Heritage Value of Pok Fu Lam Reservoir, Tai Tam Group of Reservoirs, Wong Nai Chung Reservoir, Kowloon Reservoir, Shing Mun (Jubilee) Reservoir and Aberdeen Reservoir

INTRODUCTION

Tracing back the historical development of water supply in Hong Kong before 1860s, water supply mainly relied on primitive sources such as wells and streams. Since the mid-nineteenth century, the continual growth in population and the accompanying city expansion had placed an increasing demand on urban infrastructure, of which water supply was in utmost need for the development of Hong Kong given the fact that rainfall and natural fresh water resources were erratic.

HISTORY

Pok Fu Lam Reservoir

2. From 1841 to 1861, the first 20 years of British rule, the population of Hong Kong increased rapidly from 7,000 people to almost 120,000, the majority of whom lived in the City of Victoria. As no private enterprises were interested in water services due to the fact that the initial cost and risk for such a provision were excessively high, the government found it necessary to assume responsibility for a permanent public water supply scheme.

3. It was not until the time of Sir Hercules Robinson, Governor from 1859 to 1865, that the first water scheme was mooted. On 29 February 1860, a British national, S.B. Rawling proposed the construction of the first reservoir in Hong Kong. Potential sites for a reservoir were difficult to find and due to technological constraints on reservoir building, the location of the reservoir had to take into account water flows downstream. Thus, the reservoir had to be built in a valley situated well above and yet not too far away from the urban centre so that stored rainwater could follow mountain slopes to reach the dense population below. As the Pok Fu Lam region satisfied these requirements, Rawling proposed to build a 30-million gallons reservoir in the Pok Fu Lam Valley.

4. The Royal Commission, appointed by Sir Robinson to look into the water supply problem, recommended Rawling's proposal in 1860. It involved erection of a masonry dam 15 feet high across Pok Fu Lam Valley to collect rainwater in the reservoir. Construction works commenced in the same year and supplies began to reach the city at the end of 1863, making it the very first public reservoir in Hong Kong.

5. Because of a limited budget, the funding allocated for the construction of Pok Fu Lam Reservoir was finally cut down. The storage capacity of the reservoir was correspondingly reduced from the original 30-million gallons to 2-million gallons, which was obviously totally inadequate as the daily water consumption in 1863 was 500,000 gallons. This reduction in capacity of the Pok Fu Lam Reservoir meant that it

could only supply four days of water to the community. To redress the problem of Pok Fu Lam Reservoir's inadequate capacity, several extension improvements were undertaken between 1866 and 1871, resulting to an increase of impounding water capacity to 68 million gallons after a new reservoir (i.e. the existing reservoir) was built further upstream in 1871. Despite these extensions, the capacity of Pok Fu Lam Reservoir was still found insufficient to cater for the needs of Hong Kong's growing population.

Tai Tam Group of Reservoirs

(a) Tai Tam Upper Reservoir

6. As the first waterworks scheme at Pok Fu Lam soon proved inadequate, Governor Sir Arthur Kennedy (1872 -1877) gave the task of finding additional water supply to his Surveyor-General for the public works, J.M. Price, who proposed the bold and imaginative Tai Tam Scheme.

7. When proposed by J.M. Price in 1873, the Tai Tam waterworks was the grandest water scheme of the day. The site of Tai Tam Valley was found to be a desirable location for construction of the second reservoir in Hong Kong because of its capability to provide a large catchment area for water, plus its potential for future expansion. The site, however, was not situated on the same side of the mountain range as the town itself. As such, the logistics of conveying the reservoir water from the back, i.e. the southern side of Hong Kong Island to front where the political, economic and religious centre was located, had to be overcome. A solution proposed by J.M. Price involved the excavation of a tunnel aqueduct through the mountain of Wong Nai Chung, immediately linked to a surface conduit, i.e. Bowen Aqueduct following the hill contours of Wan Chai, and then to the filter beds and service reservoir at the western end.

8. The proposal was however considered to be well beyond Hong Kong's financial resources, as the time was not right for proceeding with a scheme of such grand scale owing to commercial depression as well as the devastating typhoon in 1874 which entailed heavy demands on public funds for rehabilitation of the badly damaged waterfront. As a result, an abridged version of the design, i.e. to divert Tai Tam stream through the hills to the city instead of building a reservoir was adopted in 1877. Although the need for water was pressing, no action was taken despite approval of the revised plan.

9. In 1882, complaints by the military department about the lack of hygiene and acute water shortage in the Chinese districts impelled the government to seriously consider reverting to the original scheme of 1873. A series of reports assessing the dire sanitary conditions of Hong Kong from the Colonial Sanitary Commissioner, Osbert Chadwick, finally provided the necessary spark that would bring momentum to the government. In his report, Chadwick strongly urged the commencement of Tai Tam waterworks in view of the alarming public sanitation. Marked by years of mounting pressure from the growing population and due to overall improved fiscal conditions in Hong Kong in the early 1880s, the proposal as conceived by J.M. Price in 1873 was

re-examined, modified by Sir Robert Rawlinson, the Consulting Engineer to the Imperial Government, and subsequently approved by the Secretary of State, the Earl of Kimberly.

10. The first phase of the Tai Tam Scheme took place between 1883 and 1888. The huge project consisted of the construction of a granite and concrete dam 90 feet high (raise to 100 feet in 1897), 400 feet long and 60 feet wide at its base; a tunnel 7,344 feet long to convey water through Wong Nai Chung mountain; a brick and masonry aqueduct 16,505 feet long (called the Bowen Aqueduct winding along the hill slopes above Wan Chai); six filter beds and a service reservoir at Albany Valley (where the aqueduct terminated). The Bowen Aqueduct, which was constructed between 1885 and 1887, functioned dually: as a method of conveyance and storage which made it a unique innovation suiting Hong Kong's particular needs. With the completion of the first phase, the Tai Tam Upper Reservoir could hold 300 million gallons of water in 1888, a quantity that was more than 4 times the size of the Pok Fu Lam Reservoir.

(b) Tai Tam Byewash Reservoir

11. Despite the voluminous capacity of the Tai Tam Upper Reservoir, the population growth rate continually exceeded its water supply infrastructure. Due to lack of available land for water catchment development on Hong Kong Island, the government continued to confine works to extending the water supply systems at Tai Tam Valley taking the advantage of its potential for further reservoir development down to sea level.

12. The extension work, which formed the second phase of the Tai Tam Scheme, included the construction of Tai Tam Byewash Reservoir to collect the overflow from Tai Tam Upper Reservoir. The scheme was drawn up by James Orange, the Resident Engineer of Tai Tam Scheme, at the suggestion of J.M. Price, with a capacity of 22.4 million gallons. Completed in 1904, Tai Tam Byewash Reservoir was formed by two dams: a main dam of concrete gravity construction incorporating an overflow most of its length, and the subsidiary dam located a short distance to the left of the main dam. A low knoll lie between the two dams.

(c) Tai Tam Intermediate Reservoir

13. Steps were further taken to develop the Tai Tam Valley following the endorsement of a draft plan on extension of Tai Tam Water Supply System which was submitted by W. Chatham, the Director of Public Works to the Legislative Council on 17 October 1903. The works were designated "Tai Tam Tuk Scheme" which was divided into two phases, i.e. First Section and Second Section. The First Section of the Scheme which involved construction of Tai Tam Intermediate Reservoir was started in 1904 and completed in 1907, adding 195.5 million gallons to the supply system.

14. Geographically, as Tai Tam Intermediate Reservoir was situated lower than the tunnel inlet of Tai Tam Upper Reservoir, water stored in Tai Tam Intermediate Reservoir had to be pumped upwards into the foothills of Tai Tam Valley in order to reach the tunnel portal of Tai Tam Upper Reservoir, where water would gravitate to the

supply system in Central. A pumping station on the west shore of Tai Tam Bay was therefore built in 1907 for this purpose with a capacity for future extension under the next phase.

(d) Tai Tam Tuk Reservoir

15. To cope with the great demand for water, maximizing Hong Kong's water storage was critical. In 1912, the government embarked on the Second Section of the Tai Tam Tuk Scheme with construction of a dam for the 1.42 billion gallon capacity reservoir at sea level. D. Jaffe was appointed as Special Engineer for the design and the contractor for the construction was Messers. Sang Lee & Co. The Tai Tam Tuk dam is a concrete dam with granite boulder as aggregate and granite masonry facing. A valve house and the outlet section were provided at the west side of the dam. Four large masonry bridges, which were built during the First Section of the Tai Tam Tuk Scheme in 1907, can be found at the Tai Tam Tuk Reservoir area.

16. The Tai Tam Tuk Raw Water Pumping Station was constructed in the First Section of the Tai Tam Tuk Scheme in 1907, including the engine house, store and office, and it was extended during the Second Section between 1914 and 1916 to accommodate additional pumping machinery, including two steam-driven pumps to transfer three million gallons of water per day. Further extension to the site was also made in 1925. Today the chimney-stack for the steam-driven pumps can still be seen in the vicinity of the Tai Tam Tuk Raw Water Pumping Station.

17. There are three staff quarters around the Tai Tam Tuk Raw Water Pumping Station. The Senior Staff Quarters was built in 1905. The Staff Quarters, with additional concrete stairways and connected to a store, was completed in 1907, while another one was built in 1936 originally as a pressure filter house but later converted to staff quarters.

18. The Tai Tam Tuk Reservoir and contingent works were completed in 1917. To mark the completion, a memorial stone was laid and Sir Francis Henry May, the then Governor (1912-19) officiated at the opening ceremony on 2 February 1918. The stone plaque that marked the event can still be found by the roadside near the Tam Tai Tuk dam.

19. Supply for the Western Water Supply System between 1863 and 1899 mostly came from Pok Fu Lam Reservoir which was mainly responsible for providing water to residents living in Central and Western Hong Kong Island. In the early twentieth century, the Tai Tam Group of Reservoirs, being the Eastern Water Supply System were the main storage reservoirs and formed the backbone for the Island's water supply. The improvement to the water supply system meant that the urban area gradually spread to the eastern side of Hong Kong Island.

20. The engineering techniques used for the Tai Tam project were much more advanced than those used for the Pok Fu Lam Reservoir. The Pok Fu Lam project relied wholly on gravity flow. With the Tai Tam project, gravity flow only accounted for 20 per cent of the total capacity of the final fresh water supply.

21. Moreover, the Tai Tam Group of Reservoirs furthered the waterworks technology by the unprecedented construction of a tunnel aqueduct through the mountain range of Wong Nai Chung as well as introduction of the first water pumping mechanism in the water supply history of Hong Kong to overcome the constraint of gravity. This could be regarded as innovative water engineering at the turn of the century leading to advancement of urban and social development and improvements in the sanitary condition of the City of Victoria.

Wong Nai Chung Reservoir

22. Situated near Wong Nai Chung Gap above Deep Water Bay, Wong Nai Chung Reservoir was the third oldest waterworks construction in Hong Kong, coming after Pok Fu Lam Reservoir and Tai Tam Upper Reservoir.

23. In response to Chadwick Reports' suggestion for increasing and improving water supply resources, given the fact that poor sanitary conditions were exacerbated in particular after the plague broke out in 1894, the government built the Wong Nai Chung Reservoir in 1899 with a storage capacity of 27 million gallons, i.e. about 38 per cent of that of Pok Fu Lam Reservoir as a supplementary source to Tai Tam Group of Reservoirs. The surviving historical structures in Wong Nai Chung Reservoir include a masonry dam which is 50 feet high and 270 feet long, a valve house and a weir.

24. As other larger reservoirs were constructed, Wong Nai Chung Reservoir gradually became superfluous. By the late 1960s, it was no longer essential to Hong Kong's water supply. The then Urban Council proposed to improve recreational facilities in the urban areas by making use of the small reservoirs and catchment areas. Wong Nai Chung Reservoir, regarded as one of these small reservoirs, ceased its original function and has been opened to public as the first boating park in Hong Kong since 1986.

Kowloon Reservoir

25. Kowloon Reservoir was the first reservoir in Kowloon and was built as an integral part of Kowloon Group of Reservoirs which also include Kowloon Byewash Reservoir, Shek Lei Pui Reservoir, and Shek Lei Pui Reception Reservoir (also known as Kowloon Reception Reservoir).

26. The reason for building Kowloon Reservoir was closely related to the development of the city. The process of urbanization was undoubtedly intertwined with the provision of water supplies. When the government first regarded Kowloon as a military base, the suggestion of building a reservoir was rejected. This could explain why when the Kowloon Peninsula was ceded to Britain in 1860, the government offered no scope for extending water storage capacity of this newly acquired land which was still served solely by wells and streams.

27. With the commencement of the twentieth century, the government decided to develop Kowloon. The Kowloon Waterworks Gravitation Scheme was initiated and a

search for a suitable site began. The Public Works Department dispatched an engineer, L. Gibbs, to survey the topographical conditions of Kowloon. After the lease of New Territories from China in 1898, the government managed to construct waterworks facilities beyond the ceded territories of Kowloon where more available and suitable land for construction of reservoir could be identified. L. Gibbs located a site north of Boundary Street in the New Territories in a valley to the west of Beacon Hill and south of Needle Hill. The construction works on Kowloon Reservoir, which was the first phase of the Kowloon Waterworks Gravitation Scheme, began in 1901. The project consisted of the construction of a dam, storage tanks, filter beds and a pipeline connecting the reservoir with the Yau Ma Tei Pumping Station. With its completion in 1910, the reservoir system could store 353.5 million gallons of water.

28. The way in which water was provided for the Kowloon Peninsula was radically changed by the establishment of the Kowloon Reservoir. Rainwater impounded in the reservoir replaced well water and subterranean water, and the improved water network meant that the Kowloon Peninsula could now be developed.

Shing Mun (Jubilee) Reservoir

29. The population of Hong Kong was continuously increasing which grew from 283,975 in 1901 to 840,473 in 1931. The growing demand for water gave rise to the Shing Mun Valley Scheme which followed the Kowloon Waterworks Gravitation Scheme.

30. The area decided upon for the next reservoir was a lowland area known as the Shing Mun Valley nestling between the mountain ranges surrounding Tsuen Wan, Kwai Chung and Sha Tin.

31. Shing Mun (Jubilee) Reservoir was the core construction of Shing Mun Valley Scheme formulated in 1923 by R.M. Henderson, the then Director of Public Works, who studied the possibility of using Shing Mun stream as a source of water supply. The major construction was to build a gigantic dam at the mouth of the gorge to retain rainwater and form a huge reservoir to afford additional supply of water to the communities of Hong Kong and Kowloon which had a combined population of between 700,000 and 800,000 people in the 1930s. The reservoir was originally called Shing Mun Reservoir, which was officially renamed Jubilee Reservoir in 1935 to commemorate the Silver Jubilee of King George V.

32. Construction work on the Shing Mun Reservoir began in 1923. There were three construction phases taking fourteen years in all so that the whole project was not completed until 1937. The total capacity of the completed reservoir was three billion gallons. A catchwater conveyed water to the urban area of Kowloon Peninsula and cross-harbour mains also conveyed fresh water to Hong Kong Island, making it the major and largest capacity reservoir in the pre-war time to supply water for both Kowloon and Hong Kong Island.

33. The memorial stone, situated at the side of the road at the southwest end of the gorge dam, is a granite slab built onto the face of a granite retaining wall with

inscription recording the construction of the reservoir. This stone plaque together with the one at Tai Tam Tuk dam are the only two memorial stones erected to mark the completion of the two largest reservoirs on Hong Kong Island and New Territories respectively built before World War II.

Aberdeen Reservoir

34. Even with the establishment of the Tai Tam Group of Reservoirs with its large capacity, water supply to Sheung Wan and Western District continued to be inadequate because it utilized a 10-inch diameter water pipe to convey water from the Tai Tam Water Supply System to the western part of Hong Kong Island, which still mainly relied on supply from the Pok Fu Lam Reservoir.

35. To tackle this problem, the government adopted a new water scheme, Aberdeen Valley Water Scheme for the purpose of finding new water source instead of installing costly water pipes for improving the existing transfer system. The Scheme, which involved construction of the fourth reservoir on Hong Kong Island – the Aberdeen Reservoir, was approved on 2 May 1929 with the intention that residents in the western part of Hong Kong Island were no longer reliant solely on water supply from Pok Fu Lam Resrevoir.

36. Aberdeen Reservoir comprises the Upper Reservoir and the Lower Reservoir. The former was completed on 15 December 1931 with construction of a concrete dam 400 feet long and 138 feet high, and held 175 million gallons of water. The opening ceremony of the Aberdeen Upper Reservoir was officiated by the then Governor, Sir William Peel (1930-1935) and attended by members of the Executive and Legislative Council on 15 December 1931. Whereas the dam of the Lower Reservoir was modified and reconstructed from a private reservoir of 1890 owned by Tai Shing Paper Manufacturing Co. When the Lower Reservoir was completed in 1932, it had a capacity of 91 million gallons.

37. The inauguration of the Aberdeen Reservoir also represented the completion of the last water storage development on Hong Kong Island. When it was put into service in the early 1930s, the pressure for adequate fresh water from the reservoirs of Pok Fu Lam and Tai Tam was further relieved. Moreover, as the water supply network was now far more expanded, even remote areas like Ap Lei Chau could receive fresh water.

ARCHITECTURE

Pok Fu Lam Reservoir

38. The Former Watchman’s Cottage, presently the Pok Fu Lam Management Centre is a single-storey building constructed in Neo-Classical style featuring white painted walls, triangular pediments and a pitched roof of Chinese tiles. It is rectangular in plan having a verandah of four natural finished granite columns.

39. The gauge basin is an elongated pit with coursed granite walls, a semi-circular end and a tunnel inlet at the other end with rock-faced rusticated voussoirs in the Italianate Renaissance style which is regarded as the most outstanding feature of the gauge basin. The structure also features perforated and stepped concrete walls across the pit, tubular steel guard rails, and raised rectangular tanks with coursed granite walls.

40. The four masonry bridges span the mouths of four feeder streams which run off the hillsides. They are constructed of granite with semi-circular or segmental arches. Two of the smaller bridges have granite copings with the ends of the stones neatly finished with chamfered margins and reticulated or vermiculated surfaces in Italianate Renaissance style.

Tai Tam Group of Reservoirs

(a) Tai Tam Upper Reservoir

41. The dam is a masonry faced concrete gravity dam. The masonry is roughly coursed with dressed ashlar copings. Access walkways or berms running along the dam (presumably for regular inspections) have cast iron safety railings consisting of two rows of round iron bars supported by inverted T-shaped cast iron stanchions which are believed to be the original fixture when the dam was built.

42. The valve house is situated on top of the dam about a third of the way along it. It is a square structure built of rock-faced rusticated granite blocks laid to courses. There is only one door opening and the two window openings at the back have been blocked up. The original hipped roof has been converted to flat roof with a projecting cornice supported on carved ornamental corbels. Small gaps for ventilation have been formed between the corbels.

43. The masonry aqueduct and bridge are situated behind a small hill to the south-west of the dam. They are built at right angles to one another and span across narrow channels that presumably were once streams. They are simply constructed with thick concrete slabs supported on masonry piers or columns. The piers and columns are capped with moulded capitals or corbels to provide support for the slabs.

44. The tunnel inlet surmounted by a recorder house is situated to the south of the dam. The tunnel inlet which is situated within the recorder house has a decorative pedimented stone plaque incised with the dates 1883-8. The inlet is fitted with an iron grating and there are access catwalks with tubular steel guard rails constructed above it. The recorder house is built with coursed granite walls. The roof is flat with a plain coping to the parapet. The entrance door and window are of plain design. A small square building attached to the recorder house at the south-east corner is built in a different style with rock-faced rusticated granite walls.

45. Built between 1885 and 1887, the Bowen Aqueduct was officially named after the then governor Sir George Bowen, who undertook the commencement of the Tai Tam Scheme. The masonry Bowen Aqueduct was built along the hillside and is 16,505 feet long. Some sections of it are supported by arch structures. At the most prominent design,

there are 21 consecutive arches. The arches were constructed of granite voussoirs about 12 inches thick each; the stone were laid in stretcher bond, the joints clayed, 2 to 1 cement grout was run in, and chippings were wedged into the cement. The Bowen Aqueduct is an example of Victorian civil engineering heritage. The construction of masonry arches in the waterworks was indeed an integration of engineering work and aesthetics.

(b) Tai Tam Byewash Reservoir

46. The dam is a concrete gravity construction faced with masonry with an overflow or spillway for most of its length. There is a wing wall of coursed rubble on either side of the dam to support the embankments with flight of steps along the parapets. Also, there is a tide gauge with access steps and safety railings at the west end of the dam. A subsidiary masonry dam is situated to the north of the spillway dam connected to it by a masonry faced earth embankment. The original cast iron safety railings can still be found along the top of the dam.

47. The valve house is situated midway along the subsidiary dam. It is rectangular in plan with rock-faced rusticated granite wall, a flat roof, an entrance door and window of plain design.

(c) Tai Tam Intermediate Reservoir

48. The dam is a masonry faced concrete gravity dam. There is a stilling pool at the foot of the dam with concrete side walls and tubular steel guard rails. For dam safety reasons, the north section of the spillway has been lowered by 9 feet in 1977, resulting in today's indented appearance of the crest of the dam.

49. The valve house is situated about midway along the dam reached by a footbridge over the dam. The valve house is built on a projecting platform. It is rectangular in plan with curved corners. The base or plinth consists of several courses of dressed ashlar, and the walls are constructed of rock-faced rusticated granite built to courses. Projecting string courses run around the building at parapet level. The roof is flat. The door and window openings have semi-circular arched heads and plain stone cills. A rectangular cast iron rainwater pipe with an ornamental hopper head fixed with ornamental pipe ears can be seen at one corner of the building.

(d) Tai Tam Tuk Reservoir

50. The dam is a masonry faced concrete gravity dam with an overflow of twelve arched spillways in the middle. There is a stilling pool and footbridge at the base of the dam on the downstream side. The masonry to the dam is coursed granite with ornamental parapets of rock-faced rusticated granite. Ten spillways have been modified by additional concrete structures to work as siphon spillways while the two remaining spillways on either end of the row are original. The side spillways are faced with granite with half-rounded columns on either side. A road runs along the top of the dam.

51. The valve house is situated near the south end of the dam. It is built on a

projecting platform which has cantilevered steel balconies or catwalks fixed to the front of it. The valve house is built to a rectangular plan with walls of rock-faced rusticated granite. The roof is flat and the parapet has a moulded projecting cornice and coping all round the building. Window and door openings have semi-circular arches and flush cills. The windows on the side facing the road have been blocked up.

52. The memorial stone at the south end of the dam has a moulded plinth, a recessed panel and a splayed top. The inscription on the stone commemorates the completion of the reservoir and has the names of the Governor Sir Henry May, the Director of Public Works, the Engineer and the Contractor.

53. The four masonry bridges situated along Tai Tam Tuk Reservoir's west shore are of granite arch structures. Boulder faced rustication is applied on the bridges. Cornices are lining along the bridge's top. The columns are huge in size and converging to the top. Granite imposts are inserted between the columns and the arches.

(e) Tai Tam Tuk Raw Water Pumping Station

54. The Engine Hall is a large single-storey warehouse-type building with red-brick walls and Chinese tiled pitched roofs. It is a rare piece of industrial architecture. There are several annexes built on to it used as a boiler room, workshops, stores and offices. Architectural features include brick quoins at the corners, semi-circular arches and keystones to windows, pediments, column capitals and bull's eye windows. The annexes built at a later date have simple concrete lintels and cills. The windows are steel framed with small glazing squares. Loopholes formed in the wall facing the sea probably were for wartime defensive purposes. An underground air raid shelter is situated at the east end of the building. The architectural style has been classified as Neo-Georgian but it is better described as Georgian Revival.

55. The chimney shaft is situated at the rear of the Engine Hall. A smoke tunnel connected it to the Engine Hall to take off the smoke generated by the coal burning steam boilers that used to work the pumps. The chimney shaft is square in plan and built of red bricks with a plinth of offset courses and a coping of oversailing courses. It generally matches the Engine Hall in style, but is classified in the utilitarian category.

56. The Senior Staff Quarters are situated on a raised platform at the east end of the Engine Hall. The main building is two stories high with plain white walls and pitched roof. A covered walkway at the rear connects to the single-storey servants' quarters. It is white in colour and was originally built for the manager of the waterworks. The architectural style has been classified as Neo-Georgian.

57. The Staff Quarters, with additional concrete stairways and connected to a store, was completed in 1907, while another staff quarters, namely No. 2 Staff Quarters was built in 1936. The former are situated at the west end of the Engine Hall. The brick walls have been painted, but probably originally they were exposed red brickwork matching the Engine Hall. The roof is pitched covered with Chinese tiles. Windows are wooden casement with segmental arched heads. The larger building is long, narrow and rectangular, two stories high with open verandahs on the side facing the sea. A

single-storey store building is built at one end of the quarters at a slight angle to it. There is a small detached block which dated from 1936. The architectural style has been classified as Arts and Crafts.

Wong Nai Chung Reservoir

58. The dam is built at the northeast corner of the reservoir across a small valley and in a boomerang shape. It is constructed of large granite blocks laid to courses with a walkway along the top of the dam.

59. The valve house is situated halfway along the dam. It is a small square structure built of rusticated masonry with dressed ashlar stones around the door and window openings. The construction year of the reservoir, 1899, is inscribed on the lintel above the entrance. The original hipped roof was replaced by a concrete flat roof in 1979.

60. The weir is incorporated into the dam to channel off excess water. It is formed of masonry, stepped and curved, connected to a bevelled channel to join the natural watercourse downstream of the dam. As engineering structures, the dam, valve house and weir do not really fall into any architectural style, but the heavily rusticated stonework is reminiscent of the monumentality of Florentine architecture.

Kowloon Reservoir

61. The main dam is situated between the Kowloon Reservoir and the Kowloon Byewash Reservoir for controlling water influx into the latter. The dam is of concrete gravity construction faced with masonry. A road is constructed on top of the dam with a solid parapet wall on the upstream side and steel railings on the downstream side.

62. The main dam valve house is a square shaped building projecting from the upstream face of the dam. It is built of rusticated granite blocks with a low pyramid shaped concrete roof. The valve house sits on top of a shaft and has valves to control the draw-off and flow rates through the dam.

63. The spillway dam is constructed to the southeast of the main dam. It is a concrete gravity weir faced with masonry on both sides. Whilst the main dam is curved in plan, the spillway dam is straight in plan. It carries a road bridge supported by nine granite piers. The bridge has simple steel railings on either side. The weir discharges water over the stepped downstream face to a stilling basin below, and subsequently over a vee-notch weir.

64. The spillway dam recorder house is built at the west end of the spillway dam. It is the same design and construction as the main dam valve house. Another recorder house, situated to the northeast of the spillway dam, is a small square building constructed of rusticated granite blocks with a flat concrete roof. It is fitted with a steel door, steel framed windows, guard bars and ventilators.

Shing Mun (Jubilee) Reservoir

65. The memorial stone is situated at the side of the road at the southwest end of the dam. It is a granite slab built onto the face of a granite retaining wall with an inscription recording the year of construction of the reservoir, the names of the designers and engineer and details of the dam.

Aberdeen Reservoir

66. The bridge of the Aberdeen Upper Reservoir carrying the outflow main is probably constructed of reinforced concrete. It is segmental in shape, raised off granite piers, and marked with lines to resemble masonry joints and voussoirs. There is a classical style balustrade on either side of the bridge. The culvert entrance is built of reticulated masonry blocks and features a voussoired arch fitted with steel doors and an ornamental ironwork grille. It has a thick flat roof slab.

67. The dam of the Aberdeen Upper Reservoir is a concrete gravity dam faced with pre-cast concrete blocks laid to courses and finished with reticulated dressing. The upstream face of the dam is vertical and the downstream face is battered or inclined. A series of segmental arches span across the central spillway. A road runs along the top of the dam with guard rails on either side between granite posts built on top of the copings.

68. The valve house is situated in the middle of the dam and is built on to the rear wall projecting into the reservoir. The walls are built of coursed pre-cast concrete blocks. The structure is square in plan with a doorway facing the road. The windows are blocked up. The roof is flat with a plain parapet and a moulded projecting cornice all the way around. The style of the reservoir structures can be classified as Utilitarian with Italianate Renaissance influence.

69. The dam of the Aberdeen Lower Reservoir is a concrete gravity dam with a vertical rear wall and a battered or inclined front wall facing downstream. The dam has a rounded overspill and carries a footbridge along the top with guard rails and posts on either side.

CONCLUSION

70. Pok Fu Lam Reservoir, the Tai Tam Group of Reservoirs and Wong Nai Chung Reservoir are the three pioneering waterworks projects that played a significant part in the social development of Hong Kong in the early years of city building. They not only showcase the determination of the government as to provision of permanent water supply system in the early colonial period, but also demonstrate how western expertise in civil engineering was adopted in the local context to overcome the topographical constraints, creating a feat of reservoir engineering unique to Hong Kong. Some of the waterworks elements first introduced at that time even became the standard provision for the future reservoir construction.

71. At the beginning of the twentieth century, the provision of water supply still relied on the waterworks facilities developed in the nineteenth century. It was only

when the government decided to develop the Kowloon Peninsula in the early twentieth century that more larger reservoirs and technically complicated water-service-related infrastructures were initiated across the harbour, moving the city development further afield.

72. From the time when the Pok Fu Lam Reservoir was built, the development of Hong Kong's waterworks has been trying to keep up with the needs of an ever-increasing population. A turning point had come when the first reservoir in Kowloon came into operation in 1910 and subsequently followed by the completion of Shing Mun (Jubilee) Reservoir in 1937 which was the largest reservoir throughout the territory before World War II, the increase capacity of fresh water supplied began to overtake population growth. Severe water shortage by then gave way to adequate supply for the fundamental needs of the community though soon after the War adequate water supply was exception to the rule due to large influx of population. But before then, the whole pre-war water supply network for the urban areas was basically completed.

73. The major waterworks structures of the above six pre-war reservoirs remain largely intact nowadays as living witness of the evolution of public water supply facilities as well as urban development of the territory from the mid-nineteenth century to the late 1930s before World War II. While Wong Nai Chung Reservoir accomplished its historic mission and has been adaptively reused as a boating park since 1986, the remaining five reservoirs have been continuing their original services and operations since their inception.

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