VINELANDS HYDROELECTRIC POWER PLANT

LOAN FEASIBILITY STUDY

SUBMITTED TO THE
COLORADO WATER CONSERVATION BOARD

Primary Contact: Max Schmidt, Manager
Orchard Mesa Irrigation District
688 38 Rd
Palisade, CO 81526
Phone: 970-464-7885
Fax: 970-464-5928
max@omirrigation.com

February 1, 2021

FEASIBILITY STUDY APPROVAL
Pursuant to Colorado Revised Statutes 37-60-121 &122, and in accordance with policies adopted by the Board, the CWCB staff has determined this Feasibility Study meets all applicable requirements for approval.

Signed

3/11/21
Date

Table of Contents

Contents Page

List of Tables

List of Figures

CWCB Loan Package

Executive Summary

Orchard Mesa Irrigation District and Grand Valley Water Users Association have partnered with Sorenson engineering to replace the 90-year-old, hydroelectric Grand Valley Power Plant, located about ½ mile southeast of the Town of Palisade. The new hydroelectric power plant will be known as the "Vinelands Power Plant."

The Grand Valley Power Plant was built by the US Bureau of Reclamation (BoR) in the 1930's and consists of two turbine / generator sets housed in a single building. It and the water rights that power the turbines are owned by the United States. The original plant capacity was 3.2 megawatts (A megawatt of electricity can power roughly 250 homes in Colorado). Until 2010 it was operated almost continuously by Public Service Company of Colorado, now known as Xcel Energy. In 2010 Xcel ceased to operate the power plant, and its operation was assumed by the Grand Valley Water Users Association and the Orchard Mesa Irrigation District, the "Irrigators."

The Grand Valley Water Users Association is a not-for-profit irrigation water delivery corporation operating on the north side of the Colorado River. It provides irrigation water to nearly 23,500 acres in Mesa County extending westward from the mouth of DeBeque Canyon nearly 40 miles and on both sides of Interstate 70 to beyond the village of Mack.

The Orchard Mesa Irrigation District is an irrigation district established under Colorado statute. It irrigates nearly 9,200 acres in Mesa County and on the south side of the Colorado River from the mouth of DeBeque Canyon, nearly 15 miles southwestward to the Gunnison River.

The water which powers the turbines is diverted from the Colorado River at the "Cameo Roller Dam", located in DeBeque Canyon immediately east of the intersection of Colorado Highway 65 and Interstate 70. The water is carried west in the "Canyon Canal" of the Grand Valley Water Users Association roughly three miles on the north side of the River. The Project's water then siphons beneath the Colorado River and continues westward along the south bank of the River just south of Interstate 70 through Orchard Mesa's "Power Canal" another 5 miles to a point near 38 Road, about ¼ mile south of US Hwy. 6. The water drops about 75 feet through piping to spin the turbines, which powers the generators. Both canal systems are part of the Grand Valley Project, which was created by the BoR in the early 1900's. The water rights associated with the power plant are part of the Cameo Call at the "Roller Dam" operated by the Irrigators.

Maintenance of the Cameo Call and associated facilities was identified as a high priority by the Colorado Basin Roundtable Basin Implementation Plan. Since 2015 a suite of improvement projects has been undertaken at the Roller Dam, water diversion structures, Canyon Canal, Orchard Mesa Siphon and a re-regulating reservoir on the Orchard Mesa system. Replacement of Grand Valley Power Plant is an integral part of these ongoing projects.

The Power Plant also provides significant benefits to the Colorado River Basin and the Grand

Valley specifically. It helps to convey the Irrigators water through the nearly 8 miles of canal upstream of the Power Plant. After the water spins the turbines, under certain circumstances it can be returned to the Colorado River at a location where it helps to sustain reliable flows in the Grand Valley Irrigation Company's ditch system.

Also, when the water is not returned above the Grand Valley Irrigation Company's point of diversion the water returned to the stream helps to sustain flows in the 15-mile reach of the Colorado River between Palisade and the confluence of the Colorado and Gunnison Rivers. That stream reach is critical habitat for four endangered fish species who benefit from the reliable flows created by the Power Plant "calling down" water from the upper reaches of the Colorado River in Summit, Grand, Eagle, Gunnison and Pitkin Counties, Colorado.

The Irrigators recognized when they took over the old power plant that it was near the end of its useful life. It had very few upgrades over its 90-year life and replacement parts were no longer available. Only one of the two generators at the old plant remains in operation today. The Irrigators began planning to rebuild or upgrade the power plant in 2014 in order to continue the benefits of having a hydroelectric power plant operating at the same location well into the future.

The Vinelands Power Plant

In early 2020 it became clear replacing the old power plant with a new plant adjacent to the old plant made economic sense. The new plant, to be called the "Vinelands Power Plant" (VPP), could be built less expensively than rebuilding the existing plant, and it will produce about 40% more power, nearly 4.5 megawatts.

The new VPP will be funded by a combination of private capital, loans, grants from both Federal and State sources, and grants from various non-profit organizations. Those organizations include the Colorado Water Trust, the Walton Family Foundation, Endangered Species Recovery Grant and Water Smart Grant (BoR), Species Conservation Trust Fund and loans (Colorado Water Conservation Board), and a grant from funds controlled by Grand Valley irrigators and domestic water providers.

The level of support from the several governmental and private foundations demonstrates the level of interest in the benefits of the VPP, especially as it relates to sustaining flows in the 15-mile reach of the Colorado River for the endangered species. The power generated by the VPP is considered to be renewable and "green" in character It will have zero emissions created by its electrical generation. It is a "Qualifying Facility" as defined under the Federal Public Utility Regulatory Policies Act of 1978 (PURPA).

Final negotiations are in progress to sell the VPP's electricity to a public utility in Central Colorado. Power revenues and the level of grant support make the plant both economic and sustainable. The VPP will operate 10-11 months annually, with the non-operating months used for routine maintenance of the plant itself and the water delivery system. The expected service life of the VPP is several decades.

The VPP will be privately owned by the Irrigators and Sorenson Engineering of Idaho. Sorenson specializes in the design, construction and operation of small hydroelectric power plants throughout the Western US, many operating as part of extensive irrigation systems. They have several similar projects operating in Montrose and Ouray Counties, Colorado.

The Irrigators will have a long-term lease of the Federal water rights to spin the turbine of the VPP and well as the land where the it will be built. They will carry the Federal water rights in the Grand Valley Project canals they operate to the VPP. Construction is expected to begin in Fall 2021 with the VPP generating electrical power by mid-2023.

1.0 BACKGROUND

1.1 Purpose

The existing Grand Valley Power Plant (GVPP) was built in the early 1930s by the United States through the Bureau of Reclamation near the town of Palisade, Colorado at the lower end of the Orchard Mesa Power Canal and has received very few upgrades since that time and is at the end of its useful life. Public Serve Company of Colorado (PSCC) operated the GVPP between 1931 and 2011 under a lease agreement between the United States, Orchard Mesa Irrigation District (OMID), and the Grand Valley Water Users Association (GVWUA). In 2011 the lease of Power Privilege (LOPP) was amended, removing PSCC as a party to the contract. The operation and maintenance responsibility of the GVPP were assumed by OMID and GVWUA.

The continued functions of the existing GVPP by replacement by a new Vinelands Power Plant (new Power Plant) is critical to Colorado River operations being located at the beginning of the 15 Mile reach, critical habitat identified by the Upper Colorado River Endangered Fish Recovery Program (Recovery). Power plant operations are an important element in assuring Endangered Species Act (ESA) compliance for 2200 water diverters on both eastern and western Colorado. The power plant has been instrumental in the creation of several recent progressive water stewardship agreements. Replacing the existing GVPP with an enhanced facility and operations assures the continued use, and expansion, of these agreements for the benefit of all Colorado River and related water needs.

The power rights associated with Power Plant are part of the Cameo Call at the "Roller Dam" in Debeque Canyon operated by the GVWUA and OMID. Maintenance of the Cameo Call and the associated facilities are identified as a high priority by the Colorado Basin Roundtable Basin Implementation Plan (BIP). Since 2015 a suite of improvement projects have been undertaken at the Roller Dam, diversion structures, Canyon Canal, and the Orchard Mesa Siphon. The replacement of the GVPP is an integral part of these ongoing rehabilitation and replacement projects.

OMID, GVWUA, members of the Grand Valley Fund (Grand Valley Irrigation Company, Palisade Irrigation District, Mesa County Irrigation District, Ute Water Conservancy District, OMID, and GVWUA, and the many other supporters of this replacement project

recognize its current importance and its increasing importance to the Grand Valley and the Colorado River Basin as climate, hydrology, and demographics continue to evolve. OMID and the GVWUA remain committed to securing and extending these multiple and ongoing benefits for all water users.

1.2 Study Area

The Grand Valley, located in west-central Colorado, Mesa County, is a broad valley about 12 miles wide and 35 miles long. The steep cliffs flanking its side have been cut by the Colorado River as it works its way to the Gulf of California. About midway through the Grand Valley the Colorado meets the Gunnison River near downtown Grand Junction. Fifteen miles upstream and to the east is the Town of Palisade. The GVPP is located adjacent to the District headquarters approximately 1mile south of the Town of Palisade on the south side of the Colorado River. The District's western boundary is the Gunnison River at the confluence with the Colorado near downtown Grand Junction. The elevation of the irrigated area averages about 4700 feet above sea level.

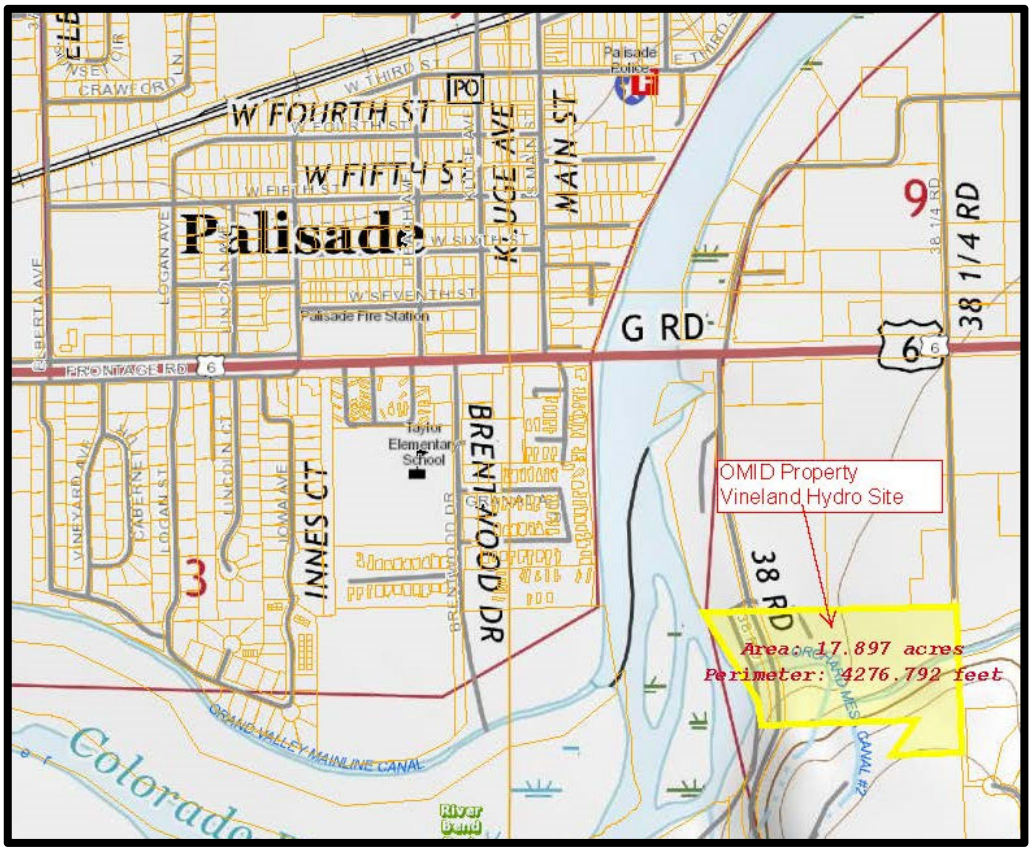

Figure 1 - Vinelands Hydro Location Map

The climate in the Grand Valley is that of mild winters and hot summers. Temperatures extremes can vary from occasional below zero in the coldest winters to above 100 degrees in the warmest part of the summer. The annual precipitation in the Grand Valley averages about 9.0 inches with most of the precipitation occurring during the spring and fall months. Table 1.1displays the annual precipitation, and Max and Min temperatures for a recent 11-year period at the nearby Grand Junction Regional Airport.

Climate Summary - Grand Junction Regional Airport			
2009 - 2019			
Year	Annual Precipitation (in)	Max Temp (F)	Min Temp (F)
2009	7.79	102	-16
2010	8.8	105	-9
2011	9.76	101	-9
2012	4.53	102	-5
2013	12.43	103	-12
2014	11.96	99	0
2015	13.25	101	-5
2016	8.83	104	-1
2017	5.08	102	-4
2018	8.21	102	7
2019	8.56	102	-4

Table 1 - Climate Summary 2009 - 2019

1.3 Previous studies

The Project Sponsors have had various engineering firms evaluate the GVPP and provide engineering proposals and feasibility studies for plant rehabilitation/rebuild.

Firm	Date	Type of Study
Electrical Machinery	December 2013	Alternative Presentation/ Component Quote
AECOM	April 2015	Feasibility Study
HDR	April 2015	Engineering Service Proposal
SGM	April 2015	Scoping Review
Wattera	April 2015	State of Qualifications
AECOM	April 2015	Technical Proposal
Sorenson Engineering	April 2015/2015	Feasibility Study/Rebuild Proposal
Sorenson Engineering	October 2020	Supporting Design Report

Table 2 - List of Previous Studies

2.0 SPONSORS

The fiscal and contractual responsibility for operation and maintenance of the GVPP lies equally with the Association and the District. The loan application and repayment responsibilities as outlined below are equally shared by both entities. A more detailed description of the sponsors follows.

District

The Orchard Mesa Irrigation District was formed under the Colorado Irrigation District Law of 1903. In 1921, districts were given the option to be governed under the Irrigation District law of 1921 (CRS 37-42-101 thru 141), which the District chose to do. The District is currently governed under the Irrigation District Law of 1921 and Article 43, Irrigation Districts of 1905, 1921 and Irrigation District Salinity Control Act (CRS 37-43-101 thru 211). The District was formed for the purpose of diverting, carrying and delivering irrigation water within the District's boundaries.

The District became a division of the U.S. Bureau of Reclamation's Grand Valley Project on March 19, 1921, through the Secretary of the Interior's approval under the Interior Department Appropriation Act for 1923 (42 Stat. S84). The Act authorized federal money for the reconstruction of the Orchard Mesa Division.

The District serves 9,200 acres and provides irrigation water to farms, vineyards, orchards, and subdivisions in the Grand Valley of Mesa County, east of the Town of Palisade, south of the Colorado River beginning at 39 1/2 Road. The northern boundary line follows the left bank of the Colorado River to the confluence of the Colorado and Gunnison Rivers near downtown Grand Junction, about 15 miles east of the GVPP. The southern boundary of the district is generally OMID Canal #2. The population within the District is about 15,500 and the population of the Grand Valley as a whole is around 100,000.

The District provides irrigation water to approximately 9,800 parcels in Mesa County, on the western slope of Colorado. The District receives monies through an annual assessment of the water users that is collected by Mesa County with property taxes. The 2019 estimated receipts from the assessments total $1,303,000. The OMID also receives interest income from cash reserves of about $116,000 annually. The District had total revenue on December 31, 2019, of about $2,015,000.

The major crops grown in the District include alfalfa, orchards, vineyards, corn/grain, pasture, grass lawns, and truck gardens. Most vineyards are irrigated with micro-spray or drip systems; orchards with a combination of gated pipe or micro-spray or drip; alfalfa and corn with gated pipe. There are some concrete and earthen siphon tube ditch systems.

Association

The Grand Valley Project was one of the first six projects to be authorized by the Reclamation Act of June 17, 1902, and the Grand Valley Water Users Association

(Association or GVWUA) was officially formed in 1905. It is a private incorporated not-for-profit ditch company. The Association is the managing entity for the majority of the federally owned Grand Valley Project. These Grand Valley Project facilities include the Grand Valley Diversion Dam and headworks, also known as the Roller Dam or Cameo Diversion, on the Colorado River in Debeque Canyon; the Canyon Canal through Debeque Canyon; the 55-mile-long Government Highline Canal; 150 miles of project operated laterals; 100 miles of drainage ditches; and the GVPP. In recent years, approximately 130 miles of the laterals have been re-constructed into pressure piped laterals.

GVWUA first delivered water in 1917 to Reclamation's Grand Valley Project and since then has furnished a full supply of irrigation water to approximately 1,800 water users on 23,500 irrigated acres under the Government Highline Canal and 15,000 irrigated acres under the Mesa County, Palisade, and Orchard Mesa Districts and diverts the water for the Grand Valley Power Plant year-round. Water for the GVPP is diverted at the Roller Dam, flows through the Canyon Canal and is diverted to the District's Power Canal along with the District's irrigation water at the mouth of what's known as Tunnel No. 3. Water flows under the Colorado River through a 12 ft diameter pipe and is delivered to the GVPP and the District's irrigation pumping plant through the 4-mile-long Power Canal.

The District and Association share in the cost of the Canyon Canal operation under a 1955 agreement at 71.6% and 28.4%, respectively. The Association undertakes daily operation of the Roller Dam and Canyon Canal while day-to-day operation of the GVPP and other OMID facilities are carried out by the District. Each entity contributes 50% of the cost of operation and maintenance of the GVPP.

Revenue for Association operations is collected through assessments that are billed in December for the upcoming irrigation season based on allotments for individual parcels of land. Any excess usage of water from the previous season is included on the December bill. Revenue collected by the Association from annual assessments totals a little over $1M per year.

Major crops served by the Association include corn, dry beans, alfalfa, grass hay, pasture, small grain and seed crops, fruits, vegetables and a variety of truck crops.

3.0 WATER RIGHTS

The water for the GVPP is diverted from the Colorado River at the Roller Dam and is a part of what's known as the "Cameo Call." The Cameo Call along with water rights of the Shoshone Hydropower Plant upstream in Glenwood Canyon, control administration of the Colorado River basin within Colorado. The flows generated by the "Cameo Call" help provide water for recreational activities, environmental benefits, irrigation, power production, some domestic water, and aesthetics along the entire Colorado River. Flows generated by the Cameo Call also help to fulfill the State of Colorado's obligations under

the Colorado River Compact and in maintaining water levels in Lake Powell. Water rights that comprise the Cameo Call are designated for irrigation, power production, and domestic use.

The GVPP is located at the beginning of the 15 Mile Reach designated as critical habitat and provides the legal mechanism to deliver surplus water from Green Mountain Reservoir for the endangered fish. Water rights for the GVPP are owned by the United States and put to beneficial use by the Association and District through the LOPP. The maximum water right of 800 cfs has an appropriation date of February 27, 1908, and was adjudicated in 1934. Depending on conditions, the Power Canal has a capacity of up to 800 cfs. Typically, during irrigation season up to 400 cfs may be used for power production while the remainder is used to power the hydraulic pumps delivering water to the District's irrigation canals. During the non-irrigation season, up to the Power Canal's capacity of about 800 cfs may be diverted solely for power production. Table 3 summarizes the water rights tied to the Cameo Diversion at the Roller Dam.

Owner	Amount	Adjudication Date	Appropriation Date	Use
GVWUA/USA	730	7/22/1912	2/27/1908	Irrigation
GVWUA/USA	400/800	1934	2/27/1908	Hydro-electric Power
GVWUA/USA	220	7/25/1941	2/27/1908	Domestic & Livestock
OMID	450	7/22/1912	10/25/1907	Irrigation
OMID	10.2	7/22/1912	10/1/1900	Irrigation
Palisade Irrigation District	80	7/22/1912	10/1/1889	Irrigation
Palisade Irrigation District	23.5	7/25/1941	6/1/1918	Irrigation
Palisade Irrigation District	40	7/22/1912	7/6/1903	Irrigation

Table 3 - Cameo Diversion Water Rights

4.0 Project Description

4.1 Analysis of Alternatives

Under the No Action Alternative, the Sponsors would not build a new power plant and Reclamation would not issue an LOPP. Due to the unfavorable economics of rehabilitating the 90-year-old plant, the existing Grand Valley Powerplant would cease operations. The US Bureau of Reclamation would lose the ability to put their 400 summertime and 800 cfs wintertime power water right to beneficial use, thus putting the water rights at risk. Protection of the hydropower return flows and all other legally available water that can be delivered to the 15 Mile Reach via the powerplant would cease. The loss of these indirect deliveries to the 15-Mile Reach would make it

extremely difficult for Reclamation to fulfill its obligations to the Upper Colorado Endangered Fish Recovery Program and threaten ESA compliance for over 2000 Colorado River water diverters.

Rebuilding the existing Grand Valley Power Plant was determined to not be economically viable due to design and permitting requirements. The revenue generated from the limited capacity of the existing power plant were not adequate to rebuild the powerplant to meet USBR requirements and were limited by design and capacity of the historical equipment. It has proven to be much more cost effective to build a replacement 4.5 kW hydrogenating plant, adjacent the existing power plant, than to restore the existing plant to its original 3.5 MW capacity, and all our efforts in 2020 have been toward that end. Greater power plant capacity expands all the benefits associated with the Power Plant currently and in the future.

4.2 Selected Alternative

a. Under the proposed action the Sponsors would build a new power plant and Reclamation would execute an LOPP to permit GVWUA and OMID to construct, operate, and maintain a 4.5 MW hydropower plant and associated facilities adjacent to the retired Grand Valley Project Power plant. The applicant on the LOPP would be Grand Valley Water Users Association and Orchard Mesa Irrigation District. Water which previously flowed through the old powerplant would be directed into the new power plant. The pipeline from the power canal to the powerplant (penstock) would be buried from the power canal to the new power plant.

The new plant will, as does the current plant, operate under a Bureau of Reclamation License of Power Privilege exercising the use of and protecting the 400 cfs irrigation season and 800 cfs non-irrigation season US BOR power water right. The power right water along with any legally available water will be diverted at the GVWUA "Roller Dam" in Debeque Canyon into the Government Highline Canal (GHC) operated by the GVWUA and OMID and then diverted into the OMID "Power Canal" for carriage to the head of the Penstocks at the new plant. Portions of such water then being released from the plant's after bay will be available for Recovery's 15 Mile Reach, administration of the Orchard Mesa Check Case and the physical check itself, and other appropriate and allowable uses.

The new power plant will be operated by Grand Valley Hydro LLC (GVH LLC) ultimately comprised of OMID, GVWUA, and Sorenson Engineering. Initially the LLC will be owned by Sorenson Engineering (SE). After the first year of operation the Sponsors will secure a 20% ownership interest and after five years of operation the Sponsors will be 51% owners. Sorenson Engineering will build the facility, and retain a 49% ownership stake in the Plant. The new Plant will know as the Vinelands Power Plant.

GVH LLC is very close to a Power Purchase Agreement (PPA) with a regional power provider contain favorable terms and conditions making the new plant and GVH LLC economically and operationally feasible and sustainable.

The new Grand Valley Hydroelectric Project will be 4.5 MW and produce approximately 22,380 MWHrs of clean, non-carbon emitting energy annually. The project site is owned by the United States and Orchard Mesa Irrigation District. The project will be interconnected with Xcel Energy and the power wheeled to Holy Cross Energy. A general layout of the site is shown in Figure 2.

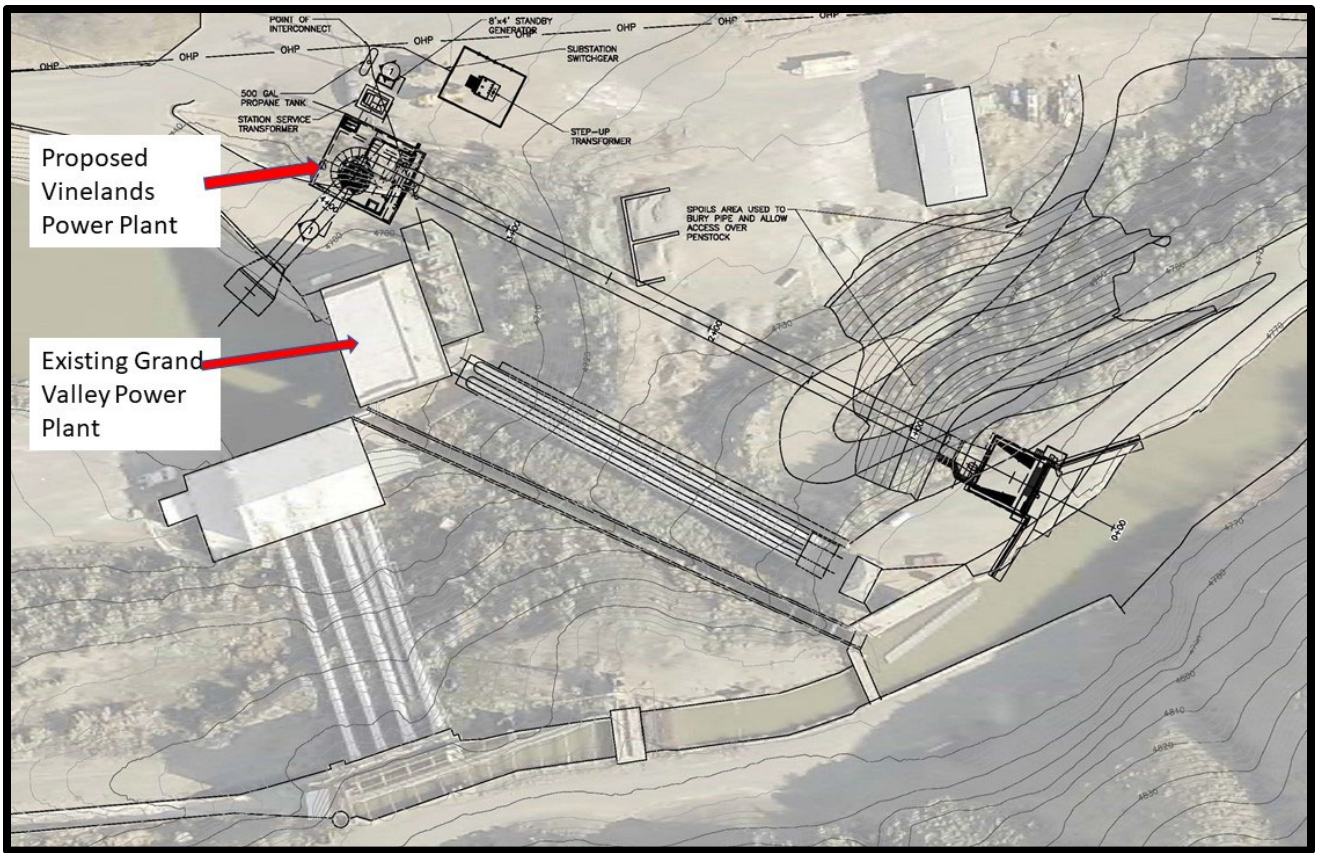

Figure 2 - General Layout of Vinelands Power Plant

Existing Substation

The existing substation equipment is owned by OMID and is located on OMID property. The existing substation will be removed. A 2016 soil sampling was conducted and there were no Polychlorinated Biphenyl (PCB) and any Volatile Organic Compound (VOC) fell well below the EPAs Regional Screen Levels. Based on the sampling results, no further action concerning hazardous materials was recommended.

Canal System

Water is diverted from the Colorado River at the Grand Valley Diversion Dam into the Government High Line Canal approximately 23 miles Northeast of Grand Junction, Colorado. Approximately 4.6 miles below the diversion dam at the inlet

of Tunnel #3, water for the Orchard Mesa Diversion is diverted from the Government High Line Canal. This water passes through the Orchard Mesa Siphon under the Colorado River and then through the Orchard Mesa Power Canal. The water quantity and quality will be unaltered by the hydroelectric power plant.

Siphon Bypass System
The existing, proven siphons will be used to automatically bypass flows in the event the hydroelectric facility shuts down for any reason. The proposed hydroelectric facility will not alter the siphon bypass system.

Intake Structure - The intake structure will be approximately 30’ long by 26’ wide section of new concrete to spread and slow the water. The water will then cross through a UHMW bar screen trashrack to remove debris. It will then enter the 120-inch-diameter penstock pipe which will deliver the water 275-feet-downstream to the powerhouse. Maximum pressure rise during an emergency shutdown is 20 psi. This was considered in the penstock design. A 24’ wide by 14’ high intake roller gate will be installed upstream of the trashrack. This will used to shut off flows to the hydroelectric facility for penstock maintenance.

The new intake structure will be adjacent to the existing intake structure. The existing structure will not be undercut during excavation for the new structure. The base elevation of both structures is 4756.20’.

The new western wing wall will tie into the edge of the existing structure. Dowel bars will be smooth round bars confirming to ASTM A 315/A 615M, Grade 60 or equivalent.

Ice management in this area has been a problem in the past. The OMID Manager, Max Schmidt has been successfully operating the existing facility (and ice management) since 2011 and will continue to do so with the proposed hydroelectric project. The proposed project is not anticipated to negatively impact ice management. The new trashrack will be constructed of UHMW to reduce potential ice issues.

Powerhouse
The powerhouse will be a 40’ wide by 36’ long steel building structure with a steel reinforced concrete foundation. The foundation will embed the turbine housing and steel draft tube. The draft tube extends approximately 65’ into the existing tailrace. The building will house the generator and mechanical/electrical auxiliaries. The building will be equipped with a roof access hatch to facilitate future maintenance.

Containment for any accidental spills inside the powerhouse will be contained by floor drains that go to an oil-water separator and sized according to NFPA 851 section 5.5.2.

Turbine
The turbine will be a vertical double regulated Francis. The turbine will be of American/European design built in China, as will be the generator. The turbine manufacturer is represented by Far East Power Equipment of Boise, Idaho.

Similar units have been installed in the United States by the Twin Falls Canal Company near Hansen Idaho, the Boise Project Board of Control in Ada County, Idaho, and the Uncompahgre Valley Water Users Association in Montrose, Colorado. Sorenson Engineering has ordered and installed 21 generation units from Mr. Lianggao Liu.

Turbine	Francis
Wicket Gates	Yes
Arrangement	Vertical
Rated Flow	800 cfs
Rated Head	75 ft
Speed	200 RPM
Rated Runway Speed	340 RPM

Generator-

Generator	Synchronous
Rated Speed	200 RPM
Rated Output	4.5 MW
Service Factor	0.9
Exciter	Brushless
Frequency	60 Hertz
Voltage	4,160 Volts

Mechanical Equipment
The turbine wicket gates will operate hydraulically. The hydraulic power unit will be of American make – with accumulators for black shutdown. The governor will be digital. The intake roller gate will be fitted with DC electric power by motor to drive the pinion gears. Level sensors (differential pressure) in the intake forebay will be utilized to provide information to the powerhouse PLC (programable logic controller) to maintain constant head in the upstream forebay and thus in the feeder canal.

Powerhouse Electrical Controls
The controls will be utility grade. The switchgear will be backed by 125 volt DC service battery system for operation of essential features during power outages, specifically turbine shutdown and maintenance of flow in the canal system including the bypass roller gate. The control panel will be fitted with an automatic telephone dialer to alert of alarm conditions. A dial in signal will allow remote

monitoring of the plant including critical variables (bearing temperature, voltage etc.) from any telephone.

Transformers
There will be two new outdoor oil-insulated transformers to the side of the powerhouse. The step-up transformer will be 5 MVA, 4,160 volts to 13,200 volts. The station service transformer will be 480 volts.

The station service transformer has less than 50 gallons of oil, and the step-up transformer has approximately 1,200 gallons of oil. The U.S. Bureau of Reclamation design standard 3-32 (Transformer Fire Protection 2005), recommends compliance with FM Global datasheet 5-4. Both transformers will meet these separation requirements.

The transformers will have concrete retention areas with a storage volume at least 1.5 times the volume of oil within the transformer per U.S. Code of Federal Regulations, Title 40 (CFR 40), Parts 110 and 112.

Substation and Transmission Line
The power will be interconnected to Xcel Energy and sold to Holy Cross Energy. It may be possible to use the existing power lines from the existing power plant to connect to Xcel Energy's transmission system. If these power lines are insufficient, it may be necessary to upgrade the power line from the power plant to Xcel Energy's Palisade Substation, approximately 0.5 miles away. If it is not possible to upgrade the existing power line, a new transmission line would be constructed to the Palisade Substation. The transmission line will be constructed on 40-foot poles with a pole spacing of approximately 300 feet. The transmission line will follow the north power canal O&M road east to 38-3/8 Road. It will turn north and go up the east side of 38-3/8 Road to the existing Palisade Substation.

Figure 3 - Possible transmission line route

A switchyard will be constructed at the powerhouse with a transformer capable of stepping up the power generated at 4,160 V to the interconnection voltage of 13.2 kV.

Operation and Maintenance

The Sponsors would operate and maintain the proposed hydropower facility. Sorenson Engineering would provide overall management of the facility. The facility would be controlled within the plant by an isolated automated computer (unmanned) system fitted with a telephone dialer to allow remote monitoring of the plant, including critical variables (temperature, voltage, etc.). This dialer will automatically alert the operators of critical conditions, such as the generator turning on or off, changes in temperature of bearings, generator, and cooling water, and canal water intake levels.

HYDROLOGY

Daily flow data for the existing power plant is available from 2004 through 2019. This was refined because the deteriorating facility did not utilize the full water right available to the hydro. To correct this, theoretical canal flow data was calculated by applying the full water right to the historical Colorado River flows at Grand Valley Diversion Dam (power plant canal diversion). These two flow datasets were combined to create a more precise projection.

The total number of irrigated acres below the hydroelectric facility has remained constant over the past and is projected to remain constant in the future. Flows in the canal system will not be altered by the hydroelectric facility.

4.3 Impacts

Hydropower is increasingly being recognized for its reliable, carbon-free contributions to the grid – with projects like this on existing water infrastructure having minimal environmental impacts. Producing 22,380 MWHrs annually of carbon-free energy is the equivalent of offsetting approximately 35,000 tons of coal every year.

The Upper Colorado River Endangered Fish Recovery Program was established to help bring four species of endangered fish back from the brink of extinction. One of the Recovery Implementation Program's primary components are reliable river flows to the 15-Mile Reach which host fish on the Endangered Species List. The on-going operation of this power plant is critical to the delivery of water to the 15-Mile Reach of the Colorado River and the ongoing recovery of endangered fish species. The project will ensure the continued delivery of water to the hydroelectric facility which, because of its location and the water rights decreed for its operation, sustains critical river flows. The power water right, which returns water to the river after passing through the power plant,

is a crucial component of Reclamations activities to avoid jeopardizing the continued existence of four species of fish listed under the Endangered Species Act.

4.4 Institutional Feasibility

Sorenson Engineering is a partner in the new hydro plant. For tax purposes the arrangement that makes this project works for Sorenson, and consequently, the Sponsors, requires that Sorenson is 100% “at risk” for the first year. The Sponsors are purchasing an option to buy into the power plant before construction begins. Once the Option fee is paid, Sorenson must offer the Sponsors the opportunity to buy 20% interest in the power plant after 1 year of operation. Then after 5 years of operation, Sorenson must offer the Sponsors the option to buy an additional 31% interest. In the end, the Sponsors will own 51% of the power plant. The option 1 and option 2 amounts are fixed at the beginning of construction.

On day 1 of operation, the power plant is 100% owned by Grand Valley Hydro, LLC. However, until the Sponsors exercise their purchase options, Sorenson is the only member of the LLC. At year one, Sorenson will be 80% owner and Sponsors 20%. At five years, ownership will be 49% Sorenson, 51% Sponsors. This arrangement puts Sorenson “at risk” during the first year of operation as required by the IRS. It is this arrangement that makes the economics work for Sorenson.

The primary purpose of the Sponsors is to operate and maintain our irrigation systems. This power plant arrangement provides the necessary Sponsor control of the irrigation systems and provides a method to pay for and finance the new power plant without over extending our financial obligations.

4.5 Implementation Schedule

Task/Milestone	Start	Finish
Power Purchase Agreement with Holy Cross	June 2020	Nov 2020
Interconnect Agreement with XCEL Energy	July 2020	Nov 2020
Lease of Power Privilege with US Bureau of Reclamation	Aug 2020	Jul 2020
Order Turbine and Generator	Dec 2020	
Order Pipe	Mar 2021	
Mobilize to Site	Sept 2021	
Excavate Powerhouse	Nov 2021	Dec 2021
Excavate Intake	Dec 2021	Jan 2022
Excavate Penstock	Jan 2022	Feb 2022
Install Intake Gate	Mar 2022	Mar 2022
Install Station Service (new transformer)	Mar 2022	Mar 2022
Construct Powerhouse	Dec 2021	Oct 2022
Construct Intake	Jan 2022	Mar 2022
Place and Weld Penstock	Mar 2022	July 2022
Erect Powerhouse Building	June 2022	July 2022
Install Turbine and Generator	July 2022	Sept 2022
Mechanical/electrical auxiliaries	Mar 2022	Sept 2022
Install New Step-up Transformer (5MVA)	Aug 2022	Sept 2022
Install New Interconnect with XCEL Energy (recloser anticipated)	Aug 2022	Sept 2022
Testing and Commissioning		Oct 2022

Table 4 - Project Implementation Schedule

5.0 Financial Feasibility Analysis

5.1 INCOME - ENERGY PROJECTION

Historical diversions were used to estimate the energy available if the hydroelectric facility were in place during past years. The model utilizes the flow approximately 95%. Table 4 shows the summary for the energy production. The average annual generation is 22,380 MWHrs.

New Vinelands Hydroelectric Production (MWHrs)													
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
2004	2,904	2,717	1,968	1,640	1,404	1,257	1,311	1,238	1,269	1,700	1,874	2,904	22,185
2005	2,904	2,623	1,968	1,647	1,443	1,318	1,379	1,358	1,380	1,740	1,874	2,904	22,539
2006	2,904	2,623	1,968	1,697	1,430	1,285	1,382	1,351	1,398	1,632	1,874	2,904	22,449
2007	2,904	2,623	1,968	1,708	1,568	1,345	1,424	1,483	1,586	1,531	1,874	2,904	22,919
2008	2,904	2,717	1,968	1,430	1,527	1,408	1,442	1,435	1,464	1,818	1,874	2,904	22,891
2009	2,904	2,623	1,968	1,744	1,481	1,382	1,425	1,403	1,416	1,763	1,874	2,904	22,887
2010	2,904	2,623	1,968	1,595	1,498	1,407	1,435	1,456	1,453	1,792	1,874	2,904	22,911
2011	2,904	2,623	1,968	1,437	1,501	1,299	1,417	1,397	1,467	1,732	1,874	2,904	22,524
2012	2,904	2,717	1,968	1,636	1,529	1,347	1,224	1,099	1,118	1,170	1,874	2,866	21,451
2013	2,904	2,623	1,968	262	1,318	1,336	1,297	1,398	1,477	1,824	1,874	2,904	21,185
2014	2,904	2,623	1,968	1,564	1,483	1,379	1,406	1,573	1,456	1,549	1,874	2,904	22,683
2015	2,904	2,623	1,968	1,768	1,607	1,488	1,446	1,394	1,513	1,856	1,874	2,904	23,345
2016	2,904	2,717	1,968	1,689	1,518	1,433	1,363	1,360	1,313	1,604	1,874	2,904	22,647
2017	2,904	2,623	1,968	1,594	1,439	1,368	1,349	1,358	1,462	1,392	1,874	2,904	22,237
2018	2,904	2,623	1,968	1,610	1,468	1,372	1,289	1,208	876	1,056	1,874	2,904	21,151
2019	2,904	2,623	1,968	1,257	1,449	1,324	1,377	1,324	1,412	1,695	1,874	2,904	22,111
Average	**2,904**	**2,647**	**1,968**	**1,517**	**1,479**	**1,359**	**1,373**	**1,365**	**1,379**	**1,616**	**1,874**	**2,902**	**22,382**

Table 5 - Projected Energy Production

Loan Repayment Sources

Loan repayment will be accomplished through generation revenue. Net Annual Gross revenue is the revenue generated after operational cost and debt service, but before organization administrative expenses. Revenue generated by the new power plant was estimated using historical flow data rather than theoretical plant capacity. This should provide a conservative estimate of generation capacity. The historical flow data partially included water conservation efforts that can increase available capacity to the power plant, but with historical and on-going water conservation efforts, additional capacity to deliver water to the power plant will improve. As entities provide additional water to protect endangered fish flows, that water will be used to protect those deliveries, generate more hydropower and provide revenue stream protection.

Vinelands Hydro Economic Performance

Year	Year	Price per MWHr	Average Generation MWHr	Average Gross Revenue	Annual O&M	Debt Service	Net Annual Gross Revenue
1	2023	$39.07	22,380	$ 874,387	$ 284,000	$ 130,277	$ 460,109
2	2024	$40.05	22,380	$ 896,246	$ 289,680	$ 130,277	$ 476,289
3	2025	$41.05	22,380	$ 918,652	$ 295,474	$ 130,277	$ 492,902
4	2026	$42.07	22,380	$ 941,619	$ 301,383	$ 130,277	$ 509,958
5	2027	$43.13	22,380	$ 965,159	$ 307,411	$ 130,277	$ 527,471
6	2028	$44.20	22,380	$ 989,288	$ 313,559	$ 130,277	$ 545,452
7	2029	$45.31	22,380	$ 1,014,020	$ 319,830	$ 130,277	$ 563,913
8	2030	$46.44	22,380	$ 1,039,371	$ 326,227	$ 130,277	$ 582,867
9	2031	$47.60	22,380	$ 1,065,355	$ 332,751	$ 130,277	$ 602,327
10	2032	$48.79	22,380	$ 1,091,989	$ 339,406	$ 130,277	$ 622,305
11	2033	$50.01	22,380	$ 1,119,289	$ 346,194	$ 130,277	$ 642,817
12	2034	$51.26	22,380	$ 1,147,271	$ 353,118	$ 130,277	$ 663,875
13	2035	$52.54	22,380	$ 1,175,953	$ 360,181	$ 130,277	$ 685,495
14	2036	$53.86	22,380	$ 1,205,352	$ 367,384	$ 130,277	$ 707,690
15	2037	$55.20	22,380	$ 1,235,485	$ 374,732	$ 130,277	$ 730,476
16	2038	$56.59	22,380	$ 1,266,373	$ 382,227	$ 130,277	$ 753,869
17	2039	$58.00	22,380	$ 1,298,032	$ 389,871	$ 130,277	$ 777,883
18	2040	$59.45	22,380	$ 1,330,483	$ 397,669	$ 130,277	$ 802,537
19	2041	$60.94	22,380	$ 1,363,745	$ 405,622	$ 130,277	$ 827,845
20	2042	$62.46	22,380	$ 1,397,838	$ 413,734	$ 130,277	$ 853,827
21	2043	$64.02	22,380	$ 1,432,784	$ 422,009		$1,010,775
22	2044	$65.62	22,380	$ 1,468,604	$ 430,449		$1,038,155
23	2045	$67.26	22,380	$ 1,505,319	$ 439,058		$1,066,261
24	2046	$68.94	22,380	$ 1,542,952	$ 447,839		$1,095,113
25	2047	$70.67	22,380	$ 1,581,526	$ 456,796		$1,124,730
26	2048	$72.43	22,380	$ 1,621,064	$ 465,932		$1,155,132
27	2049	$74.24	22,380	$ 1,661,590	$ 475,251		$1,186,340
28	2050	$76.10	22,380	$ 1,703,130	$ 484,756		$1,218,374
29	2051	$78.00	22,380	$ 1,745,708	$ 494,451		$1,251,258
30	2052	$79.95	22,380	$ 1,789,351	$ 504,340		$1,285,011
O&M Escalation =			2%				
Revenue Escalation			2.5%				
Holy Cross Contract			20 year	Assume edxisting indecx after 2043			

Table 6 -Vinelands Hydro Economic Performance

5.2 Cost Estimate

Grand Valley Hydro Summary Costs 10-6-20

Bid Item	Description	Qty	Unit	Totals
1	**Division 1 - Direct Job Expenses**			
	MSH Project Deveoplment	1	LS	$ 8,092
	MSH Project Manager during construction	1	LS	$ 101,147
	MSH Superintendent during construction	1	LS	$ 72,826
	MSH Subsistance (Crew and Mangement)	1	LS	$ 323,125
	Equipment Fuel, oil, gease, and manintenance	1	LS	$ 68,650
	Forklift, air compressor, dust control, light plants, welder	1	LS	$ 72,151
	Office Trailer, connex, garbabge dumpster, tempoary toilets, water, copi	1	LS	$ 32,350
	Cell phone, Temporary Internet, Computers	1	LS	$ 4,900
	Mobe and Demobe equipment	1	LS	$ 48,589
	Temporary electricity charges	1	LS	$ 10,000
	Safety Equipment	1	LS	$ 2,500
	Continous jobsite cleanup	1	LS	$ 23,858
	Surveying	1	LS	$ 15,000
	Misc. Hardware	1	LS	$ 10,000
	Sorenson Engineering Design	1	LS	$ 500,000
	Sorenson Engineering On-Site Engineering and Testing	1	LS	$ 370,000
	Sorenson E+O Policy	1	LS	$ 17,137
	Sorenson Development Cost	1	LS	$ 150,000
2	**Division 2 - Sitework**			$ -
	Excavation and Grading	1	LS	$ 717,413
	Cofferdam	1	LS	$ 22,560
	Dewatering	1	LS	$ 102,328
	Site BMP's	1	LS	$ 4,000
	Road Maintenance	1	LS	$ 10,000
	Crane Pads	1	LS	$ 6,180
	Snow Removal	1	LS	$ 9,361
	Reseeding	1	LS	$ 2,400
	PH Trench Drain	1	LS	$ 7,815
	Bollards	1	LS	$ 8,572
	Oil / Water Seperator	1	LS	$ 17,494
3	**Division 3 - Concrete**			$ -
	Concrete Form, place and strip	1	LS	$ 307,437
	Concrete	1	LS	$ 419,369
	Pump Concrete			
	Cold Weather Protection	1	LS	$ 23,560
	Rebar	1	LS	$ 346,560
	Sales Tax on Material	1	LS	$ 6,000
5	**Division 5 - Misc. Metals**			$ -
	Intake Braces	1	LS	$ 2,081
8	**Division 8 - Doors, Hardware and Windows**			$ -
	Overhead Door and Man Doors	1	LS	$ 9,290
9	**Division 9 - Finishes**			$ -
	Painting Turbine/Generator and Misc Metals	1	LS	$ 27,822
10	**Division 10 - Specialty Items**			$ -
	Signage and Fire Extingushers	1	LS	$ 1,921
13	**Division 13 - Pre-Engineered Building**			$ -
	Pre-Engineered Metal Building	1	LS	$ 100,824
	Powerhouse Propane Tanks and Heaters	1	LS	$ 18,251
14	**Division 14 - Turbine Installation & Canal Gates**			$ -
	Purchase Turbine and Generator	1	LS	$ 1,660,000
	Turbine Ancilary Parts and Taxes	1	LS	$ 15,000
	Turbine Oil	1	LS	$ 10,000
	Terrif on Turbine	1	LS	$ 100,000
15	**Division 15 - Mechanical**			$ -
	Riverside (Install Turbine and Generator, Stop Log Gates)	1	LS	$ 703,600
	Outside Rent Crane for Turbine Installation	1	LS	$ 69,000
	Purchase Penstock	1	LS	$ 262,500
	Intake Reducer with vent stack	1	LS	$ 40,500
	Penstock Welding	1	LS	$ 24,000
	Penstock Weld Testing	1	LS	$ 8,000
	Penstock Heat Shrink Wrap / Paint joists / Assist with setting Penstock	1	LS	$ 19,159
16	**Division 16 - Electrical**			$ -
	Engineering	1	LS	$ 10,000
	Controls and Switchgear	1	LS	$ 275,000
	Powerhouse Electrical	1	LS	$ 256,680
	Interconnect to public utility			$ 900,000
	Electrical Contingency	1	LS	$ 15,000
	Stand-by Generator	1	LS	$ 30,000
	Base Bid Total			**$ 8,400,000**

Table 7 - Project Cost Estimate

5.3 Financing sources

Vineland Power Plant Financing Sources	
$8,400, 000	Total project budget inc. design, construction, project management
1,500,000	Recovery Program Grant (secured and in progress)
600,000	CWCB Species Conservation Trust Fund Grant (secured and in progress)
425,000	Colorado Water Trust Grant (secured and in progress)
$964,852	Reclamation WaterSMART Grant (WEEG) we are optimistic
$2,405,973	Sorenson Engineering Cash for 49% equity in GVH LLC
$2,504,175	Required cash and debt by OMID and GVWUA required for construction scope
200,000	Remaining OMID and GVWUA regulatory compliance
200,000	Reaming OMID and GVWUA legal, professional, and administrative expenses
$2,904,175	Total OMID and GVWUA funding needs
$1,000,000	Grand Valley Fund (local irrigators plus Ute Water) grant to OMID and GVWUA
200,000	November 10 Alex Funk CWCB Water Plan contribution
$1,704,175	Total loan required by both Sponsors without contingencies
$852,088	GVWUA loan without contingencies
$852,088	OMID loan without contingencies

Table 8 - Financing Sources

$858,000 due diligence cash expense and OMID and GVWUA in-kind costs are not included in the GVH LLC Power Plant budget outlined below and reimbursement **is not** being requested. Orchard Mesa Irrigation District (OMID) and the Grand Valley Water Users Association (GVWUA) have been working on plans to rehabilitate or replace the Grand Valley Power Plant since 2014. OMID and GVWUA have spent nearly $400,000 in cash reserves and over 3000 man-hours as of January 2020 to leverage $458,000 in accumulated Extraordinary Maintenance revenues generated by the existing power plant and held by the Bureau of Reclamation (BOR) to get the project to this point. OMID and the GVWUA expect to invest another $400,000 cash in the project and will continue to spend hundreds of hours working to make this Project a reality.

5.4 Loan Request

Funds required	$1,704,175
Contingencies (25%)	426,045
Total loan required	$2,130,220
GVWUA loan request rounded up to nearest $1,000	$1,066,000
OMID loan request rounded up to nearest $1,000	$1,066,000
Term	20 years
Rate	2% per year

Table 9 - Loan amount and Terms

5.5 Construction Funds and Expenditure Projections

Based upon Sorenson Engineering's experience with similar power plant across the west and particularly in western Colorado, Sorenson's financial involvement in the project provides confidence in the overall project costs. If contingencies are necessary, the payment amounts are financially feasible.

12/22/2020 — **Vinelands Hydro Revenue and Expenditure Projections**

	Payment Schedule	Cumulative Expenses	Project Account Balance	Funding Sources: Sorenson 49%	LLC Grants: RIP Available 6/2021	LLC Grants: CWT available 3/2021	LLC Grants: Water smart 6/21	LLC Grants: SCTF Available 3/2021	Irrigators 51% – Irrigator Grants: GV Fund	Irrigator Grants: Water Plan	Irrigator Grants: CRWCD	Irrigator Grants: CWCB	OMID Loan	GVWUA Loan	Description
				2,405,973	1,500,000	425,000	964,852	600,000	1,000,000	200,000	0	0	836,324	836,324	Available
12/31/2020	-450,000	-450,000	0	25,000		425,000									Runner and generator deposit
3/31/2021	-650,000	-1,100,000	0					600,000		50,000					Design & development
9/30/2021	-1,360,000	-2,460,000	0				964,852		245,148	150,000					Runner and generator balance due
10/31/2021	-225,000	-2,685,000	0						225,000						Mobilization
1/30/2022	-1,203,750	-3,888,750	0	1,121	672,777				529,852						1/4 remaining construction
3/1/2022	-1,203,750	-5,092,500	27,648										615,699	615,699	1/4 remaining construction
8/1/2022	-1,203,750	-6,296,250	0	1,176,102											1/4 remaining construction
11/1/2022	-1,203,750	-7,500,000	0	1,203,750											1/4 remaining construction
Construction costs		-7,500,000		2,405,973	672,777	425,000	964,852	600,000	1,000,000	200,000	0	0	615,699	615,699	
				0											
9/30/2021	-900,000	-8,400,000	0	0	427,223								236,389	236,389	Interconnect
3/31/2021	-225,000	-8,625,000	0		225,000										NEPA and permitting
9/30/2021	-175,000	-8,800,000	0		175,000										NEPA and permitting
	-400,000	-8,800,000			400,000	0	0	0	0	0	0	0	0	0	
Total project costs		8,800,000		2,405,973	1,500,000	425,000	964,852	600,000	1,000,000	200,000	0	0	852,088	852,088	

Table 10 - Revenue and Expenditure Projections

5.6 Financial Impacts

It has been the goal of the Orchard Mesa Irrigation District and Grand Valley Water Users Association Board of Directors since beginning this replacement project several years ago to do so in a way that does not jeopardize the financial well-being of either organization. Net revenue generated after expenses, appropriate reserves, and debt service can be used to assist in funding improvements in infrastructure appurtenant to the Roller Dam and Canyon Canal facilities that serve several Grand Valley irrigation companies in the Grand Valley and to the other infrastructure needs of the Orchard Mesa Irrigation District and the Grand Valley Water Users Association.

5.6.1 Tabor

Does not apply to the Sponsors.

5.6.2 Collateral

The revenue stream will be used as collateral.

5.6.3 Sponsor Credit worthiness

The last 3 years of financial reports are attached.