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Nutrient Removal in Texas

Overview and Case Study

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TACWA
A CLEAR COMMITMENT TO TEXAS WATERS

About Me

- University of Houston, B.S. Civil Engineering
- Senior Engineer with Jones|Carter
- 15 years in wastewater treatment
- Experience includes:
  - BNR, chemical P removal, and zero-discharge WWTPs
  - New and expanded WWTPs
  - Complex rehabs and retrofits

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Nutrient limits are coming…for us all.

There is nothing you can do to stop it.

But it doesn't have to be scary…

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Today's Discussion

- Why Nutrient Removal Matters
- What Regulations Drive Nutrient Removal
- Case Study

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Nutrient Basics

- Nitrogen & Phosphorus
  - Essential for plant and animal nourishment
  - Fertilizers, detergents, human and animal waste
  - Agricultural runoff, stormwater runoff, WWTP effluent
- Chlorophyll a
  - Allows photosynthesis
  - Indicator used to measure algae biomass in water body
- Eutrophication
  - Increased nutrient load in water bodies

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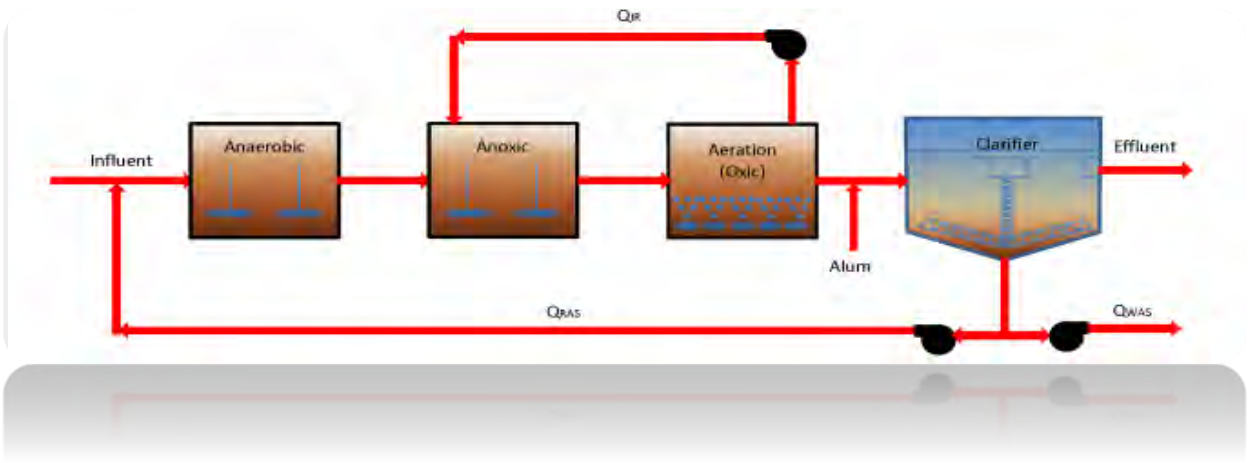
Why Manage Nutrients in Water Bodies?

- Hypoxia
  - DO depletion due to excessive organic matter decay
  - Displace or kill aquatic life
  - Dead zones and fish kills
- Algal Toxins
  - Released from blooms of certain algae
  - Aquatic life, drinking water, and contact recreation
  - Blue-green algae and cyanobacteria

What is Nutrient Removal?

- Point-source discharges easy to regulate (WWTPs)
- Nutrient limits in discharge permits (TP or TN)
- Additional treatment and equipment
  - Biological Removal (TP & TN)
  - Chemical Removal (TP)



Biological Phosphorus Removal

- AO
- A2O/A^2C
- Modified Bardenpho
- UCT
- MUCT
- VIP
- Johannesburg
- Modified Johannesburg
- West Bank
- SBR
- Phostrip

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Nutrient Management in Texas

- EPA
  - Clean Water Act

- TCEQ
  - Texas Surface Water Quality Standards (2018)
  - Procedures to Implement the TSWQS (2010)
  - TPDES Discharge Permits
  - Nutrient Criteria Development Plan (2014)

Update to Standards and IPs are expected to be released for public comment in February 2022.

Numeric vs. Narrative Criteria

- 1998 EPA National Strategy for the Development of Regional Nutrient Criteria
- Long-term goal Numeric Nutrient Criteria (NNC) for all water bodies
- 2010 TCEQ adopted Chl a for 75 reservoirs
- 2013 EPA approved 39 of the 75
- All others screened under narrative criteria:
  - *Nutrients from permitted discharges or other controllable sources must not cause excessive growth of aquatic vegetation that impairs an existing, designated, presumed, or attainable use.*

TPDES Permit Nutrient Limits

- Prevent violation of NNC **or** *preclude excessive growth of aquatic vegetation*
- TP screening for
  - New or expanding domestic discharges
  - Reservoirs, streams and rivers
- TN screening for
  - Sensitive site estuaries (seagrass beds)
  - New and increased discharges
- Renewals and industrial case-by-case

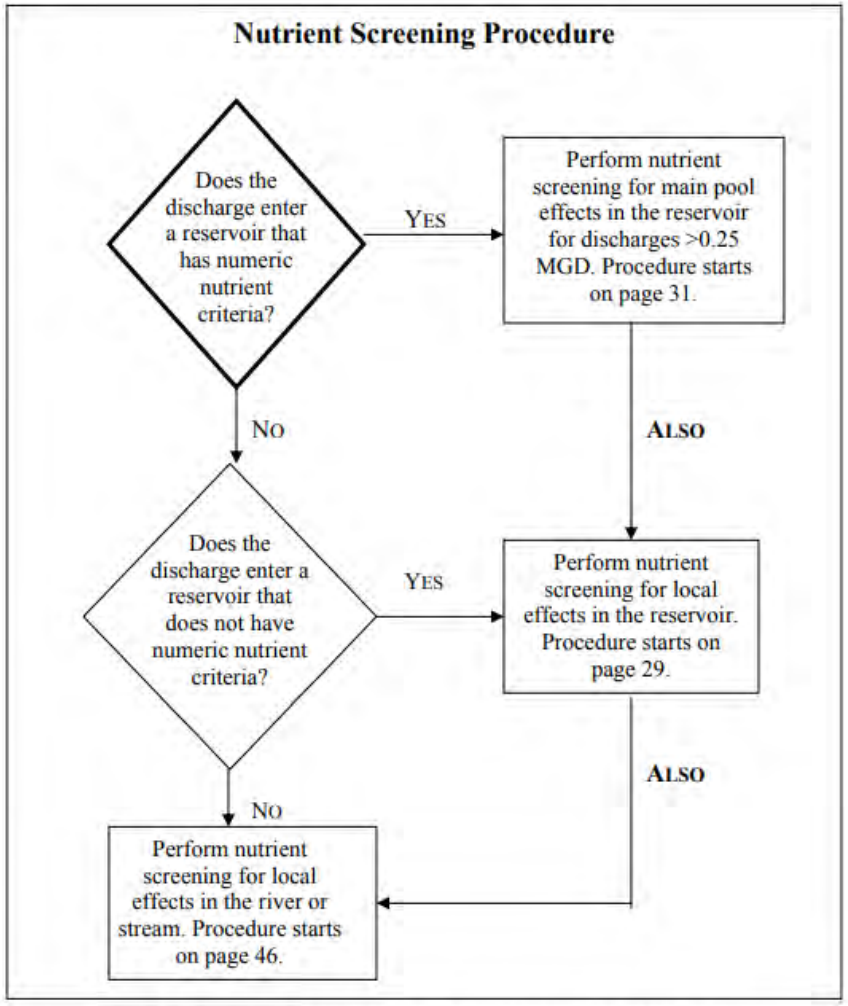

Figure 1. Flow chart showing the nutrient screening procedure.

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The Future?

- Nutrient limits likely for all TPDES permits ultimately
- No timeline or defined path forward
- Start planning now, don’t be caught by surprise!

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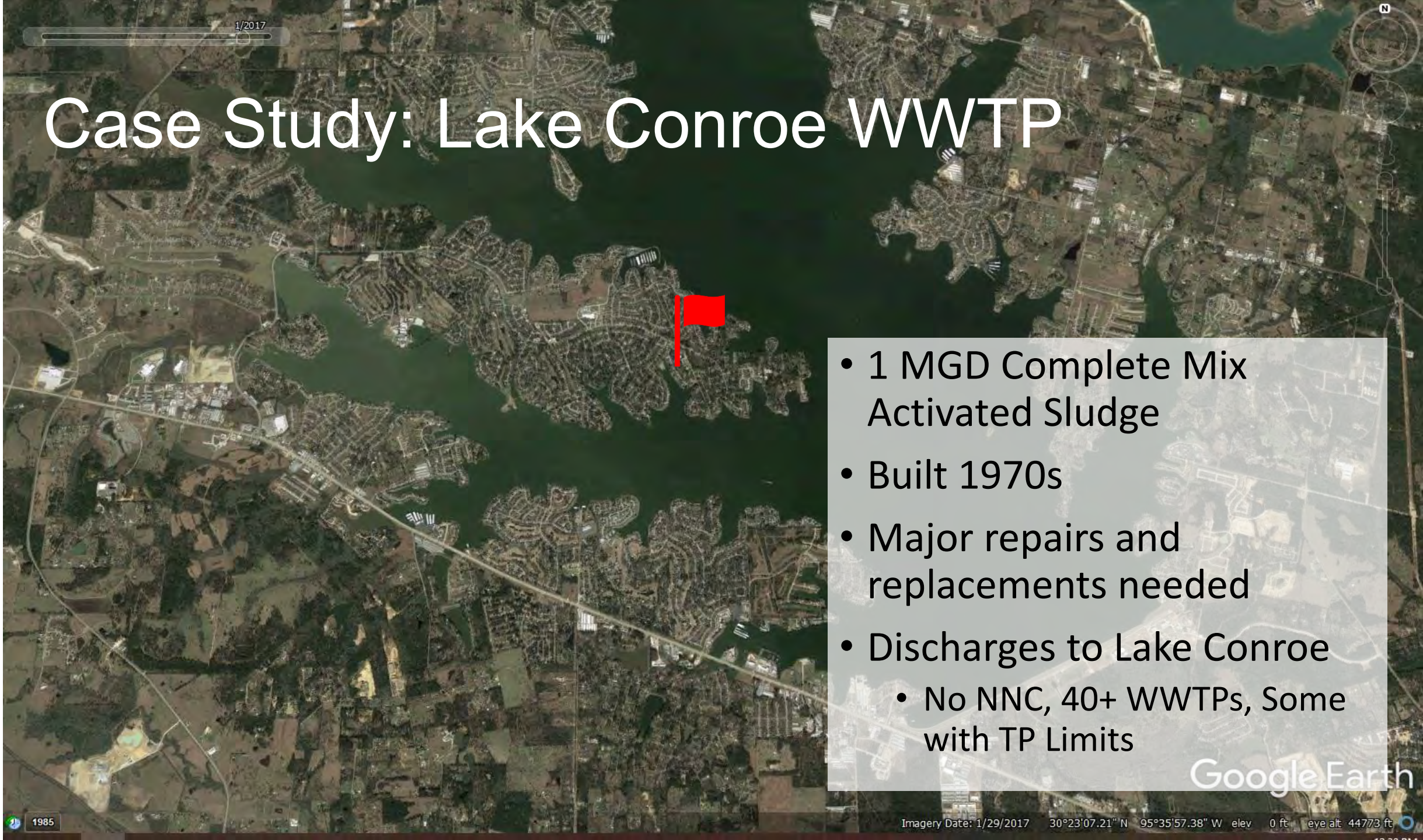
Case Study: Lake Conroe WWTP



- 1 MGD Complete Mix Activated Sludge
- Built 1970s
- Major repairs and replacements needed
- Discharges to Lake Conroe
  - No NNC, 40+ WWTPs, Some with TP Limits

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Reactive Approach

- Historically common approach
- Don’t spend money until forced
- Limited options for upgrades and improvements
- Lower cost as you go, greater cost in the long run

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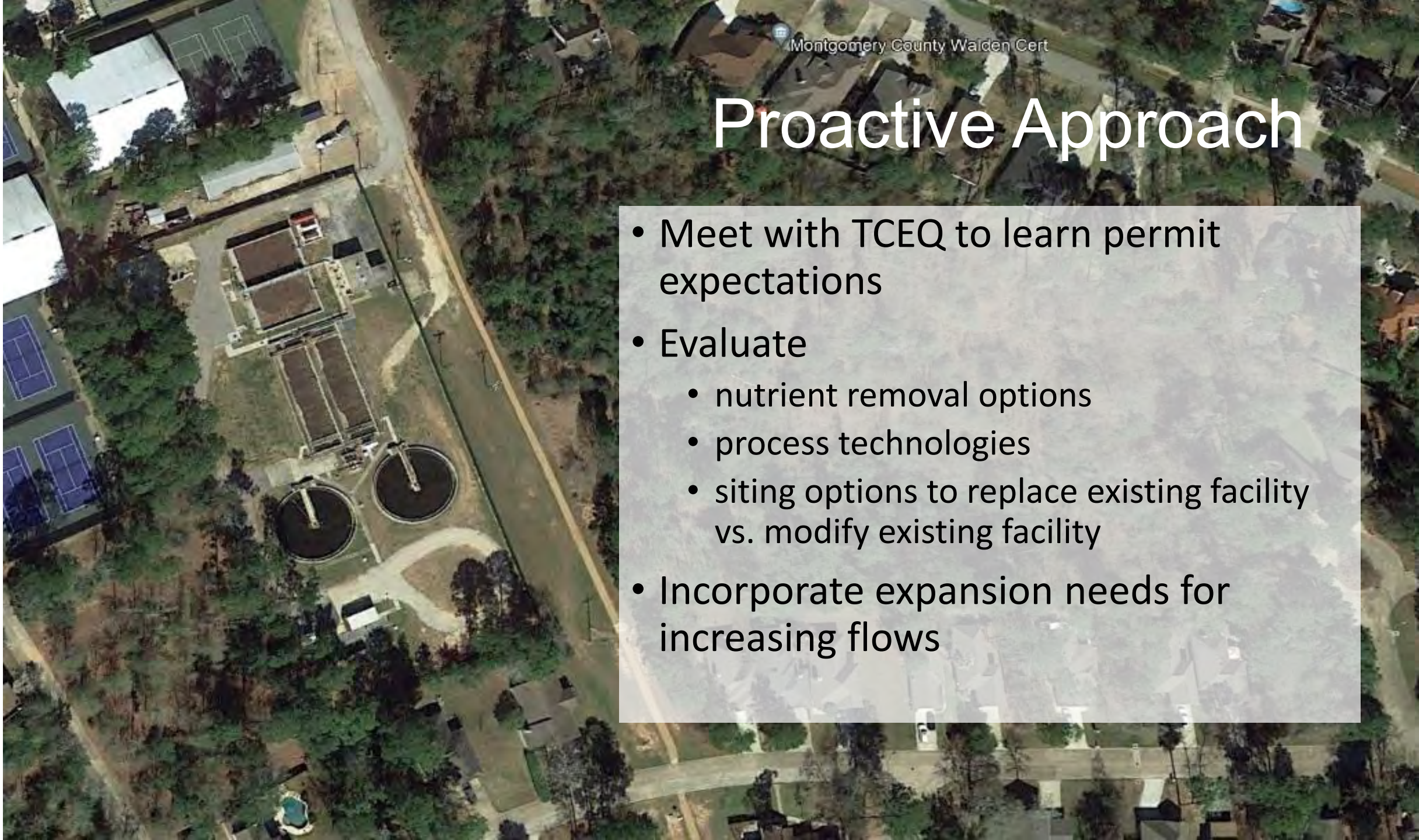

Proactive Approach

- Meet with TCEQ to learn permit expectations
- Evaluate
  - nutrient removal options
  - process technologies
  - siting options to replace existing facility vs. modify existing facility
- Incorporate expansion needs for increasing flows

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REACTIONARY APPROACH

PROACTIVE APPROACH

Item	Retrofit Exist Plant	SBR East Site	Carrousel East Site
Exist Plant Improvements	$9,400,000	$1,000,000	$1,000,000
New Improvements	$8,400,000	$20,900,000	$24,400,000
Overall Project Cost	**$17,800,000**	**$21,900,000**	**$25,400,000**

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A Better Future

- ✕ Reactionary approach
- ✓ Proactive approach
  - ✓ Open to new ideas
  - ✓ Met short-term goals
  - ✓ Long-term solutions
  - ✓ Time to plan
  - ✓ Best value

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Questions?

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