Cruise Ship Dock Electrification Study

Presentation to Assembly Committee of the Whole

November 1st, 2021

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McKINLEY RESEARCH GROUP, LLC

CITY & BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DOCKS & HARBORS

Cruise Ship Dock Electrification Study

Where are we in the process?

RAISE Grant Submitted → **Assembly COW Presentation** → Draft Report Open for Public Comment → Compile Comments, Make Edits → Final Report

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Can we provide power to cruise ships at both city owned docks?

Yes! - with some caveats.

- When there is excess water on a normal or wet year
- When the ships have power portals and are oriented correctly to the dock.

What forecast data did we use?

- 10 years of AEL&P consumption and curtailment data
- 2022 cruise schedules for ship energy consumption, docking locations, time at dock and power portal locations
- Future forecasts for vessels entering our market

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Juneau Energy Profile
Hydroelectric Energy production

Present Hydroelectric Power Plants

Hydroelectric Plant	Peak Capacity (MW)	Typical Annual Energy Production (MWH)
Snettisham (Crater & Long Lakes)	78.2	295,000
Lake Dorothy, Phase I	14.3	75,000
Salmon Creek	5	31,000
Annex Creek	3.6	24,000
Gold Creek	1.6	5,000
Totals	**102.7**	**430,000**

These tables are based on an Average (Firm) precipitation year.

The energy production on a Dry year is currently 257,000 MWH

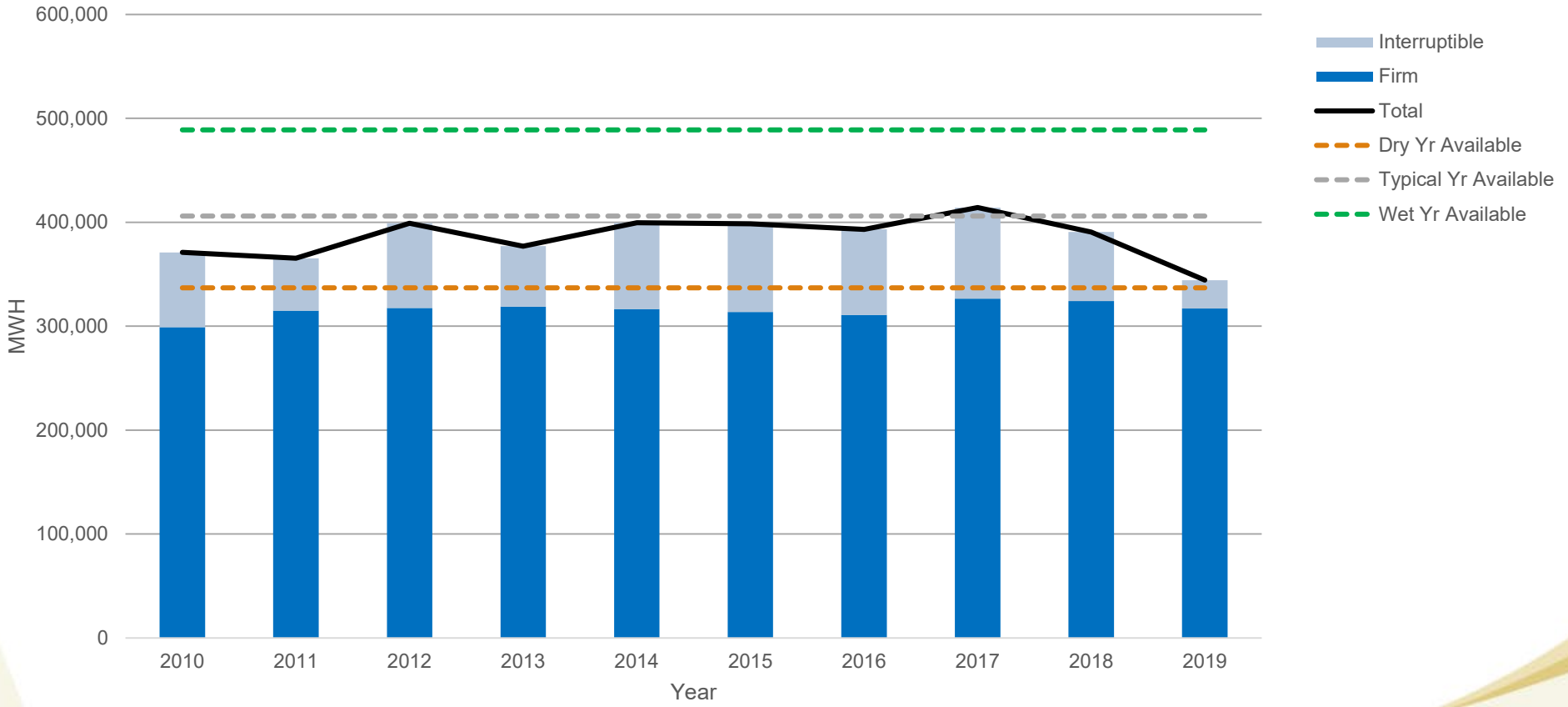
The energy production on a Wet year is currently 518,000 MWH

Future Hydroelectric Power Plants

Possible Future Hydroelectric Plants	Peak Capacity (MW)	Estimated Annual Energy Production (MWH) *
Sweetheart Lake	19.8	116,000
Lake Dorothy Ph II	30	94,000
Sheep Creek (Chas' heeni)	3.3	13,300
Total	**53.1**	**223,300**

Juneau Energy Profile
Energy production by AEL&P

Juneau's Annual Energy Sales (2010 through 2019)



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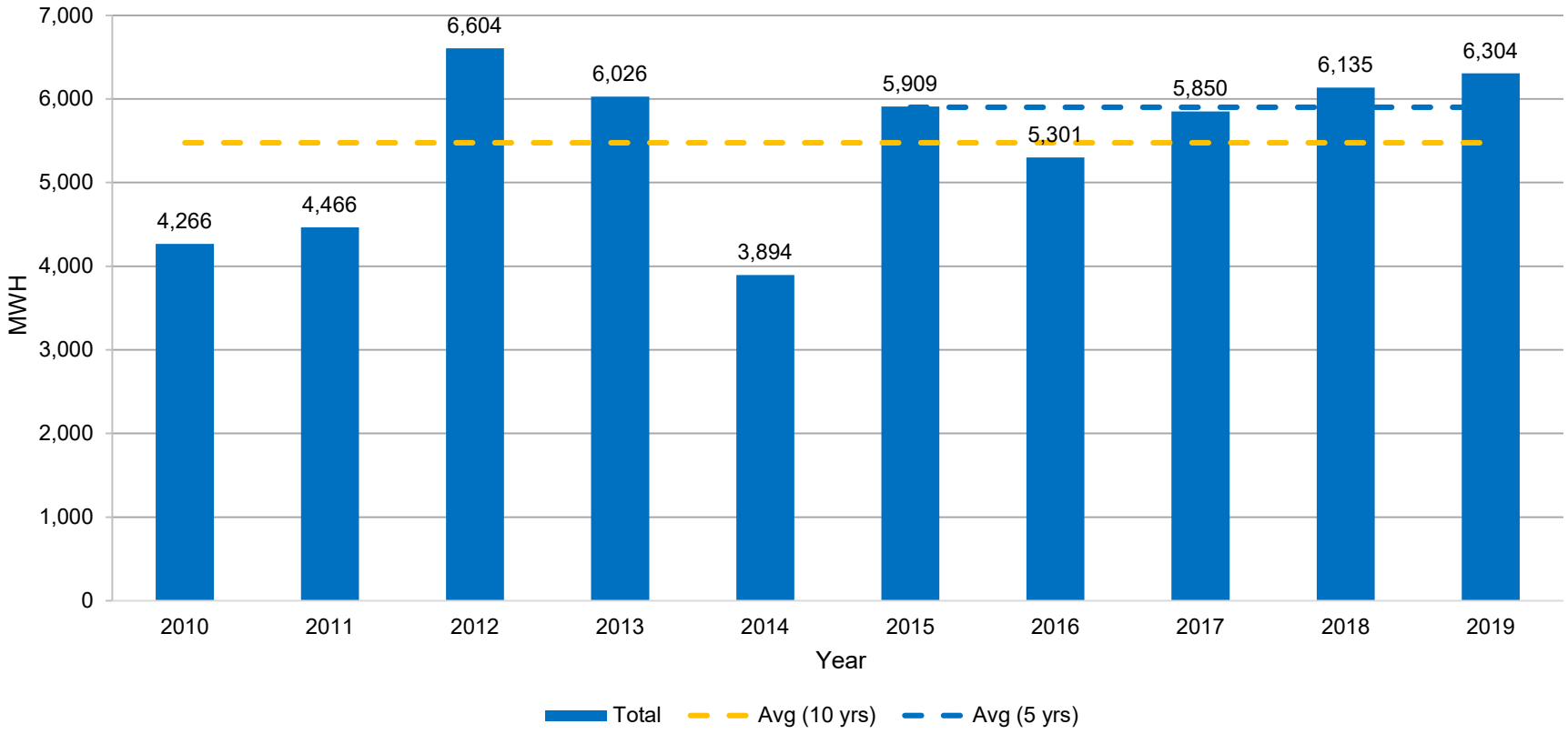
Cruise Ship Energy Profile

Energy consumed at Franklin Dock

Franklin Dock Annual Energy Consumption (2010 through 2019)



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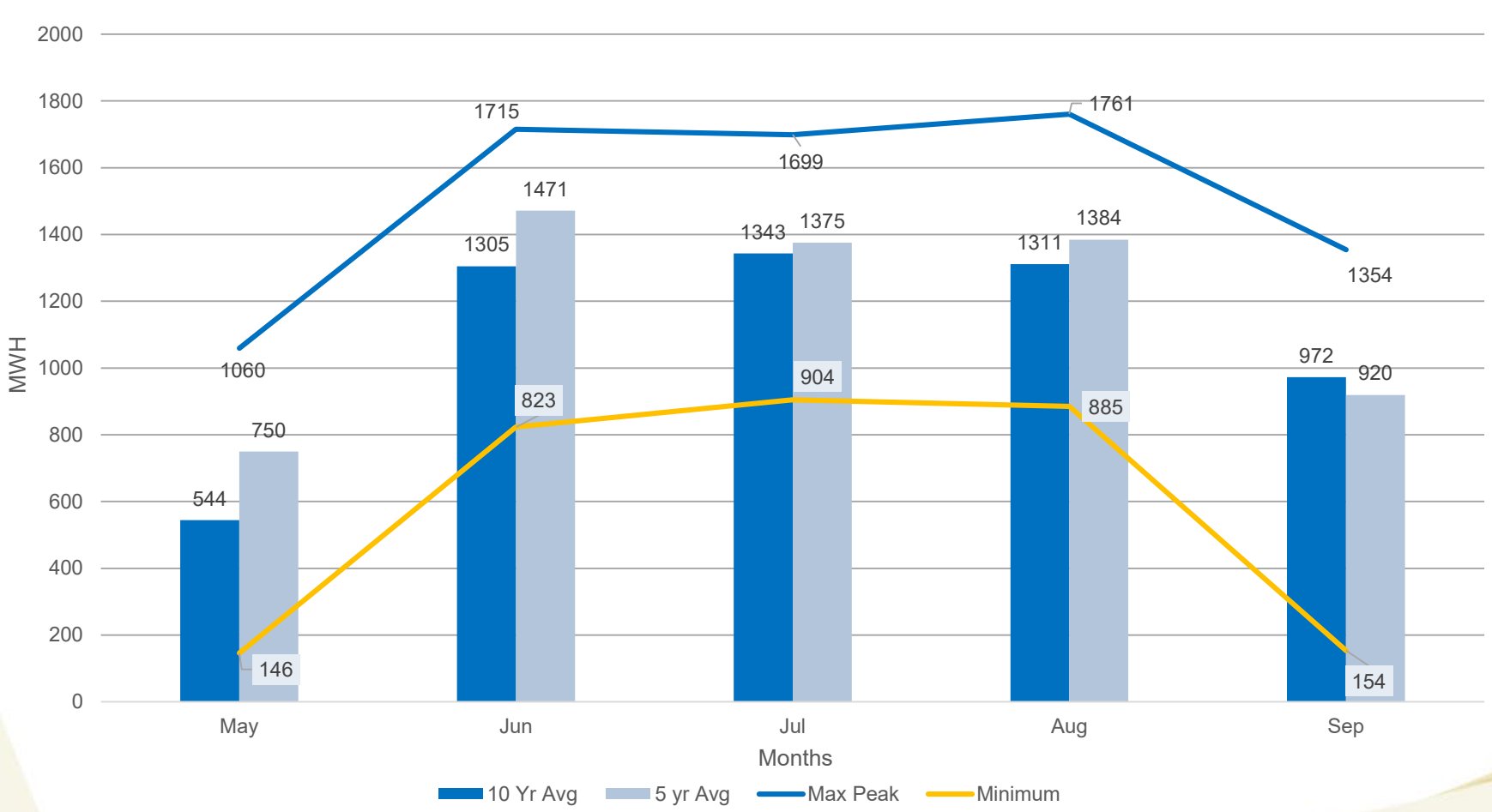
Cruise Ship Energy Profile

Energy consumed at Franklin Dock

Franklin Dock Historical Energy Consumption – Monthly (2010 -2019)



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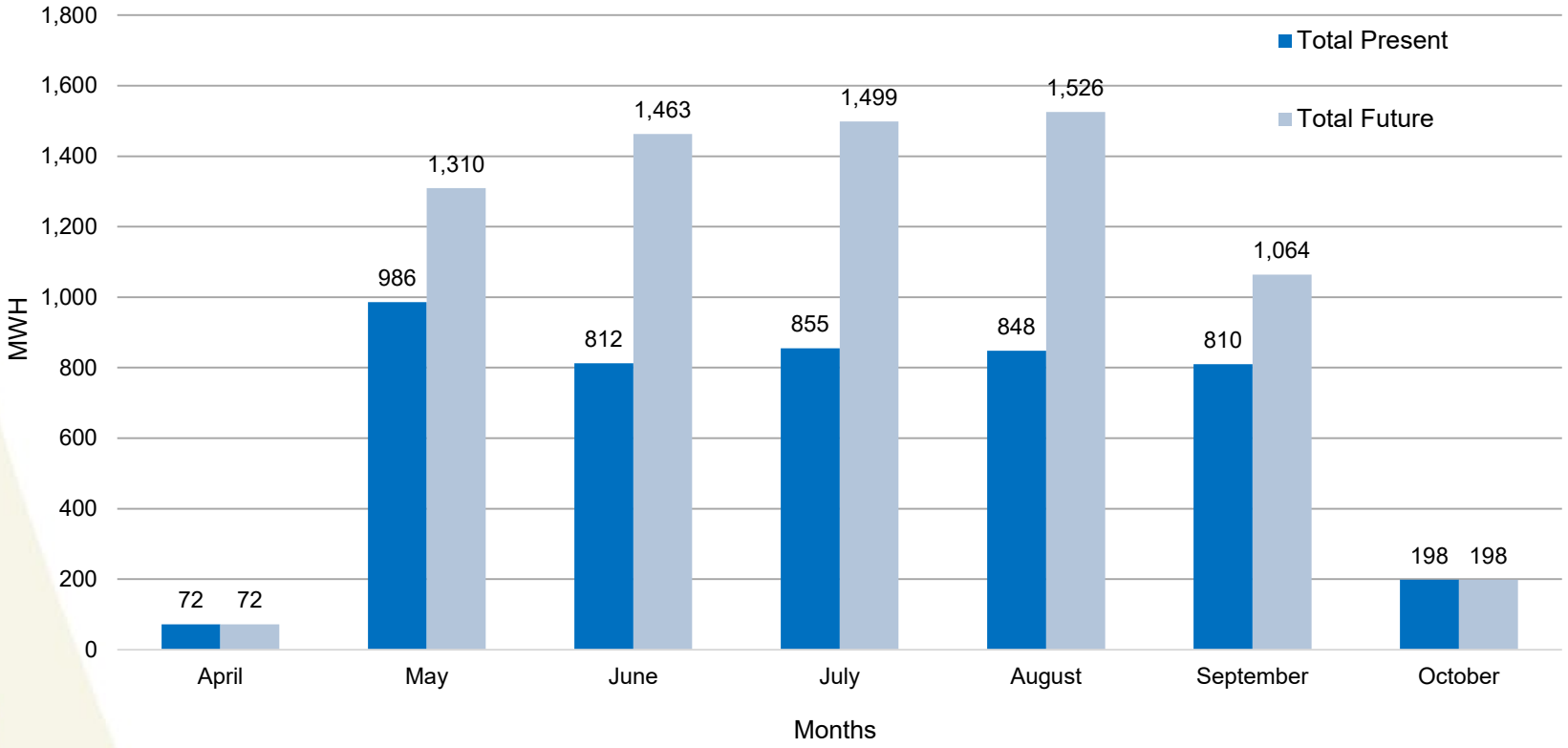
Cruise Ship Energy Profile

Calculated energy consumption at CBJ docks

CBJ Dock Calculated Energy Consumption – Monthly



- **2022 Energy Consumed: 4,581 MWH Per Year**
- **Future Energy Consumed: 7,133 MWH Per Year**

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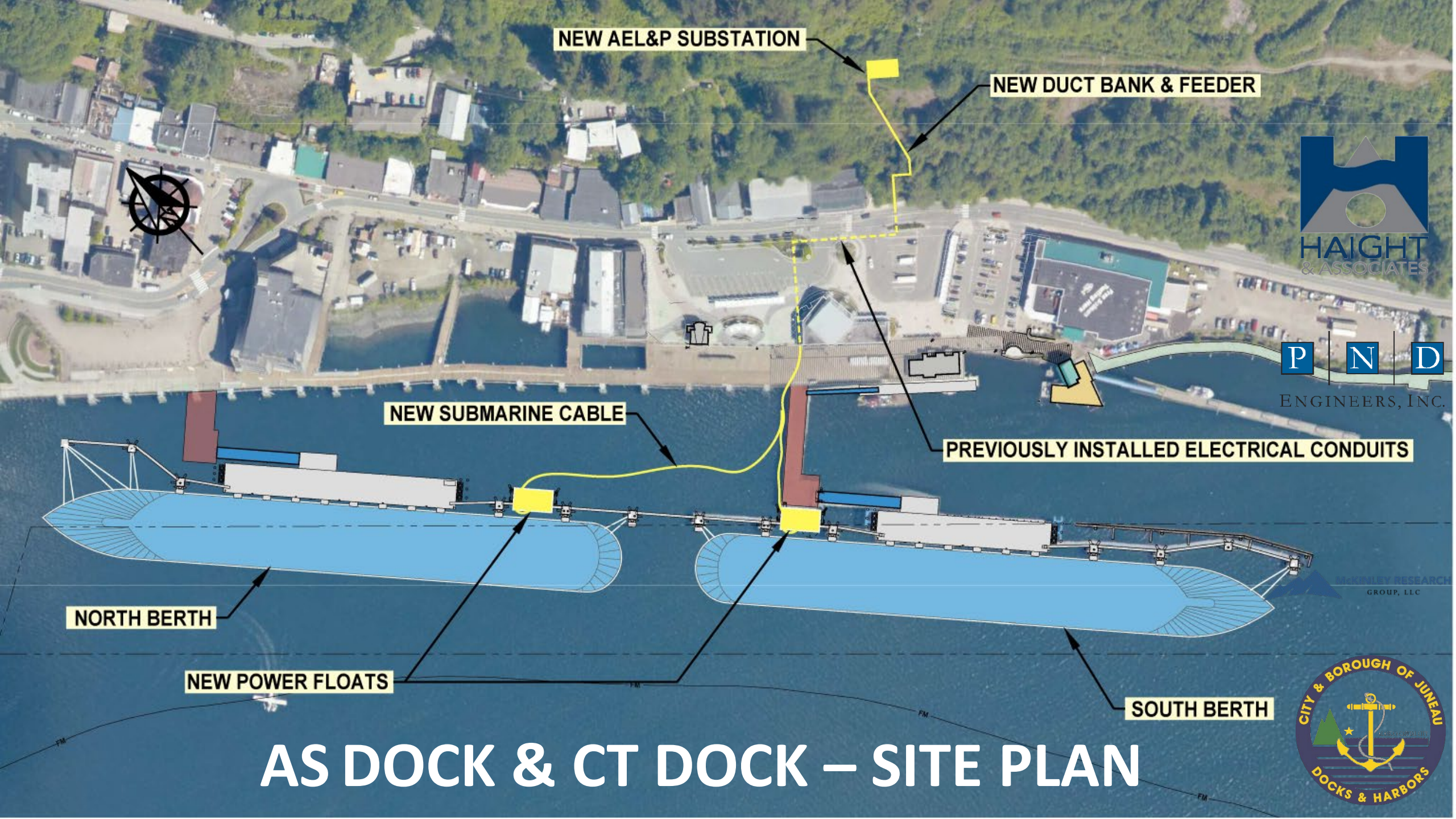
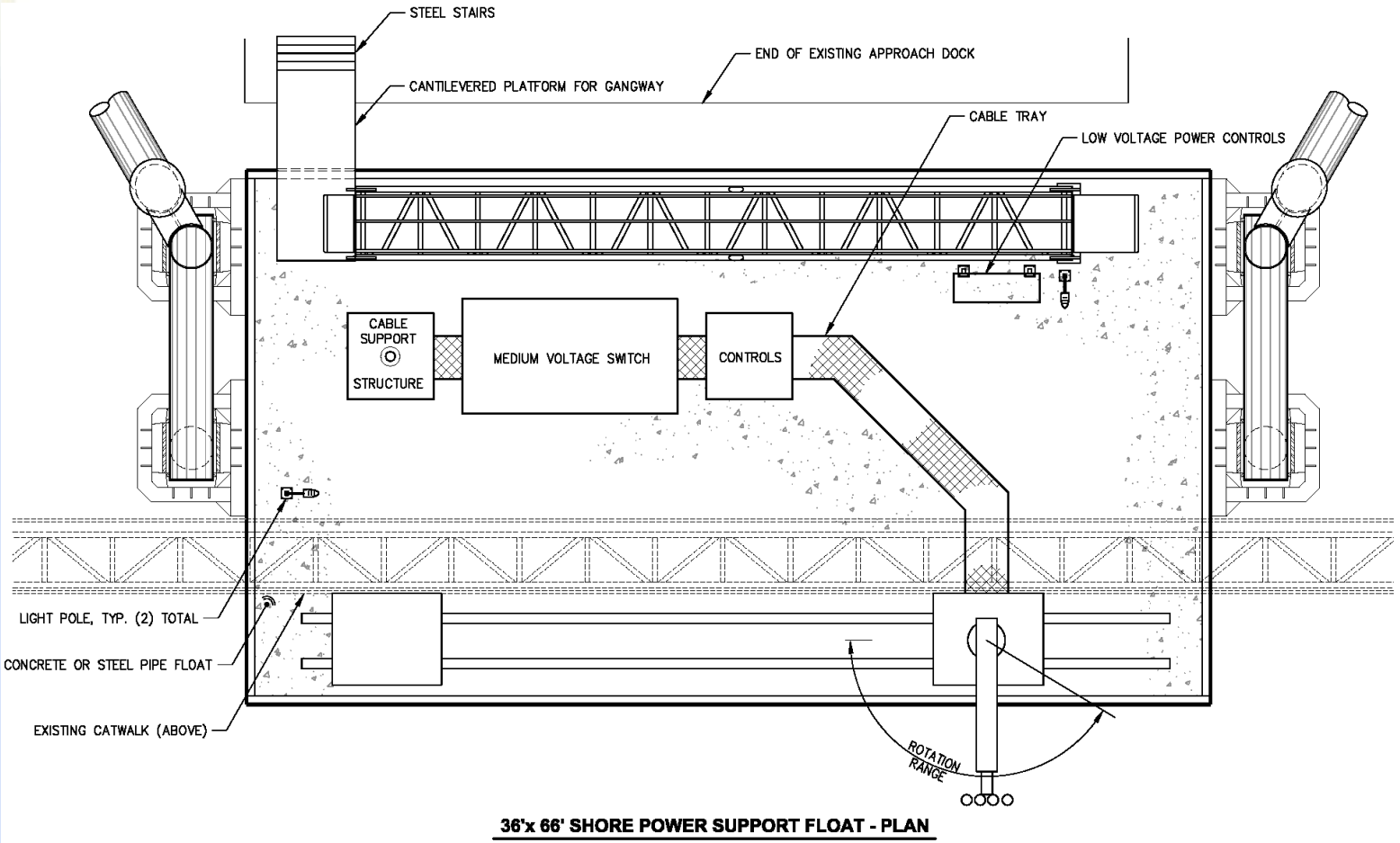
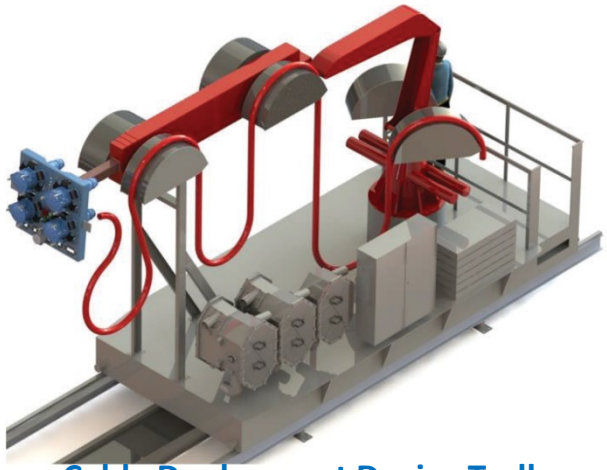


AS DOCK & CT DOCK – SITE PLAN

Shore-Tie Cable Deployment System



36'x 66' SHORE POWER SUPPORT FLOAT - PLAN



Cable Deployment Device Trolley

Stemmann-Technik
A Wabtec Company

AS Dock Construction Estimate

Item	Item Description	Units	Quantity	Unit Cost	Amount
1505.1	Mobilization	LS	All Req'd	20%	$1,646,200
2702.1	Construction Surveying	LS	All Req'd	$75,000	$75,000
2894.1	100-ft Aluminum Gangway with Pontoon Mounting Assemblies	LS	All Req'd	$400,000	$400,000
2895.1	Floating Dock, 36' x 66'	SF	2,376	$500	$1,188,000
2896.1	Furnish 36-Inch dia. Steel Pipe Pile	LF	1,200	$350	$420,000
2896.2	Install 36 -Inch dia. Steel Pipe Vertical Pile	EA	4	$30,000	$120,000
2896.3	Install 36 -Inch dia. Steel Pipe Batter Pile	EA	2	$40,000	$80,000
2896.4	Furnish and Install Pile Frames	LS	All Req'd	$250,000	$250,000
2897.1	Transition Plates	LS	All Req'd	$75,000	$75,000
2899.1	Supply and Install Pile Anodes	LS	All Req'd	$75,000	$75,000
5120.1	Electrical Support Assemblies	LS	All Req'd	$50,000	$50,000
11000.1	Cable Positioning Device	LS	All Req'd	$1,000,000	$1,000,000
16000.1	Electrical Substation	LS	All Req'd	$3,193,000	$3,193,000
16000.2	Feeder to Shore	LS	All Req'd	$500,000	$500,000
16000.3	Submarine Cable & Support Structure	LS	All Req'd	$660,000	$660,000
16000.4	Power on Float	LS	All Req'd	$145,000	$145,000
	ESTIMATED CONSTRUCTION COST				$9,877,200
	CONTINGENCY (15%)				$1,481,580
	ENVIRONMENTAL PERMITTING & IHA				$200,000
	FINAL DESIGN & CONTRACT DOCUMENTS (10%)				$1,135,878
	CONTRACT ADMINISTRATION & CONSTRUCTION INSPECTION (10%)				$1,135,878
	TOTAL RECOMMENDED PROJECT BUDGET (AS DOCK)				$13,830,536

Note: Estimate assumes the AS Dock (North Berth) Shore Power System is constructed prior to the CT Dock (South Berth) Shore Power System.

CT Dock Construction Estimate

Item	Item Description	Units	Quantity	Unit Cost	Amount
1505.1	Mobilization	LS	All Req'd	20%	$1,319,000
2702.1	Construction Surveying	LS	All Req'd	$75,000	$75,000
2894.1	50-ft Aluminum Gangway	LS	All Req'd	$100,000	$100,000
2895.1	Floating Dock, 36'x66'	SF	2,376	$500	$1,188,000
2896.1	Furnish 36-Inch dia. Steel Pipe Pile	LF	1,200	$350	$420,000
2896.2	Install 36 -Inch dia. Steel Pipe Vertical Pile	EA	4	$30,000	$120,000
2896.3	Install 36 -Inch dia. Steel Pipe Batter Pile	EA	2	$40,000	$80,000
2896.4	Furnish and Install Pile Frames	LS	All Req'd	$250,000	$250,000
2897.1	Transition Plates	LS	All Req'd	$75,000	$75,000
2898.1	Approach Dock Addition with Gangway Mounting Assemblies	LS	All Req'd	$350,000	$350,000
2899.1	Supply and Install Pile Anodes	LS	All Req'd	$75,000	$75,000
5120.1	Electrical Support Assemblies	LS	All Req'd	$50,000	$50,000
11000.1	Cable Positioning Device	LS	All Req'd	$1,000,000	$1,000,000
16000.1	Electrical Substation	LS	All Req'd	$1,855,000	$1,855,000
16000.2	Feeder to Shore	LS	All Req'd	$482,000	$482,000
16000.3	Submarine Cable & Support Structure	LS	All Req'd	$310,000	$310,000
16000.4	Power on Float	LS	All Req'd	$165,000	$165,000
	ESTIMATED CONSTRUCTION COST				$7,914,000
	CONTINGENCY (15%)				$1,187,100
	ENVIRONMENTAL PERMITTING & IHA				$200,000
	FINAL DESIGN & CONTRACT DOCUMENTS (10%)				$910,110
	CONTRACT ADMINISTRATION & CONSTRUCTION INSPECTION (10%)				$910,110
	TOTAL RECOMMENDED PROJECT BUDGET (CT DOCK)				$11,121,320

Note: Estimate assumes the AS Dock (North Berth) Shore Power System is constructed prior to CT Dock (South Berth) Shore Power System.

Total Both Docks

AS Dock	$13,830,536
CT Dock	$11,121,320
Total Project Budget	$24,951,856

Juneau Cruise Ships Air Quality

- The total time of cruise ships in port per season: 6800 hours

Dock	Time Connected to Shore Power per season	Fuel Consumption Avoidance per season
Franklin Dock	825 hours	461,000 gallons
AS Dock	833 hours	293,000 gallons
CT Dock	185 hours	65,000 gallons
Total	1,843 hours	819,000 gallons

- With possible adjusted berth assignments fuel consumption avoidance could be up to 1,018,000 gallons per season

Economic Analysis

Economic goals:

- Reduce the “cost” of carbon emissions from cruise ships, calculated at $78 million over 20 years
- Avoid increasing the cost of energy for Juneau’s firm rate payers
- Provide reasonable cost structure for cruise lines

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Interruptible Power

- CBJ docks would join Franklin Dock, Greens Creek, and Dual Fuel customers as interruptible energy buyers
  - *Revenue from interruptible sales lowers costs paid by firm customers*
- Interruptible sales depend on available excess hydropower
  - *In years with average (or above) rain/snow, sufficient excess energy would be available for CBJ docks*
  - *Interruptible sales curtailed in 2011 (Jan. thru Aug.), 2013 (Jan. thru April) and the fall of 2018 thru early 2020.*
- Costs would be higher with cruise docks as firm customer
  - *Would result in lower revenue offsets*
  - *Firm status may be better option in the future*

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Cost Recovery

- $25 million investment required ($13.8 million for AS dock)
  - *$4.9 million already committed by CBJ as match to federal grant*
- With demand from CBJ docks of about 5 million kWh/yr, full cost recovery (incl. debt service, O/M) would require rates of over $0.50 per kWh.
- Some local investment could be recoverable from cruise lines, with rates at about the cost of on-board power.
  - *Risk associated with revenue losses during curtailment, or from vessel redeployment*

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Economic Analysis: Conclusions

- Federal grant funding is essential
- Avoid debt financing
- Plan for interruptible sales to ships, for now

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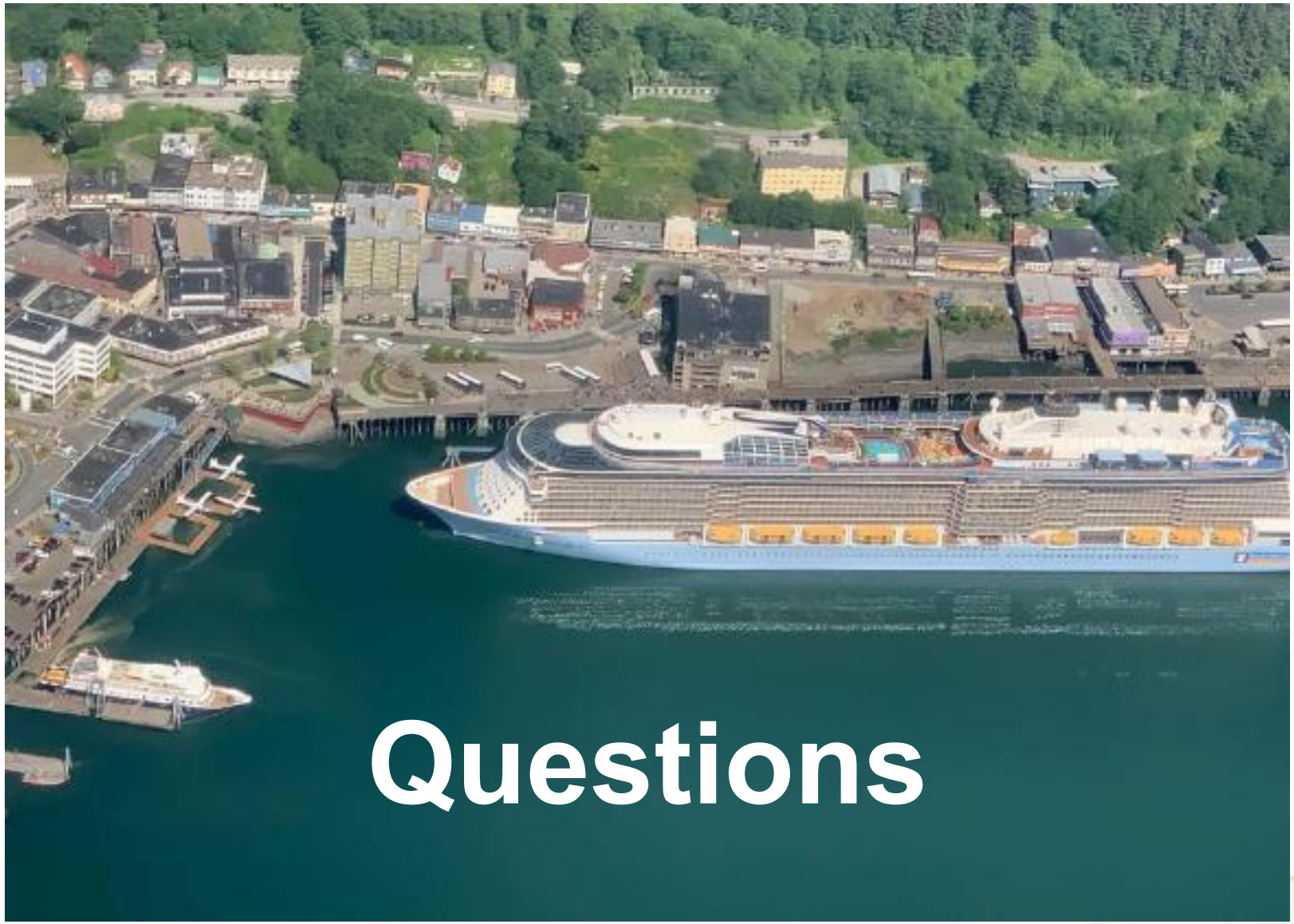

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