SUSITNA-WATANA HYDRO

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Report
14-21-REP
v0.0

Susitna-Watana Hydroelectric Project
Engineering Feasibility Report

AEA11-022

Prepared for:
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December 2014

Significant parts of this report are subject to FERC CEII regulations and should not be disclosed.

PREFACE

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MWH

January 26, 2015

File No. 14-21-REP

Wayne Dyok
Project Manager
Susitna-Watana Hydro Project
813 W. Northern Lights Blvd.
Anchorage, AK 99503

Re: Engineering Feasibility Report – December 2014

Dear Wayne:

We herewith submit our Engineering Feasibility Report describing investigations, and assessments of the Susitna-Watana Hydro Project carried out through December 2014, together with a suggested layout.

The report incorporates results of feasibility work on the Project conducted by MWH and sub-consultant firms during the period from 2011 through 2014, and updates the information contained in the previous Interim Report Summary dated December 2012.

As highlighted within the text of the report in various sections, although key findings such as dam type etc. are final, additional important work is needed to support ongoing project development and design. Among the required supplemental tasks are the completion of detailed site investigations (including drill holes and adits within and around the dam footprint), the completion of the Site Specific Seismic Hazard Analysis, and a thermal analysis of the dam construction sequence. Analyses and verifications that would further clarify costs and details of the proposed project are dependent on the completion of these tasks.

We have enjoyed our collaboration with you, your staff and other key stakeholders in completing this phase of the work. We look forward to discussing our findings with you at any time.

We are available of course to present the results of the studies to AEA, or to key stakeholders.

Respectfully submitted,
MWH Americas, Inc.

Brian E. Sadden, P.E.
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CERTIFICATE OF ENGINEER

ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT
ENGINEERING FEASIBILITY REPORT

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seals, as professional engineers licensed to practice as such are affixed below.

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Acronyms and Abbreviations

$	U.S. dollars
2-D	two dimensional
3-D	three dimensional
AACE	Association for the Advancement of Cost Engineering
AAR	alkali-aggregate reactivity
ac-ft.	acre-feet
ADOT&PF	Alaska Department of Transportation and Public Facilities
ADSAS	Arch Dam Stress Analysis System (Software)
AEA	Alaska Energy Authority
AEC	Alaska Earthquake Center
ANSI	American National Standards Institute
ANSYS	Finite Element Analysis Software
APA	Alaska Power Authority (State)
APD	analytical probabalistic dispatch
ARRC	Alaska Railroad Corporation
ASTM	American Society for Testing and Materials
ATK023	Japanese Interface Earthquake Record – March 2011
ATV	all terrain vehicle
AUL	Italian Crustal Earthquake Record - November 1980
BESS	battery energy storage system
BH	borehole
BIL	basic impulse level
BOD	biochemical oxygen demand
BTU	British thermal units
^{14}C	Carbon 14
CADAM	Computer Analysis of Dams (software)
CD	compact disk
CFD	computational fluid dynamics
CFRD	concrete faced rockfill dam
cfs	cubic feet per second
CHB012	Japanese Interface Earthquake Record – March 2011
Chile	Chile Interface Earthquake Record - February 2010
Chugach	Chugach Electric Association
c/mmBTU	cents per million British thermal units
CO_2	carbon dioxide

.CSV	comma-separated value format
CURI	Chile Interface Earthquake Record – February 2010
CVC	conventional concrete
cy	cubic yard
Dips	software for interactive analysis of orientation base geological data
DSM	demand side management
DSM/EE	demand side management / energy efficiency
ECRD	earth core rockfill dam
EFR	Engineering Feasibility Report
EIS	environmental impact statement
El.	elevation
EPS	Electric Power System Inc.
ESS	energy storage system
F	fahrenheit
FAA	Federal Aviation Administration
FE(A)	finite element (analysis)
FERC	Federal Energy Regulatory Commission
FOS	factor of safety
FPC	Federal Power Commission
FSI	fluid structure interaction
ft.	feet
FTE	full time equivalents
FY	fiscal year
g	gravitational acceleration - 32.2 ft./sec^2
GF	geologic feature
GIL	Loma Prieta, CA Crustal Earthquake Record - October 1989
GIN	grouting intensity number
GIS	geographic information system
GMPE	ground motion prediction equations
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GPS	global positioning system
GSI	geologic strength index
GSU	generator step up (transformer)
GVEA	Golden Valley Electric Association
GWh	gigawatt hours

HB	House Bill
HB 306	House Bill 306
HDPE	high density polyethylene (also high-density polyethylene)
HEA	Homer Electric Association
HEC	Hydraulic Engineering Center
HMC-TAM	hourly Monte Carlo-transmission analysis mode
HMR	Hydrometeorological Report
hr.	hour(s)
HVAC	heating, ventilating and air conditioning
Hz	hertz
IDF	inflow design flood
IEEE	Institute of Electrical and Electronics Engineers
IFSAR	Interferometric Synthetic Aperture Radar
ILP	Integrated Licensing Process
I/O	inputs and outputs
IPCC	International Panel on Climate Change
ISO	International Standards Organization
ISR	Initial Study Report
IWT010	Japanese Intraslab earthquake record- April 2011
JRC	joint roughness coefficient
kcmil	one thousand circular mils – area of a circle with a diameter of one mil (one thousandth of an inch)
kips	1,000 lbs
km	kilometer(s)
kV	kilovolt
kW	kilowatt
lbs/ft^3	pounds per cubic foot
lbs/in^2	pounds per square inch
LiDAR	**Li**ght **D**etection **a**nd **R**anging
Ma	megaannum / one million years
MCE	maximum credible earthquake
MCF	one-thousand cubic feet
MEA	Matanuska Electric Association
MG	million gallons
mgd	million gallons per day
mi	mile(s)
mi^2	square mile

ML&P	Anchorage Municipal Light & Power
mm	millimeter(s)
MOL	minimum operating level
MONT	El Salvador Intraslab earthquake record – Jan 2001
MP	milepost(s)
MPMR	modal participation mass ratio
msl	mean sea level
MVA	megavolt-ampere
MW	megawatt(s)
MWh	megawatt hour(s)
MWH	MWH Americas, Inc.
MYG 009	Japanese Intraslab earthquake record- April 2011
NAD	North American Datum
NAD83	Horizontal North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NERC	North American Electricity Reliability Council
NFFTB	Northern Foothills Fold and Thrust Belt
NMOL	normal maximum operating level
NOI	notification of intent
NPS	National Parks Service
O&M	operation and maintenance
OBE	operating basis earthquake
OFAF	oil forced air forced
OMB	Office of Management and Budget
ONAN	oil natural air natural
OPCC	opinion of probable construction cost
PAD	Pre-Application Document
pcf	pounds per cubic foot
PGA	peak ground acceleration
PLC	Programmable Logic Controller
PMF	probable maximum flood
PMP	probable maximum precipitation
PRM	project river miles
PROMOD	Production Modeling Software
psi	pounds per square inch
PSS/e	Power System Simulation for Engineering
pu	per-unit

RCA	Regulatory Commission of Alaska
RCC	roller-compacted concrete
RIRP	Alaska Railbelt Regional Integrated Resource Plan
RM	river mile(s)
ROW	right-of-way (also right of way)
rpm	revolutions per minute
RPZ	runway protection zone
RQD	rock quality designation
RSP	Revised Study Plan
RTS	reservoir triggered seismicity
RUS	Rural Utilities Service
SAB	Southern Alaska Block
SCADA	Supervisory Control and Data Acquisition
SCR	silicon controlled rectifier
SDM	El Salvador Intraslab Earthquake record - Jan 2001
SES	City of Seward Electric System
sf; ft^2	square foot (feet)
SF^6	sulphur hexafluoride
SI	site investigation
SPM	Shoreline Protection Manual
SPP	South Anchorage Power Project
sq.mi.	square mile
SSSHA	site specific seismic hazard analysis
STTEC	El Salvador Intraslab Earthquake record - Jan 2001
SVC	Static VAR Compensator(s)
SWE	snow water equivalency
TM	technical memorandum
TOC	total organic carbon
TSS	total suspended solids
UCS	uniaxial compression strength
UFLS	under frequency load shed
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Service
USR	Updated Study Report
UV	ultra violet
VALPM	Chile Interface Earthquake Record – Feb 2010

V_{S30}	Seismic Shear-Wave Velocity (from the surface to a depth of 30 m)
WBS	work breakdown structure
wl	water level
WRAM	Water Resources Assessment Methodology
WTP	Water Treatment Plant
yr.	year