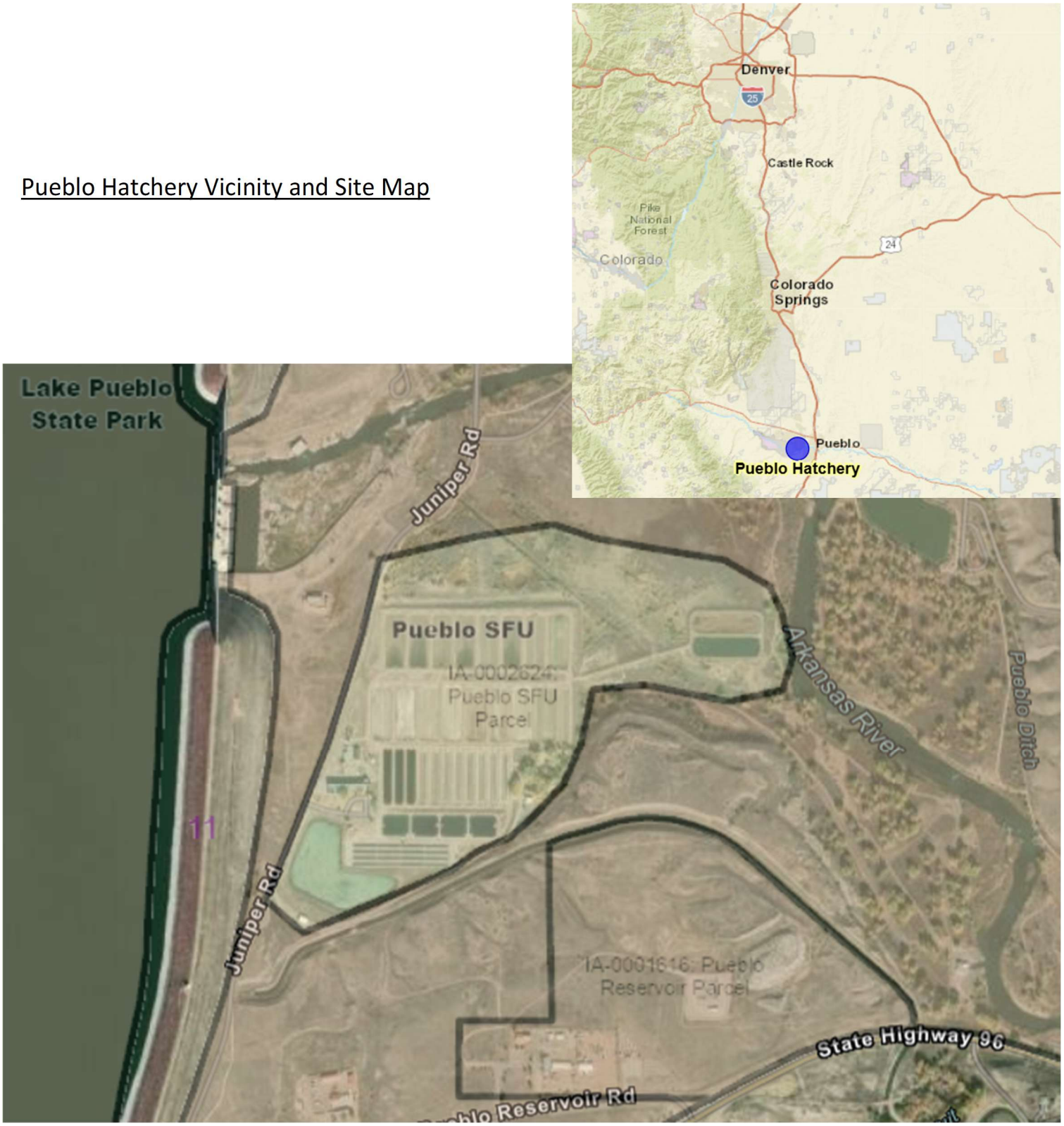
Appendix B

Pueblo Hatchery Temperature Feasibility Study RFQ

Pueblo Hatchery Vicinity and Site Map



Pueblo Hatchery Flow Diagram

CPW's Pueblo hatchery utilizes 2 sources of water in order to sustain operations; well water and water from the Pueblo reservoir. The following is a flow diagram that illustrates the path of the two water sources through the hatchery. The reservoir water and well water flows are depicted with green and orange lines, respectively. Reservoir water and well water sources are separated from one another throughout most of the process until the water is piped to the settling ponds and the two sources of water merge (depicted with purple lines).

RESERVOIR WATER

- **1(a) Water from Pueblo Reservoir:** water leaves the reservoir and is funneled through underground pipes to the screen house (max flow of ~32cfs). Excess water that is not being used flows down an overflow pipe that eventually flows into the settling pond. There is a valve that can be opened to allow water to flow into the solar pond from the main reservoir water supply supplying the whole facility.
- **2(a) Screen House**: water that enters the screen house is filtered with a set of metal microscreens to remove debris left over from the reservoir.
- **3(a) Outside Aerator:** valves and underground pipes take the filtered water to an outside aerator. The water daylights in an outside building that is exposed to the ambient air. Through separate series of valves and underground pipes, water is then piped underground to the raceways and production ponds. Although the water used to run through a set of aerators, it currently does not because it was found that it reduced the flow of water to the raceways and ponds.
- **4(a) Raceways:** there are 8 strings of raceways giving a total of 32 raceways. Pueblo has the water and pipe capacity to run 16 total raceways. Each raceway is 150 feet long and averages 3 feet in depth. Each raceway has ~ 2 cfs of water flow. Every section in a raceway has an independent system of valves and pipes that release or drain water, depending stage of the hatchery process
- **5(a) Pipe to Settling Ponds:** after water from the raceways are drained, the water enters an underground pipe which follows a fence along the perimeter of the hatchery and eventually drains to pipe labeled **1C.**
- **6(a) Pipe to Production Ponds:** pipe from the outside aerator travels to the production ponds.
- **7(a) Production Ponds:** water enters the ponds on one side, and then drains through the opposite side. It takes 1 ½ to 2 days to fill or drain the ponds. Water that is drained from the ponds enters underground pipes and flows into pipe **1C.**

WELL WATER

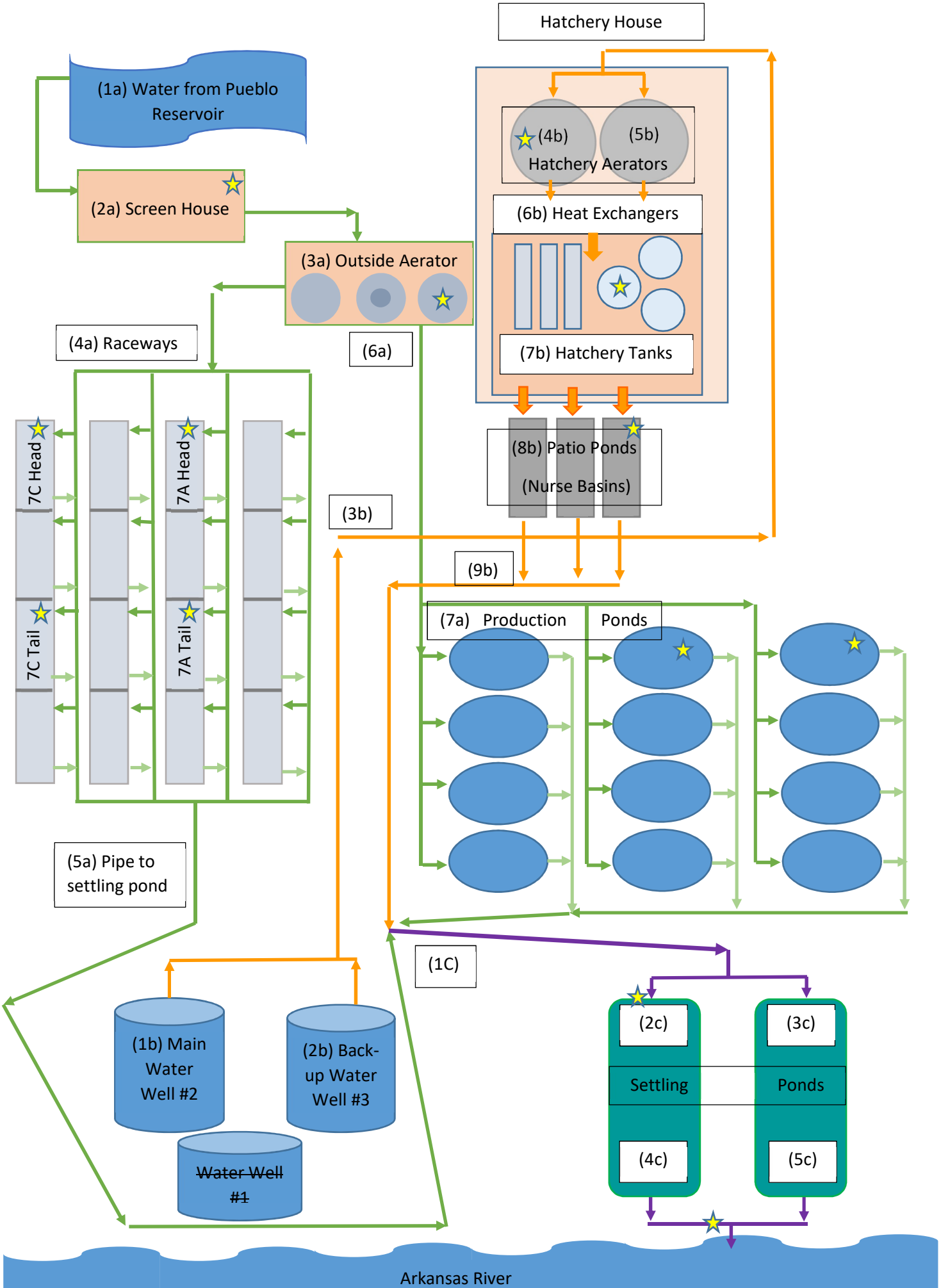
Water wells: there are currently 3 wells on the property, these are alluvial wells that are believed to use water that is generated by the river. Water temps from the wells averages around 59-60°F at its warmest in November and 48°F at its coldest in March. Wells labeled 1(b) and 2(b) provide water to the hatchery building. Well #1 is dry and no longer operational. There are plans to build a new well.

- **1(b) Main Water Well:** about 30-50 feet deep, this is the main well for hatchery operations. Flows are about 400 gpm at the maximum.
- **2(b) Back-up Water Well**: about 30-50 feet deep, this is the back-up well for hatchery operations. Flows are about 130 gpm at the maximum.
- **3(b) Pipe to Hatchery Aerators:** well water is piped to the two hatchery aerators. The well water that is brought to the hatchery is split between 2 aerators that run each side of the hatchery (one is labeled bass and the other walleye, names have no significance of what they are used to raise). Water in the hatchery is allowed to drain to the floor drains where it is only used once before heading to the settling pond or it can be drained to the "wall drains" where the water is sent back to the water process room and piped out to the nurse basins on the patio.

- **4(b) Hatchery Aerator:**
- **5(b) Hatchery Aerator**
- **6(b) Heat Exchangers:** after aeration, water travels through a heat exchanger when needed. The heat exchangers are used for warming the water to a desired temperature for the hatching of walleye, wiper, or striper in the hatchery. Well water is used and mixed with water from the boiler system to warm it up.
- **7(b) Hatchery Jars and Tanks:** water is piped into the hatchery building for the use of hatching and rearing cold and warm water fish. Eggs are placed into jars and 1-1.5 gpm of water is ran through the jars for hatching. There are a series of 4 foot circular tanks where fish are placed after hatching for rearing. Trout will remain in these tanks until around 2" of length when they are then taken to the nurse basins (patio tanks)
- **8(b) Patio Tanks (nurse basins):** water from the hatchery room is drained into wall drains, taken back into a sump located in the water process room and then pumped to the 3 patio tanks (nurse basins). The basins are made of concrete are shaded with an awning. The patio tanks are a single pass flow through system. The water is brought to the patio tanks through a PVC pipe from the water process room. Each patio tank is ~7 feet wide and ~134 feet long and are ~30 inches deep).
- **9(b) Pipe to Settling Ponds:** underground pipes drain the water from the patio ponds to converge with the reservoir water at one common pipe **(1C)** which then leads to the settling ponds.

SETTLING PONDS

- **1(c) Pipe to Settling Ponds**: All water from raceways, production ponds, and hatch house building drain into one pipe. This pipe then drains the water to the settling ponds.
- **2(c) and 3(c) Settling Pond In**: water from pipe enters pond here. Currently, only one settling pond is in use. The water is not stored in the settling ponds. Based on the flow coming to the ponds effects the retention time of the water here. The water enters the ponds on the west end and exits on the east end. The water flows over weirs where it can be measured.
- **4(c) and 5(c) Settling Pond Out:** water is discharged to the Arkansas River at this point. The water then enters a pipe and flows ~50-60 feet and is discharged to the Arkansas River.


Hatchery House
(1a) Water from Pueblo Reservoir
(2a) Screen House
(3a) Outside Aerator
(4b) Hatchery Aerators
(5b)
(6b) Heat Exchangers
(7b) Hatchery Tanks
(8b) Patio Ponds (Nurse Basins)
(4a) Raceways
(6a)
7C Head
7A Head
7C Tail
7A Tail
(3b)
(9b)
(7a) Production Ponds
(5a) Pipe to settling pond
(1C)
(1b) Main Water Well #2
(2b) Back-up Water Well #3
~~Water Well #1~~
(2c)
(3c)
Settling Ponds
(4c)
(5c)
Arkansas River