

History 11 WATER SURVEY FOR THE PA STATE CRESSON SANATORIUM 1909

This article about sources of water for the Cresson Sanatorium is lengthy and very technical. However, it does give an in-depth look at the sources of water in Cresson and surrounding towns.

WATER SURVEY FOR THE PENNSYLVANIA STATE CRESSON SANATORIUM 1909

Mr. Andrew Carnegie presented to the Commonwealth of Pennsylvania, a tract of land located near Cresson on top of the Allegheny Mountains, for use as the site of a tuberculosis sanatorium. This gift was made during the summer of this year, and as soon as the necessary details could be arranged, surveys of the property were started and a general engineering investigation was made.

The proposed site for the new State Tuberculosis Sanatorium near Cresson, Cambria County, is located on the summit of the Allegheny Mountains *li* miles east of the borough of Cresson which lies 15 miles west of Altoona on the main line of the Pennsylvania Railroad. The tract of land presented to the State by Mr. Andrew Carnegie for this purpose has an area of 49N acres and is at an elevation ranging from 2,300 to 2,560 feet above the sea level and averaging approximately 2,450 feet above the sea level.

The land is on the watershed divide between the Susquehanna and the Conemaugh Rivers. It comprises the highest land in elevation in Ibis vicinity, although there is a hill one mile south of this property on the divide which rises to an elevation of 2,520 feet. The land lies on both sides of the Pittsburgh and Philadelphia Turnpike and is bordered on the northwest by the Old Portage Road. Plane No. 5 of the Old; Portage Road is immediately west of the main section of this tract, being separated therefrom by a small tract of private property. At the intersection of the Old Portage Road with the turnpike is the village of Summit which consists of a group of houses extending along both roads from their intersection for a distance of several hundred feet.

The tract is drained on the north by the headwaters of Bradley Run, which flows northerly near the western part of Oallitzin Borough and helps to form one of the headwaters of the Susquehanna River. On the east the tract is drained by Blair Gap Run and Adams Run which drain that portion of the tract which extends into Blair County and flows easterly, forming one of the headwaters of the Juniata River, a tributary of the Susquehanna. On the west several small streams head in the tract and flow westerly, forming the headwaters of the Conemaugh River.

The northern portion of the tract along the turnpike has been cleared but the main portion lying south of the turnpike and extending across the county line into Blair County is covered with a second growth of timber. This latter section embraces the elevated portion of the tract which extends along a ridge having a northwesterly and southeasterly trend.

The surveys were begun on November 18th, at which time permission was obtained by the Commissioner of Health from Mr. Carnegie to enter the premises. The survey consists of a complete topographic survey of the entire property; a property survey for establishing the boundary lines; a survey of the Pittsburgh and Philadelphia turnpikes from the Pennsylvania Railroad at Cresson to the property; and check

levels from the railroad bench mark at Cresson marks on the property including a series of check levels around the property.

The survey of the turnpike was begun first and a traverse was run from the railroad to the property. This was tied in with the various roads and lanes connecting with the turnpike and all houses and other structures were accurately located. A profile of the road was then run with elevations taken at 100 foot intervals and at changes of line and grade. Check levels were then run from the railroad bench mark and bench marks were established on the property. Observations were then made on Polaris and a true north and south line was established on the property.

The property survey was started after these preliminary steps had been completed. Asmuths referring to the true north were used on all courses. The property was divided into two nearly equal parts for the survey and a control traverse was run around each part. This control traverse consisted of a random traverse following as closely as possible the property lines and tying in with all corners. A level party followed up the transit party and established bench marks at all hubs for the stadia survey. After the traverse was balanced and found to be correct, cross traverse were run across the tract at 400 foot intervals and transit stations were established along them at points approximately 400 feet apart. Levels were carried to all these transit stations by the level party and from these points stadia shots were taken for topography and location of streams, houses, trees and other objects. The field work was plotted every night and during bad weather so as to have the office work kept up with the field work. In this way mistakes were picked up and corrected easily, and there was no difficulty in remembering local conditions at any particular point.

The main difficulty encountered in making this survey was the weather conditions. The winters on top of the Allegheny are extremely severe and start early. Before the work had been in progress two weeks there were frequent snow storms and the temperature during the early morning hours became so low that it was impossible for the men to work. Work was, however, pushed on under these trying conditions, and by the latter part of December the eastern half of the tract had been completed in addition to the survey of the turnpike and the check levels. On December twenty-seventh it was decided to suspend work temporarily on account of the severity of the weather. 85—16—1909

WATER SUPPLY.

A general investigation was made of the water supply available for this institution. All sources available were investigated and a study was made of the most available sources. It has been assumed for the purpose of studying the source of supply that the sanatorium will be constructed for a capacity of 1,000 people and that the water consumption will be at a rate of 100 gallons per capita per 24 hours. This would make the required water supply 100,000 gallons per 24 hours. It has further been assumed that the sanatorium will be located on the high ground somewhere along the ridge and as this is shown above any source of supply available, it will require that the water supply be pumped.

No plans or estimates have been prepared for the water works system or storage reservoir, as the details of this cannot be determined until the exact location of the sanatorium has been decided upon. The location of a large reservoir could be made on the hill 2,020 feet high located one mile south of the tract on private property. There is an open field on this hill and inspection shows that a good site can be obtained. An elevated tank or standpipe could be built on the Carnegie property in case it was decided not to construct a reservoir. A comparative cost of the two projects cannot be made until the location of the sanatorium has been decided

upon. There are four sources of supply to be considered for obtaining the water supply for this sanitarium. They are: First, springs: second, drilled wells: third, surface water supply: fourth, water company supply.

The strata below the surface of the Carnegie tract dips between three and four per cent, in the direction of 27 degrees west. It consists of alternate layers of sand stone, shale and fire clay lying above the Upper Freeport coal vein, which on the western portion of the tract near the village of Summit lies at a depth of 200 feet below the surface. These layers outcrop along the western slope of the tract and it would therefore be expected that springs would be found along this slope. There are several springs along the western slope of this tract and the main group is situated near the western central portion at the head of several ravines and feed several of the small streams which unite at the foot of Plane No. 5 on the Portage road and form one of the headwaters of the Conemaugh River. These springs are located at an elevation approximately of 2,300 and as the Upper Freeport coal vein outcrops near the eastern boundary of the tract, the strata which feed the springs outcrop within the tract at correspondingly higher elevations so that the water storage in the strata of these springs is extremely limited and during a prolonged drought these springs are practically dry. The strata which feed these springs appear to be of excellent water-bearing formation and during a wet season there is an ample supply for them.

It might be possible to construct dams across the ravines from these springs to form storage reservoirs which would hold sufficient water to supply the institution during the dry season. Such storage would have to be for at least 120 days' supply which would require 12,000,000 gallons storage. These ravines will receive all the natural drainage from the proposed site of the institution and although this could be protected from contamination by ditches, yet the fact that these ravines form the natural drainage for the Institution site would probably prejudice it against use for storing the water supply. During the drought in the fall of 1909 all of these springs were examined and the flow was so small that it could not be measured. There appeared to be no water in the creek beds in the ravines. Springs, however, which outcropped at a lower level on the adjacent property and which had a larger storage capacity continued to flow and a measurement taken on the creek below Plane No. 5 just above the Upper Freeport coal gave a flow of 52,750 gallons in 24 hours. Most of this water appeared to outcrop at Plane No. 5 from the strata above the Upper Freeport Coal Seam.

On the western side of the Carnegie tract a few feet south of the turnpike (here is a spring on the Carnegie property which supplies the Summit Hotel, belonging to Mr. Joseph Fisher. This spring has a small flow and has never been known to go dry. It is understood that the rights of this water belong to Mr. Fisher. On the north side of the turnpike opposite to this spring there is another spring on the Carnegie property which is included in the sub-division assigned by Mr. Carnegie to the Cresson Cemetery Association. This spring is also small and has never gone dry. The springs which furnish the water supply for Cresson Borough are located in the extreme eastern portion of the borough on the side of a hill $\frac{1}{2}$ mile northwest of the Carnegie tract. These springs outcrop at an elevation approximately 200 feet above the Upper Freeport coal. They have gone dry practically every summer and the borough of Cresson has been without water. They outcrop from strata similar to those which furnish the springs on the Carnegie property.

There are several dug wells and shallow drilled wells in the village of Summit along the boundary of the Carnegie property. These wells extend into the same strata which furnish water to the springs previously described and in most cases the wells have not been a success. There is a dug well 25 feet deep on Mr. Shumate's property which goes dry in the dry season. Between Mr. Shumate's property and the Summit school house there is a dug well 27 feet deep belonging to Mr. John McConnell. The bottom of this well is in

shale and it is reported that there is two feet of water in it in the dry season. No test of the capacity has been made. The school house well is 30 feet deep and is reported to contain six feet of water in the driest season. This well is used by most of the neighbors when the other wells are dry.

Directly across the Portage road there is a drilled well 11 inches in diameter and 47 feet deep which belongs to Mr. W. S. McClosky. This well has been in use for one season and went completely dry. There is also a dug well on the property of Frank Adlesberger on the turnpike adjacent to the Carnegie property. This well is 12 feet deep and contains water during the dry season. There is another well 10 feet deep on the property of Sam Lilly near the turnpike. This well is a dug well and contains water during the dry season. The water in these wells is hard water. Only one of them has been tested during the dry season and this test consisted in pumping out two hogsheads of water, which emptied the well. It required from eight to ten hours for the well to refill and this would indicate that the supply was extremely limited.

The next group of wells near the Carnegie tract lie 4 mile northeast of the tract in the eastern portion of the borough of Cresson at an elevation of 2,200. The Upper Freeport coal at this point is at an elevation of approximately 2,000 or 200 feet below the surface. Three (> inch drilled wells have been located at this point and have been drilled to depths of 100, 130 and 171 feet respectively. The two shallower wells have supplied not over 15,000 gallons of water in 24 hours during the dry season of the current year. The 171 foot well, which was recently drilled, was tested for 27 hours and gave a flow of 50 gallons per minute or 80,000 gallons in 24 hours. This test was, however, made after the drought was broken. Immediately south of this group of wells on the side of the hill near the turnpike and at elevation 2,231 there is another 6 inch well belonging to Mr. Luther. This well is 190 feet deep and had been in use several years. It was used by the water company during the drought of the current year as an auxiliary for its water supply and furnished an estimated quantity of 40,000 gallons per 24 hours, although no tests were made of it.

It will be noted that the two deepest wells in this group go down to a depth of approximately 20 feet above the Upper Freeport coal. The Upper Freeport coal in this vicinity is covered with a layer of Mahoning sandstone, averaging up to 90 feet in thickness. In drilling the deep well on the Cresson Water Works property it was noted by the well driller that there were several streams of water which entered the well between the surface and the final water bearing strata. The main supply, however, entered the well through the sandstone formation towards the bottom. This same sandstone formation in all probability feeds the Luther well. This water bearing strata outcrops on the extreme eastern portion of the Carnegie tract so that there is a storage of water for wells at this location of much greater extent than the storage on the western portion of the Carnegie tract.

Another group of wells has been drilled at Bens Creek 5 miles southwest of Summit on the Main Line of the Pennsylvania Railroad. These wells were drilled to furnish the pumping station of the Standard Oil Company with a water supply and have been very successful. The Upper Freeport coal outcrops at the surface of the ground at Bens Creek and underlying it are various strata intermingled with coal layers, several of which such as the Miller seam are mined. Under these coal layers which extend to a depth of 150 feet or more, there is a 100 foot layer of Connoquenessing sandstone and below this there are thick beds of soft red shale followed by a thick bed of sandstone underlaid with silicious limestone formation. In the wells constructed at this point a large well was sunk through the coal measures into the sandstone underlying them and cased out and completely sealed, so as to cut out the sulphur water from the coal measures. A smaller well was then sunk through the sandstone into the underlying red shale. Two wells were constructed in this

manner and proved very successful. The largest well was 8 inches in diameter and 432 feet deep and upon completion overflowed at the surface with soft water. The second well was 0 inches in diameter and approximately 500 feet deep. This well did not overflow, but water stood in it to within 0 inches of the surface. It is reported that recently a third hole has been sunk by the Standard Oil Company at the Bens Creek pumping station. This well was sunk to obtain additional water for condensing purposes. The well at this point, according to reports has been sunk to a depth of 780 feet and a vein of salt water has been struck, also gas. The report of the U. S. Geological Survey indicates that this red shale formation which supplies the water to this last group of wells underlies the Carnegie tract of land also and outcrops along the eastern slope of the mountain a mile east of the Cambria-Blair County line. The outcrop is along the steep slopes of the mountain in this section, while east of Bens Creek the outcrop is along the top of the mountain in flat territory, permitting far better facilities for the entrance of the water. As the vein is reported to be 100 feet thick and as there is considerable storage in this strata for wells which would be driven along the western side of the Carnegie property it is not improbable that a supply of water could be obtained from this stream. The water supply for the borough of Gallitzin was originally obtained from several drilled wells.

It is reported that these wells were supplied by strata located above the Upper Freeport coal similar to the location of the Luther well and the deep well on the Cresson Water Company property. When the coal was mined these wells went dry and the water supply for Gallitzin has since that time been supplied by the Coal Company. Nearly all the streams in this vicinity have already been taken for water supplies. Most of them are controlled by the Pennsylvania Railroad Company or by the American Pipe Manufacturing Company, which it is reported acts in conjunction with the Railroad Company. East of the sanatorium property are Blair (Jap Run and Adams Run which flows through deep ravines easterly towards Hollidaysburg. Blair (Jap Run is used during the dry season to its full capacity by the Blahs Gap Run Water Supply Company to supply the railroad at Altoona. Adams Run is used by the Hollidaysburg Water Works Company and the entire surplus is used by the Blair Cap Water Supply Company. This company has two main storage reservoirs, one on Blairs Cap Run above the junction of Adams Run and one below it.

Sugar Run, which lies north of Blairs Cap Run in the Muleshoe of the Pennsylvania Railroad, is reported to be held in reserve by the city of Altoona for an additional water supply. This is two miles north of the Carnegie tract and is at such a low elevation that the cost of pumping the water from a storage reservoir on this run would be high. Poplar Run, which lies south of Blairs (Jap Run on the eastern slope of the mountains, is reported to be unused at present for a water supply. This run is five miles from the Carnegie tract and it would require very heavy pumping to lift the water to the sanatorium. Bradley's Run, north of Summit, which flows northerly near the eastern boundary of Gallitzin, is also used by the American Pipe Manufacturing Company. They have a reservoir on this run at a distance of one mile from the Carnegie tract and this water is used to supply the railroad.

Clearfield Creek which lies 11 miles west of the borough of Cresson, contains a good flow of water which is not used at present for public water supply. There are some large ponds on this creek just west of Cresson which are used by an ice company for an ice supply and large shipments of ice are made from this pond to Altoona and other points. During the drought of 1891, a weir was placed on Clearfield Creek near the wooden bridge which crosses this stream on the Pine Grove and Cresson road. A reading was taken on the weir on December 15th, at the time of the lowest flow of water and a flow of 2,000 gallons in 24 hours was obtained. This point is on the creek above the branch which drains Sankertown and the northern portion of Cresson Borough. The drainage area of the creek above this weir is 5 square miles, so that there is a run-off

for this territory amounting to 0.002 cubic feet per second per square mile during the driest season known. The Cresson Water Company is planning to place their pumping station on this creek and to construct a large storage reservoir and to pump the water from this point to a point on the summit near the Canwjrie property. If this installation is made the water rights on this creek during the dry season would be practically exhausted and for an additional supply it would be necessary to depend entirely tilion storage. The distance from this creek to the Carnegie property is 3 miles and it would require a lift of nearly 1 .(Mil) feet to provide ample pressure at the sanatorium so that the cost of pumping would be high.

The small streams which head in the ravines on the western slope of the Carnegie property, of which mention has been made before in this report, unite near Plane No. 5 on the Portage Road and form one stream which Hows southwesterly towards Lilly. As previously stated, a weir was placed on this creek during the fall of 190!) at a point 200 feet west of the Old Freeport Road on private property. The flow as measured on the weir at this point in December was 02,750 gallons per 24 hours. A reading was also taken on this weir on December 8th, when the flow of 38,000 gallons was obtained. At the time of this latter reading the flow of water was held in check by heavy ice on the creek, so that it does not represent the lowest flow under normal conditions. The watershed drained at this point has an area of one square mile so that the minimum run-off under normal conditions is 0.082 cubic feet per second per square mile. As previously stated, this watershed drains the main portion of the Carnegie tract consisting of the entire western slope. It appears, however, that most of the flow during the dry season comes from strata immediately above the Upper Freeport coal which outcrops at this point.

Burgoon Run, which is also known as Adams Run, lies one-half mile south of the Carnegie tract and flows westerly entering Bear Rock Run immediately west of Lilly. This run beads at Adams (Jap and flows through a territory which is very sparsely settled and is mainly covered with a second growth of timber. During the dry season of 100!) there was no water flowing in this run at a point one mile from its source. Sites for the construction of storage reservoirs on this run are available and an ample supply could be obtained during the wet season for filling the storage reservoirs. Two miles south of the Cresson tract Christie Hollow Run, which heads in Laurel (Jap and flows westerly, unites with Bear Rock Run which in turn Hows westerly, passing through Lilly at a distance of 2 miles from the junction. The water supply for the borough of Lilly is taken from Rear Hock Run nt a point just below the junction of Christie Hollow Run. There is no attempt at providing storage for the Lilly supply and the intake consists of a crude dam which probably permits of a certain amount of leakage. <»n Rear Rock Run just above the junction with Christie Hollow Run are two large storage reservoirs belonging to Bear Rock Water Company, which lias been purchased by the Summit Water Supply Company. This Company belongs to the American l'ipe Manufacturing Company and is used to supply the Pennsylvania Railroad with water in the (Jallitzin district. The two reservoirs have storage capacity of 10,000,(100 gallons and 2.1,000,000 gallons respectively and furnish a gravity supply. It is reported that during the dry season this company is compelled to divert a portion of its water from these reservoirs into the creek to supply the borough of Lilly and that the amount which they arc compelled to divert is in a proportionate ratio to the amount supplied from Christie Hollow Run. A weir was placed on Christie Hollow Run and on December 4th, a reading was taken on this weir which gave a How of 02,000 gallons per 24 hours. This weir is located at a distance of one-half mile above the junction with Rear Rock Run at an elevation of approximately 2,240 feet. There is a drainage area at this point of 1.2 square miles, which gives a minimum run-off for this stream of 0.080 cubic feet per second per square mile. There is a reservoir site of approximately 2o acres in this vicinity, which has been considered by other water companies for constructing a storage reservoir. It is reported that this site was offered to the Cresson Water Company by the owner several years ago for \$3,000.

A mile east of this point is the high point on the ridge which was previously mentioned in this report as an available site for a reservoir. A certain amount of the dry weather flow of this stream would have to be bypassed for the supply of the Lilly Water Works as in the case of the Rear Rock reservoir. There are two water companies from which water could be obtained for supplying the sanatorium, namely; the Summit Water Supply Company and the Cresson Water Company.

The Summit Water Supply Company has two 12 inch mains which extend through Cresson parallel with the railroad. One of these mains extends along Sixth Street in the eastern portion of the borough and is supplied from the two large storage reservoirs in Rear Rock Run, three miles south of Cresson and at an elevation of 2,344 feet. The other main is supplied by a series of reservoirs located 12 miles or more south of Cresson on various streams which form the headwaters of the Conemaugh River. The two largest of these reservoirs have each a capacity of over 200,000,000 gallons and are at elevations 2,317 and 2,142 respectively. It is reported, that this company sells water to the Pennsylvania Railroad Company at eight cents per thousand gallons. Recently this company has entered into an agreement to supply water to the borough of Cresson at wholesale rates, the said borough furnishing the distributing pipe lines.

The main from the Rear Rock Water Supply Company which is the nearest main to the Cresson tract could be tapped at a point a mile from the western boundary of the Carnegie tract. It would be necessary to install the pumping plant at this point and pump the water to a reservoir or standpipe on the tract. The supply furnished from the Rear Rock reservoirs should be of very excellent quality as there are only one or two houses on the watershed and with the large storage, contamination should be practically eliminated.

The Cresson Water Company is at present planning to make extensive additions to its plant. It is the intention of this company to install a pumping plant on Clearfield Creek just above the ice company's pond and to pump from a large storage reservoir at this point to a distributing reservoir to be located on the property on the north side of the highway adjacent to the Carnegie property. This main force line will extend along the highway through the Carnegie property. The elevation of the reservoir on this side will be too low to supply the institution by gravity and it will be necessary to install a pumping plant and lift the water to a reservoir or stand pipe on the property. The water obtained for this supply from Clearfield Creek is subject to contamination from various houses on the watershed and will have to be treated. The water company will be directed as to the requirements of the Commissioner of Health in the permit which the Commissioner of Health will issue at an early date to this company for the construction of this additional supply. It is not known what the rates of this company will be for furnishing water or how soon this supply will be completed. The company states that they intend to immediately proceed to install this additional supply.

From the facts presented it appears that there is no spring supply available for the institution during the dry season, and that in case a surface supply is used storage would have to be resorted to. It has been planned several times in the past few years by the borough officials of Cresson to construct storage reservoirs on Burgoon Run and Christie Hollow Run in order to furnish a gravity supply of water to the borough of Cresson. Unfortunately the borough has not been in a financial condition to carry out this scheme and in fact no plans have ever been prepared. It is also reported that the Cresson Water Company at one time had considered using the Christie Hollow Run Supply. This is undoubtedly the best surface water supply available in this district at present and with a large storage reservoir would furnish an excellent supply for the State Institution, although as previously stated, it will be necessary to pump it with a medium lift.

The population of Lilly Borough is approximately 1,500 people and with a per capita consumption of 50 gallons it is probable that the water consumption does not exceed 75,000 gallons per day. Of this amount 35,000 gallons would have to be by-passed from Christie Hollow Run, which would leave a dry weather flow available of 27,000 gallons. This would require for 120 days' storage with a consumption of 100,000 gallons per day for the sanatorium a storage reservoir of 10,000,000 gallons. This would not be an excessively large reservoir and would be small compared with the large reservoirs belonging to the Summit Water Supply Company previously described.

It would probably be unnecessary to treat the water obtained from this source as there are no houses on the watershed and it is covered with a second growth of timber. The location of a good distributing reservoir site within a distance of one mile east of this run is very advantageous and this site is conveniently located with respect to the institution site as it is only 1/2 miles from the probable site for the buildings at the institution.

In case it was found on making surveys that it was inadvisable to construct a 10,000,000 gallon reservoir on this creek it would be possible to construct another storage reservoir on Burgoon Run and use the combined storage of these two reservoirs for supplying the institution. No estimates have been made on the construction of a water works system based on this scheme, as no surveys have been made and without them it is impossible to determine the cost of constructing the reservoirs.

It would appear from the results obtained from the Standard Oil Company's wells at Bens Creek that a water supply from drilled wells might be obtained for the sanatorium by sinking the wells to the red shale formation which underlies this district at a depth of 500 to 600 feet. The result obtained from shallower wells would indicate that an adequate supply could not be obtained from the strata above the coal veins. It might be possible to obtain a supply from the strata immediately above the Upper Freeport coal which supply water to the two successful wells in Cresson Borough. These wells could hardly be considered permanent and judging from the experience of Gallitzin, there would be a grave danger that these wells would fail after the coal is mined from under this tract of land.

In case an adequate supply of water is not obtained from the wells it would be possible to use water from one of the water company's supplies as an auxiliary. The water from one of the water companies might also be used as an auxiliary to the water from the creeks which flow from the western slope of the Carnegie tract. These creeks, during the winter season and probably during a good portion of the year, furnish a large supply of water and if it was possible to protect them from the drainage from the sanatorium an excellent supply of water could be obtained for at least a portion of the year. The use of water company water could also be made an auxiliary to the flow from Christie Hollow Run or from Burgoon Run. These two runs also during a good portion of the year would provide an ample supply of water and in case it was found that a storage reservoir was too expensive it might be advisable to use the normal flow from these streams.

An estimate of the cost of drilling a test well to extend to the red shale formation has been made on the basis of the cost of drilling wells at Cresson to the depth of this strata as given by the U. S. Geological Survey. The estimates of the cost of this well have been prepared for two locations, one on the turnpike on the northwestern portion of the tract immediately east of the village of Summit. This well would be located conveniently for tapping the main of the Cresson Water Company and it would also be conveniently located for extending a pipe line along the turnpike from the Summit Water Supply Company's main. The other site would be located in the western portion of the tract on the creeks which unite at Lane No. 5 of the Portage

Road. This well would not be conveniently located for obtaining water from the water company pipe lines but would be well located for use in connection with the water supply in the creek at l'lane No. 5

Before any final decision is reached with respect to the water supply for the Institution, a further investigation should be made. The following are the conclusions derived from the investigations just made:

FIRST: That the springs on the Carnegie tract should be developed and used so long as they last.

SECOND: The springs should be supplemented by a supply from the run until it is exhausted.

THIRD: An auxiliary supply should be obtained from a drilled well made shallow if good water and enough of it can be found in the coal measures. Otherwise drill it into the loose red shale below the A seam. This will make a depth estimated between 500 to 700 feet.

FOURTH: Put in a connection to the Summit Water Supply Company's main, or that of the Cresson Water Company.

FIFTH: If all these sources should fail, then build the Christie Hollow supply and as a safeguard purchase options of long term on Christie Hollow Run.

In the west end of the Carnegie tract there is a natural basin away from pollution at the head of a ravine fed by a spring that can be turned into an ice pond by the building of a dam. In case of a drought in the winter time, the basin could be filled with water from the force main which is likely to be laid out on the line to the hill where the standpipe or storage reservoir may be built passing along near the site proposed for the ice pond. This would be on the assumption that the main supply of water would be ample at all times.

The natural pond now existing at the Portage Road could be developed and made an excellent place for the harvesting of ice. Of course, if the water from the run were good enough to be used for drinking purposes, it ought to be good enough for ice. In either case the sewage purification plant from the institution would be located further down stream unless it were located in the valley of Burgoon Run next west of Spring Run and off the Carnegie tract.

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