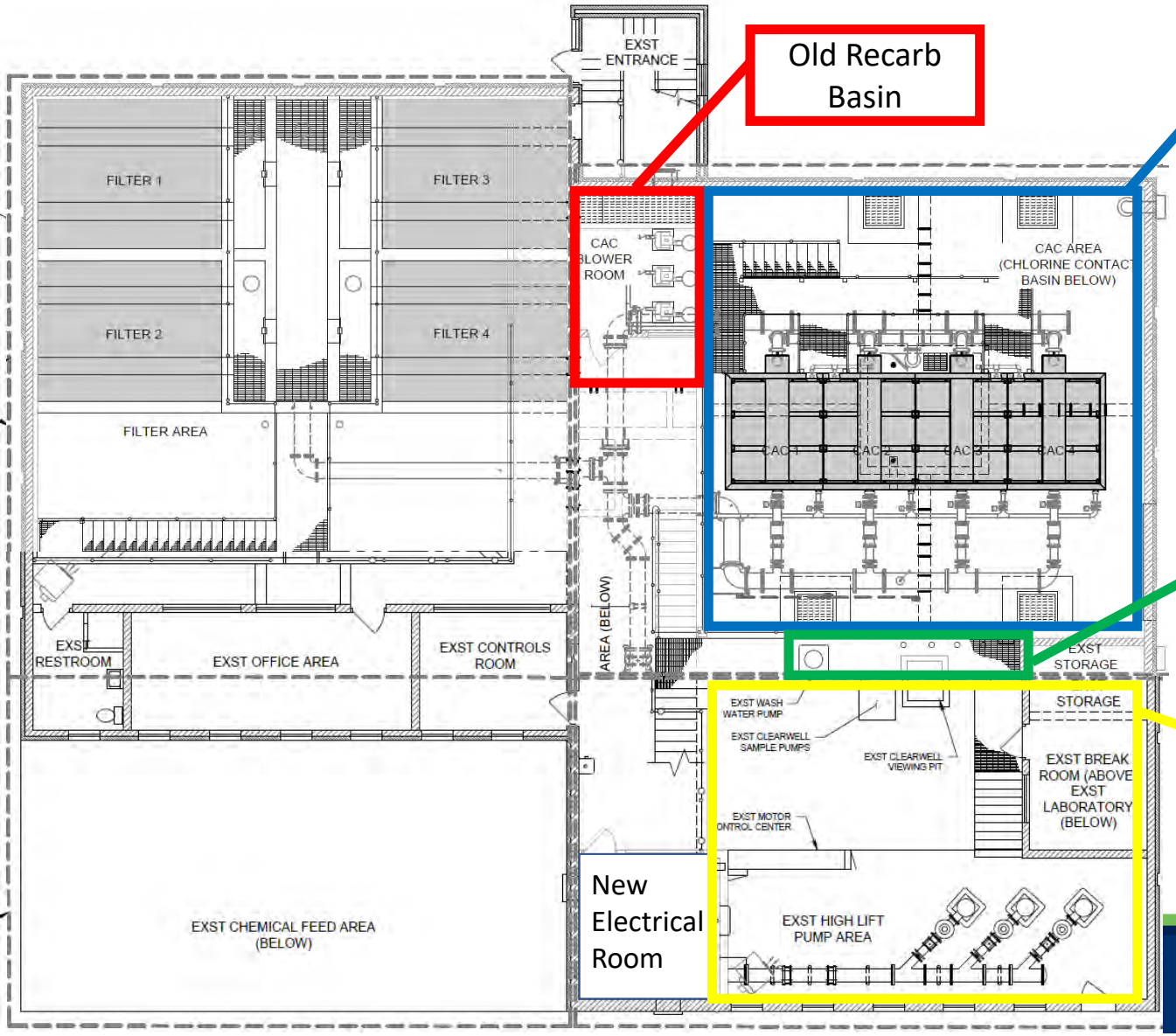
Phase B
Direct Filtration

2020 Retrofit & Upgrades
Conventional Filtration



What a waste of space → Chlorine Contact Volume

Chlorine Contact Volume



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Webinar Take-Aways

- Find the right treatment approach
- Sole-source vs. competitive bid
- Complicated retrofit ➔ include construction sequencing in design
- DEQ involvement early and often

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Retrofitting a 1960s Water Treatment Plant

Glasgow, Montana

Questions

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