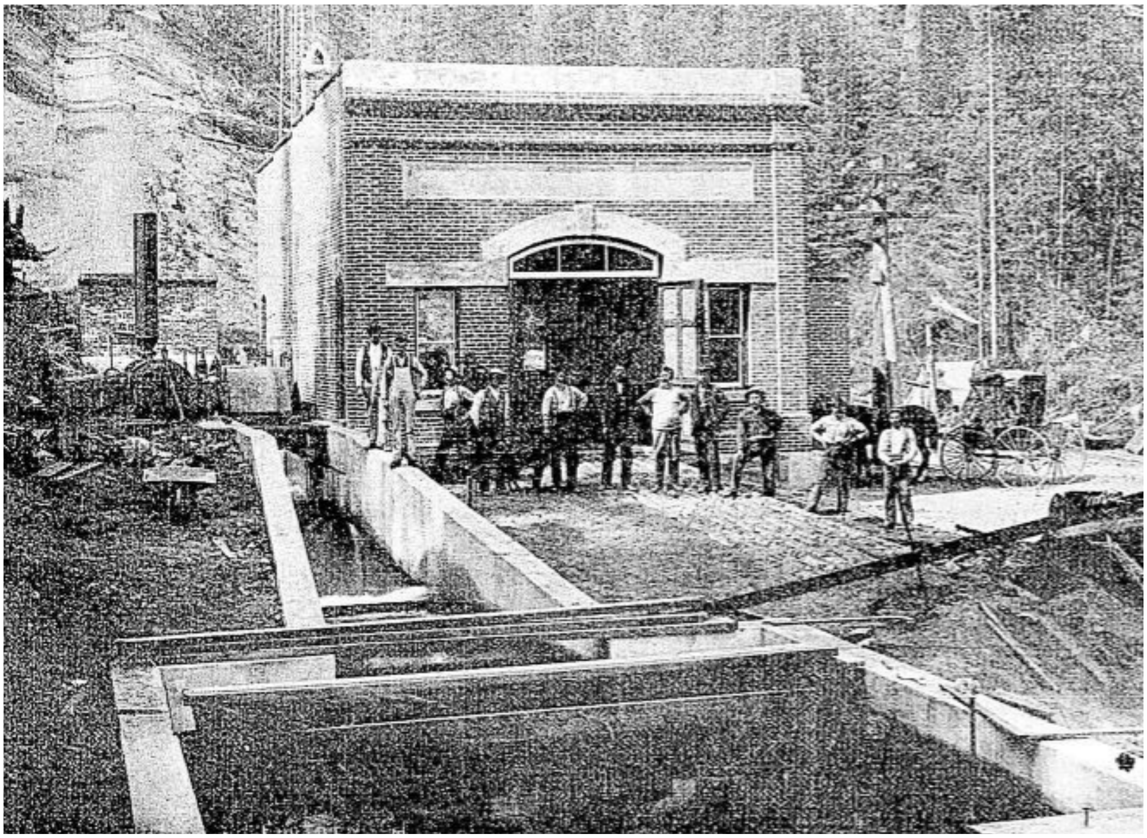
APPENDIX A: GOLDSTREAM POWERHOUSE

Historical Context, Character-defining Features and Preliminary Assessment of Condition

December 2016, with minor revisions December 2017


Powerhouse under construction, 1898, from *Water Powers*, British Columbia, Ministry of Lands, 1924

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EXECUTIVE SUMMARY

The CRD Integrated Water Services commissioned this study in September 2016 to assemble information on the history, significance and condition of the Goldstream Powerhouse as a basis for future management of this heritage resource. Key deliverables include:

- A preliminary description of the powerhouse, its associated structures and features and their historical significance.
- A summary of a literature and archival search for related documents, photographs and other material that can inform a full assessment of the cultural value of the powerhouse.
- Results of consultation with other experts and or agencies/organizations who may provide future, related technical assessments, planning or funding for heritage conservation work on the powerhouse.
- A preliminary assessment of potential heritage conservation approaches/options for the powerhouse.

Research, consultations and site investigations have contributed to a better understanding of the significant role that the Goldstream Powerhouse has played in the growth of the Capital Region and in the development of the Greater Victoria Water Supply Area. In order to secure this important heritage resource and further investigate its condition as a basis for subsequent planning and decision-making, it is recommended that the following short-term actions (summarized from Section 8.0 Recommendations) be undertaken:

- Clear rubble from the building and organize those materials stored in interior spaces.
- Ensure that doors and window openings can be closed and secured to prevent intrusion.
- Examine the roof for leaking and address any problems.
- Maintain barriers to interior/exterior features that present threats to visitors' physical safety.
- Invite curatorial staff from the Royal British Columbia Museum and the BC Hydro Power Pioneers to assist in the development of an inventory of movable and immovable cultural resources on site.
- Clear away vegetation to improve air circulation and improve workers' capacity to examine the wall, foundation and windows.
- Document the building, waterworks and site.
- Systematically assess the condition of the building and grounds.
- Develop and implement a stabilization plan for the Powerhouse and its waterworks including the Expansion Bell, based on the findings of the conservation assessment.
- Develop and implement a site monitoring and maintenance plan.

This report has been prepared by Joy Davis, PhD CAHP, cultural heritage specialist, working with Lands End Environmental Consulting Limited. Dr. Davis can be reached at joydavis@uvic.ca or by telephone at 250 477 0072.

Revision December 2017: See pp. 20-21 for revision relating to 1904 addition to the Powerhouse.

CONTENTS

Note that other appendices omitted in this attachment to the Goldstreram Watershed Report.

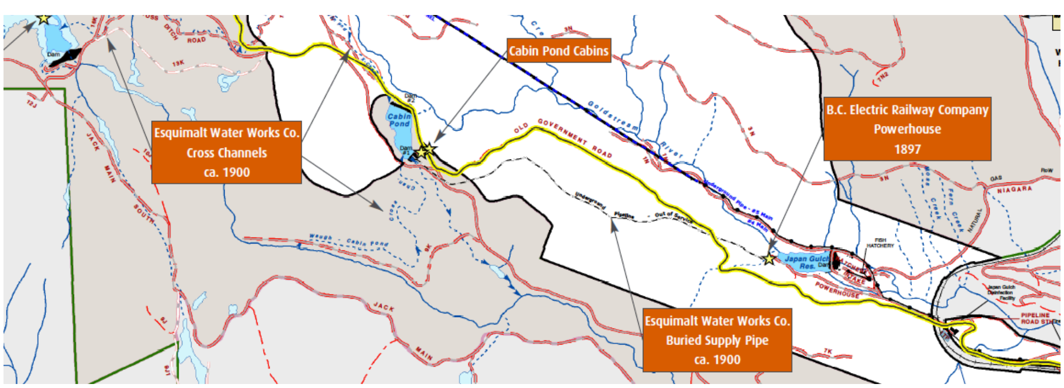
1.0 Introduction

The history of community service in the Goldstream Water Supply Area stretches back almost 125 years to the construction of waterworks and the Goldstream Powerhouse in response to increasing demands for electricity to illuminate Victoria's homes and business and run its streetcars. This is a story of firsts: Goldstream Powerhouse is widely recognized as the first major hydroelectric utility in the Pacific Northwest with the longest power transmission line in Canada at the time. This is also a story of innovative entrepreneurs who adopted leading-edge technologies to transform the quality of life in Victoria. Their commitment to developing and providing a valued utility continues today in the work of the Greater Victoria Water Supply Area.

The Goldstream Powerhouse is situated 3.6 kilometers from the Goldstream Entrance Gate on Powerhouse Road, adjacent to Japan Gulch. The Powerhouse, which was developed and managed throughout its 60 years of operation by the British Columbia Electric Railway Company (BCER), was decommissioned in 1957. At that time, the building was transferred to the Greater Victoria Water District but most of the heavy machinery was removed. Windows and doors were boarded up and the grounds left to gather moss.

While the building is located within the Goldstream Water Supply Area, it has not served a useful purpose since it was decommissioned and has not been maintained. As a result, this long unused brick building is in need of attention. While the roof and wall systems are intact and evidence of its long history is still seen in many corners, conditions inside and out threaten the integrity of the structure. For this reason, the CRD Integrated Water Services has commissioned this assessment of the historic values and condition of the Powerhouse.

This report offers an overview of the history and evolution of the Powerhouse, its significance to Victoria, its character-defining features, and conditions that are impacting the fabric of the building. Recommendations for short and longer term actions are included as a basis for decision-making on stabilization, maintenance, interpretation and adaptive re-use of this heritage resource. While the immediate concern is safeguarding the structure, this research suggests important ways of telling the story of how the hard work of providing utilities makes a very real difference in the life of the region.



Extract from CRD Map: Overview of Historic Sites in the Goldstream Water Supply Area, 2012. Note that the Powerhouse was constructed in 1898, the same year that the Esquimalt Waterworks pipeline from Cabin Pond was built.

2.0 METHODOLOGY

In order to build understanding of the historic and technological significance of the Goldstream Powerhouse and to identify and describe its character-defining features, this study combined research in primary and secondary sources with site investigation and description.

Archival sources consulted include:

- British Columbia Electric Railroad (BCER) and Predecessor Companies incoming and outgoing correspondence and clippings files between 1892 and 1910 at the Public Archives of British Columbia. As there are approximately 40 meters of records from the BCER Victoria Branch office, it was necessary to be somewhat selective in seeking files that were specifically linked with the Powerhouse.
- *Daily Colonist* files, 1890 to 1948, using keyword searches. Accessed online through University of Victoria Special Collections.
- Review of holdings and finding aids for archives at the University of British Columbia Special Collections, City of Victoria Archives, and Esquimalt Archives. While these collections should be consulted in an exhaustive review of Goldstream Powerhouse history, these holdings were not examined in detail as they appear to duplicate sources available through the Public Archives of British Columbia

Despite specific efforts to locate blueprints or other drawings, no materials that described the initial design or functional layout of the powerhouse were located. Further searches to locate such materials and the specification for the hydroelectric equipment would be of value. Transcripts of materials that are of particular relevance to the study of the Goldstream Powerhouse are included as Appendix C, listed in chronological order.

A range of secondary sources was also consulted, as noted in Appendix B. Many of these are helpful in establishing the social and economic context for the development of the Powerhouse; others specifically mention the Powerhouse in its role as the first hydroelectric utility in the Pacific Northwest. It is worth noting that a number of secondary sources perpetuate minor inaccuracies relating to dates and equipment and should be compared with primary sources to ensure accuracy. For this reasons some quotes may include inaccurate dates or dimensions.

Both primary and secondary sources were helpful in identifying maps and images associated with the site. These are included in Appendix D.

These sources of information have been helpful in identifying character-defining features during a visual inspection, as they clarified how the structure and associated waterworks were designed to meet functional needs and offered insight in the uses of the various spaces and remaining equipment. The design, construction and functions of the Powerhouse are described in Section 4.0; a visual assessment of the condition of the structure is included in Section 5.0.

3.0 HISTORICAL CONTEXT

The story of the Goldstream Powerhouse is best understood in the context of rapidly growing demand for electricity as residents of Victoria embraced new technologies and urban amenities at the turn of the 19th Century. In just a few short years, Victorians became accustomed to tramways that broadened access to homes in the suburbs of Fairfield, Oak Bay and beyond; incandescent lights and readily accessible power that changed how they viewed and lived in their homes; and energy for new industrial enterprises. The Powerhouse at Goldstream was a direct, highly entrepreneurial response to both needs and opportunities in this period of rapid social, technological and economic change.

3.1 Electrical Innovation

Harnessing electricity to power communications, transportation and a remarkable range of industrial and domestic chores, was core to the industrial revolution that reshaped the western world. Writing from an American perspective, historian of science and technology, David Nye (1990, p. 381), comments

> In a single lifetime between 1880 and 1940 the process of electrification transformed the landscapes of the city, factory, home, and farm. Americans built electrical devices into their lives, and… social reality by definition became electrified. Six decades after Edison, Brush and other inventors had created the electrical system. it was an essential part of civilization that underlay most of its workings. Its adoption had profound consequences for the design of the city, the craft of the theater, the structure of the factory, the ambience of the home, the landscapes of art and photography, transportation systems, systems of communication, and forms of security—in short for the total social construction of reality…

Experimentation with electricity began in the 18th century when such scientists as Benjamin Franklin explored characteristics of electricity observed in nature. Putting electricity to work was a phenomenon of the 19th century when Alessandro Volta invented the battery (1800), Michael Farraday explained electromagnetic induction (1831), Samuel Morse developed the telegraph (1844), Alexander Graham Bell invented the telephone (1876), Thomas Edison created the light bulb (1879) and devised direct current (DC) generation systems (1880s), and Nicholas Tesla developed the first systems for generating and transmitting alternating current (AC) (1888) along with AC motors for power generation (1895). The first use of electricity to run streetcars came with the development of DC current-wound electric motors in the early 1880s.

With so many innovations involving electricity, capacity to generate and transmit power became a priority. After all, as the BC Department of Lands comments in 1924, "Among the great agencies that contribute to the development of the modern state, cheap power stands in the front rank" (Department of Lands, p. 4). Early power generation involved direct current (DC) dynamos, initially developed by Edison in the 1880s. The first centralized DC generating stations were located in Godalming, England (1881) and New York (1882). However, transmitting power from these DC generators was problematic since so much DC power is dissipated in transmission lines. As a result early electric power systems required multiple generating stations, no more than a mile from the usage point. Steam, coal, wood and water wheels were commonly used to run such stations. The development of alternating current (AC) generators, transformers and transmission systems, starting in 1888, revolutionized the usage of electricity in urban settings as they allowed electricity to travel for miles without significant loss of capacity.

3.2 Electrifying Victoria

First occupied by the British in 1843 as a military outpost at a key access point to British territories north of the United States, Victoria thrived as a supply and administrative centre when gold brought thousands of miners to the island and the mainland in the 1850s and 60s and to the Yukon in the '90s. The Colony of Vancouver Island was formed in 1858, Victoria was incorporated as a city in 1862, the Colony amalgamated with the Colony of British Columbia in 1866, and it joined the Canadian confederation in 1871. Victoria, as provincial capital, maintained its prominence, even as cities on the lower mainland thrived with the arrival of the Canadian Pacific Railway in 1886.

While small and relatively remote, Victoria and its entrepreneurial business community were consistently on the forefront of experimenting with new technologies designed to enhance the quality of life in the young city. The Victoria Gas Company created infrastructure for gas lighting in commercial properties starting in 1862, and provided gas street lighting in 1873. The first telephone system in Canada was installed in 1878, only two years after Alexander Graham Bell invented the concept (IEEE Canadian Region, 1985, p. 4). The Victoria Transfer Company began offering horse drawn transit services in 1883 to serve the growing residential and commercial areas of the city.

Interest in electrical systems was first expressed in Victoria 1878 as an alternative to gas-fueled street lighting, given residents' dissatisfaction with the quality, cost and management of gas service. In this period, international attention to the development of centralized urban electrical systems using increasingly reliable electric generators would have stimulated local thinking. And a first practical example of incandescent light came in 1879 with the visit of the *HMS Triumph* – a naval vessel that used this system throughout the ship. In 1882, the same year that Edison organized the world's first steam powered commercial generating station in New York, the City authorized $12,500 for street lighting, powered by a 25 horsepower steam engine driving two dynamos (IEEE Canadian Region, 1985, p. 50). Three 150' towers were erected by the Victoria Electric Illuminating Company to shed light on major intersections in the City. Power was also supplied to local businesses for lighting. This was the first commercial incandescent lighting system in Canada. While it was troubled with technical issues, the City took pride in its progressive amenities, claiming that it had "in proportion to population the most complete and finest [lighting system] on the Pacific Coast" (Roy, 1977, p. 89).

As electrical technologies and systems became more robust, attention turned to electrically powered streetcar systems as an economical and efficient alternative to horse-drawn carts. A key innovation that made electric traction possible was the development of electric motors powered through overhead transmission lines, to drive the wheel systems. The first electric streetcar service on the continent was an experimental line in 1883 at the Toronto Industrial Exhibition (IEEE Canadian Region, 1985, p. 50). Another was developed in Cleveland in 1884, "although this system and many others pioneered in the 1880s were plagued by technical problems with the design of the cars, the tracks and the power delivery and management systems" (Vuchic, 2007, pp. 12-16).

On February 22nd 1890, using power provided by coal-fired generators at the Store Street Power Station, Victoria became the third Canadian city, after Windsor (1886) and St. Catharines (1890) in Ontario, to introduce an electric streetcar line, run by the National Electric Tramway and Lighting Company (NETLC). It later changed its name to the National Electric Railway and Lighting Company (NERLC). The initial streetcar lines served the downtown core.

Even in these early days, the managers of the NETLC were concerned about the technical and economic limitations of the steam-powered generation facilities, first on Store Street and then nearby at Rock Bay. The DC power they generated constrained the scope of streetcar services and restricted other uses. And power was expensive to produce in a steam plant. NETLC began considering innovative new hydroelectric generation systems that were being developed to power mining and milling enterprises. The first conversations about switching to a water-driven system were in 1889 (Myers, 1953, pp. 10-11). Over the next two years, as technologies for AC power transmission also became more viable, NETLC consulted with Esquimalt Water Works (EWW) about working together to generate power at Goldstream, taking advantage of the considerable water pressure available by damming high elevation lakes in the watershed. EWW, initially formed in 1885 to provide water from Thetis Lake and the Deadman River to Esquimalt and the Naval Dockyard and Hospital, sought a provincial water license for the Goldstream drainage, and with it in hand, signed a contract with NETLC and began construction of the 1505' elevation Goldstream dam in 1892. As Goldstream Lake was at 1505' in elevation in a remote area, it was a challenging construction project at a time when transport was by horse and cart and hand tools, levers and pulleys were the only implements for construction. Lubbe describes the process:

> When it was first decided to make the little lake a huge reservoir, the first step after necessary surveys was to blast through the solid rock at the outlet and lower the lake ten feet, so that it could be cleared of all deadwood and cleaned. Every stick of timber was taken out and burned, and the standing timber on the banks was cut down and disposed of in the same way until a basin was made which, above all things, was clean and free from any vegetable matter that in decomposing would affect the quality of the water. The land surrounding the lake was all acquired by the company, and on the edges was cleared and burned so that the prime requisite, purity, could be maintained. All this having been done the dam was built, 400 men having been at work on it all last summer and a good portion of this [summer]. (*Daily Colonist*, July 16, 1893, p.3)

Even as Goldstream Dam construction was underway, complex tramway infrastructure, technical issues, and high maintenance costs forced the NETLC to back away from its hydroelectric scheme, and together with a Vancouver-based tramway company, the company was forced into receivership during the global depression of the early 1890s. In order to keep streetcars running, investors amalgamated these business interests in 1896 as the Consolidated Railway and Light Company (CRLC). However, just as this new company was getting on its feet, the Point Ellice Bridge disaster occurred in May 1896 due to the failure of the bridge to support an overloaded streetcar during the Queen Victoria birthday celebrations. This accident resulted in the loss of 55 lives, making it the most tragic disaster in the history of streetcar use in North America. Although the City of Victoria was held to blame, the CRLC went into receivership and was reorganized as the British Columbia Electric Railway Company (BCER) in April of 1897.

Victoria's lighting and streetcar systems were now in the hands of a relatively wealthy British-based company whose Board of Directors resided in London. In light of commercial and residential development that accompanied the completion of the Canadian Pacific Railway line to Port Moody in 1886 and then Vancouver in 1887, the new BCER was heavily focused on the needs of rapidly growing communities on the lower mainland where its main operational offices were located. Johannes Buntzen assumed leadership as Managing Director. The BCER Victoria branch office was located on Langley Street (Myers, 1953, p. 75), under the direction of Albert Goward, Manager. In addition to improving the street railway systems, Goward and Buntzen turned their attention to developing reliable and cost effective sources of power for operations in both Victoria and the Lower Mainland.

Because "Victoria operations were on a much smaller scale and the capital requirements considerably less" (Roy, 1970, p. 187), the BCER made the decision to revive discussions about hydroelectric power from Goldstream. By September of 1897 it signed a contract (*Daily Colonist*, September 29, 1987, p. 5) with the EWW to lease land for a $1 a year for the first hydroelectric generating facility in the Pacific Northwest[1], and to acquire a consistent supply of up to 15,000,000 gallons a day of high pressure water. The BCER also committed to building a transmission line to its sub-station in Victoria where energy could be stepped down and distributed throughout the City. In turn, the Water Company agreed to develop three new reservoirs involving nine dams, along with an eight thousand foot pipeline to bring water to the BCER's new Powerhouse. The system was confidently expected to serve Victoria for years to come. "The power delivered to Victoria will be sufficient to operate the street railway, electric lighting system, commercial and municipal, and also to furnish considerable power for the operation of stationary motors for manufacturing purposes, elevators, etc." (*Daily Colonist*, April 2, 1898, p. 5).

3.3 The Goldstream Powerhouse Project

Planning for the Powerhouse began in the late summer of 1897 under the local direction of R.H. Sperling, an electrical engineer who would go on to be the first superintendent of the Powerhouse. He turned to the firm of Hasson & Hunt of San Francisco for further expertise, "this firm having had sole control of the remodeling of the Los Angeles system, which turned out so successfully under their supervision and instructions. This firm has also been connected with all late remodeling of Coast [rail] roads, and ranks second to none in their line" (*Daily Colonist*, April 2, 1898, p. 5). Particular expertise in hydroelectric generation was provided by Wynn Meredith, an American electrical engineer who worked with Hasson & Hunt. A graduate of the College of Engineering at the University of Illinois, Meredith had been on the forefront of early AC current usage in the United States. In 1889 he was involved in the installation of the newly introduced Westinghouse alternating current apparatus in Aurora, Ohio, and went on to serve as the electrical engineer of the Aurora Street Railway. At the Chicago Columbian Exposition in 1892 he served as assistant superintendent and electrical engineer in one of the first large installations of the alternating current lighting, and then moved west to serve as first assistant electrical engineer at the San Francisco Mid-Winter Exposition (*New York Times,* 1950) where it seems likely he met Hasson & Hunt. Meredith went on to work on the Buntzen Powerhouse Project in Vancouver as Chief Engineer in 1902 (Cotton, 2003) and then returned to Victoria in 1910 where

[1] The first hydroelectric power station to serve an urban area in British Columbia was opened by the Nelson Electric Light Company in 1896 and enlarged in 1897. Another was opened in the nearby mining town of Sandon in 1897. http://www.nelson.ca/EN/main/services/electrical-services/history.html

his new employer, Sanderson & Porter, was involved with the design and construction of the Jordan River Power Plant (Personals, 1910).[2]

Local architect, W. Ridgway Wilson, was retained to design the Powerhouse structure and Robert Dinsdale was hired as general contractor[3]. While no records were located with design specifications or details on the placement of equipment, it seems very likely that the local designer and builders worked alongside the electrical engineers to develop the functional elements of the small brick and concrete structure. Hasson & Hunt called for two 600 HP Pelton Water Wheels manufactured in San Francisco to power a 360 KW generator and related equipment supplied by Canadian General Electric from Toronto. During the summer of 1898 considerable correspondence among the various suppliers and the BCER[4] highlights the challenges of coordinating the fabrication of the various parts, shipping them by rail or boat over considerable distances, and moving them to the site for installation. In seeking an estimate for local transportation, Goward notes "I shall be obliged if you will make a tender for hauling 12 tons of machinery from the Outer Wharf to the E. & N. Ry. And from Snider's crossing [near Goldstream] to the site of our new power house. The machinery is in 61 packages, 2 pieces being heavy weighing about 3800 lbs. each."[5] BCER historian T.R. Myers (1953, p. 19) observes that the project

> …must have been a tremendous task, from a physical aspect alone. The reader must bear in mind that fifty years ago there were no such things available as power-operated tractors, bulldozers, trucks, graders, etc. Human brawn and muscle and straining horse flesh had to make up for such deficiencies. It took days to accomplish what can now be done in as many hours with the aid of modern power-operated construction tools and equipment.
>
> Heavy equipment for the power house evidently was shipped on the Esquimalt and Nanaimo Railway to Goldstream station [Snider's crossing], from which point the power house was a relatively short distance away. From that point on, men and horses took over. Planks were laid on the road between the two points and the heavy items of equipment were inched, with the aid of block and tackle, to their final resting place in the power house.

At the same time, Sperling and Goward coordinated the construction of what was to be the longest transmission line in existence, covering the twelve miles to the Rock Bay sub-station in Victoria. Poles were sourced from Mr. G.W. McKean in Shawnigan Lake[6], and vast quantities of wire and insulators were ordered and installed.

By August 1898, the *Daily Colonist* (August 25, 1898, p. 3) declared the construction process seamless and indicated that the plant was ready to open.

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[2] The Jordan River Powerhouse was built by Vancouver Island Power Company, a subsidiary of British Columbia Electric Railway, and opened in 1912.
[3] As noted in Letter from A. Goward to Messrs. Hasson & Hunt, August 10, 1898 CTR 880058-0435 Volume 11-Z-4, p. 148.
[4] Included in Appendix C.
[5] Letter from A. Goward to J.E. Grice, Esq. Teamster, May 20th 1898, CTR 880058-0435 Volume 10-Z-4, p. 507.
[6] Letter from Goward, Asst Comptroller, to J. Buntzen, BCER Comptroller, March 25, 1898, PABC CTR 880058-0435 Volume 10-Z-4, p. 330.

> A test was made yesterday of the new power plant the BC Electric railway company have been installing at Goldstream, the power being conducted over the line to the city power-house [Rock Bay]. The test was considered satisfactory, and showed that the plant will work well. Two water-wheels will be used for the present, but provision has been made for a third as soon as it is necessary. The power, light and tramway circuits will each be independent of the other, and in case of accident, enough of the plant at present in the city power-house will be retained to use in cases of emergency, so as to obviate the least chance of trouble.

Not surprisingly however, a number of technical problems plagued the small plant in its early days. Perhaps the most costly was the failure of the pipeline installed by Esquimalt Waterworks to withstand the ramming effect inevitable when the high-pressure water intake was adjusted to manage water flow. It was also observed that the concrete tailrace was deteriorating. As Buntzen noted to Lubbe, "We regret that you did not make this sufficiently strong in the first instance, which would have saved you an unnecessary expense and us a great deal of inconvenience and trouble…"[7] Although Lubbe and others repaired the various waterworks problems within a matter of weeks, the recriminations went on for months, laying down the groundwork for years of acrimony between the BCER and the EWW over such matters as volume of water consumed, cost of water, contractual obligations, planning, management and land use issues. The correspondence between the principals of the two companies is full of disparaging references to one another's failings and bad faith.

Other early problems included the need to replace the high-pressure nozzles that channeled water to activate the Pelton Water Wheels and to adjust settings on the generators. By mid-November 1898, however, Goward was able to report to Buntzen the Powerhouse was generating revenue and that "…last night the whole of the systems in Victoria were operated from Goldstream. With the exception of two shut downs of about five minutes duration each on one of the circuits, it appeared quite successful."[8]

The *Daily Colonist* describes what happens after the Goldstream generators produced their electricity:

> This electrical current after passing through the controlling switchboard, is raised by means of three large step-up transformers to a pressure of 11,800 volts. At this pressure it is conducted thirteen miles into Victoria by means of six copper wires. The high voltage was chosen as by this means but a very small per centage of the power is lost on the way. The current, when reaching Victoria, enters the company's sub-station on Store street, where, by means this time of three step-down transformers, it is converted into a suitable voltage both to run the cars and to light the business and private houses in Victoria. (August 5, 1900, p. 2)

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[7] Letter from Buntzen to Lubbe, November 8th, 1898, PABC CTR 880058-0435 Volume 11-Z-4, p. 497.
[8] Letter from A. Goward to R.H. Sperling, Goldstream Power House, 18th November, 1898, PABC CTR 880058-0435 Volume 11-Z-4, p. 452.

As word spread that the Powerhouse was up and running it began attracting international attention. The *Daily Colonist* reported that:

> "…the Hon. A.E. Smith, the United States consul at this port, has written to the state department on account of the completion of the British Columbia Electric Railway and Lighting [sic] Company's plant at Goldstream. …Quoting from the report, the *Tacoma Ledger* [with some degree of inaccuracy] says: It is the highest fall in Canada, 2,300 feet above sea level. At an elevation of 700 feet, 16 miles from Victoria, the waters form a lake covering 150 acres, into which empties the Goldstream river. The power house of the electric company is 460 feet above sea level, giving a fall of 1,000 feet from the main lake, through which 15,000,000 feet of water pass every 24 hours, forming 1,500 horse power. In the power house at the foot of the mountain is an electric plant without a rival for its size and completeness on the North Pacific coast. From the power house the electric current is carried on six copper wires 12 miles to the city, and furnishes power sufficient to operate the street car and electric light systems, and office and factories in addition.
>
> It is the largest work of the kind in Western Canada, and with its mammoth machinery, miles of ditching and piping, the dam construction, the amount of general work accomplished, and its successful result, the expense incurred, nearly $250,000, seems reasonable…" (November 15, 1898 p. 3)

3.4 Powerhouse Expansion

It did not take long for the BCER to recognize the need for additional power generating capacity as Victoria's appreciation of electricity increased. As the *Daily Colonist* noted,

> …when one looks back at the crude system in vogue so short a time ago in this city, and compares what then obtained in catering to the wants of citizens in the way of rapid transit, with that which now supplies this want, the conviction is forced upon one that in comparison to its size Victoria is second to none in the matter of street car service. In fact it is a question how many citizens fully appreciate what they can enjoy for their nickel. A ride all the way from Oak Bay across the peninsula to Victoria harbor and away down to the furthest Western limits of the city on Esquimalt road, for the one fare is a concession to the thrifty seeker after a pleasant manner in which to spend an odd half hour, which cannot be bettered in any portion of this fair Dominion. (August 5, 1900, p. 2)

In 1899 the BCER began investigating new water wheel and generator options, though it decided to stay with the Pelton Water Wheel Company and Canadian General Electric when it finally placed an order early in 1901. The new, more powerful equipment included a 900 HP Pelton Water Wheel and a 500 KW generator. At the same time it was decided to more than double the size of the building in order to house both the water wheel apparatus and the transformers that had been installed outside in 1898. Early in the summer of 1901 construction was completed (*Daily Colonist*, April 11, 1901, p. 5), and the generating apparatus was installed by mid fall. Goldstream now produced almost twice the horsepower, delivered to Victoria on two sets of transmission wires, one for incandescent lighting, the other for street railway lighting.

Further expansion was called for only two years later and by fall of 1904, the Powerhouse was also home to a double-hung Pelton Water Wheel that created 2000 HP (Department of Lands, 1924, p. 21), and a 1000 KW Westinghouse generator. The BCER, with Sperling now working in the head office in Vancouver, was disappointed with Westinghouse for delivering the new generator without testing since this delayed operations in costly ways. It is interesting to read the BCER background correspondence regarding such failings while also noting *Daily Colonist*'s cheery description of a gathering to celebrate the installation of this massive new equipment.

> To explain the situation: The new 1,000 K.W. (which is kilowatt) unit is an immense individual generator—one big individual piece of machinery taking the water from the pipe line, obtaining its power by means of modern water wheels, and turning over to the transformers for transmission and distribution 1,0000 kilowatts or about 2,400 horse power, quite sufficient to provide about 20,000 lights of 16 c.p. (which of course is candle power).
>
> It is referred to as a unit because there are other individual pieces of machinery of similar purpose in the power house, two of 360 k.w. each and another of 500 kw., and these units are capable of being used singly or connected up to provide 2,2000 k.w. or 4,600 horse power. The whole set of great machines is given life and strength for usefulness by means of a 700-foot head of water furnishing 285 pounds of pressure to the square inch.
>
> The "opening" of the new unit—by far the largest piece of electrical hydraulic machinery on the Island—was, to translate freely, merely the inauguration of its use. At the same time it marks an epoch in the history of the company's operations in Victoria and furnished an excellent opportunity for admiration by the fortunate guests of the occasion, of the modern perfection of the plant and equipment.
>
> To get the new machinery (the latest Westinghouse model) from the railway to the power house was in itself no little undertaking. The weight is 28 tons and the heaviest separate part, or single casting, no less than 16 tons, awkward and cumbrous. To transport it over the power house road demanded that that road should be heavily planked, and that block and tackle should be utilized the entire distance, with two teams on the end of the fall.
>
> And all the time, it is recorded in history, a myriad of wasps and hornets were serving mandatory injunctions by painful natural process.
>
> Still the transportation problem was eventually solved and installation followed…
>
> Not only is the great unit itself a marvelous illustration of modern mechanical skill demonstrated in the construction of ponderous electrical machinery. [sic] the incidental equipment is equally admirable. The necessary extension of the building 64 x 25 feet in floor area[9], is a very solid substantial and fireproof structure of brick and concrete, no fewer than 50 carloads of beach gravel being utilized in the making of the floor alone. The switchboards, too, are of finest Italian marble and their instruments ultra modern. These include the perfected watt meter, which indicates at a glance the capacity and horse power at any second; the ampere meters showing in capacity the output of the generators, etc.,
>
> Every arrangement in connection with the switchboards assures the safety of the operations, for all connections are made below the board and below the floor level; the operator has but to pull a harmless lever and the connections are made or broken in oil--there is absolute and positive safety, for there are no high tension or dangerous parts near the switchboard

[9] To the best of my knowledge, the addition of the 1000 KW generator did not involve any new construction although it appears that the layout of the various generators was altered to accommodate the large apparatus.

> Another feature of the new unit itself is found in the attachment of small motors to the needle valve of each water wheel, these being connected with the switchboard so that the power can be regulated from one horse power up to full capacity without touching the machinery or going near it, simply by moving a little lever on the switchboard The saving in time and in labor may be guessed at.
>
> Another feature of the power house is found in the new Lombard governors. In the old days, it was a worrisome [line cut off] regulated to the constantly variable requirements, deflecting the water from the wheel into the tailrace without ramming the pipe. The Lombard Type F. hydraulic governor, operated from a piston valve, regulates the inflow automatically and saves grey hairs and much incentive to profanity.
>
> There are a hundred and one other features that might be dealt with—suffice it to say that the new and important additions to the plant are the best that money can buy or practical science can devise for the work to be put upon them. Heretofore, so rapidly has the tram car business developed and the demand for electric light increased, it has been necessary for the company to use a steam plant in the city as an auxiliary to their transmitted power from Goldstream. With the new unit connected up and in use, the steam plant can be shut down and the entire tramway and lighting system be operated with increased economy and enlarged satisfaction to the public, better regulation being assured with the death of all jumping of lights at each change from steam to water power, or vice versa.
>
> The "opening" was a ceremony delightful in its simplicity and informality. …Insulators were filled to the brim with aerated waters from the famous spring of G. H. Mumm & Co., and the health and success of the big unit was heartily honored, with best wishes for its continued smooth-running usefulness.
>
> It was Mr. Goward who gave the toast, incidentally remarking that the unit represents the biggest and best piece of hydraulic and electrical machinery on Vancouver Island. He cordially complimented all in any way identified with the installation, paying tribute more particularly to Mr. Tripp, who has been in full charge of the big work, laboring indefatigably and against many unforeseeable hindrances almost night and day. (December 7, 1904, p. 8)

3.5 Fifty Quiet Years at Goldstream

Even after doubling the capacity of the Goldstream Powerhouse in 1904, the BCER was challenged to keep pace with Victoria's electricity needs, particularly in the late summers of 1907 and 1908 when drought limited water supply and forced the Company to turn to its auxiliary steam plant for costly back up. Disruptions in street railway service at the height of the drought and ongoing disputes with Esquimalt Waterworks prompted BCER to look further afield for high-pressure water sources. The Shawnigan area attracted initial interest, but Jordan River quickly became the focus for new development. The BCER through its subsidiary, the Vancouver Island Power Company, began construction of a power plant in this remote location in 1909 and opened the state-of-the-art power plant in 1912, although it took a number of months for the plant to operate without disruption. During this period the daily log at Goldstream reports repeated stresses on their system as they absorbed the impacts of Jordan River black-outs.[10]

In the same period the City of Victoria was exploring alternatives to water supplies from Beaver and Elk Lakes. An extended debate over the water rights of Esquimalt Waterworks in the Goldstream area started in 1904. When it was resolved in favour of the EWW, the City spent

[10] Powerhouse Note Book, PABC MS 1321 Box 5, 1912.

considerable time unsuccessfully negotiating a purchase price for the Waterworks and even considered going into the power utilities business, before shifting its gaze to Sooke Lake. This area was developed as the City's primary water supply, although the City eventually appropriated the Goldstream waterworks in 1924 to consolidate its holdings.

As these new power and water utilities settled into reliable service, ongoing power generation at Goldstream became uneventful and did not attract much attention in the media or the literature on power generation. Theodore Lubbe passed away in 1910 and his son, also named Theodore, assumed the role as managing director and signed a renewal of the EWW contract with BCER in 1915[11]. Goward and Sperling moved to more senior positions in BCER, and George Tripp served as Goldstream superintendent from 1903 to 1944.

In 1938 the forty-year contract that BCER had signed with Esquimalt Waterworks ended, prompting considerable debate at the City that, as a result of the expropriation of EWW, now held the contract to supply water to the Powerhouse and manage the area. Consultant R.W. Beck reviewed BCER's long history of providing power to the City and decried its monopoly[12]. The recommendation that the City borrow provincial funding to take over Powerhouse operations was accepted, but when the Province refused a loan, the contractual arrangements to provide water to the Powerhouse were extended. The BCER transitioned in this period to the British Columbia Electric Company to reflect its primary role as a power provider in a period when electric streetcars were being replaced by buses. Given the age of the Goldstream Powerhouse, its equipment was clearly obsolete. However, the BC Electric response[13] to the Beck report summarizes the ongoing value of the Powerhouse:

> The Goldstream Plant, built in 1898, is housed in a substantial brick building on land leased from the City at $1.00 per year.
>
> It has four units totaling 4100 h.p. connected to two generators of 2600 K.V.A total capacity. Two 600 h.p. units installed in 1898 are very inefficient, obsolete, and are now seldom operated. The third unit, 900 h.p. and 600 K.V.A. capacity is also obsolete, having an estimated over-all efficiency of 65%. The fourth unit of 2000 h.p. and 1200 K.V.A capacity is fairly efficient, but not modern. Switchboard equipment and apparatus are also outmoded.
>
> Notwithstanding the high degree of obsolescence in this plant, it is in good operating condition and would continue to give many years of service adequately, providing there is no increased demand for energy upon the plant, and providing that ample water is available to the turbines.
>
> This Goldstream plant is a very valuable asset to the British Columbia Electric system. Its fixed capital investment was originally low and at this time should have been completely amortized.
>
> The principal value of this plant to the Company now and for a number of years past, is not as a producer of kilowatt-hours but as an auxiliary station to 'top off' the peak loads of the system when necessary. If Goldstream Plant never generated a kilowatt-hour of energy, it still would be a valuable asset to the system as a guarantee of service. A steam plant to fulfill this function would cost considerably more in first cost and several times more to maintain and

[11] Goldstream Agreements File, PABC BCER MS 1320, Box 3.

[12] Beck Report (1938) file in PABC MS 1321 Box 3.

[13] BC Electric response to the Report by R.W.Beck, R.W. Utility Engineer (1938) in PABC MS 1321 Box 3.

> operate. Analyzing all the factors connected with the operation of this plant, I unhesitatingly state that in my opinion the Company has enjoyed the full benefit of this vitally necessary auxiliary to its system without net cost to the Company.

Nevertheless, provision to close the Goldstream Powerhouse was included in the final contract renewal between BC Electric and the Greater Victoria Water District (formed in 1948). With the expiration of the final contract, after almost 60 continuous years of operation, the Powerhouse was decommissioned in 1957. As part of the agreement to cease operations, BC Electric agreed to remove the power generation equipment and turn the building over to the Water District for future uses.

> At the expiration of the agreement and within the time specified in the document, my Company will take steps to remove the generators and other machinery from the Power House building but is prepared to leave the building in place on the understanding that you desire to take it over and use it for storage purposes. The remaining buildings on the property under lease from your Board we will arrange to demolish and have the materials removed.[14]

Equipment is said to have been disposed of through Capital Iron. While now largely empty, the few pieces of equipment and materials left behind are reminders of the significant role that Goldstream played in the life of Victoria.

[14] Letter from E.W. Arnott, Vice President of the British Columbia Electric Company Limited to R.A. Upward Chief Commissioner of the Greater Victoria Water District, from the PABC BCER MS 1320 Box 3, Goldstream Agreements File.

4.0 GOLDSTREAM POWERHOUSE FEATURES

Located at the foot of a complex system of dams and reservoirs constructed through back-breaking work in the final decade of the 19th Century, the Goldstream Powerhouse represents the ingenuity and dedication of prominent Victoria entrepreneurs who sought to harness the innovative forces of electricity that were transforming urban development locally and around the world. The Powerhouse is notable in that it was the first hydroelectric power utility in the Pacific Northwest and enabled the transmission of electricity across the longest span of power lines at the time. While no longer in use, this brick and concrete structure in the Goldstream Watershed, just over 12 km from the heart of the City of Victoria played a significant and transformative role in Victoria's history.

4.1 Site and Tenure

The Goldstream Powerhouse was constructed in 1898 by the British Columbia Electric Railway Company (BCER) on land leased from the Esquimalt Water Works Company (EWW) to take advantage of the 700' static head of water pressure available through the system of 10 dams and four reservoirs that the EWW constructed throughout the Goldstream watershed. It is situated on Powerhouse Road, 3.6 km inside the gateway to what is now the Goldstream Water Supply Area (WSA), managed by the Greater Victoria Water Supply Area of the Capital Regional District. The Esquimalt Waterworks water rights and infrastructure were appropriated by the City of Victoria in 1925 to consolidate its water management systems, and in 1948 came under the management of the Greater Victoria Water District, now a line agency of the Capital Regional District. When the Powerhouse was decommissioned in 1957 by its operating agency at the time, BC Hydro, the structure reverted to the care of the Water District on whose land it is located. Because the Goldstream reservoirs serve as a secondary water supply to the Sooke WSA and are used when annual maintenance of the Sooke WSA infrastructure takes place, public access is restricted to prevent contamination.

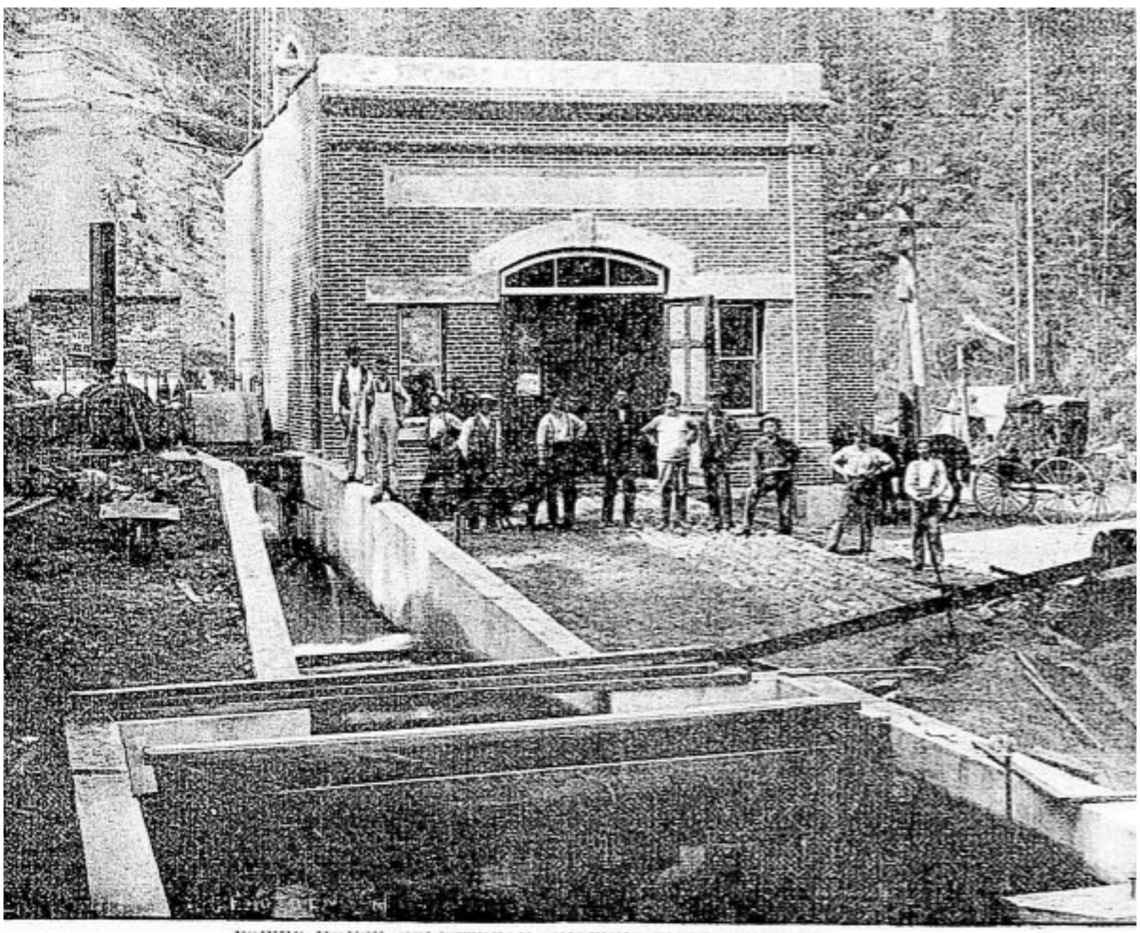
The Powerhouse sits at the base of steep hills on its west and south sides and is adjacent to Japan Gulch Reservoir on its north-east side. Access is by a gravel road that runs alongside Japan Gulch. As it its site resides within the Goldstream WSA, no specific site boundaries are described.

Aerial view of Powerhouse site adjacent to Japan Gulch, from CRD *Japan Gulch – The Powerhouse* poster.

4.2 Building Design and Layout

The Goldstream Powerhouse was planned in 1897 and built and equipped in 1898 to supply power to the street railway and residential and commercial lighting services offered by the Victoria Branch of the newly formed British Columbia Electric Railway Company. Including additions in 1901, the Powerhouse is a 2352 square foot industrial building, constructed in brick with concrete detailing. As a hydroelectric generating plant, it is purpose-built to accommodate water intake and outlet, penstock, water wheel, generator, transformer and transmission functions needed for this purpose.

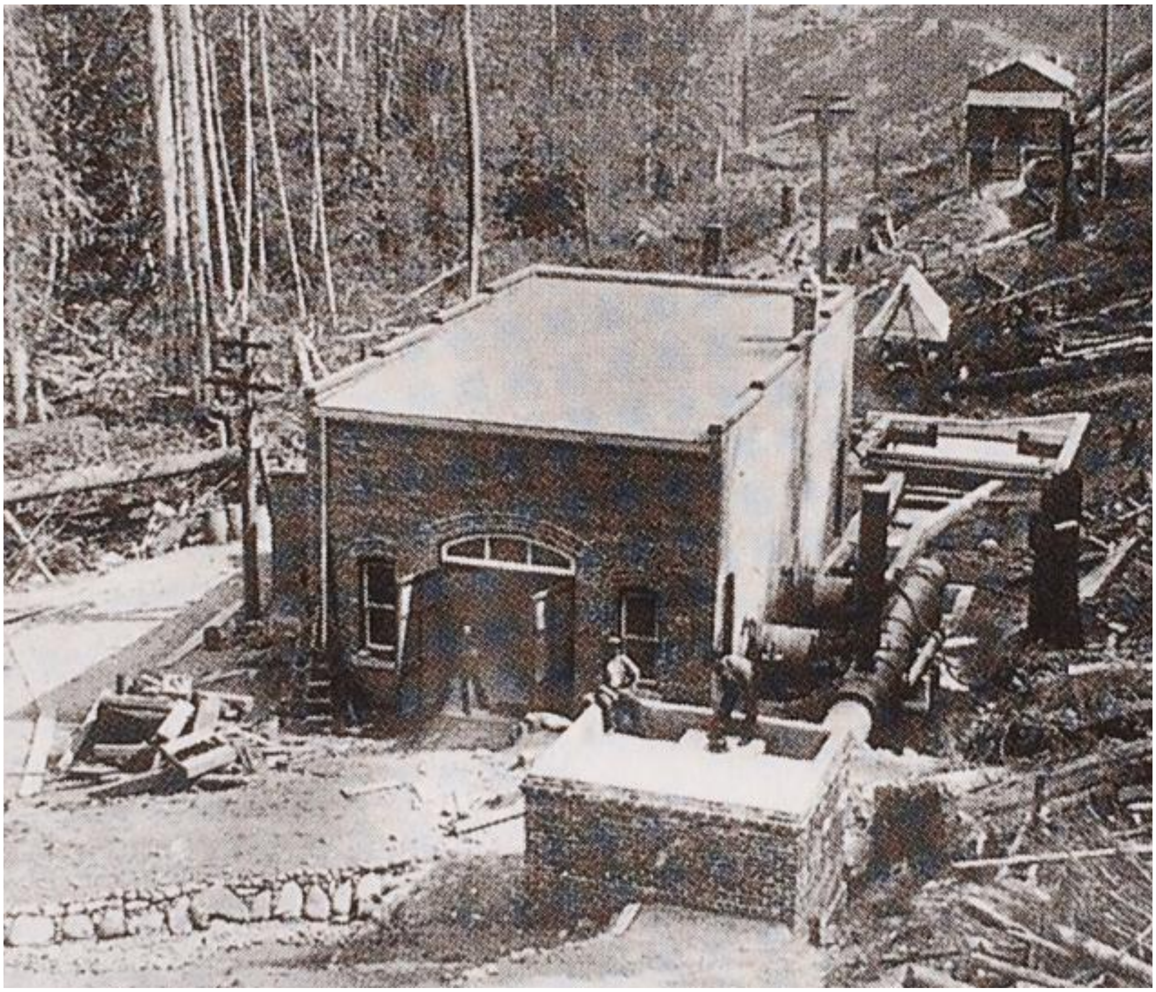
The initial structure, completed in July 1898 was designed by noted Victoria architect, W. Ridgway Wilson, and built by contractor, Robert Dinsdale. It was developed to house two 360 kW stationary field generators, built by Canadian General Electric. These were run by two 660 HP Pelton Water Wheels, powered by water provided by the Esquimalt Waterworks Co. from a series of upstream reservoirs in the Goldstream Watershed. A 7920' pipeline, averaging 28" in diameter (Myers, 1953, p. 18) carried water from the Cabin Pond reservoir to the south-west corner of the building where it was fed through an intake system and discharged through tailraces to Japan Gulch Reservoir adjacent to the Powerhouse. This system generated 1000 HP to run Victoria's street railway and its residential and commercial lighting systems.



POWER HOUSE, GOLDSTREAM, SHOWING WATER WHEELS.

Image from *Water Powers, British Columbia*, Ministry of Lands 1924. Powerhouse under construction in the summer of 1898. Note the clearing uphill from the Powerhouse, the reference to water wheels installed at head of tailrace, and the equipment which was later enclosed in the SW side addition. Also note the brick structure along the NE side.

Note that the following terms are used to describe the structure and site: ‘Front’ indicates the front or main entrance of the Powerhouse, ‘NE’ indicates the side that aligns with Japan Gulch; ‘back’ is the rear of the building, and ‘SW’ is the side that aligns with the tailrace. While these facades are not exactly aligned with these directions on the compass, they offer useful descriptors for Powerhouse features.

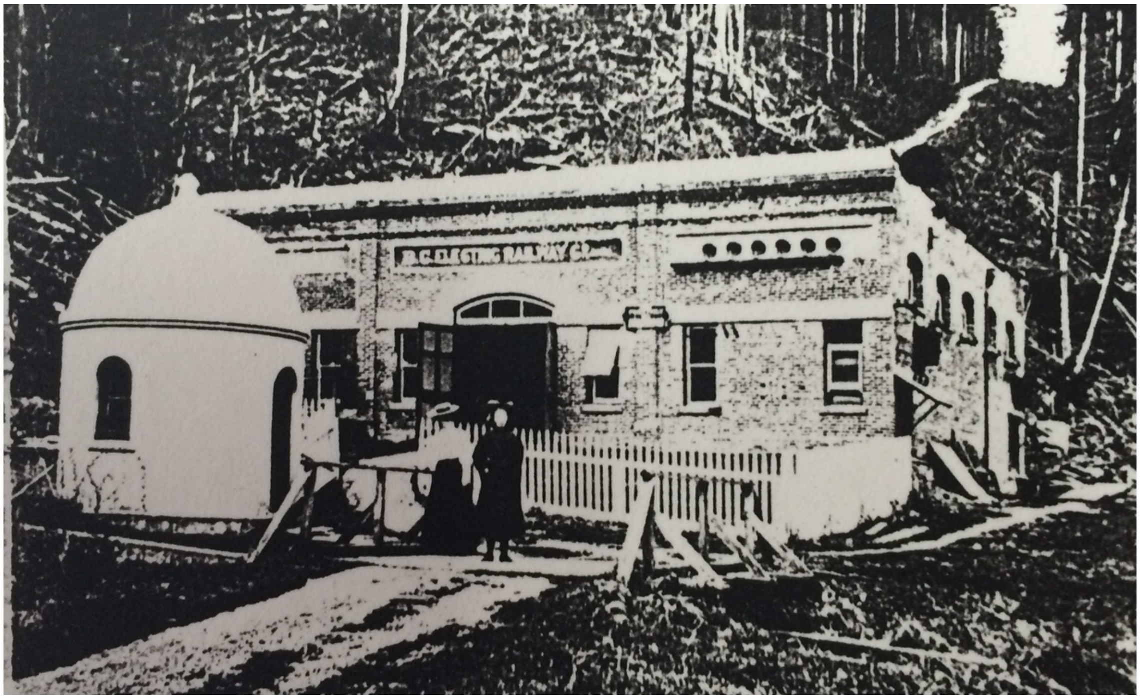


From Gaslights to Gigawatts, p. 16. View of Powerhouse from rear, looking down from pipeline. Note bunker at SW corner of the building and beyond it the casings for two waterwheels alongside the cylindrical water jacket now housed in the 1901 addition. Also note the brick structure on the NE side of the Powerhouse, the transmission pole, and the structure (two storeys?) down the road. The area toward Japan Gulch remains heavily treed.

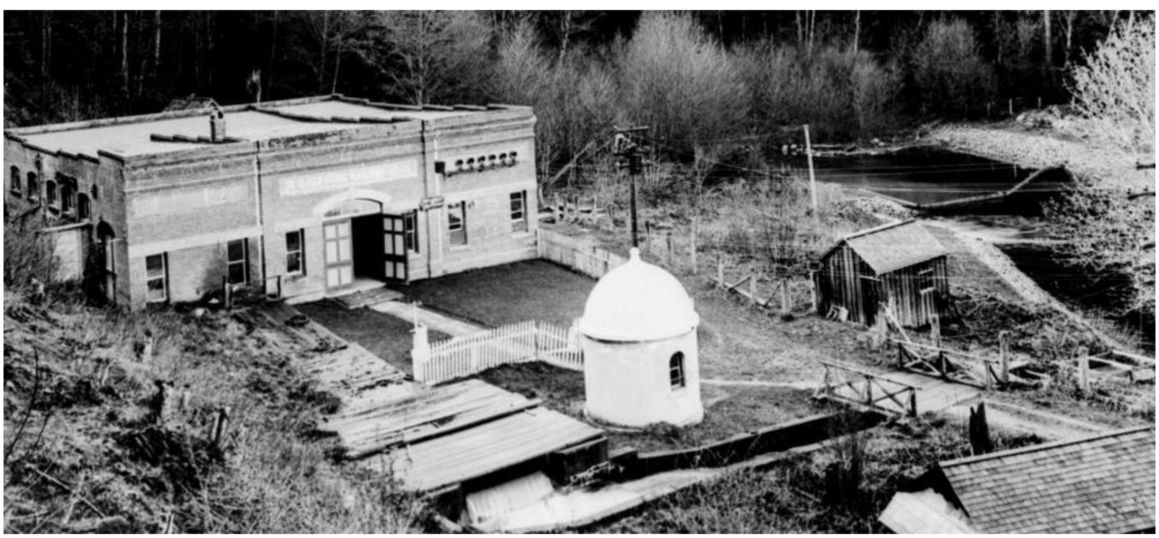
The Powerhouse was expanded in 1901 to better accommodate its operations and to house an additional 500 kW generator powered by a 900 HP Pelton Water Wheel. The addition on the SW side enclosed the water wheels and cylindrical tank that had been operating out doors, while the NE side addition appears to have accommodated transmission equipment.

Final changes to the Powerhouse took place in 1904 with the addition of a 1,000 kW Westinghouse generator, powered by a 2000 HP double-hung Pelton Water Wheel (Department of Lands, 1924, p. 21). December 2017 note: At that point in time, it seems likely that a further addition to the rear of the Powerhouse extended the building back to the edge of the bunker in which the pipeline connected with the valve, based on a comment in the *Daily*

Colonist on December 7, 1904 that "The necessary extension of the building 64 x 25 feet in floor area, is a very solid substantial and fireproof structure of brick and concrete, no fewer than 50 carloads of beach gravel being utilized in the making of the floor alone." [15]



City of Victoria Archives image, 97809-01-3863, dated c. 1908. This image indicates the clearing around the pipeline from Cabin Pond, the NE and front facades, and the bridge crossing the tailrace on which the ladies are standing.



Public Archives of British Columbia Image 1-52551 (cropped). Not dated, but post-1901 when the two additions were constructed. Note that the tailrace is covered and a bridge crosses the portion carrying water to Japan Gulch to the west of the Powerhouse. Also note the building in the lower right corner that could be the residence constructed for Powerhouse staff. Close examination of the photograph indicates that the sign above the main entrance reads BC Electric Railway Co.

[15] The observation that the Powerhouse had been extended at the rear was first made during a structural assessment prepared by John Dam, P.Eng, in Fall 2017.

The reservoir to the NE of the Powerhouse is Japan Gulch, developed to manage the 4,000,000 – 15,000,000 million gallons of water discharged from Powerhouse operations daily. The following picture shows the view of the Powerhouse across the reservoir along with the discharge from the tailrace.

Victoria City Archives Image 97809=01-4861, c. 1908. Note structures along NE side, and behind the Powerhouse.

4.3 Character-defining Features

The distinctive characteristics of the Goldstream Powerhouse during its operational years are described below, based on a handful of photographs taken between 1898 and c. 1925, archival research, and a visual inspection of the site in November 2016.

4.3.1 Roof

The Goldstream Powerhouse has a flat roof, with an upward incline toward the front of the building, reflected in stepped up segments of the side walls. Wide flashing has been installed across the front and rear facades, and much narrower flashing along the sides.

4.3.2 Foundations/Flooring

The three components of the overall structure appear to rest on concrete foundations, with rockwork along the exterior edges visible in some locations. Flooring systems appear to be designed both to support heavy equipment and to allow mechanical systems to run below flooring surfaces.

4.3.3 Exterior Walls

Red brick is the primary building material, with slight variations in colour between the original structure and the 1901 additions. A number of openings for waterworks and energy transmission purposes are highlighted with brick archwork. This can be observed along the current exterior walls built in 1901 as well as on internal walls since these were the exterior walls of the original 1898 structure. Vertical brick pilasters that mark the corners of the original structure, are likely to be structural as well as decorative features. In the 1901 building, these pilasters frame the main entrance. A brick cornice formed of successive layers of projecting brick across the front of the building lends an Italianate industrial air to the structure.

Below the cornice, a recessed line of concrete provided a background for the painted British Columbia Electric Company sign. A raised concrete decorative feature crosses the front of the building, arching across a central window above the main entrance and serving as the decorative lintel above the series of rectangular windows on this façade, matching their concrete sills. Windows on the additions match those on the original section.

4.3.4 Windows

Decorative segmental arched windows are placed immediately above the front and rear entrances. Six double-hung rectangular windows are recessed in symmetrically arranged brick window settings across the front, with concrete lintels and sills. Five windows, with similarly scaled brickwork arches are placed along the west side just below the roofline. These are replicated on the east facade. In addition to its segmented arch window above the west addition door, the south facade features brick arch rectangular windows in arched window settings.

4.3.5 Doorways

Large double doors are placed in both the front and back facades of the structure. It is likely that these have been sized to allow the passage of large pieces of machinery and equipment. At the rear entrance to the west addition there is a somewhat smaller a smaller doorway that replicates the shape of the adjacent doorway in the original section.

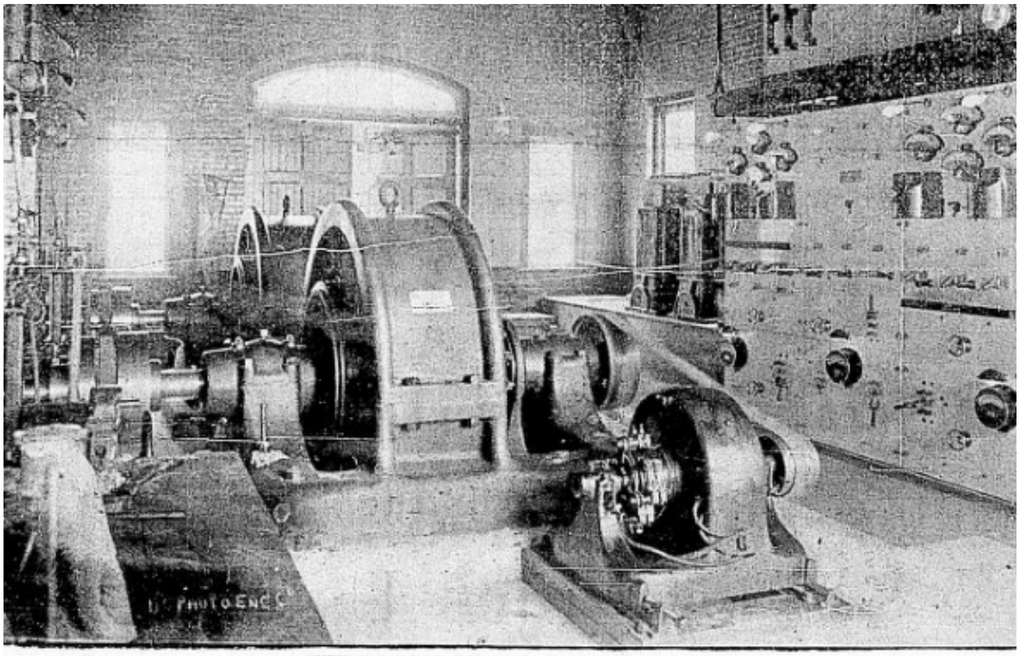
4.3.6 Interior Spaces

As noted, the original Power House was a rectangular one-story structure, designed to house two water wheels and generators. In order to expand generating capacity, additions along the east and west sides in 1901 more than doubled the interior space and allowed the addition of two more water wheels and generators along with switchboard and office areas. The interior space is therefore divided into three spaces, separated by the brick walls that had formed the east and west exterior walls of the original building.

Part of the original east wall was removed at the time of renovation to create a large L shaped central space and a low brick penstock enclosure runs the length of the east wall in this area. The remainder of the east addition is walled-off to house the water wheels and equipment that had been on the exterior of the original building. Interior doorways have been placed at two points to access this enclosed space.

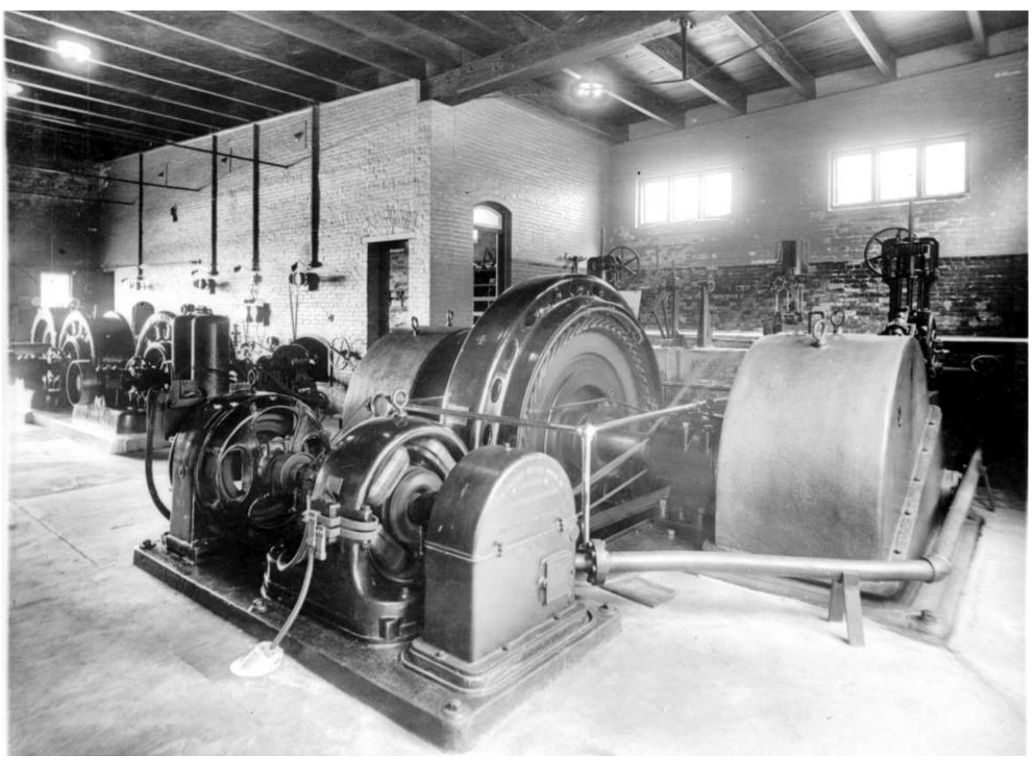
The west addition is walled-off from the central space, with access doors. A stud wall was constructed at some point in time along the dividing wall, and a half wall has been constructed to partially divide the area into two working spaces. Near the front end of the west addition a concrete trough runs the width of the space. High on the front wall, six masonry tubes that allow transmission lines to exit the building are placed in a horizontal row.

The following pictures provide a sense of the layout of interior spaces of the original building after 1898 and the enlarged structure after 1901. It is interesting to note that the original generators appear to have been moved at a time when either the 500 KW or 1000 KW generator was installed.



SWITCH-BOARDS, POWER HOUSE, GOLDSTREAM.

From *Water Powers*, Department of Lands, 1924. Given the placement of generators and shafts relative to the penstock, this picture appears to be from the main entrance of the 1898 powerhouse space and is likely to have been taken between 1898 and 1901 before construction of west addition, since the window beyond the switchboard appears to look to the exterior and only two generators are depicted. The doorway in the back of the photo is therefore at the rear of the building.



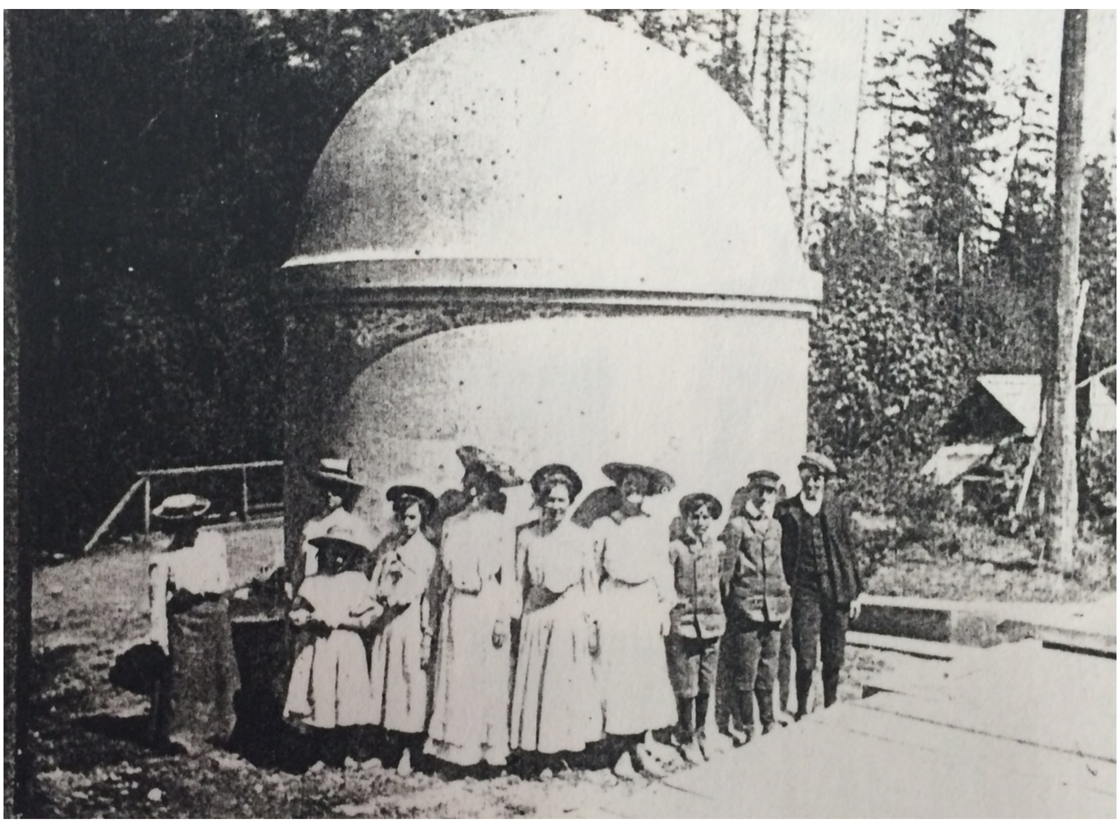
PABC Image 1-52563, Interior of Powerhouse. This photo, taken from the south end of the central (original) area of the powerhouse shows the placement of four generating systems, and the corner of the east addition that houses the waterworks equipment. Note the original generating equipment (1898) is has been moved to the far end of the area.

4.3.7 Waterworks
The area immediately surrounding the Powerhouse is dominated by a number of water intake and outflow features. There is a buried pipeline coming down the steep hillside at the SW rear corner of the structure. It ends in a small concrete bunker set close to the corner. Within this bunker is the junction with the gate valve that controls water flow to the hydroelectric equipment downstream.

At the other rear corner of the building is a narrow concrete tailrace that carries excess or diverted water to the Japan Gulch reservoir which collects all from the Powerhouse.

On the left side at the front of the Powerhouse the main concrete tailrace carries water expelled after use approximately 100 feet in an easterly direction before turning north to discharge the water in Japan Gulch. A later pipeline has been installed following the easterly part of the tailrace to its end before going underground toward Japan Gulch.

4.3.8 Expansion Bell
A brick chamber with a concrete roof and skin is set at the point where the main tailrace turns 90 degrees toward Japan Gulch. As noted by Duffus (2003), instruments in this structure were used to measure the volume of water flowing from the plant. It seems likely that Esquimalt Water Works constructed and maintained this facility since it used the water volume data to bill BCER for monthly water consumption. The term 'Expansion Bell' comes from the caption of the Victoria City Archives photograph below:



Victoria City Archives Image 98008-01-665, dated 1904, with text "Children in front of Expansion Bell." Note transmission pole in background, and building along roadway behind the Bell.

4.3.9 Transmission Lines

Power lines exit the Goldstream Powerhouse through a series of six masonry tubes set in a horizontal row high on the front façade. These attach to the first of many transmission poles that carried power to Victoria.

4.3.10 Grounds

A lawn was planted at the front of the building after the 1901 additions. Access to the building is provided by a road approaching the Powerhouse from the Goldstream Entrance Gate, along Japan Gulch; in early pictures it crossed a bridge across the tailrace and continued along the NE side of the building. A walkway connected the road with the front entrance of the Powerhouse. Picket fencing borders the lawn on the front side, and rougher fencing borders the roadway. A shed is positioned to the NE of the road, and a house or larger shed is positioned beyond the easterly arm of the tailrace.

4.3.11 Staff Housing

While records indicate that two houses for staff were constructed nearby in fall 1898 and in 1907, both appear to have been demolished and their siting is uncertain. Some reference is made to Esquimalt Waterworks making land available below the Japan Gulch reservoir, but it should be noted that two buildings that may be residences appear adjacent to the Powerhouse in photographs. The cabin constructed in 1907 was a "sectional cottage" acquired from Ready Made Houses.[16] There are cabins located upstream in the Goldstream watershed at Goldstream Lake and Cabin Pond, but these were most likely used to house caretakers for the Esquimalt Waterworks Co. or local farmers.

Public Archives of British Columbia Image 1-52551 (cropped). Note structure in lower right corner.

Victoria City Archives Image 97809=01-4861, c. 1908 (cropped). Note two-story structure on right, behind the Powerhouse.

[16] Letter from British Columbia Mills Timber and Trading Company to BCER, August 17, 1907, PABC BOX 880058-0431 File 5Z 3/1.

5.0 Condition Assessment

5.1 Site Inspection
A visual inspection of the Goldstream Powerhouse site was conducted on November 29, 2016 by Joy Davis and Gordon Joyce of Lands End Environmental Consulting and Don Herriott of CRD Integrated Water Services. The inspection included ground-level observation of the front, NE and rear sides. Given the difficulties of walking along the SW side posed by the open creek and heavy vegetation, a cursory visual inspection took place from the SW rear corner of the building. The addition on the NE side and the central spaces were accessed through the main door, and the SW side addition was viewed through openings from the central area. Photographs and field notes, taken by Joy Davis, were used to record current conditions.

5.2 Roof
While it was not possible to view the roof itself, an interior inspection did not reveal any water in the building as a result of rood leakage despite very recent heavy rainfall. Flashing around the perimeter of the roof is damaged or absent in a number of cases, and no downspouts were observed.


SW facade roofline


Front facade roofline

5.3 Facades
The exterior walls on all sides of the powerhouse appear to be stable, in that they are not leaning, distorted or bulging. On the front facade, at the junction of the original building and the NE side addition, there is severe structural cracking that has, at some past date, been stabilized by a rod and plate installed near the top. Other, more minor cracks in the brickwork are noted at various places around the building.


Goldstream Powerhouse in 2016, front and NE facades


Cracking at junction between 1898 original structure and 1901 NE side addition

The condition of the brickwork, mortar, and concrete lintels and window sills varies considerably, depending upon location and environmental impacts. Rising damp, efflorescence, damage from impacts and erosion can be observed on all exterior walls, resulting in significant discoloration, weakness and breakage. Mortars have eroded away in many locations and associated brickwork shows signs of breakage and spalling along exposed edges. The NE side, in particular, has been damaged by plant growth. Grasses and moss are observed along window sills and between bricks. A large tree, recently cut down, has its roots embedded in the foundation, and an evergreen tree, approximately fifteen feet high, was growing immediately below the sill of a high window. Its recent collapse appears to have dislodged the brickwork between the top of the window and the roofline.


NE facade


Front facade


NE facade


Front facade, window sill


NE facade tree roots in foundation


NE facade damage from tree growth

Graffiti and other forms of vandalism are evident in many locations.

5.4 Doorways and Windows

As the building was renovated to accommodate new equipment in its early years, and then decommissioned in 1957, many of the door, window, and functional openings to accommodate power generation have been closed up and/or bricked in. Most notably, the entire front of the original structure has been removed and is now clad with plywood and a large double door with a heavy locking mechanism. The matching doorway openings on the rear side of the building are intact, although the door on the original section has been replaced with a plywood wall with openings across the bottom. The large doorway on the rear of the NE side addition was open to the weather.

Front facade, note missing masonry front of 1898 structure.

Rear facade; the door to the NE addition is open.

The frames and glazing of the double hung windows on all sides are damaged beyond the point of use and in a few instances on the SW and rear facades, have been boarded up.

Rectangular double hung windows on front facade

Window in arched setting on NE facade

SW facade, five arched window openings

Rear facade, relatively intact window

5.5 Foundations

The earth has been built up along the front facade to the degree that foundations are not visible. Build up has taken place to a lesser degree along with NE and rear facades. It was not possible to observe the SW facade given the density of plant growth.

NE corner, showing build up of earth along front side

NE facade, foundation

5.6 Interior Spaces

A thorough visual inspection of interior spaces was not possible due to the range of materials stored in a haphazard fashion in the SW side addition, the central area and the NE side addition.

The central area (1898), accessed through the front entrance, is now a large 'L' shaped space that includes an alcove created in the rear portion of the SW side addition (1901). A range of materials is stored in this area atop the penstock enclosure, including lumber and a small boat. Evidence of hydroelectric functions are two 'Pelton Water Wheel' branded metal through-wall fixtures that appear to have enabled the shafts of water wheels to connect to generating equipment, and a large metal framed opening through to the east addition that may have had a similar purpose. Two blocked doorways and a blocked window are also observed as connections to the enclosed portion of the SW side addition.

Central area, viewed from front entrance

Alcove on the left at the back of the central area, used for storage

One of two Pelton Water Works (dated 1898) throughways to SW side addition – may allow the shaft of the water wheel to connect with generator

Opening to SW side addition

Along the dividing wall with the NE side addition, a British Columbia Electric Railway sign painted on a masonry feature remains intact. It is interesting to note that this spells out the full name of the company while the external sign above the main entrance, now gone, said B.C. Electric Railway Co. Ltd. A large arched doorway below it has been blocked with plywood, and outlines of windows at either end of the doorway appear to overlap with the doorframe, suggesting renovations at some point in the wall's history.

Wooden shelving, presumably installed after the Powerhouse was decommissioned, blocks the rear entrance, but the segmented arch window frame remains intact. Graffiti is seen throughout this space. Florescent light fixtures are affixed along the ceiling.

Boarded doorway on NE wall of central area; note overlapping window settings.

SE corner of central area; note staining on masonry, reinforcement near ceiling, and blocked doorway to SW side addition.

The interior of the SW side addition (1901) is difficult to access as doorways are blocked. The space still contains a large, rusted cylindrical piece of equipment that would have been linked with the delivery of water to the water wheels and related equipment. Further investigation may reveal that this created the jets that drove the Pelton Water Wheels, based on the report in the *Daily Colonist* (August 5, 1900, p. 2) that states that "The water at the power house enters a riveted steel receiver, from which under this enormous pressure it is forced through two pipes terminating in four nozzles a couple of inches in diameter. Strange as it may seem these four small streams of water working the water-wheels develop sufficient power to run all the electric cars and electric lights in Victoria."

The walls in this area are similar in condition to those in other spaces, and piles of abandoned equipment remain in several spots. It is unclear where water wheels would have been located, given the presence of two broad pipes that run the length of the room.

Interior of SW side addition, still housing massive power generation equipment seen outdoors in 1898 photographs of original building

Walls of the SW side addition, taken from back of central area. Note blocked doorway and window providing access and view the enclosed area.

The NE side addition was accessible through the open back door, but as floor planks are damaged or missing in a number of spots and as stored materials are scattered throughout the space, only a cursory observation was undertaken. Some cracking is observed in the brickwork and there is considerable graffiti on walls. As breakage high on the exterior wall leaves the adjacent area open to the elements, some water damage on the wall below is evident. All of the windows are broken and dysfunctional. The six transmission openings on the front wall have been blocked with an unidentified material.

NE side addition, from front end; note half-wall midway down the space, and stud wall backing the wall that separates this space from the central area.

Damaged floor near rear entrance


Water trough (?) and sealed round openings on exterior (NE) wall, viewed through window on north facade.


Sealed tubes on front wall of NE side addition, used as exits for transmission lines.

5.7 Waterworks

The 1898 bunker that houses the junction of the pipeline from Cabin Pond at the rear of the Powerhouse is of masonry construction with a recessed roof, heavily plant encrusted around its edges. The interior space is open to the elements but fairly dry, and houses a corroded gate valve that was used to regulate water flow to the penstock immediate inside the Powerhouse building.


Exterior bunker, south side of Powerhouse


Water control valve (Pelton?)

A stream down the steep slope behind the Powerhouse appears to be diverted into the tailrace that carries excess water from the NE rear corner of the Powerhouse to Japan Gulch.


Stream behind SW rear corner of Powerhouse


Tailrace from NW rear corner of Powerhouse

The large tailrace in front of the SW side addition, that carried water from power generating equipment to Cabin Pond, is not used and, while intact, is heavily overgrown and eroded in places. A substantial pipe that may have been installed at a later date to carry used water to Japan Gulch aligns with the easterly part of the tailrace and is also covered with moss.

Tailrace

5.8 Transmission Lines
No evidence of power transmission poles was found on site.

5.9 Expansion Bell
The Expansion Bell is largely intact although the door is gone and the window screen is damaged. In places the concrete skin is damaged, revealing the brick structure. Moss grows across the top, and graffiti covers large portions of the exterior sides.

Expansion Bell; note trees that have grown adjacent to the structure and build up of soil

Interior of Bell structure, showing brick construction and damaged window screen


Concrete ceiling of Expansion Bell


Floor of Expansion Bell, showing pipe opening


Damage to concrete skin of Expansion Bell


Side view of Expansion Bell doorway providing a sense of wall thickness

5.10 Security Issues

CRD signage warns against trespassing, and the main door to the Powerhouse is locked – although there are several other relatively easy ways to access the building. As the site is 3.6 km from the security gate of the Goldstream Water Supply Area, few members of the public are able to access and view it. Nevertheless, hikers and others do find their way to the building and may do so with increased frequency with the opening of the nearby Trans-Canada trail. Broken windows, refuse, and extensive graffiti are the main signs of intrusion. At the same time, degraded floors, open tail races, haphazardly stacked materials, glass shards and other hazards on this deserted site create potential security issues for staff and curious visitors.

6.0 Draft Statement of Significance

A statement of significance captures the values that historic places hold for the stakeholders who care for and about them. As such, preparation should be a collaborative effort that weighs the varied and subjective historic, scientific, aesthetic, social and/or cultural meanings of a place. This draft is therefore intended a starting point in a consultative process to develop a statement of significance for the Goldstream Powerhouse.

6.1 Description of the Historic Place

Goldstream Powerhouse sits alongside Japan Gulch on the Goldstream River at the base of a complex system of dams and reservoirs that provided high-pressure water power for its innovative hydroelectric system from 1898 to 1957. This unique historic resource lies within the Goldstream Water Supply Area managed by the Capital Regional District where public access is restricted.

6.2 Heritage Value

The Goldstream Powerhouse represents the ingenuity and dedication of prominent Victoria entrepreneurs who sought to harness the newfound electrical technologies that were transforming urban development at the turn of the 20th Century. The Powerhouse is notable in that it was as the first hydroelectric power utility in the Pacific Northwest and enabled the transmission of electricity across the longest span of power lines at the time. In doing so, it made possible such amenities as incandescent lighting in residences and businesses, expanding streetcar service to new communities in Fairfield, Oak Bay and Esquimalt, and industrial enterprises that created employment and stabilized the economy of the area. While no longer in use, this brick and concrete structure in the Goldstream Water Supply Area, managed by the Capital Regional District, is evocative of the transformative role of electrification in Victoria's history.

In addition to its historic value, the Goldstream Powerhouse is a physical record of architectural and technological approaches to power generation at a time of tremendous innovation and growth in the uses of electricity, and is associated with a range of prominent entrepreneurs who helped shape the region and the Province.

6.3 Character-defining Elements

The following features contribute to the distinctive nature of the Goldstream Powerhouse:

- Its setting within a complex system of dams and reservoirs engineered and constructed under difficult conditions to utilize water for commercial purposes.
- The purpose-built brick and concrete structure, designed by noted architect W. Ridgway Wilson to house the first major hydroelectric utility in the Pacific Northwest.
- An innovative waterworks system including a 7000 foot pipeline, penstock, tailrace, and reservoir for discharge of water, designed to power an innovative hydro-electric system.
- Remnants and records of monumental hydroelectric apparatus that, at the time, was state-of-the-art.

7.0 CONSERVATION OPTIONS

7.1 Approaches to the Conservation of a Heritage Place

As a heritage resource that has significance for the Water Supply Area and for the Capital Region, stewardship of the Goldstream Powerhouse should be guided by standards and practices consistent with good heritage conservation practice. These have been articulated in *Standards and Guidelines for the Conservation of Historic Places in Canada*, collaboratively prepared by the federal, provincial, and territorial governments of Canada in 2010 (2nd Edition). This tool outlines a process for systematically considering conservation options (p.3), as follows:

> Conservation activities can be seen as a sequence of actions — from **understanding** the historic place, to **planning** for its conservation and **intervening** through projects or maintenance. Because conservation is an ongoing and cyclical process, people involved in conservation must often retrace their steps to re-examine their approaches, namely, to assess the impacts of planned interventions on character-defining elements, or to obtain additional information.
>
> **Understanding** an historic place is an essential first step to good conservation practice. This is normally achieved through research and investigation. It is important to know where the heritage value of the historic place lies, along with its condition, evolution over time, and past and current importance to its community. The traditional practices associated with the historic place and the interrelationship between the historic place, its environment and its communities should also be considered. The understanding phase can be lengthy and, in some cases, may run in parallel with later phases as the understanding of the place evolves and continues to inform the process. The information collected in this phase will be used throughout the conservation decision-making process and should remain accessible.
>
> **Planning** is the mechanism that links a comprehensive understanding of an historic place with interventions that respect its heritage value. Planning should consider all factors affecting the future of an historic place, including the needs of the owners and users, community interests, the potential for environmental impacts, available resources and external constraints. The most effective planning and design approach is an integrated one that combines heritage conservation with other planning and project goals, and engages all partners and stakeholders early in the process and throughout.
>
> For historic places, the conservation planning process also needs to be flexible to allow for discoveries and for an increased understanding along the way, such as information gained from archaeological investigations or impact assessments. It is important to maintain a firm sense of the larger picture over the long term, and not to emphasize particular character-defining elements at the expense of others.
>
> **Intervening** on an historic place, that is, any action or process that results in a physical change to its character-defining elements, must respect and protect its heritage value. Interventions can include:
>
> - Preservation actions that are part of the ongoing maintenance of an historic place;
> - Rehabilitation activities related to a new use or code upgrades;
> - Restoration activities associated with the depiction of an historic place at a specific period in its history⋯
>
> These three phases can further be defined through a series of steps. Although presented sequentially, these steps should be revisited regularly as part of the ongoing conservation decision- making process.

This study is a first step in the process of **understanding** the Goldstream Powerhouse, and reveals the importance of immediate steps to secure the site and ensure that it is safe for visitation and further study. The next step in understanding the site is preparation of drawings or other forms of surveying that capture the layout of the structures, adjacent waterworks and grounds, along with the dimensions and characteristics of the Powerhouse and Expansion Bell. With these in hand, a thorough and systematic assessment of condition provides the information needed for subsequent planning and intervention activities.

It is important to note that since the outcomes of systematic surveying and assessment are precursors to planning, this report focuses on these two final stages in understanding the site, in this section and in Section 8.0 Recommendations. Planning and intervention actions are referenced as longer-term activities that are contingent on completing the 'understanding' phase of conservation.

7.1.1 Site Surveying: Systematic surveys of the site and buildings establish a baseline of the contemporary character of the Goldstream Powerhouse and provide valuable reference tools to guide condition assessment and stabilization activities, document interventions, plan for appropriate and sustainable uses, and enrich interpretation. Two-dimensional site plans and architectural renderings are typical outcomes of site surveying. And "with the evolution of new methods of three-dimensional measurement, computer software ubiquity and literacy among users, there is a growing demand for three-dimensional digital information" (Historic England, 2011, p. 3). Such images may be of particular value in online site interpretation.

The CRD should determine the desired level of detail, format and uses in considering approaches to surveying. Three options might be considered, as suggested by local heritage conservation specialists.

- **3 Dimensional Renderings in CAD Format:** Recommended by John Dam, B.A.Sc., M.Sc., P.Eng., CAHP, LEED AP, Principal of John Dam & Associates (JDA). JDA would complete the dimensioning and necessary measurements of the relevant assemblies of each structure and produce 3 dimensional renderings in CAD format. The identified existing condition of each structure with associated photographs could then be overlaid on these renderings. A photogrammetric record of each structure could also be provided if requested. A preliminary estimate for the work of producing CAD drawings with an existing condition overlay [based on a separate condition assessment study] would be $4,000 to $6,000.

- **Photogrammetry or Laser Scanning**: Recommended by Gord Macdonald, of Macdonald & Lawrence Timber Framing Ltd. Photogrammetry is the science of systematically photographing the interior and exterior elements of a structure and using images as a means of determining measurements that assist in mapping and/or modelling the building in CAD. Laser scanning involves working with sophisticated scanning equipment to capture multiple data points and converting these to two and three-dimensional products in CAD.

  As noted in a letter from Mr. Macdonald, "There a several ways to approach the assessment and modeling of the building; laser scanning and photogrammetry modeling (typically performed in combination with survey data using our total station) are two such techniques that we commonly use. There are pros and cons to each technique, and the key to determining the best fit for a project is to understand the purpose of the data capture. Both techniques result in highly-accurate measured drawings in CAD format, and both techniques result in spatially correct CAD drawings. Similarly, both approaches can produce 3D models for the purpose of interpretation and 'fly-through' type navigation/articulation by users. Laser scans simply use a different method to gather the data, and typically gather much more of it."

Macdonald & Lawrence indicate that they also have the capacity to do aerial photography of the site using drones, and note that "Small local buildings such as the Goldstream Powerhouse can usually be inspected, modeled, drawn and reported for a budget in the range of $14,000 to $16,000 depending on the degree of drawings required.

A valuable resource in considering survey options is *3D Laser Scanning for Heritage*, produced by Historic England in 2011. While it focuses on the uses and techniques of laser scanning, it offers useful advice in determining the level and nature of surveying suited to various projects. It can be found online on the historicengland.org.uk website.

7.1.2 Condition Assessment: This process involves the systematic inspection of the fabric of the buildings and waterworks with a focus on identifying the state of the various structural systems and materials and analyzing factors that may be causing degradation. It also provides an important baseline for ongoing site monitoring and risk analysis. Undertaking assessment *after* the preparation of renderings allows the assessor to more accurately describe the locations of various physical characteristics, problems and causal factors. The nature, focus and degree of detail specified for a Condition Assessment is normally established in the context of the client's interest in interventions along a continuum from stabilization to restoration. While decisions regarding the degree of intervention are normally finalized after the condition assessment, it seems appropriate to assume that stabilization and some degree of adaptive reuse at the Powerhouse is the likely guideline for this condition assessment. John Dam & Associates has indicated that they would take the following approach to the condition assessment process:

- For a condition assessment of the building and associated 'outstructures,' JDA would complete a structural/material review, making note of existing conditions as they relate to the as-built condition and provide recommendations for renewals and maintenance based on the priority of life-safety, structural risk and material durability. The recommendations could come with associated opinions of probable cost to compete them if the CRD is interested. This condition assessment and associated report would also be developed based on the Client's intent to simply stabilize or restore the assemblies. A preliminary estimate for this work would be $4,000 - $6,000, depending on approach and extent of services. JDA would be able to proceed with work on this assignment within two weeks of award and could have it completed within four weeks of beginning work.

7.2 Consultations

The following conservation specialists have provided valuable insights in many aspects of this study:

- Harold Kalman, CM, PhD, CAHP, LLD, Architectural Historian and Conservation Planner, hal@haroldkalman.ca

- Martin Segger, MPhil, FCMA, Architectural Historian and Conservation Specialist, msegger@uvic.ca

- John Dam, B.A.Sc., M.Sc., P.Eng., CAHP, LEED AP, of John Dam & Associates, Building Conservation Engineering, Victoria, BC, john@jdabc.ca

- Richard Linzey, Director, British Columbia Heritage Branch and Conservation Architect, richard.linzey@gov.bc.ca

- Patricia Crawford, Corporate Librarian and Archivist, BC Hydro, Patricia.Crawford @bchydro.com

- Gord Macdonald, Master Carpenter and building conservation specialist with Macdonald and Lawrence Timber Framing Ltd., gord@macdonaldandlawrence.ca

7.3 Similar Heritage Resources

Industrial heritage is of compelling interest to many people because it relates to their day-to-day experiences and offers insight to the monumental–and mundane–enterprises that shape a progressive and well-functioning society. The following listing of heritage resources associated with the generation of power in British Columbia provides a context in which to consider the significance of the Goldstream Powerhouse:

Of the 52 historic sites directly linked with the generation of power listed on the Register of Canada's Historic Places, thirteen are located in British Columbia and seven on Vancouver Island. British Columbia sites include:

- Stave Falls Power House, 31338 Dewdney Trunk Road, Mission, British Columbia

- Anyox Powerhouse No. 1, Anyox, British Columbia

- Powerhouse Museum, 587 Beach Road, Qualicum Beach, British Columbia

- Murrin Substation, 721 Main Street, Vancouver, British Columbia

- Stave Falls Hydro-Electric Installation National Historic Site of Canada, Mission, British Columbia

- Bay Street Substation, 637 Bay Street, Victoria, British Columbia

- Dal Grauer Substation, 944 Burrard Street, Vancouver, British Columbia

- National Electric Tramway and Light Company Powerhouse, 2110 Store Street, Victoria, British Columbia

- Victoria Gas Company Works, 512 Pembroke Street, Victoria, British Columbia

- Transformer House, 825 Admirals Road, Esquimalt, British Columbia

- Grist Mill at Keremeos, Upper Bench Road, Keremeos, British Columbia

- Searchlight Engine Room, 603, Fort Rodd Hill Road, Colwood, British Columbia

- McLean Mill National Historic Site of Canada, 5633 Smith Road, Port Alberni, British Columbia

Sites that are not registered but of interest include:

- City Lights Building, 450 Swift Street, Victoria (built 1894 to house the coal generators for the City's streetlight system, now the Canoe Brewpub)

- Buntzen Lake Power Stations, #s 1 &2, Anmore (built by the BCER in the early 1900s to supply power to Vancouver)

- Jordan River Power Station, Jordan River (opened by the BCER subsidiary Vancouver Island Power Company in 1912 as the primary source of hydroelectric power for Victoria)

- Brentwood Bay Steam Auxiliary Plan, Brentwood Bay (built by BCER in 1912-13 as a back-up to Jordan River and Goldstream)

Note that images of some of these sites are included at the end of Appendix D.

8.0 RECOMMENDATIONS

The following short-term actions are highly recommended to ensure the security of the building and to acquire the core information needed for planning and decision-making associated with recommendations for mid-term actions and longer-term considerations.

8.1 Short term actions to secure and stabilize the site and build understanding

- Clear rubble from the building and organize those materials that will continue to be stored in the space.
- Ensure that doors and window openings can be closed and secured to prevent intrusion.
- Examine the roof for any immediate concerns with regard to leaking and address these problems.
- Assess and either fix or create barriers to those interior and exterior parts of the building that present threats to visitors' physical safety. The collapsed flooring in the NE wing is of particular concern.
- Invite curatorial staff from the Royal British Columbia Museum and the BC Hydro Power Pioneers to assist in the development of an inventory of movable and immovable cultural resources on site, including the remaining power generation apparatus.
- Clear away vegetation that prevents access to the SW side of the building, both to improve air circulation and improve workers' capacity to examine the wall, foundation and windows.
- Document the building, waterworks and site, choosing a method and level of recording that meets needs for Powerhouse stewardship, management and interpretation.
- Systematically record and assess the physical condition of and primary threats to the building and grounds.
- Undertake immediate actions needed to stabilize the Powerhouse and its waterworks including the Expansion Bell, based on the findings of the condition assessment.
- Develop and implement a site monitoring and maintenance plan.

8.2 Mid-term actions to plan for appropriate and sustainable uses

- Determine the CRD's interest in and commitment to the long-term stewardship of the Powerhouse and associated cultural resources.
- Confirm accountability for management of the Goldstream Powerhouse in light of long-term maintenance and conservation objectives. Consider the roles of such units as CRD Engineering and Regional Parks and Trails in the management and interpretation processes.

- Convene a specialist group of architectural historians, industrial architects, conservation specialists and CRD staff on-site to consider both conservation and interpretation options, based on the outcomes of the condition assessment and on CRD objectives for the site; this could be linked with a conservation field school run by the University of Victoria

- Consider undertaking a broader assessment of the historic themes presented within the CRD Water Supply Areas in order to further contextualize the significance of the Goldstream site in light of these interesting industrial heritage areas.

- Consider the implications of the Trans-Canada Trail for public access and interpretation.

8.3 Long-term considerations around strategies for conservation, adaptive reuse and interpretation

- Consider potential for adaptive reuse of the building, depending upon the challenges and costs involved in building conservation and adaption. Among the possibilities are:
    - Workshop and administrative spaces
    - Repurposing for power generation to meet local needs
    - Interpretive space, if the area can be made more accessible to visitors and to hikers on the Trans-Canada Trail.

- Identify strategies for interpretation of the Powerhouse and its role in the development of the Goldstream Water Supply Area and the Capital Region, considering the following options:
    - Develop a web-based account of the history of waterworks and power generation to meet Victoria's needs, perhaps done in collaboration with BC Hydro. A virtual tour of the waterworks system and the ways in which the powerhouse functioned to provide power to Victoria at the turn of the 20th Century would be of particular interest.
    - Include the story of the Goldstream waterworks system and the Powerhouse in interpretative activities on adjacent portions of the Trans-Canada Trail.
    - Include an exterior view of the Powerhouse in tours of the Goldstream Water Supply Area
    - Development of curriculum for the public school system around the provision of utilities to support urban lifestyles
    - Contact academic institutions to encourage student and faculty research (engineering, history of technology, urban development) on the waterworks and the powerhouse
    - Disseminate findings of research on the site and on any stabilization and conservation activities.

- Propose that the Goldstream Powerhouse and perhaps other heritage resources in the Greater Victoria Water Supply Area be included on the Register of Canada's Heritage Places, a searchable data base that includes information on places of local, regional, provincial and national significance across Canada.

9.0 References

The following materials are specifically cited in the preceding texts. A full bibliography of secondary sources that relate to the Goldstream Powerhouse is included as Appendix B.

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APPENDIX A: KEY PEOPLE AND ORGANIZATIONS

The following people and organizations are frequently referenced in the primary and secondary sources that describe the development and management of the Goldstream Powerhouse:

BARNARD, Frank Stillman. Managing Director of the British Columbia Electric Railway from 1897 to 1898. As noted on the Victoria Heritage Foundation website, Barnard was son of the founder of Barnard's Express which served the Gold fields, formed the Victoria Transfer Co in 1883 and merged it with the Express. He represented James Bay Ward on Victoria City Council from 1886-87. In 1888 and 1891 he won the federal seat for Lillooet-Cariboo. In 1894, he established the Consolidated Railway Co., which went into receivership after the Point Ellice bridge disaster. It was sold in 1896 to English financiers, who formed the BC Railway Co. with Barnard as managing director until resigning in 1898. From 1914-19, Barnard was Lieutenant-Governor of BC. He was knighted in 1919.

BRITISH COLUMBIA ELECTRIC RAILWAY (BCER). The company that was established in 1897, building on the legacy of the bankrupt Consolidated Electric Railway Company and prior to that the National Electric Railway and Lighting Company. It developed the Goldstream Powerhouse to generate Electricity to power both tramways and commercial and residential lighting in Victoria and its subsidiary, the BC Electric Company, developed the Jordan River Power Plant in 1912. In 1948 BCER became BC Electric.

BUNTZEN, Johannes. A Dane who emigrated to British Columbia in the 1890s, Buntzen became the Managing Director of BCER in April 1898, succeeding Barnard. Based in Vancouver, he was driving force in the creation of both the Goldstream Powerhouse and the Buntzen Lake power houses. He retired in 1906, when R.H. Sperling assumed the General Manager role, and died in 1922.

CAMPBELL, J.M. Assistant Manager of BCER and supervisor of supplies/materials.

CANADIAN GENERAL ELECTRIC. A major Toronto-based company, founded in 1892, that manufactured generators, transformers, motors, and other Electrical products. CGE supplied generators and other equipment to the Goldstream Powerhouse in 1898 and 1901, while Westinghouse provided equipment in 1904.

DINSDALE, Robert. (1866–1934) Contractor for the construction of the Goldstream Power House in 1898. Dinsdale associated himself with another early contractor and formed the company of Dinsdale and Malcolm. In 1903 he was elected to City Council, serving as an alderman for one year. He was elected again in 1917 and served until 1921.

ESQUIMALT WATER WORKS COMPANY. Established in 1885, with Theodore Lubbe as its managing director, to supply Esquimalt and the Royal Navy Dockyard with water from Thetis Lake and Deadman's River. Expanded holdings to Goldstream in 1892 to provide water to power a generator for the National Electric Tramway and Lighting Company, and when this company failed, waited until 1897 to further develop dams, reservoirs and pipelines in the Goldstream watershed to serve the BCER Goldstream Powerhouse.

GOWARD, **Albert T.** BCER Manager in Victoria District during the initial development of the Powerhouse, and promoted to Vice President of BCER in 1924. "Goward, of Welsh birth, began as a junior oiler in the Rock Bay steam plant in 1890 and served briefly as conductor with the NET&L Company. He retired in 1945 as vice-president of the BCER after having spent his entire career with the company in Victoria" (Roy, 1970, p. 54). He passed away in June 1946 and Myers cites an editorial in the Colonist for the following comments: "For close upon half a century Mr. A.T. Goward…was identified with the pioneering and development of Electric light and power in British Columbia. He was part of the former National Electric Tramway and Light Company Ltd., which gave Victoria its early start in hydroelectric service towards the end of the Nineteenth Century. He rose from conductor on the system to be Vice-President in charge of Vancouver Island Services of the BC Power Corporation Ltd., the modern counterpart of the very early venture.

Born at Tenby, South Wales, he was educated in the United Kingdom. He came to Victoria as a young man in 1890, and went to work for the National Electric Tramway and Lighting Company, one year later he was promoted to its pioneer office force" (Myers, 1953, p. 306).

HASSON, W.F.C., Engineer with Hasson & Hunt, San Francisco, who assumed the role of Engineer in Chief of the Goldstream Project when Meredith stepped away in June 1898.
As noted in *The Electrical World,* "The Engineering profession of the Pacific Slope is to be congratulated upon the entrance into its ranks of the new engineering firm of Hasson & Hunt, Electrical and mechanical engineers. Both of the members of the firm are thoroughly accomplished engineers, not only by education but also through the possession of wide and varied engineering experience. Mentally they are endowed with the broad caliber and sound judgment characteristic of the higher order of engineering ability, and thus in every respect are thoroughly equipped to successfully undertake the most difficult engineering problems that may come before them. Mr. W.F.C. Hasson, the senior member of the firm, was graduated from Woodward College of Cincinnati, as gold medallist in 1874, and the same year entered the United States Naval Academy as a cadet engineer…. In 1893 he resigned from the naval service and began the practice of his profession in civil life at San Francisco.

Mr. A.M. Hunt, the junior member of the firm, is also a graduate of high standing from the engineering course of the Naval Academy, and like Mr. Hasson, was highly regarded in the naval service for his professional accomplishments. … When work on the mid-winter fair was begun Mr. Hunt was detailed by the Navy Department to take charge of the mechanical engineering department, where he made a most enviable reputation and, upon the closing of the fair, resigned from the naval service to enter into partnership with Mr. Hasson. The work of Messrs. Hasson and Hunt in connection with the mid-winter fair gave evidence of not only fine engineering ability but of unusual executive talent. The entire execution of the Electrical and mechanical portion was left with Mr. Hasson as chief engineer and, with the assistance of Mr. Hunt, the result produced was little short of marvelous when the extraordinary difficulties are considered. The success was entirely a personal one, the large equipment required being obtained by personal solicitation from every imaginable source. Every sort of engineering expedient had to be devised in order to fit the heterogenous [sic] assortment of apparatus to each other and the end in view and make the odd combinations serve the desired purpose, and this with an inadequate force of men, restricted funds and extremely limited time in which to complete the work. Notwithstanding all these discouraging features, on opening day the Electrical department was the only complete one of the Fair, and its excellent operation throughout was one of the largest factors in the great success of the exhibition. ("Personal Notes," 1894)

KRASE, W.J. The Pelton Water Wheel Co. employee who supervised installation of first two wheels in 1898.

LUBBE, Theodore (1848 - 1910), Managing Director of with the Esquimalt Water Works Company from 1885 until his death. Born in Hanover, Lubbe came to North America to work in the fur trade and continued to be actively involved in this trade after his arrival in Victoria. He developed waterworks at Thetis Lake to supply Esquimalt and the Royal Navy Dockyard and Hospital starting in 1885, and then acquired water rights to the Goldstream watershed in 1892 in order to develop waterworks for hydroelectric power generation. The Goldstream Powerhouse was his sole client.

MCKEAN, G.W. Shawnigan-based supplier of poles for Goldstream transmission lines

MEREDITH, Wynn. Engineer with Hasson & Hunt, San Francisco, overseeing the planning and design of the Powerhouse until replaced by Hasson in June of 1898. He stayed involved in subsequent monitoring of the Powerhouse and in additions made in 1901, was lead engineer in the construction of the first power plant at Buntzen Lake, and was instrumental in the selection and development of the Jordan River power plant site. "Mr. Meredith attended the College of Engineering at the University of Illinois and later engaged in engineering and Electrical work, including the purchase and installation in 1889 for the Aurora Electric Light Company of the then newly introduced Westinghouse alternating current apparatus. He also served as Electrical engineer for the Aurora Street Railway.

In 1892, he became assistant superintendent and Electrical engineer of the Chicago Columbian Exposition, making one of the first large installations of alternating current lighting. Two years later, he was the first assistant Electrical engineer of the San Francisco Mid-Winter Exposition. He also had engaged in private engineering practice on the Pacific Coast.

Sanderson & Porter retained him in 1908 as a consultant on Western hydroelectric projects and two years later he became a member of the firm. He directed the design and construction of hydroelectric installations for the British Columbia Electric Railways and the water supply to the City of Victoria, B.C." (*New York Times*, 1950)

PELTON WATER WHEEL COMPANY. A San Francisco based company, formed in 1888 to market the water wheels developed by Lester Allan Pelton. These highly efficient impulse wheels were instrumental in the widespread use of hydroelectric power in the late 19th and 20th centuries. Pelton Water Wheel Company supplied the Goldstream water wheels and related equipment in 1898, 1901 and 1904. It also provided water wheels to many other Pacific Northwest power generation facilities including those at Jordan River and Buntzen Lake.

RIDGWAY WILSON, W. (1863-1957) Architect of the Goldstream Powerhouse. He kept offices at 6 Bastion Square. According to the Biographical Dictionary of Architects in Canada 1800-1950 (http://dictionaryofarchitectsincanada.org/node/1286) the structures he also designed and/or managed construction for included:

- Opera House & Hotel in Nanaimo, 1889
- 'Gyppeswyk', residence for Mrs. Alexander A. Green, now the Art Gallery of Victoria, 1889
- South Park School, Douglas Street at Michigan Street, 1893
- Asylum for the Insane in New Westminster, two major extensions, 1897
- Metlakatla, B.C., rebuilding (after a fire) of three school buildings for Indian and white children, for Bishop William Ridley, 1901
- Bank Of British North America, Yates Street near Langley Street, extensive alterations and

new glass dome, 1902

- 'Arbutus', residence for John Douglas on Fairfield Road, 1903
- Lampson Street Public School in Esquimalt, 1903
- Victoria West School, 1907
- Ker Block, Pandora Avenue at Cook Street, 1911
- Wilson Block, Government Street at Trounce Alley, for W. & J. Wilson, 1912
- St. John's Anglican Church, Quadra Street at Mason Street, 1912
- Saanich Provincial Jail & Prison Farm, Wilkinson Road, 1912-13
- Victoria Drill Hall, for the Fifth Regiment, Bay Street at McBride Street, 1913-14 (

SPERLING, Rochfort Henry. Son of one of the British directors of BCER (R.K. Sperling) and an Electrical engineer, Sperling served as Supervisor of Goldstream Power House in 1898; moved to Vancouver in 1903 and took on role as General Superintendent of BCER in 1906.

TRIPP, George M. Superintendent of the Goldstream Powerhouse after 1903 when Sperling moved to the role of General Manager of the BCER**.** "Mr Tripp retired from the Company September 1, 1944, after 46 years service. Born in Woodstock, Ontario, he came to Victoria in 1898 to supervise the installation of certain items of Electric equipment in the Company's Goldstream hydro-Electric plant which was then under construction. He and Mr. R.H. Sperling both worked on the erection of the plant. Mr. Tripp remained as operator at the plant and Mr. Sperling became Superintendent of the Company on the mainland. Later Mr. Tripp divided much of his time, as an Electrical engineer, between the Island and the Mainland. Following several years at this, he became Superintendent for the Company on Vancouver Island and later general superintendent. …Mr. Tripp may quite truthfully be described as the Father of hydroelectric development on Vancouver Island. …It became apparent to Mr. Tripp as early as 1906-07 that the Goldstream hydro-Electric plant, together with the steam plant in the Rock Bay substation would soon be inadequate to meet the rapidly growing demands for light and power services in Victoria and the surrounding districts and that the Company would seriously have to consider the development of hydro-Electric power on a scale which in those early days, seemed almost fantastic" (Myers, 1953, p. 309).