# EXHIBIT A

# PROJECT DESCRIPTION

## REVISION 1 NOVEMBER 20, 2015

# 1. Description of the Project

Rugraw, LLC proposes to construct a small hydroelectric project, the Lassen Lodge Hydroelectric Project (Project). The proposed Project will have a nameplate capacity of 5 megawatts (MW). The purpose of the Project is to generate electricity through hydropower.

The Project is sited on the upper South Fork Battle Creek on the western slopes of the Cascade Range, approximately 1.5 miles west of the town of Mineral, an unincorporated community in Tehama County, California. The Project elements are located primarily on the south bank of South Fork Battle Creek between elevations of 3,417 feet and 4,310 feet above mean sea level. Power generated from the Project will be transmitted by a new, approximately 12-mile-long, 60 kV transmission line ranging in elevation from 3,470 feet at the generation substation climbing up to a maximum elevation of 4,422 feet then down to the low point of the transmission line at an elevation of approximately 2,105 feet, where it interconnects with the Pacific Gas and Electric (PG&E) Volta – South Transmission line in the town of Maton, California.

The following describes the proposed Project elements, including the diversion works, pipeline and penstock, transition structure, powerhouse, substation, station service line, transmission line, switchyard, and multipurpose areas.

## 1.1 Diversion Works

The diversion works will be located at river mile (RM) 23, approximately 0.5 RM upstream of the Old State Highway Route 36 Bridge (RM 22.5), at a finished floor elevation of ~~4,304~~ 4,302 feet and a water surface level (WSL) of 4,310 feet. The diversion works will include a diversion dam, intake structure, and a control/fish screen structure. This site has been chosen in order to utilize the existing natural water features of the stream and to minimize environmental impacts in the area of the diversion works. This diversion location is at an inflection point in the channel gradient ~~and a change in channel direction~~. A historic water diversion utilized the natural gradient existing at the site to divert streamflow into a ditch for lumber conveyance purposes. The control/fish screen structure will be placed ~~within a short segment of~~ adjacent to the diversion structure, and the pipeline/penstock will be placed in this historic ditch alignment. The diverted water entering the intake structure will move away from the South Fork Battle Creek main channel and maintain an elevation above the main channel as the stream proceeds downstream, due to the 3 to 5 percent stream channel gradient downstream of the proposed diversion. The diversion structure has been modified from what was originally proposed and is now finally located a few hundred feet upstream from the original proposed location as shown in updated Exhibit F, Drawings. This was done based on consultation with CDFW and based on the results of the Sedimentation Study

(NHC 2015) to allow the originally proposed remote “in-line” downstream fish screen structure to be incorporated into the diversion structure and to be in a straighter run of the stream to allow for optimized sediment pass-through. The Operating Water Surface Level has been retained at 4,310 feet, so the retention pond is, therefore, smaller due to the diversion relocation upsteam. Operable pneumatic gates in the center of the diversion structure, and bottom opening sediment sluices have been added on either end of the diversion structure, to allow for optimized sediment pass-through in sluicing and in off-operation periods when the pneumatic gates drop and open to allow all flow and sediment to pass-through like the diversion structure didn’t exist.

### 1.1.1 Diversion Dam Instream Flow Bypass Channel and Fish Passage

The diversion dam will be a buttressed concrete stem wall structure placed in the streambed, perpendicular to streamflow. It will be ~~94~~ 63 feet in total length at an installed height of ~~6~~ 8 feet above the natural streambed floor. River rocks displaced during diversion construction will be stockpiled and placed against the upstream and downstream faces of the structure for ballast and to be visually consistent with the boulder-strewn environment present in the natural streambed. The required instream bypass flows will be continually maintained passing through the instream flow bypass channel incorporated in the diversion dam. The applicant ~~will work~~ has worked with the California Department of Fish and Wildlife (CDFW) post-license submission to finalize the ultimate design for desired fish passage elements to be contained within the diversion dam instream bypass flow channel as shown in Exhibit F, Drawings.

### 1.1.2 Intake Structure

The Intake Structure will be a ~~20~~ 17 by ~~10~~ 25 foot enclosed concrete structure located out of the normal stream wetted area constructed partially in the south bank above the stream-adjacent to the Diversion Structure. Project operating flows will be diverted into the structure through two 5 foot by 12 ~~a 6 by 16~~ foot trash racks. Debris accumulating on the trash rack will be manually removed when debris impedes flow into the intake structure, and hauled away from the influence of the stream. The intake structure will have facilities to flush accumulated sediments. This will be accomplished by manually opening debris valves installed within the intake structure. For normal operations, the diverted water will pass through the intake structure and into the control/fish screen structure. A manually-operated and automatically controlled sluice gate will isolate the control/fish screen structure which will allow isolation of flows during periods of non-operation and maintenance.

### 1.1.3 Control/Fish Screen Structure

The control/fish screen structure will be ~~an~~ approximately ~~12~~ 20 by ~~48~~ 59 foot located contiguous with the enclosed concrete intake structure as shown in Exhibit F. ~~The control/fish screen structure will be~~

~~connected to the intake structure and located within the disturbed ditch grade and in the south bank of the stream out of the influence of the natural streambed.~~

Consistent with consultation with CDFW and per the CDFW (NOAA/NMFS Southwest Region Fish Screening Criteria for Anadromous Salmonids January 1997) and NOAA/NMFS (NOAA/NMFS Northwest Region Anadromous Salmonid Passage Facility Design July 2011) fish screen and passageway design criteria, although the intake and fish/screen control structure as shown on the updated Exhibit F is contiguous with the diversion structure and fish passageway, it does not meet the definition "in-steam" fish screen but falls under the definition of a "canal" fish screen. As a canal fish screen in the presence of resident trout fry, the Design Approach Velocity shall not exceed 0.40 feet per second (fps), and Screen Face Material - perforated plate or woven wire -screen openings shall not exceed 3/32". These elements have been incorporated into the updated design as shown in Exhibit F, Drawings.

Based upon the design criteria, ~~L~~ located within the control/fish screen structure will be twenty-seven ~~nine~~ 4-feet-by-8-feet stainless steel perforated plate ~~flat~~ panel screens. Specifications for each 4-foot-by-8-foot screen panel are as follows:

- Hole type: round
- Pattern: 3/32 x 5/32 ~~5/32 x 3/16~~ centers
- Pattern type: 60 degree staggered
- Open area: 33 ~~63~~%
- Holes per square inch: 48 ~~33~~
- Wetted screen area per panel: 29.69 ~~31.67~~ ft.$^2$
- Total wetted screen area: 800 ~~285~~ ft$^2$

Fish screens will be automatically cleaned by a travelling screen cleaner as frequently as necessary to prevent flow impedance and violation of the approach velocity criteria. Frequency of cleaning cycles will be determined by installation of water level transducers (sensors) to continually monitor WSL on either side of the screens. Operating WSL within the structure will be maintained within +/- 0.5 inches. Flows to the turbine will be determined by changes WSL and automatically adjusted.

WSL sensors at the control/fish screen structure and pressure sensors at the powerhouse will continually monitor operating parameters. In the event of unanticipated pipeline rupture, inflow into the structure will be stopped by closure of the automatically controlled sluice gate located at the inlet to the structure. The automatically controlled sluice gate will also be programmed to close, relative to the ramping sequence, maintaining the WSL in the structure during normal maintenance and/or dewatering scenarios.

Also, per the design criteria for a canal, a juvenile fish return pipe has been incorporated into the downstream end of the fish screen structure. Some flow through the intake and past the fish screens will continue into this juvenile fish return pipe which will return any fish entering the fish/screen control structure into the pond near the bottom of the fish passageway. This flow in the juvenile return pipe will be a part of the instream flow maintained during project operations. And, the sum of this juvenile fish return pipe flow and the fish passageway flow make up the total maintained instream flow.

## 1.2 Pipeline and Penstock

The Project will include ~~7,258~~ 7,565 feet of 48-inch high-density polyethylene (HDPE) low-pressure pipeline and 5,230 feet of 36-inch welded steel high-pressure penstock. All pipe and penstock material will be of new manufacture. The total length of the pipeline/penstock will be approximately ~~12,493~~ 12,795 feet (2.4 miles) placed within the 40-foot-wide penstock ROW. The pipeline and penstock will be buried in accordance with general engineering and construction practices to assure proper bedding and approximately 3-feet of cover.

The low pressure pipeline will begin at the control/fish screen structure (invert elevation 4,304 feet) and follow the general alignment of the historic ditch grade approximately ~~7,258~~ 7,565 feet (1.4 miles) to be joined to the high pressure steel penstock at a cast-in-place concrete transition structure at an invert elevation of 4,192 feet. The low-pressure pipeline will be 48-inch diameter HDPE with a wall thickness as required per the expected pressure within the pipe at each respective elevation. The pipe lengths will be joined by fusion welding and flanged joints. The 36-inch high-pressure penstock will begin at the transition structure and terminate at the powerhouse (elevation 3,350 feet). The approximate length will be 5,230 feet (1 mile). The high-pressure penstock will be of spirally welded steel American Society for Testing and Materials (ASTM) A-139 and ASTM A-252 standards. Grades and thickness of the steel pipe will vary depending upon pressure head. The steel pipe will be field welded and inspected by third parties. Anchors, thrust blocks, and expansion joints will be provided as necessary. The exterior of the pipe will be protected against corrosion with the application of factory-applied coal tar enamel coating and the interior of the pipe will be protected with polyurethane lining.

An emergency sluice gate located within the control/screen structure will block water flowing into the penstock in the unlikely event of penstock rupture. Pressure-differential, water level, and velocity sensors will be installed to sense any anomaly indicating a rupture in the penstock.

## 1.3 Transition Structure

The transition structure will be an engineered cast-in-place concrete block structure located downhill from the control/fish screen structure and uphill from the powerhouse. It will encapsulate a fabricated bell reducer (a pipe fitting that joins two pipes of different diameter) providing the transition from the 48-inch low-pressure HDPE pipeline to the 36-inch high-pressure steel penstock. Attachments to both the 48-inch low-pressure HDPE pipeline and to the 36-inch high-pressure steel penstock consist of bolted flanges outside of the structure. The transition structure will be buried with the pipes and not visible after construction of the proposed Project is complete.

## 1.4 Powerhouse

The powerhouse will be located on the south bank of South Fork Battle Creek with a floor elevation of approximately 3,350 feet. The powerhouse will consist of a reinforced concrete foundation and a metal building designed to blend into the natural environment. The powerhouse will contain all switchgear, circuit breakers, meters, valves, and controls necessary to operate and monitor the Project. The 36-inch diameter high-pressure penstock will enter the powerhouse at its south east corner. The penstock will be anchored within an engineered thrust block, located approximately 40 feet upstream of the powerhouse. The 36-inch penstock will be attached to the thrust block via bolted flanges outside of the thrust block. From the downstream attachment point, the penstock enters the powerhouse and attaches to the turbine. A dresser-type coupling will be attached to the penstock approximately 3 feet upstream of the powerhouse foundation. The coupling will be contained within a vault allowing access and visual inspection. The powerhouse will disturb an approximate 50 by 50 foot area.

### 1.4.1 Turbine/Generator

The turbine will consist of one multi-jet vertical Pelton-type and will be closed–coupled to a synchronous generator. The design flow for the turbine will be 95 cubic feet per second (cfs). Minimum operational flow for the turbine will be 5 cfs and maximum flow will be 105 cfs. The generator will be nameplated at 5,000 kilowatts at an effective net design head of 791 feet.

### 1.4.2 Tailrace

Tailwater from the turbine will exit (fall off) at atmospheric pressure into the tailwater chamber (floor invert elevation 3,435.6 feet) within the powerhouse foundation. Tailwater will then enter the buried concrete box culvert (8 by 6 by 70 feet) and exit to the stream at invert elevation of 3,417 feet. Tailwater will cascade 9 feet to the rock-strewn streambed (elevation 3,408 feet) over existing large boulders. The observed high-water mark (1997, 100 year event) elevation is 3,414 feet and approximately three feet below the tailrace exit invert elevation. There is no barrier rack or screen contemplated at the tailrace exit as it releases the water 9 feet above the streambed cascading over existing boulders and is not accessible to fish in the stream. Tailwater exit velocity is projected not to exceed 3 feet per second (ft/s) at maximum operating flow.

## 1.5 Substation

An enclosed and security-fenced substation will be located approximately 500 feet west-southwest of the powerhouse and within the eastern portion of the multipurpose area near the powerhouse. Underground conduits from the powerhouse to the substation will convey generated power at 4,160 volts to the transformer located in the fenced substation where the power will be stepped up to 60 kV.

The 12 kV station service line will extend from Highway 36 aerially to the substation and then continue to the powerhouse in underground conduits. All underground conduits will be buried within the access road from the substation to the powerhouse. The substation will disturb an approximate 50 by 50-foot area.

## 1.6 Station Service Line

An approximately 0.5-mile-long 12 kV aerial station service line along a 40-foot-wide right-of-way (ROW) easement will be constructed from the substation location southeast to the PG&E 12 kV distribution line adjacent to Highway 36 to provide electricity and phone service to the powerhouse facility. The station service line will be constructed aerially on wood poles from Highway 36 to the substation, and will continue from the substation to the powerhouse in underground conduit buried within the access road from the substation to the powerhouse. The installation of the poles for the station service line will require augured holes in the soil up to 8 feet deep and approximately 12 inches in diameter. The poles will be erected into the holes (directly embedded) and then backfilled for a secure installation.

## 1.7 Transmission Line

Power generated from the Project will be transmitted by a new approximately 12-mile-long 60 kV transmission line within a 40-foot-wide ROW easement to the point of interconnection (POI) on the PG&E 60 kV Volta-South transmission line in the town of Manton, California. The transmission line will be supported by both wood towers and wood poles.

The new transmission line will begin at the substation and proceed in a westerly direction approximately one-half mile down the canyon. It will then turn north approximately 1 mile, crossing Panther Creek. The transmission line then traverses west-northwest approximately 10.5 miles to the switchyard and POI on South Powerhouse Road. The transmission line and appurtenant facilities will be located entirely on private lands with the exception of approximately 1.5 mile of transmission line within the Tehama County road ROW on Hazen and School House Roads. If the "Alternate" Transmission Route is selected, approximately 2 miles of transmission line will be located in the Tehama County, CA public road ROW on Hazen and South Powerhouse Roads.

## 1.8 Switchyard

The switchyard will be located approximately 300 feet east of the POI on South Powerhouse Road within the Rugraw, LLC ROW easement on private lands. The security-fenced switchyard will contain the metering and protective devices as required by the utility. The switchyard will disturb an area of approximately 40 by 35 feet with a depth of disturbance of up to 2 feet to accommodate the 10 by 10-foot concrete block construction metering and protection building, foundation and floor slab. There will be an approximately 0.1 mile aerial 12 kV power line connected to an existing PG&E distribution line adjacent to the POI on South Powerhouse Road to provide electrical and telephone service to the switchyard.

### 1.9 Multipurpose Areas

Multipurpose areas include construction yards, storage areas, staging areas, and helicopter landing and staging sites. Multi-purpose areas will vary in size from 100 by 100 feet to an acre and be located within previously disturbed areas (e.g., log landings) on private lands entirely within the study and monitoring areas. A total of four multipurpose areas will be required: one construction yard near the diversion dam; one construction yard near the powerhouse; one multipurpose area near the Old Highway 36 Bridge that will also serve as the helicopter landing site; and one multipurpose area toward the west end of the Project to support transmission line construction.

# 2. Proposed Mode of Operation

## 2.1 Energy Production, Head, Hydraulic Capacity, and Impoundment

### 2.1.1 Energy Production

The Project is expected to produce between 21,000,000 kilowatt hours (kWh) and 30,000,000 kWh annually with the average to be approximately 25,000,000 kWh annually.

### 2.1.2 Static and Design (Net) Head

Static head for the Project equals elevation change from the WSL of 4,310 feet at the diversion/intake to the turbine exit at the powerhouse at 3.445 feet elevation, which equals 865 feet. The design (net) head equals the static head less the pressure losses in the pipeline/penstock between the control structure and the powerhouse, which is expected to be 791 feet at the design flow of 95 cfs. The head is the energy per unit weight (or unit mass) of water. The static head is proportional to the difference in height through which water falls.

### 2.1.3 Hydraulic Capacity

The minimum water inflow through the intake structure for turbine operation is 5 cfs. With a minimum instream bypass flow of 13 cfs, a natural stream flow quantity of 18 cfs must be present at the diversion to commence turbine operation. The maximum water inflow allowable through the turbine is 105 cfs. With sufficient stream flows for operation at the design flow of 95 cfs, and minimum retained flow in the stream of 13 cfs, any natural flow over 108 cfs will supplement and be in addition to the 13 cfs minimum retained flow to be maintained within the entire bypass reach. Based on information garnered from the sedimentation study and in consultation discussions with resource agencies, the project is planned to go "off-line" at very high flows. Initially this is thought to be in the range of 450cfs, but will be determined based on actual operation of the project. This operating rule is for a combination of the protection of the project structures and operating equipment, the safety of the project operators and for the overall health of the stream allowing it to run its natural and unimpeded course in extreme high flow conditions. With the lowering of the pneumatic gates in the center of the Diversion Structure, this will also allow all sediment pass through and transfer in the system like natural and unimpeded course in extreme high-flow and flood conditions.

### 2.1.4 Impoundment

The surface area of the pond for the Project is approximately ~~0.5~~ 0.4-acre at normal WSL operating elevation of 4,310 feet. Water surface elevation is expected to be maintained at +/- 0.5 inches throughout the normal operating range with no storage capacity.

This Project will be operated as a run-of-the river (ROR) project. ROR facilities produce electricity by diverting river flow through turbines that spin generators before returning water back to the river downstream. Little water storage is required in a ROR operation. The diversion works will re-establish the pre-existing pond of approximately 0.5-acre in surface area. The plant will be a non-peaking facility with no storage capacity and automated to efficiently utilize variations of stream flow

## 2.2 Bypass Reach

The bypass reach on South Fork Battle Creek extends 2.4 miles from the diversion, intake and control/fish screen structures at RM 23 to the powerhouse tailrace at RM 20.6 where all flow will be returned to the stream. The proposed location of the powerhouse, different from previous proposals for the Project, is located 1.7 miles upstream of Panther Grade (RM 18.9), a putative barrier to upstream fish migration, and the upper Project limit of the BCSSRP (Jones and Stokes 2005). Thus, the Project will not affect flows at Panther Grade and anadromous fish will only enter the Project bypass reach if they successfully pass over Panther Grade and travel an additional 1.7 RM up to and past the powerhouse tailrace. The bypass reach has been noted as critical habitat for ESA listed steelhead that extends up to Angel Fall at RM 22.3 and critical habitat for ESA listed spring-run Chinook salmon which extends up to RM 21.4. However the presence of either of these species in the bypass reach is not known since the designation was made after downstream barriers to anadromous fish passage had been in place for many years.

The instream bypass flow will flow through ~~a slot in the diversion dam into~~ a fish passageway, the final design of which the applicant ~~will agree to~~ has developed in consultation with the CDFW. As the Project will have a minimum operating limit of 5 cfs and a maximum flow capacity through the turbines of 95 cfs, the flow regime through the bypass reach can be predicted through the use of historical flow data from the Old Highway 36 gauge (near the Project intake). A proposed minimum instream bypass flow of 13 cfs will be maintained whenever the Project is operating, provided the stream is naturally flowing at 13 cfs or greater. At lower flows, and at natural flows up to 18 cfs, the entire natural streamflow will stay in the stream and not be diverted as the Project will cease to operate. At flows equal to 18 cfs (13 cfs + 5 cfs needed to initiate turbine operation), the Project will operate at the minimum operating flow of 5 cfs. This scenario is illustrated in Figure 2-1 for the median daily flows over the period of record. This graph for "Median" flows ~~It~~ shows that hydro operations would typically cease in early July and resume in mid to late November. It also shows that flows will naturally exceed 108 cfs (95 cfs turbine capacity plus 13 cfs bypass flow), and result in bypass flow frequently in the 30-60 cfs range during the spring runoff season (April – June). See also analysis of Hydrology (NHC 2014) and record of measured and synthetic stream flows (NHC 2014) to see what dates hydro operations might cease in various years and water year types based on when natural flows drop below 18 cfs.

The proposed minimum instream flow of 13 cfs was designated to sustain functions that support fish and habitat in the stream. Minimum instream flow releases during Project operations will be maintained at all times and monitored in accordance with requirements of the CDFW.

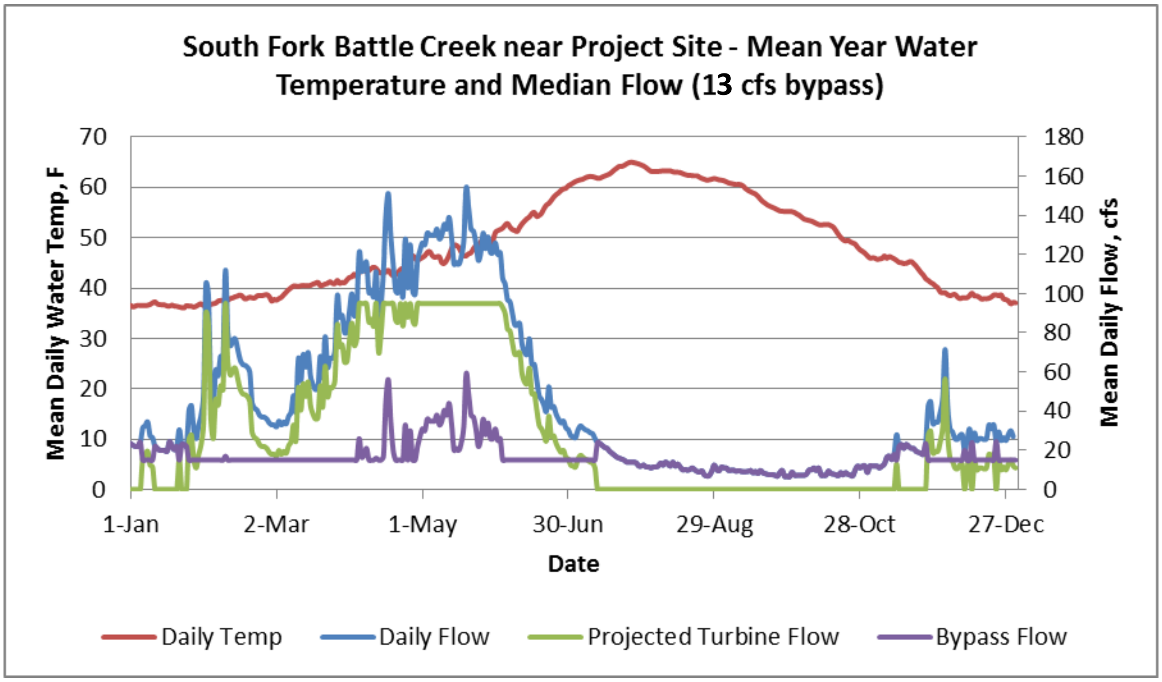


**Figure 2-1.** Average flow and temperature regime of the SF Battle Creek with the proposed minimum instream flow of 13 cfs in the bypass reach. The analysis assumes a minimum turbine flow of 5 cfs and maximum turbine flow of 95 cfs as suggested in Knight-Piesold (Hydmet 2012). Temperatures are the average of 2004-2006 at the powerhouse site. Flows are the median of daily values at Old Highway 36 bridge for 1959 – 1967 (Department of Water Resources [DWR]) and June 1995 – May 1996 and May 2011 – February 2012 (Hydmet 2012)).

## 2.3 Sluicing Operations

Sluicing operations will be completed in a manner that will not increase sediment deposition above background levels and in compliance with requirements of the CDFW.

## 2.4 Air Entrainment and Nitrogen Supersaturation

The Project intake, penstock, and turbines will be designed to prevent air entrainment and gas supersaturation in the powerhouse discharge waters. Protections of downstream fish species, maximum plant efficiency and good turbine operation have the same goals in this respect. Excess dissolved gases in water can be harmful to fish, particularly small fingerlings and fry. Gas can come out of solution after it enters a fish's bloodstream and causes internal hemorrhaging and "pop-eye". Increase of both air bubbles and dissolved air will be prevented by designing the intake to avoid vortices and prevent air entry into the pipeline. The Pelton turbine will spray water against the turbine buckets and casing which will release dissolved gases at atmospheric pressure.

## 2.5 Flow Continuity and Ramping Rates

A system of control features at the diversion works and the powerhouse will control changes in the rate of water diversion. Any rapid changes in the rate of flow diversion could cause adverse effects on fish, wildlife, or even human safety through rapid changes in water surface elevations in the reaches below the diversion works. These changes could result either from normal Project operation or in the event of a load rejection. Two controls will be in place to regulate the rate of diversion:

1. Ramping Rate: Under normal operation any change in diversion flow, whether from powerhouse startup or shutdown will be regulated slowly. The standard rate-of-change will meet the agreed upon criteria of the CDFW of 30-percent of the existing stream flow per hour (10 percent load every 20 minutes), or less, regulated in small incremental stages by automatic or manual valve control.
2. Flow Continuity: In the event of load rejection when power is no longer able to be transmitted, generation must stop as quickly as possible or the generator and circuits may be damaged. The Pelton turbine has automatic jet deflectors to divert the water stream from the turbine cups on the turbine wheel and will continue the water flow in the system and tailrace.

## 2.6 Vegetation Management

The transmission line, service station line, and pipeline/penstock ROWs will require regular vegetation management activities during operation of the Project to ensure the safe operation and reliability of the Project. Minimum clearance distances from conductors must be maintained to prevent fires and outages that could be caused by trees or vegetation damaging the lines. Deep-rooting vegetation will not be allowed to establish above the buried pipeline/penstock to prevent structural damage or failures from large roots. Vegetation management inspections will be conducted on an annual basis and clearing or danger tree removal conducted as needed to maintain reliability of the Project.

# 3. Proposed Mode of Construction

Construction of the Project would include the following activities at most Project element locations:

- Delineation (by staking and flagging) of work and avoidance areas.
- Mobilization of construction equipment, personnel, and materials for clearing, grubbing, grading and surface preparation of construction and multi-purpose areas.
- Installation of erosion and sediment control structures (e.g., silt fence) in compliance with the Project Storm Water Pollution Prevention Plan (SWPPP).
- Clearing and grubbing of vegetation and debris within the limits of construction and ROW easement areas as shown on the construction plans or as designated by the engineer. Vegetation and debris will be removed and disposed of on-site away from the influence of the stream. This work also includes preserving (from injury and defacement) vegetation and objects designated to be protected and remain in place.
- Grading and surface preparation of roads for access to Project components. Most roads to be utilized for the Project are existing logging roads. New roads will be constructed to access the diversion works and powerhouse.
- Excavating, forming, and placement of concrete foundation and other components. Foundations will be required for the powerhouse, substation, switchyard, transition structure, diversion dam, intake structure, and control/fish screen structure.
- Backfilling, clean up, and revegetation of temporarily disturbed areas.

## 3.1 Diversion Dam, Intake and Control/Fish Screen Structures

The footing excavation for the diversion dam, intake and control structures will be constructed in two sections. The southern section will be completed first in the streambed but out of the stream flow during low stream flow periods and will include the intake and control structures footing work as well. This work will consist of excavating the streambed and southern bank to receive the diversion dam and intake structure components (approximately 125 cubic yards [CY] of excavation) and pouring in place the concrete footings (approximately 35 CY of concrete footings will be poured in place to be cured in the streambed for the southern section diversion dam and intake structure components). The excavation will be done to minimize the impact to the streambed outside of the footprint of the footing. Rocks removed for the footings will be restacked on the either side of the diversion dam once completed. The control/fish screen structure will be located in the southern bank and at the head of the historic ditch grade out of the natural streambed (except possibly in severe high-water/flood flows). The southern bank will be excavated for the control/fish screen structure (approximately 400 CY). The footing and floor area will be formed, and poured in place on site (approximately 40 CY).

Once the southern portion is complete, the stream will be diverted through the diversion dam dewatering drain pipe at invert elevation 4,304' to maintain its natural flow. Then the northern section of the diversion dam footings would be excavated (approximately 40 CY) and the concrete footings poured in place (approximately 20 CY of concrete footings will be poured in placed to be cured in the streambed for the northern section). After both sections of the footings are complete, precast concrete elements cured off-site will be brought to the site and installed for the diversion dam, buttresses, intake and control structure walls and will be attached to the cast-in-place concrete floor and to each other. Valves, piping, and screens will be attached to the intake and control structure walls. The northern and southern diversion dam abutments that meet with the hill slopes and the intake and control structures will be backfilled to meet existing established finished grades (approximately 400 CY). Upon completion of all of the Project elements, the diversion dam dewatering drain pipe will be closed and the impound behind the diversion dam will form.

For the diversion dam, intake and control/fish screen structure construction and associated piping as described in detail above and as depicted on Drawing Sheets 6 through 9, there will be a total of approximately 565 CY of excavation, 95 CY of poured in place concrete to be cured on-site and 400 CY of backfill to match up to existing established finished grades.

## 3.2 HDPE Pipeline and Penstock

The 40-foot-wide pipeline and penstock corridor will be cleared and graded to establish access for excavating equipment. The 48-inch diameter HDPE pipeline trench which starts in the existing ditch grade at the control/fish screen structure will be excavated to finished invert grade in segments of approximately 1,000 feet (approximately 2.85 CY of excavation and backfill per lineal foot (LF) of HDPE 48-inch pipe, or 142.5 CY per 50 foot pipe length, or 2,850 CY per 1,000 foot segment, or 21,560 ~~20,685~~ CY for approximately 7,565 ~~7,258~~ total LF of 48-inch diameter HDPE pipeline excavation and backfill). The HDPE pipeline joints will be seam welded together to create 500 to 1,000-foot pipe units as appropriate. Pipe units will be positioned in the excavated trench and attached to adjacent pipe units by seam welded bolted steel flanges. Placed pipe units will then be backfilled and graded to meet existing established finished grades. The HDPE pipeline continues approximately 7,565 ~~7,258~~ feet this way until it connects with the cast-in-place concrete transition structure buried in the ground and located at invert elevation 4,192 feet. The 36-inch diameter steel penstock starts at the transition structure and continues downslope to the powerhouse approximately a mile (5,230 feet) away.

The steel pipeline trench will be excavated to finished invert grade (approximately 2 CY of excavation and backfill per LF of pipe, or 100 CY per 50-foot penstock segment, or 10,460 CY for all 5,230 LF of 36-inch diameter steel penstock excavation and backfill). Then the pipe units will be welded together at the joints and x-rayed to inspect that the welds are secure and acceptable before being placed into the trench. Welded pipeline segments will then be placed into the trench and backfilled to match established existing finished grade.

### 3.3 Powerhouse and Tailrace

The powerhouse access road, powerhouse and tailrace areas will be cleared and graded to extend the existing logging road access the powerhouse area (estimated 16,800 CY of excavation/cut and 1,650 CY of engineered and compacted soil fill will be incorporated into the powerhouse road extension and powerhouse foundation site). The powerhouse foundation will be formed and approximately 200 CY of reinforced concrete will be poured to form the base for the turbine, generator and thrust blocks for the penstock transition to the turbine. The powerhouse structure will be erected. The turbine and generator will be placed in the powerhouse. The controls and wiring will be completed. Concurrent with the powerhouse construction, the excavation for the cured off-site precast concrete box culvert tailrace sections will be accomplished in the southern (near) bank above and out of the streambed (approximately 300 CY of excavation). Once assembled and connected together, the precast concrete tailrace culvert will be placed in the excavated tailrace channel and then backfilled to match existing established finished grades (approximately 175 CY of backfill). Once all of these Project elements are completed the powerhouse will then be ready for water in the penstock and test operations followed by production operations.

### 3.4 Substation

Construction of the substation will require clearing and grading of a 50 by 50-foot area. A 12 by 12-foot concrete pad will be installed to support the transformer. This will be surrounded by a 20 by 4 foot by 2-foot-deep concrete floor and wall oil containment pit filled with gravel to bring the surface back up to grade elevation. A 3-pole wooden H-frame structure will be installed to convey electricity on overhead power lines from the transformer, which will be fed by Project-generated power via cables in underground conduit from the powerhouse, to the 60 kV transmission line that leads to the POI in Manton. The wooden H-frame structure will be installed as described below for transmission and station service line structures. The substation will be surfaced with gravel and surrounded by an 8-foot-tall security fence with two locking gates.

### 3.5 Transmission and Station Service Line

The installation of the transmission and service station line poles/towers will require augured holes up to 8 feet deep and approximately 12 inches in diameter. Each hole augured for pole construction will result in less than 1 CY of soil disturbance per single pole set. Each pole will be erected into their respective hole and then backfilled for a snug installation. Most of the pole sets can be accessed on existing timber roads and will be set with conventional ground crews using auger trucks and pole trailers. In locations where the pole sets cannot be accomplished with conventional ground crews and equipment, helicopter aerial installations will be deployed. For long-span locations where wooden transmission “H” towers are utilized, in lieu of the typical single wooden pole as used on most of the transmission line, 3 poles will be utilized at each location with 3 augured holes and less than 3 CY of soil disturbance.

Tower sites will require a 60 by 40-foot workspace, while poles will require an 8 by 8-foot workspace. During construction, temporary transmission line pulling sites for utilization of tensioning equipment will be located approximately 10,000 feet apart. Pulling sites will be 50 by 100 feet and may occur outside the ROW easements but always within the defined study and monitoring areas. Conductor installation and pulling will be performed by conventional ground crews with conductor reels and pulling equipment trucks and trailers. In locations where the conductor installation and pulling cannot be accomplished with conventional ground crews and equipment, helicopter aerial installations will be employed.

## 3.6 Switchyard

Construction of the switchyard will require minimal clearing and grading of an approximate 40 by 35-feet area. A 10 by 10-feet foundation requiring excavation of up to 2 feet below the ground surface will be formed and poured on site in the southeast corner of the switchyard for the metering and protection building constructed out of concrete block walls. Two wooden H-frame structures will be installed within the switchyard: one on the east side where the 60 kV transmission line enters the area, and one on the west side towards the POI. An aerial 12 kV power line will be constructed to provide electrical and telephone service to the switchyard building from an existing PG&E distribution line adjacent to the POI. The 12 kV single wooden pole line and H-frame structures will be installed as described above for the station service line and transmission structures.

## 3.7 Construction Sequencing

Outdoor construction activities are proposed to commence in the spring and cease in late fall of each year. Such activities are weather-dependent, with the general outdoor construction period being from April 15th through October 15th. Unseasonably wet, dry and cold (frozen) conditions can modify start and ending dates.

1. The initial construction activity will be the mobilization of construction equipment, personnel, and staging of materials for clearing, grubbing, grading, and surface preparation of construction and multi-purpose areas and access roads.
2. After the roads to the diversion and powerhouse areas are upgraded, construction will commence on the powerhouse foundation.
3. Simultaneous with upgrading of diversion and powerhouse roads, clearing, grubbing, grading, excavation and placement of the HDPE pipeline and steel penstock will commence working from the top down (form the intake to the west) and from the bottom up (from the powerhouse to the east).
4. Powerline ROW clearing and grubbing will commence. Upon completion of ROW preparation, individual pole and tower sites will be prepared. Upon completion of pole and tower sites, built-up poles will be delivered and placed. The electrical conductors

will then be placed, tensioned, and secured on the poles and terminated at the substation and switchyard.

5. Substation and switchyard components will be installed.
6. Construction of diversion, intake and control structures and tailrace will take place during periods of lowest stream flow. This is typically from August through September. Unseasonably wet, dry and/or cold (frozen) conditions can modify start and ending periods.
7. Installation of powerhouse rotating equipment will occur after the powerhouse foundation has cured sufficiently to receive the equipment. After placement of the rotating machinery, the powerhouse structure will be completed to a weather-tight condition and subsequent powerhouse equipment will be installed.
8. Upon completion of installation of all powerhouse components, testing of system components will begin.
9. After testing and acceptance, the plant will go into commercial operation.

## 3.8 Construction Schedule

The beginning construction of the Project is scheduled for May 1, 2016 ~~2015~~. The planned commercial operation date is October 15, 2016 ~~2015~~.

A more detailed proposed construction milestone schedule is as follows:

- Obtain final permits and approvals — May 1, 2016 ~~2015~~
- Issue Notice to Proceed (NTP) for construction — May 1, 2016 ~~2015~~
- Complete preconstruction biological monitoring and staking — Apr. 30, 2016 ~~2015~~
- Contractors mobilize on-site — May 2, 2016 ~~2015~~
- Commence powerline, substation, and switchyard construction — May 3, 2016 ~~2015~~
- Commence grading of powerhouse access road — May 3, 2016 ~~2015~~
- Commence grading of powerhouse foundation — May 4, 2016 ~~2015~~
- Commence penstock and HDPE pipeline excavation — May 6, 2016 ~~2015~~
- Form and pour concrete powerhouse foundation — June 2, 2016 ~~2015~~
- Excavate powerhouse/tailrace — June 16, 2016 ~~2015~~
- Install tailrace precast concrete box culvert and backfill — June 20, 2016 ~~2015~~
- Excavate, form, and pour concrete transition structure — June 25, 2016 ~~2015~~
- Complete HDPE piping and backfill — July 15, 2016 ~~2015~~
- Complete steel penstock installation and backfill — July 31, 2016 ~~2015~~

- Excavate diversion & intake south section (depends on streamflow) Aug. 1, 2016 2015
- Excavate control/fish screen structure Aug. 1, 2016 2015
- Pour concrete diversion and intake south section footings and slabs Aug. 3, 2016 2015
- Pour concrete footing and slab control/fish screen structure Aug. 3, 2016 2015
- Excavate diversion north section (depends on streamflow) Aug. 4, 2016 2015
- Pour concrete diversion north section footings Aug. 7, 2016 2015
- Erect diversion, intake, control structure precast walls Aug. 10, 2016 2015
- Backfill diversion, intake, and control structure Aug. 10, 2016 2015
- Install trash rack, fish screens, valves at diversion, intake, control Aug. 12, 2016 2015
- Build powerhouse building July 1, 2016 2015
- Set turbine and generator into powerhouse Aug. 1, 2016 2015
- Hook up turbine and generator controls Aug. 2, 2016 2015
- Finalize electrical for transmission line substation and switchyard Aug. 15, 2016 2015
- Test System – in-house Aug. 16, 2016 2015
- Send test energy to PG&E POI Sept. 15, 2016 2015
- Commercial Operation Oct. 15, 2016 2015

## 3.9 In-Water Work Window

The general in-water work window designated by the CDFW for SF Battle Creek is from July 1 to October 15. Extensions of this work window may be allowed based on rain forecasts (M. Myers, CDFW, pers. comm. 2011). This in-water work window has been developed for CDFW Streambed Alteration permitting with the intention to protect aquatic species and is designated for the time period when juvenile salmonids are least likely to be present. The primary in-water work elements proposed are the diversion dam, intake and control/fish screen structure concrete foundation and floor slab installations.

If any in-water work window extensions beyond those proposed here would be necessary (when the construction contractor develops their final work plan), then supplemental consultation would occur with CDFW and NMFS.