Willamette Water Supply
Our Reliable Water

TRI-CITIES TRI-WATER
2017 PNWS-AWWA

Advancing the Design of a New 60 MGD Water Treatment Plant

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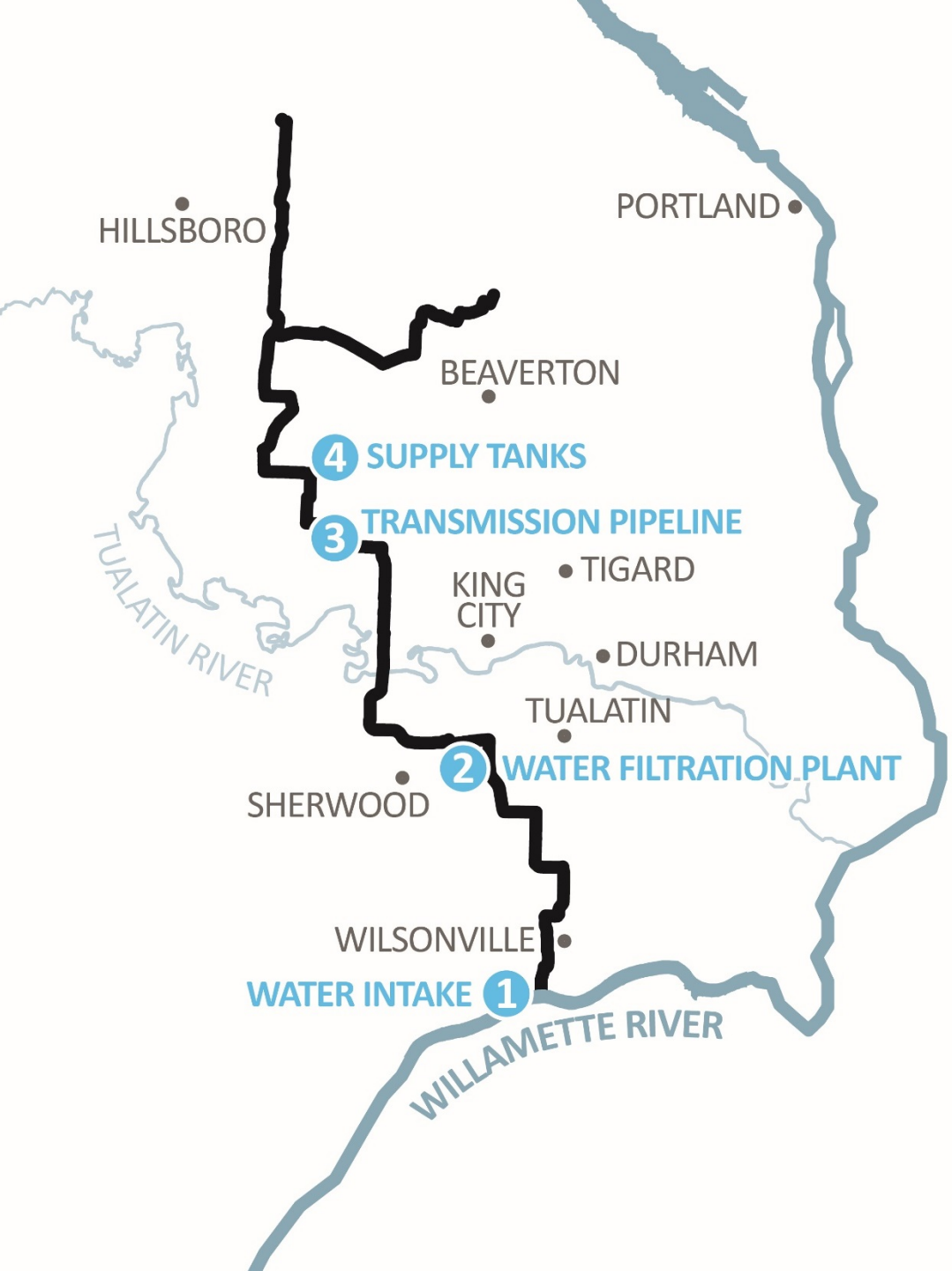
Thursday, May 4, 2017

This afternoons topics…

- Background
  - Overview of Willamette Water Supply Program
  - The Program's history of advancing a Willamette River water supply
  - Recap of where we were as of last year's conference…
- Water Treatment Plant Site Selection
  - Developing and applying screening criteria
  - Analysis of the preferred site
- Water Treatment Plant Site Layout
  - Applying best practices in treatment procedures
  - Evaluating the latest treatment technology advancements
  - Putting the puzzle pieces together

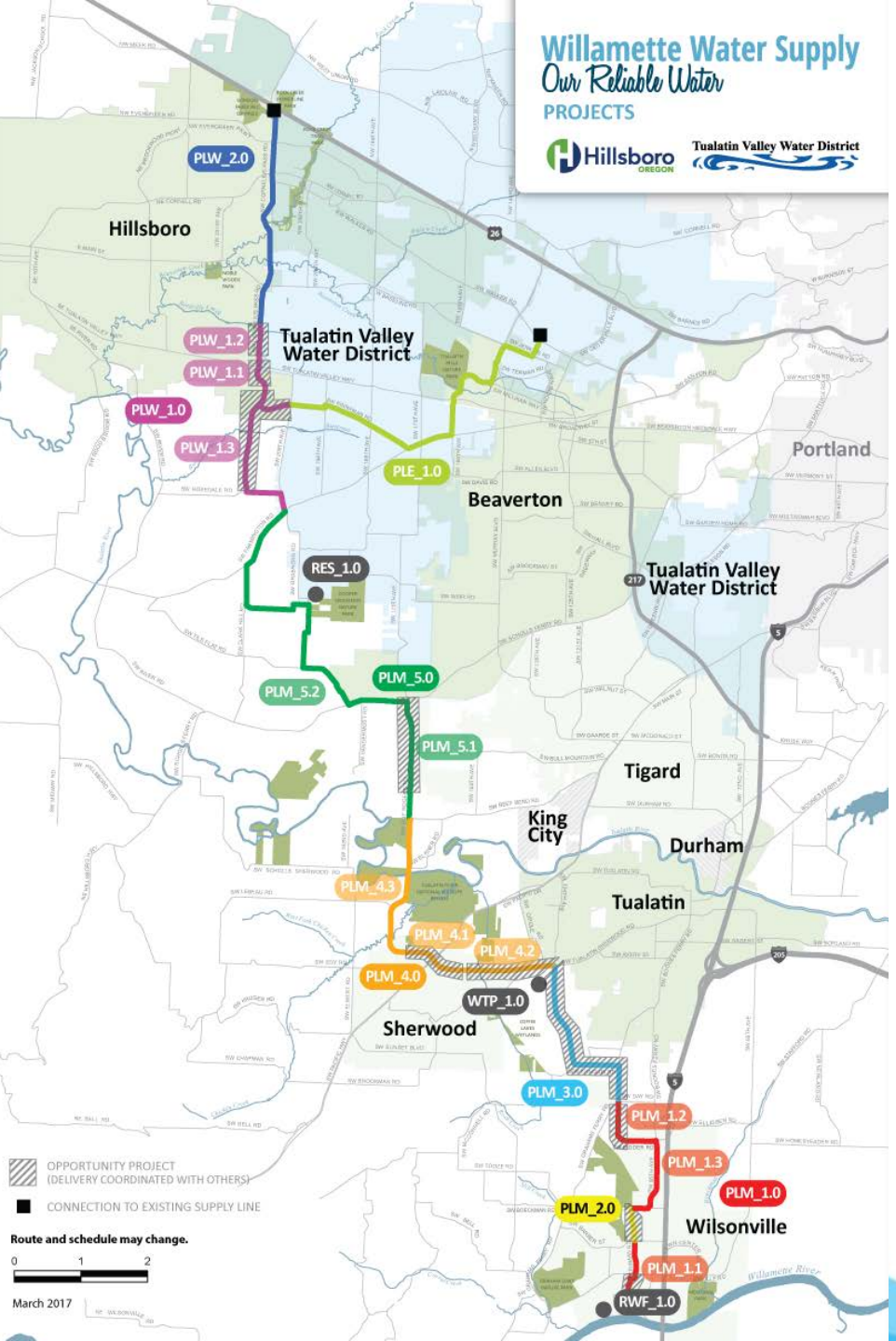
Willamette Water Supply

PROGRAM OVERVIEW



Water Supply Program

- Modified water intake
- New water filtration plant
- Water reservoirs
- 30+ miles of large diameter pipeline
- Tualatin Valley Water District: 60% City of Hillsboro: 40%
- Scheduled completion: 2026

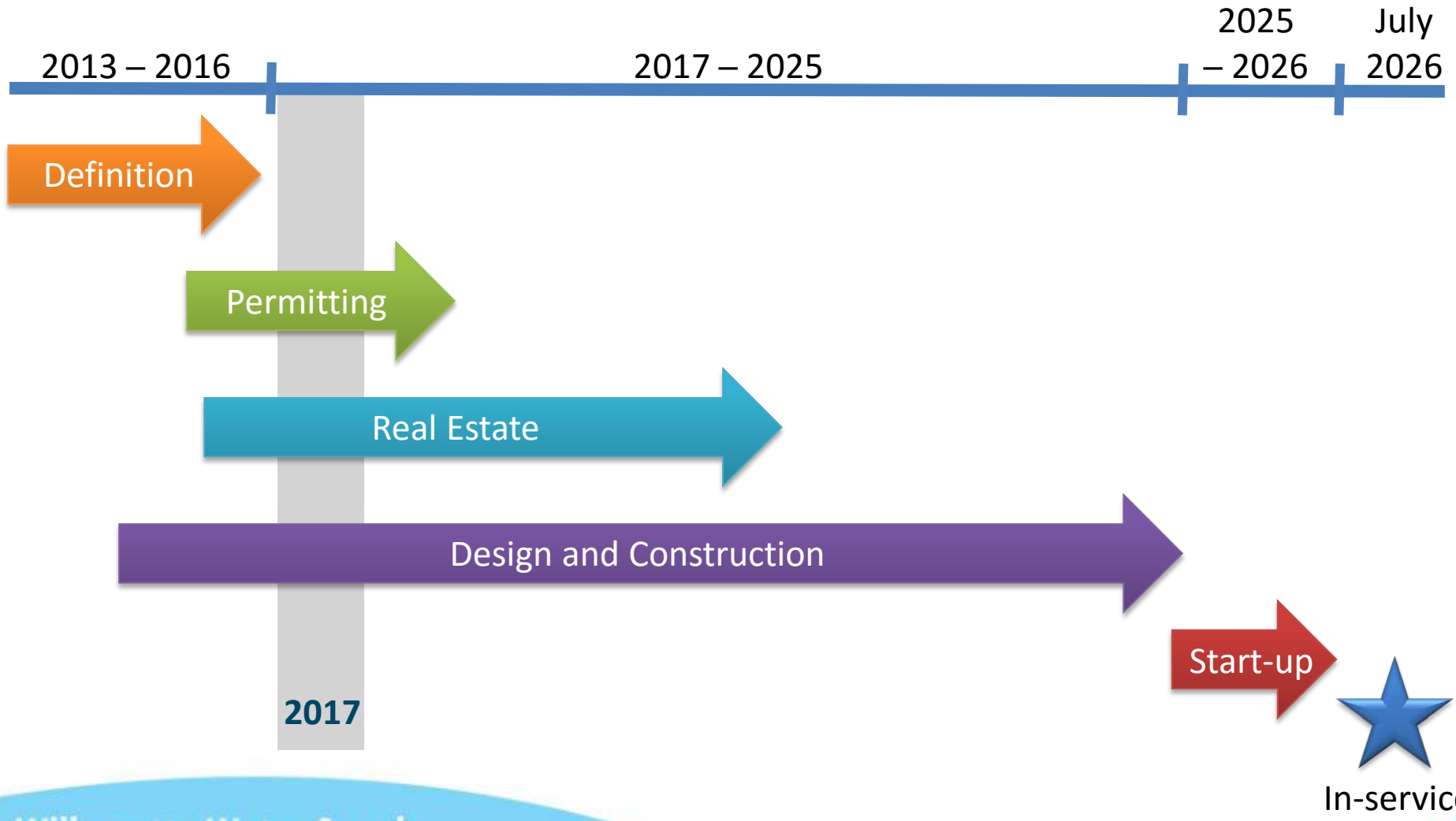


Tualatin Valley Water District

Hillsboro OREGON

SAFELY DELIVERED
WILLAMETTE WATER SUPPLY

Program Schedule



Willamette Water Supply
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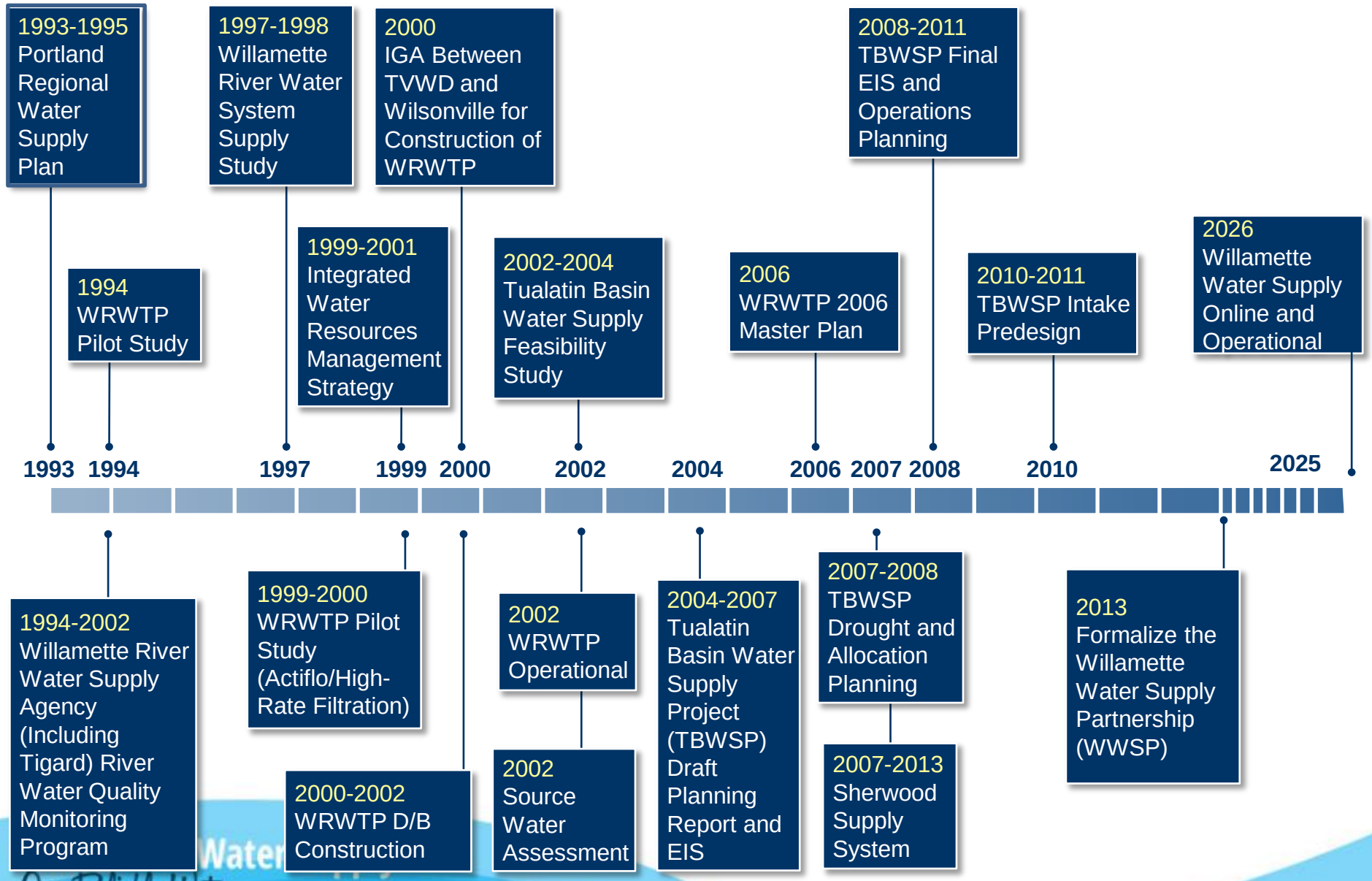
The Program's history of seeking a

WILLAMETTE RIVER WATER SUPPLY

The Long Road to a Regional Water Supply



Our Reliable Water

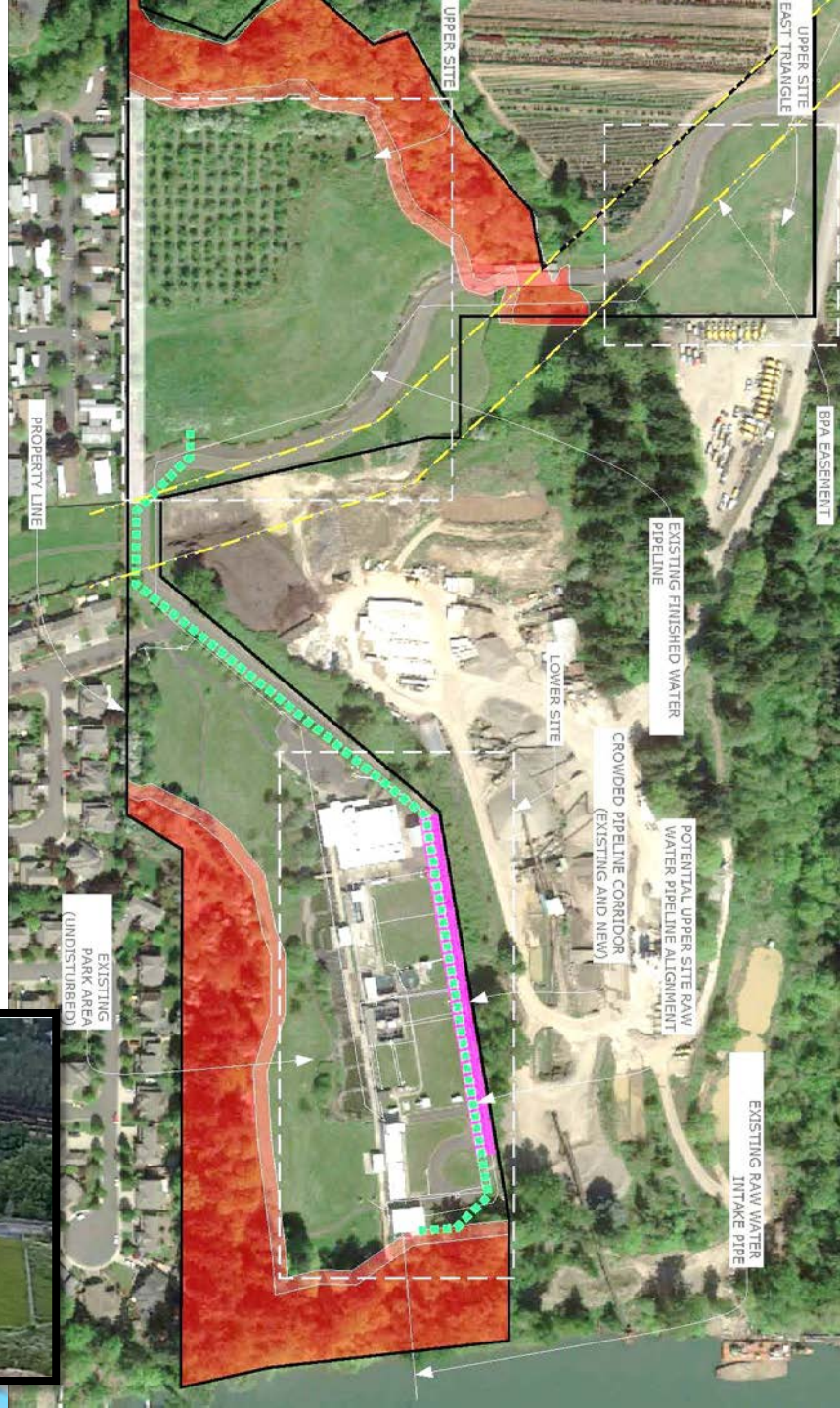
A lot can happen in a year…

QUICK RECAP OF WHERE WE WERE LAST YEAR

The “Upper” Site

Benefits:

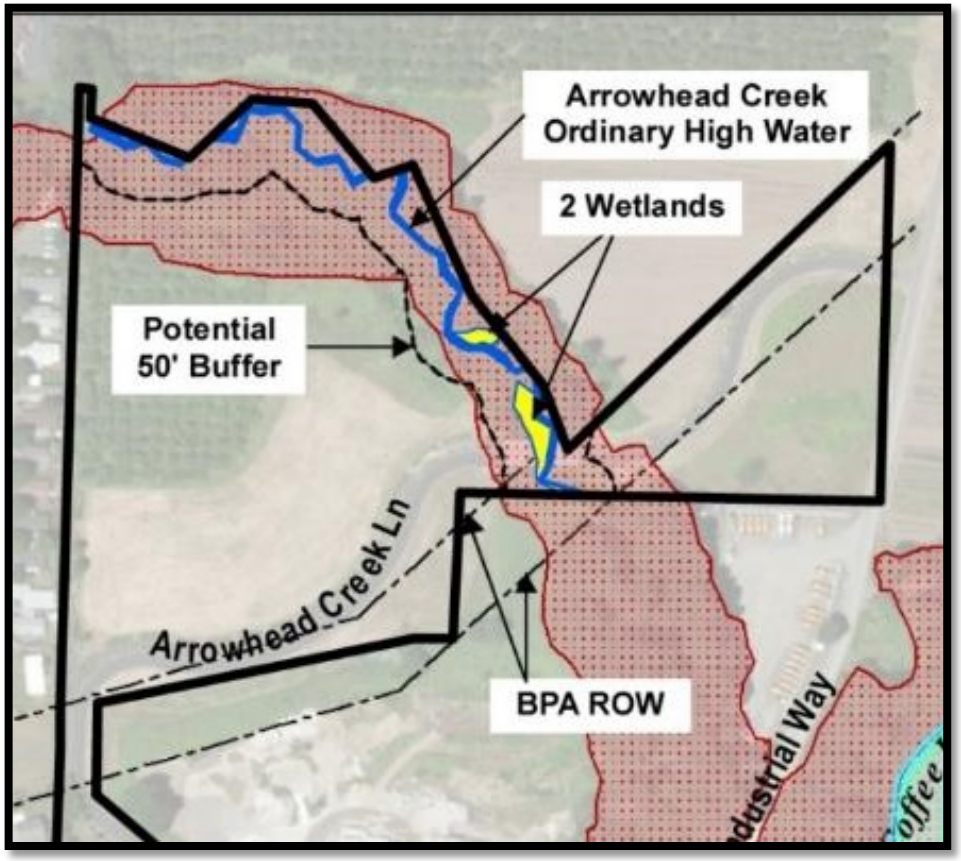
- Close proximity to the source
- Shared ownership and existing facilities
- Opportunities for shared operations



The “Upper” Site

Challenges:

- Constrained site and environmental buffers
- Irregular shaped property boundary
- Proximity to residential neighborhood
- Challenging geotechnical conditions



Developing and applying screening criteria

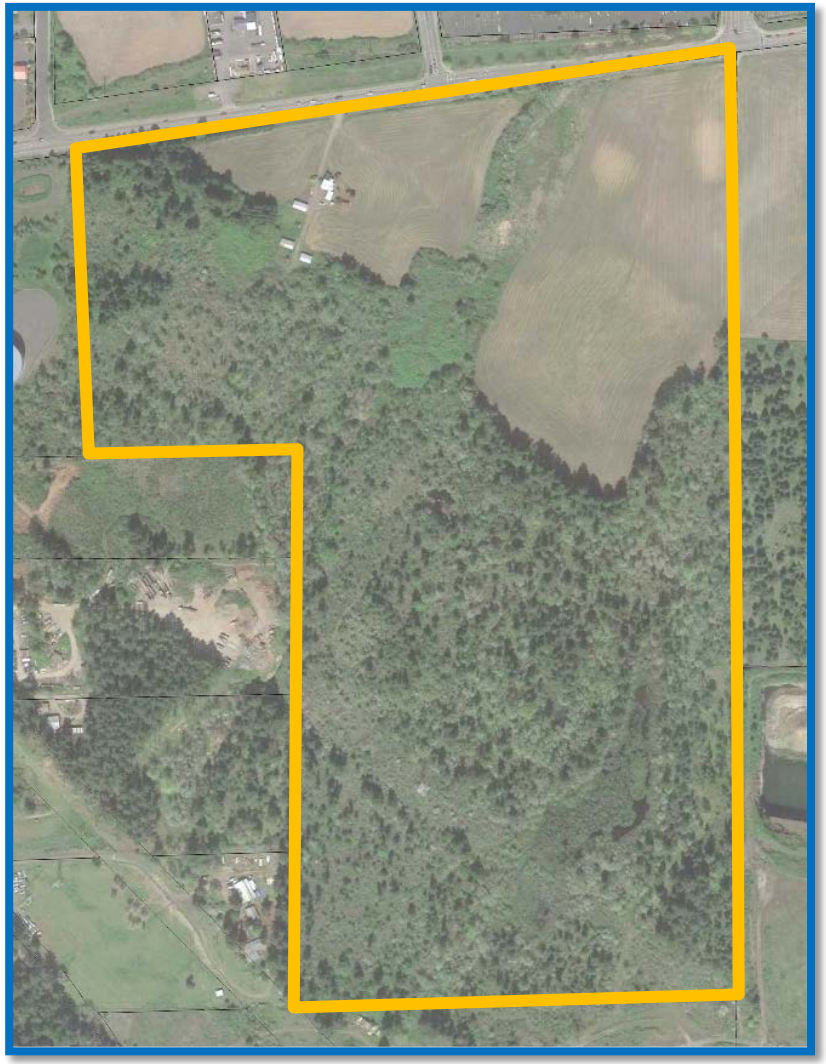
WATER TREATMENT PLANT SITE SELECTION

Evaluation Criteria

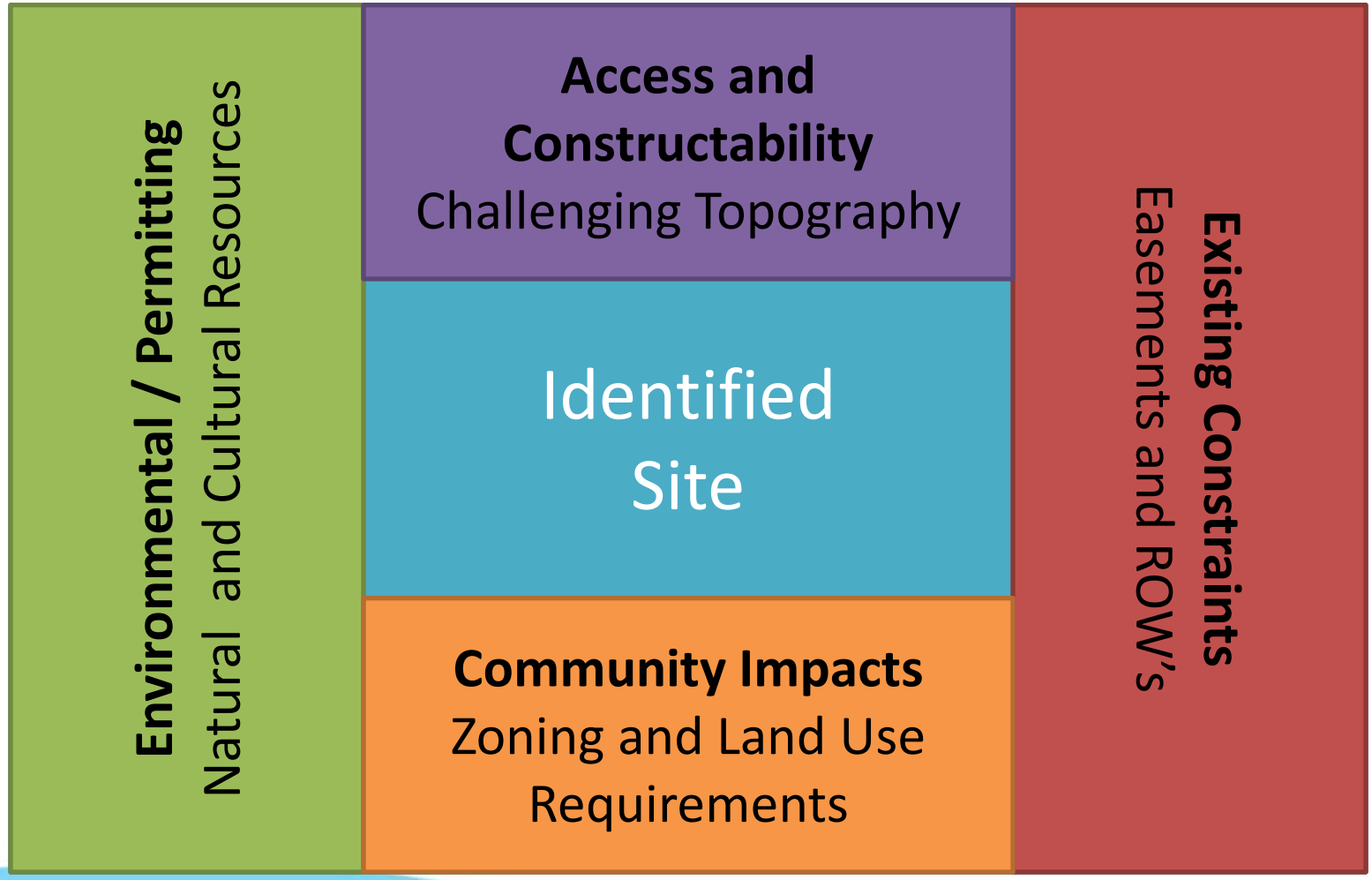
- **System Compatibility**
  - Site area/dimensions
- **Existing Constraints**
  - Encumbrances/ restrictions on parcel
- **Social/Community Impacts**
  - Visual/local character impacts
  - Impacts to neighbors during construction
- **Opportunities/Benefits**
  - Property availability
  - Opportunity for community benefits
- **Environmental/Permitting**
  - Current land use zoning
  - Natural/cultural resources
- **Access and Constructability**
  - For transmission pipeline
  - Construction access and staging
  - Geologic hazards
  - Access roads
- **Operations and Maintenance**
  - Flexibility for future expansion
  - All treatment facilities located together

Preferred site selection

- ✓ Compatibility: Sufficient area
- ✓ Community: Located in an appropriate commercial/ industrial zone
- ✓ Environmental / Beneficial Opportunities: Protection & enhancement of significant resources.
- ✓ Constructability: Adjacent to the RW/FW pipeline alignment. Stable geology.

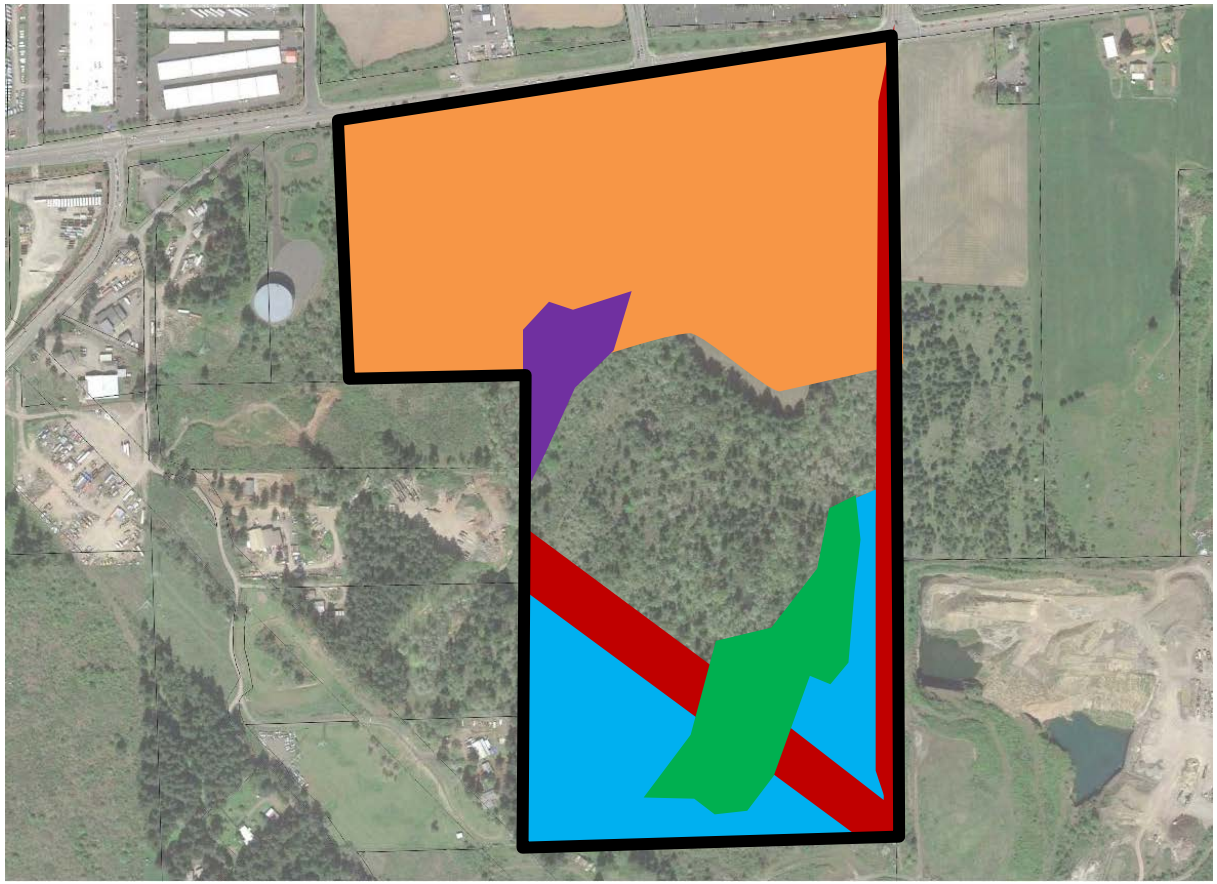


Site constraints can impact actual buildable area…



How constraints impact the preferred site

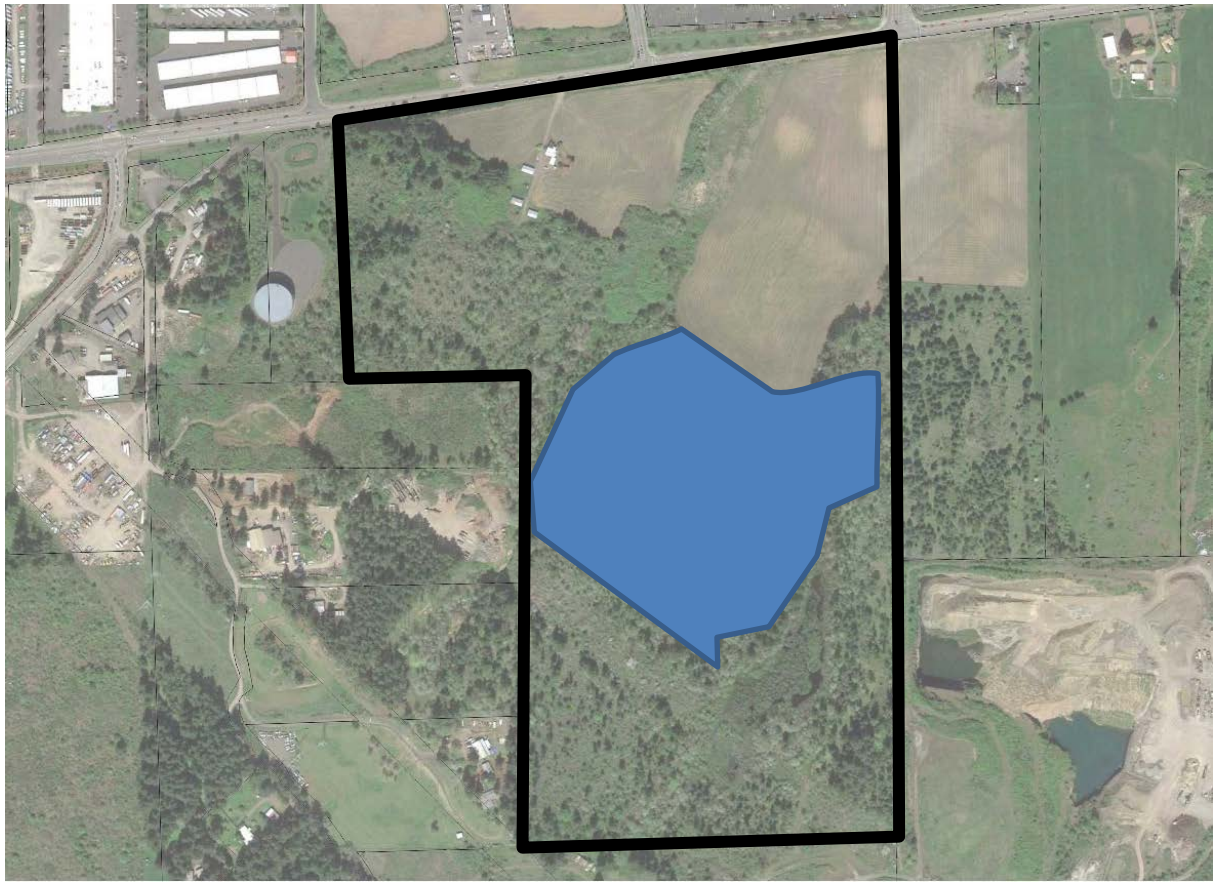
- Start with the entire site
- Identify existing encumbrances
- Delineate significant environmental resources
- Consider existing topography and constructability
- Consider long-term O&M
- Identify future community uses



WATER TREATMENT PLANT PROCESS SELECTION & SITE LAYOUT

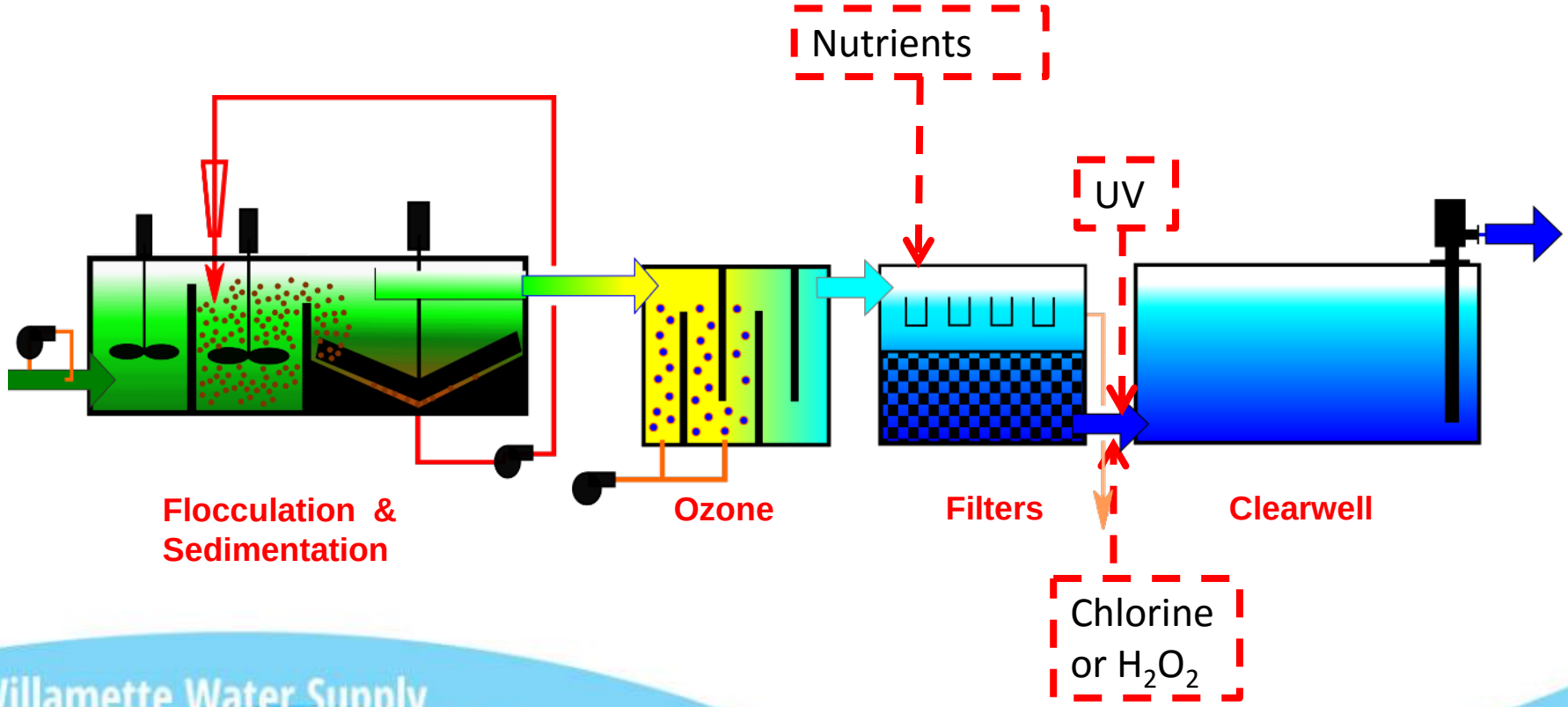
Developing efficient site layouts

- Confirm treatment processes and process design criteria
- Identify supporting facilities and facility requirements
- Consider plant access and operations
- Minimize environmental and community impacts



Treatment Process Selection

- Blue Ribbon Panel found that existing WRWTP process with potential enhancements, was best technology for application.



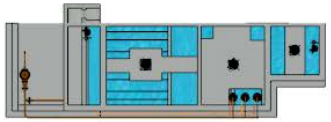
Floc/Sed Design: Ballasted Flocculation

What is it?

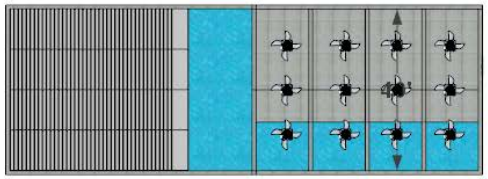
- High rate, sand ballasted sedimentation process

Benefits

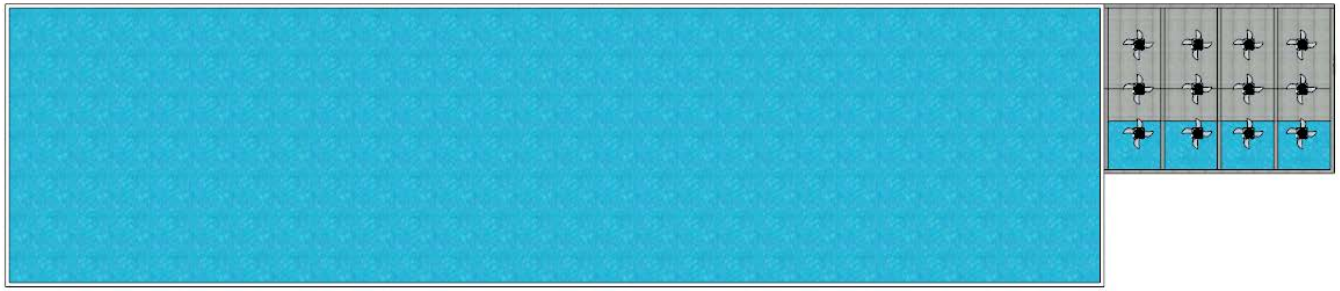
- Compact footprint
- Excellent settled water quality
- History of successful pre-treatment of Willamette River water



Ballasted Flocculation



High Rate Sedimentation with Plates

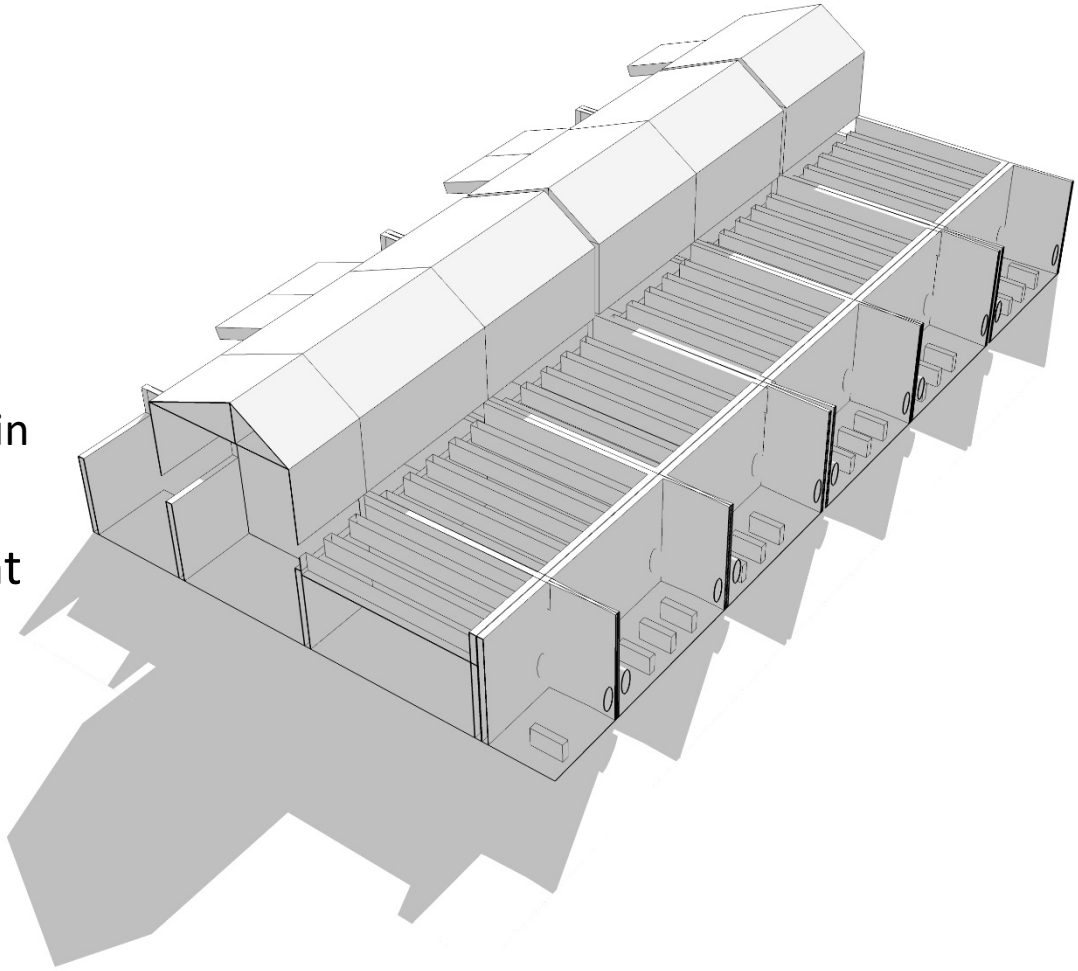


Conventional Flocculation / Sedimentation

Floc/Sed Design: Ballasted Flocculation

What is required?

- Series of treatment basins
  - Coagulation Basin, Maturation Basin, Sedimentation Basin
- Sand recycle pumps located in an adjacent gallery
- Multiple trains for redundancy and turndown



Intermediate Treatment: Ozone

What is it?

- Injecting ozone (O_3) into settled water to oxidize contaminants

Benefits

- Eliminates Taste and Odor compounds (MIB & Geosmin)
- Breaks down organic contaminants
- Improves filtration performance
- Enhances bio-filtration through generation of biodegradable organic matter (BOM)

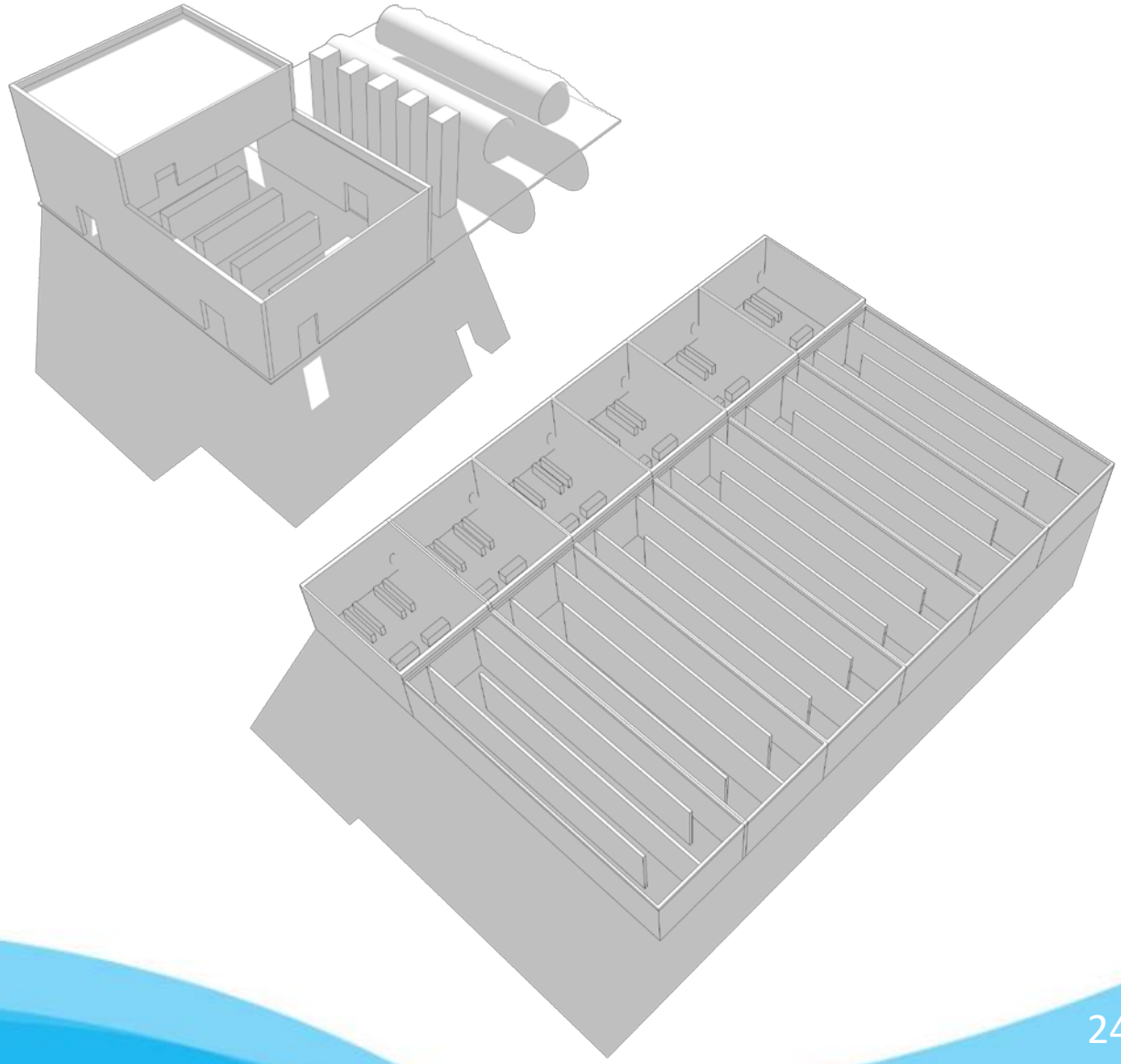
Ozone generation equipment at the Willamette River WTP, Wilsonville

Ozone injection equipment at the Lake Oswego – Tigard WTP

Intermediate Treatment: Ozone

What is required?

- Liquid oxygen and vaporization equipment
- Ozone generation equipment
- Ozone injection system
- Ozone contactor basin
- Multiple parallel trains for redundancy and turndown



Filtration Design: Engineered Biofiltration

What is it?

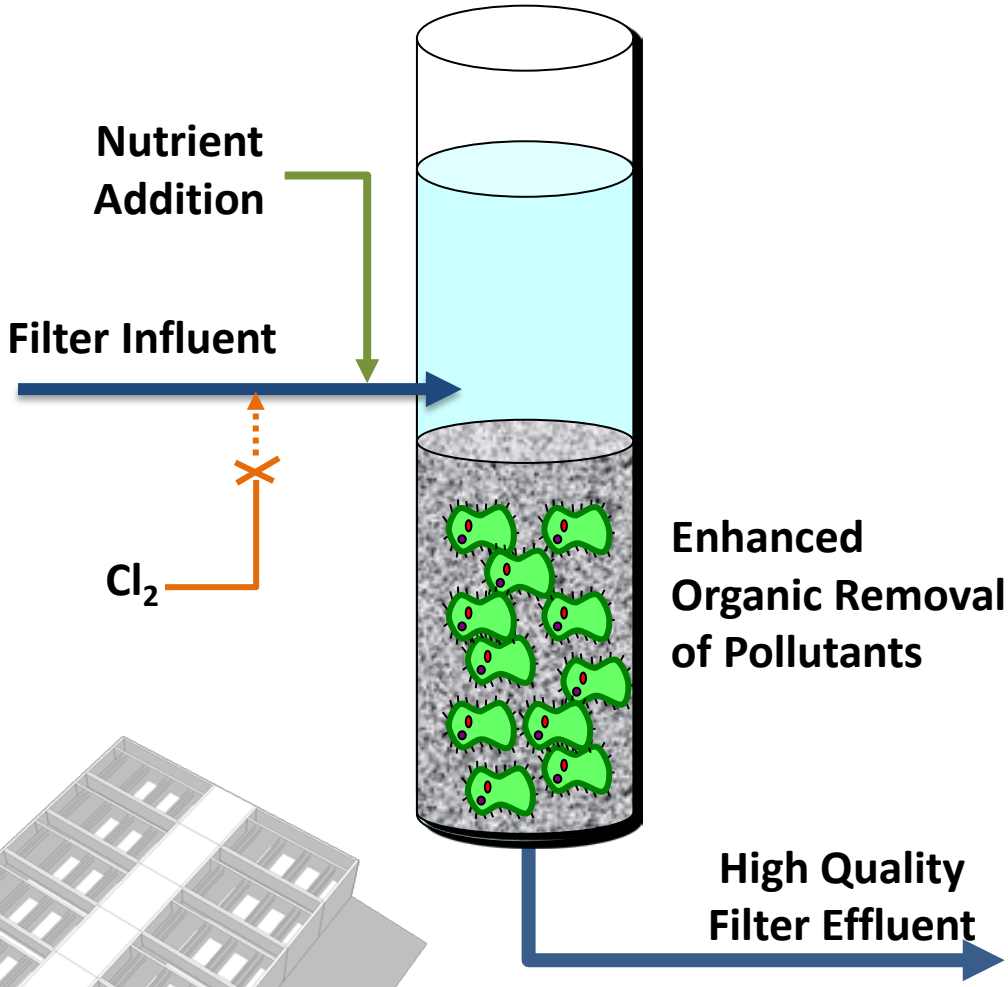
- An operational practice of managing, maintaining, and promoting biological activity on granular media in the filter

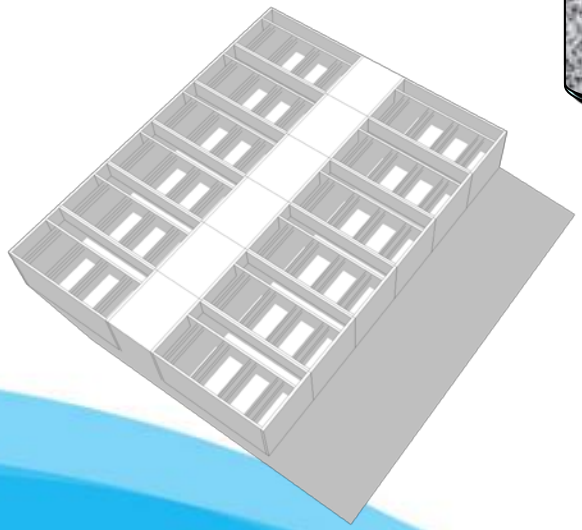
Benefits

- Enhances the removal of organic and inorganic constituents.

What is required?

- Granular media filters
- Nutrient addition

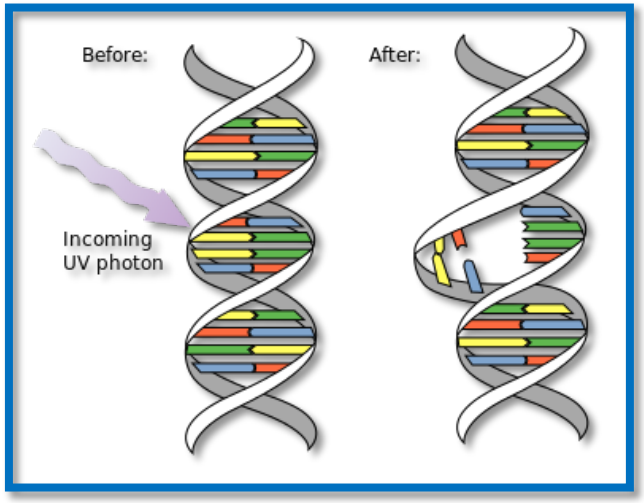




Disinfection Design: UV or UV AOP

What is it?

- Use of UV light to disrupt the DNA of micro-organisms.



UV Reactors at Canby WTP

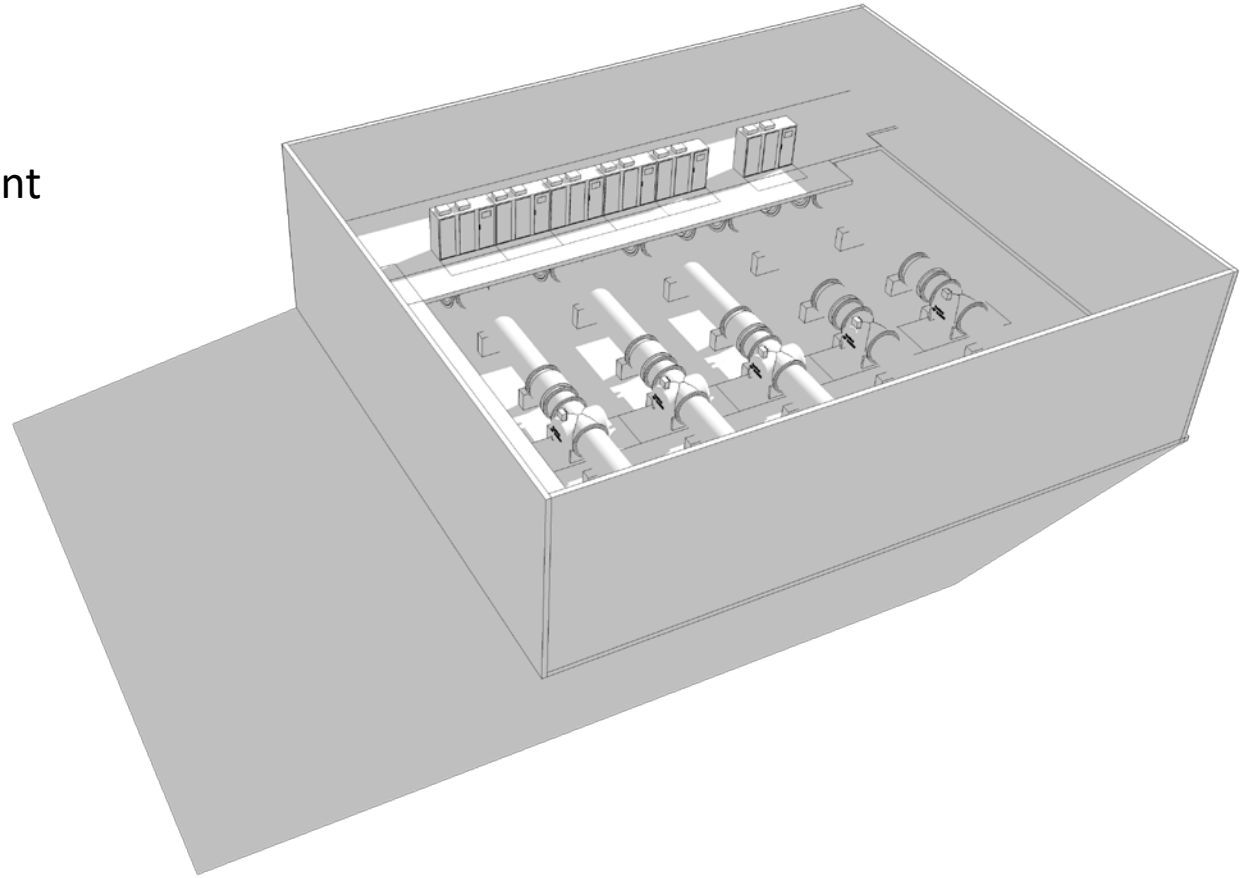
Benefits

- Effective inactivation of *Giardia* and *Cryptosporidium*
- Reduced chemical use and reduced disinfection by-products
- Increased "usable" clearwell storage
- Can be enhanced to AOP for improved removal of emerging contaminants such as PPCP and algal toxins.

Disinfection Design: UV or UV AOP

What is required?

- Pipes
- Electrical equipment
- UV reactors
- In a building



Dewatering Design: Screw Presses Continue to be a Promising Technology

What is it?

- Mechanical dewatering equipment

Benefits

- Low speed and low power consumption
- Low polymer usage (6 – 10 lbs / dry ton)
- Excellent dewatering results (35% – 40%)
  with the right polymer

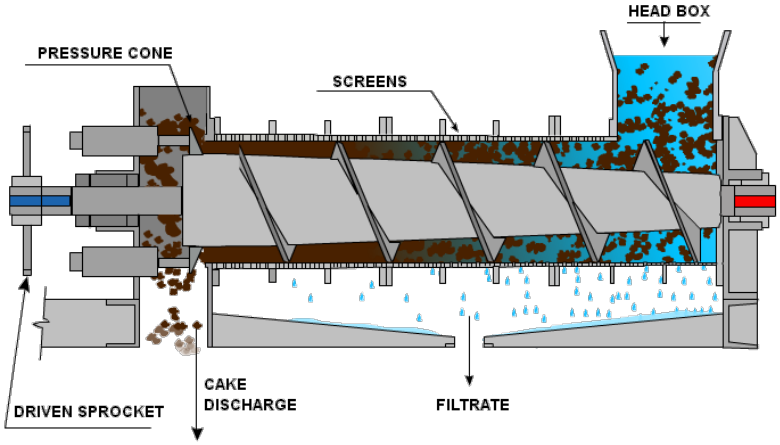


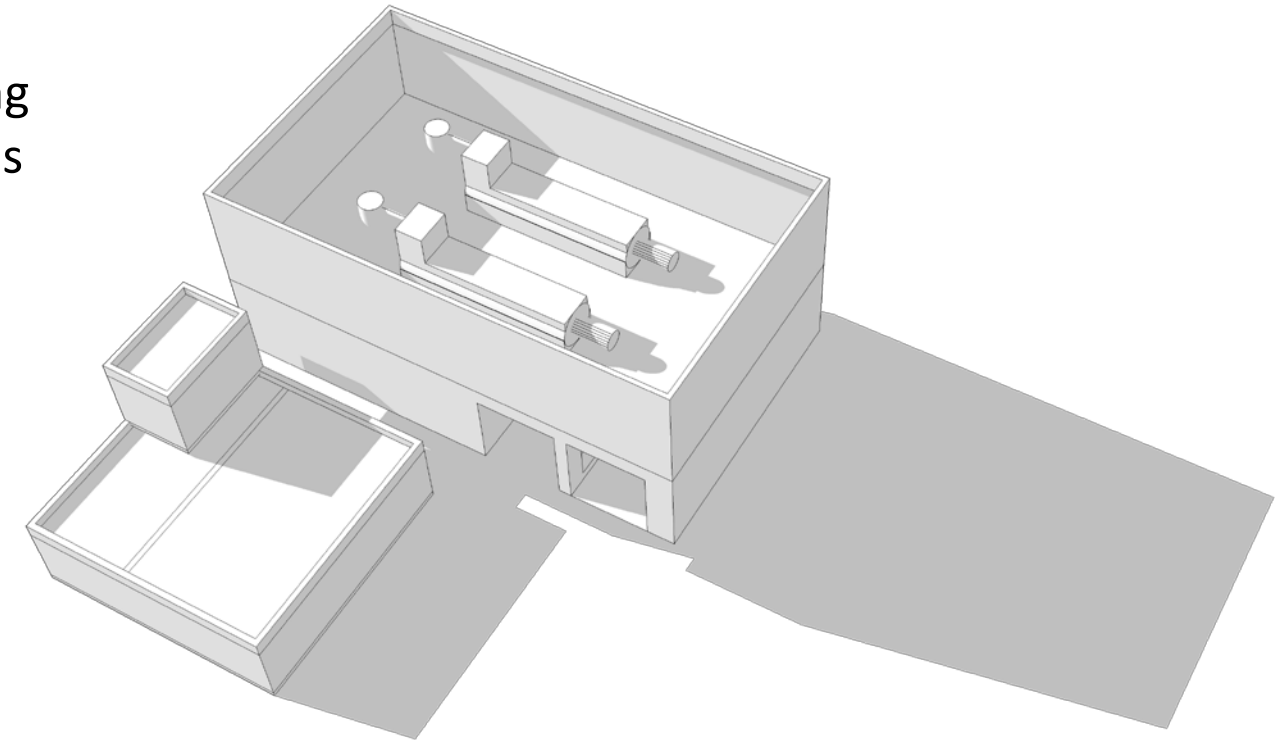
Diagram Courtesy of FKC Co., Ltd.

Screw presses at the LO-T WTP

Dewatering Design: Screw Presses Continue to be a Promising Technology

What is required?

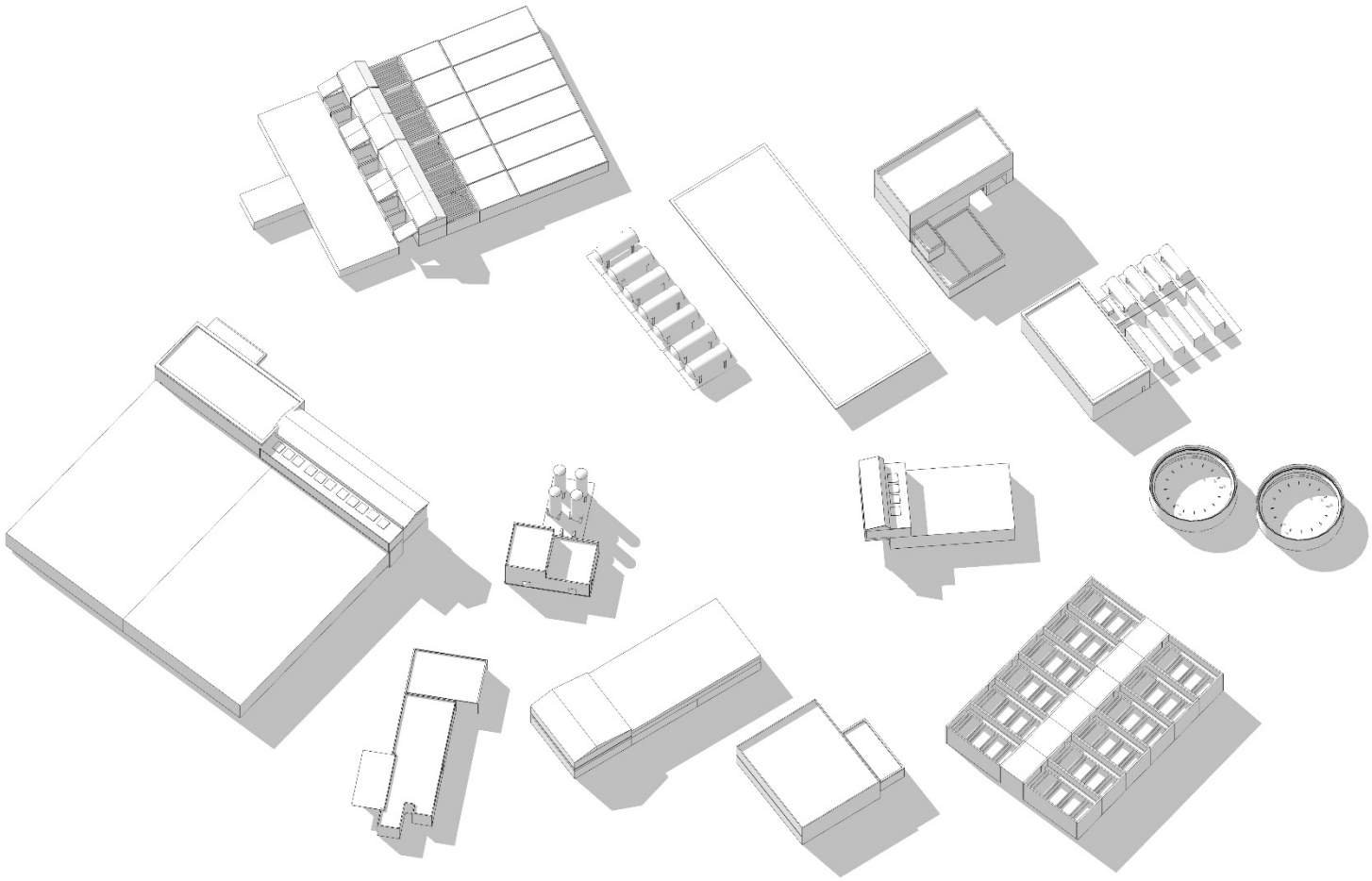
- Screw presses
- Solids thickening
- Thickened solids storage
- Polymer conditioning



Putting it all together

PRELIMINARY WATER TREATMENT PLANT LAYOUT

Treatment Process Defines the Puzzle Pieces



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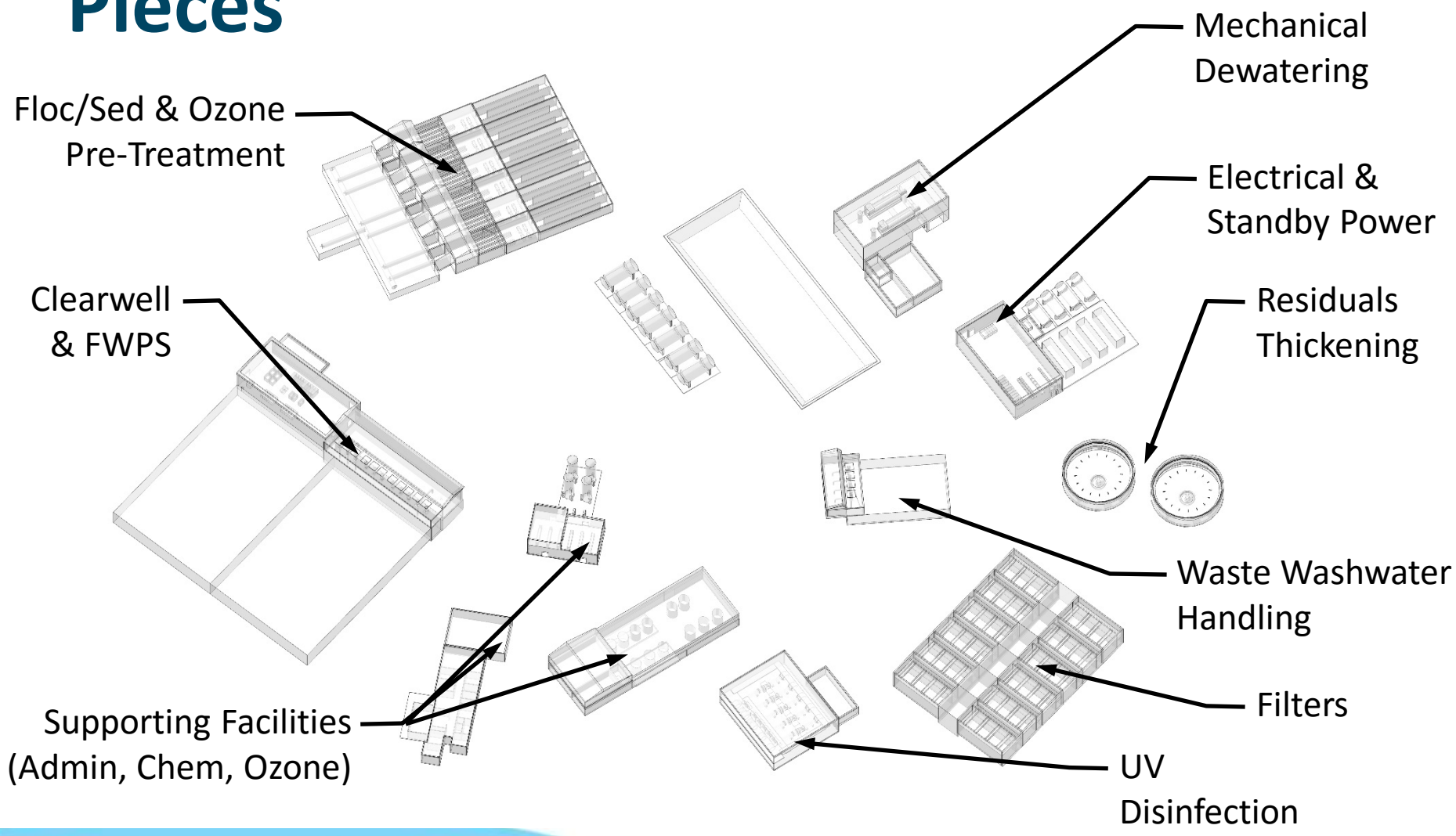
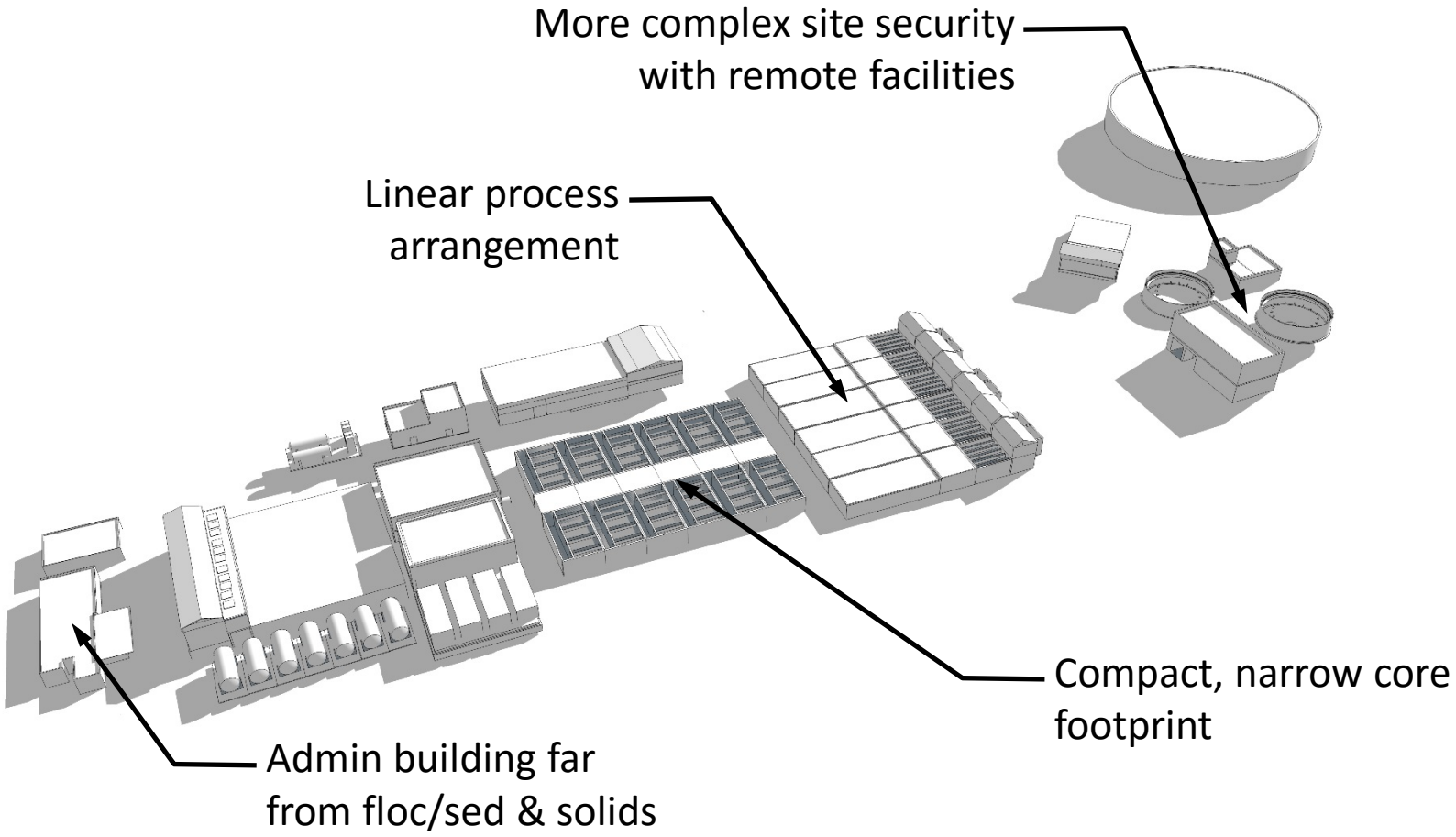


Site Constraints & Operations Defines the Layout



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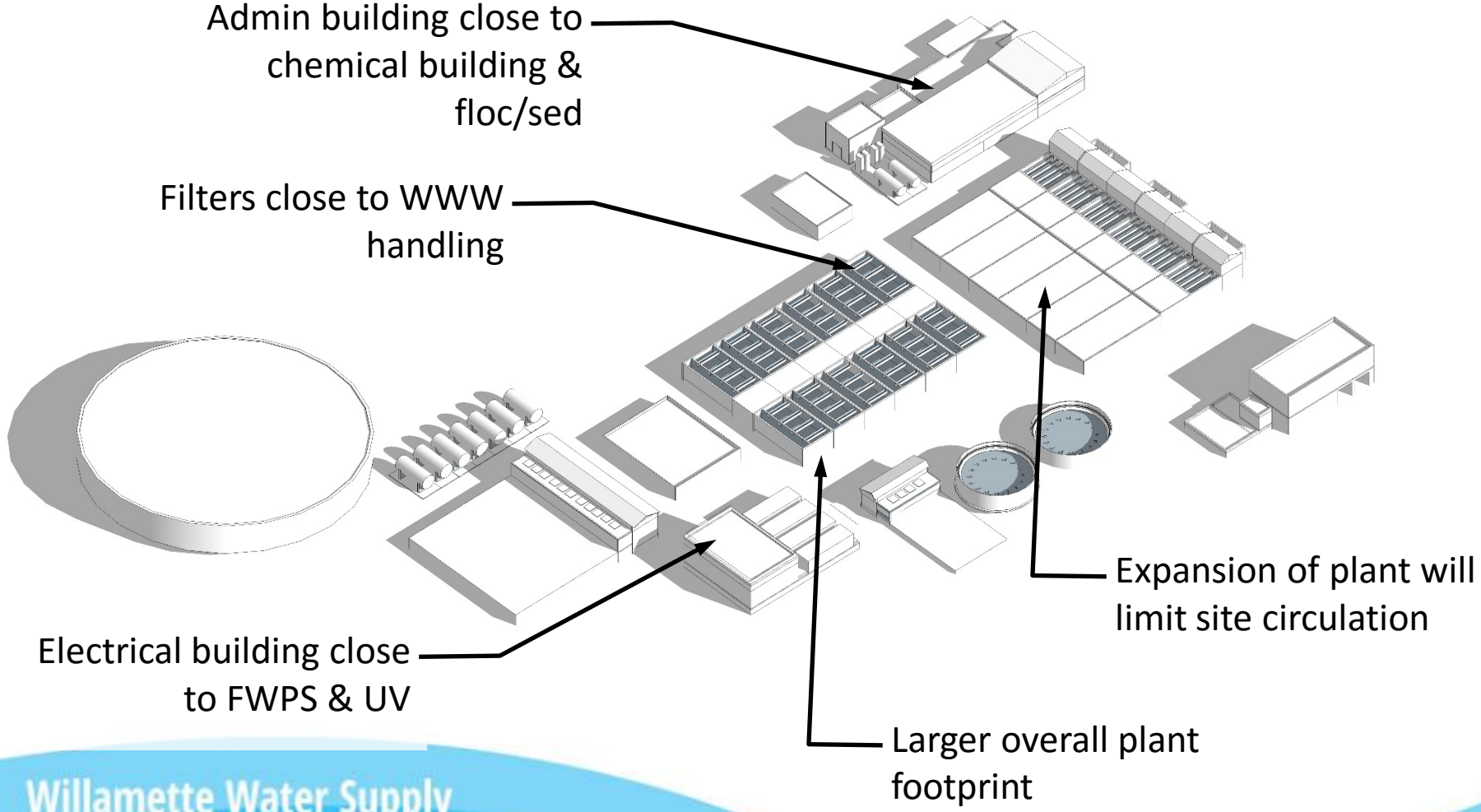

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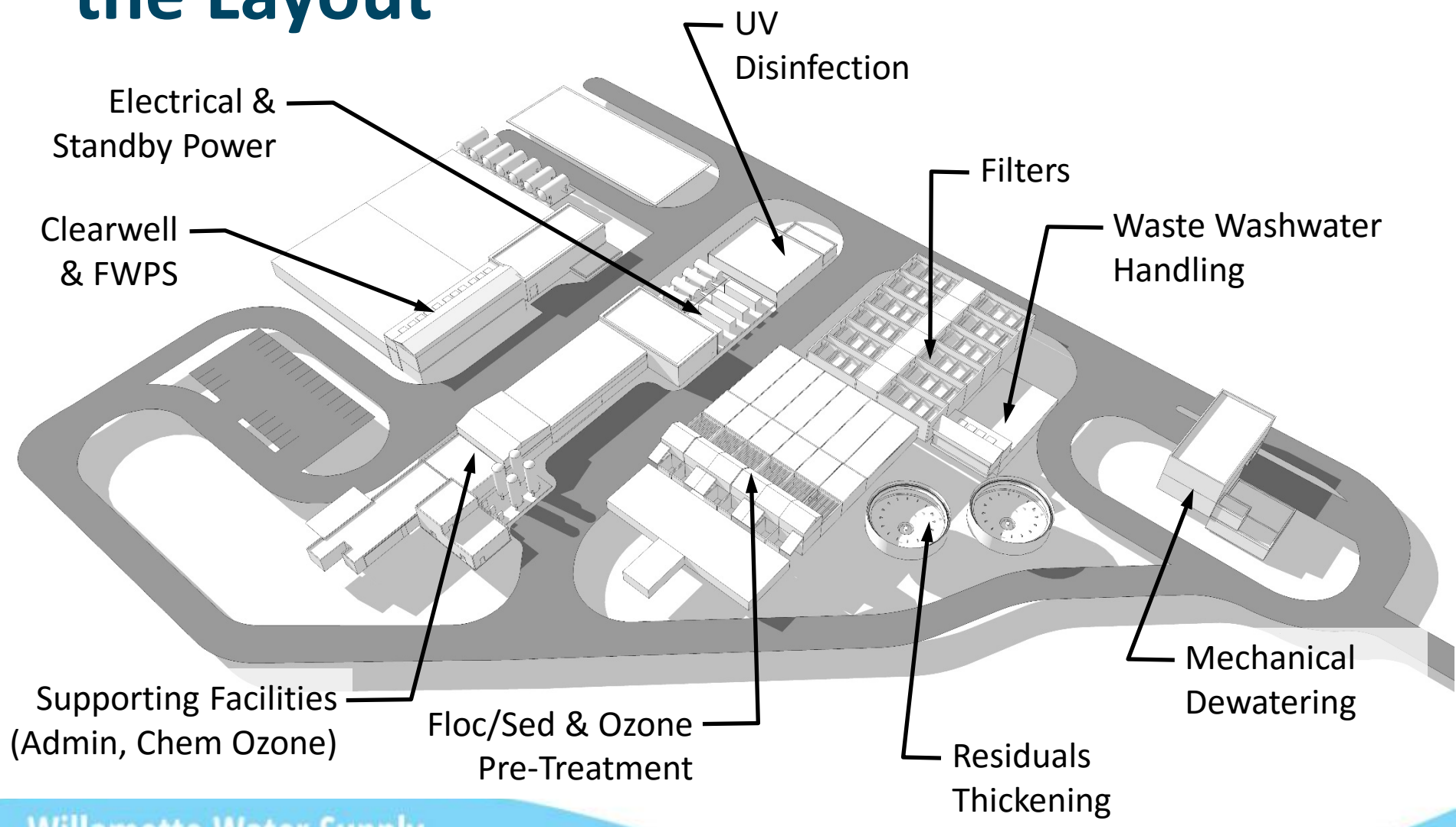

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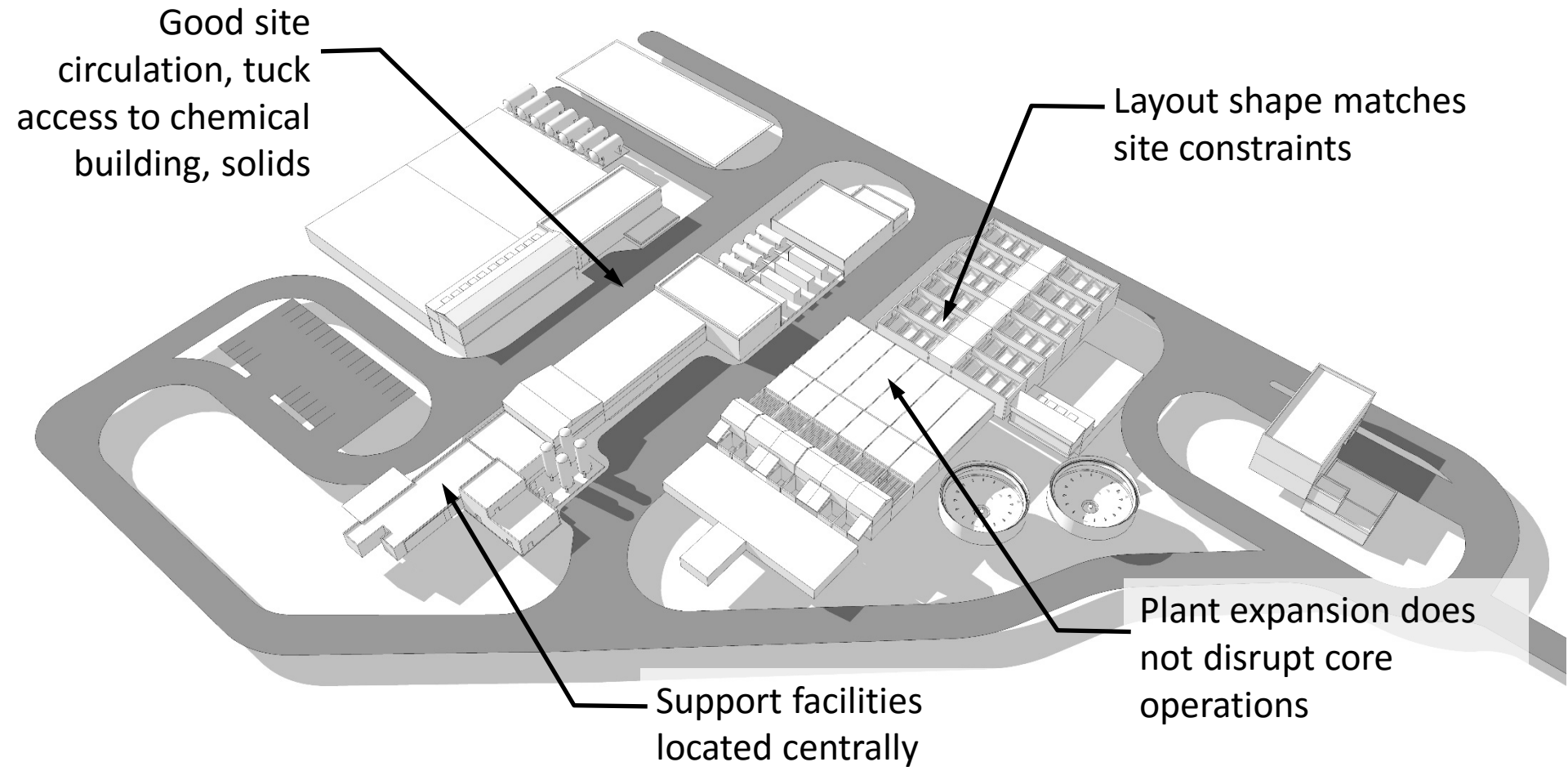
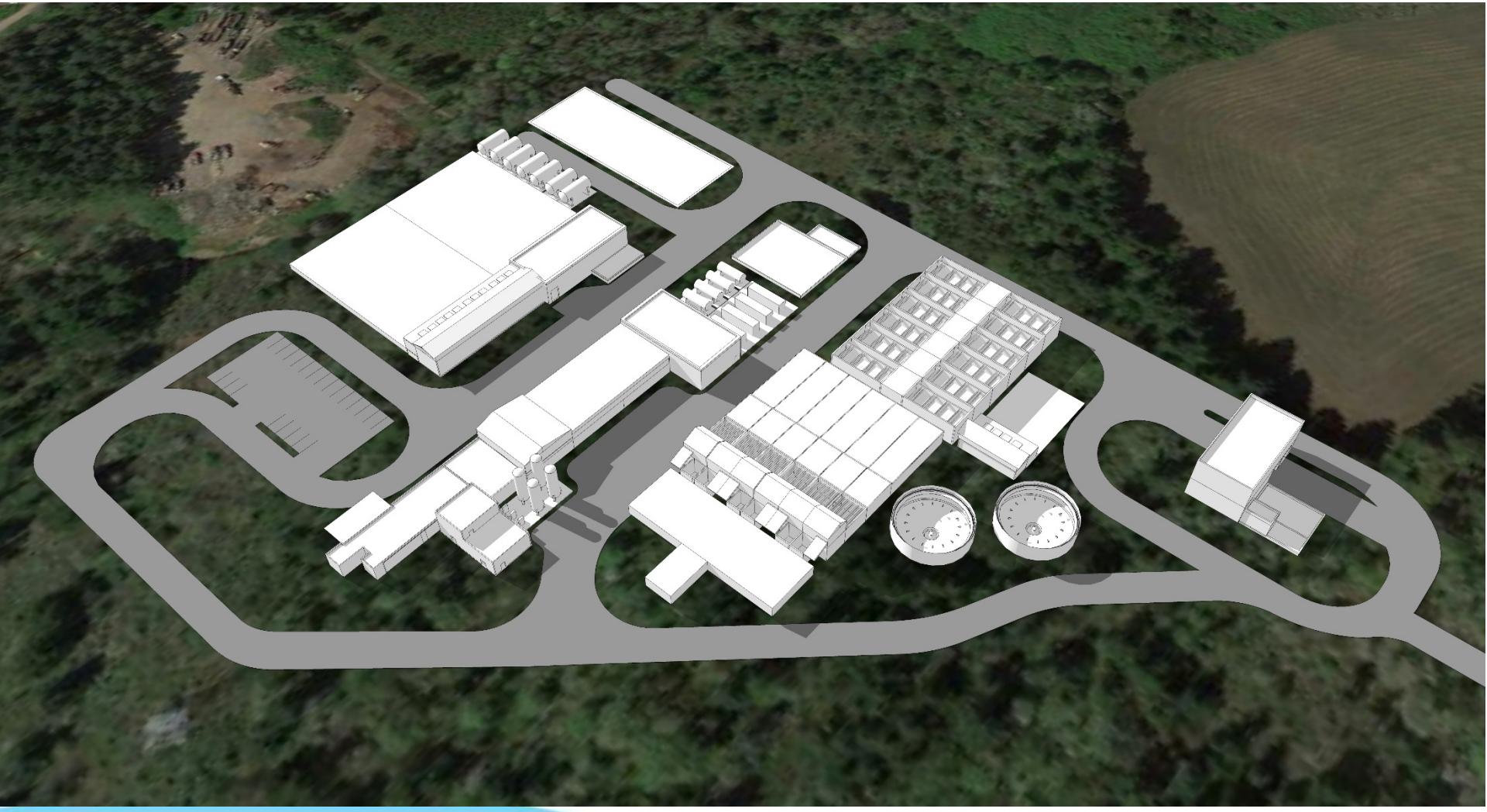


Preliminary WTP Layout at Build-Out



Conclusions

- Siting a new water treatment plant is a complex, multi-discipline process. Some of the most difficult issues cannot be solved with engineering.
- Advancements in treatment technologies over the last 20 years can improve treatment performance and decrease plant footprint.
- Treatment plant layout must balance multiple sometimes competing criteria including permitting/environmental, construction, operations and security needs.

Next Steps

- The treatment plant layout will continue to be refined through an upcoming pre-design process which will better define:
  - Individual process layouts and building area requirements
  - Optimize layout for constructability and long term operations.

Thank you!

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