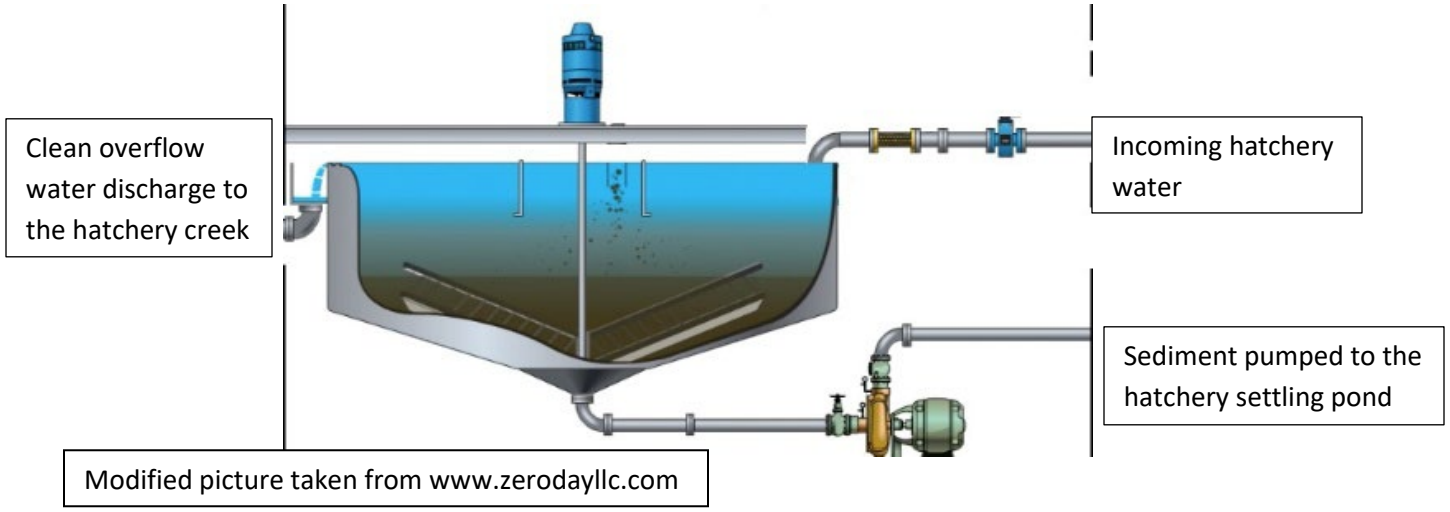
STATEMENT OF WORK
Effluent system Design
Dale Hollow National Fish Hatchery
September 8, 2021

1. GENERAL: Dale Hollow National Fish Hatchery provides aquatic/biological mitigation of Tennessee Valley Authority and U.S. Army Corps of Engineers water development projects in the Southeast and supports USFWS national conservation efforts for threatened/endangered/at-risk species. The hatchery produces 300,000 to 400,000 pounds of fish each year utilizing a feed conversion rate between 1 and 1.25 when corrected for interim fish stocking and attrition. This leaves a biological effluent load of 500,000 pounds of fish waste and excess feed containing regulated nitrogen and phosphates. The removal of these aquaculture byproducts is currently accomplished via a combination of gravity sedimentation and drum mechanical filtration during active physical rearing unit cleaning. Relatively clean water that meets state/federal discharge requirements is passed onto surface waters and the thickened sedimentation is pumped to a confined surface pond.
There are problems with the current effluent system:

- Waste is only diverted to gravity and mechanical separation during active cleaning/draining which allows an unknown percentage of carryover into the hatchery surface water discharge.
- Drum filters require significant routine maintenance that often exceeds station staff manning capacity
- Drum filters are prone to shut-down from clogging, breakdown, or exceeded capability an average of 6 days per month, meaning the station is potentially exceeding discharge permits without the ability to track the amount of waste added to Tennessee surface waters.
- Water flows through the hatchery at a rate of 16,000 gpm with untreated water from the Dale Hollow reservoir through an inlet piping 75' below the surface
- Effluent samples from the facility show consistent reduction in suspended solids as water transfers through the hatchery indicating the gravity settling of sediment in the system exceeds fish feeding and waste production and even reduces the pre-existing solids in the influent supply water. The hatchery is proposing the use of a gravity sedimentation effluent system.



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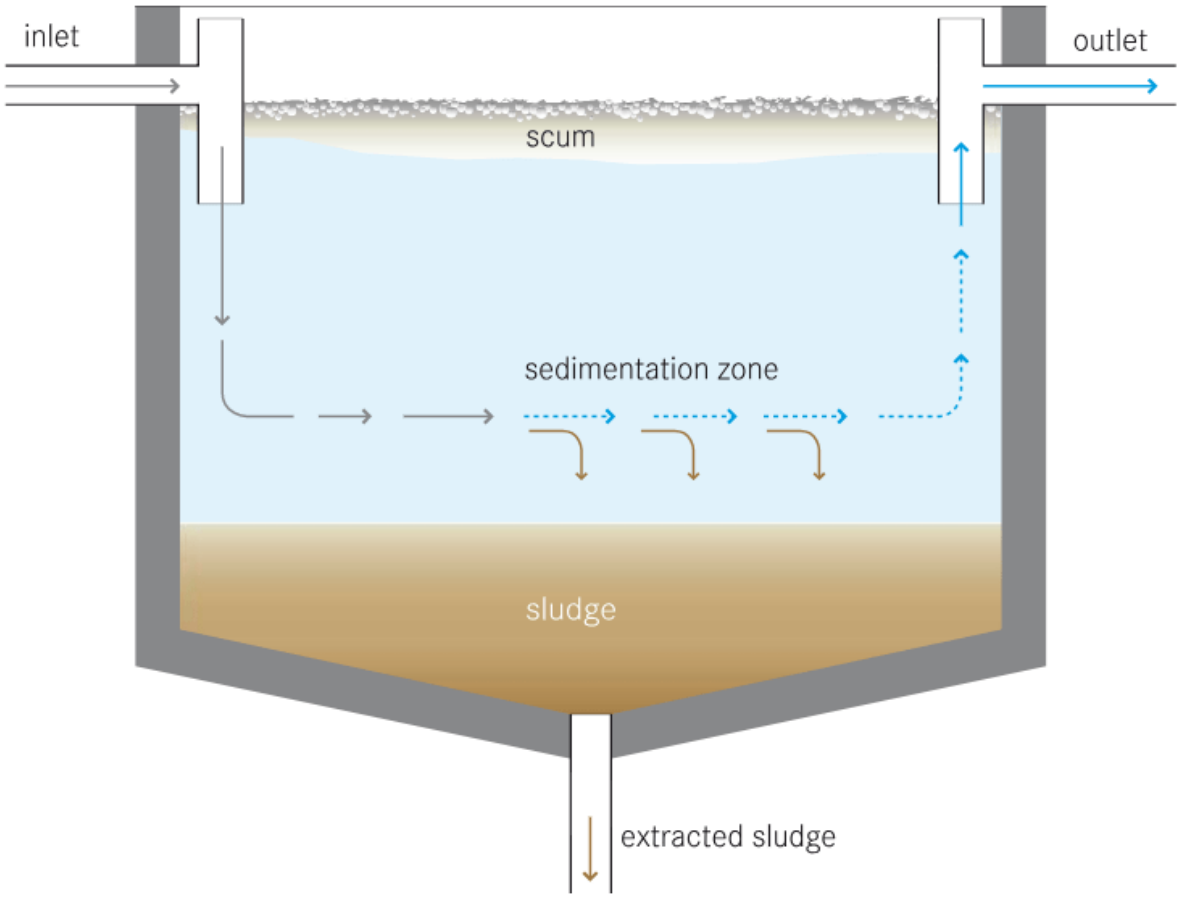
BACKGROUND: Dale Hollow National Fish Hatchery is requesting a replacement effluent system for the facility utilizing technologies employed by other aquaculture programs, the first stage of majority of waste-water treatment plants and a strategic approach customized to the reliability and sustainability of national fish hatcheries. The station will use in-ground cylindrical bottom drain flow-through tanks designed to use slow moving water and gravity sedimentation to thicken and remove solids constantly from the system with minimal moving parts and minimal maintenance and maximal reliability.

2. SCOPE:
General: Modify the current hatchery regular discharge to supply a 24" supply header and 16" supply lines for each sedimentation tank.
Excavate the current hatchery discharge lines and surrounding soil sufficient to safely construct in-ground thickening/waste tanks
Route 3 phase power supply with an outdoor junction station to supply power to drain pumps,



Clarifier explaining picture from Savree.com

mechanical sludge fan motors, outdoor lighting, VFD controls, spare circuits and local outlets
Perimeter fencing buried 6 inches in the ground. Chainlink with 8' height connected to the hatchery netting system with support wires and poles.
Excavation will include tapping into the hatchery discharge and waste lines connecting both lines to the effluent tank supply header with isolation valves gear assist manual diversion valves.
Each tank requires railed gangplanks spanning the diameter of the tanks.

Cylindrical tanks:

Customization:

- Space estimate to treat hatchery flowrates that meet the design specifications are 8,105 cubic feet of volume necessitating 3 tanks with a cuft of 2701.8 each with 4' depth and 15' radius.
- This estimate is based on a cursory review of gravity sedimentation rates for solid particulates specific to a 16,000 gpm fish hatchery producing 400,000 lbs of fish annually.
- These are only preliminary planning numbers used to test the effluent design concept, design for all parameters and capacities are requested as part of the design component of this project.
- Other configuration/system proposals are welcome based on proven designs that meet the goal of low labor autonomous operation to meet facility discharge requirements.

Preparation:

- Soil excavation area near current hatchery clean and waste discharge exposing piping and prepping for tank installation
- Soil and structure requirements for a gravity water effluent system.
- Water diversion and connectivity plan to route water from waste and discharge lines with isolation and diversion capability maintaining the current effluent treatment plant in offline with functional configuration capability.
- Include plans to demo and replace hatchery fencing and netting
- Plan for cement pads for pumps/motors and driving areas connecting the raceways to the current hatchery effluent building parking lot.

Tanks:

- Cement in-ground circular tanks with sloped bases (3 minimum)
- Depth from base to surface less than 4' to avoid enclosed space limitations for maintenance
- Radius per unit limited to 17' or less
- Sufficient number of tanks to process 16,000 gpm of water with sufficient primary treatment exposure time to allow collective gravity sedimentation of 1,400 pounds of solid particulate waste per day
- An additional 50% capacity for redundancy, safety, routine maintenance and future expansion ability.
- A smooth, low permeability concrete with minimal cracking potential without the use of seams or other collection points is the desired outcome. The final product must meet or exceed uncoated steel supported fiberglass impregnated concrete.

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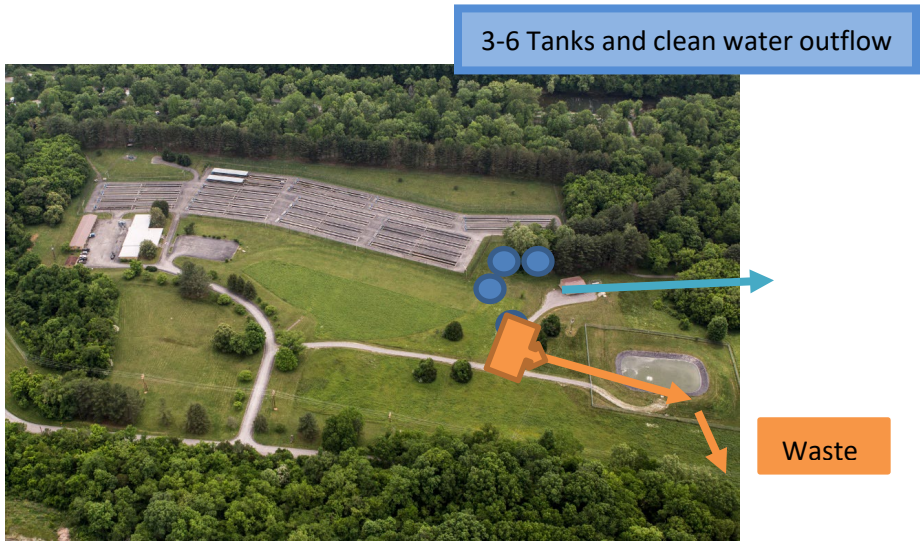
Piping:

- Supply lines, isolation valves and manually controlled throttle valves (approx. 16")
- Trough discharge lines (~16") tied together into a (~24") discharge line that leads to the creek hatchery discharge.
- A (~6-10") bottom drainline from the bottom of each tank tied to a (~8-12") header
- The bottom discharge line tied downhill to above ground sludge pumps with gear-assist quick action dual valve isolation for repairs
- A combined (~8-12") discharge line to the station sedimentation pond – this line will be combined with the installed effluent system downstream of the check valve with the addition of a manual isolation valve to the line heading to drum filters and both a check and isolation valve on the new tank line (with a lock mechanism added to the tank drainline discharge isolation valve.
- Freeze protection on any above ground piping located between isolation valves (drain line etc)
- Water supply lines for washdown pumps (6-10"), truck fill line (3"), and a frost-free hose spigot for general use.

Equipment:

- 3-phase 220 motors and outdoor electrical supply to operate the shaft driven sludge diversion scraper arm
- Magmeter flowmeters on the clean water outlet line of each tank
- Sludge pumps (as needed for 100% redundancy, approx. 4 units at 300 gpm) configured in parallel with VFD and timer local controls
- Quick connect on each sludge pump suction line with a rotating motor mount for manual impeller debris clearing
- 100-150 psi washdown pumps (2 for redundancy) with sufficient flowrate to manually washdown clean the tanks from the walking platform and tank perimeter
- Running lights, power supply lights, overheat and impeller blockage protection for all pumps.



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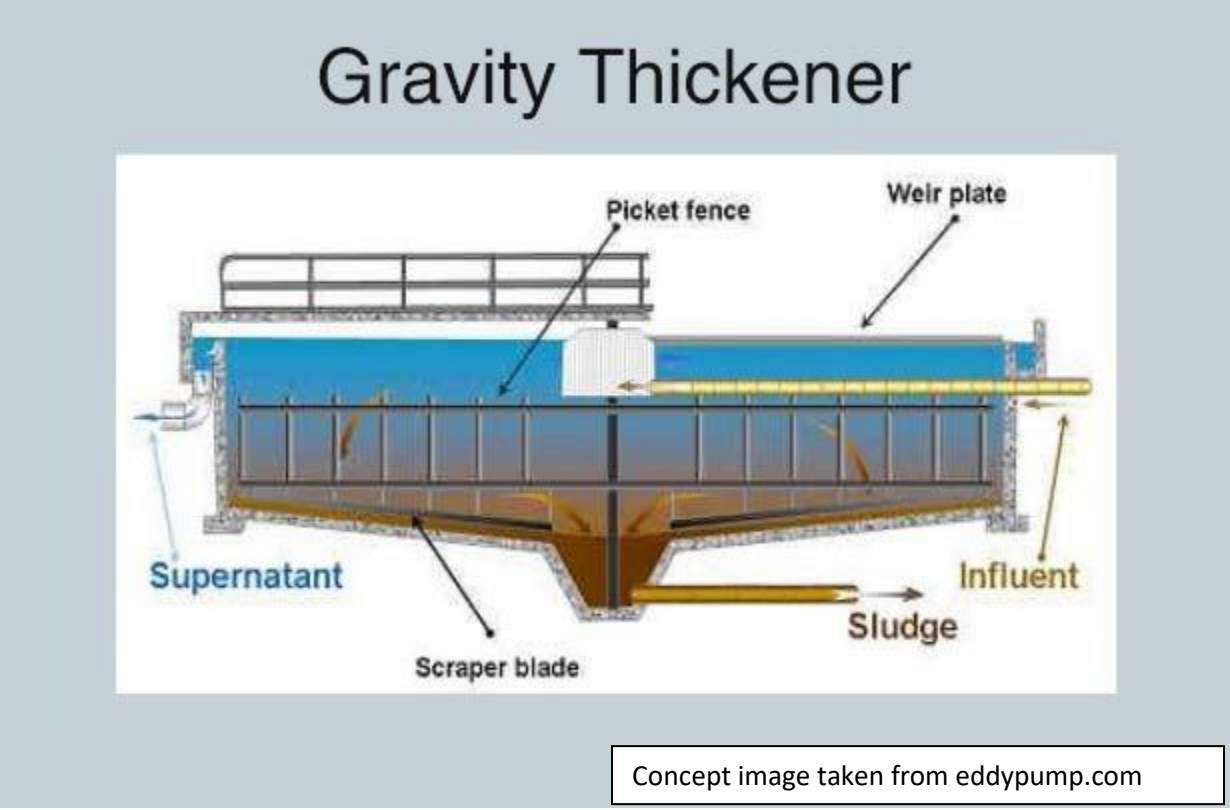

Supplemental work:

- Not all components of the project need have been covered, the design must incorporate all of the project execution and completion components sufficient to supply a construction crew with the full installation scope.
- The engineering design is responsible for contractor support in all phases of construction including overall system performance upon completion.

3. PLACE/DELIVERY AND PERIOD OF PERFORMANCE:
Design scopes will proceed in three phases: 35% required, 65% optional and 100% required. Each stage will have a review period for written feedback and group meetings with the USFWS engineering or contracting office, station representative and contractor representative.

Dale Hollow National Fish Hatchery
145 Fish Hatchery rd
Celina, TN 38551

4. GOVERNMENT FURNISHED EQUIPMENT OR

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MATERIALS/INFORMATION: No supplied government equipment.

5. SPECIAL NOTICE: Site meetings are available if conformance with any/all state/federal regulations and may include no-contact requirements with virtual meetings. Full access to the facility will still be available as needed, but in-person interactions may be limited due to safety precautions.

All project safety and building requirements must meet state and federal guidance.

6. AVAILABILITY: Station delivery hours are 7:00am-3:30pm M-F for public access (excluding federal holidays). Access outside these hours are permitted with contracting officer and station approval

7. TECHNICAL COORDINATOR/COR:
STATION POINT OF CONTACT:
Settleable
Degradation

Thomas Reeves, Project Leader
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