

BACKGROUND, GOALS, OBJECTIVES, AND CRITERIA



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8 May 2014

**CREATIVE RETROFIT SOLUTIONS TO EXPAND PLANT
CAPACITY BY 20 MGD WITHIN AN EXISTING
FOOTPRINT AT THE MEDFORD WATER COMMISSION**

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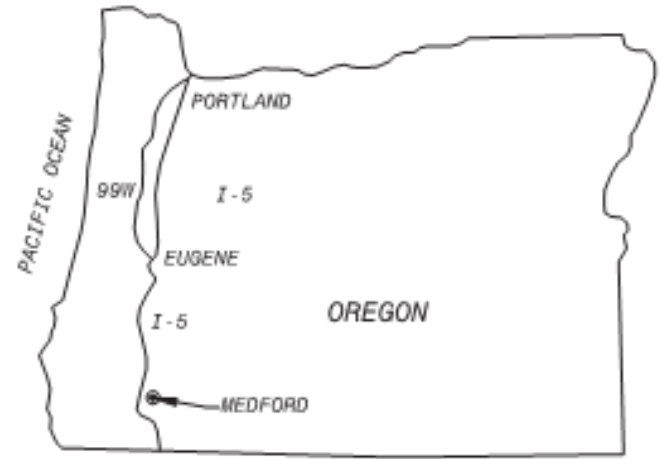
AGENDA

- Background
- Project Goals
- Objectives and Criteria
 - Performance Objectives
 - Jar Testing and Treatment Criteria
 - Hydraulic Objectives
 - Evaluation Criteria
- Design Alternatives
- Summary of Design Alternatives



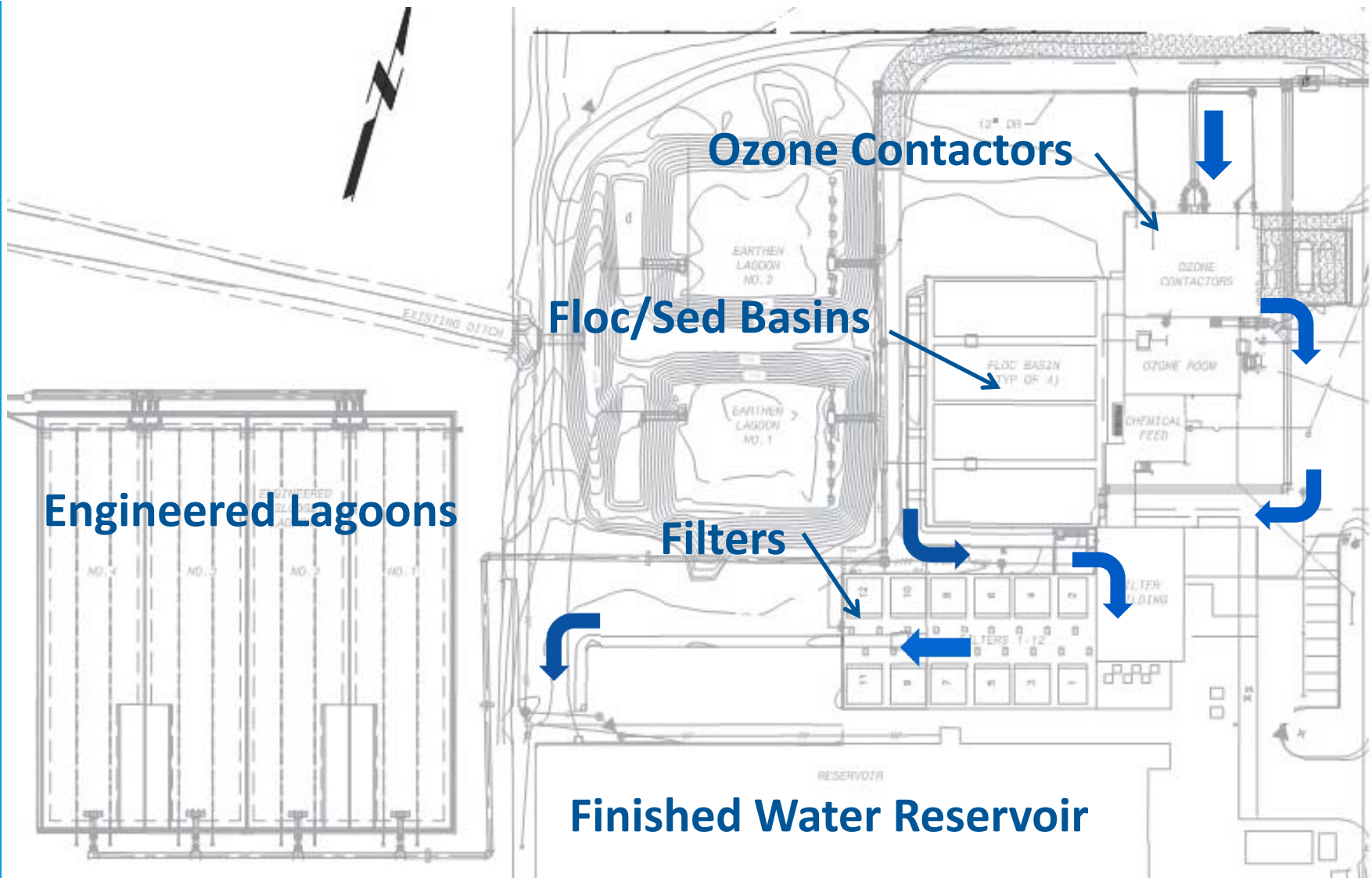
BACKGROUND

- Robert A. Duff Water Treatment Plant
- Direct Filtration
- Plant Capacity = 45 MGD
- Operated seasonally
- Future operation is anticipated to be year-round



LOCATION MAP
NO SCALE





Overall Site Plan

PROJECT GOALS

- *Increase hydraulic capacity of pretreatment processes by 20 MGD.*
- *Improve filter UFRVs by yielding a high quality settled water effluent.*



PERFORMANCE OBJECTIVES

- **65 MGD (Peak summer)**

- Settled water turbidity < 2 NTU
- Worst case raw water turbidity 20 NTU and temperature 65-70° F

- **45 MGD (Typical summer)**

- Settled water turbidity < 1 NTU
- Average raw water turbidity < 10 NTU

- **23 MGD (Winter)**

- Settled water turbidity < 2 NTU
- Worst case raw water turbidity 60 NTU and temperature 50-55° F



JAR TESTING

- Used to establish treatment criteria.
- Flocculation times were varied between 20 to 45 minutes.
- Settling rates were varied between 0.3 to 1.0 gpm/sq ft

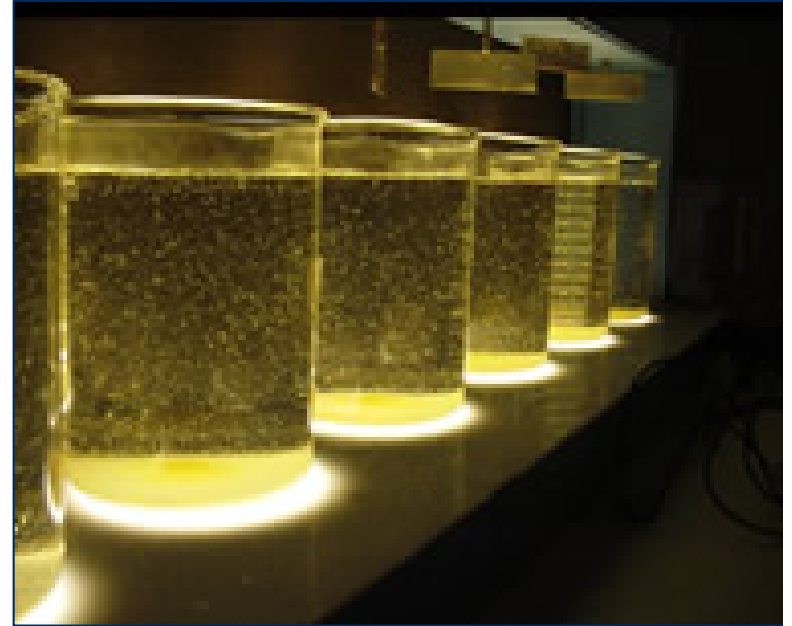
TREATMENT CRITERIA

Flocculation criteria:

- Detention time = 30 mins
- 3 stage tapered
- G values between 10 and 70 s^{-1}

Sedimentation settling rate:

- 0.3 gpm/ft² for plate settlers
- 0.5 gpm/ft² for conventional



HYDRAULIC OBJECTIVES

- Maintain total headloss through filters (7 ft – 8 ft ideal)
- Minimum filter WSE 1 ft above backwash troughs & 4 ft above media
- Achieve equal flow split between floc/sed basins
- Free discharge at adjustable ozone weir gates
- Freeboard at ozone baffle walls



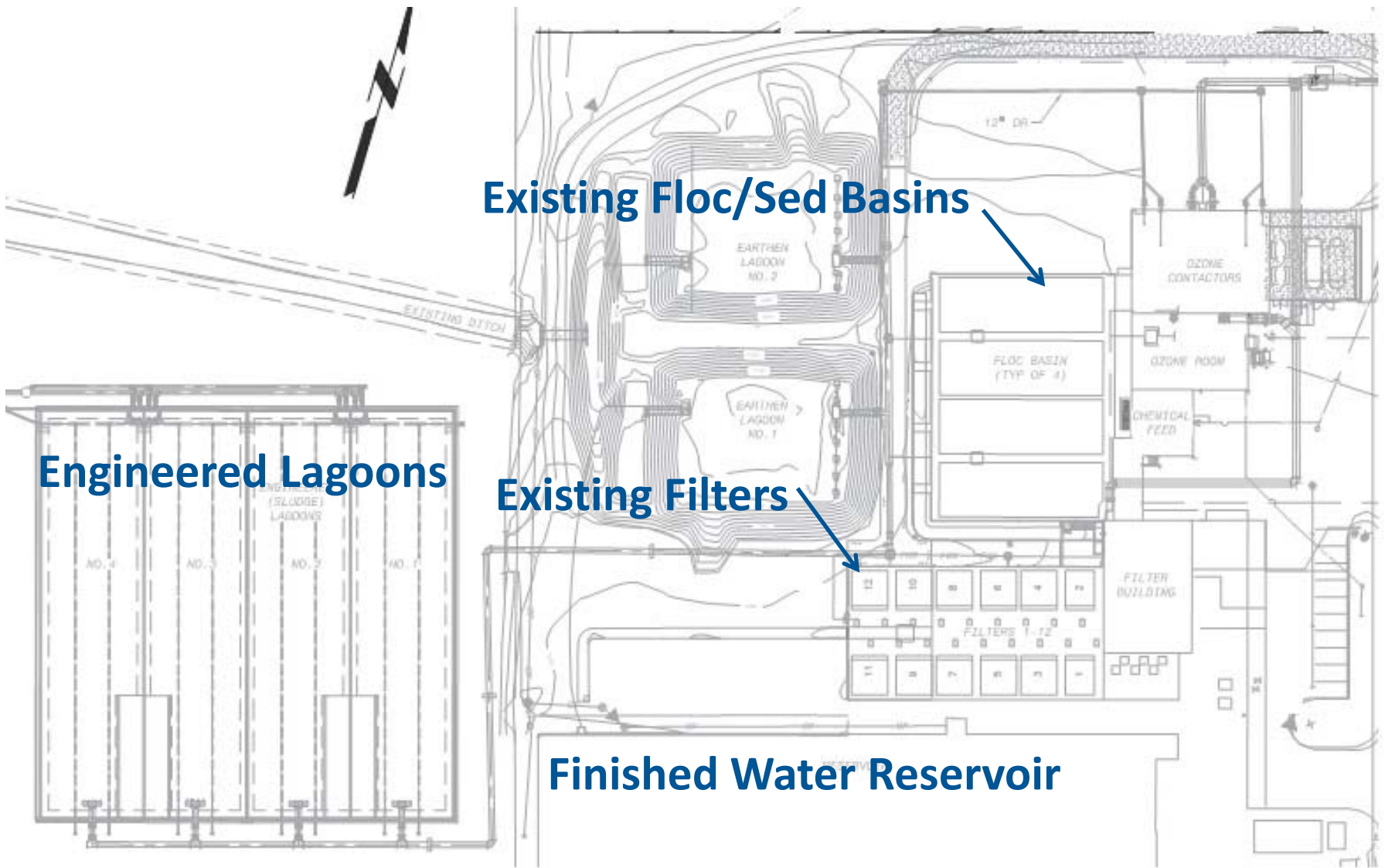
EVALUATION CRITERIA

- **Cost**
 - Capital
 - O&M
- **Operability**
- **Maintainability**
- **Constructability**



DESIGN ALTERNATIVES





Existing Floc/Sed Basins

Engineered Lagoons

Existing Filters

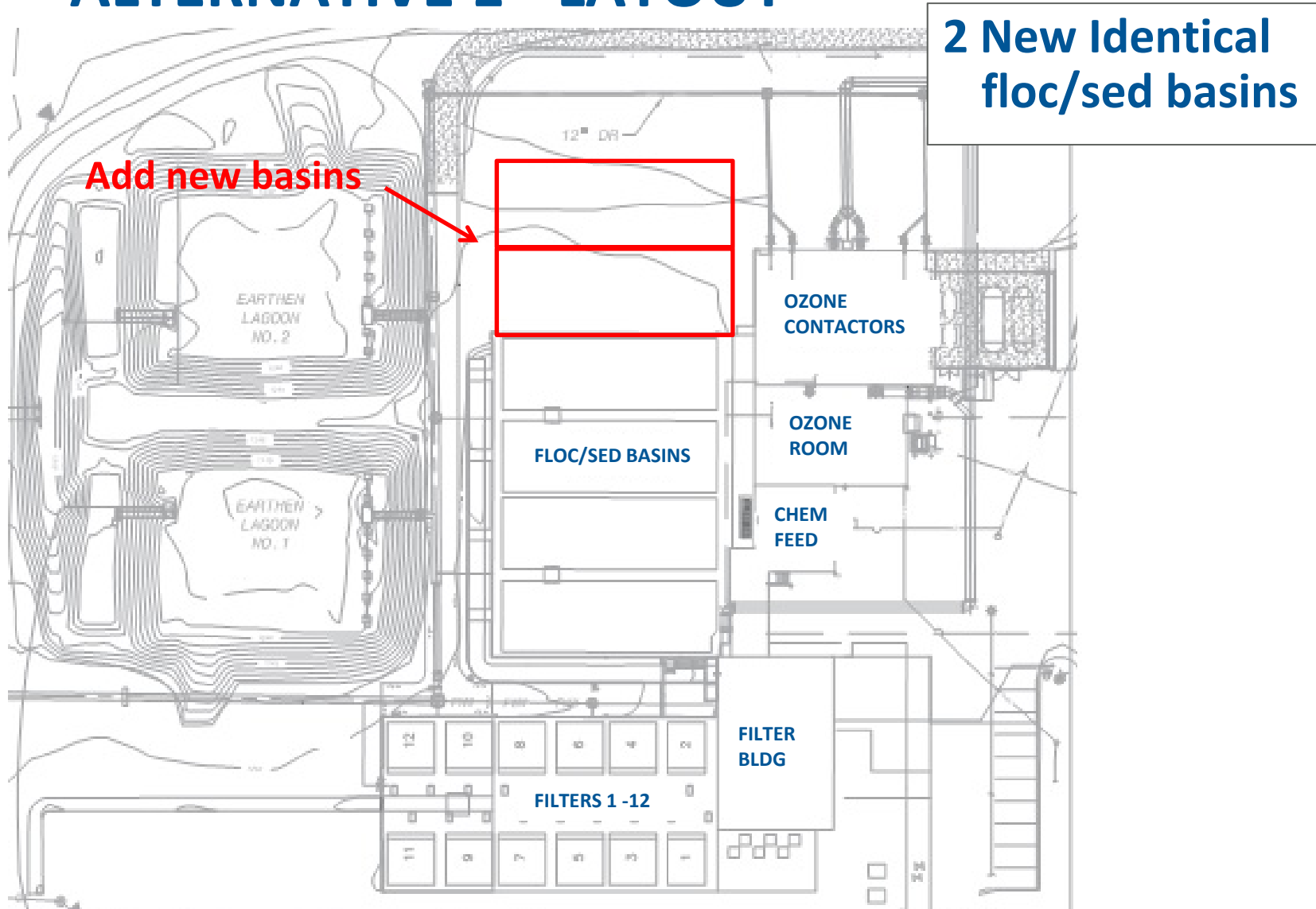
Finished Water Reservoir

Overall Site Plan

FLOCCULATION/SEDIMENTATION ALTERNATIVES

	Description of Alternative	Meets Treatment Criteria
1	<i>Expand-in-Kind: Two new floc/sed basins identical to existing with automated sludge collection and hydraulic flocculation. No change to existing basins.</i>	No
2	<i>Expand-in-Kind: Two new floc/sed basins, with mechanical flocculation and plate settlers only in the new basins.</i>	No
3	Expand-in-Kind: Two new basins with mechanical flocculation and plate settlers or two larger basins for conventional sedimentation	Yes
4	Re-Purpose Existing Basins: Convert the existing floc/sed basins into flocculation only and add mechanical flocculation. Add four new sedimentation basins with plate settlers or conventional sedimentation basins	Yes

ALTERNATIVE 1 - LAYOUT



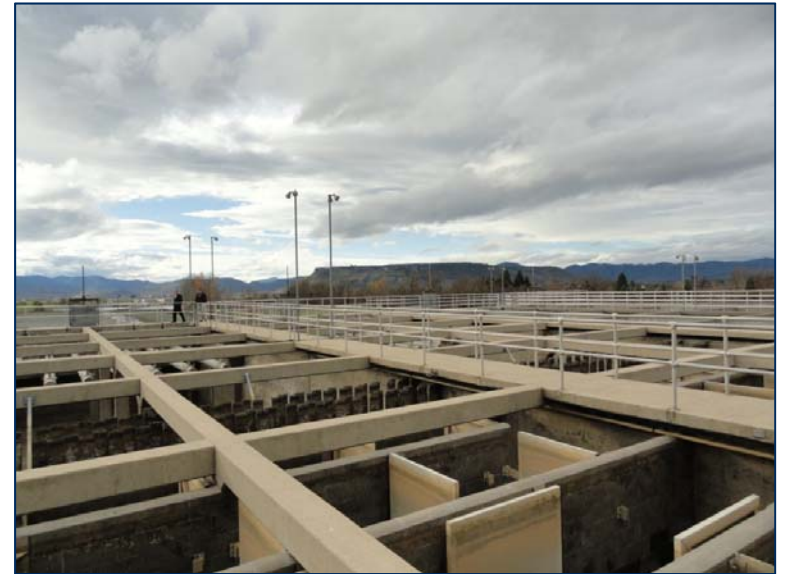
ALTERNATIVE 1

Pros

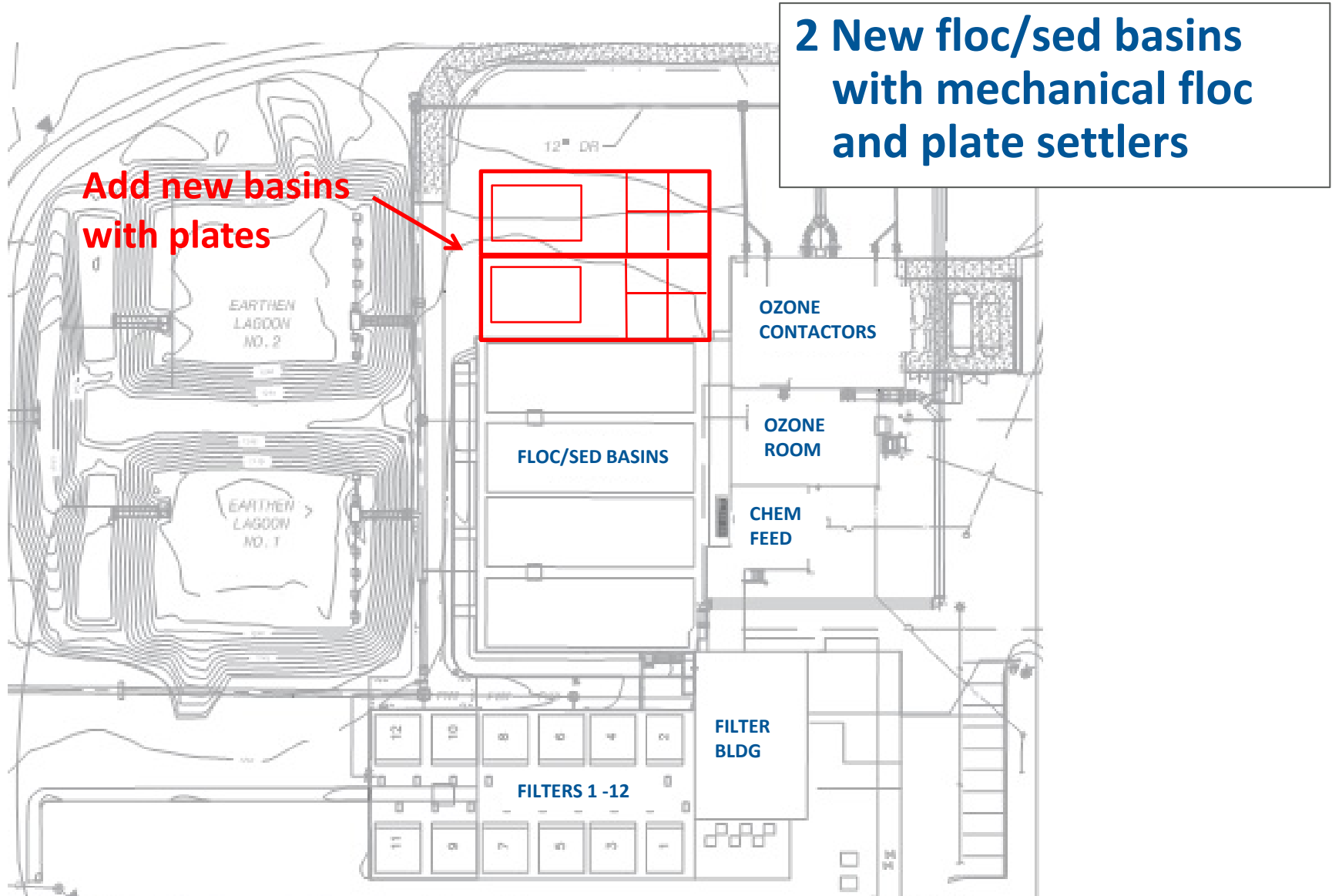
- Add automated sludge collection (new basins)

Cons:

- Fatal flaw – does not meet treatment criteria above flows greater than 9 MGD
- Operation may be difficult (in winter & higher flow)
 - Higher solids loading
 - Frequent backwashes
- Manually move baffle doors



ALTERNATIVE 2 - LAYOUT



ALTERNATIVE 2

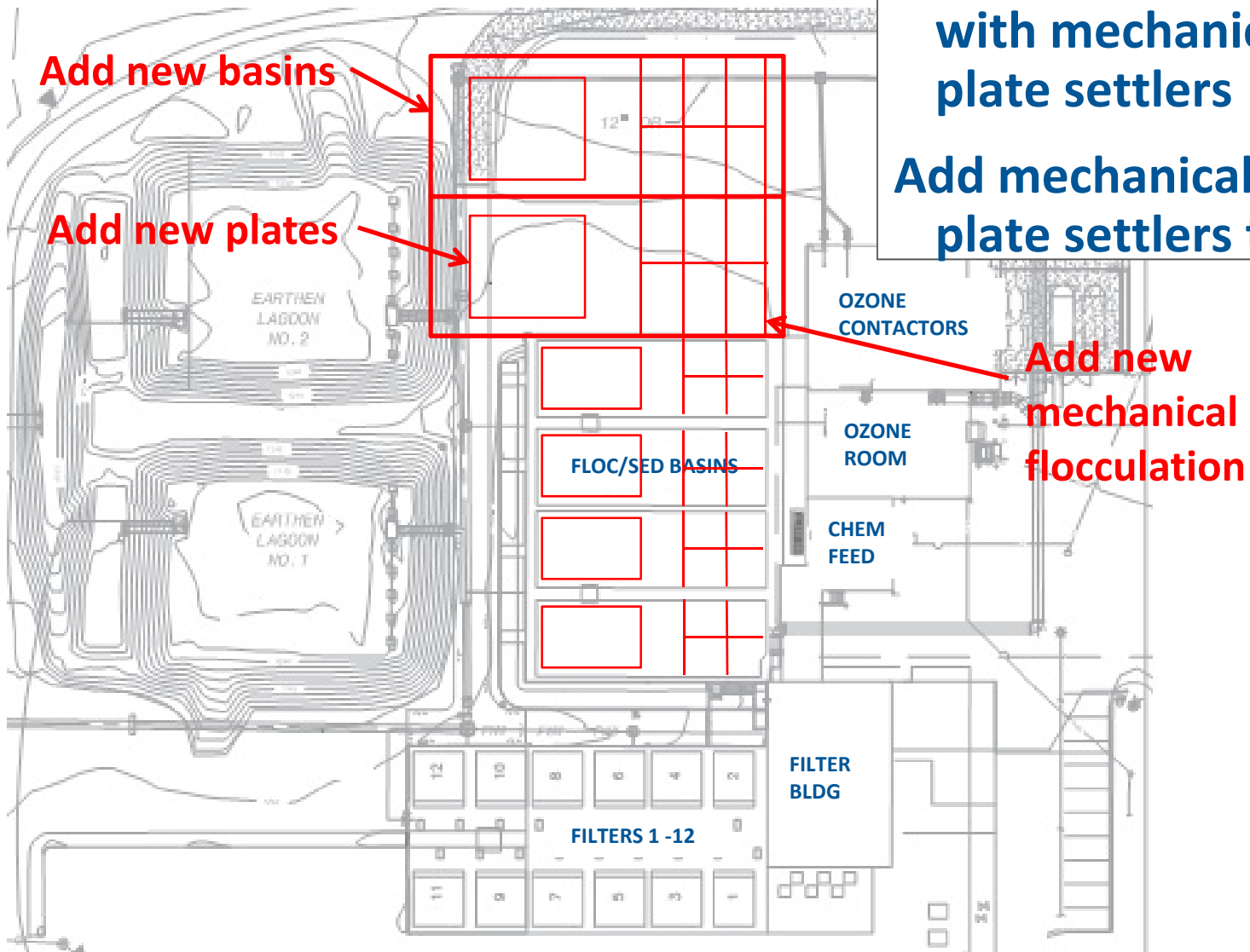
Pros

- Meets treatment criteria up to 25 MGD
- Automated sludge collection in new basins

Cons:

- Fatal flaw - Does not meet treatment criteria for flows above 25 MGD
- Two different settled water qualities

ALTERNATIVE 3 - LAYOUT

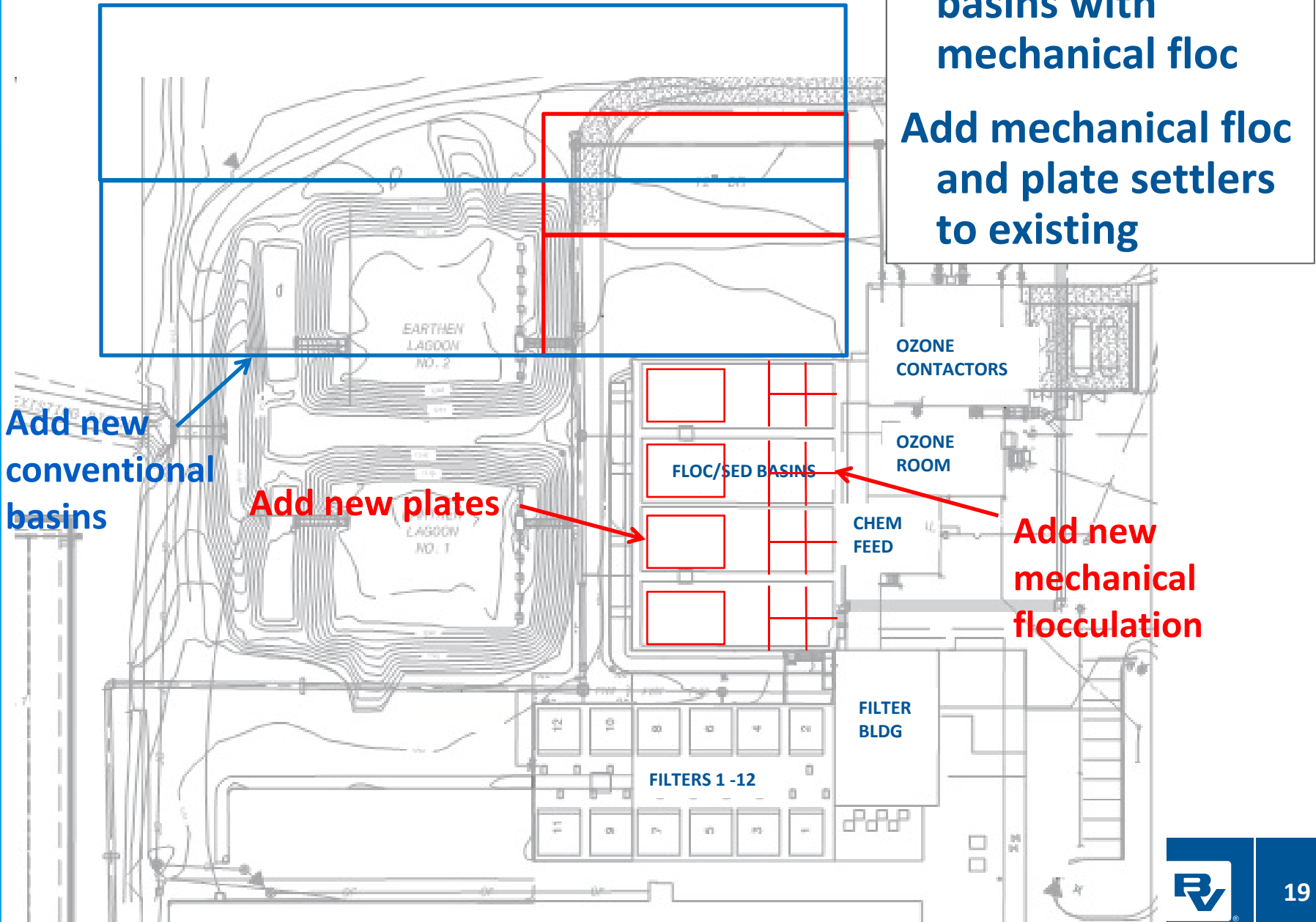


2 larger floc/sed basins with mechanical floc and plate settlers

Add mechanical floc and plate settlers to existing

Add new mechanical flocculation

ALTERNATIVE 3.1 - LAYOUT



ALTERNATIVE 3

Pros

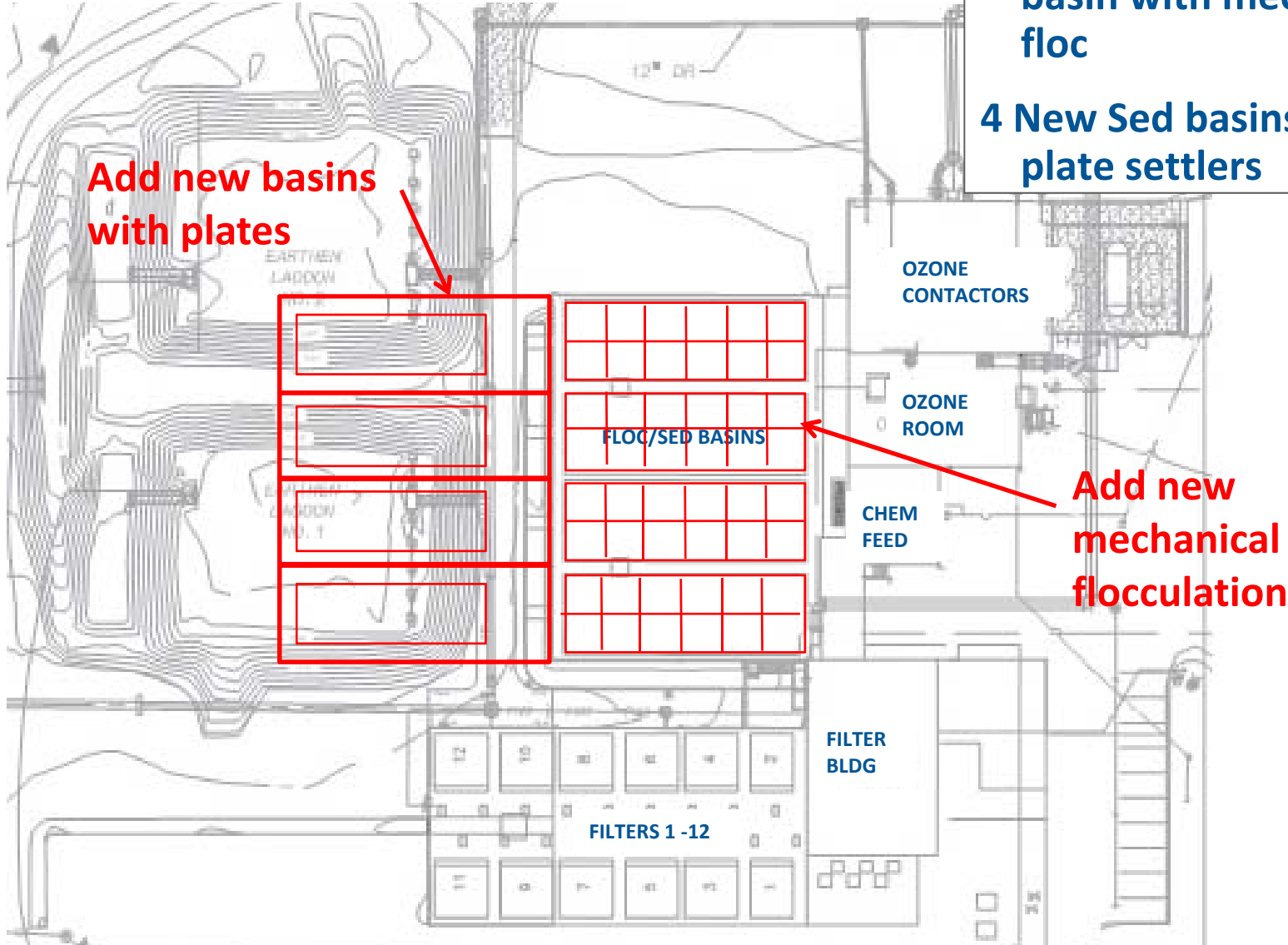
- Meets treatment criteria up to 65 MGD
- Automated sludge collection in all basins

Cons:

- Columns in basins will make retrofitting plates and sludge collection equipment difficult
- Flow splitting issues in distribution flume

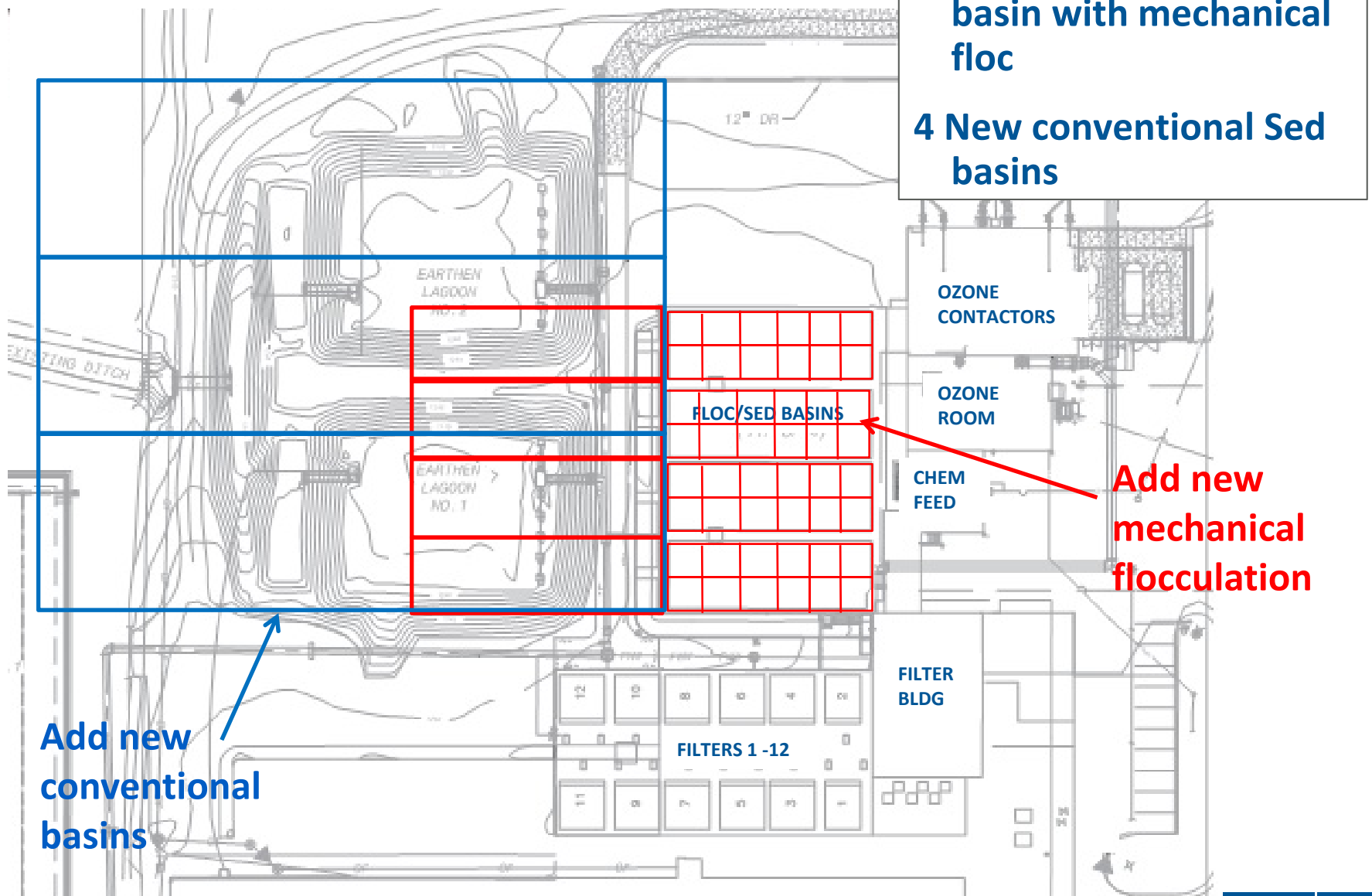


ALTERNATIVE 4 - LAYOUT



Convert existing into Floc basin with mechanical floc
4 New Sed basins with plate settlers

ALTERNATIVE 4.1 - LAYOUT



Convert existing into Floc basin with mechanical floc
4 New conventional Sed basins

Add new conventional basins

Add new mechanical flocculation

ALTERNATIVE 4

Pros

- Meets treatment criteria up to 65 MGD
- Minimal retrofit required
- Automated sludge collection in all basins

Cons:

- Less redundancy with 4 process trains
- Need redesign of basin overflow



SUMMARY OF DESIGN ALTERNATIVES

	1) Two Identical Basins	3) Two Larger Basins and Retrofit Existing		4) Convert to Floc and New Sedimentation Basins	
Criteria	No Equipment	Plates	Conventional	Plates	Conventional
Meet Treatment Criteria	Red	Green	Green	Green	Green
Capital Cost	Green	Yellow	Red	Yellow	Yellow
O&M Cost	Green	Yellow	Green	Yellow	Green
Operability	Red	Yellow	Red	Yellow	Red
Maintainability	Green	Red	Green	Yellow	Yellow
Constructability	Green	Red	Yellow	Yellow	Yellow

Alternative 4 with plates selected. Meets both treatment and hydraulic criteria.

QUESTIONS?

CONTACT INFORMATION

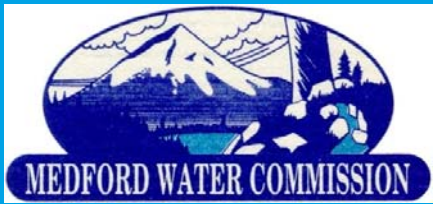
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