



# WASTEWATER TREATMENT ALTERNATIVES

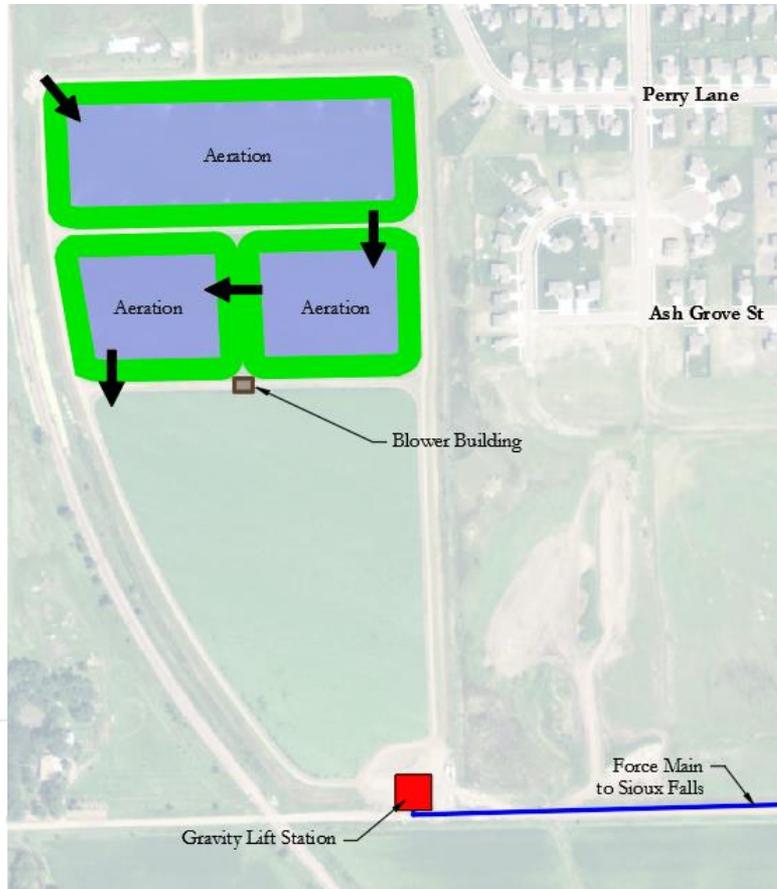
September 6, 2016 – Presentation

# Treatment Alternatives

- 1** Partial Pumping to Sioux Falls
- 2** Complete Pumping to Sioux Falls
- 3** Sequencing Batch Reactor (SBR)
- 4** Oxidation Ditch
- 5** Aeromod - SEQUOX
- 6** Submerged Attach Growth (SAGR)



# Partial Pumping to Sioux Falls



- **Maintain Existing Ponds**
- **Additional Aeration – Cells 1 and 2**
- **Treatment Credit – 10 years**
- **Equalization Credit – 20+ Years**
- **Force main extension – Pump Station 240**



# Complete Pumping to Sioux Falls



- **Maintain Cell 3** – Emergency storage
- **No Treatment Credit**
- **No Equalization Credit**
- **Force main extension** – Pump Station 240



# Sequencing Batch Reactor



Lennox, SD

- **Batch Process**
- **Flow Equalization** – Existing lagoons or new pond onsite
- **Odor Control** – Odor scrubber and aerobic treatment
- **Nutrient Removal** – May require additional processes



# Oxidation Ditch



Dawson, Mn

- **Continuous Flow**
- **No Flow Equalization** – Large basin volume for treatment
- **Odor Control** – Odor scrubber and aerobic treatment
- **Nutrient Removal** – May require additional processes



# Aeromod – SEQUOX

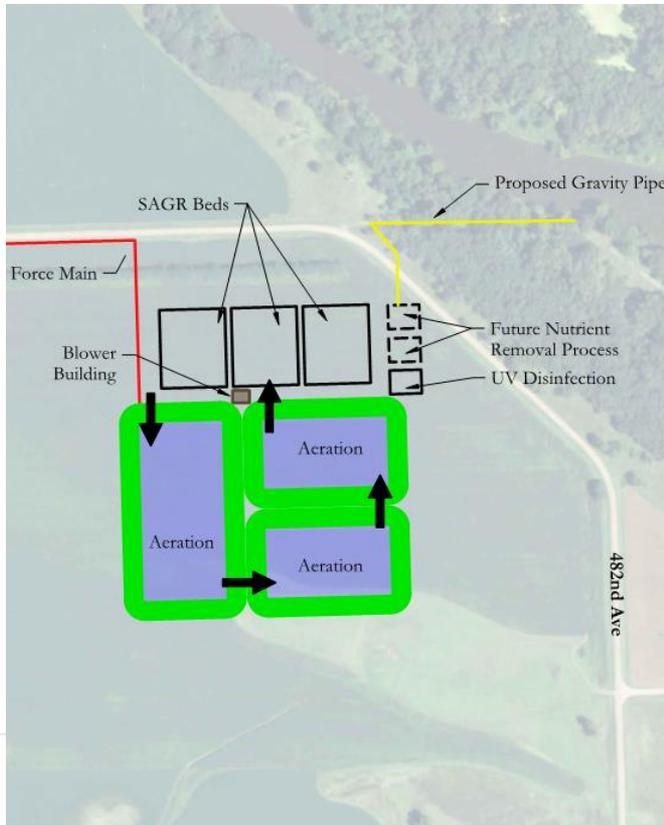


Alta, IA

- **Continuous Flow** – Sequenced aeration cycle
- **Flow Equalization** – Existing ponds or new pond onsite
- **Odor Control** – Odor scrubber and aerobic treatment
- **Nutrient Removal** – May require additional processes



# Submerged Attach Growth



Southeast of Harrisburg

- **Continuous Flow** – aerated lagoons with buried treatment media
- **New site location** – New ponds
- **Odor Control** – Aerobic treatment
- **Nutrient Removal** – May require additional processes



# Treatment Summary

Alternative	Treatment Type	Number of Motorized equipment	Pros	Cons
<b>Partial Pumping to Sioux Falls</b>	Regional Service Agreement	3	<ul style="list-style-type: none"> <li>▪ Least cost regionalization alternative</li> <li>▪ Buy as capacity as needed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Maintain existing pond and potential odor issues</li> <li>▪ Future sludge removal</li> <li>▪ Expensive pumping charges</li> <li>▪ Expensive capacity purchase</li> </ul>
<b>Complete Pumping to Sioux Falls</b>	Regional Service Agreement	1	<ul style="list-style-type: none"> <li>▪ Simplest treatment alternative</li> <li>▪ Buy as capacity as needed</li> <li>▪ Lowest overall capital cost</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expensive pumping charges</li> <li>▪ Expensive capacity purchase</li> </ul>
<b>Sequencing Batch Reactor</b>	Batch treatment	11	<ul style="list-style-type: none"> <li>▪ Small foot print</li> <li>▪ Equipment located inside</li> <li>▪ Low capital cost</li> <li>▪ High energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>▪ Unforgiving process</li> <li>▪ More difficult to operate and train personnel</li> </ul>

# Treatment Summary

Alternative	Treatment Type	Number of Motorized equipment	Pros	Cons
Oxidation Ditch	Continuous flow	24	<ul style="list-style-type: none"> <li>▪ Forgiving process</li> <li>▪ Easy to operate</li> <li>▪ No equalization</li> </ul>	<ul style="list-style-type: none"> <li>▪ Large foot print</li> <li>▪ Equipment located outside</li> <li>▪ Higher capital cost</li> <li>▪ High energy consumption</li> </ul>
Aeromod - SEQUOX	Continuous flow, sequenced aeration	5	<ul style="list-style-type: none"> <li>▪ Small foot print</li> <li>▪ Equipment located inside</li> <li>▪ Easy to operate and maintain</li> <li>▪ High energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>▪ First plant in South Dakota</li> </ul>
SAGR	Continuous flow	3	<ul style="list-style-type: none"> <li>▪ Low capital and operating cost</li> <li>▪ Easy to operate</li> <li>▪ Low maintenance</li> </ul>	<ul style="list-style-type: none"> <li>▪ High energy consumption</li> <li>▪ Buried aeration pipes</li> <li>▪ Future sludge disposal</li> </ul>

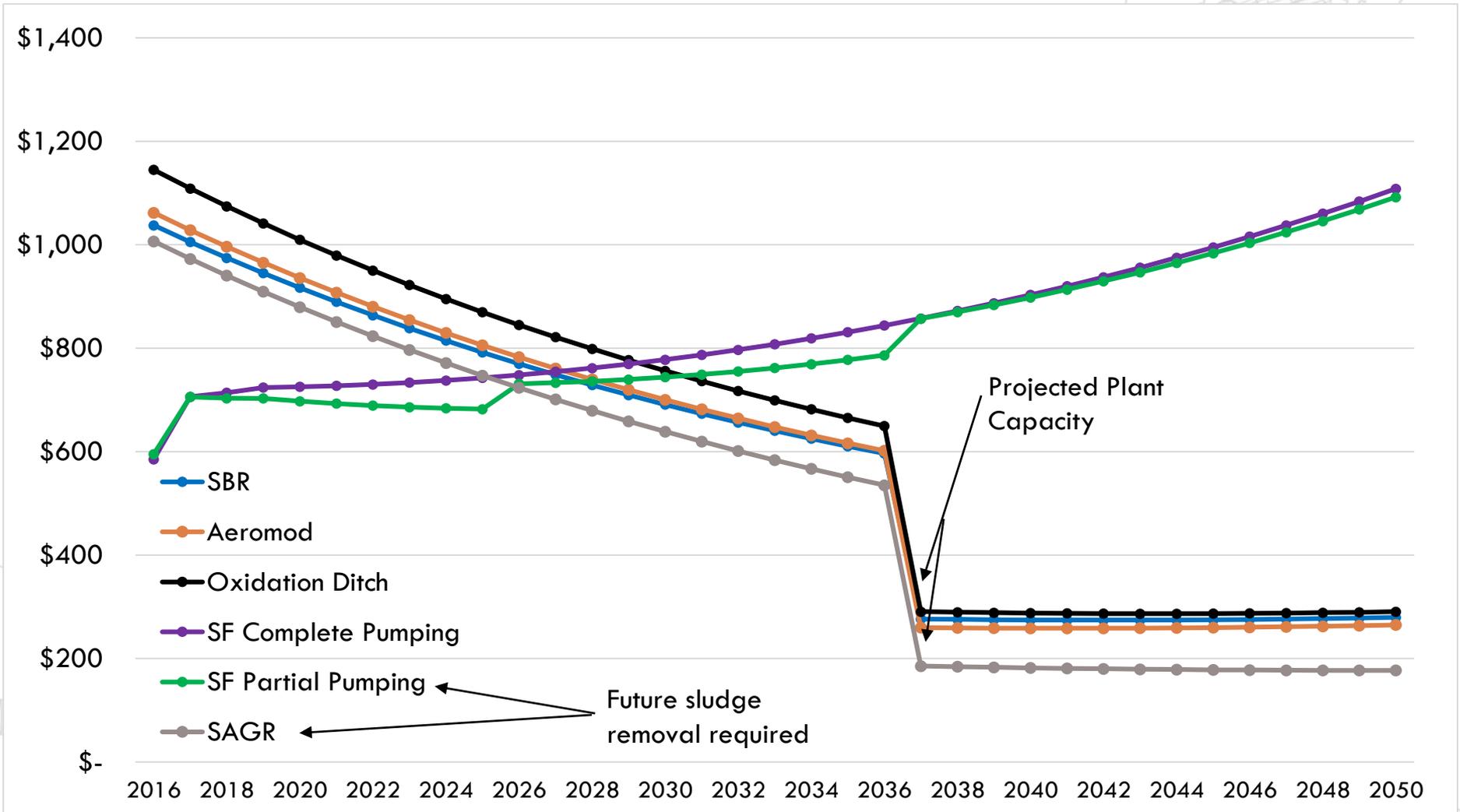
# Cost Summary

Alternative	Capital Cost	Equivalent Annual Cost
Submerged Attach Growth (SAGR)	\$20,215,000	\$1,278,762
Sequencing Batch Reactor (SBR)	\$19,220,000	\$1,433,940
Aero-Mod SEQUOX®	\$19,804,000	\$1,437,208
Partial Pumping to Sioux Falls	\$11,412,297	\$1,570,733
Oxidation Ditch	\$20,762,000	\$1,597,669
Complete Pumping to Sioux Falls	\$8,044,125	\$1,642,367

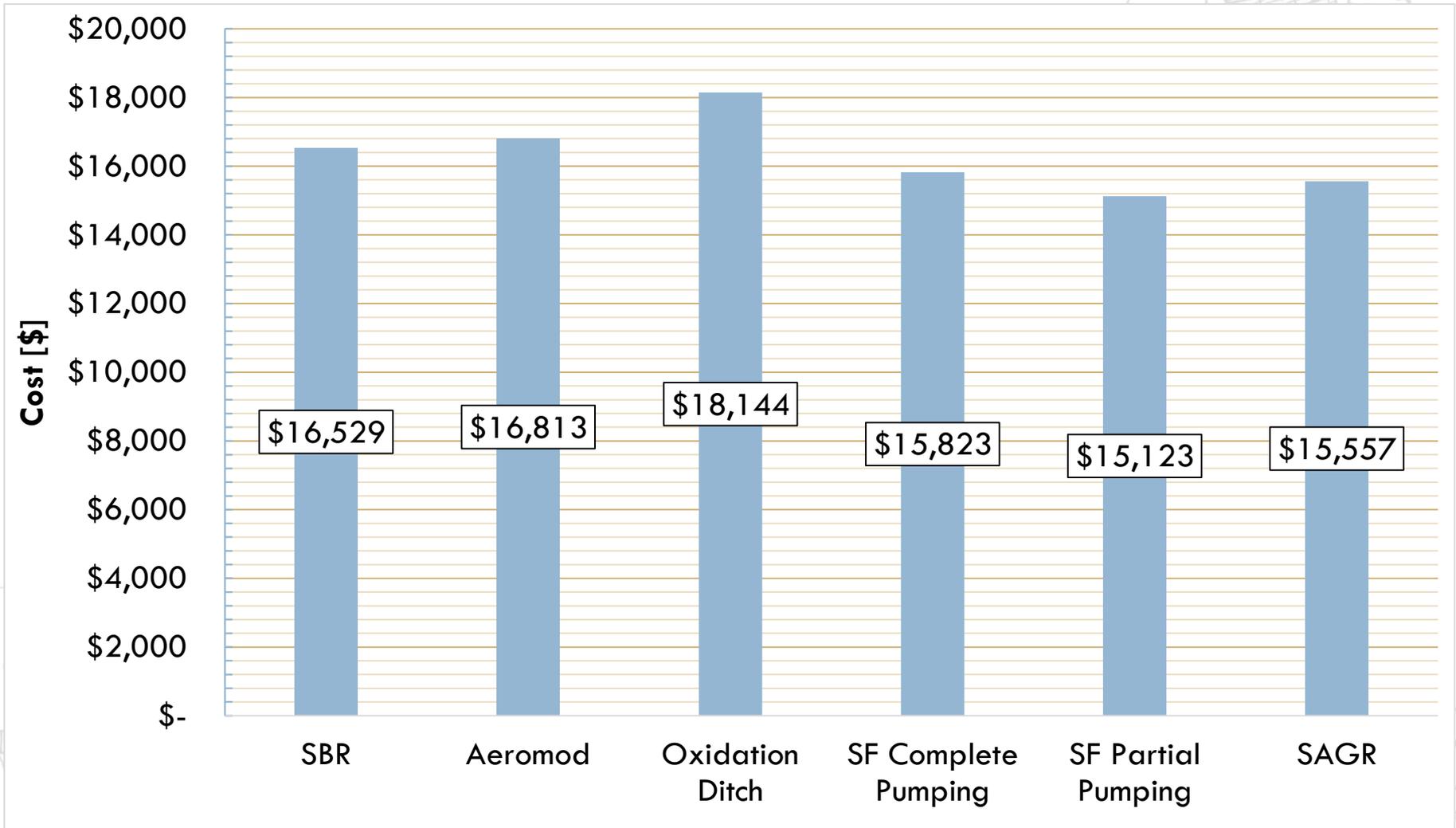
Least Cost Option

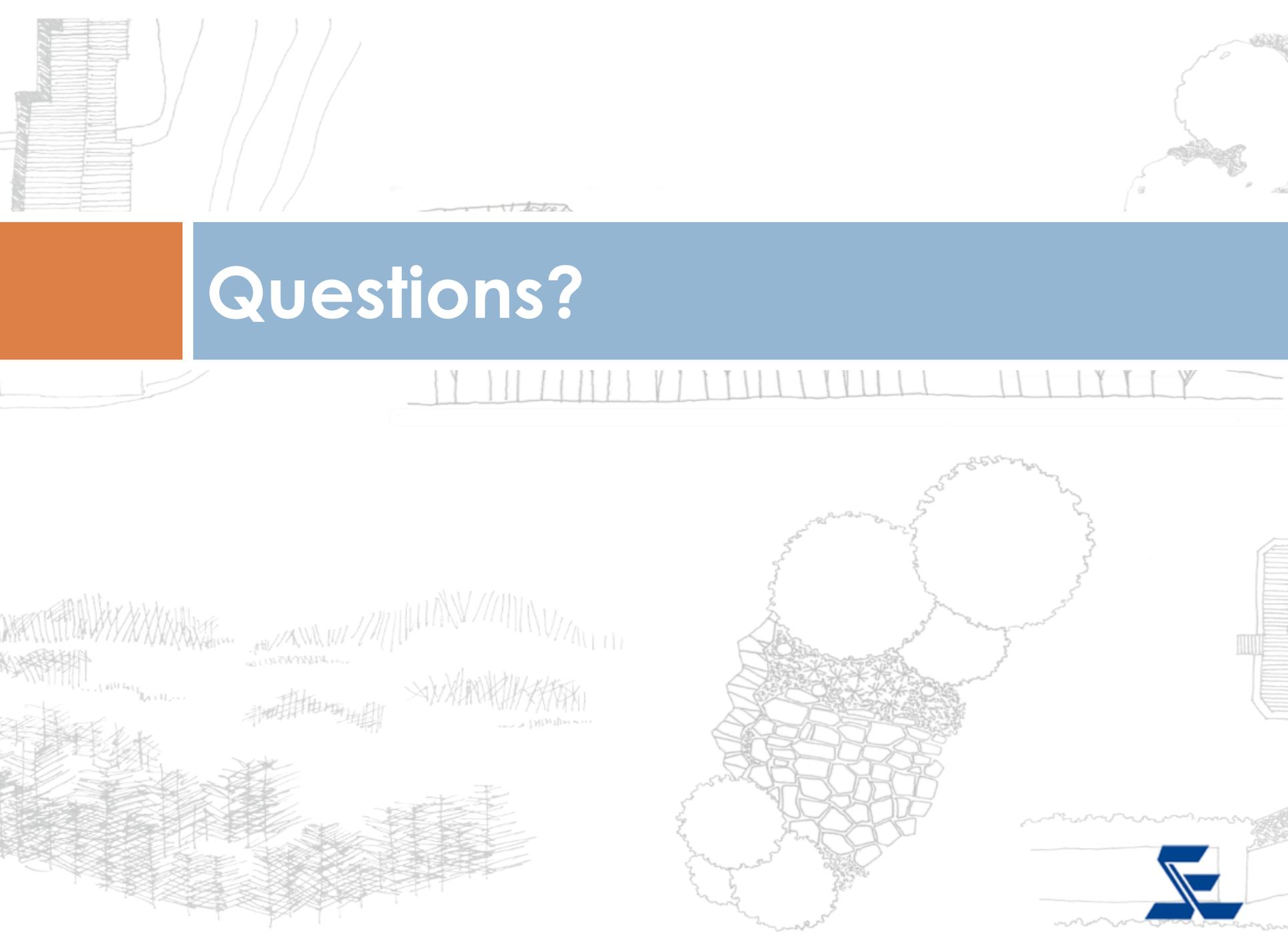


# Cost to Customer 30-year



# Cost to Customer over 20-years





# Questions?

