Kenai Hydro, LLC
3977 Lake Street
Homer, AK 99603

December 15, 2014

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
Attn: DHAC, PJ-12.2
888 First Street, NE
Washington, DC 20426

- FILED ELECTRONICALLY -

Final Grant Lake Project Public Meeting Minutes

Dear Secretary Bose:

Kenai Hydro, LLC (KHL) hereby submits its Grant Lake Project Public Meeting Minutes for the public meeting held in Moose Pass on November 6, 2014. The complete package includes:

- Public Meeting Minutes
- Public Meeting Sign-in Sheets
- Public Meeting Presentation Given by KHL

On November 6, 2014, KHL held a Public Meeting in Moose Pass to present the natural resource study results to the public, discuss design characteristics of the Project, describe progress related to the develop of the Draft License Application (DLA) and field any questions the public may have in advance of the formal distribution of the DLA for public review and comment.

KHL is in the process of developing their DLA and associated management plans with the current intent of distributing to FERC and the public for comment in early 2015. To date, our comprehensive natural resource results and impact assessments, engineering feasibility and preliminary design work and collaboration with stakeholders corroborate KHL's impression that the Grant Lake Hydroelectric Project presents an extremely viable opportunity for KHL to diversify its generation portfolio and reduce its current level of dependence on fossil fuel generation.

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KHL is committed to keeping FERC apprised of developments during Draft and Final License Application development and will be scheduling another progress/advisory call with our FERC Representative, Ken Hogan soon. As always, please don't hesitate to call or email if you have any questions or concerns.

Sincerely,

/s/ Mikel Salzetti

Mikel Salzetti
Project Manager
Kenai Hydro, LLC

KENAI HYDRO LLC, GRANT LAKE PROJECT
DRAFT MOOSE PASS PUBLIC MEETING NOTES
NOV. 6, 2014
6:00PM – 9:31PM

Presenters: Mike Salzetti (HEA), John Stevenson (BioAnalysts, Inc.), John Blum (McMillen, LLC), Cory Warnock (McMillen, LLC), Mike Yarborough (Cultural Resource Consultants), Dwayne Adams (Earthscape), Mort McMillen (McMillen, LLC)

Attendees: See sign-in sheet (Attachment A)

Attachments

A – Sign-in sheet
B – Public Meeting Presentation

Mike Salzetti (HEA) opened the meeting at 6:07pm by briefly introducing the project and the project team. He introduced the audience to the project resources (paper copies) made available at the meeting and gave instructions regarding the single question survey that Kenai Hydro (KHL) would like to have meeting attendees complete and turn in.

Mike explained that the main purpose of the meeting is to summarize and share the results of the various resource studies. He emphasized that tonight's presentation would only be an overview of what is a body of very detailed information. The detailed study plans and results are available on KHL's website.

Mike explained that Kenai Hydro LLC is a wholly-owned subsidiary of HEA.

Mike provided a brief history of the project from work in the 1980's, to more recent studies, and leading up to the material to be presented today. Mike explained that following the scoping process in June of 2010, it was evident that Stakeholders desired studies that were more quantitative in nature than those developed earlier. As such, KHL refine the study plans based on comments, hired appropriate study consultants and vetted the refined plans with Stakeholders to confirm their adequacy. The studies were then implemented in 2013/2014. Mike then explained the key project features: a water fall at the outlet of Grant Lake, steep topography, and proximity to infrastructure (transmission lines, road & rail system).

The project's operating assumptions were presented to the group. There is no longer a dam associated with the project. Lake level will fluctuate from 0 to -13ft (Elev. 703-690-ft). There will be a tunnel, a powerhouse, and a detention pond.

John Stevenson (BioAnalysts) gave his presentation of the Aquatic/Fisheries Studies. John identified four anadromous salmonid species that are found in Grant Creek, which include pink, Chinook, sockeye, and coho salmon. Key resident species include rainbow trout and Dolly Varden. Based on visual, redd, carcass and radio telemetry surveys, John pointed out that Reaches 1 and 3 were most important to all species of interest, and that only 1.3 percent of all spawning occurred in Reach 5. He explained that this was a summary of what amounted to an extensive amount of data. Primary methods included but were not limited to:

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- Use of a weir
- Radio tagging and tracking
- Incline plane traps
- Minnow trapping
- Spawning surveys
- Snorkeling
- Floy tagging
- Genetic sampling

John reiterated that the entirety of the study report and associated results could be found on the KHL website. John's portion of the presentation is incorporated into the attached document.

John Blum (McMillen) presented the instream flow study results. He explained that the purpose of the study is to answer two questions: 1) Where is the preferred fish habitat and, 2) How does the project hydrology affect this habitat? Minimum instream flow rates for the bypass reach were presented along with their influence on the fish habitat of Grant Creek. John explained that the entirety of the report and associated results can be found on KHL's website. John's portion of the presentation is incorporated into the attached document.

*** A short break was taken from approximately 7:10-7:19pm. ***

Cory Warnock (McMillen) presented the Water Resources and Terrestrial study plans and summaries. Water quality was found to be consistent with results from previous studies in the 1980's as well as the 2009 study data. The Terrestrial Study looked at botanical, wetlands, and wildlife resources. The study findings were summarized by noting the species and counts observed within the study area. Cory noted that the project intake design and lake levels were altered to avoid impacting botanical resources identified in the study. Cory explained that the entirety of the report and associated results can be found on KHL's website. Cory's portion of the presentation is incorporated into the attached document.

Mike Yarborough (Cultural Resource Consultants), presented the Cultural Resource study and findings. The study conducted included a literature review and pedestrian surveys… no native Alaskan sites were discovered in the surveys. Some of the information has been kept confidential at the request of the agencies and per the Section 106 process. Fourteen newly identified historic sites were identified and only one was recommended as eligible for the National Register. Impacts were deemed as minimal and mostly associated with potential increased access as a result of the project.

Dwayne Adams (Earthscape) presented the Recreational and Visual Resource study findings. The study looked at both winter and summer uses of the area. Noise levels were also assessed; typically 40dB or

less with peak levels at 80-90dB from airplane flyovers or snowmachines. Work to address the commemorative Iditarod National Historic Trail impacts were explained. Dwayne explained that the entirety of the report and associated results can be found on KHL's website. Dwayne's portion of the presentation is incorporated into the attached document.

Mort McMillen (McMillen) presented an overview of the proposed project design and the elements that addressed the findings or issues identified by the studies. Construction would be expected to take place over two summers. Efforts are made to mitigate construction impacts through planning, monitoring, and Best Management Practices. Mort explained that the entirety of the infrastructural design and associated operational regime would be described in the DLA. Mort's portion of the presentation is incorporated into the attached document.

At 8:19pm, the meeting was opened for questions from the audience.

Q: Mark Luttrell said that he felt that KHL was there to tell the public what we are going to do, not "if" KHL was going to do the project. He said that he thought the public was against the project and was "torqued" that HEA does not seem to have heard this input.
A: Mike replied that the public has been informed of the process and has been kept in the loop regarding the Project status, and that while there are some elements of the public that are opposed to a Grant Creek Project, there are also proponents, including HEA's Board of Directors and HEA members. Furthermore, Stakeholders which include both state and federal entities have been heavily involved with development of operating conditions.

Q: Mike Cooney asked what the estimated capital construction cost was.
A: Mike Salzetti said it is approx. $58M.

Q: What % of the overall power production will this project represent?
A: Mike Salzetti said this plant would produce about 4% of HEA's energy usage.

Q: What other renewable projects is HEA investigating?
A: Mike Salzetti stated that HEA is looking at tidal and solar energy projects. Mike explained that wind energy is an intermittent source and can impact our gas contracts and cost.

Q: Mike Cooney asked if the number of sockeye fry counted during the 2013 study in Grant Creek would allow us to accurately predict the contribution of Grant Creek sockeye to the Kenai system run.
A: John Stevenson said that the study was not able to quantify the number of sockeye fry produced in Grant Creek, and that Sockeye fry move very quickly out of the Grant Creek drainage and rear in downstream lakes such as Lower Trail Lake or Kenai Lake.

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Q: Mike Cooney asked again if there is there a way to quantify what the rearing effect of Grant Lake on Trail Lake and Kenai River fisheries?
A: John said he could not say what Grant Creek contributes relative to other tributaries to the Kenai River since that was not part of the scope of study. Cory Warnock added that while fish quantities are difficult to extrapolate (to other areas), the fish habitat pre- and post-project would help to form opinions of effects on fish productions. Ricky Gease said that Grant Creek has a very small population of sockeye relative to the entire sockeye return to the Kenai system (in 2013, about 1,150 sockeye returned to Grant Creek, while approximately 1,000,000 sockeye returned to the Kenai system overall). Mr. Gease briefly explained correlations to the Cooper Lake hydro relicensing project. The increase of flows to the creek during the winter months seems to have a net positive effect on rearing capacity for juvenile fish.

Q: Hal Shepherd asked why the Integrated Licensing Process not used for this project. I'm concerned that Stakeholders haven't had the opportunity to weigh-in on the project.
A: Cory Warnock stated that KHL was using the Traditional Licensing Process or "TLP" and that this process was vetted with Stakeholders and subsequently approved for use by FERC. With the TLP, KHL was able to go back and use the process to revise its study plans to address concerns that were voiced. Public agencies and their experts have been collaborating extensively with KHL during the study process. Many meetings, workshops, conference calls at all phases have been taking place.

Q: How often have the state and Federal agencies been involved and what input have they had?
A: Cory Warnock referred to the slide in the presentation that listed the various consultation meetings. Agency experts were consulted in Dec 2012 to review the latest study plans. Plans were adjusted to address their comments. In March 2013-Nov 2013 the data were collected and the remainder of the year was spent preparing reports. This was followed by 6-8 meetings to present the results, much like tonight, to the agency Stakeholders. In July, a meeting was conducted to take input on the preliminary engineering and design. A large instream flow work group was formed to vet the results of the studies. All of the meeting notes and agency input are documented and this information is available on the KHL website.

Q: Will there be any provision for flushing flows?
A: Cory Warnock indicated that much of the canyon reach is well armored and it is sediment-starved. He stated that most of the sediment that was routed from Reach 5 (bypass reach) to the high quality habitat areas (Reach 1-4) likely occurred during episodic events (slides, quakes, etc.). Cory acknowledged that some level of sediment comes from Reach 5 and as such, one of the mitigation efforts that is proposed is to monitor sediment in the creek in an adaptive management approach. Plans will be made to address mitigation of sediment in the creek. If, during the first couple years of operation, it is determined that sediment routing is being negatively impacted out of Reach 5, KHL will meet with Stakeholders and discuss the appropriate option between flushing flows and/or gravel supplementation to allow for the continued natural level of sediment deposition into Reaches 1-4.

Q: Beside this project, is Bradley Lake the only HEA hydro project?

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A: Mike Salzetti clarified that Bradley Lake is not owned by HEA, but HEA operates it for the project participants and enjoys a small share of the energy produced by the plant.

Q: What lessons from operating the Bradley Lake have we learned and applied to this project?
A: Mike Salzetti said that we have applied lessons learned from other hydro projects, such as operationally to optimize flows for energy production and sizing of the project. Mort McMillen added that when you look at historical hydro projects, they tended to be oversized. The way that powerhouses are laid out is important and the project design calling for two 2.5MW units is important vs. having a 1- and a 4-MWuntThe current design allows for sharing spare parts, etc. With respect to the tunnel, we have learned how to craft the construction specifications and sequence of construction to minimize costs. Mike Salzetti also said that our level of study has been significantly more rigorous compared to previous projects.

Q: Why didn't the negative project sentiment from earlier meetings have a larger affect?
A: Mike Salzetti said that a more quantitative approach needed to be taken and more substantive data needed to be collected and subsequently analyzed for project impacts. KHL has done that.

Q: Has HEA conducted a survey of its members to see how many support this project?
A: Mike Salzetti explained that our Board of Directors is elected to represent our members. The Board has been a proponent of the project.

Q: When we are looking at potential mitigation measures, in Reach 1there are 2 large projects in the area that "reformatted" (glide-riffle-glide?) the lower reaches (to improve habitat). Is there any concept for Grant Creek to reformat or optimize the "distributary reach", similar to Dave's creek or Stetson Creek?
A: Cory Warnock said that KHL plans to modify the upstream control at the distributary to permit consistent flows that would allow improved habitat. Monitoring efforts will be in place to ensure that this habitat is being maintained and utilized.

Q: Ricky Gease stated that he was impressed by the project's ability to model a 66-year hydrologic history. He stated that something lacking in Alaska, in general, is water flow data over time. Is there any way to take the data that we have collected here and work with Stakeholders to develop a comprehensive Kenai River watershed model? Could this be done?
A: Cory Warnock said that what the project could contribute to such an effort is that the project plans to leave its gaging station in place to continue to collect flow data and potentially allow for synthesis of hydrologic data to other basin around the Kenai Peninsula. Mike Salzetti said that overall, the development of a watershed model is a great idea, but it is not currently a proposed KHL mitigation measure.

Q: What do you call the trail going to the Case Mine?

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A: Dwayne Adams stated that the trails in that area are called “Grant Lake Trail north” and the portage trail is called the “Saddle Trail”.

Q: The proposed access road appears to cross State Land. Who would be best to make comments to regarding the access road?
A: Mike Salzetti indicated that in addition to commenting on the Draft License Application (DLA), comments should be given to State Lands, State Parks and the US Forest Service.

Q: Are there plans to have a public restrooms on the project?
A: Mike said it depends on the decisions made with respect to access being allowed via project routes. If public access is allowed, then it may be a mitigation measure.

Q: Mark Luttrell said he thinks that the Recreation Study is not complete. Would HEA commit to doing a comprehensive usage study including Seward & Cooper Landing?
A: Dwayne Adams asked how this would be relevant to the questions for Grant Lake. One of the questions may be latent demand… i.e., if we build it, will they come?
Q: What are the exact questions to be asked that would answer what impact increased access would have on things, such as the creek banks?
A: Dwayne stated that it is very difficult to design a study to assess latent demand. We expect that the access would be used and these uses have been quantified in the current study.

Q: An individual stated that every year he has come and seen the project presentations, and he has been impressed. If this project is built, this person thinks that usage will increase. He indicated that he does not favor the project and is concerned about the potential increased usage. He expressed frustration that Moose Pass is not being served by HEA, but HEA is benefitting from having a project in Moose Pass.
A: Mike Salzetti drew a comparison to the Bradley Lake Project that serves and benefits all of the Railbelt, but is located away from the utilities and communities that it serves.

Q: Did you say that if the access is opened or closed will determined by input tonight?
A: Mike Salzetti said no, that is was a more comprehensive process than just this informal survey and that the agencies will provide input as well. The Forest Service is in the process of updating their Forest Plan and they will likely address the access and usage to this area.

Q: Who makes the final decision related to access?
A: Mike Salzetti stated FERC does with input from Stakeholders. If you really want your voice heard, you must comment during the DLA comment period. Tonight is an informal survey.

Q: Were effects of flow on the Lower Trail Lake ice modeled?
A: Cory Warnock stated that this has not been modeled or assessed.

Q: Is the genetic (fish) population in Grant Creek isolated?

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A: John Stevenson stated that the genetic data was collected per the request of ADF&G and they now have all of the samples. KHL doesn't have the results from the State's study, but there is no reason to think that fish from Grant Creek are genetically isolated.

Q: Where will the intake tower will be located, have we taken into account climate change effects on this location?
A: Mort McMillen stated that the design of the intake allows for water temperature to be taken into consideration by moving the elevation of the intake. From a hydrology viewpoint, this is why KHL looked at the hydrologic history and design the project for flexibility of the intake structure.
Q: What is your timeline for licensing and construction?
A: Cory Warnock stated that the plan is to have the DLA complete and available for comment by early spring. There is a 90-day public comment period, and then a Final License Application (FLA) will be prepared to address the comments received which will be filed with FERC. FERC's review and ruling on the FLA could take from 9-months to 2-years. Final engineering design then typically takes 1 year and construction would take approximately 2 years. From final engineering to commissioning of the project is estimated to take approximately 3 years.

Q: What is the length of the FERC license?
A: 30-50 years.

Q: How long would it take for HEA to realize its return on its investment of $58M?
A: Mike Salzetti stated that gas pricing plays a big role in estimating this payback. The payback period is expected to be a 30-50-years, but beyond this time it produces very inexpensive power.

Q: Mark Luttrell asked if HEA would commit to 2 more public meetings, one in Seward and one in Cooper Landing and structure them to take more public comment?
A: Mike Salzetti stated that he would need to think about this.

Q: A suggestion was made that HEA needs to take more public comment on the study results due to the fact that he fears that FERC will rubber stamp this project based on the results of our studies.
A: Cory Warnock said that FERC does not rubber stamp projects; it is not a foregone conclusion that FERC would issue a license. Mike Salzetti added that this meeting is not required by the (licensing) process and KHL is conducting this meeting tonight as a good-faith effort to inform and involve the public in advance of their ability to review and comment on the DLA.

Q: Jim Herbert stated that they came tonight to obtain information. HEA is in Moose Pass's backyard. The local benefit is perceived to be little and the impact is large. He stated that HEA needed to consider some sort of local contribution or remediation for the impact that locals feel the project will have on them and their community.
A: Mike Salzetti stated that KHL would take this into consideration.

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Q: Mike Cooney said that he thinks that there are likely to be large impacts to local residents, but very little benefit. He thinks that FERC awarding a license is a foregone conclusion. He would like for HEA to collaborate with the community to develop the project plan. He said that he made this request of HEA in 2009. He asks for a collaborative process.

After a call for any further questions and seeing none, the meeting adjourned at 9:31pm.

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Attachment A

Public Meeting Sign-in Sheets

Grant Lake Hydroelectric Project (FERC No. 13212)
Grant Lake Project Public Meeting
November 6, 2014
Moose Pass Community Hall, Moose Pass, AK

Name	Residential Location	Phone	Email
Cory Warnock	Ferndale, Wa.	360-384-2662	cory.warnock@mcmillen-llc.com
John Stevenson	Redmond, WA	206 390-7116	john.stevenson@biozuzlysts.net
Mike Insalaco	Seward	907-830-7393	mike@alaskaenergy.com
Hal Shepherd	Homer	907-991-1355	hal.shepherd@chd.org
Mark Luttrell	Seward	907 224 5372	profrock@arctic.net
Irene Lindquist	Moose PASS	288-3186	irene@arctic.net
Donna Wotllin	Seward	224-5711	bearimage.dw@gmail.com
T. Angh	Moose Pass		
Ryan Thomas	Anchorage	907 269 8692	ryan.j.thomas@alaska.gov
Bob Baldwin	Cooper Landing	907-250-3313	akcengr@yahoo.com
Jim Herbert	SWD	224-8060	jherbert8060@gmail.com
Katie Baldwin-Johnson	Cooper Landing	440-6664	katie.johnson@alaska.gov
Judith Owen	Moose Pass	288-3678	
Brad Zuback	Kenai	907-395-6232	

Grant Lake Hydroelectric Project (FERC No. 13212)
Grant Lake Project Public Meeting
November 6, 2014
Moose Pass Community Hall, Moose Pass, AK

Name	Residential Location	Phone	Email
Mike Yarborough	Anchorage	907 349-3445	Archeology@acsalaska.net
DWAYNE ADAMS	ANCHORAGE	907 274 2688	wdadams@earthscape.alaska.com
John Lang	Moose Pass	907-288-7719	
Jenny Nassen	Moose Pass	907-288-3119	Pm99588@yahoo.com
Ricky Gease	Kenai	262.8588	ricky@krsa.com

Grant Lake Hydroelectric Project (FERC No. 13212)
Grant Lake Project Public Meeting
November 6, 2014
Moose Pass Community Hall, Moose Pass, AK

Name	Residential Location	Phone	Email
Mike Salzetti	Kenai	(907) 283-2375	msalzetti@homerelectric.com
Mort McMillen	Boise	(208) 342-4214	morton.mcmillen@mcmillenllc.com
Mike Cooney	Moose Pass	907 288 5022	mcooney@arctic.net
Angela Coleman	Moose Pass	907-288-3110	perupraisie@hotmail.com
Mike Glaser	mile 20	288-3133	glaser@seward.net
Dennis Gease	Kenai	242-9291	dgease@gmail.com
David Griffin	Anchorage	222-3846	david.griffin@alaska.gov
China duVall	Anchorage	269-8720	china.duvall@alaska.gov
Andrew Bacon	Seward	362-7719	andbacon2@yahoo.com
Claire Shipton	Moose Pass	288-4111	claireshipton@gmail.com
David Pearson	Moose Pass	288-4111	
Jeff Hetrick	"		jjh@seward.net
Jeanette Hannemann	Seward	907-317-4518	dyrkss@yahoo.com

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Attachment B

Public Meeting Presentation

Grant Lake Hydroelectric Project

Public Meeting

November 6, 2014 – Moose Pass, AK

McMillen

DESIGN with Vision. BUILD with Integrity.

In Association with

HEA

Introductions

- HEA
  - Mike Salzetti Manager of Fuel Supply & Renewable Energy Development
  - Brad Zubeck Manager of Engineering - Power Supply
  - Joe Gallagher Director of Member Relations

- Consulting Team
  - Cory Warnock – Project Manager (McMillen, LLC)
  - Mort McMillen – Lead Engineer (McMillen, LLC)
  - John Blum – Senior Instream Flow Scientist (McMillen, LLC)
  - John Stevenson – Senior Fisheries Biologist (Bioanalysts Inc)
  - Mike Yarborough – Cultural Specialist (Cultural Resource Consultants)
  - Dwayne Adams – Recreation/Aesthetics Specialist (Earthscape Alaska)

Presentation Overview

- Project Introduction
- Natural Resource Studies
- Engineering / Infrastructure / Operations
- Licensing Overview
- Questions

INTRODUCTION TO HEA

- 158 Employees
- Member-Owned Cooperative
- 32,853 Meter
- 2,392 Mile of Energized Line
- 3,166 Sq. Mile of Service Territory
- Sales of 482 GWh/year
- Governed by an Elected Board of Directors

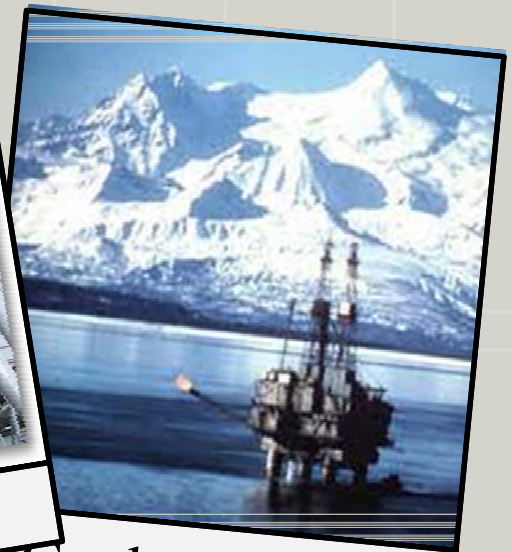
WHY

- Members via the BOD Desire Renewable Energy
- Independent Light
- Cook Inlet Gas Situation

Renewables

Independent Light

NCC Power Plant



Cook Inlet Gas

History

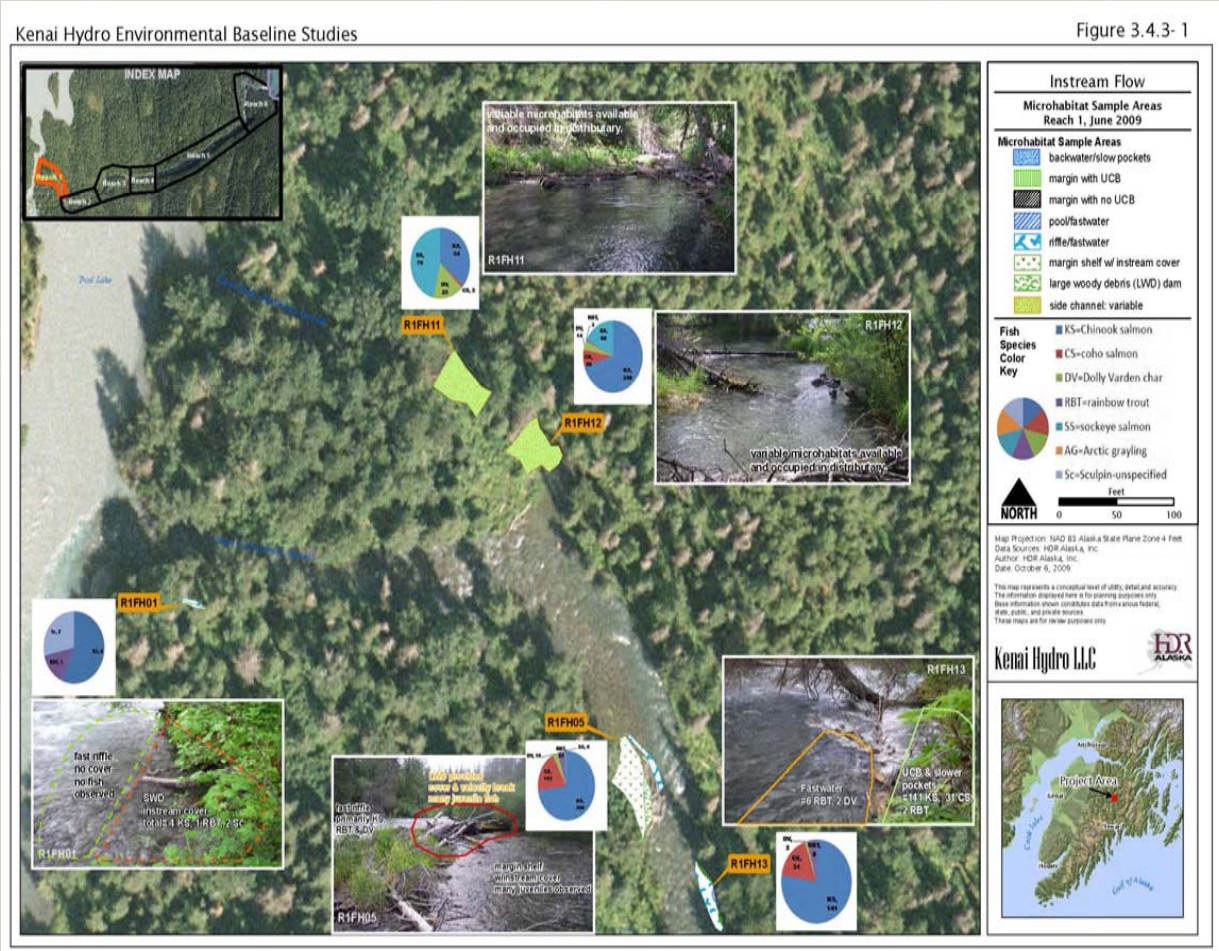
Feasibility Studies

- Grant Lake
- Falls Creek
- Ptarmigan Lake
- Crescent Lake

HISTORY

2009 Environmental Baseline Studies

- Examine Previous Studies
- Fill Data Gaps
- Develop Study Plans
- Joint Meeting



HISTORY

- 2010 Study Season
- FERC Scoping Process
- Quantitative modifications
- 2011 AEA Grant
- Preliminary Permit Expiration (Oct 2011)
- 2nd Preliminary Permit (March 2012)
- RFP Process
- Securing McMillen as Natural Resources/Engineering Consultant
- 2013 Successfully Executed NR Studies

Recent Consultation

- ✓ KHL meets with Stakeholders to present final study plans and re-integrate – December 12, 2012
- ✓ KHL incorporates informal comments from Stakeholders and files Final Study Plans with FERC – March 25, 2013
- ✓ Site visit with Stakeholders to Grant Creek – September 5, 2013
- ✓ KHL meets with Stakeholders to discuss natural resource study results – Week of March 19, 2014
- ✓ KHL forms Instream Flow Workgroup with Stakeholders to advance and collaborate on appropriate bypass flows – April, 2014
- ✓ KHL meets with Stakeholders to discuss and collaborate on engineering/design aspect of the Project – July 7, 2014
- ✓ KHL advances engineering design of the Project and meets with Stakeholders to collaborate and refine – July 7, 2014
- ✓ KHL files final natural resource study reports with FERC – August 25, 2014
- ✓ Development of Draft License Application – September, 2014 - Present

Key Natural Project Features

Waterfall

There is a natural anadromous barrier at the outlet of Grant Lake.

KEY NATURAL PROJECT FEATURES

Steep Topography

Vast majority of the potential energy occurs in the 1st half mile of stream.

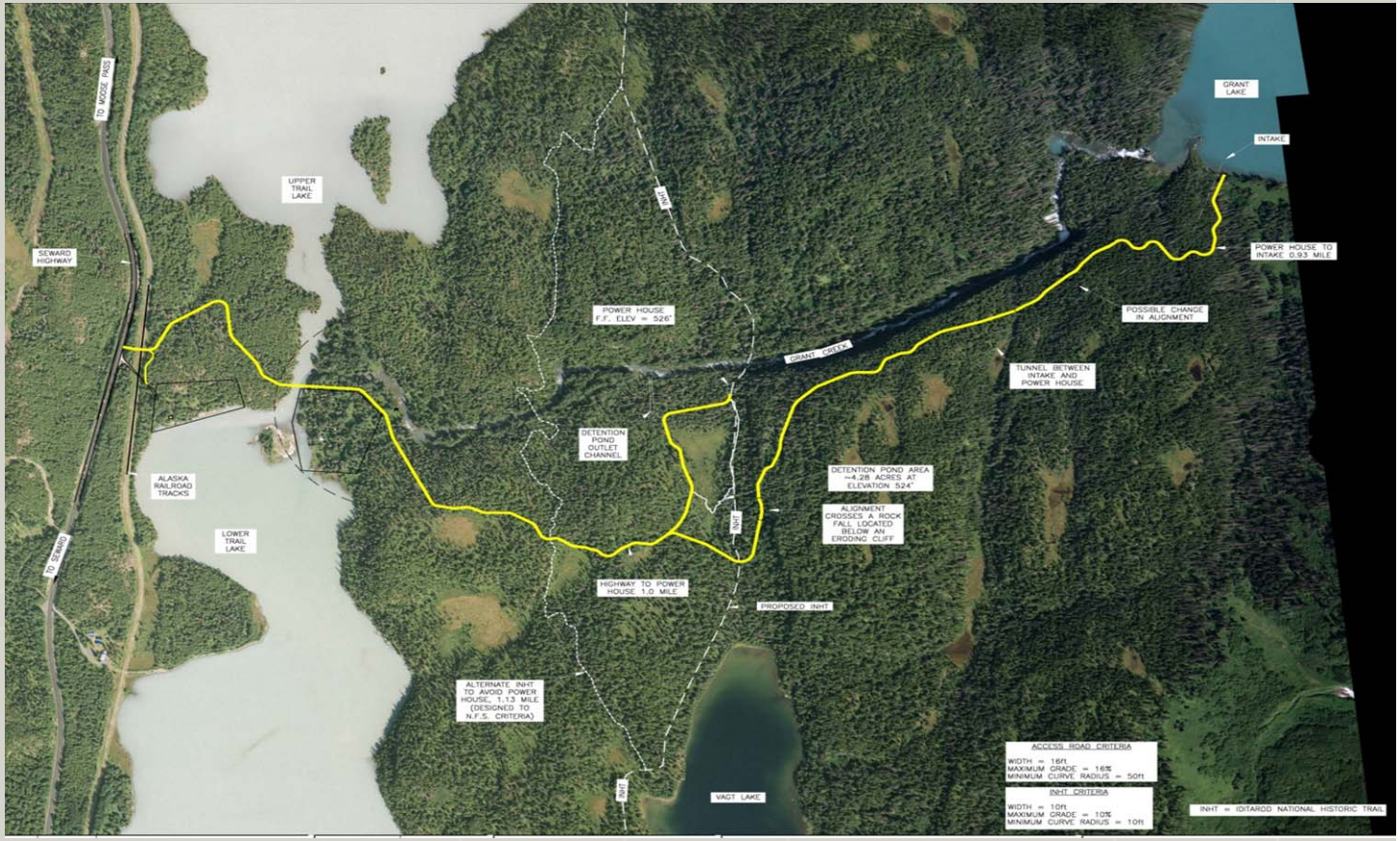
Key Project Features

Short River

1. Approximately 1 mile of creek length.
2. Most valuable habitat continues to see full water flow.

Proximity to Existing Infrastructure

1. Two Miles of Road Construction
2. One Mile of Transmission Line
3. Access to the Seward Highway
4. Access to the Railroad



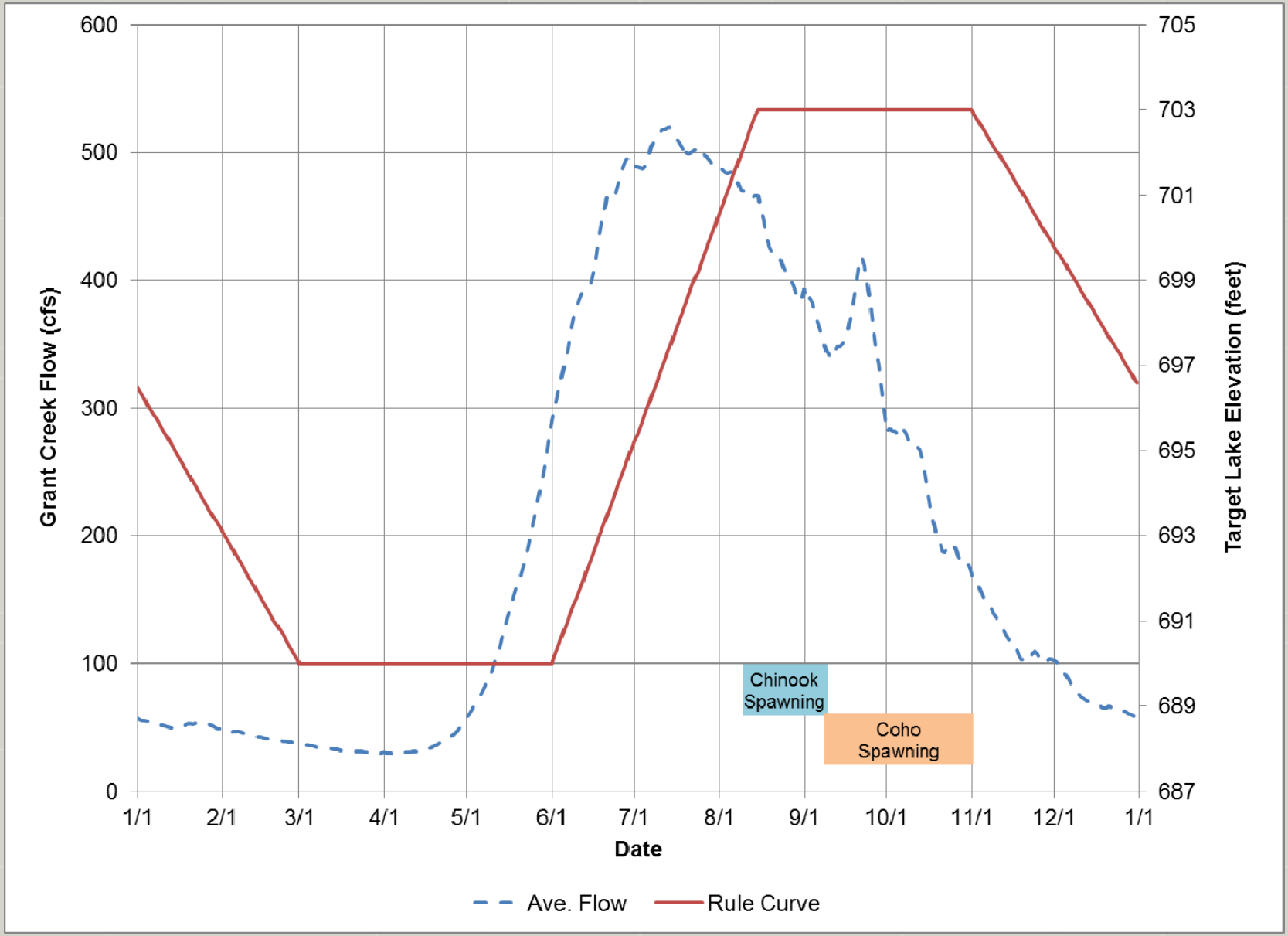
Natural Resource Studies

- ✓ Comprehensive, quantitative natural resource studies collaboratively developed for 5 disciplines:
  - ✓ Fisheries/Instream Flow
  - ✓ Water Quality/Quantity
  - ✓ Terrestrial
  - ✓ Cultural
  - ✓ Recreation and Visual
- ✓ Study Period – March 2013-July 2014
  - ✓ Stream gauging ongoing
- ✓ Study results integrated with all historical data collected in the Project Area and region
  - ✓ AEIDC
  - ✓ Ebasco

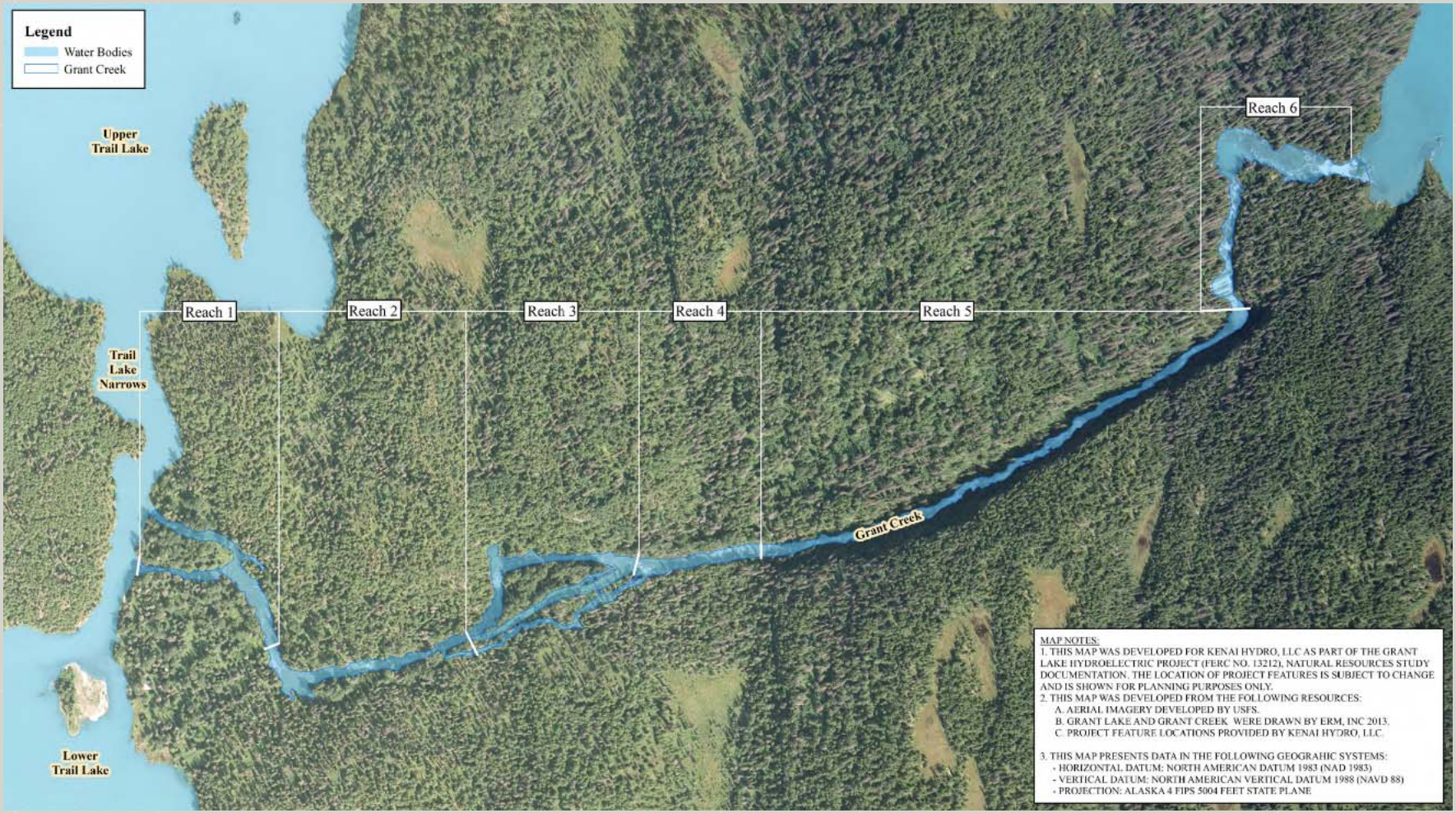
Operating Assumptions

No.	Assumption	Data
1	No Dam	Natural Storage Only
2	Reservoir Operating Range	703-690 feet (13 feet)
3	Approximate Tailwater Elevation	518 feet
4	Peak Powerhouse Discharge	385 cfs
5	Minimum Powerhouse Discharge	23 cfs
6	Turbines	2 - 2.5 MW Francis Units
7	Instream Flow Releases in Reach 5 and 6	10 cfs during Chinook spawning (Aug-Sept)
		7 cfs during Coho spawning (Sept-Oct)
		5 cfs for the remainder of the year

Operating Assumptions



Grant Creek Study Area



Fisheries

- ✓ Focus on Grant Creek and Narrows (no salmonids in lake due to anadromous barrier and failed historical plantings)
- ✓ Comprehensive study assessing:
  - ✓ Salmon spawning, distribution and abundance
  - ✓ Resident and rearing fish abundance and distribution
  - ✓ Instream habitat availability and abundance (Instream flow study)
- ✓ Fisheries staff on site daily from March – November implementing a variety of sampling methods including:
  - ✓ Weir operation
  - ✓ Radio telemetry
  - ✓ Floy tagging
  - ✓ Redd, carcass, and foot surveys
  - ✓ Incline plane trapping
  - ✓ Minnow traps
  - ✓ Beach seining
  - ✓ Snorkeling
  - ✓ Macroinvertebrate sampling

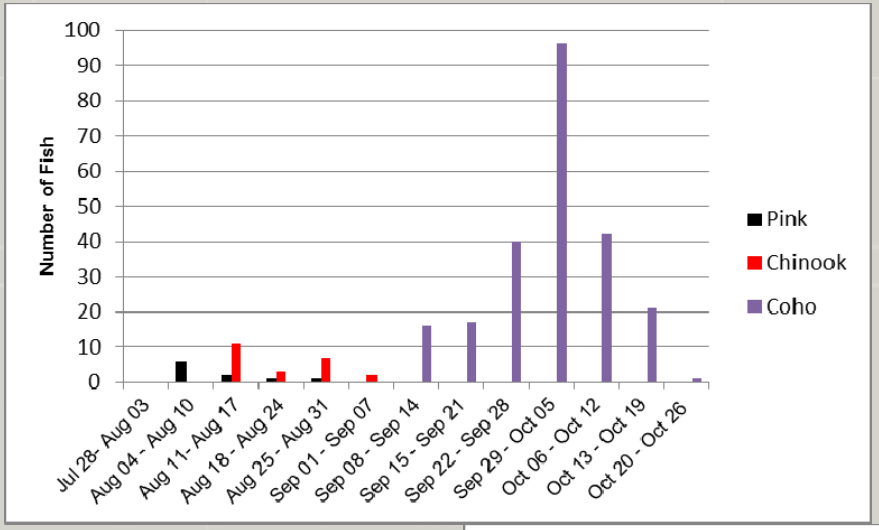
Fisheries Results

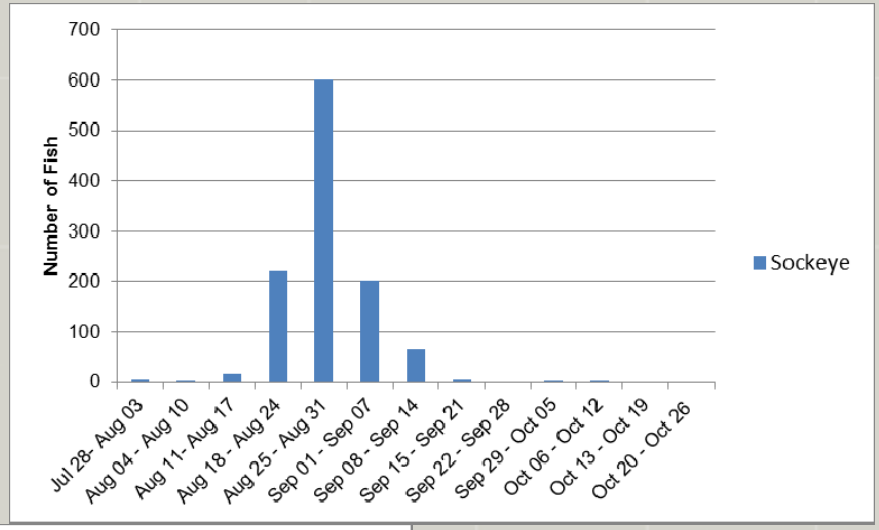
- ✓ Snapshot – Full details of all study elements in Aquatics Resource Study Report
- ✓ Species present:
  - ✓ Anadromous
    - ✓ Chinook
    - ✓ Sockeye
    - ✓ Coho
    - ✓ Pink
  - ✓ Resident
    - ✓ Rainbow Trout
    - ✓ Dolly Varden
    - ✓ Sculpin
    - ✓ Three-Spine Stickleback
    - ✓ Round Whitefish

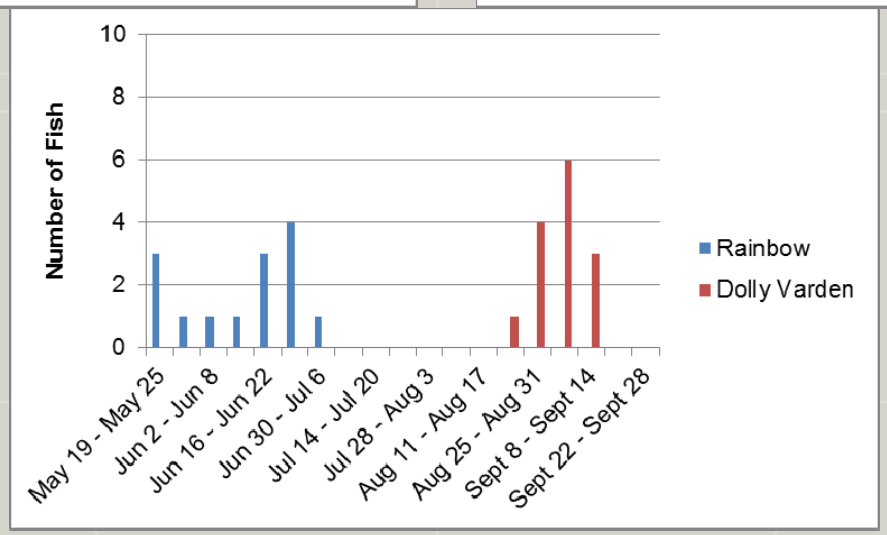
Fisheries Results
(Weir)

- ✓ Adult Weir Counts
  - Total of 1,439 Salmon Migrated Upstream of the Weir
    - Chinook – 35 (Floy-Tagged 33; Radio-Tagged 9)
    - Sockeye – 1,153 (Floy-Tagged 533; Radio-Tagged 65)
    - Coho – 239 (Floy-Tagged 176; Radio-Tagged 50)
    - Pink – 12 (Did Not Floy- or Radio-Tag)
  - Total of 27 Resident Salmonids Migrated Upstream of the Weir
    - Rainbow Trout – 13 (Floy-Tagged 13; Radio-Tagged 4)
    - Dolly Varden – 14 (Floy-Tagged 14; Radio-Tagged 1)
- ✓ Run timing – Adult Anadromous Salmon
  - Pink – August 4 through August 25; Peak August 15
  - Chinook – August 11 through September 5; Peak August 16
  - Sockeye – July 29 through October 9; Peak August 29
  - Coho – September 8 through October 26; Peak October 3

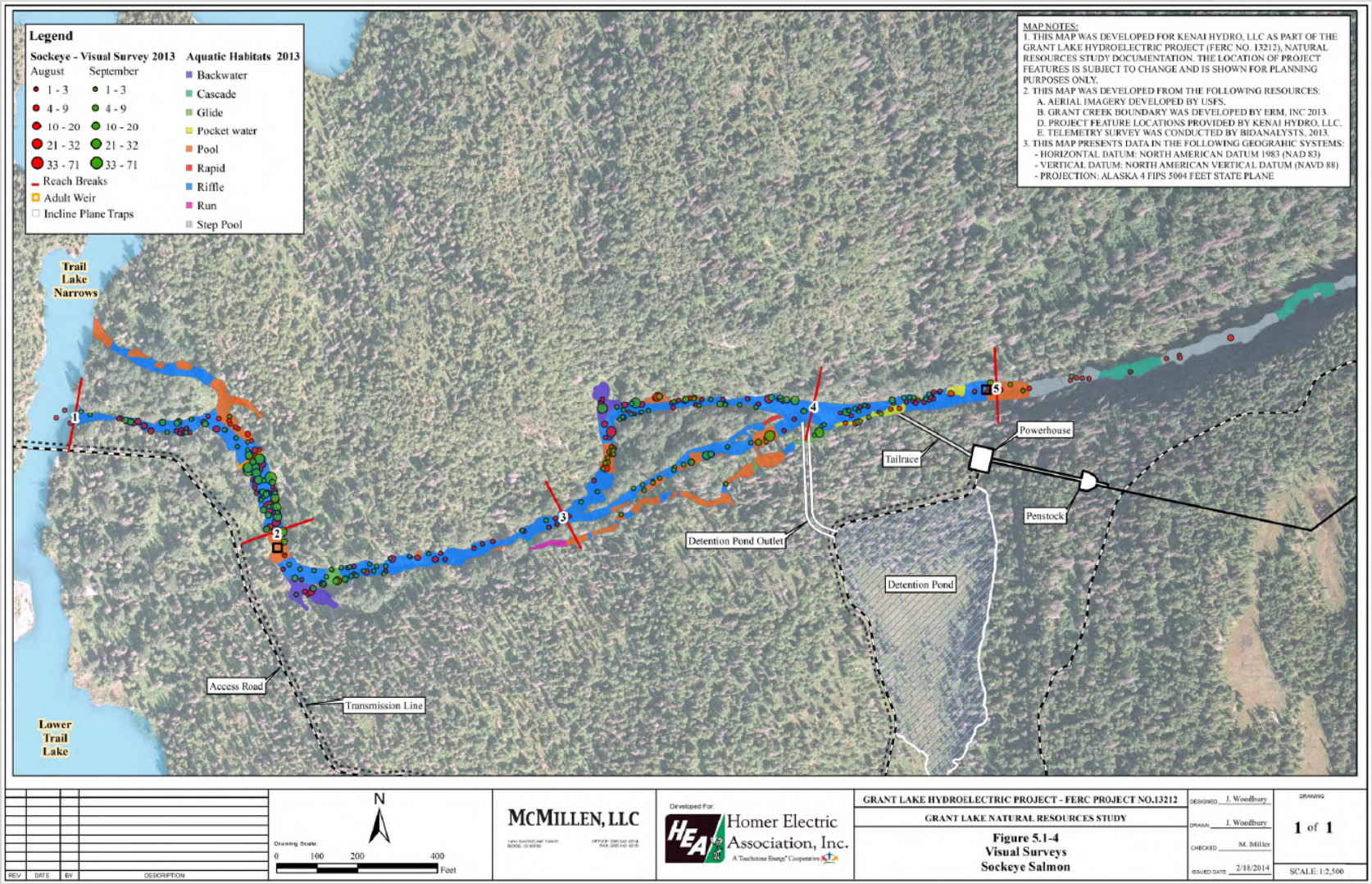
Fisheries Results
(Run Timing)



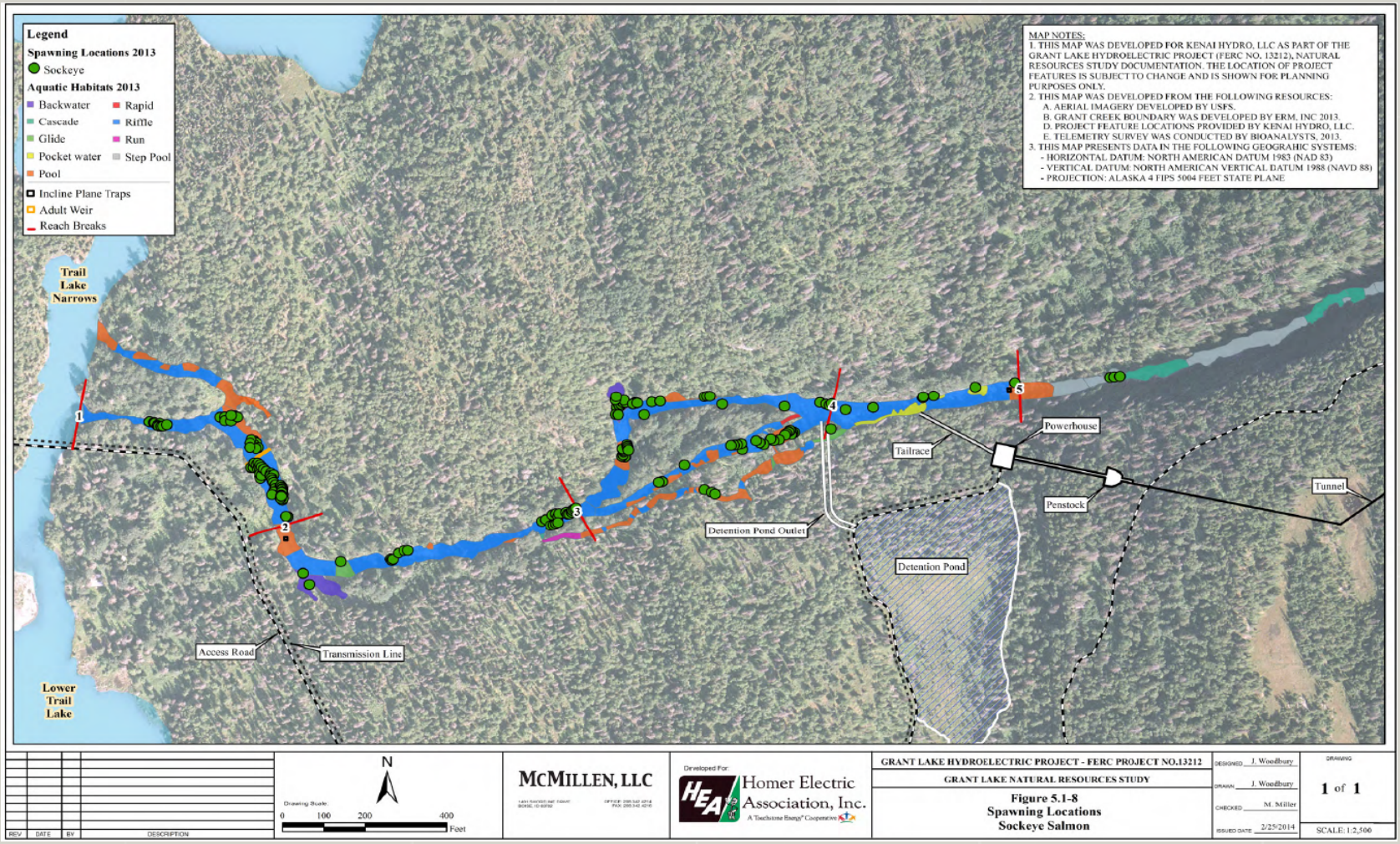




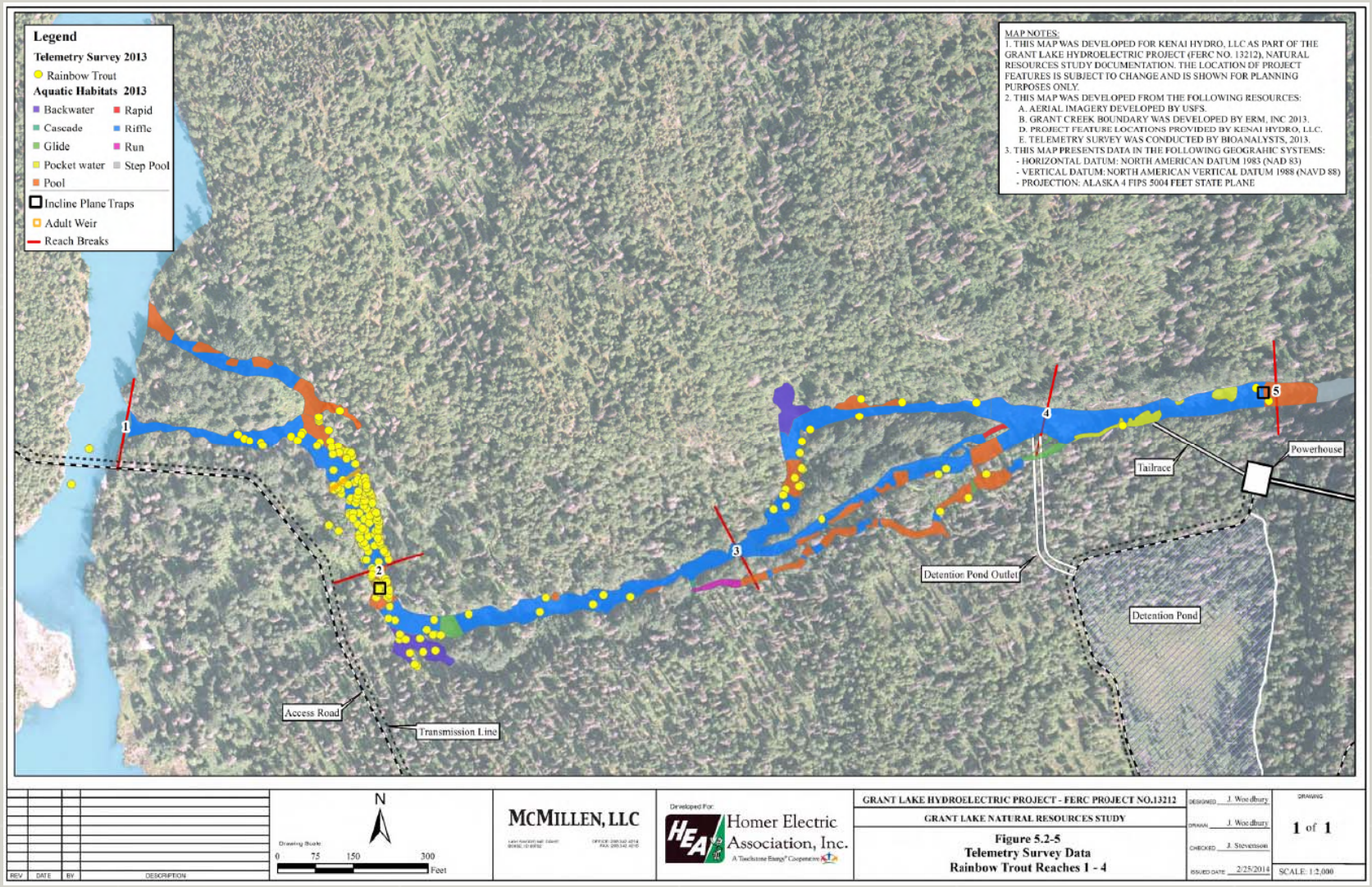
Fisheries Results
(Adult Sockeye Distribution – Visual Survey)



Fisheries Results
(Adult Sockeye Redd Locations)



Fisheries Results
(Rainbow Trout Radio Telemetry Detections)



Results

- Adult Salmonid Spawning – Number of Redds by Reach

Reach	Species				Total	Proportion
	Pink	Chinook	Sockeye	Coho		
1	2	4	144	18	168	0.433
2	0	0	52	7	59	0.152
3	0	1	102	38	141	0.363
4	0	1	7	7	15	0.039
5	0	0	3	2	5	0.013
Total	2	6	308	72	388	1.000

Note: No Rainbow or Dolly Varden Spawning was Observed

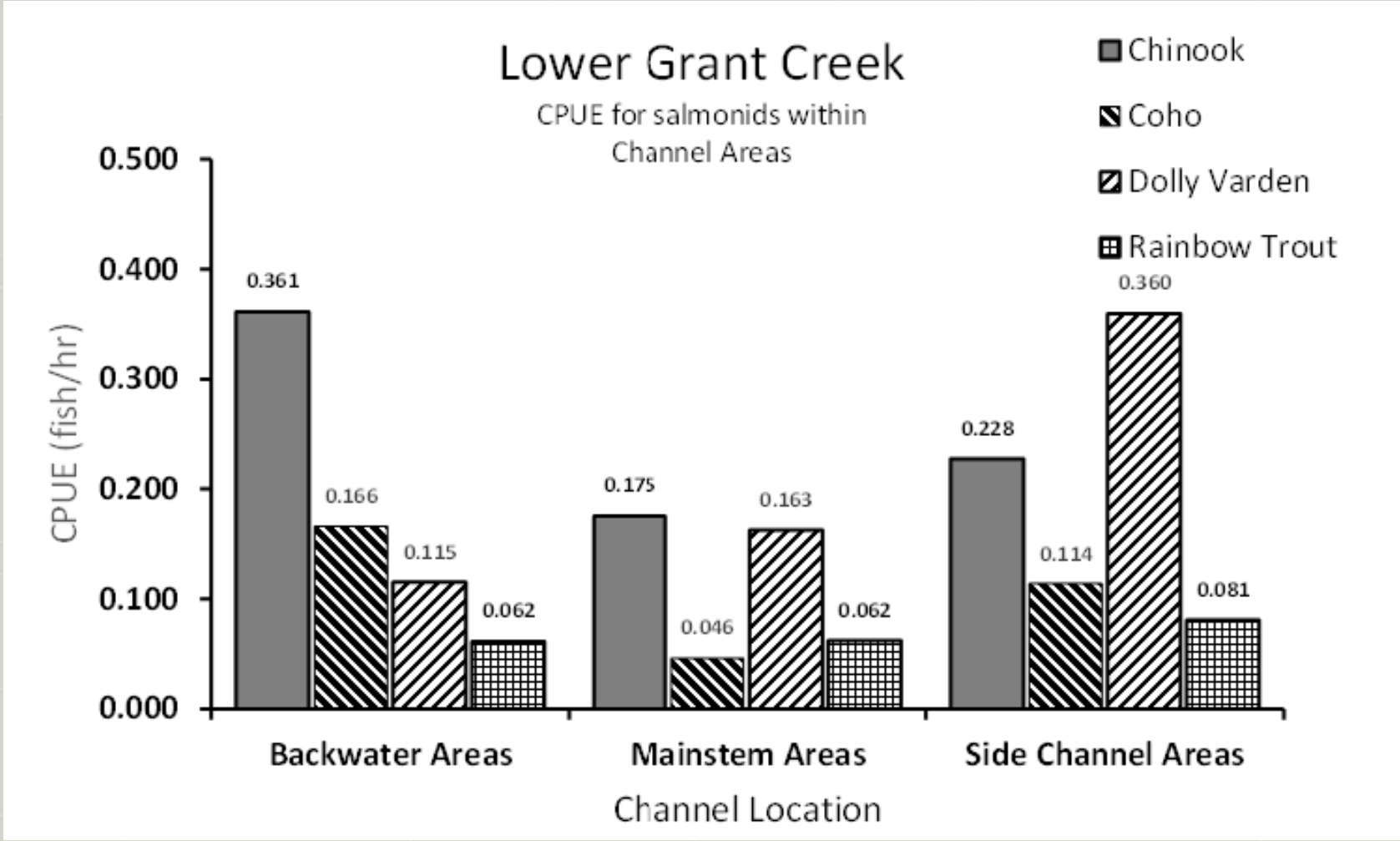
Fisheries Results

(Juvenile Distribution – Minnow Trap and Snorkel Surveys)

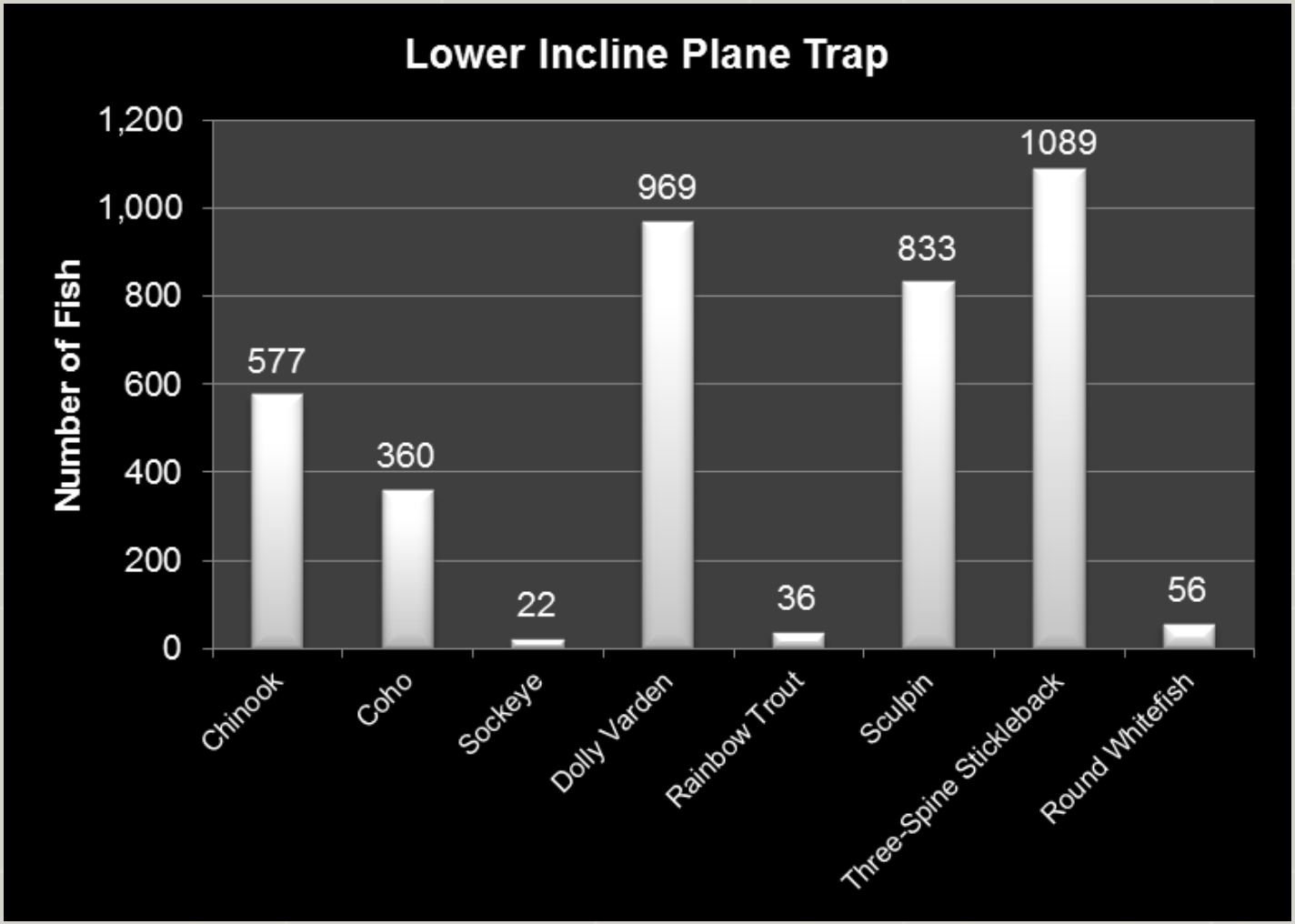
Species	Number	Proportion	CPUE (Fish/Hr.)
Chinook	31	0.15	0.024
Coho	5	0.02	0.004
Dolly Varden	102	0.50	0.077
Rainbow Trout	48	0.23	0.036
Sculpin	19	0.09	0.014
Total	205	1.00	0.156

		April 2013 Snorkel Results		
Channel	Habitat	No. Fish	Area Sampled (m^2)	Density (Fish/100 m^2)
Mainstem	Glide	42	933	4.50
	Pool	357	7,193	4.96
	Riffle	39	8,463	0.46
Backwater	Pool	83	794	10.46
	Total	521	17,382	3.00

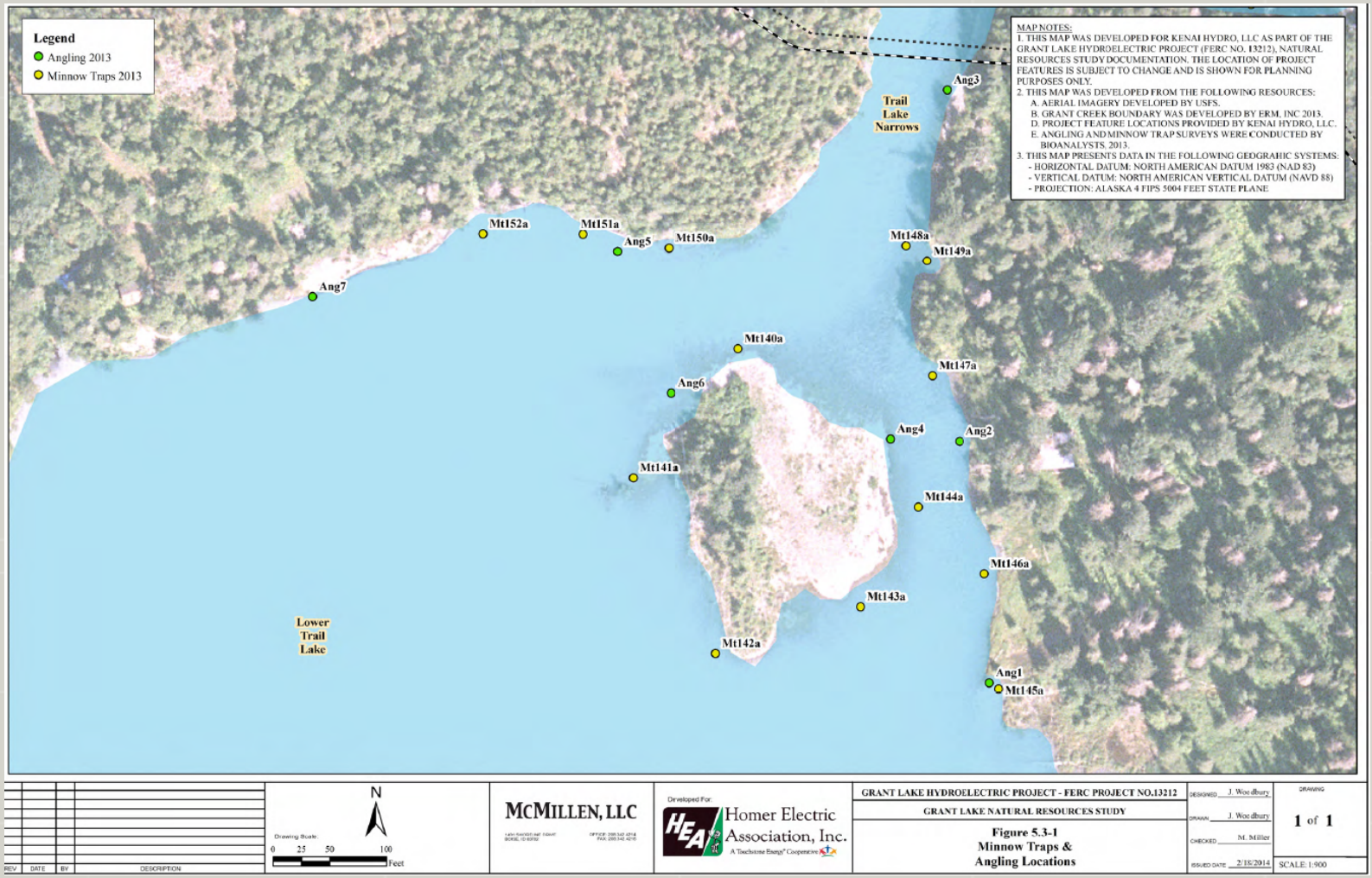
Fisheries Results
(Reach 1-4 Minnow Trapping)



Fisheries Results
(Incline Plane Trapping – N=3,942)



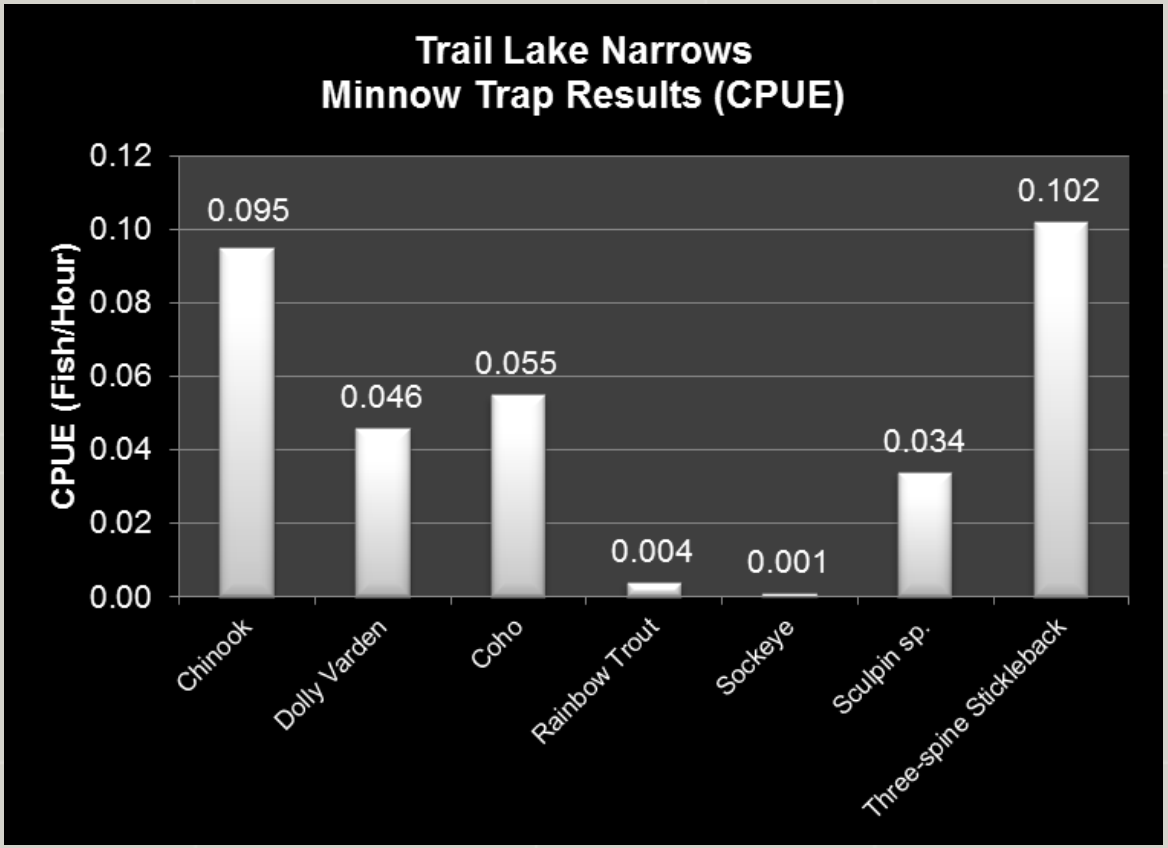
Fisheries Results
(Trail Lakes Narrows)



Fisheries Results

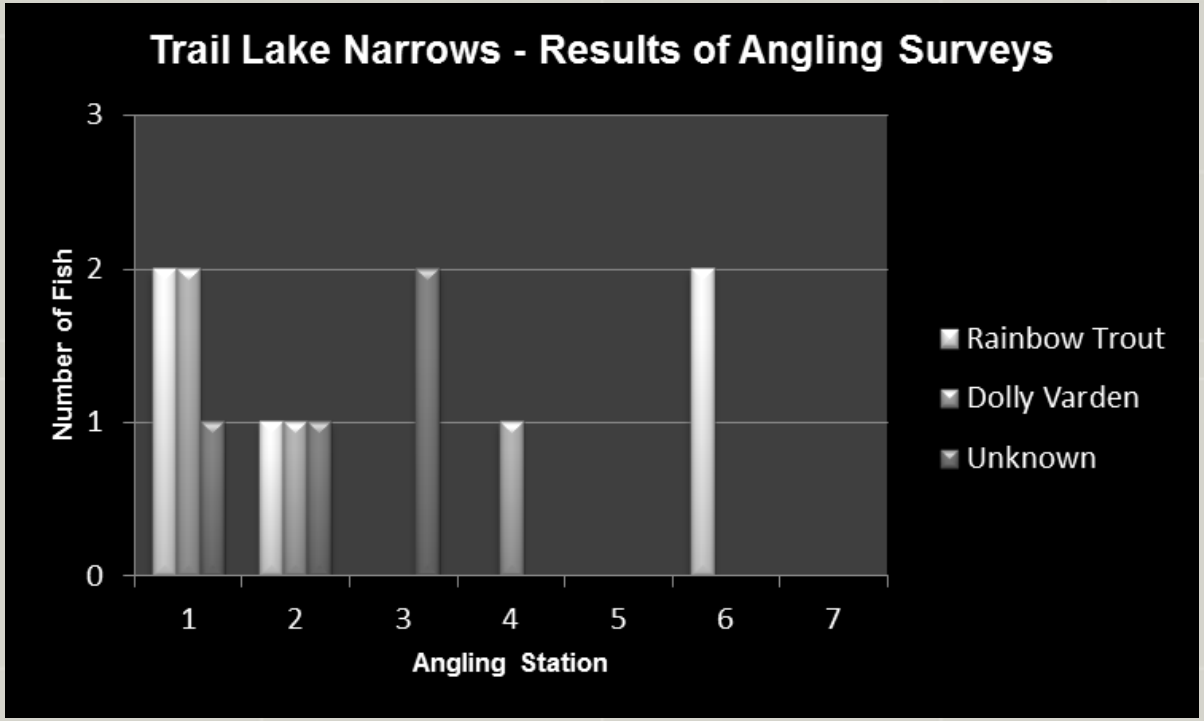
- Trail Lake Narrows – Minnow Trapping

Reach	Number of Traps	Total Effort (Hours)	Number of Fish	CPUE (Fish/Hour)
Trail Lake Narrows	52	1,133	381	0.34

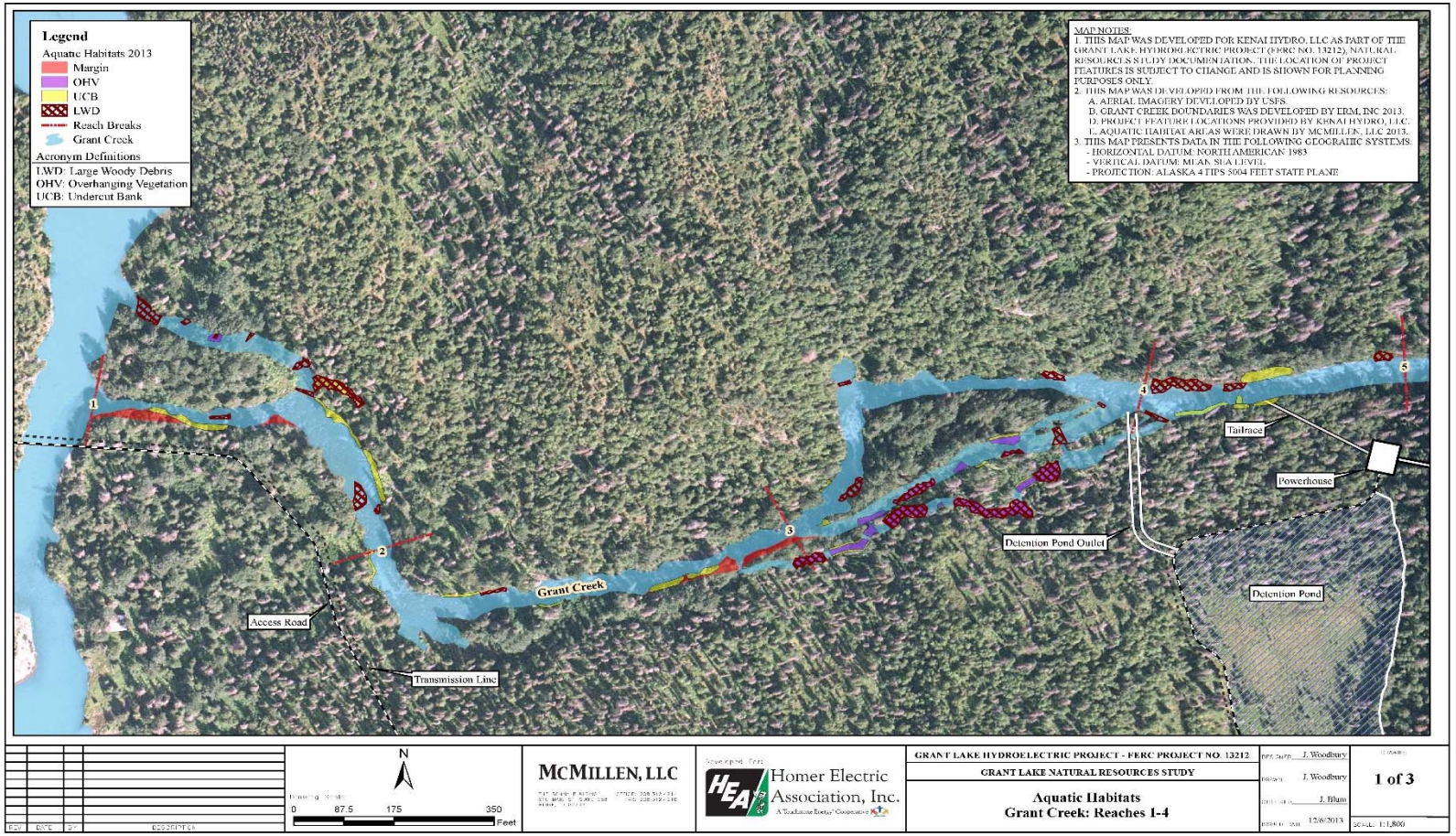


Fisheries Results

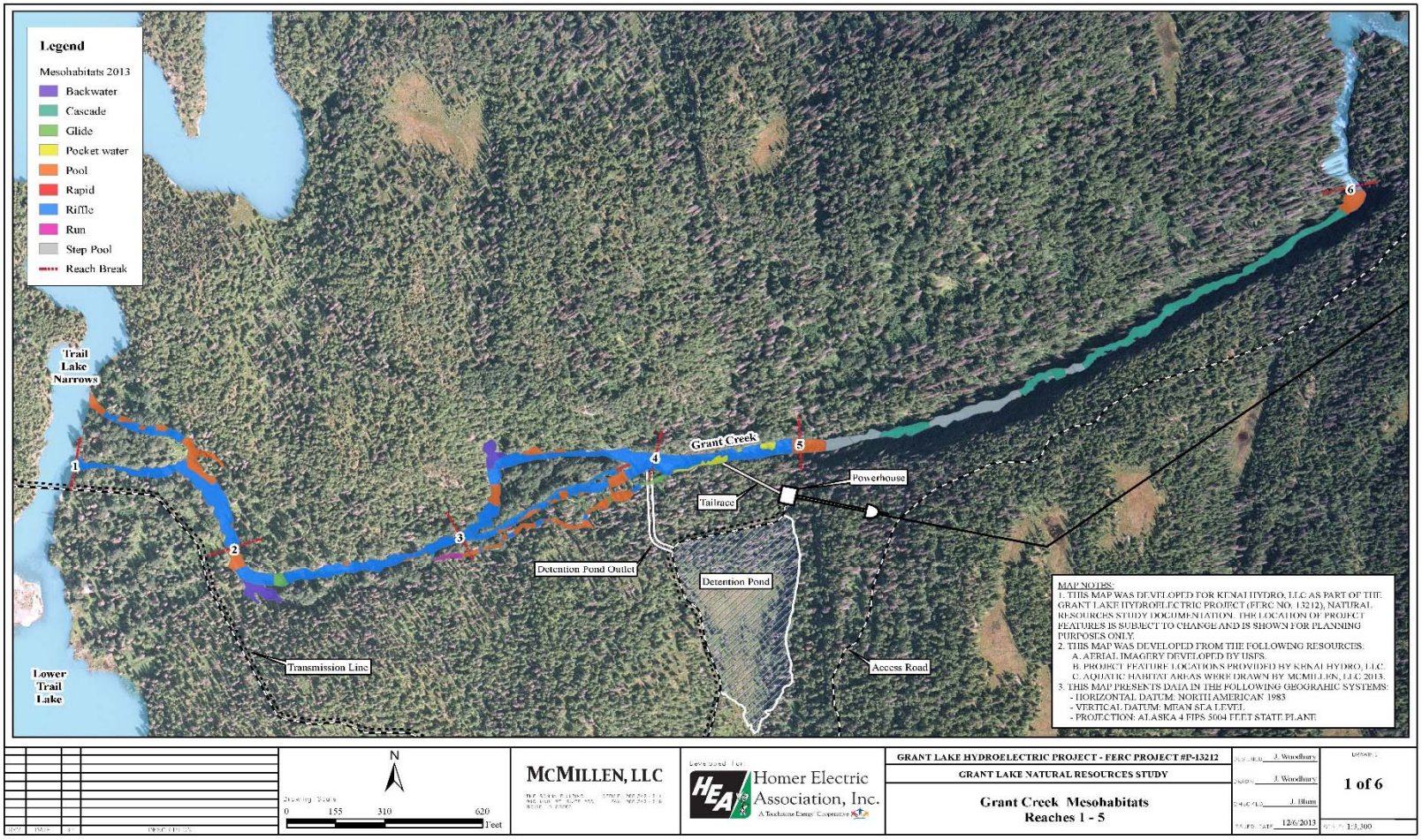
- Angling Surveys – Conducted at 7 Angling Stations (1 Hour per Station)
  - Dominant Species was Rainbow Trout (n = 5)
  - Dolly Varden were Second Most Abundant (n = 4)
  - Four Additional Fish Could Not Be Identified (Broke Off Before Landing)



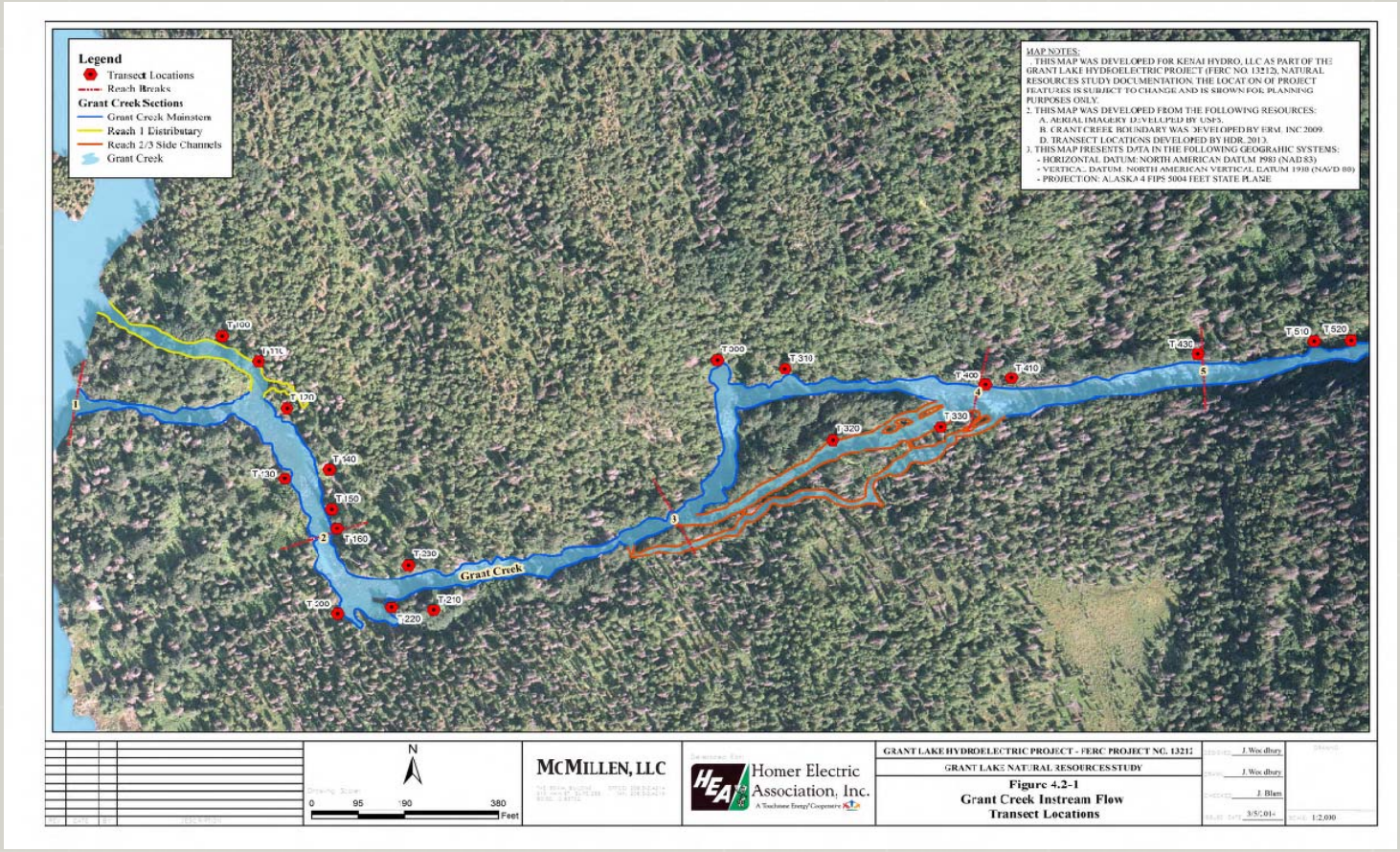
Habitat Mapping/Instream Flow Results
Aquatic Habitats



Habitat Mapping/Instream Flow Results Mesohabitats



Habitat Mapping/Instream Flow Results (Transect Locations)



Habitat Mapping/Instream Flow Results
(Flows Measured)

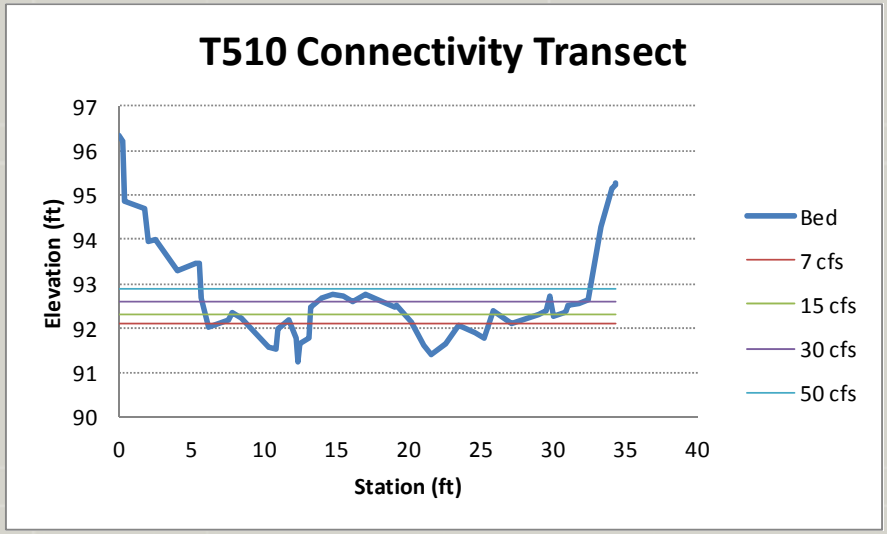
Area	Measured Flows (cfs)					
	17	**64**	**132**	**182**	**440**	**700**
Main Channel	✓	✓	✓	✓		✓
Distributary	Dry/Frozen	Dry	Dry	✓	✓	✓
Reach 3 Side Channels	Frozen	✓	✓	✓	✓	✓

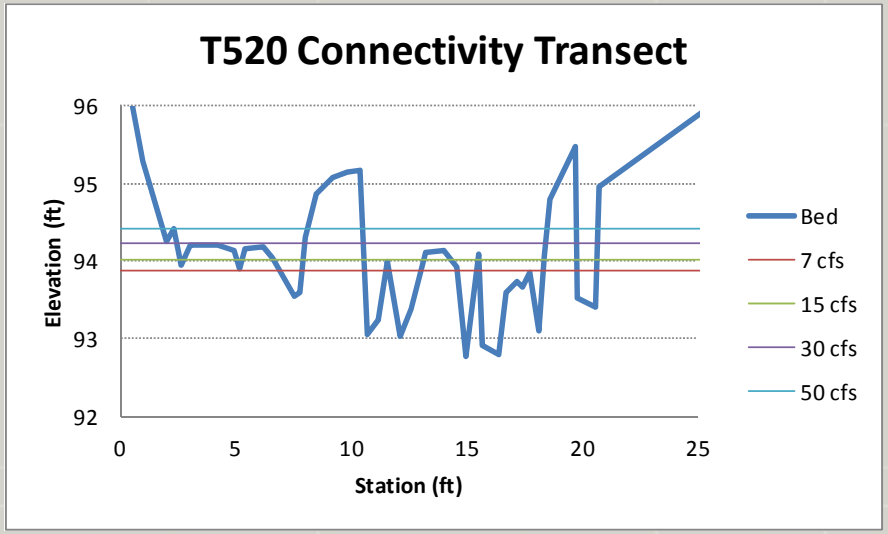
Habitat Mapping/Instream Flow Results
(HSI Data Collection)

Target species and life history stages modeled in the Grant Creek Instream Flow Study.

Species	Spawning	Fry Rearing	Juvenile Rearing	Adult Rearing
Sockeye Salmon	✓			
Coho Salmon	✓	✓	✓	
Chinook Salmon	✓	✓	✓	
Rainbow Trout	✓	✓	✓	✓
Dolly Varden Char	✓	✓	✓	✓

Habitat Mapping/Instream Flow Results
(Reach 5 Connectivity)

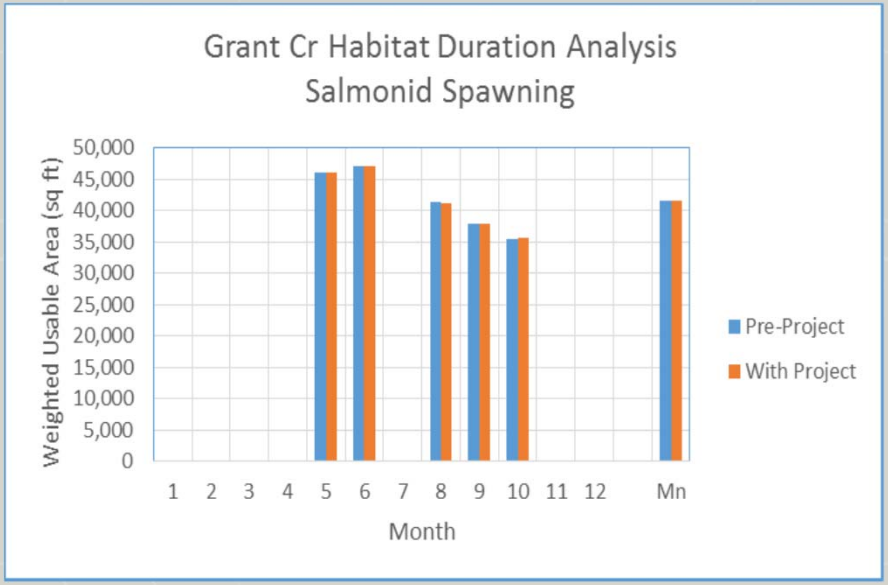


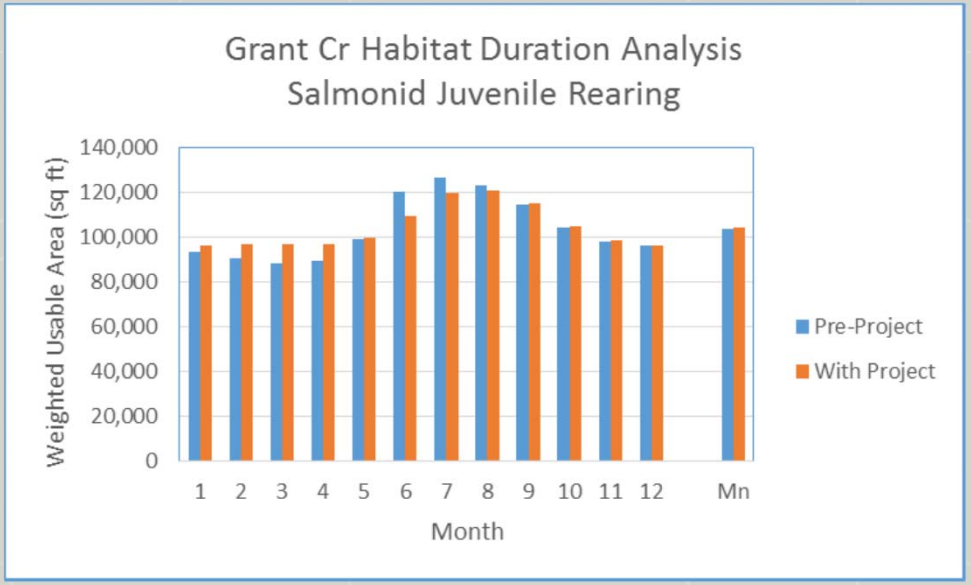


Habitat Mapping/Instream Flow Results (Take Home)

- ✓ Extensive collaboration with technical experts from agencies
- ✓ With-Project Weighted Usable Area (habitat values, all species) are 99.8% of pre-Project numbers. This is without considering ***ANY*** enhancement measures
- ✓ Side channel habitat enhancement opportunities
  - ✓ Reach 2/3 side channels
  - ✓ Reach 1 distributary
- ✓ Operations take off “top end” flows and regulate quality habitat areas

Comparison of Pre- and With-Project Habitat Values





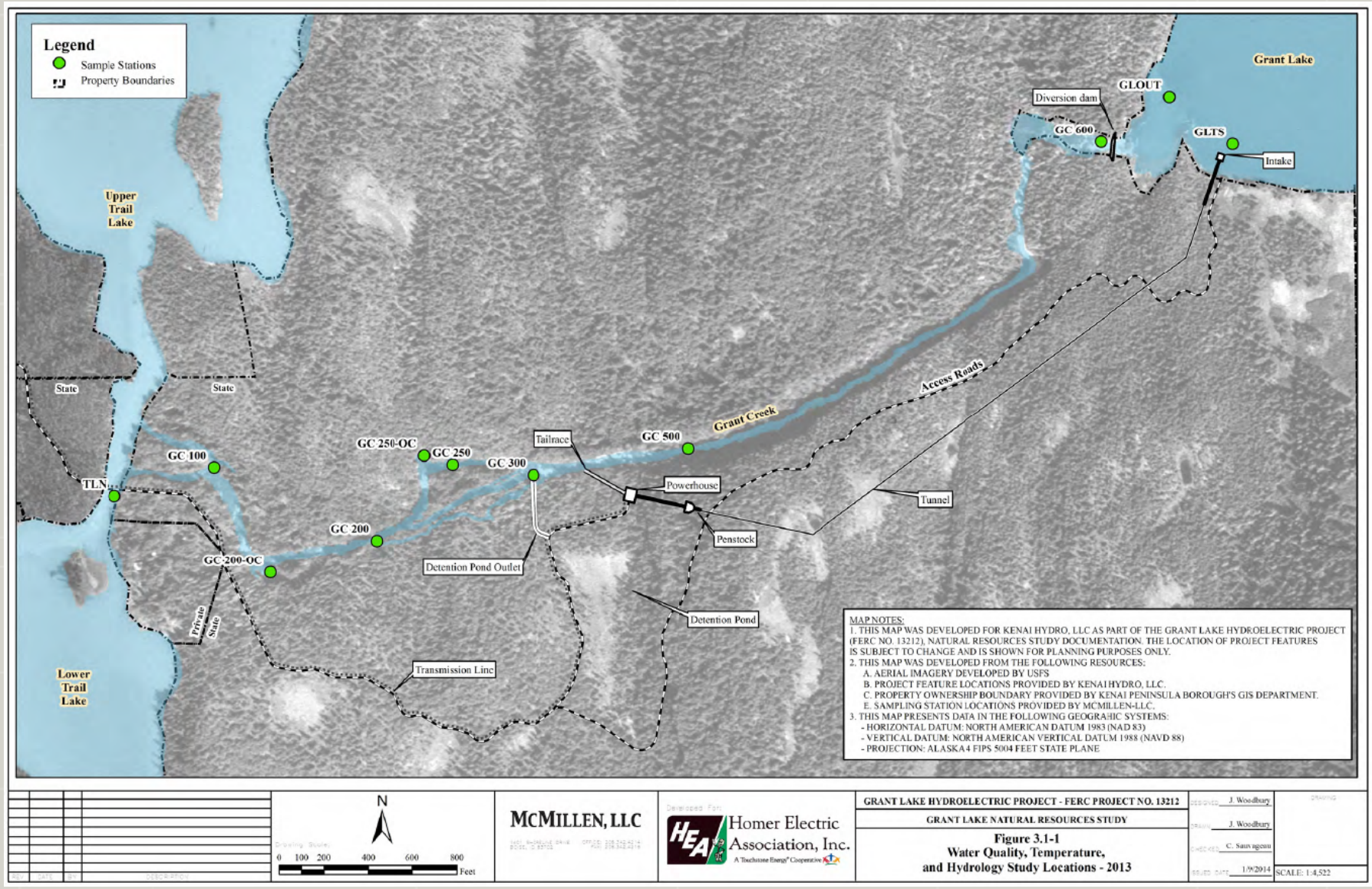
Potential Aquatic Impacts (Positive and Negative)

- ✓ Reduction in flows in bypass reach (Reach 5)
  - ✓ Less spawning habitat in Reach 5
- ✓ Less sediment recruitment from Reach 5
- ✓ Higher/more stable flows in quality reaches (1-4) during priority times (incubation and rearing)
- ✓ Decreased summer peak flows will maintain habitat and prevent stranding
- ✓ Operational flow regime will allow for high quality side channels to be more consistently wetted

Water Resources

- ✓ Permanent Stream Gauge
  - ✓ Long term record
- ✓ Thermologgers
  - – Stream and Lake
  - – Near redds
- ✓ Grab Samples
  - – Lake
  - – Stream
  - – Narrows

Water Resources
(Sampling Locations)



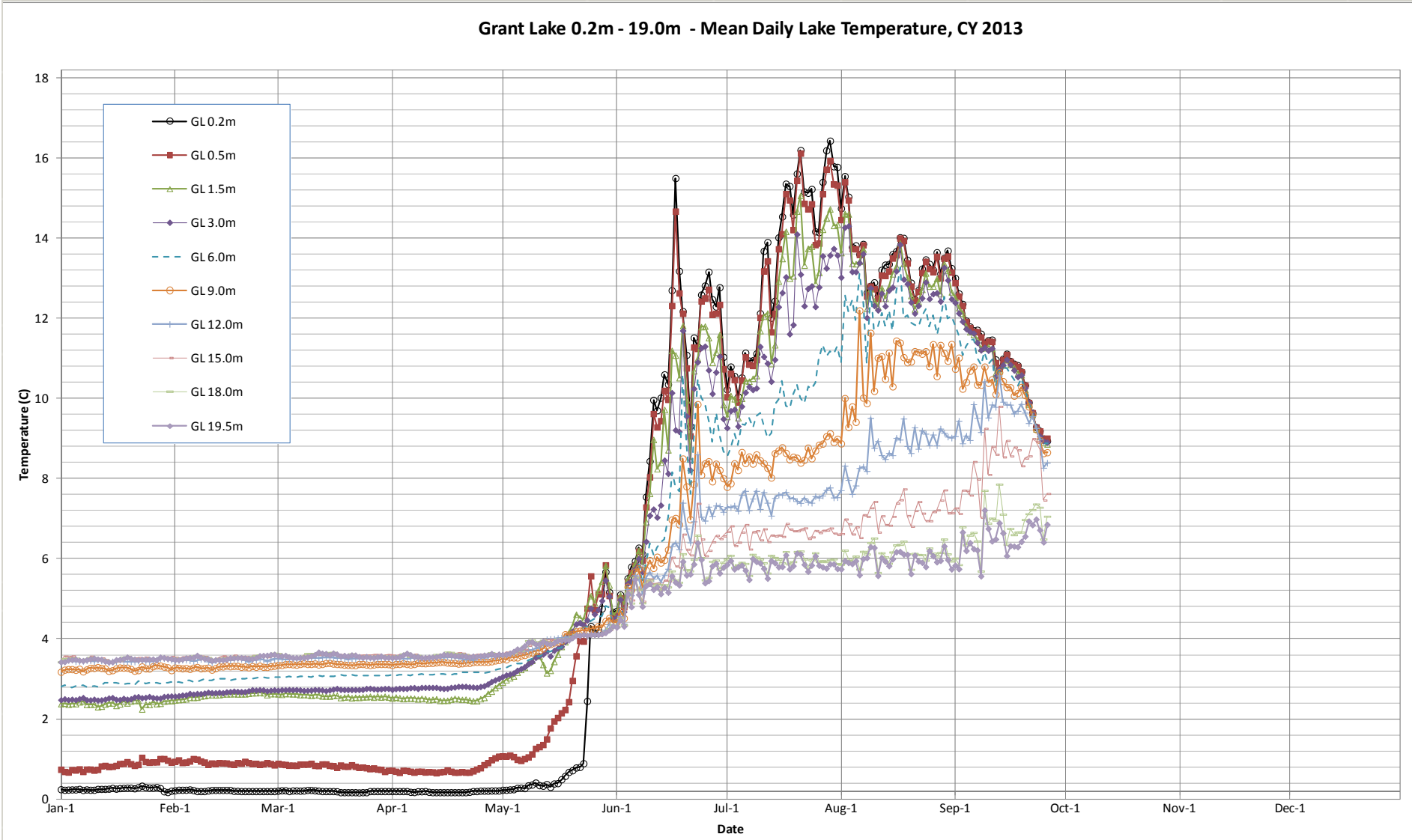
Water Quality Study Results – Grant Creek (Site GC 200)

Hydrolab Readings		Jun-09	Aug-09	Jun-10	Aug-13
Temp	°C	7.4	11.26	8.51	12.46
Sp. Cond	mS/cm	na	0.07	0.09	0.06
Dissolved Oxygen	% Sat	60.9	75.1	92.3	101.5
Dissolved Oxygen	mg/l	7.31	8.22	10.79	10.89
ORP	mV	na	na	216	408
pH	S.U.	7.66	7.39	7.39	7.02
Turbidity	NTU	0.75	11.10	1.17	4.00
Depth	m	na	na	na	1.9
Lab Analyses					
pH	S.U.	na	na	na	7.00
Turbidity	NTU	na	na	na	4.0
T. Alkalinity	mg/l	25.0	23.5	25.5	20.6
T. Hardness	mg/l	na	na	na	34.4
TDS	mg/l	60	44	50	51
TSS	mg/l	0.8	3.4	0.7	2.9
T. Nitrate/Nitrite	mg/l	0.455	0.292	0.269	0.190
K. Nitrogen	mg/l	ND	ND	ND	ND
Orthophosphate	mg/l	ND	ND	ND	ND
T. Phosphorus	mg/l	ND	ND	ND	ND
Chloride	mg/l	na	na	0.284	0.225
Fluoride	mg/l	na	na	ND	ND
Sodium	mg/l	na	na	1.14	1.18
Calcium	mg/l	na	na	13.3	11.7
Magnesium	mg/l	na	na	1.26	1.25
Potassium	mg/l	na	na	0.52	0.54
Sulfate	mg/l	na	na	17.9	15.1
Lead	µg/l	3.09	ND	ND	ND
LL Mercury	µg/l	ND	0.0016	ND	0.0013

na: not analyzed

ND: not detected

Water Temperature Results – Grant Lake Hydrograph

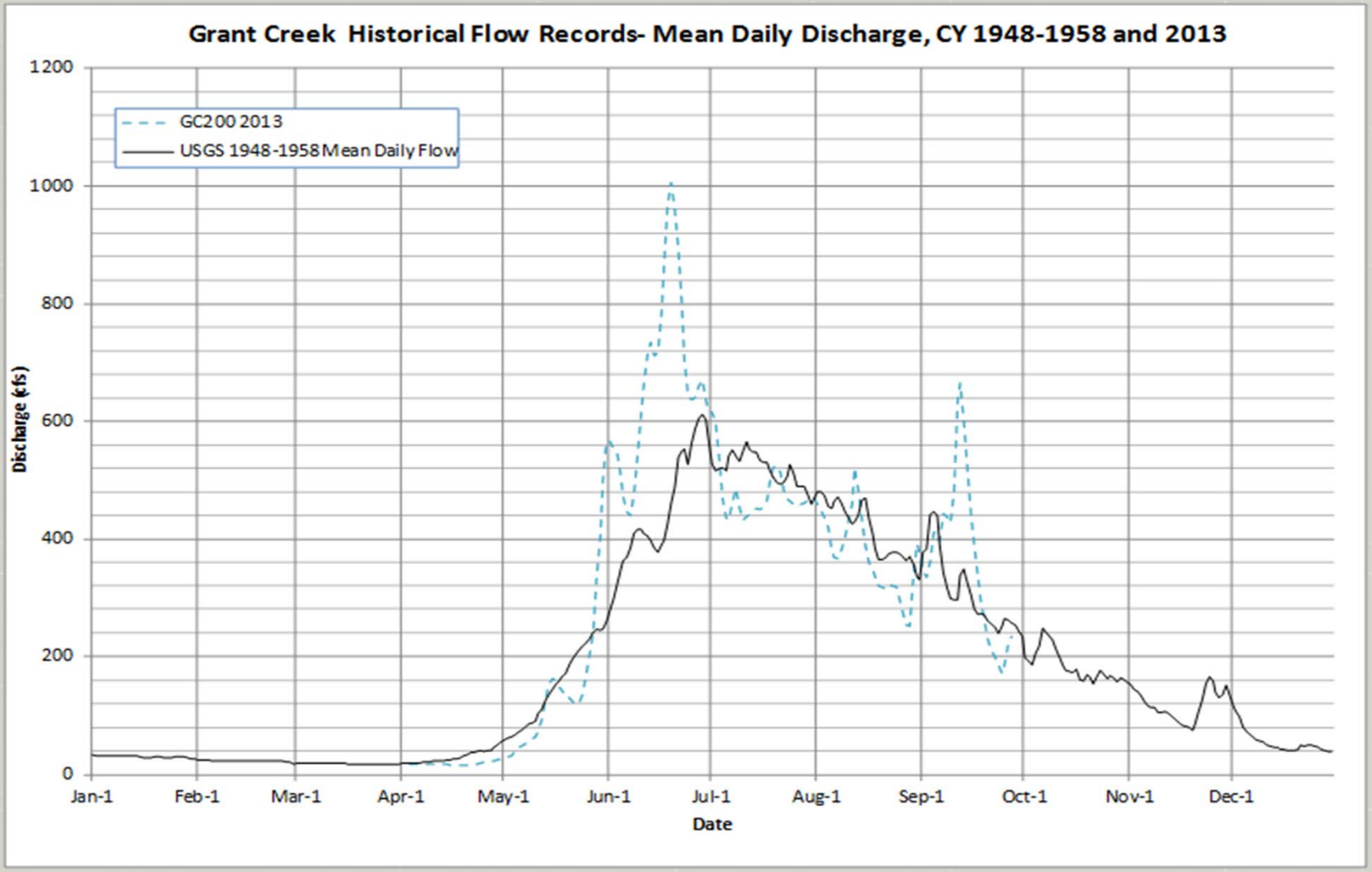


Water Quality – Conclusions

- ✓ Overall, Grant Lake, Grant Creek, and Trail Lakes have excellent water quality based on ADEC standards.
- ✓ Nearly all 2013 water quality parameters indicate stable and consistent values from the lower basin of Grant Lake (0.0 m to18.0 m depth range), downstream to the Trail Lakes Narrows. **slightly higher turbidity values at Trail Lakes Narrows is the exception to this trend*
- ✓ Most water quality parameters have remained stable based on historical sampling efforts from the early 1980's and 2009-2010.

Water Resources
(Hydrology)

Water Resources
(Hydrology)



Potential Water Resource Impacts (Positive and Negative)

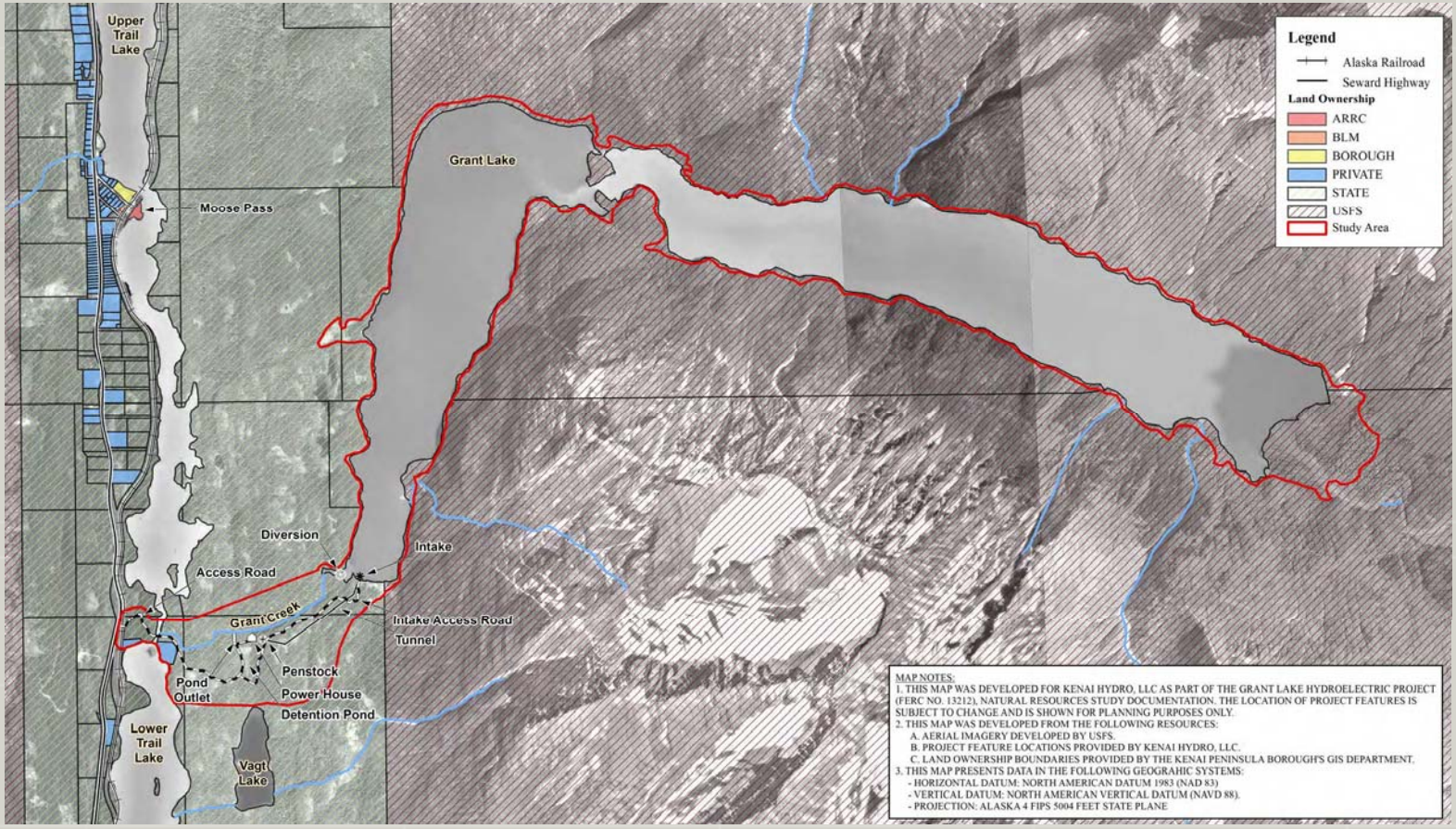
- ✓ The intake structure will be constructed to accommodate temperature lake vs. creek temperature differences during appropriate window

- ✓ Minimal impact associated with Project operations (positive or negative)

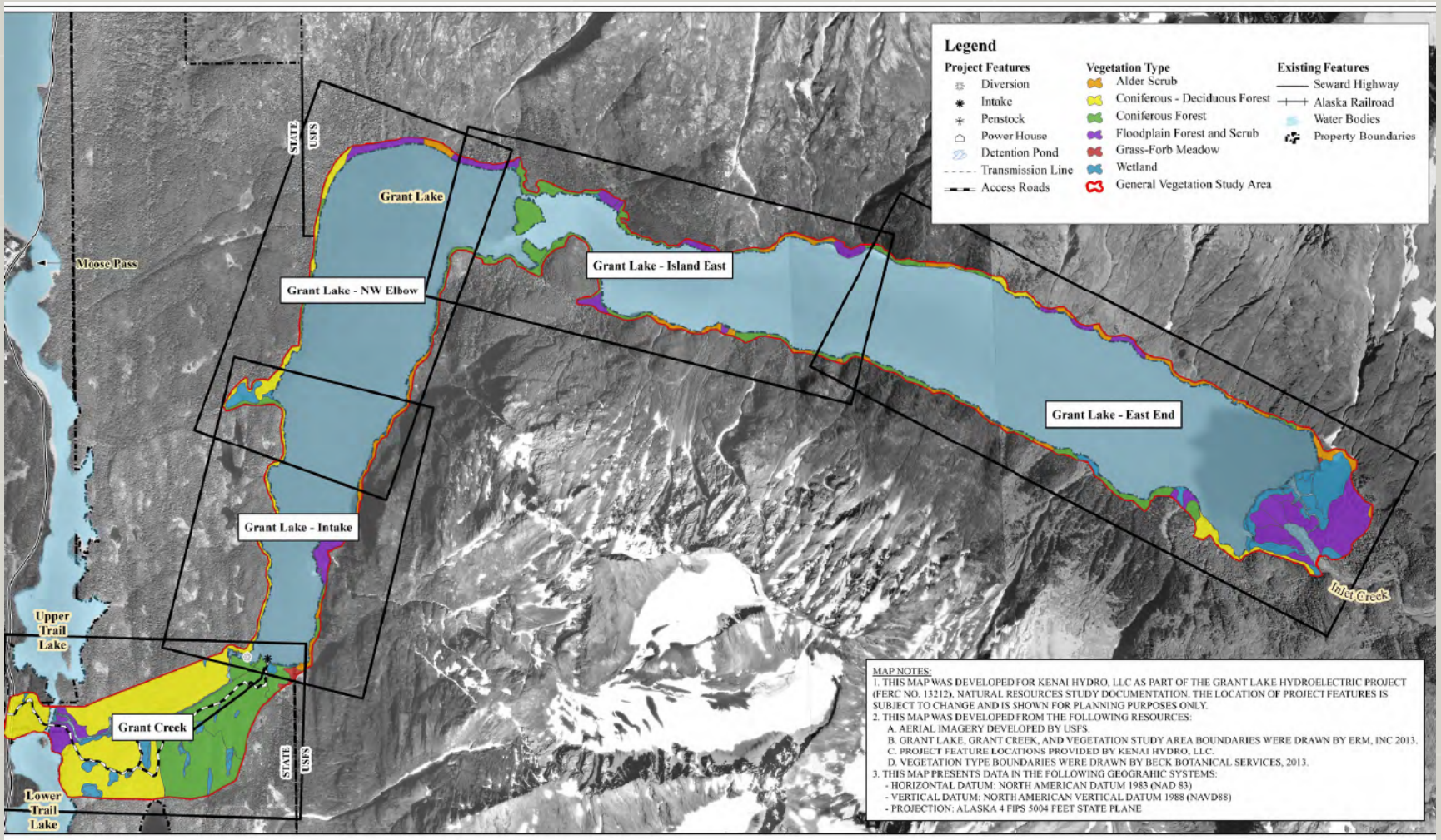
Terrestrial Resources

- ✓ Botanical
  - ✓ Vegetation mapping
  - ✓ Sensitive and invasives
  - ✓ Wetlands
- ✓ Wetlands
- ✓ Wildlife
  - ✓ Raptors
  - ✓ Breeding landbirds and shorebirds
  - ✓ Waterbirds
  - ✓ Terrestrial Mammals

Terrestrial Resources
(Study Area)



Botanical Results
(Vegetation Mapping)



Botanical Results
(Vegetation Mapping)

Botanical
(Invasive and Sensitive)

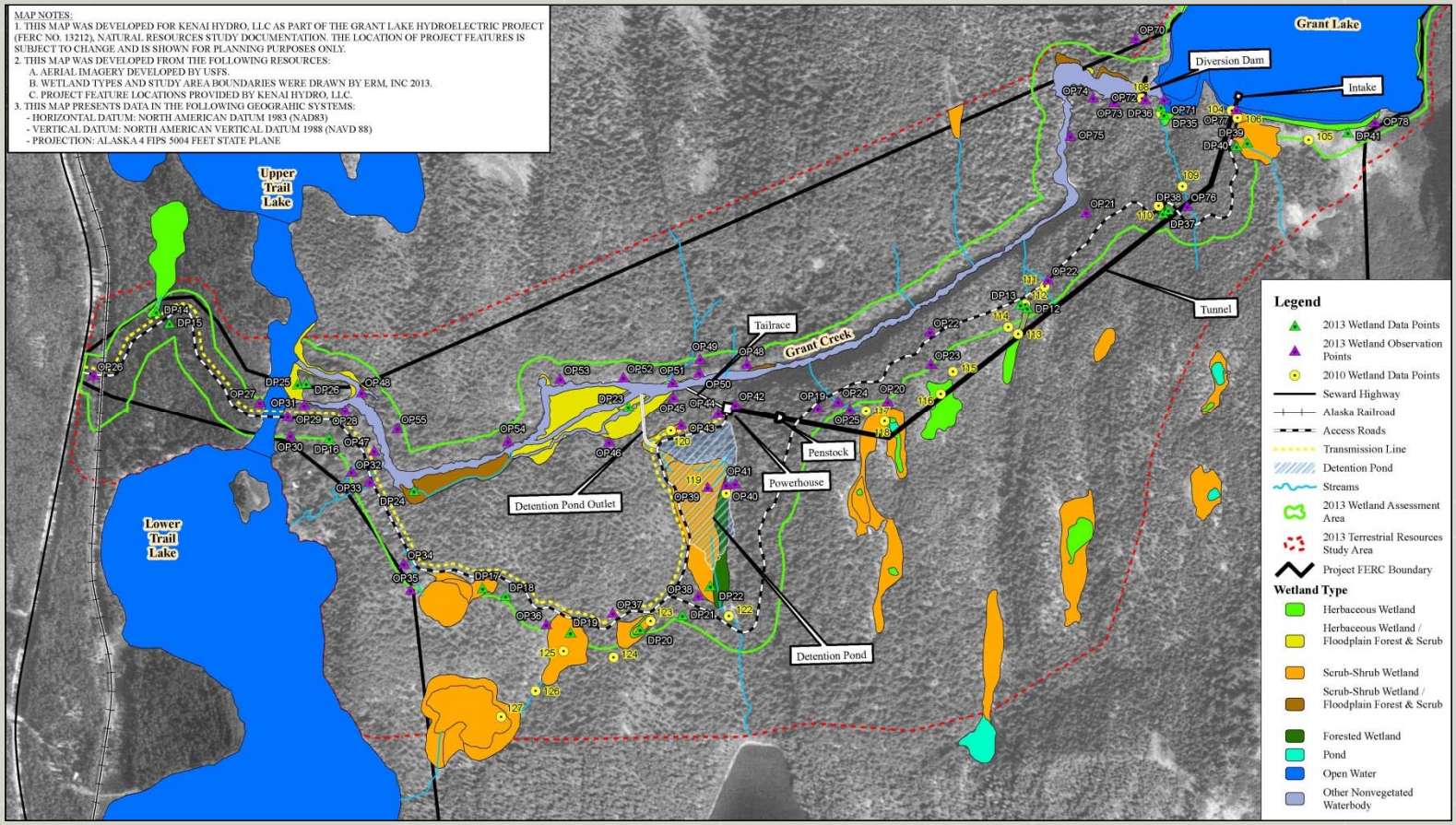
- ✓ Very few small populations of invasive plants
- ✓ All associated with previous disturbance and associated documented in the larger peninsula area
- ✓ Small population of the sensitive species pale poppy located along the lake shoreline (elevation 701 to 705)
- ✓ BE was conducted

Wetlands
(Mapping)

Vegetated wetland acres: 38 acres, 13% of vegetated area

Vegetated Wetland Communities	Acres	% Wetland Area
Herbaceous Wetlands	6	15%
Scrub-Shrub Wetlands	21	54%
Forested Wetlands	1	2%
Herbaceous Wetland / Floodplain Forest & Scrub	3	8%
Scrub-Shrub Wetland / Floodplain Forest & Scrub	8	21%
Vegetated Wetland Subtotals	**38**	
Non-Vegetated Waters	**Acres**	**% Waters Area**
Open Water - Lake	1650	99%
Open Water - Ponds	0	0%
Riverine	10	1%
Unvegetated Water Subtotals	**1660**	
WETLAND & WATER TOTALS	**1698**	

Wetlands
(Mapping)



Wetlands
(Mapping)

Wildlife
(Raptors)

- ✓ 1 female Northern Goshawk detected during surveys at 60 points over 4 survey periods
  - – Bald eagle, merlin and osprey also observed

Wildlife
(Breeding Landbirds and Shorebirds)

- ✓ 279 detections; 31 species

2013 Vegetation Types	Grass-Forb Meadow	Coniferous Forest	Birch (Original USFS Classification)	Coniferous Deciduous Forest	Scrub Shrub Wetland	Herbaceous Wetland / Floodplain Forest & Scrub
Number of points sampled in Vegetation Class (33 for 2010 and 2013)	1	16	1	12	2	1
Selected Species Detected						
Townsend's Warbler (1984, 2010, 2013)		X		X	X	
Varied Thrush (1984, 2010, 2013)	X	X	X	X	X	X
Additional Selected Species that may be Present in 2013 Vegetation Class						
Lesser Yellowlegs (1984)		X			X	
Olive-sided Flycatcher (2010)		X		X	X	
Solitary Sandpiper (2010)		X			X	
Townsend's Warbler (1984, 2010, 2013)			X			X
Wandering Tattler (1984)		X	X	X	X	X
Blackpoll Warbler		X		X	X	X
Marbled Murrelet		X				

Wildlife
(Waterbirds)

2013 Winter Waterbird Surveys

Wildlife
(Waterbirds)

2010 Waterbirds Surveys

2010 Waterfowl Surveys	Adults	Pairs	Adult Females	Documented Broods
Barrow's Goldeneye	X		X	X
Common Goldeneye	X		X	X
Common Loon	X			
Pacific Loon	X			
Common Merganser	X			
Red-breasted Merganser		X	X	X
Harlequin Duck * Grant Lake			X	
Mallard			X	

Ebasco (1984) AMWI * GWTE

2013 Incidentals

HADU * COLO * RBME * TRUS

Wildlife
(Terrestrial Mammals)

2010 Terrestrial Mammals

- ✓ Bat Survey of the historic cabin on July 23 2010
- ✓ Coordinates and Shapefile for 1 brown bear and 1 wolverine den, provided by USFS
- ✓ Six mountain goats (5 adults, 1 kid) were noted
- ✓ Incidental sightings of 3 black bear, brown bear, moose, 3 beaver, a coyote, and a porcupine

2013 Winter Moose Surveys

- ✓ 2013 Methods
    - ✓ Aerial Surveys: Gasaway et al. (1986)
- ✓ 2013 Accomplishments
    - ✓ 1 survey completed
- ✓ Results
    - ✓ No Moose or trails detected

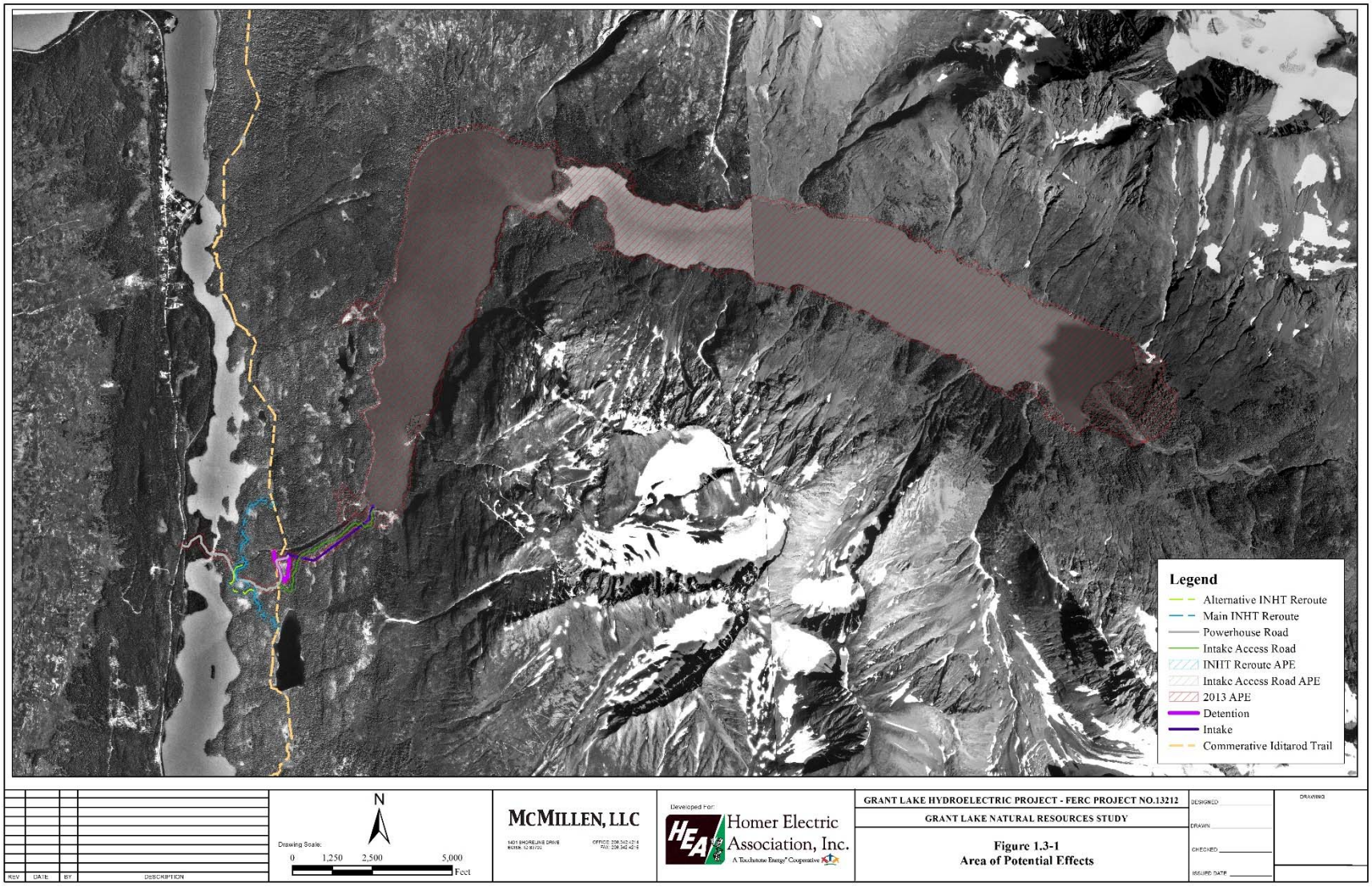
Potential Terrestrial Impacts

- ✓ Vegetation clearing associated with construction
- ✓ Potential for invasive plant species
- ✓ Wetland reduction
- ✓ Disturbance to avian species
  - ✓ Nesting
  - ✓ Foraging

Cultural Resources

- ✓ Literature Review
- ✓ Intensive Pedestrian Survey
  - ✓ Grant Creek
  - ✓ Grant Lake
- ✓ Report
  - ✓ Describes new properties
  - ✓ Updates site condition on known properties
  - ✓ Evaluates eligibility on all properties
  - ✓ Evaluates effect of the Project on all eligible properties
- ✓ Confidentiality precludes specific location photos/maps from being shown

Project Area of Potential Effects



Cultural
(Results)

- ✓ Eight geographic areas
- ✓ Nine previously known historic sites
  - ✓ Five previously determined eligible for the National Register
- ✓ Fourteen newly identified historic sites
  - ✓ One recommended as eligible for the National Register

Cultural
(Project Effects)

Property Name	AHRS Number	Recommendation of Effect
Alaska Railroad	SEW-00029	No Adverse Effect
Seward-Moose Pass Trail	SEW-00148	No Effect
Solars Sawmill	SEW-00285	Adverse Effect
Grant Lake Trail	SEW-01455	No Effect
Case Mine	SEW-00659	Adverse Effect
Case Mine Camp	N/A	Adverse Effect
Lakeside Trail	N/A	No Effect
Millsite	N/A	No Effect
Mine Workings	N/A	No Effect
Grant Lake Road to Case Mine	SEW-01454	No Effect
Case Mine Prospect Pits	SEW-01522	No Effect
North Grant Lake Cabin	SEW-00823	Adverse Effect

Cultural Resources

Potential Cultural Resource Impacts

- Given infrastructural design and operations, limited impact expected to existing culturally significant features

Recreation & Visual Resources

- ✓ Scope of Work
  - ✓ (1) Winter and (1) Summer site visit for data collection and observations
  - ✓ (1) Sight-seeing flight
  - ✓ Creation of (4) visual simulations
  - ✓ Evaluation of alternative route of Iditarod National Historic Trail (INHT).

Recreation & Visual Resources

Observed Winter Uses:

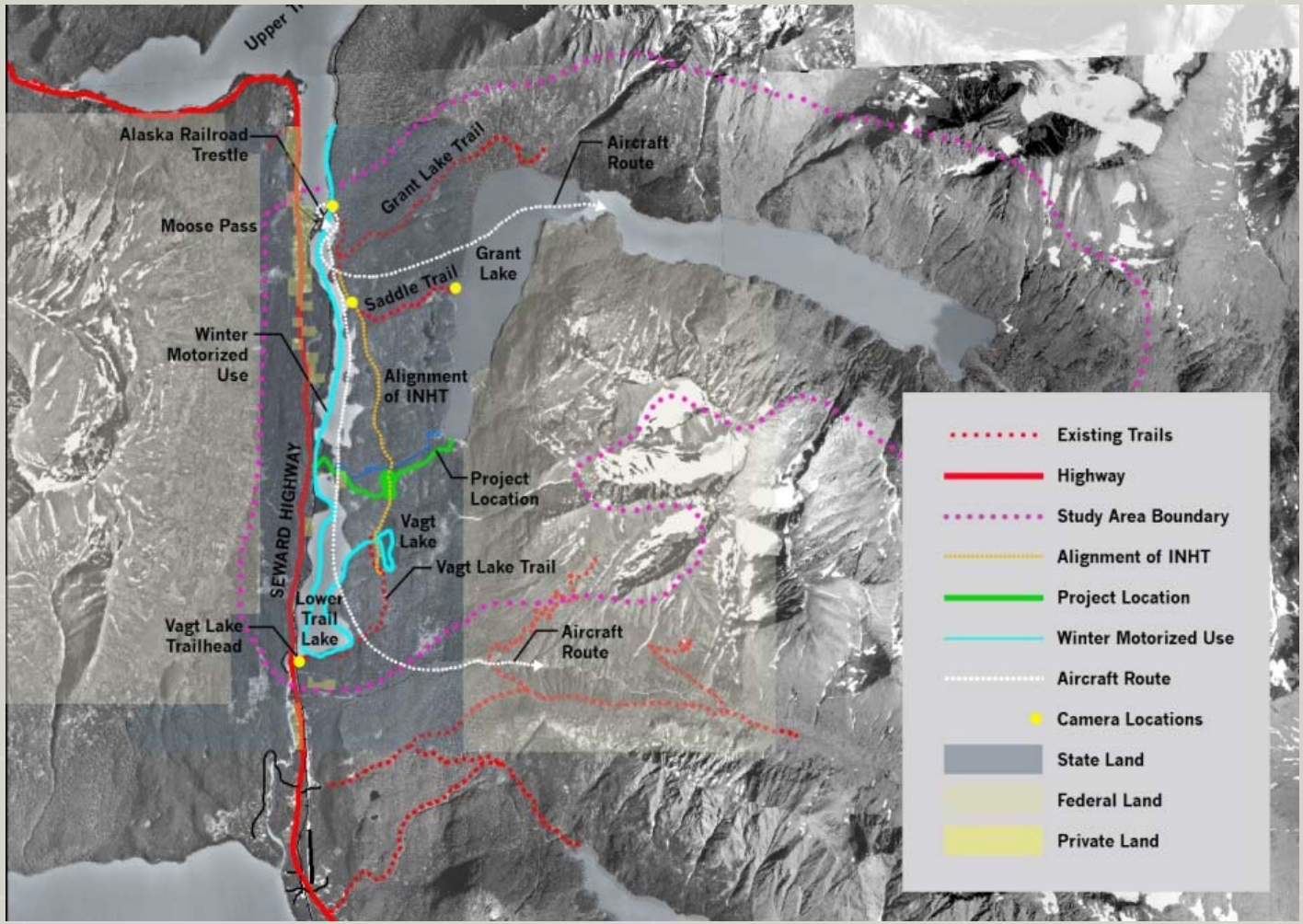
- ✓ Snow machine
- ✓ Snowshoeing
- ✓ Cross-country skiing
- ✓ Dog-walking

Recreation & Visual Resources

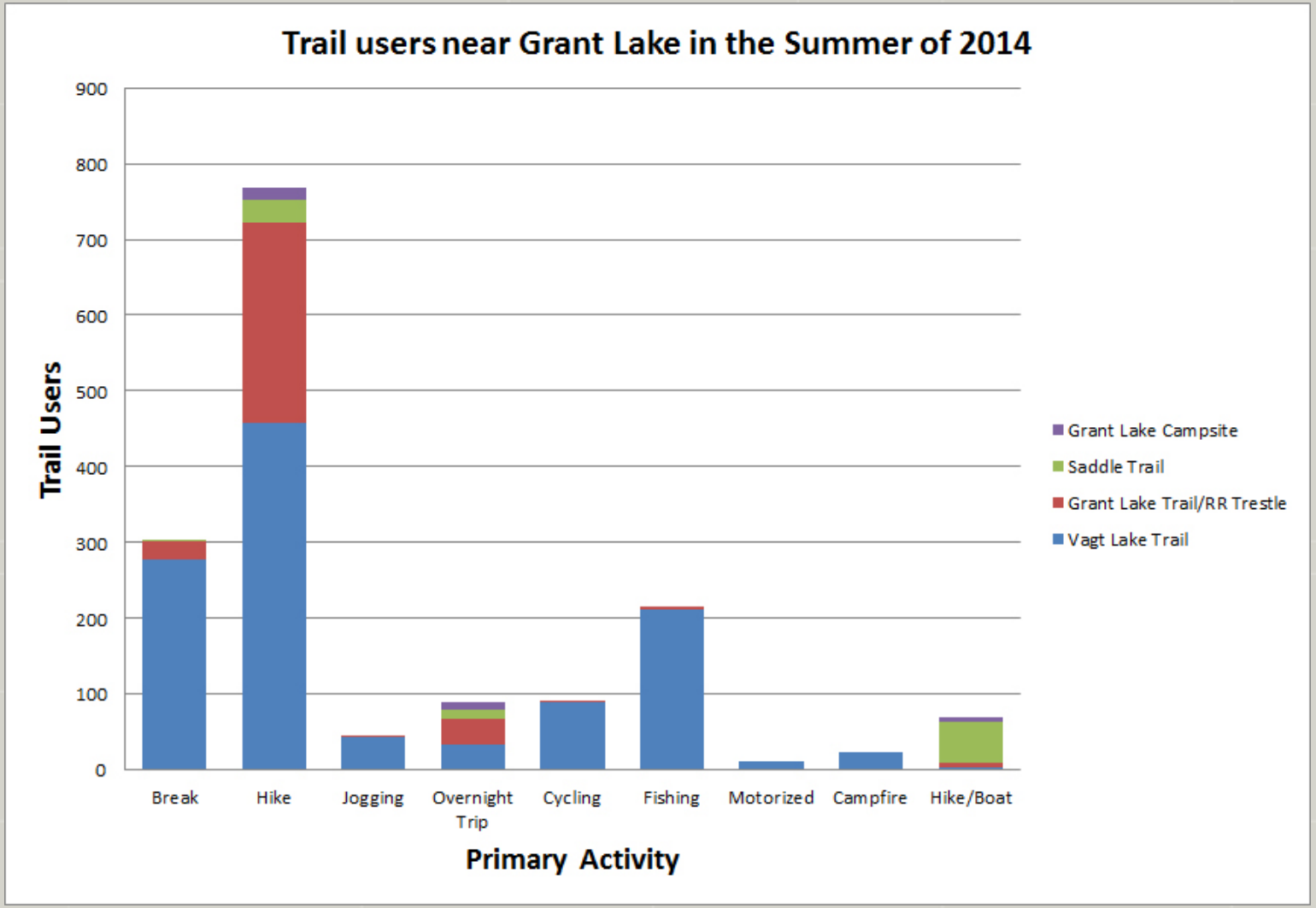
Observed Summer Uses:

- ✓ Fishing & boating
- ✓ ATV use
- ✓ Hiking
- ✓ Driving for pleasure & Sight-seeing
- ✓ Dog-walking

Summer Use Study



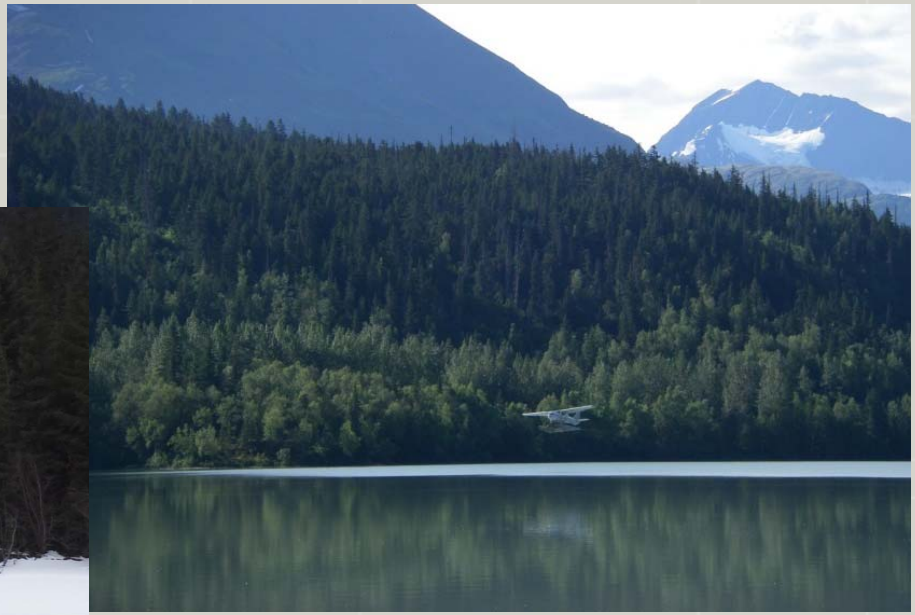
Summer Activities



Recreation & Visual Resources

Noise:

- ✓ Recorded levels 40db or less, background hum from highway
- ✓ Peak noises (80-90db) caused by aircraft take-offs and snow machine use



Recreation and Visual Resources

- Key View #1: Access Road from Seward Hwy MP 26.9

BEFORE:

Existing driveway

AFTER:

Driveway relocated to new access road

Recreation and Visual Resources Study

- Key View #2: View of Intake Structure and Lake Shoreline

BEFORE:

Existing creek outfall

AFTER:

Powerhouse, detention pond, spillover, seasonal access road, intake structure, drying of creekbed.

Recreation and Visual Resources Study

- Key View #3: View of Facilities from Seward Hwy

BEFORE:

Existing view toward facilities

AFTER:

Seasonal access road in distance, most exposed during winter conditions

Recreation and Visual Resources (Iditarod National Historic Trail)

- ✓ Currently proposed route; not yet constructed
  - ✓ Easement modification all that is needed for re-route
- ✓ Collaborative effort to re-route through the Project Area
  - ✓ Development of options
  - ✓ Meetings
  - ✓ Site Visits
  - ✓ MOA
- ✓ Effort ongoing
  - ✓ Public comment opportunity
  - ✓ MOA and refinement after acquiring FERC License

Potential Rec/Vis Impacts (Positive and Negative)

- ✓ Given the location of the Project, only minor visual or audible recognition would occur
  - ✓ Turn-off of highway
  - ✓ Lake intake
- ✓ INHT will need to be re-routed through the Project Area prior to it being constructed
- ✓ Project road to intake and powerhouse will be constructed creating possible access corridor
  - ✓ Preference for access?

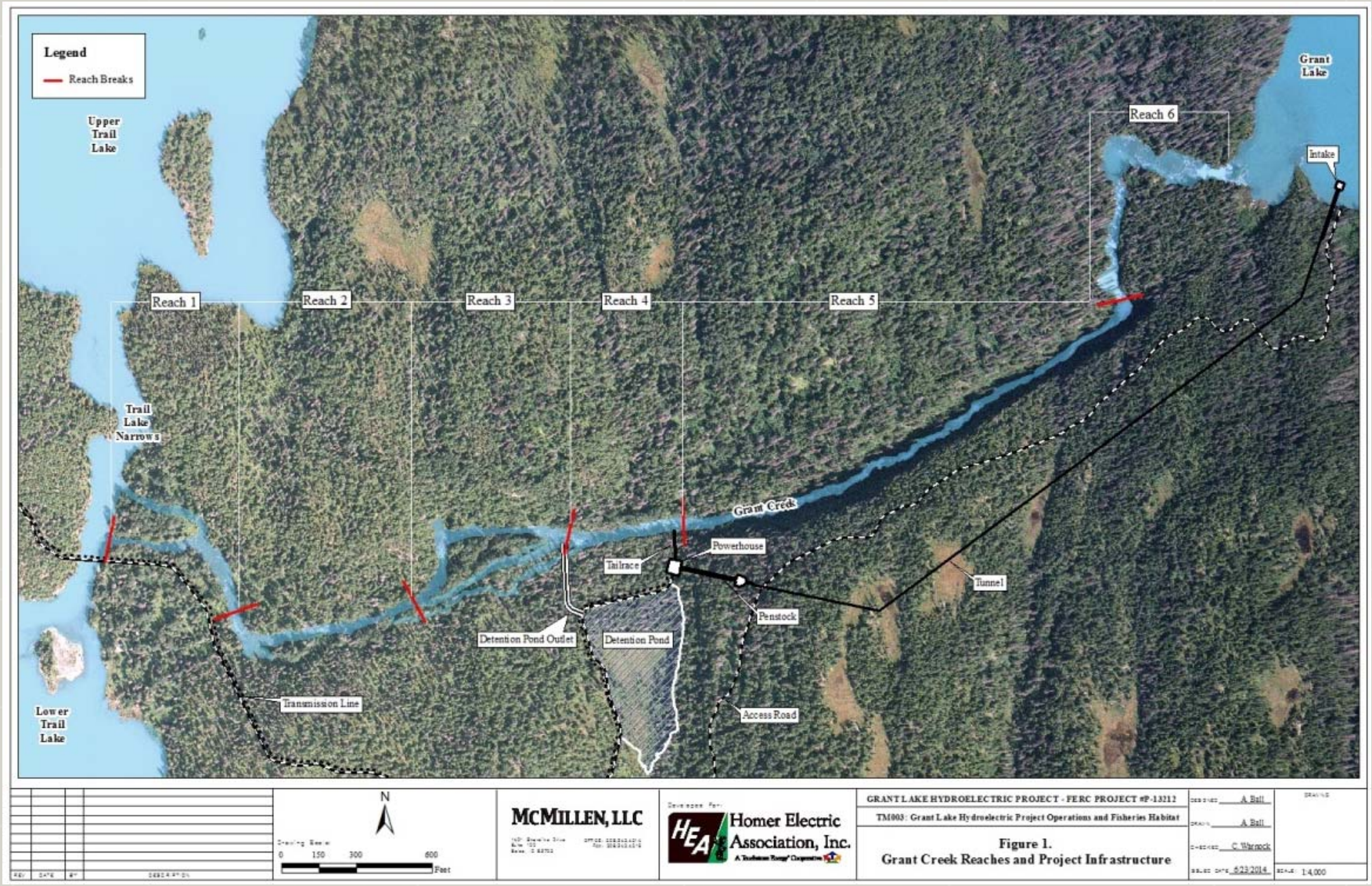
Proposed Infrastructure

- An intake structure in Grant Lake.
- A tunnel extending from the lake intake to just east of the powerhouse.
- A penstock and surge tank located at the west end of the tunnel.
- A powerhouse with two Francis turbines providing an anticipated combined 5-Megawatt output. The maximum design flow will be approximately 385 cfs.
- Tailrace channel returning powerhouse flow to Grant Creek.

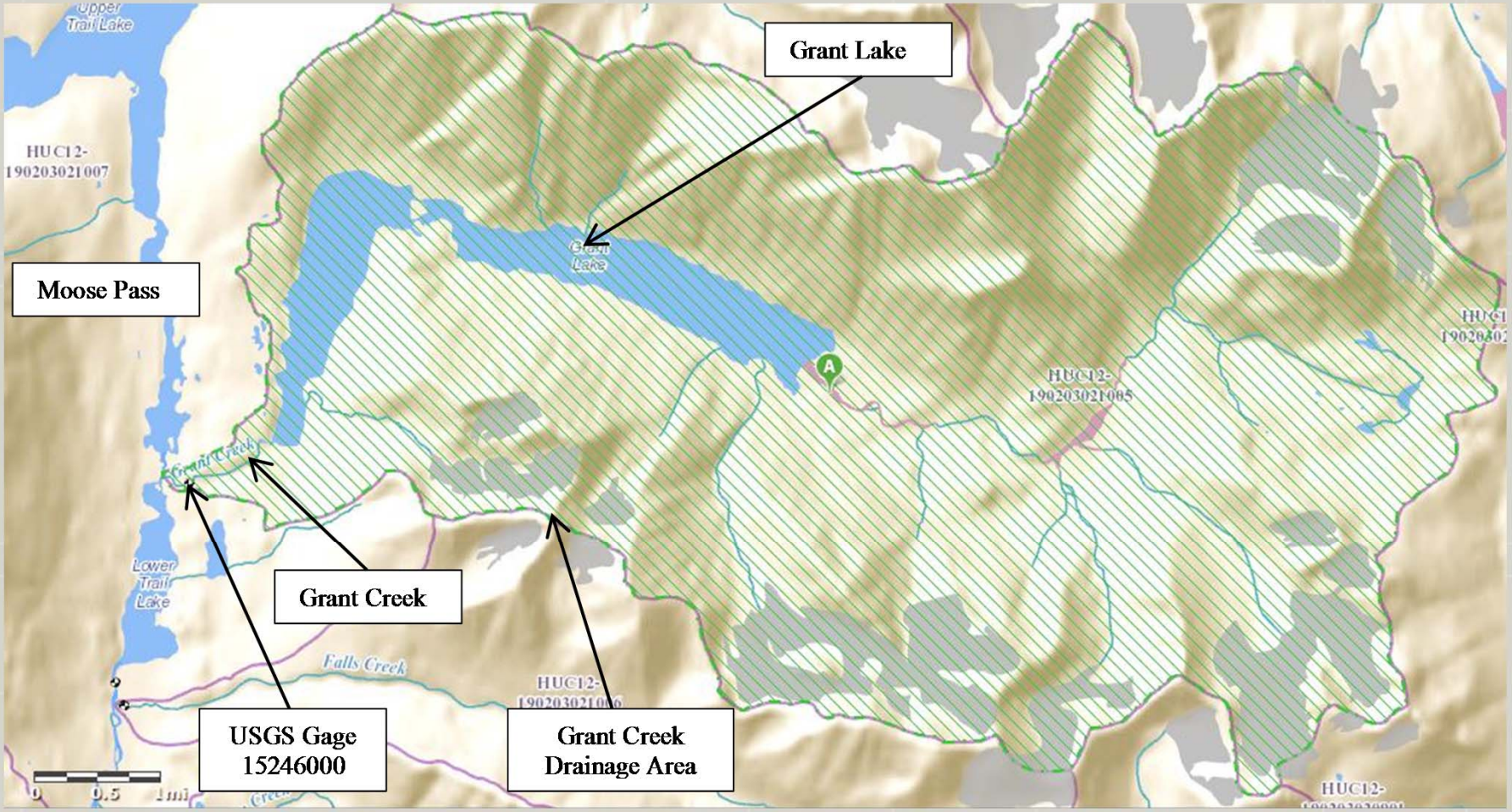
Proposed Infrastructure - continued

- Tailrace detention pond and return channel.
- Switchyard with disconnect switch and step-up transformer.
- A transmission line.
- A pole mounted disconnect switch where the transmission line intersects the main power distribution line.
- Access road from the Seward Highway to the powerhouse and extending up to the intake structure.

Grant Creek Project Layout



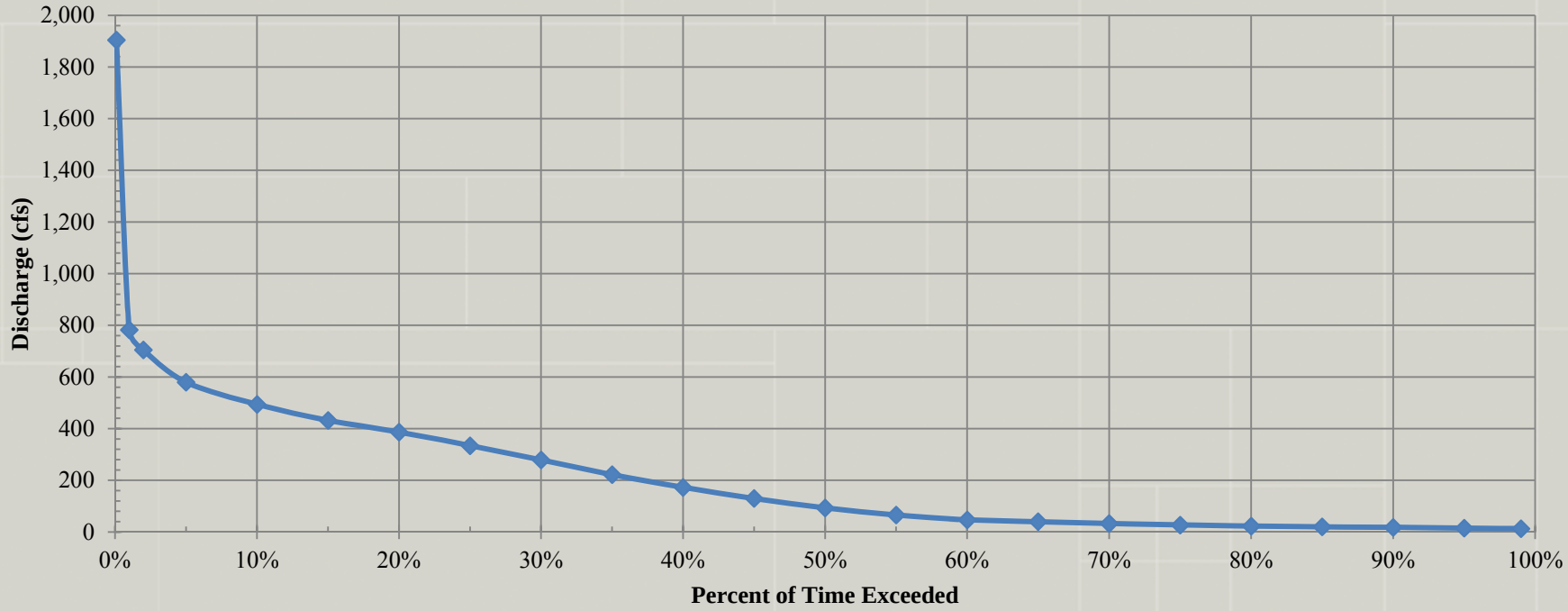
Hydrologic Review – Basin Map



Hydrologic Review – Characteristics

Item	Value
USGS Station No.	15246000
Station Name	Grant Lake near Moose Pass, AK
Drainage Area	44.2 square miles
Mean Basin Elevation	2,900 ft
Areas of Lakes and Ponds (storage)	10%
Area of Forest	20%
Mean Annual Precipitation	90 inches
Mean Min. January Temperature	10 o F

Hydrologic Review – Flow Duration

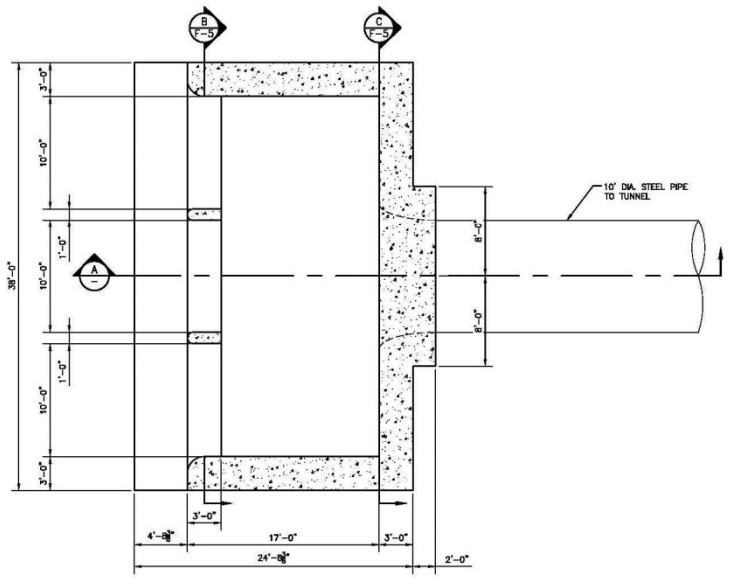


Grant Creek Flow Duration Analysis

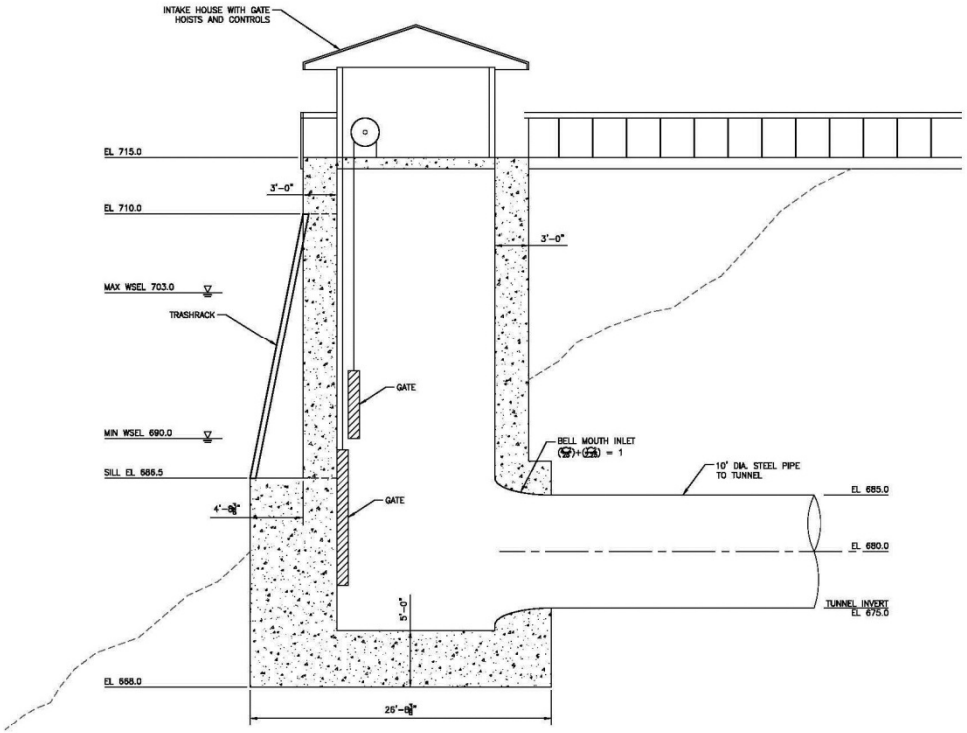
Hydrologic Analysis Review

- 66-year ‘composite’ daily streamflow record developed for Grant Creek
  - Calendar Years 1948-2013
  - USGS gage record
  - Intermittent streamflow records from engineering studies
  - Record extension based on Kenai River at Cooper Landing
- Used for Hydraulic, Generation, and Habitat Analyses
- Summarized in Technical Memo 001: Grant Creek Hydrologic Analysis

Intake Plan and Section



INTAKE PLAN AT EL 686.5
SCALE: 1"= 5'
1 F-3



INTAKE SECTION
SCALE: 1"= 5'
A

F.E.R.C. PROJECT NO. 13212
GRANT LAKE HYDROELECTRIC PROJECT
KENAI HYDRO LLC

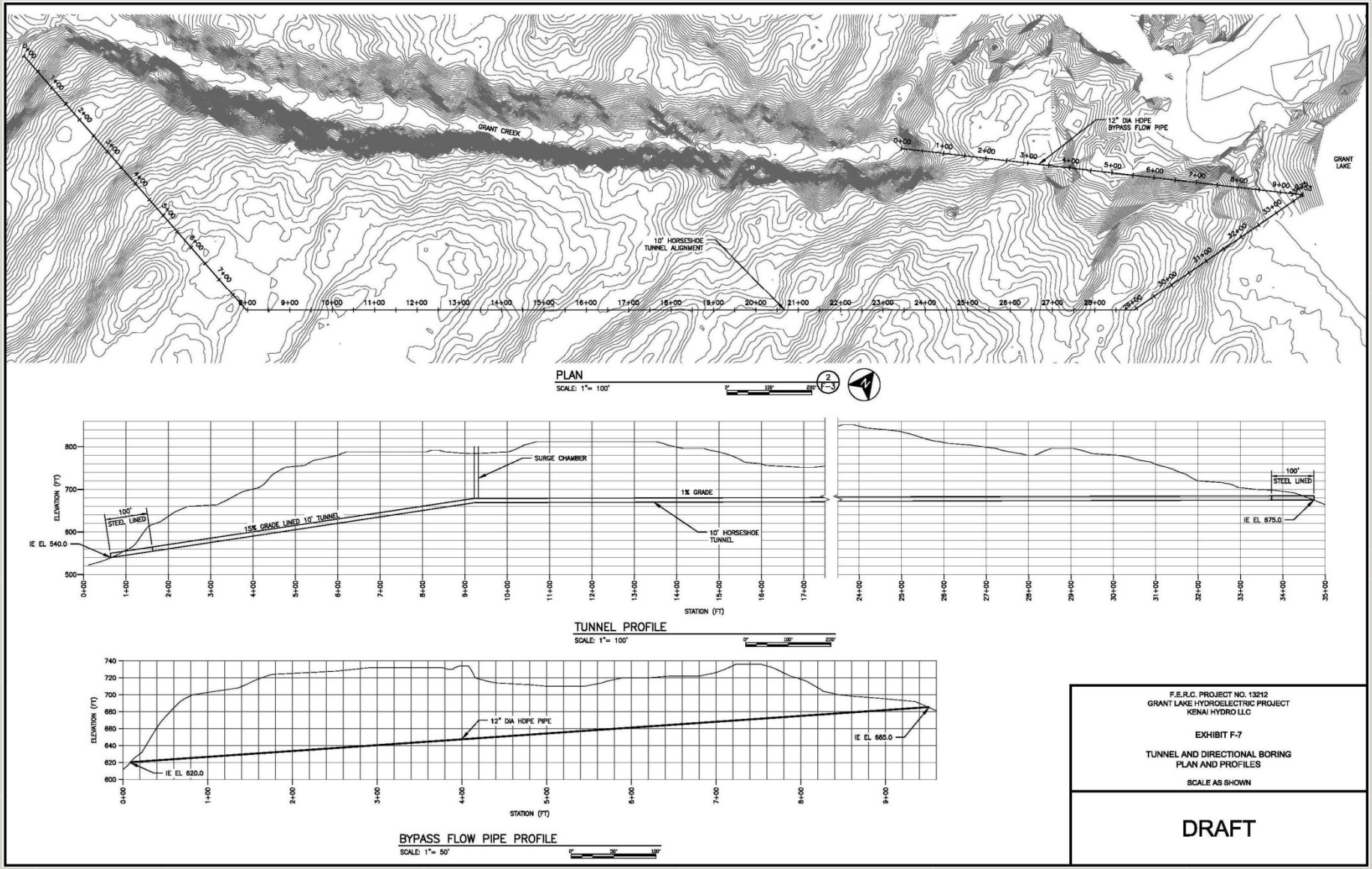
EXHIBIT F-4

INTAKE PLAN AND SECTION

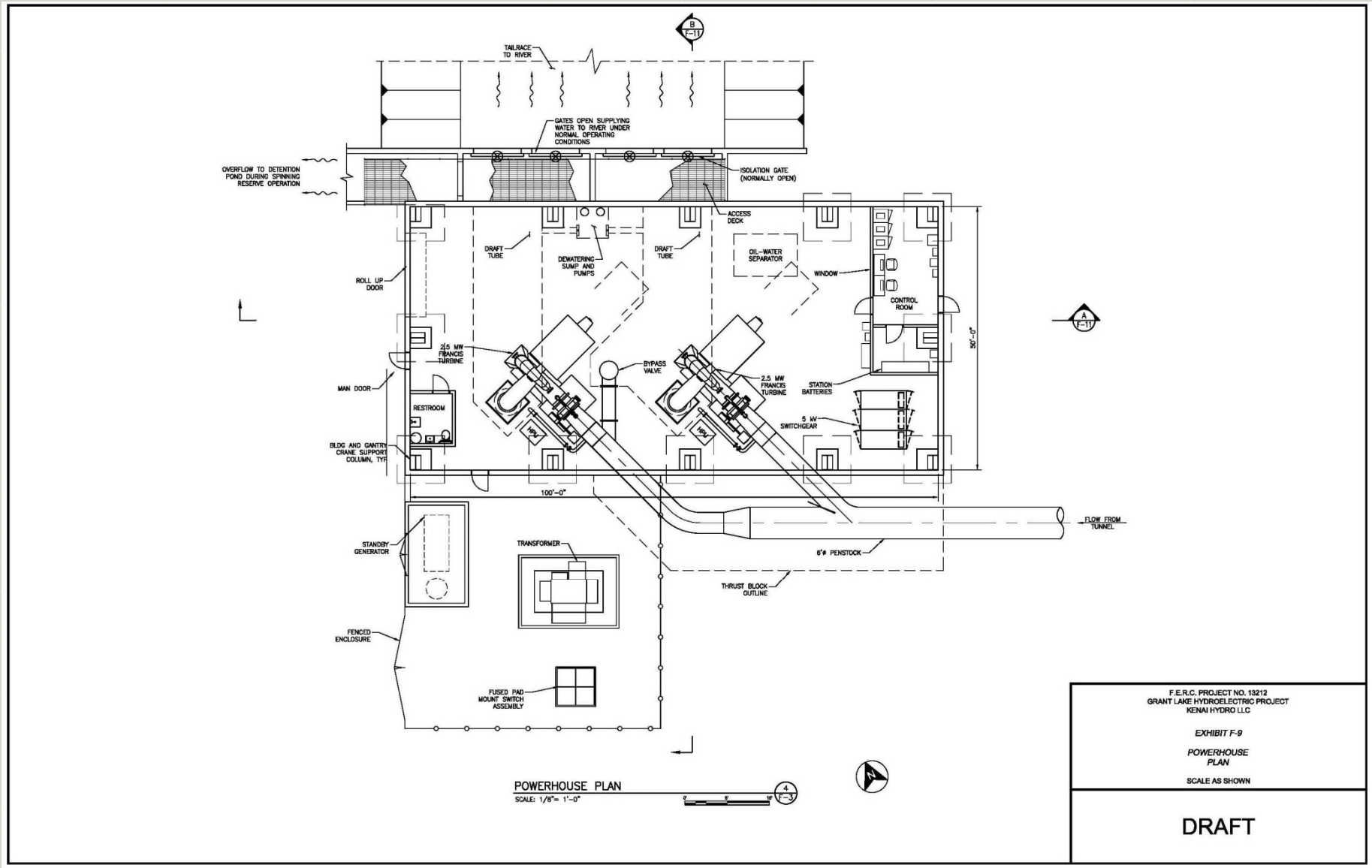
SCALE AS SHOWN

DRAFT

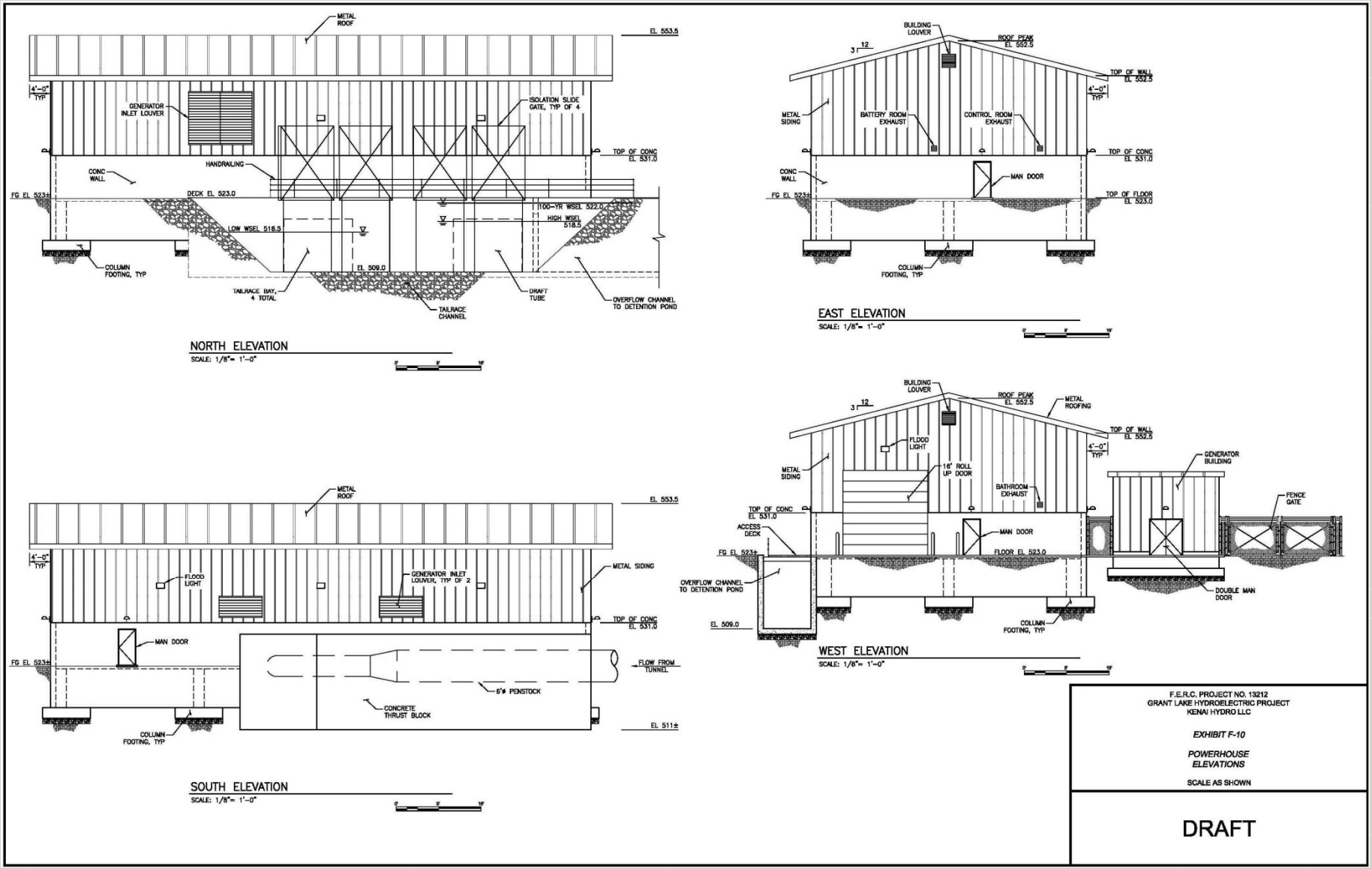
Tunnel Plan and Profile



Powerhouse Plan



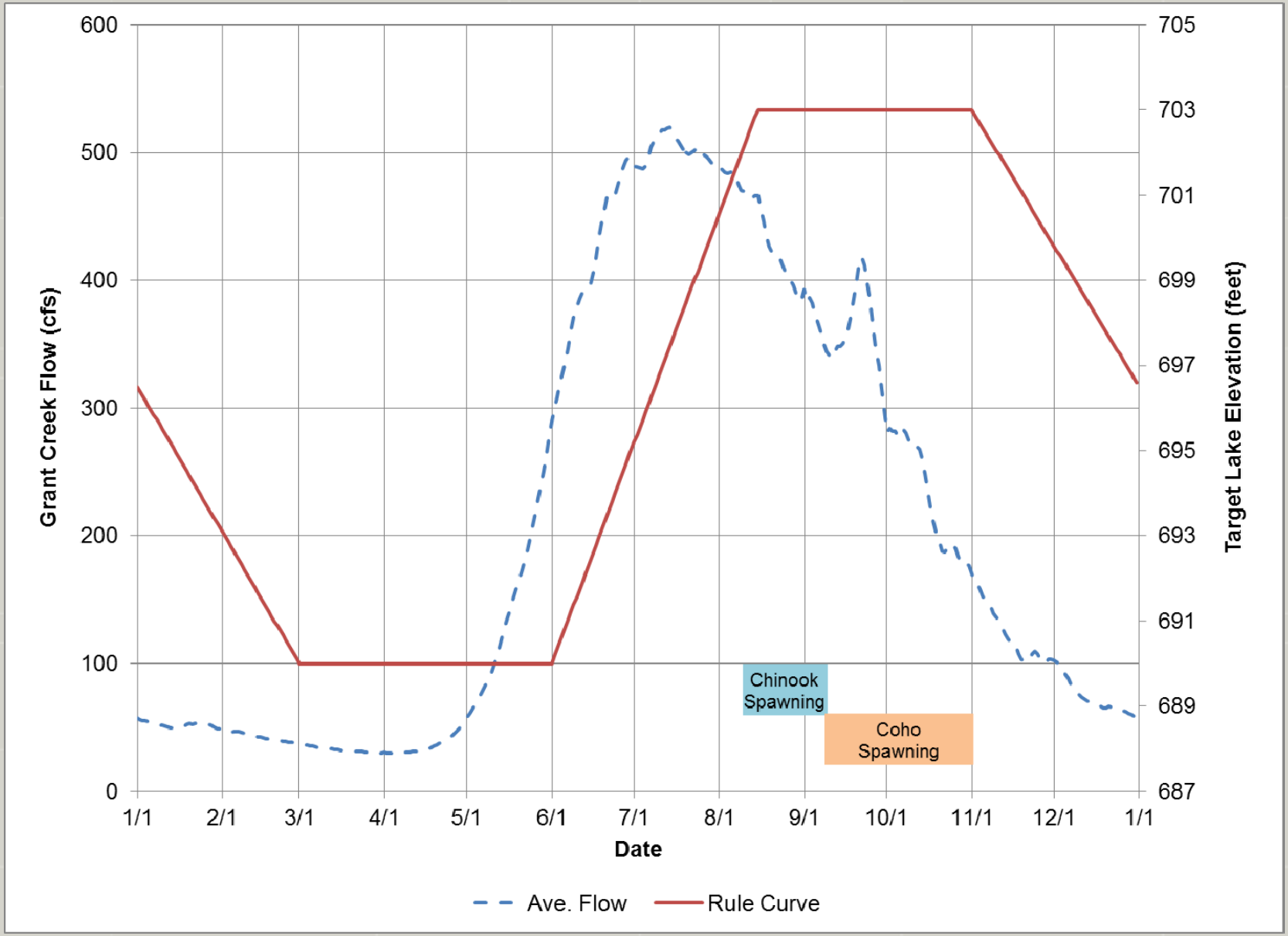
Powerhouse Elevations



Operating Assumptions

No.	Assumption	Data
1	No Dam	Natural Storage Only
2	Reservoir Operating Range	703-690 feet (13 feet)
3	Approximate Tailwater Elevation	518 feet
4	Peak Powerhouse Discharge	385 cfs
5	Minimum Powerhouse Discharge	23 cfs
6	Turbines	2 - 2.5 MW Francis Units
7	Instream Flow Releases in Reach 5 and 6	10 cfs during Chinook spawning (Aug-Sept)
		7 cfs during Coho spawning (Sept-Oct)
		5 cfs for the remainder of the year

Operating Assumptions

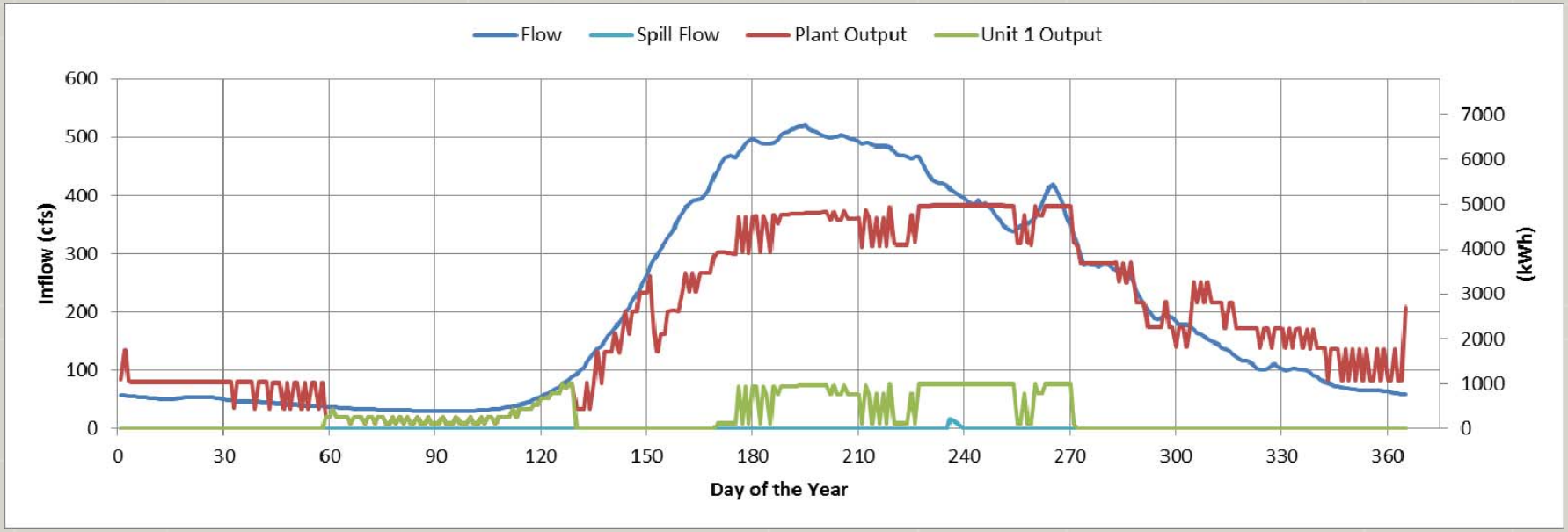


Operational/Generation Model

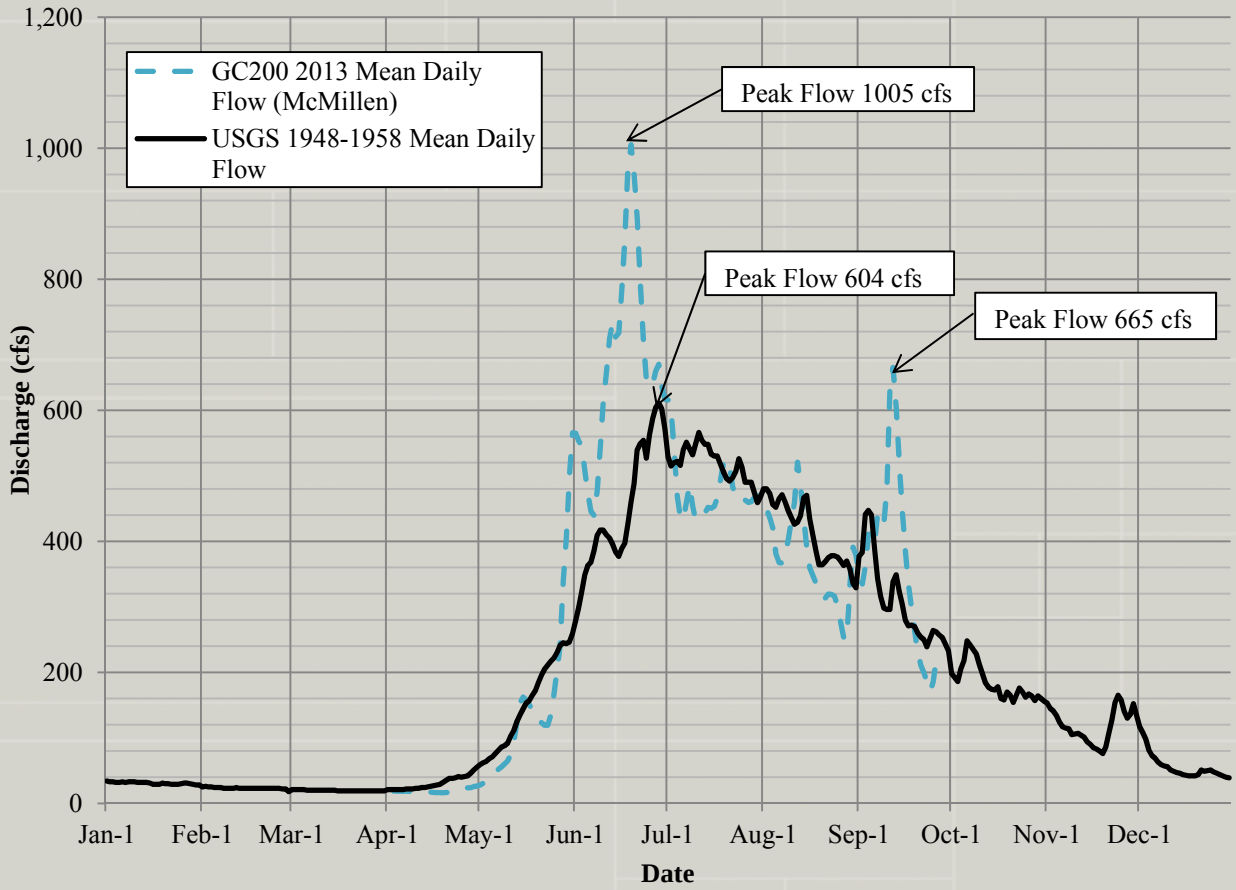
- Developed to estimate energy production under various operational scenarios
- Utilizes composite streamflow record to calculate daily power production
- Includes instream flow requirements
- Allows powerhouse size and unit configuration to be varied as well as tunnel and penstock size optimization

Generation Model Results

- Energy Production :19,500 MW-Hours Annually (based on Average Daily Flows)
- Plant Factor: 0.45



Hydrologic Review – Mean Daily Flow

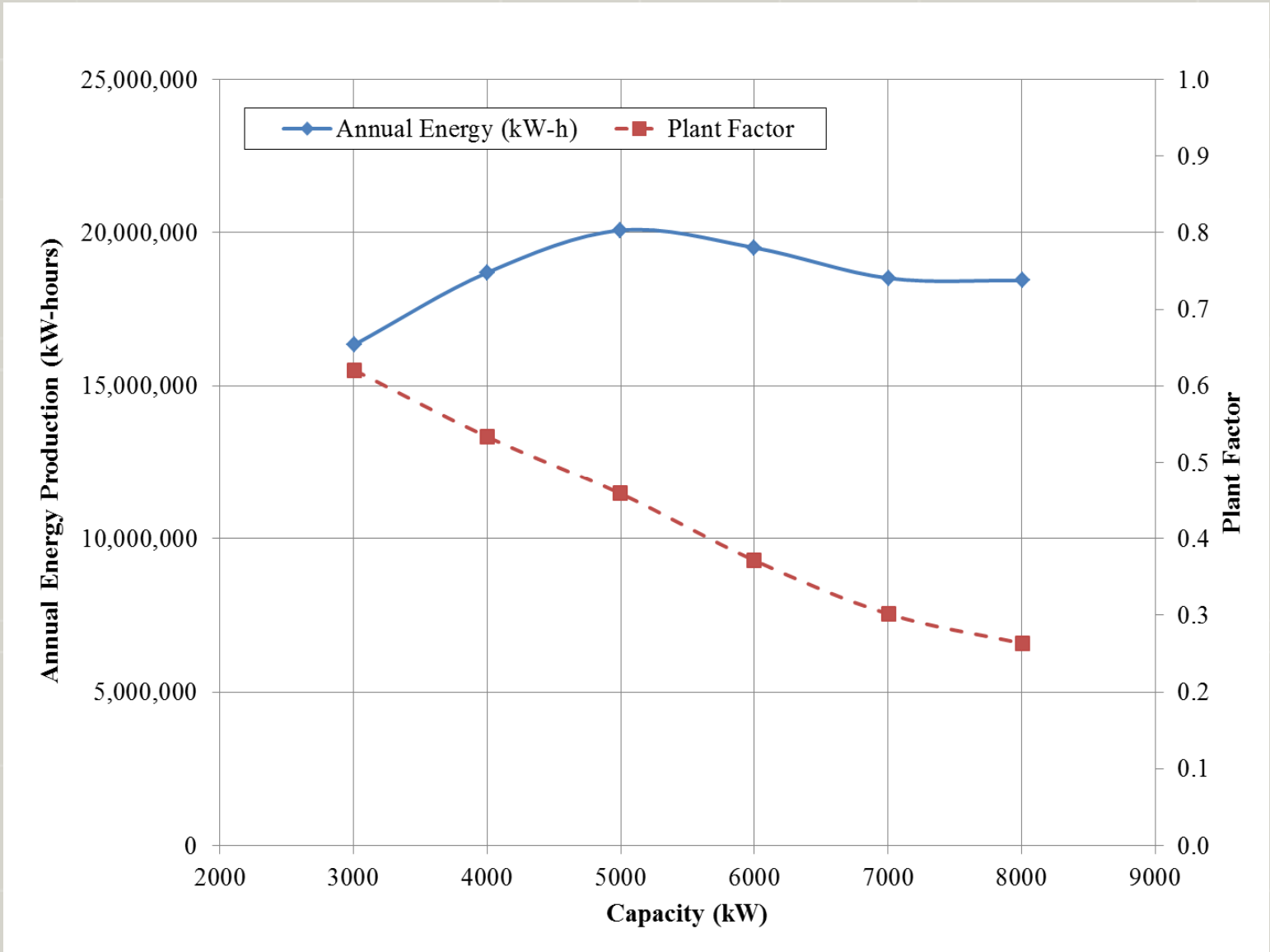


Grant Creek Mean Daily Flow - 1948-1958 and 2013 (Calendar Year)

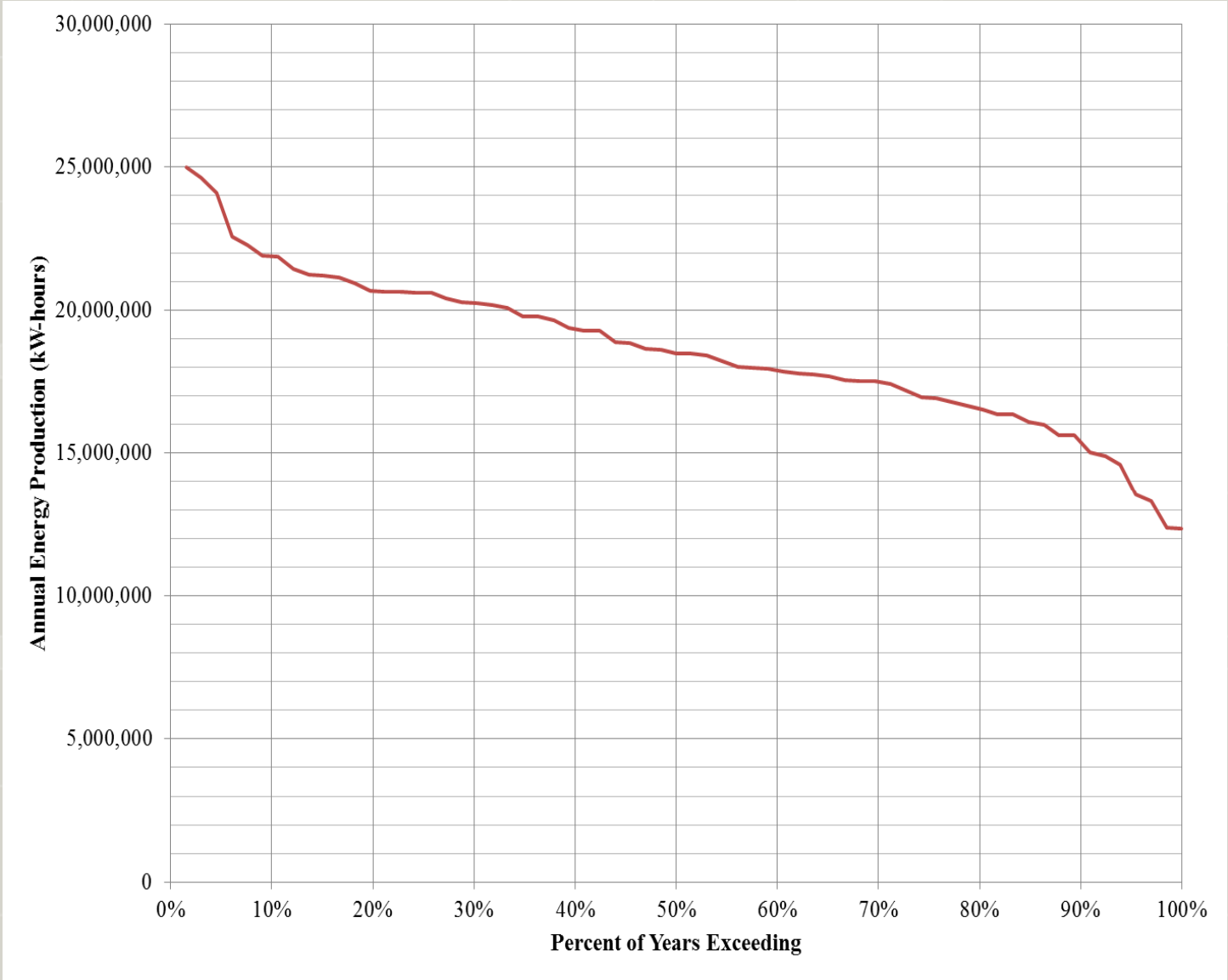
Hydrologic Review – Conclusions

- Current analysis results were consistent with previous analyses
- 95% exceedance flow of 15 cfs
- 5% exceedance flow of 580 cfs
- 20% exceedance flow of 387 cfs
- 100-year flood of 3,310 cfs for powerhouse flood protection

Power Plant Capacity Comparison



Annual Energy Production Exceedance Curve



Grant Creek Biology, Hydrology, Operations Table

	Stage	Species	January	February	March	April	May	June	July	August	September	October	November	December
Biology	Spawning	Chinook												
		Coho												
		Sockeye												
		Dolly Varden												
		Rainbow												
	Incubating	Chinook												
		Coho												
		Sockeye												
		Dolly Varden												
		Rainbow												
	Juveniles	Chinook												
		Coho												
		Sockeye												
		Dolly Varden												
		Rainbow												
	Fry	Chinook												
		Coho												
		Sockeye												
		Dolly Varden												
		Rainbow												
	Adult	Dolly Varden												
		Rainbow												
Hydrology	Composite Streamflow Record (CY 1948-2013)	Maximum Flow (cfs)	326	227	116	160	566	2140	1210	1383	1731	1295	851	570
		20% Exceedance	64	51	41	47	215	512	573	524	480	317	151	87
		Average Flow	52	43	33	36	146	409	503	444	367	233	123	73
		Median Flow	45	36	30	31	127	398	488	422	313	182	94	59
		80% Exceedance	32	25	21	22	62	290	419	346	215	115	67	42
		Minimum Flow	12	11	6	13	17	102	210	173	65	45	28	18
Operations	Typical Unit Operation	1 MW Unit (75 cfs)	Off	Off	Running	Running	Running	Off	Running	Running	Running	Off	Off	Off
		4 MW Unit (310 cfs)	Running	Running	Off	Off	Running	Running	Running	Running	Running	Running	Running	Running

Grant Creek Instream Flows under Natural Conditions

			January				February				March				April				May				June				July				August				September				October				November				December			
Biological Parameters	Instream Flow Release (Reach 5)	(cfs)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	10	10	10	10	7	7	7	7	7	7	7	5	5	5	5	5	5	5	5
	Main Channel Flow (Reach 1-4) - Natural		55	51	51	52	47	45	41	39	36	34	32	31	30	31	35	45	69	101	152	227	318	382	431	483	494	517	507	496	484	469	440	402	379	347	379	364	280	272	216	184	159	133	109	99	92	74	67	63
	Main Channel Flow (Reach 1-4) - with Project		133	128	128	128	124	119	115	106	36	34	33	30	30	30	35	46	68	97	155	224	199	260	310	360	370	390	388	375	365	347	395	399	395	374	372	365	282	273	212	187	234	207	185	180	172	150	141	147
	Approximate Reach 2/3 Side Channel Flow - Natural		9	8	9	9	8	7	7	6	6	6	5	5	5	5	6	8	12	17	25	38	53	64	72	81	82	86	84	83	81	78	73	67	63	58	63	61	47	45	36	31	26	22	18	16	15	12	11	10
	Approximate Reach 2/3 Side Channel Flow - with Project		22	21	21	21	21	20	19	18	6	6	5	5	5	5	6	8	11	16	26	37	33	43	52	60	62	65	65	63	61	58	66	67	66	62	62	61	47	46	35	31	39	35	31	30	29	25	24	24
Reservoir Rule Curve	Maximum Elevation																																																	
	Drafting/Filling		Drafting																				Filling																						Drafting							
	Minimum Elevation																																																

Mitigating Construction Impacts

- Work Execution is set up to protect natural resources.
- First Step is preparation of detailed environmental management plans; for example:
  - SWPPP
  - Erosion and Sediment Control
  - Bear Safety Program
  - Cofferdam and Dewatering
  - Vegetation Plans (Construction and Post-Construction)
  - Water Quality Monitoring
- Designate Environmental Compliance Manger (ECM) who is onsite during construction.
- Full Time Monitoring of Implemented Plan Measures and BMPs.

Allison Creek ECM in the field