

Construction and Startup of a New Sockeye Hatchery in British Columbia



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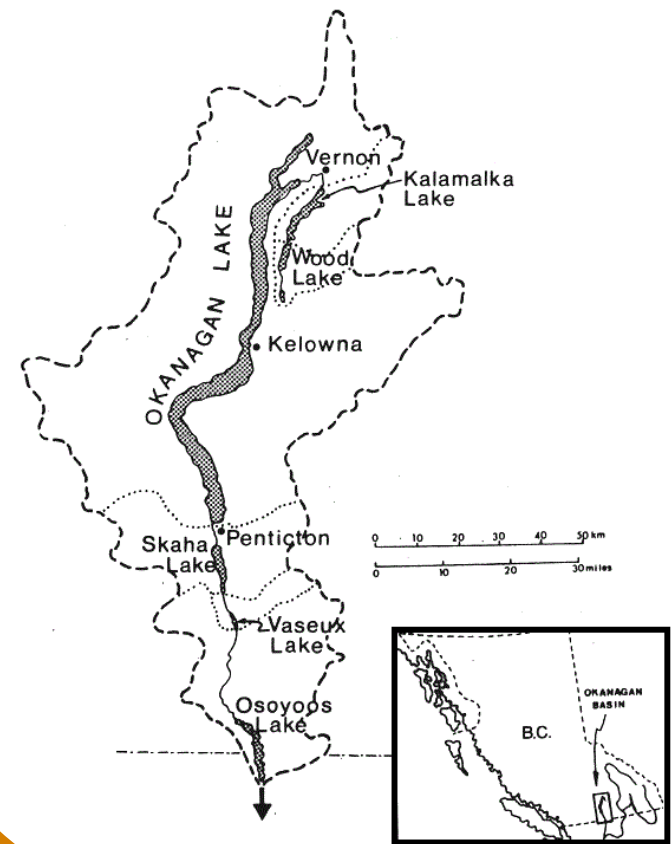
Presentation Overview

- Hatchery program
- Design and construction approach
- Hatchery facility overview
- Project lessons
 - Keep fish culture goals central to the process
 - Engage team members with instrumentation contractor
 - Develop performance criteria for critical equipment
 - Continue water quality testing after pilot stage
 - Consider seasonal impacts on operations
 - Evaluate building systems for weather impacts
- Summary
- Questions

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Okanagan Nation Alliance Sockeye Reintroduction Program

- Long-term program to restore the historical range of Sockeye in the upper Okanagan watershed
- New hatchery allows expansion of reintroduction program and consistent production of sockeye fry for release to the Okanagan River system



Hatchery Design and Construction – A Collaborative Approach



CHELAN COUNTY



PENTICTON INDIAN BAND



Aboriginal Affairs and
Northern Development Canada

Stakeholders and funding agencies included:

- Confederated Tribes of the Colville Reservation
- Grant and Chelan Public Utility Districts
- Penticton Indian Band
- Aboriginal Affairs and Northern Development Canada

Design and construction oversight by separate engineering consultants for each discipline.

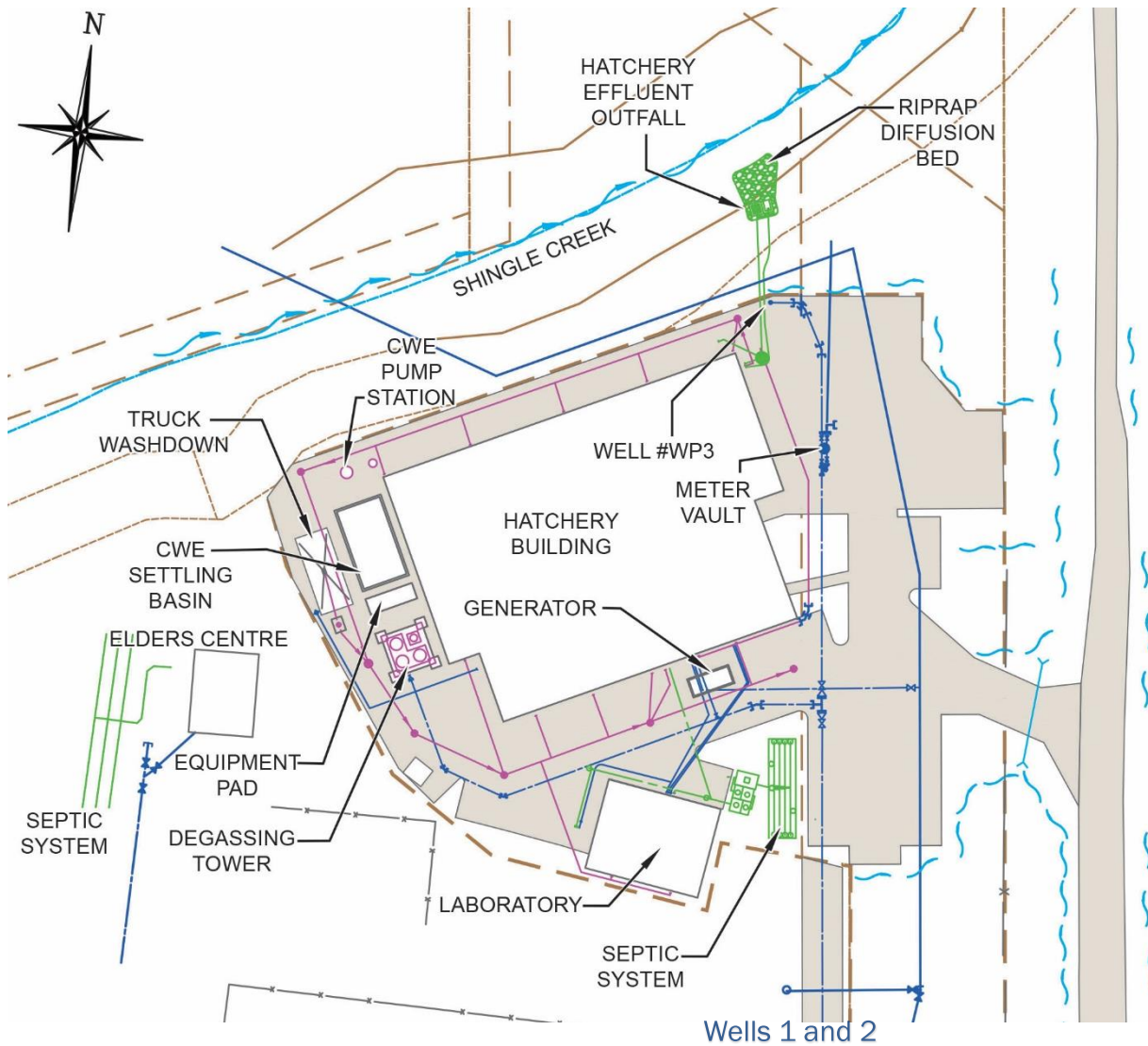
Tetra Tech had the only US engineers and designed the hatchery's aquaculture systems, and assisted with construction management and facility startup.

Kl cp'elk' stim' Hatchery (Penticton Sockeye Hatchery)

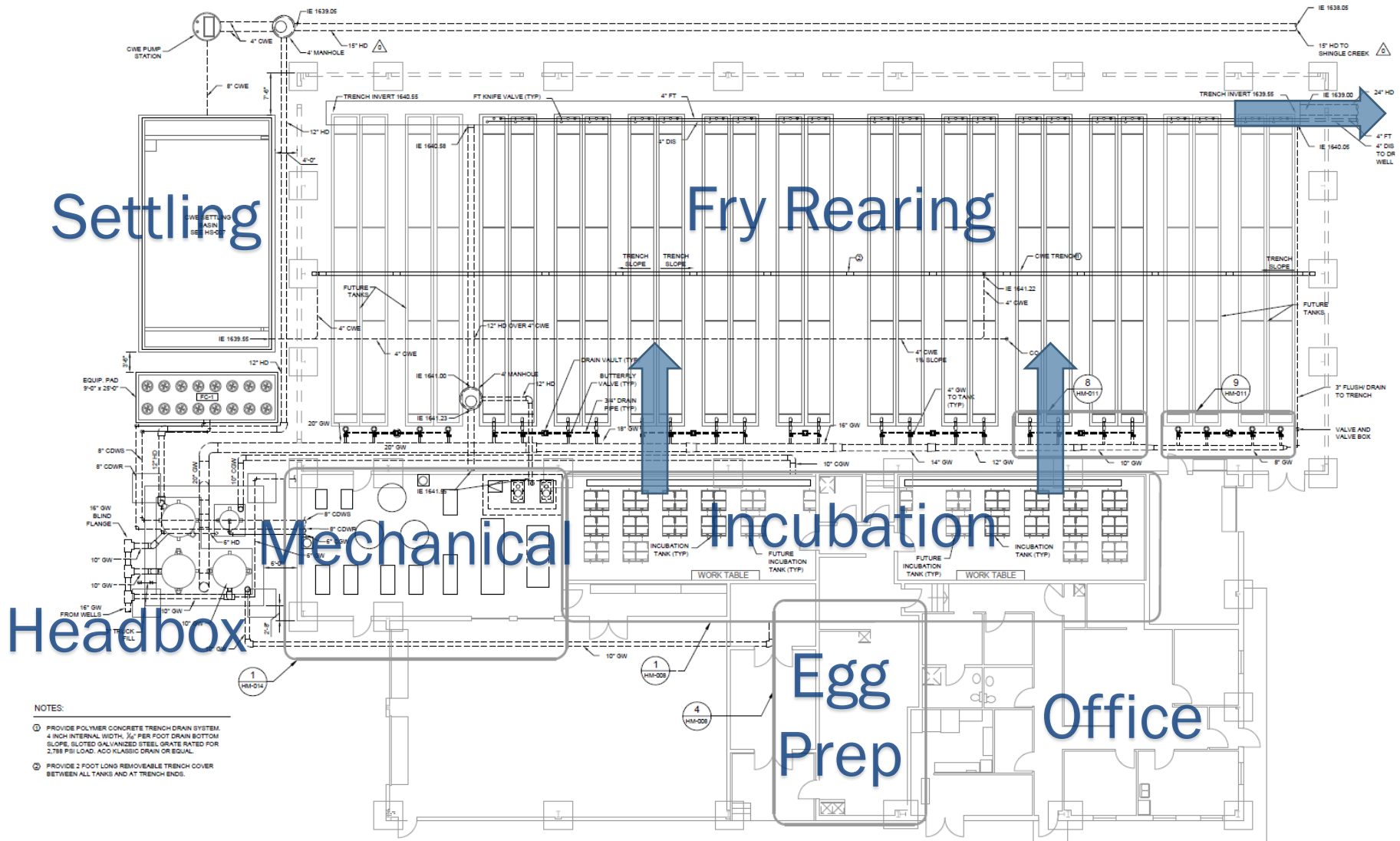
- New 25,000-square-foot sockeye salmon hatchery
- Capacity to rear up to 8 million eggs from brood stock management to fry
- Began operation in the 2014 broodstock season
- Sockeye salmon released in June as fry into the Okanagan River system



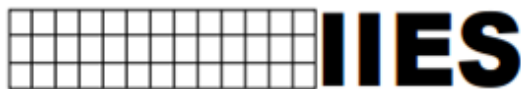
Hatchery Site



Hatchery Building



Project Lesson #1 – Keep fish culture goals central to the process



- Establish the rearing program and biological criteria
- Develop design criteria – and refer back to them throughout project
- Assign someone who understands hatchery design criteria to help lead the design and assist with construction management

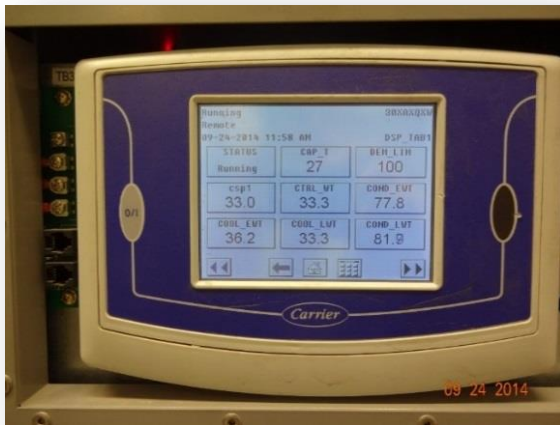
Project Lesson #1 – Keep fish culture goals central to the process

- Design criteria example

BASIC BIOLOGICALS	
Fry Production Goal (Phase I)	4,000,000 (4,542,000 @ flow req.)
Fry Production Goal (Phase II)	6,400,000 (6,813,000 @ flow req.)
Target Size at Release	1 g
Maximum Egg Take (Phase I)	5,000,000
Maximum Egg Take (Phase II)	8,000,000
Egg to Fry Survival	80%
Fry Size at Transfer to Tanks	0.13–0.15 g
Target ATUs at Release	900
Start Egg Collection	October
Fry Ponding	Early-March
Fry Stocking	Early-June

INCUBATION	
Egg Incubator	Kitoi Box
Females per Incubator	80-90
Eggs per Female	2,300–2,500
Eggs per Incubator	168,000 (200,000 @Shuswap)
Total # Incubators (Phase I)	32
Total # Incubators (Phase II)	50
Water Flow per Incubator	45.42 lpm (50–55 lpm @Shuswap)
Total Incubator Flow (Phase I)	1453 lpm
Incubation Temperature	Natural Regime

Project Lesson #2 – Engage team members with instrumentation contractor

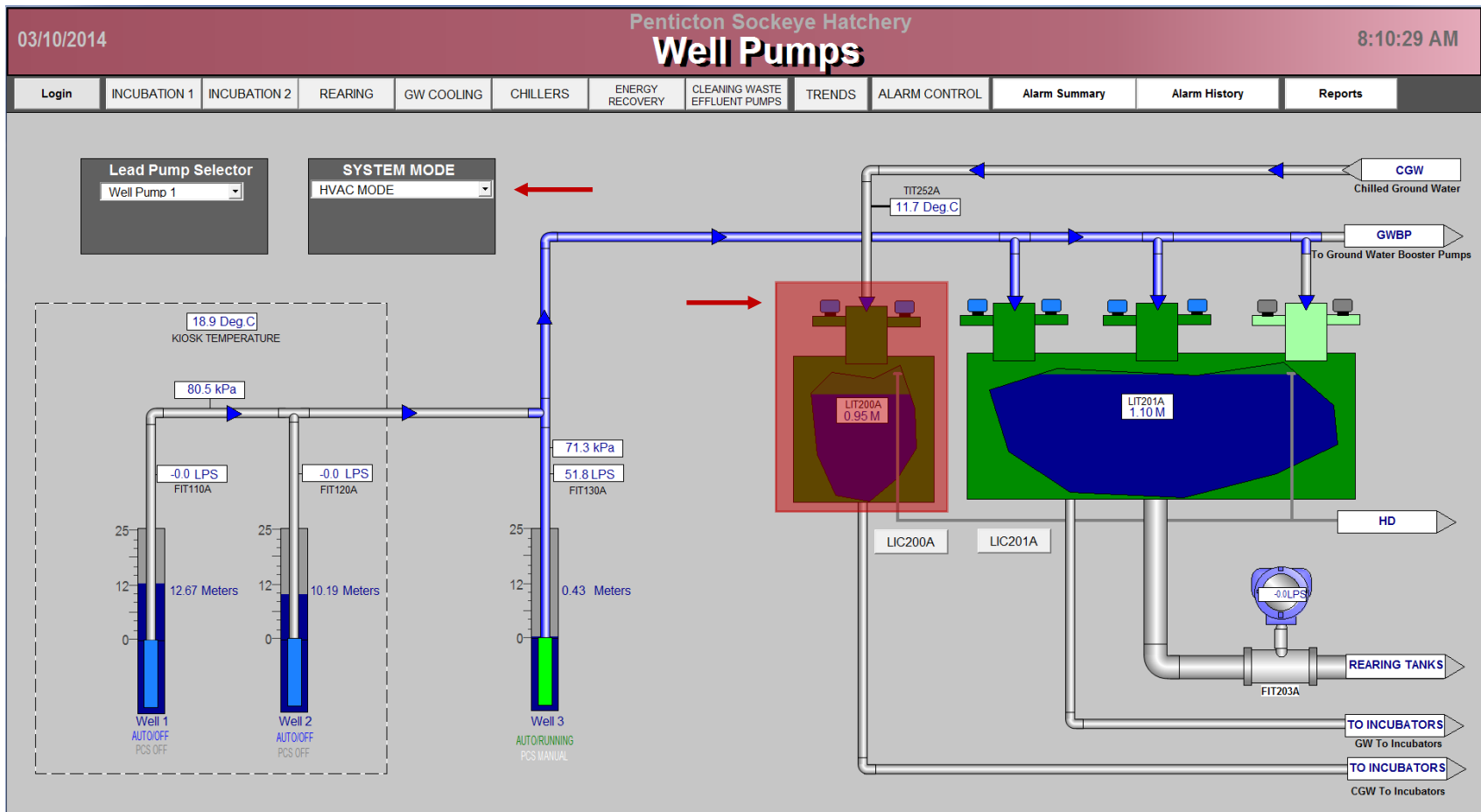


- Hatchery design engineer leads the process
 - Engage the owner
 - Meet in-person with control system designer
 - Don't forget local control panels
- Fish production operators are consulted during design process
 - Alarms, monitoring, emergency operation
- Process water system controls should be reliable, user-friendly, and easy to understand
- Prepare mock-ups of all HMI screens



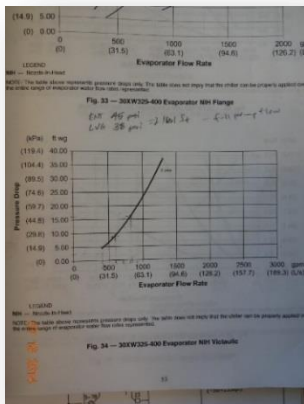
Project Lesson #2 – Engage team members with instrumentation contractor

- Example of system mode selector and color coding for off-season equipment



Project Lesson #3 – Develop performance criteria for critical equipment

- Performance criteria should be:
 - Developed during design
 - Understood during construction
 - Measured during startup
- Critical equipment directly impacts fish rearing



Project Lesson #3 – Develop performance criteria for critical equipment



- Penticton design criteria indicated “Minimum D.O. = 9.0 mg/l”
- This allows misinterpretation by any team member using the design criteria
- A better design criteria would be: “Minimum D.O. **leaving supply headbox** = 9.0 mg/l”
- Better design criteria lead to better equipment selections

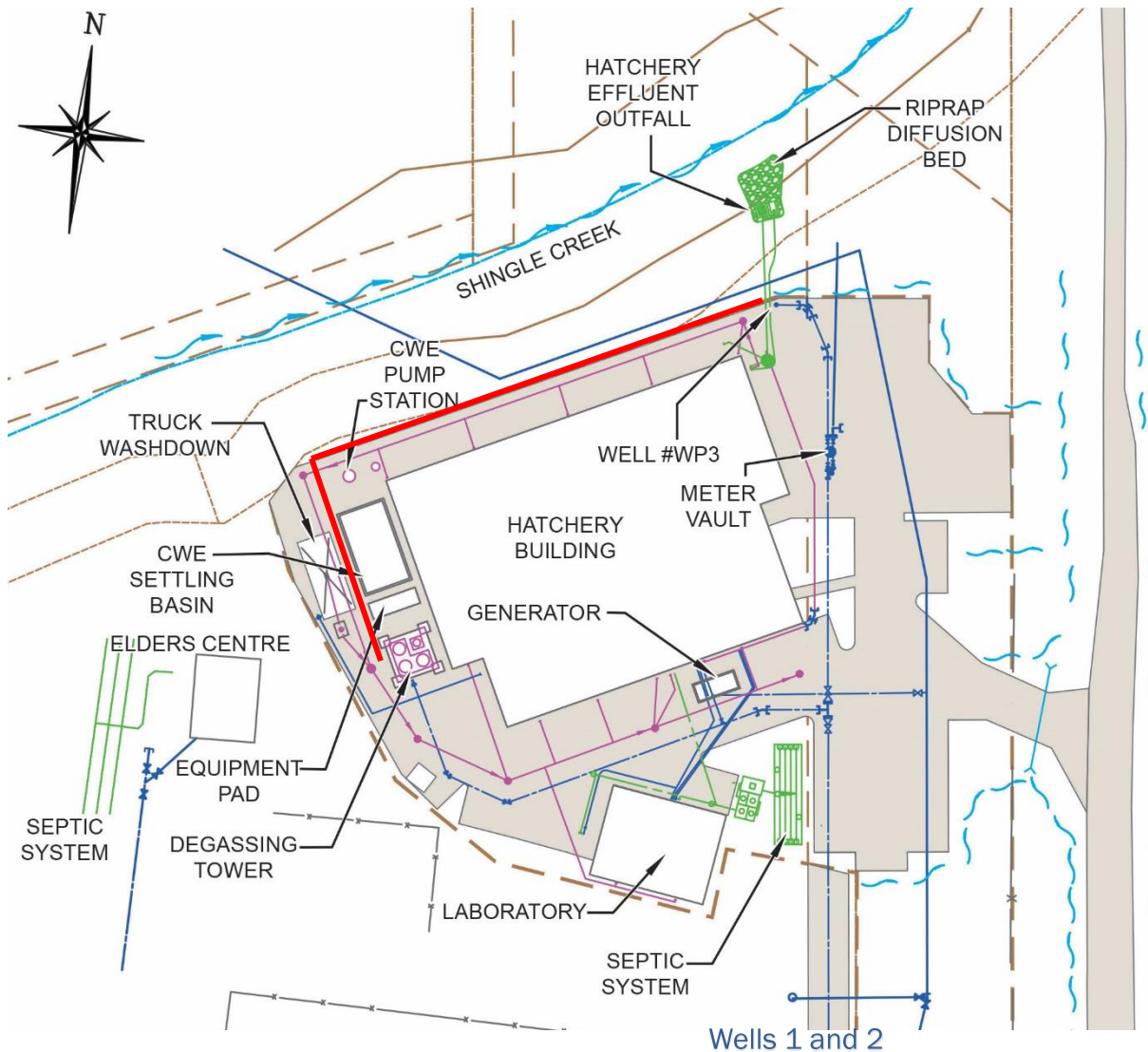


Project Lesson #4 – Continue water quality testing after pilot stage



- Pilot-testing is important in developing design criteria
- Continue testing as equipment comes online
 - Identify gaps in the pilot data
 - Identify changes over time
 - Modify design to accommodate new data
 - Hatchery operation can be modified to mitigate changes
- At Penticton, DO was lower than pilot testing, and bio-fouling was an issue

Project Lesson #4 – Continue water quality testing after pilot stage



Project Lesson #5 – Consider seasonal impacts on operations



- Hatchery systems designed for one season may need to be tested in another
- Hatchery engineer and contractor should discuss best ways to conduct testing
- At Penticton, modified testing procedures were used to operate dry cooler at summer temperatures

Project Lesson #5 – Consider seasonal impacts on operations



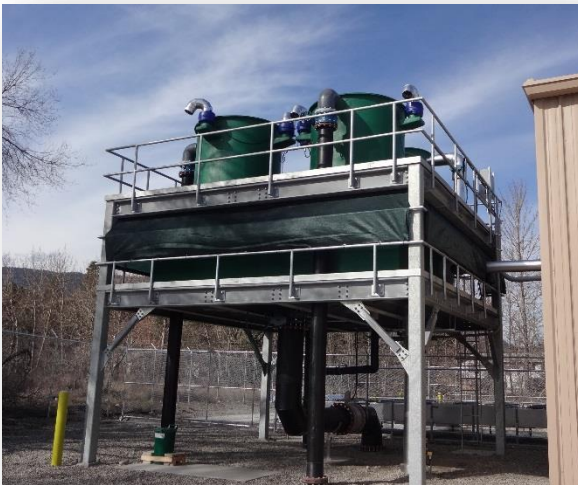
- At Penticton, flexibility for seasonal change in chilled water requirements was provided



Project Lesson #6 – Evaluate building systems for weather impacts



- Consider where enclosure is required or not
- Temperature is not the only consideration – moisture, leaves, etc.
- At Penticton, modifications were made to headboxes due to greater than expected weather impacts



Project Lesson– Summary

1. Keep fish culture goals central to the process
2. Engage team members with instrumentation contractor
3. Develop performance criteria for critical equipment
4. Continue water quality testing after pilot stage
5. Consider seasonal impacts on operations
6. Evaluate building systems for weather impacts

Questions?

