

MICRO-HYDROELECTRIC POWER FACILITY UTILIZING MINE DRAINAGE.

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Outline

- ▣ Project Overview
- ▣ Hydroelectric Basics
- ▣ Site Location
- ▣ Site Overview
- ▣ Permitting
- ▣ Construction
- ▣ Electric Generation
- ▣ Final Remarks
- ▣ Acknowledgements



Antrim Project Overview

- ▣ Babb Creek Watershed Association (BCWA) was awarded a Energy Harvest Grant
- ▣ Goal: **Reduce Annual O&M and Generate Revenue**
- ▣ Selected BioMost, Inc. for design and construction
- ▣ Design
 - utilize as much of the flow as possible
 - eliminate electric bill
 - grid-tied
 - generate & sell excess power
 - two 20kW turbines



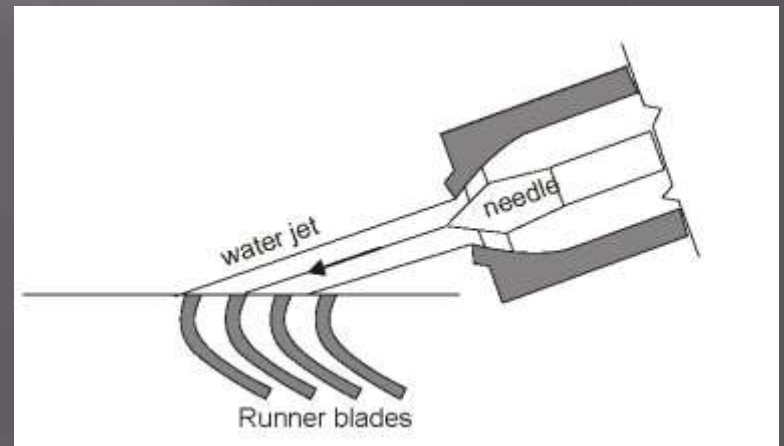
Hydroelectric Basics

▣ Terminology

- Forebay – a pond or basin of sufficient size to stabilize and control the flow of water to the penstock
- Penstock – a pipe that conveys water, under pressure, from the forebay to the turbine
- Tailrace – a channel to convey the water away from the turbine to the discharge point

Hydroelectric Basics

- ▣ Turbine
 - Reaction - low head, high flow
 - ▣ Kaplan
 - ▣ Francis
 - Impulse – high head, low flow
 - ▣ Pelton
 - ▣ Turgo
 - ▣ Cross-flow



basic diagram of a Turgo turbine

Permitting

- ▣ Less than 1 acre disturbed area
- ▣ Local – Building Permit (shed)
- ▣ State – GP4 (discharge point)
- ▣ Federal – Federal Energy Regulatory Commission (FERC)

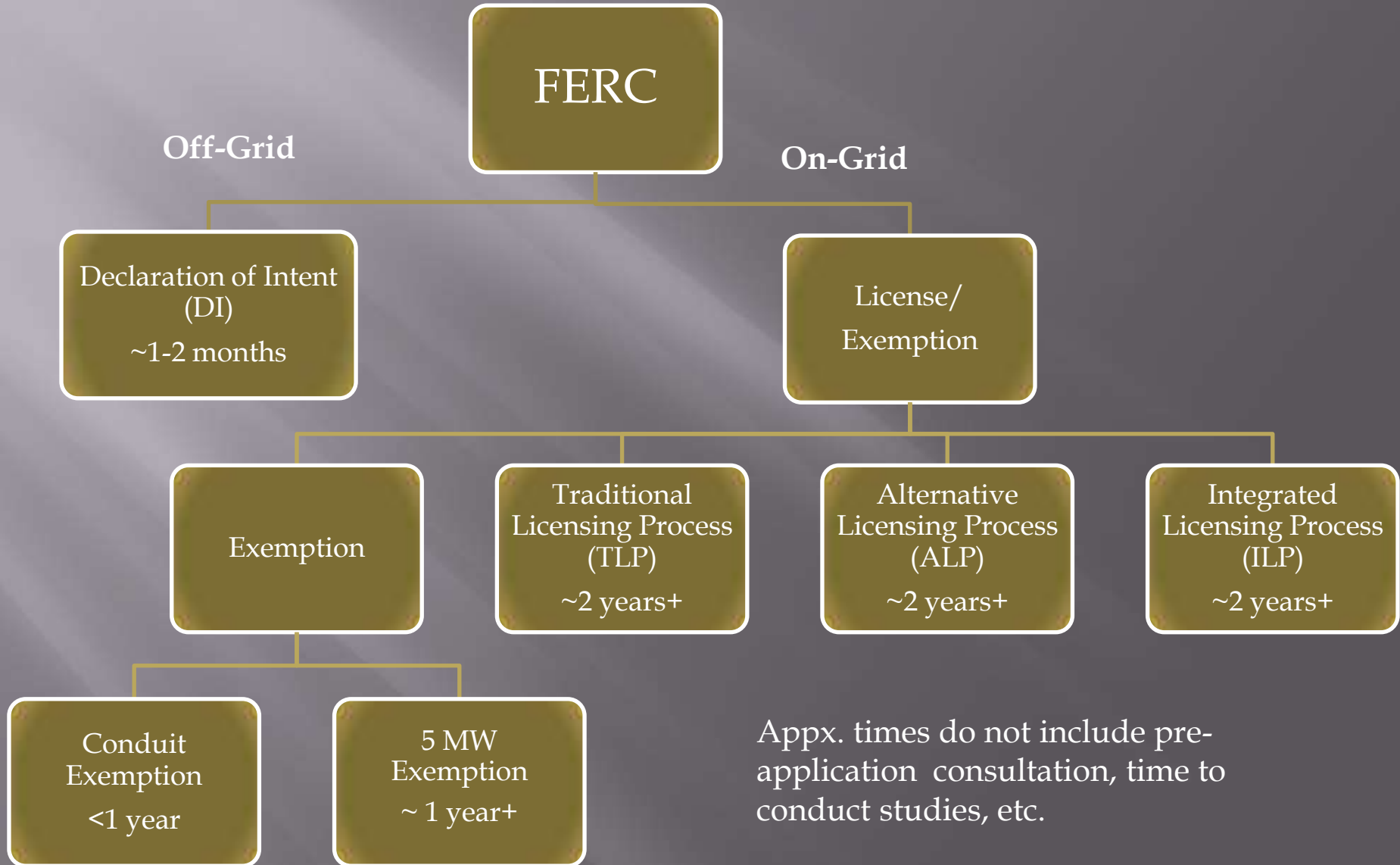


Federal Energy Regulatory Commission (FERC)

- ▣ To license or not license?
 - a.) navigable waters
 - b.) occupy U.S. lands
 - c.) U.S. government dam
 - d.) “the project affects the interests of interstate or foreign commerce”

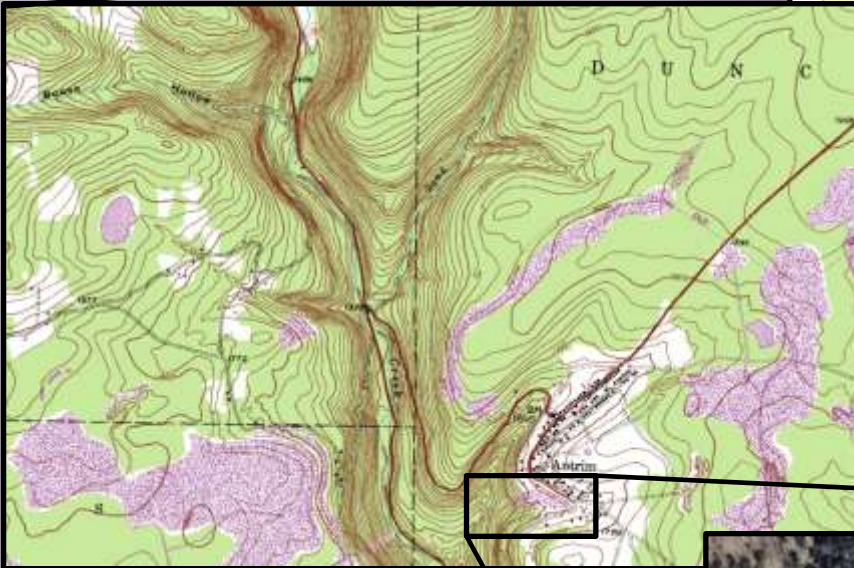
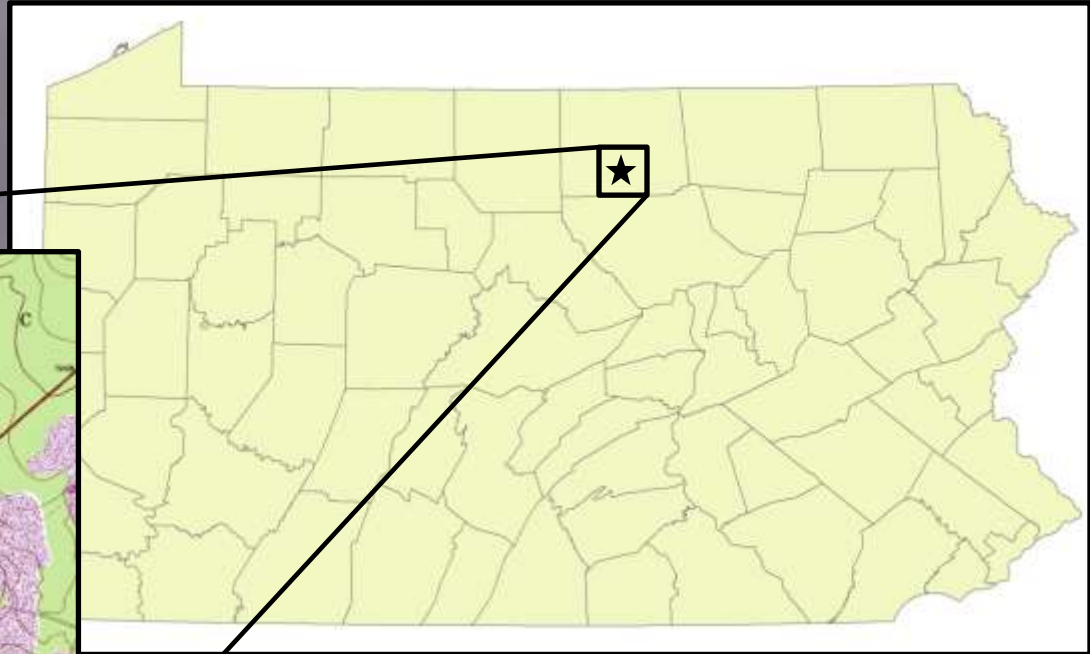


License vs. Declaration of Intent



Appx. times do not include pre-application consultation, time to conduct studies, etc.

Site Location

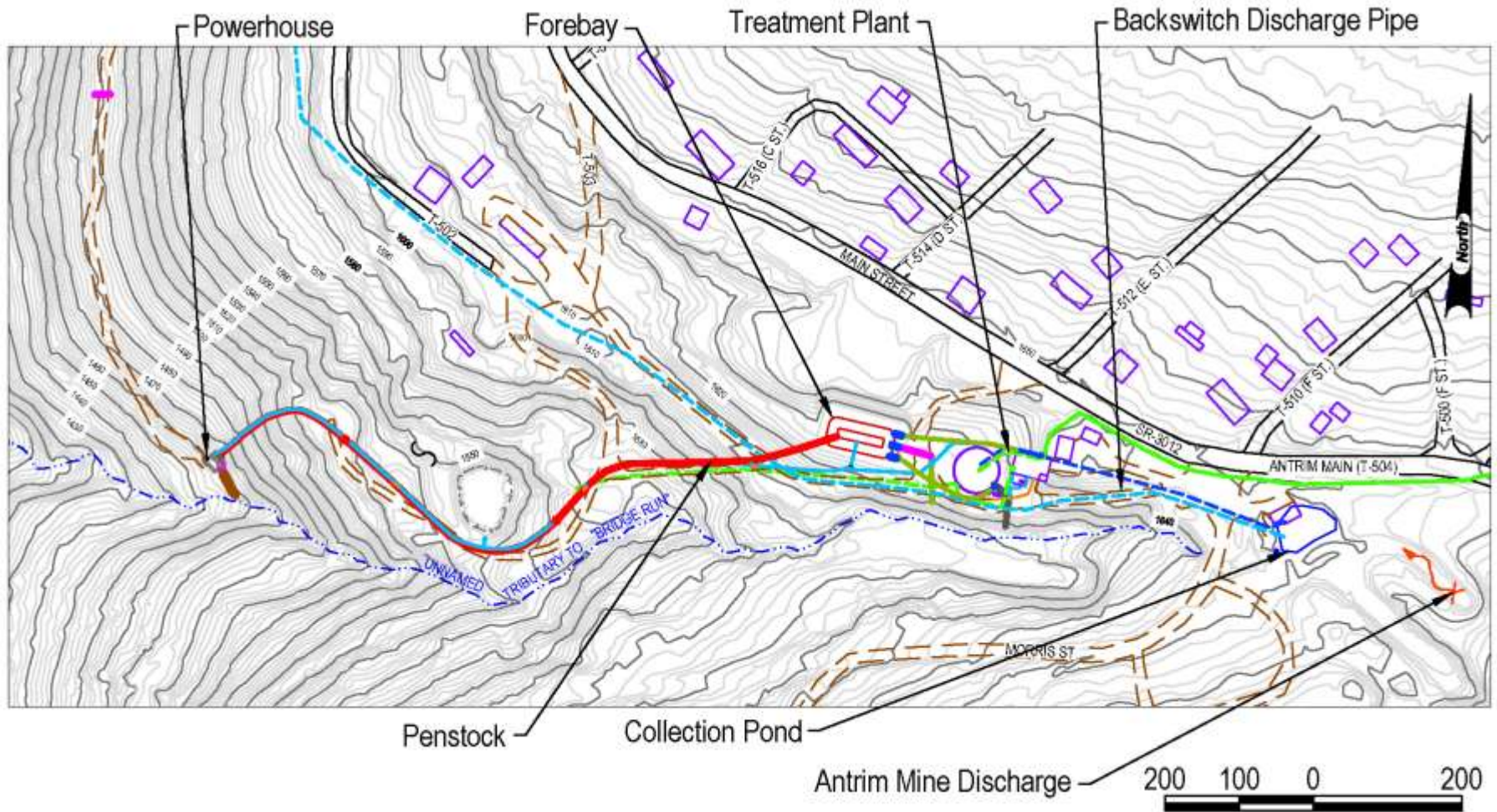


Construction

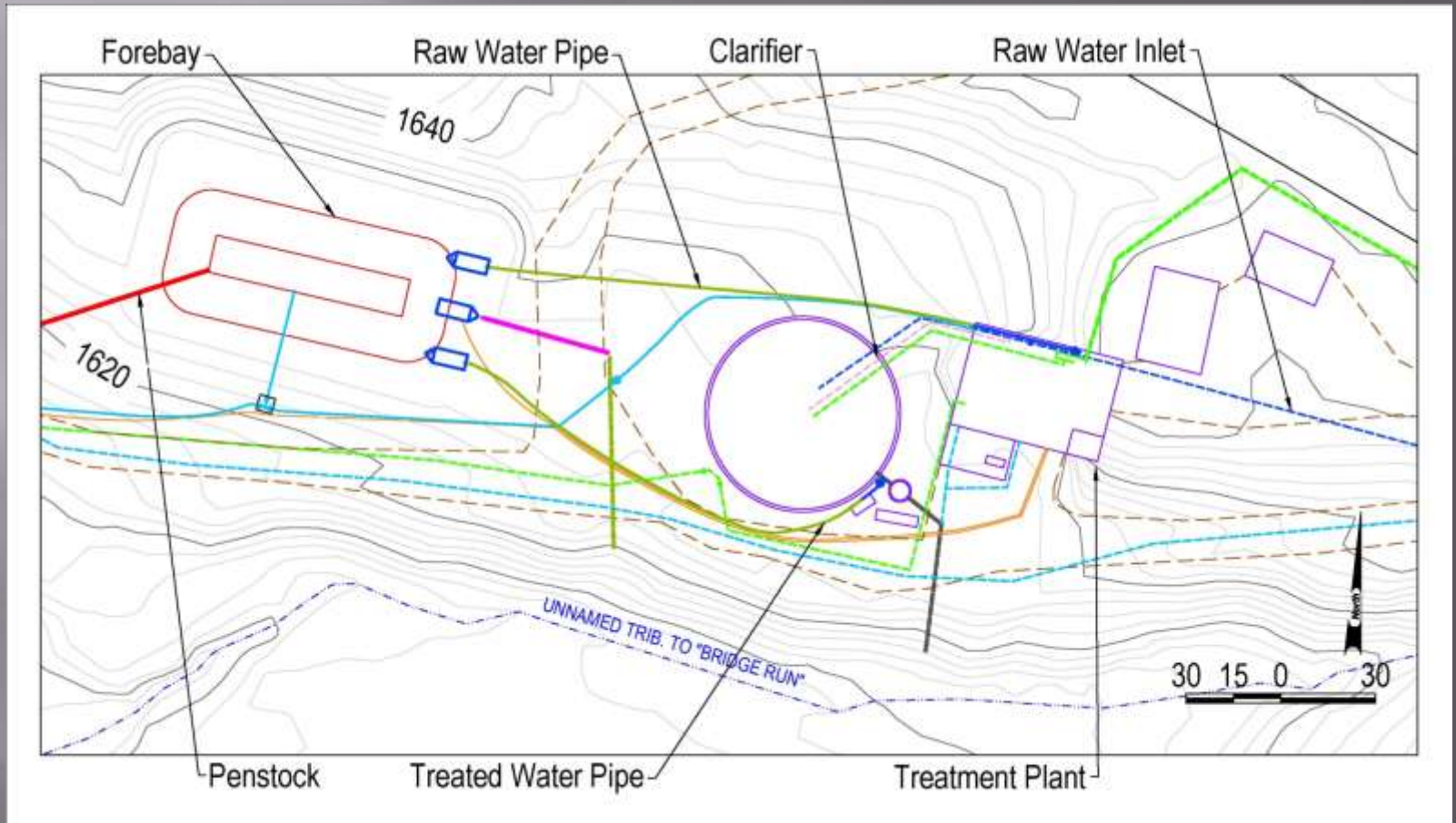
- ▣ Plant and Forebay
- ▣ Penstock
- ▣ Powerhouse



Site Overview



Plant and Forebay



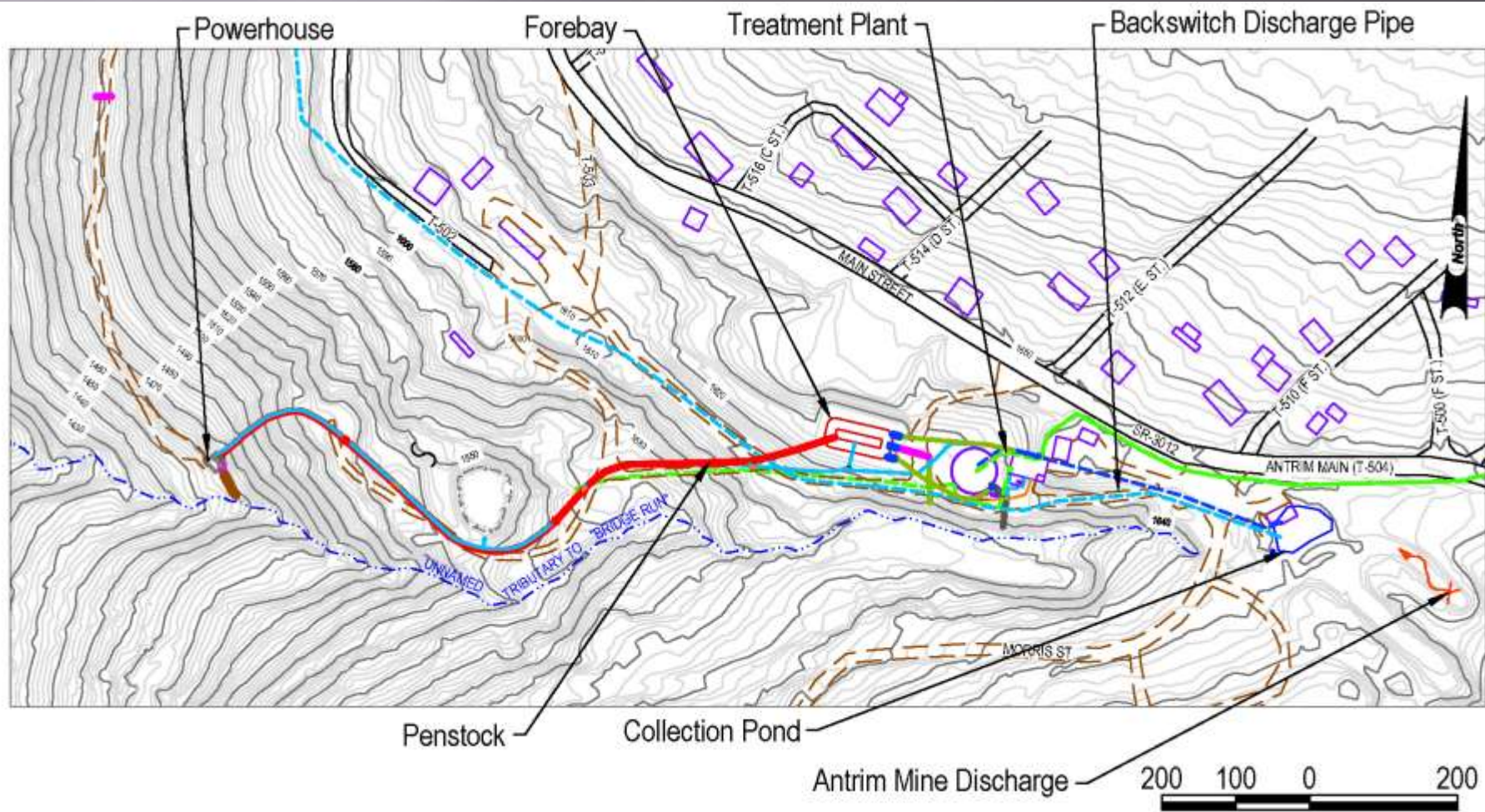
Plant and Forebay



Plant and Forebay



Site Overview: Penstock



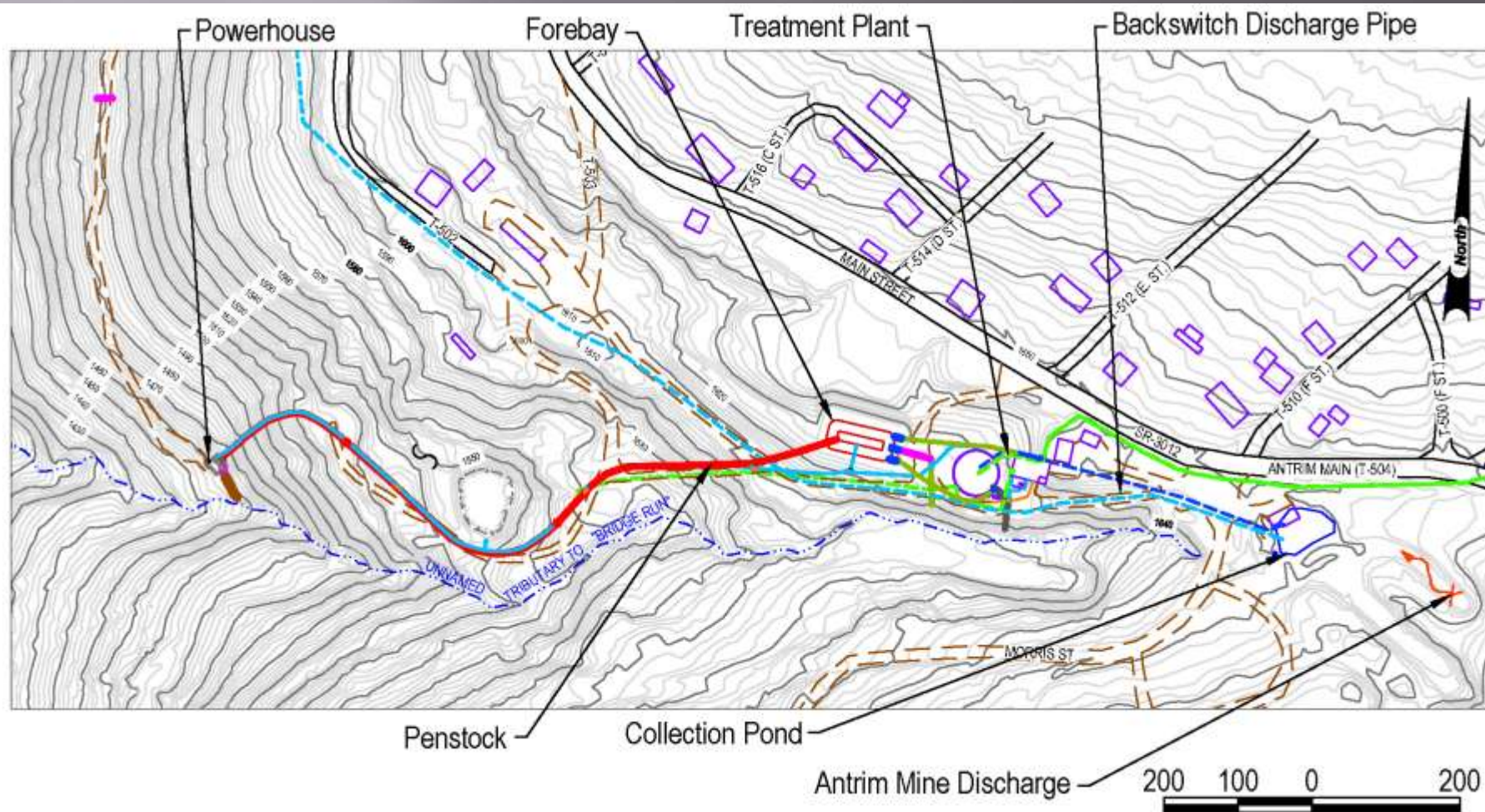
Penstock



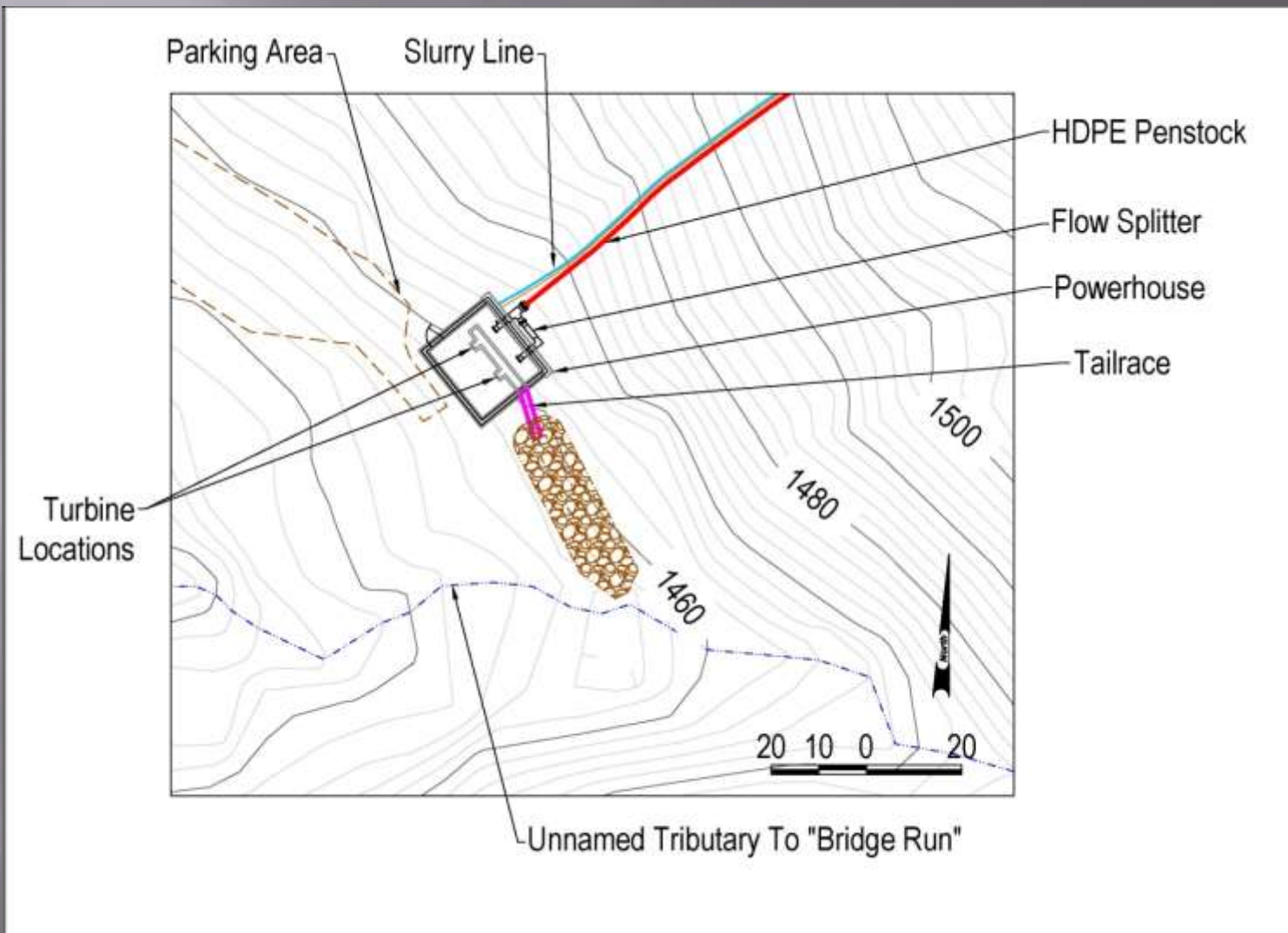
Penstock



Site Overview: Powerhouse



Powerhouse



Powerhouse



Powerhouse



Powerhouse



Powerhouse



GENERATING POWER!!!!



Antrim Power Overview

- ▣ 160' Vertical Head
- ▣ <500 – 2,000+ gpm
- ▣ <11 – 40 kW

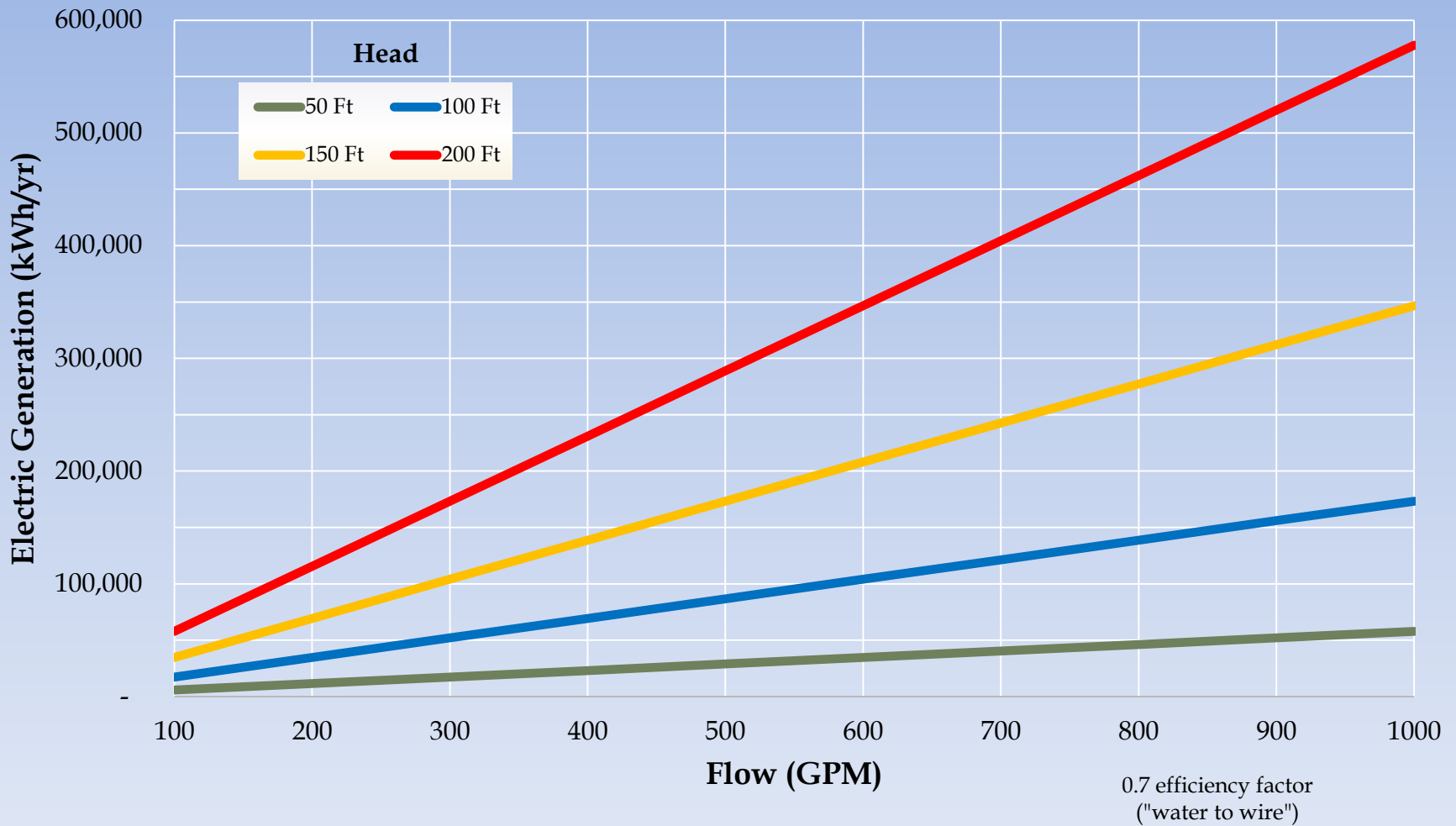
On-Grid Configuration

- ▣ 1,500 gpm average
- ▣ 280,000 kWh/Year
 - ~\$13,000/Year Savings
 - ~\$8,000/Year Revenue
 - Estimated 10-year payback



Power Generation Example

Electrical Generation Potential



Concluding Remarks

- ▣ Construction is complete
- ▣ Generating power!!
 - 9.25 hp (6.9 kW)
 - 60,400 kWh/yr
 - 19 lps (297 gpm)
 - 0.77 “water to wire”
- ▣ Off-grid configuration
- ▣ FERC application to become on-grid in-process
- ▣ Switch to on-grid in 1 hour



Acknowledgements

- ▣ Babb Creek Watershed Association
 - ▣ Bill Beacom & Denny Walbridge
- ▣ PA DEP, Mario Carrello & Mike Smith
- ▣ Antrim Treatment Trust
- ▣ Ellingham Electric
- ▣ J&S Construction
- ▣ Signor Brothers Contracting
- ▣ WPCAMR
- ▣ EPCAMR
- ▣ Bruce Leavitt



Questions?



Penstock



Powerhouse

