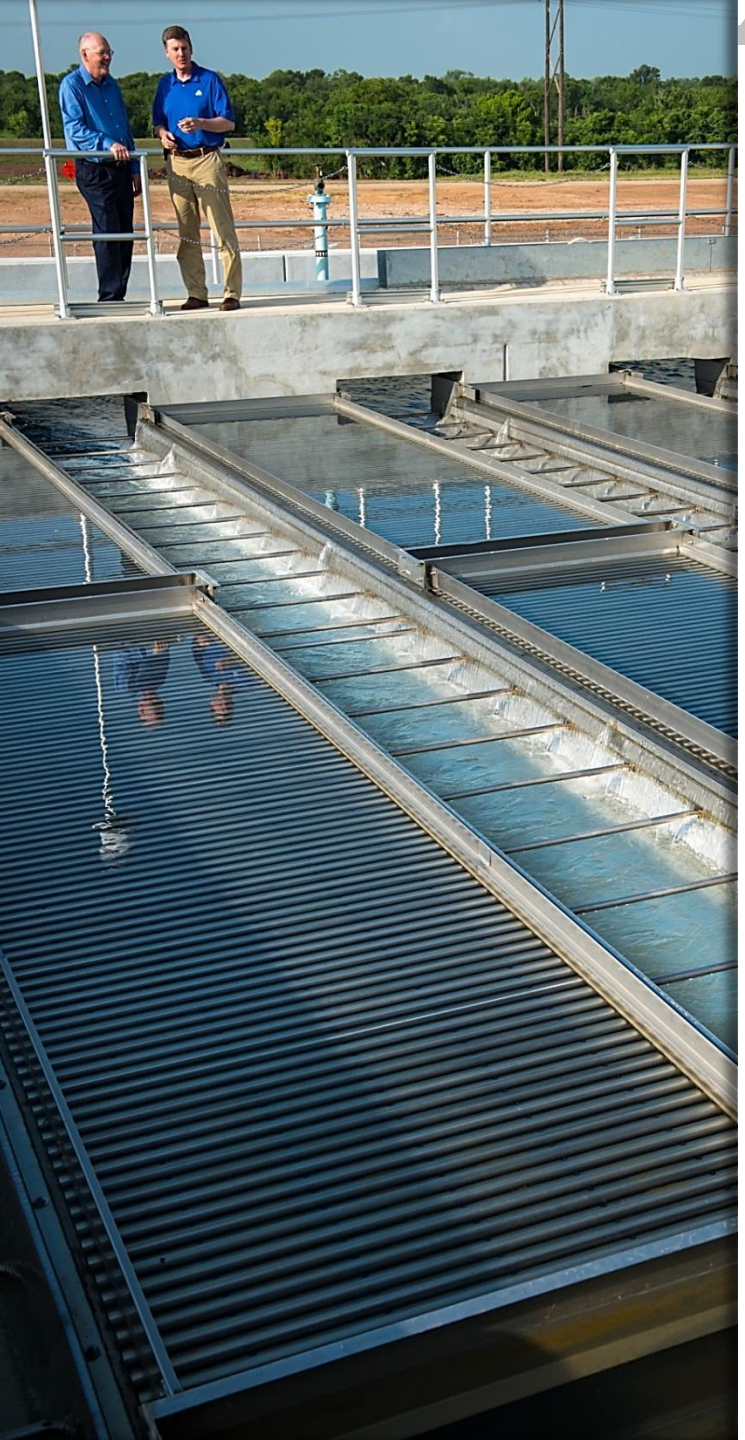


Sizing Criteria for Inclined Plate Settlers

Theory, Current TCEQ Rules, and Full-Scale Operating Data

Jordan Hibbs, P.E.

Jennie Kessler, E.I.T.

Enprotec / Hibbs & Todd, Inc.

April 16, 2014

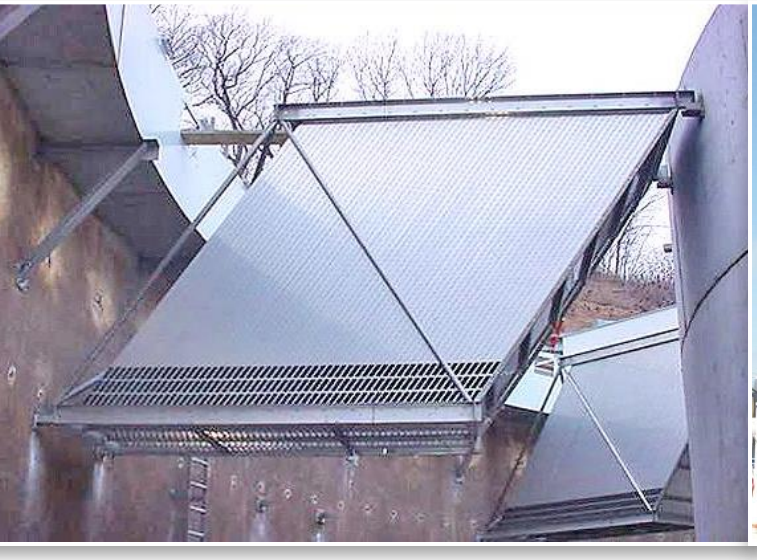
Agenda

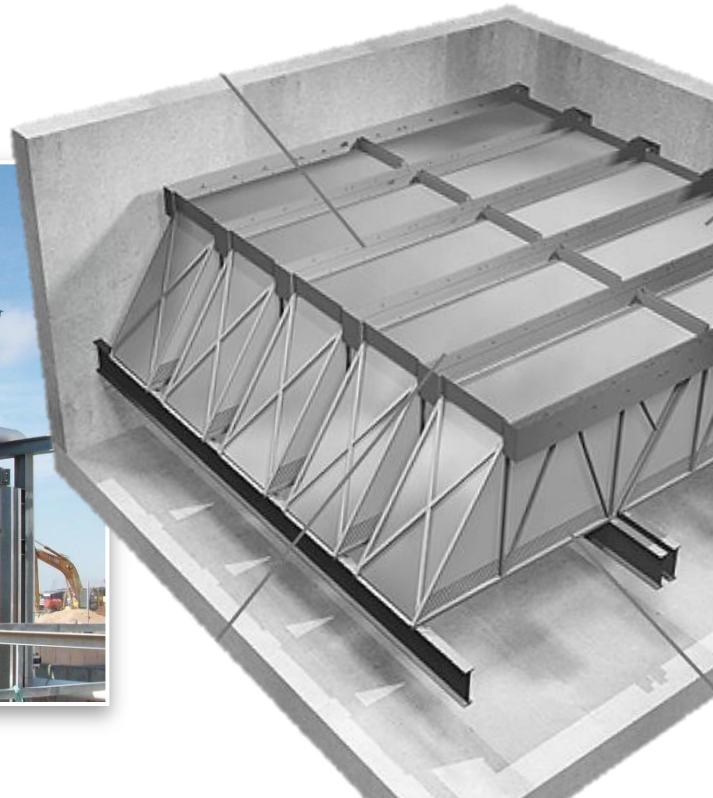
- Background and Technical Information
- Advantages
- Sizing Criteria
- Uprating: Missouri City Case Study

BACKROUND INFORMATION FOR PLATE SETTLERS

What are plate settlers?

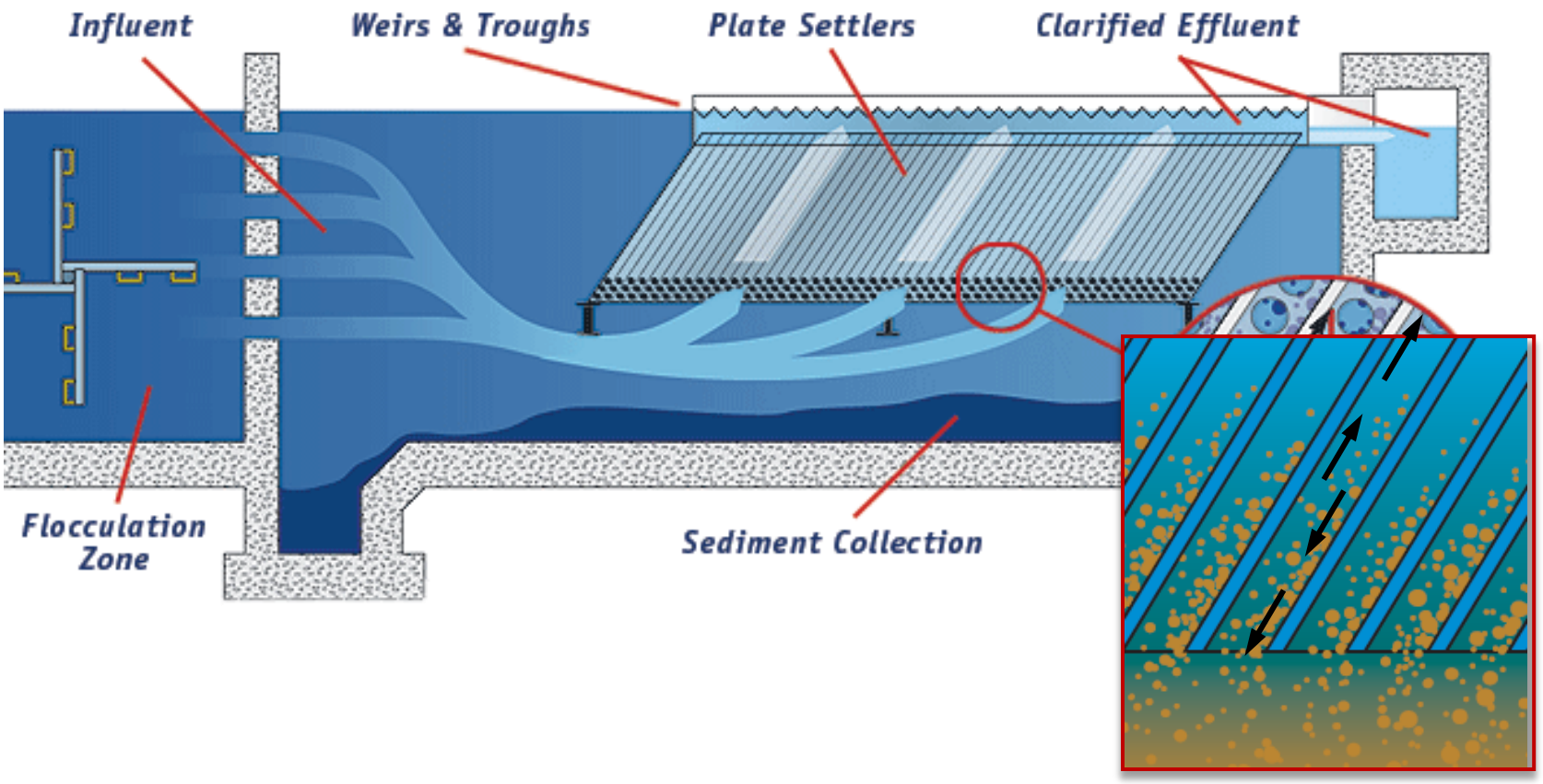
- For clarification/sedimentation
- A.k.a. lamella clarifiers
- Flexibility in type of basin





How Plates Work

- Large settling area in small volume



Sludge Collection

- Many options: existing clarifier, chain and flight, sludge scraper, hose vacuum…

- Hoseless vacuum is a low-maintenance option

Plate settlers are rapidly gaining popularity

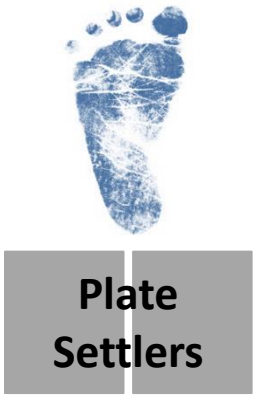
- Installations in Texas:
  - MRI – 8
  - JMS – 5
  - Parkson – (Waiting)

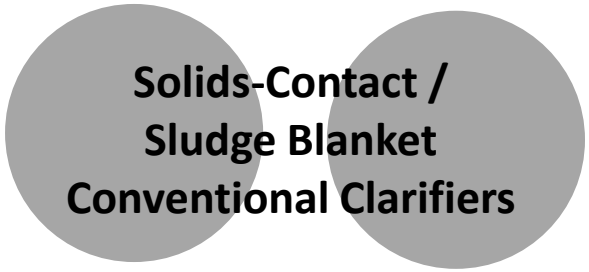
ADVANTAGES OF PLATE SETTLERS

Advantages of Plate Settlers

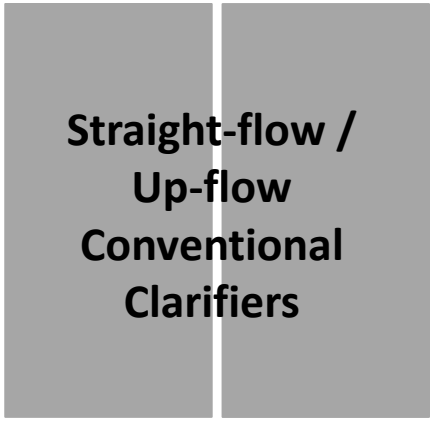
Footprint | Water Quality | Coagulant Usage | O&M

- Plates require less space than conventional clarifiers
- **Often less costly overall**





~3x the area of plate settlers



~5x the area of plate settlers

Advantages of Plate Settlers

Footprint | Water Quality | Coagulant Usage | O&M

- Plates typically boost settled water quality

Advantages of Plate Settlers

Footprint | Water Quality | Coagulant Usage | O&M

- Plates typically allow modest reduction in coagulant dosage

Advantages of Plate Settlers

Footprint | Water Quality | Coagulant Usage | O&M

- O&M is straightforward
  - Only moving parts are in sludge collection mechanism
  - Hosing down typically needed monthly

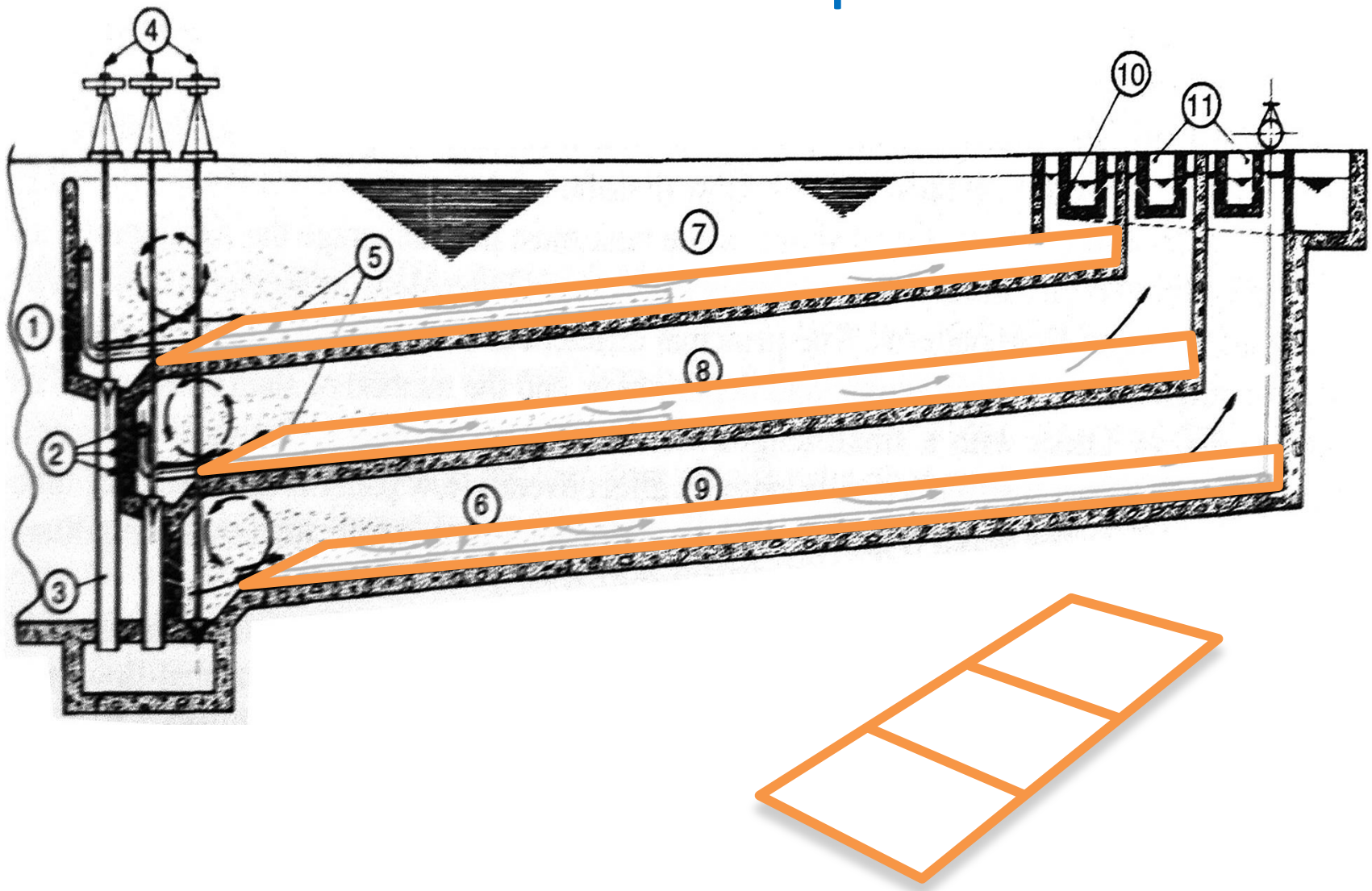
SIZING CRITERIA

From settling theory, capacity is proportional to **horizontal surface area**

Capacity = Loading Rate x Horizontal Surface Area

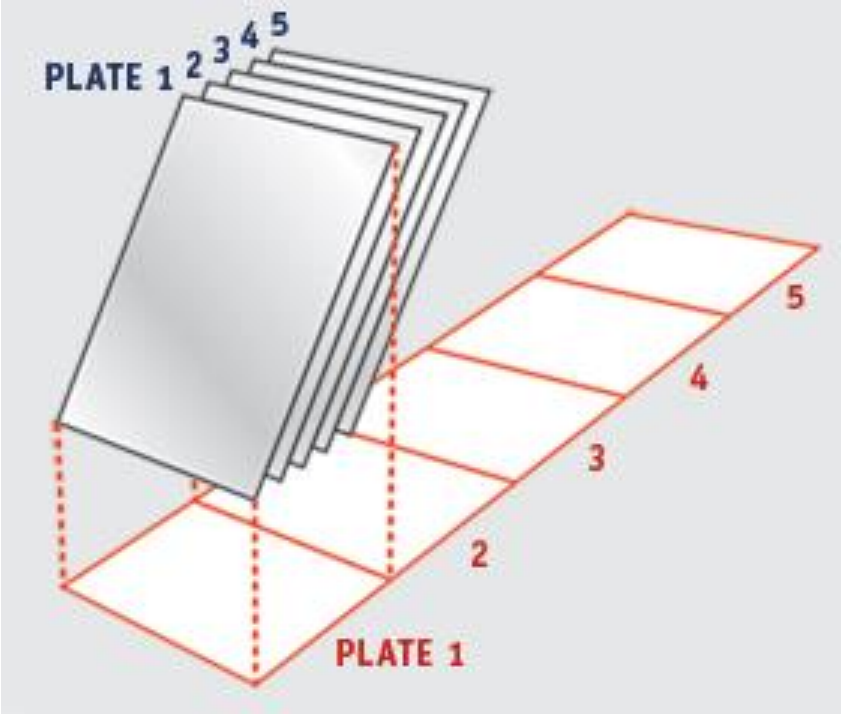
gpm gpm/sf sf

But horizontal surface area is **not** the same as footprint



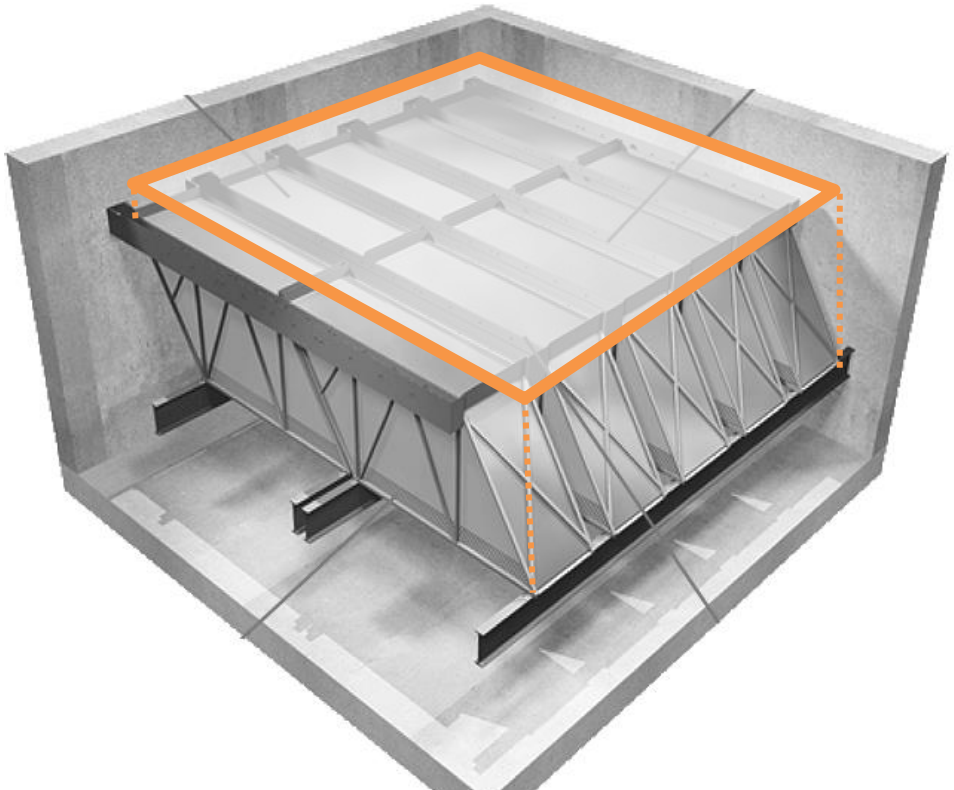
For plate settlers, capacity is based on **Surface Loading Rate (SLR)**

- Calculated over **horizontally projected area**
- Typically 0.3 gpm/sf



TCEQ currently grants capacity based on **Surface Overflow Rate (SOR)**

- Calculated over **footprint** of equipment (including troughs and support equipment)
- 3.0 gpm/sf (vs. 1.0 gpm/sf per TAC 290)



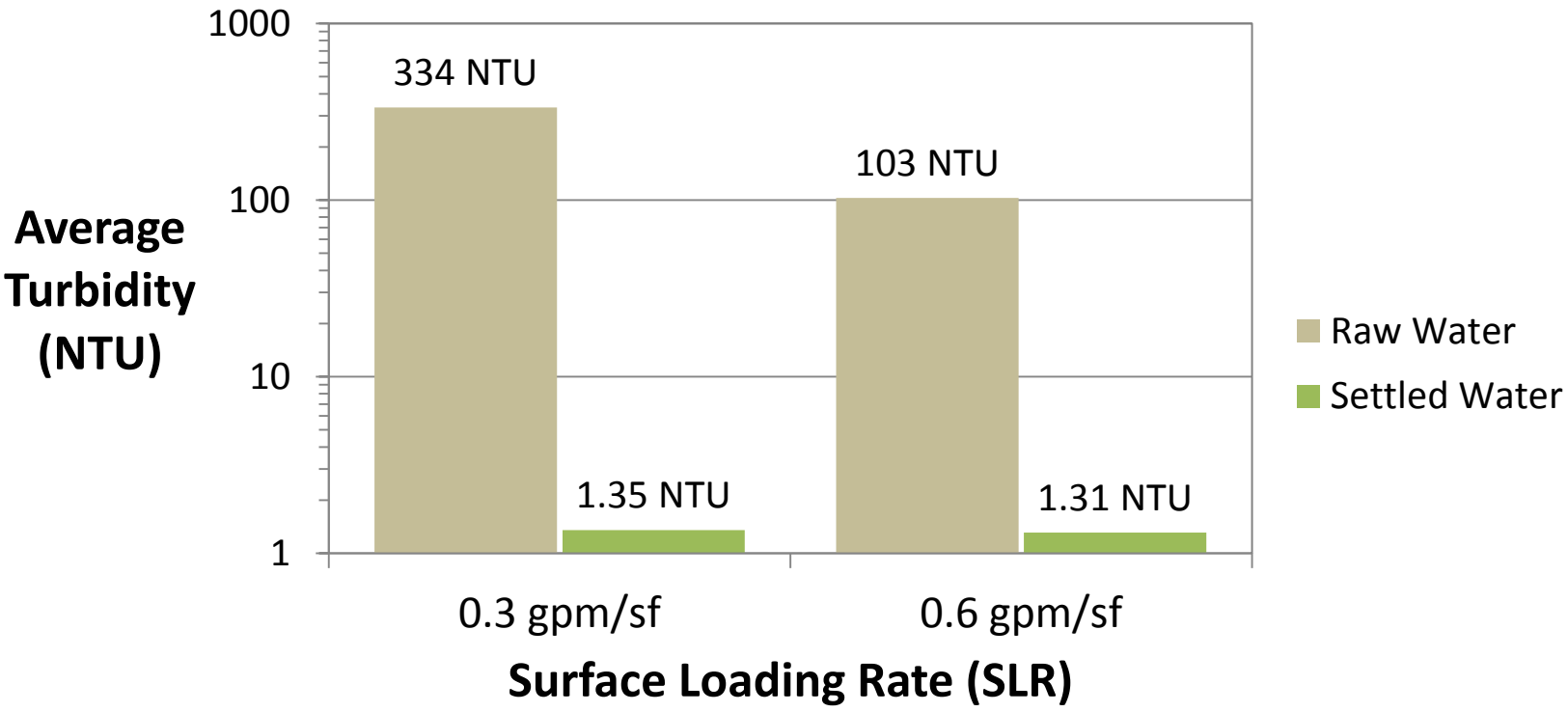
Available pilot data appears to support higher loading rates

Missouri City pilot study approach:

- Initial SLR of 0.3 gpm/sf; later 0.6 gpm/sf (using efficiency multiplier of 90%)

Missouri City Pilot Study Results

- Increased SLR did not increase settled water turbidity.



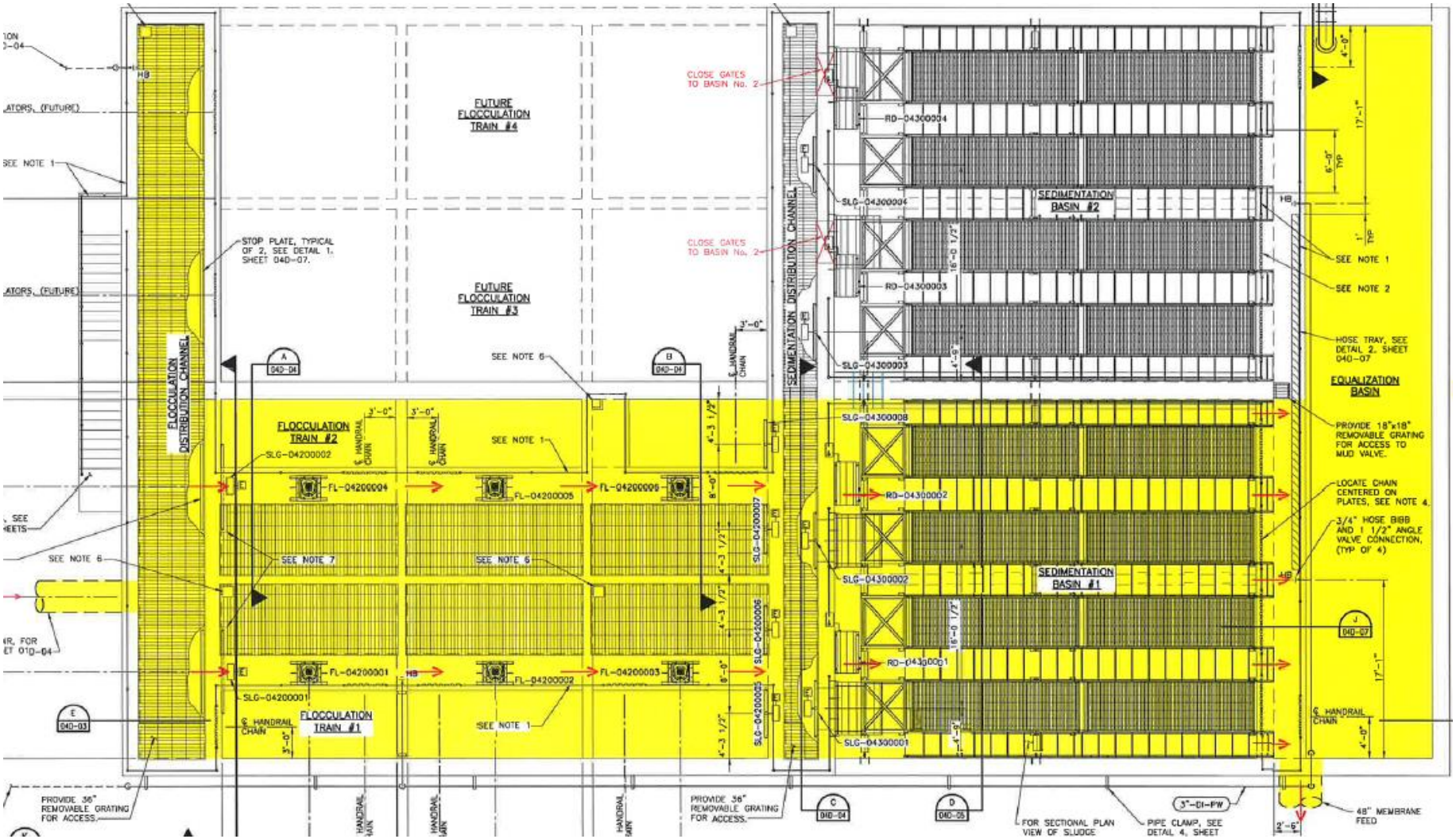
UPRATING IS AN OPTION: MISSOURI CITY CASE STUDY

Missouri City Surface Water Treatment Plant

Typical Turbidity

Average Turbidity (NTU)		
Month	**Raw Water**	**Settled Water**
April 2013	33	0.70
May 2013	33	0.72
June 2013	43	0.75
July 2013	33	0.84

Draft full-scale challenge test protocol has been submitted to TCEQ

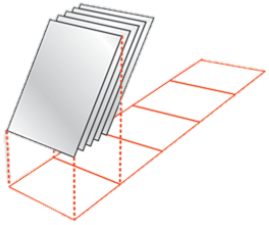


Proposed Goal: 0.6 gpm/sf while maintaining turbidity below 3.0 NTU 95% of time

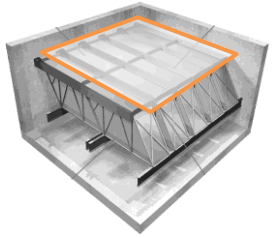
- If approved, Missouri City plate settler capacity will **double** (11 mgd to 22 mgd)

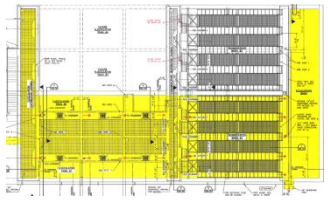
RECAP

- Plate settlers offer multiple advantages

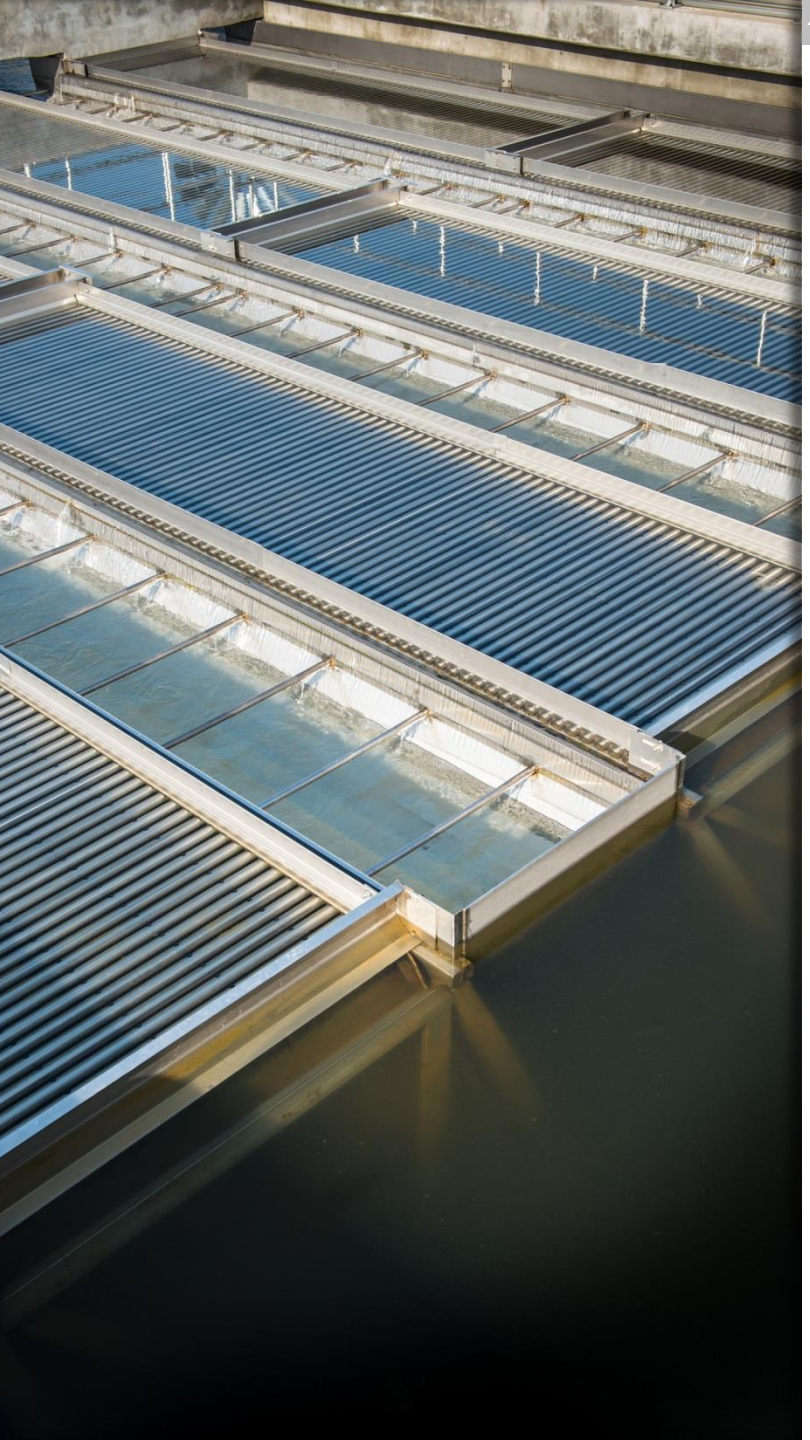


- Sizing is based on Surface Loading Rate (SLR)
  - However, TCEQ grants capacity based on Surface Overflow Rate (SOR)





- Uprating is an option, like Missouri City case



Thank you for attending

QUESTIONS, COMMENTS