

Island Water Source Declared Best From Many Standpoints

Maintenance Costs Low, Report Claims

High Quality of Water and Adequate Volume Praised Along With Its Availability; Plans Told

THE "Stayton" island source of water supply for Salem finds favor with Stevens & Koon, consulting engineers for the city, not only because of the high quality of the supply and the adequate volume but also because of its availability. In the formal report released yesterday, a general discussion of the proposed source is given. Principal portions of the report follow:

General Statement

This report will deal mainly with problems of developing an adequate supply of water for the City of Salem from water-bearing sand and gravel which underlie an island in North Santiam river above the city of Stayton.

It is essential that a water supply source be considered not only on the basis of its merits as a producer of water of high quality and adequate volume but its availability, and the cost of its development and maintenance must be given careful thought and appraisal before sound conclusions can be reached.

The city council of Salem on March 2, 1936 designated "the North Fork of the Santiam river above Stayton as the permanent source of water supply of the city of Salem" and, in pursuance of such decree, all water supply studies made under our direction since that date have had reference only to the North Santiam river source.

Drawings Explained

As a consequence there are included herewith two drawings, consisting of a map and a profile showing the relation of the North Santiam river source to the city of Salem and the location of the facilities which now exist or are to be provided within the city for the storage and distribution of water.

These drawings are marked and will be referred to as Plates A and B respectively. The map and profile are largely self-explanatory and written comments will be brief. Plate A shows the route of the proposed pipe line from the proposed source above Stayton to the new city reservoir now under construction.

The pipe line would function somewhat differently if used to convey water developed on the island than it would if water is taken from the open stream. In the former instance the water would be clear and free from any substance requiring artificial filtration for its removal while in the latter case the water taken by the pipe line would be of a character termed "raw" and such water would subsequently be filtered by passing through a modern rapid sand filter.

If water is taken from an underground development on the island and the pipe line will carry the suitable for use at all times and at any point along the pipe line route and will deliver water directly into the Salem distribution system at the intersection of 12th street and Rural avenue. Water not consumed by current demand will flow westward in a new pipe line along Rural avenue to the new reservoir and any excess of flow over city demand and that necessary to maintain a full reservoir will overflow and be carried to waste at the level of Wilamette river.

To Exceed Needs

In this method of development and operation large volumes of water will flow through the reservoir constantly and run to waste until such time as the city demand is greatly increased over that which now obtains or until a sale of excess water can be made. On the other hand, if "raw" water is taken from the open river, the pipe line from source to filter plant will contain water which, at times, will be unfit for use without local treatment at point of use.

Plate B drawing differs from plate A in that it indicates the vertical characteristics of the pipe line instead of its horizontal alignment. Under conditions which can be obtained in this project (a fall of 1.41 ft. per 1000 ft. for the island development and a little less for the open river diversion) the delivery of water in various sized pipe lines may be considered to be approximately as follows:

24-inch pipe	6
30-inch pipe	10
36-inch pipe	16
42-inch pipe	24

As nearly as can be determined, the present water demand in Salem ranges from a minimum of about 2 million gallons per day in winter to a maximum of about 7 1/2 million gallons per day for the hottest, driest day of summer.

Island and Vicinity

So far as is known the island under discussion has no official name. For convenience your engineers have given to it that name which appears to be most appropriate: Stayton Island.

This island lies mainly in Sections 13 and 14, Township 9 South, Range 1 West W. M. Its total length is slightly less than 2 1/2 miles and the width is from an eighth to three-eighths of a mile. The total area is about

400 acres. The island is low lying and is relatively level. There are, however, many small depressions and high water channels which indicate partial flooding during periods of extreme high water. . . . but the portion of the island with which the city may be concerned, there is no evidence of serious erosion.

The surface of the island is generally parallel to the river slope although the easterly third rises somewhat more steeply and its area is from eight to ten feet above normal river level. The east end of the island is about 30 feet higher than it is along a line which would divide the westerly and middle thirds of the total area.

It is only the easterly two-thirds of the island that is of any importance in connection with the studies that have been made and the water-bearing characteristics of the easterly third only are of concern to the city.

Location Shown

On the map of the island (plate C) the appropriate locations of prospective development works, pipe line and appurtenances are shown. Plate D is a surface profile of the island along the tentative pipe line route.

As land for general use, the island has no appreciable value except as a source of cord wood and gravel. The cord wood value will be acquired by the city if the island is developed as a water supply source whereas the open gravel deposits will be unaffected by any of the city's work or prospective ownership.

Surveys

Attention was first directed to the possibilities of water supply development on Stayton Island because of the opposition of Stayton interests to the suggested diversion of water from the open river above the city.

Because of its elevation, isolation and reported sub-surface characteristics, the island, which lay just across the north river channel from the most feasible point for open river diversion, offered attractive possibilities.

At the time surveys were undertaken there were available no data of consequence pertaining to the island. General information of value was given by A. D. Gardner of Stayton. His data were of a descriptive nature and useful only in so far as they expressed his personal knowledge of the island. No reliable map of this area has heretofore been made.

Surveys, map-making and surface study of the island, disclosed the possibility that here was a water supply of exceptional attractiveness.

Property Options

Before undertaking work more active and definite than an engineer's survey, the water commission secured options to purchase the lands which might be useful to the city and also easements for the construction of pipe lines and structures on properties in the vicinity of the island but not included in the lands to be purchased. On Plate C the property under option to the city is indicated. It consists of 238 acres and embraces all that part of the island which can in any way be useful to the city in its present or future water development procedures. This area includes practically all of the timbered portion of the island.

Sub-Surface Formation

Immediately following the securing of property options and the permission for further investigations contained therein, your engineers secured readily portable equipment . . . and made such sub-surface explorations on the island as could be made without the aid of heavy, power-driven excavating machinery and extensive operations which would be equivalent to a construction undertaking.

Three important excavations were made within the "area of water development" indicated on Plate C. As was to be expected, water was found at an elevation which was approximately the same as in the river channels opposite the place of excavation. Water appeared in coarse clean gravel. In low spots gravel was found at the beginning of excavation and where surface elevations were higher, an overburden of sandy soil varying in depth up to four or five feet was removed before the water-bearing gravel was reached. When an excavation had been carried to a depth of a foot or two below water level a power-driven pump was used to lower the water and permit further excavation.

By using the pump to full capacity it was possible to dig to a depth of about five feet below water level in a hole cribbed to a size about four by eight feet. The capacity of the pump was approx-

Engineers' Drawings Showing Proposed Infiltration System and Santiam Pipe Line to Salem

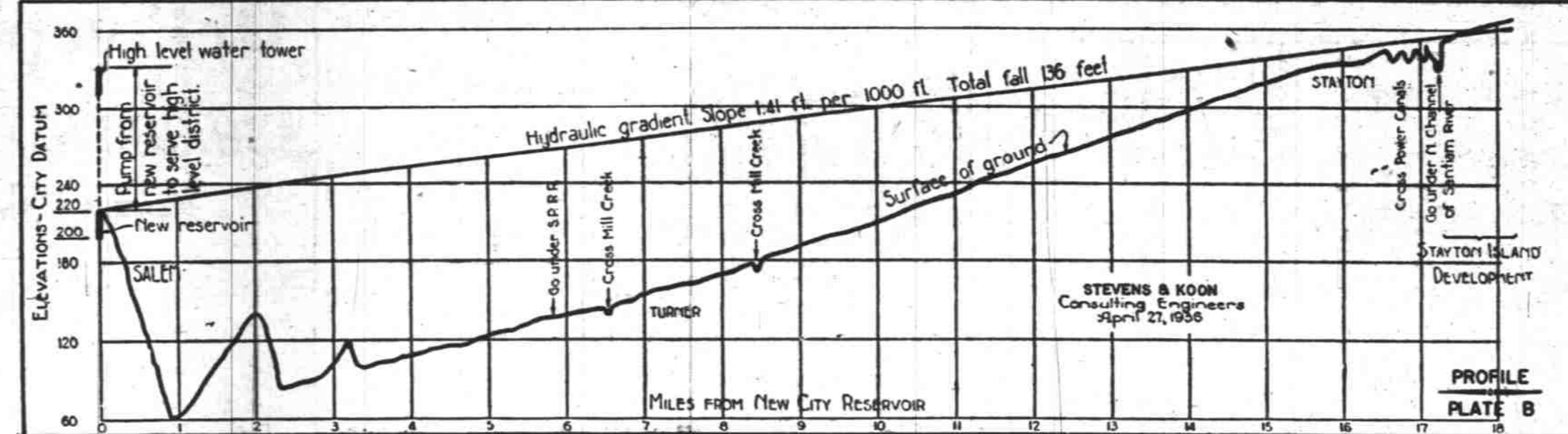
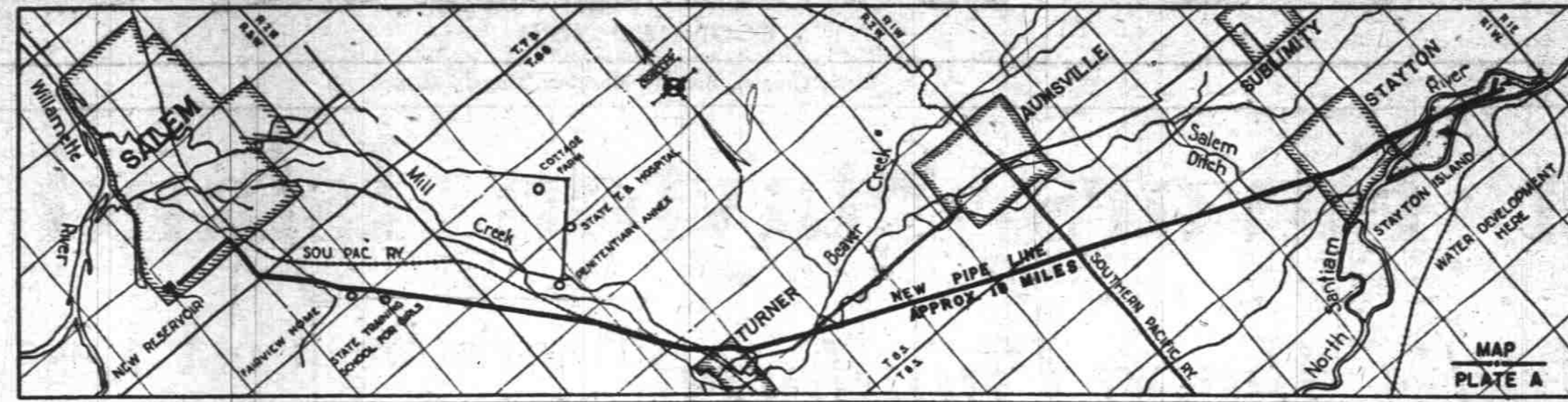


PLATE A shows engineers' location for Santiam river-Salem pipe line which will start from Stayton island, go under the north fork of the river, cross the Stayton island, go under the north fork of the river, cross the Stayton power canal and Salem ditch on an overhead crossing, run through Stayton and on, 18 miles to Salem. The line will be laid through a small section of the Turner municipal limits, run near to the state training school for girls and the Fairview home, coming into Salem at South 12th street and Rural avenue.

PLATE B illustrates the total fall of 136 feet between the intake level at the Santiam and the surface level of the new reservoir on Fairmount hill. The top line reveals the hydraulic gradient, showing a fall of 1.41 feet for each 1000 feet of pipe. The bottom line shows the actual drop from the 360-foot level at the Santiam to the minimum level of 60 feet above sea level where the pipe comes into Salem. The vertical scale in this drawing is at a ratio of 88 to one on the horizontal scale.

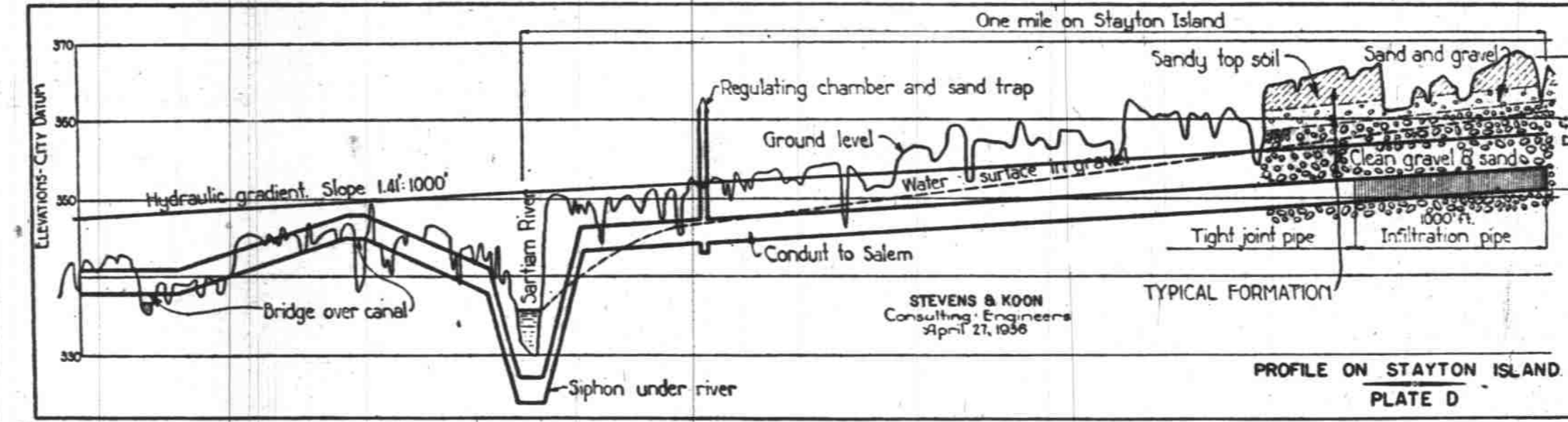
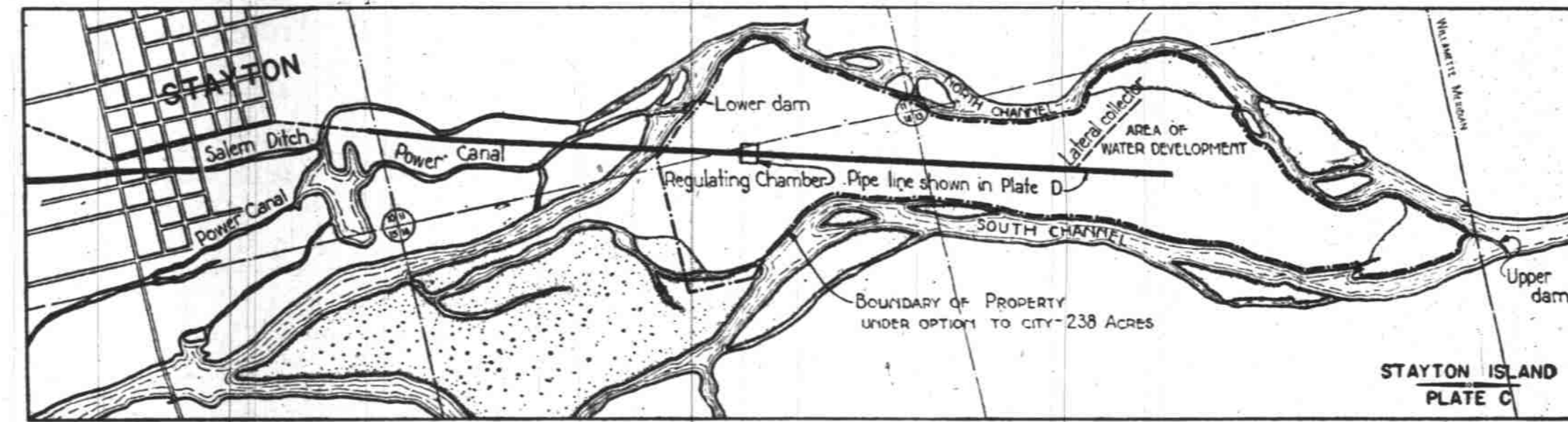


PLATE C is an engineers' drawing of the Stayton Island territory indicating the proposed intake system. The east portion of the island would be acquired by the city with water being taken from the sector shown in the right portion of the upper drawing. The pipe line for the intake would be laid with open joints in gravel through which the water would filter. The flow would be picked up in steel pipe, conveyed through a sand trap and regulating chamber and then started on its way to Salem through the pipe line which would go under the Santiam river, cross the power canal and the Salem ditch and be laid through Stayton as indicated above.

PLATE D is a profile section of the proposed intake system on Stayton Island. The vertical scale in the drawing has been enlarged to show how the water would filter through clean gravel and sand into the loose-joint infiltration pipe. The flow would be conducted into tight pipe, pass through a regulating chamber and sand trap and then be carried to Salem through an 18-mile long pipe line. The vertical scale here has been greatly enlarged in comparison to the horizontal scale to show a cross-section of the proposed infiltration system.

imately 500 gallons per minute or about 700,000 gallons per day. This volume is about one-twentieth of the capacity of the pipe line which is now tentatively considered for use in bringing water to Salem. The pump was operated continuously for a full eight-hour period without appreciable effect on the water level in the pit. Upon stopping pump operation the pit quickly filled with perfectly clear, free-flowing water. After removing top soil and entering gravel, only loose, clean sand and gravel were found in the excavations.

Advantages Shown

Development of a water supply from such a source as it available on Stayton Island is not in itself unusual but there are a number of features in this particular development, which make it especially attractive. Among waterworks men a shallow, underground water supply developed in the manner herein suggested is not uncommon and the method is known as infiltration galleries or, more simply descriptive, such a development may be called a horizontal well. More frequently than otherwise, supplies developed in this manner require pumping in order to make the water available for city service. If the Stayton Island development is made, it will be operated entirely by gravity and in this lies its most valuable feature aside from the fact that the quantity will be ample and the quality most excellent.

There will be practically unlimited opportunity for expansion of the development at any time more

water is desired. Other unusually attractive features of this particular project may be mentioned. These vast water-bearing gravel deposits occur immediately above the last point of possibly serious contamination along the river; the water which can be secured from this source will have all the characteristics of an ideal mountain supply with none of the disadvantages which necessarily obtain when such a supply is taken from a stream as large as North Santiam river; the entire area over which the development can be owned and forever controlled by the city with very nominal expenditure for land; the area under option is relatively inaccessible to man except with considerable effort and livestock, which might occasionally ford the stream voluntarily, can be excluded by fencing at moderate cost; no artificial filtration of the supply will be necessary and this construction and operating cost will be obviated; chlorination of the supply might be unnecessary although, as a precaution, adequate provision will be made so that such treatment could be instantly applied should there be any indication of pollution, however slight.

Development Method

Details of the method of devel-

opment cannot be given pending further surveys and more thorough study of the problem. In general, however, a tight jointed pipe line will penetrate the island from the point of entrance indicated on Plate D to the "Development Area." At the lower edge of this area the pipe will be at a depth of probably eight feet or more below river level. Through the development area pipes with open joints or perforations will be laid as collectors; such pipes being entirely surrounded with clean gravel of suitable size when the pipes are laid. Plate D indicates in a graphic manner a tentative scheme of development but this may be greatly altered as the ac-

tual conditions become more clearly understood.

Relative Cost

Preliminary data only have thus far been obtained relative to this phase of the prospective water supply improvements and, because of the peculiar nature of the construction problems involved, it is too soon to make reliable estimates of cost. It will be unnecessary to build certain costly works if the underground development here discussed is made and a consideration of these prospective savings may give some idea as to the merit of the island project from the standpoint of construction cost. A

supply taken from the open river would require a filtration plant which has been estimated to cost about \$170,000 and an intake structure to cost \$25,000. Neither of these items would be necessary with the underground supply. There would also be a considerable saving in pipe line cost at the Salem end. In round figures the special works made unnecessary by the island supply (Turn to page 5, col. 2)

"Exceptional" Supply Found

Purchase of Necessary Lands Recommended to Salem Council

(Continued from page 1) and designs to the end that, unless unforeseen difficulties arise as a result of such final investigations, the underground water of Stayton Island be developed as the permanent supply for the City of Salem.

The report points out that attention was first directed to the possibilities of water supply on the Stayton Island location because of opposition by Stayton interests to suggested diversion of water from the open river above the city.

"Because of its elevation, isolation and reported surface characteristics, the island offered attractive possibilities," the report reads.

"Surveys, map-making and surface study of the island disclosed the possibility that here was a rare opportunity to secure a water supply of exceptional attractiveness," the report continues. Options were then taking on 238 acres on the island needed as an intake source. Easements were secured for right-of-way for pipe-line leading away from the island.

The studies quickly revealed that water was obtainable in large quantities at approximately the elevation of the adjoining river. Water appeared in coarse gravel and a sample test pit dug and encased in cribbing to form an area four by eight feet, revealed a flow of 500 gallons of water a minute, or 700,000 gallons a day with supply undiminished by continuous pumping.

While details of the methods of developing the water supply from the island cannot be given until a more extended study is made, the engineers' report sketches the plan for taking water from the island. In the so-called development area of the island pipes with open joints or perforations will be laid as collectors, the pipes being entirely surrounded with clean gravel.

Savings in capital outlay in the proposed island system would be at least \$50,000, the report declares, with the view expressed by the engineers that the savings would probably be larger. At this stage of study and plans it is felt that a very liberal allowance should be made for the island work and the relative merits of the two supplies should be considered on the basis of the quality of water and operating cost rather than upon development cost," the report declares.

A Salem filtration plant, estimated to cost \$170,000, and an intake structure of the open river estimated to cost \$25,000, would be eliminated under the island intake proposal. Offsetting a portion of this cost would be three-quarters mile more pipe, a river crossing, a special regulating chamber and perhaps 2000 feet of collecting pipe.

In addition to the savings in capital outlay, a large saving in operating and maintenance cost would be made by the island system inasmuch as the filtration plant would be eliminated.

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