IRRIGATION BY ARTESIAN WELLS.

REPORT OF EXPLORATORY SURVEY.

BY MR. E. B. McKAY, C. E.

VICTORIA May 18th, 1888.

Hon. F. G. Vernon,
Chief Commissioner of Lands and Works, B. C.

SIR,—I have the honour to submit a report of an examination of the country in the interior of British Columbia comprising the Valleys of the Thompson and the North and South Thompson Rivers, Grand Prairie, Spallumcheen and Mission Valleys, Okanagan, and the country between Vernon and Round Prairie, Cache Creek, and Nicola Valley. The object of this examination was to ascertain from the geological formation of the country the likelihood of obtaining water for irrigation and domestic purposes by the boring or sinking of artesian wells.

On my arrival at Kamloops I at once proceeded to Tranquille, at the upper end of the Kamloops Lake.

I travelled along the base of the ridge of rocky hills which bound the extensive flat of land lying on the north bank of the river (this range of hills rises to a height of from 1,000 to 1,200 feet above the river). On this flat of land there is no water for irrigation purposes until Tranquille Creek is reached, at the extreme westerly end of the valley. This creek only supplies water enough for irrigation of the two farms on the delta of the creek, and power to drive Mr. Fortune's saw and grist mills. Along the outer edge of this range are numerous fans of broken rock, which fill the ravines in the hill-sides and convey the water to a lower strata, which is composed of the rock slides and glacial deposit which fill the bottom of the valley. Overlying this strata is a bed of stratified clay, or silt, which has at some time formed the deposit at the bottom of a lake, which then filled these valleys.

Behind this first range of hills is an extensive plateau of undulating land, composed of drift deposit lying on an exceedingly irregular rocky bed. The whole plateau is studded with lakes, varying in size from a few hundred feet to one or two miles long. They mostly show bold banks, often with rocky sides, and most of them have no outlet (on the surface) except what is due to the soakage, and yet they maintain various levels, varying sometimes as much as fifty feet, when the lakes are not more than a few hundred feet apart. This all points to some underground channel for the conveying away of this water to some lower level in the bottom of the valley, and as the thick strata of clay is quite impervious to water, it does not rise to the surface, but is kept down by the overlying strata of clay. I think that this water-bearing strata can be struck by boring in the valley, and that the depth will in no instance exceed 300 feet, or at most 400.

Further examination of this part of the country was prevented by a snow-storm, but on my return from the South Thompson River I will make further examination, and also of the North River, of which I only saw a few miles; yet from what I saw, the general features of the country are the same.

SOUTH THOMPSON.

I next proceeded to "Duck's," along the road on the south bank of river. The valley differs somewhat from the valley below Kamloops. There is a well-defined bench of varying width on both sides of the river, and above this is a second bench or terrace, at a uniform level of about 120 feet above the river. This second bench is wanting in the valley below Kamloops, and also in the North River, as far as I have seen it. Above this second bench rises the undulating country, with an extensive water-shed from the higher range which shuts in the valley.

STREAMS.

The only streams entering the South River from the south are, first, Campbell's Creek, about twelve miles from Kamloops, and, next, Duck's Creek, about seventeen miles from the same place, and Chases, at the extreme easterly end of the valley. The other streams are insignificant, and cannot be relied on for irrigation purposes, except in years of exceptional rain or snowfall. Considerable pains and expense have been gone to by the various farmers to flume and bring them into use for irrigation purposes, with but indifferent success. This arises from the fact that on the south bank the terraces are cut up and have a quicker slope, rendering irrigation more difficult. From my observations I have no doubt that water will be struck by boring on the lower benches, and in some places on the higher terraces, and in no case would the boring exceed 300 feet.

NORTH BANK.

On the north bank there are some fine flats of land, with but an indifferent supply of water. In fact, the only creeks where water is at all sure are the creek at Pemberton's and one at Graham's. Above this I did not go on this side, as the land is nearly all Indian Reserve. The water-shed is very extensive, and out of all proportion to the quantity of water in the creeks. A great quantity of water disappears into the loose rock above the second bench, and at the foot of the main range. This water must find its way into the valley under the clay.

In some places small springs occur in a band of quicksand. Sometimes this band is not more than a few inches thick, and was never noted more than a foot in thickness. When there is no water on the surface these springs will continue to run, showing that they are supplied by water from below, and from a great distance.

GRAND PRAIRIE.

On leaving Duck's, on the South Thompson, I proceeded to Grand Prairie and made a careful examination of this most interesting part of the country.

Grand Prairie is evidently the filled up or drained bed of a lake, and has an elevation of 2,000 feet. Irrigation is here necessary. On the lowering of the waters, which have at some period stood at a level of some hundreds of feet above the present prairie level, the mouth of the valley has become blocked by the fans thrown out by the creek which enters from the east on Ingram's ranch, and by an opposing creek, which is now nearly dry, but, judging by the fan thrown out by it, it must have been of considerable volume. This blocking of the valley has formed the extensive flat known as Grand Prairie. The Salmon River, which has its rise in Salmon Lake, to the south-west of the valley, runs through the prairie, and is used extensively for irrigation during the period of high water. During the winter months the river bed is dry, and when the rise of the river takes place the first water used for irrigation is so cold as to seriously check the growth of cereals, and when water is wanted for root crops the river has fallen.

The reason of this I found, on examination, to be caused by the fact that the subsoil of the prairie is composed of washed gravel, covered by a rich sandy loam, varying in thickness from a few inches to many feet. This covering of soil thins out towards the edge of the prairie, where the gravel succeeds it. The water of the river sinks into the gravel and flows underground until it reaches the low ground at the north-east corner of the prairie, where it is found issuing from the gravel in a swampy hollow, and forming Salmon River.

At the time of my visit, the quantity of water in the river south-west from the prairie and that issuing from the north-east portion into Salmon River, near the road crossing, was much the same, while the river bed across the prairie was entirely dry.

Water for household uses is found by sinking at an average depth of about forty feet, in gravel. When this level is reached, the water cannot be lowered by pumping or baling, and during the fall of the river in winter a corresponding lowering of the water in the wells is noticed. In summer, at high water, the water in the wells is at a higher level and much colder.

Part of the water for irrigation is obtained from Summit Lake, and is much better suited for the purpose, being warmer. This lake could (with a proper system of storage and fluming the water over the gravel outcrop) be made to find abundance of water for the whole prairie. The only drawback to this plan is the fact that the road from Duck's to Grand Prairie runs for a considerable portion of its length along the lake shore, at a few feet above high water, and any considerable rise of the lake would call for a corresponding rise of the roadway.

In view of the foregoing observations, which I have taken every pains to prove, I do not feel justified in advising the expenditure of a boring to reach any water-bearing strata which might be struck at a great depth.

OKANAGAN MISSION VALLEY.

On leaving Grand Prairie I found the snow still of considerable depth in Spallumcheen Valley, so I pushed on to Mission Valley. During my stay I made headquarters at Mr. Lequime's, and extended my examination to every point of interest, carefully going over a greater part of the water-sheds of the valley. I examined the extensive plateau above and to the south and south-east of the Roman Catholic Mission, and extending up the south-east side of Mission Creek. This part of the valley is composed of undulating foot-hills, with extensive flats above Mission Creek. The hilly portion cannot be brought under cultivation, even should water be found, as irrigation is rendered impossible, owing to the irregular contour of the hills and the light sandy nature of the soil.

Considerable quantities of good land could be brought into cultivation on the flats above the creek, and the extensive water-shed to the south from the range of mountains which run east and west to the Okanagan Lake make it more than likely that water could be obtained by boring here.

Turning to that portion of the valley which carries the drainage from Long and Duck Lakes along the east side of this water-shed which terminates in Mill Creek, and is joined by a small creek which comes in from the east of the valley and flows through Mr. Postill's ranch, at the base of the undulating hills which back on to Blue Mountain is the best location for boring. This extensive flat commands considerable land, and the hills contain in the undulations numerous lakes. Springs break out here in one or two places which run all summer.

SHORT-CUT VALLEY.

I explored a valley opening out of Mission Valley and running parallel to Okanagan Lake. Here considerable land is under cultivation. Water for irrigation and also for stock and household purposes is much needed. Irrigation has not been attempted, as the supply of water is extremely uncertain. However, I learned that in an ordinary dry year about one ton per acre of fall wheat was threshed by F. Brant from ground in this valley. A few wells have been sunk—in some cases quite a depth. The one I examined was about sixty feet. Only an indifferent supply of water was obtained, principally surface water, the sinking being through blue-gray cement.

This valley does not offer any great extent of land for irrigation, or any special advantages; still, I think, a well sunk near the north end of the valley might repay a boring, as I do not think the depth could exceed 200 feet.

MISSION FLAT.

Mission Flat, or that part of the valley lying between and to the north-west of Mission Creek, is well supplied with water from Mission Creek, which stream is rapidly changing its course. The north-west branch, which crosses the road near Mr. Brant's, is, or will soon be, the principal channel, as the branch which passes to the south of the Roman Catholic Mission is being blocked by fallen and float timber, thus forcing the water into the north-west branch. Quantities of good land are here uncultivated or in rye-grass, where, with a little expenditure for irrigation, good crops might be raised.

GENERAL FEATURES.

The whole of Mission Valley and branching valleys are surrounded by extensive undulating hills, in some cases rising to a great height, and holding in their undulations considerable lakes without visible outlet. Lower down, springs appear in places, forming running streams of but small extent. This, however, points to an underground supply; and should this supply be tapped by boring, an abundance of water will be obtained.

VERNON, OKANAGAN.

On leaving Mission Valley I returned to Vernon, and made a careful examination of the country surrounding that place as far as Pleasant Valley, and the valley of the Coldstream as far as the Nelson Ranch.

Water for domestic purposes is much needed in the town of Vernon, as all the wells at present sunk are strongly impregnated with alkali, carried down with the surface water.

On the high plateau above the town to the east, occupied by the farms of Mr. Price Ellison and the B. C. Express Company, &c., water is much needed, and can, from the formation of the ground, be obtained high enough to command a large area of land where irrigation is much needed. To the south-east of the town there is, between the foot of the Long Lake and the arm of Okanagan Lake, an extensive plateau of good land, but much too high to obtain water for irrigation by boring, as the water supply lying above consists of small springs and lakelets. In boring at this height, it is extremely unlikely that the water-bearing strata would be struck, from the proximity of Long Lake.

At the foot of this ridge, near the road from Vernon to Mission Valley, there is a strong spring issuing from the ground, which might be used for the town supply, as it consists of beautiful water and continues to run the year round.

Leaving Vernon, the road skirts the shore of Swan Lake until the divide at O'Keef's is reached. The valley of Swan Lake (or, more properly, Pleasant Valley) continues to run north, divided from the Slough Lake Creek (which carries the drainage of Otter Lake into the Okanagan Lake) by an undulating timbered ridge. In this valley are numbers of fine farms, where water, both for irrigation and stock, is much needed. The valley, to the east, is backed up by an extensive water-shed, the foot-hills holding numbers of small lakes. Water could be obtained here at a reasonable depth, varying from, I should say, 150 to 300 feet.

Turning to the west, there is a fine plateau of land lying between the road to Salmon River and that to Lansdowne. This land is of little value without water (although taken up and extensively improved). On this flat water might, I think, be obtained, as in the hills to the west of it are numerous lakes and swamps without much surface outlet. The mountains to the west and north form a vast water-shed, and in the depression (through which runs the Salmon River trail) there is no stream, and only some few blind lakes. It looks as if there was some underground channel by which the water is conveyed to some lower level, which could be reached by boring.

The swampy flat which connects the Okanagan Lake and Otter Lake and receives the drainage from Millstream, or Deep Creek (the stream being called by both names), continues to run north-east until near Lansdowne, where the creek turns to the west, then again to the north, running in a deep depression and having in the elbow, which it here makes, the fine farms of Mr. Schubert, &c., and known as Round Prairie.

ROUND PRAIRIE.

Water is much needed at this point, all water having to be hauled from Deep Creek. On Mr. Schubert's ranch the divining rod was tried, and in the hands of an expert showed that water would be obtained at a depth of about fifty feet. Mr. Schubert, with a faith which deserved to be rewarded, sunk (on the spot indicated by the diviner) a beautiful shaft to the depth of 125 feet, without any water being met with. A bore was then put down at the bottom of this shaft some 40 feet further, and when abandoned the depth of soil or stratified clay had not been reached. Another well was then started, near the road from Salmon River, and a shaft 120 feet sunk. This well is in a particularly good place, but no water was struck, and the sinking was abandoned, as the ventilation of a well of this depth was a great drawback to the speed of sinking. Should a site for a bore be wanted, this well is at your disposal,

and from the situation, a better site could not, in my opinion, be selected. This, together with the fact that 120 feet of boring would be avoided, would cheapen the cost of boring considerably.

SPALLUMCHEEN.

Spallumcheen Valley, including that part from Lansdowne to Enderby, was next examined. In the town of Lansdowne water is much wanted, as wells sunk to the first water-bearing strata soon become strongly impregnated with alkali from the surface. Water could be obtained at a depth varying from 200 to 350 feet.

Turning from the town of Lansdowne to the north, you enter the Spallumcheen Valley proper. On the east it is bounded by a high range of mountains running north. At their foot a wooded undulating bench falls gradually to a slough-like creek, called Bennett Creek. Rising from this creek is a flat bench from one-quarter to one mile in width. All the land on this bench is under cultivation, but for domestic and irrigation purposes there is no water. Wells have been sunk, but nearly always without striking water. The supply hauled from Bennett Creek is, in the summer months, neither plentiful nor good. The well on the Bennett & Lumby farm was some 65 feet deep, and at this depth the soil was found to be the same as that found a few feet from the surface.

To the west of this bench, and rising to a considerable height, are undulating ridges with some good land in their hollows; but from their height and the light sandy nature of the greater part of the soil, and the irregular contour of the land, irrigation, even if water could be obtained, would be difficult; and from the depth of Deep Creek Valley, it is extremely unlikely that water would be found here by boring.

The drainage of this upland is partly into Deep Creek and partly into Bennett Creek; so that, boring on the bench above Bennett Creek, water might be met with at a depth of 250 feet. This would hold good for almost the entire length of the valley, except that portion of it which widens out at the north end, near the ranches of Messrs. Fortune and Campbell, where the valley widens out and the creek keeps on the western side. The boring here would be much deeper—I should say, in the neighbourhood of 500 or 600 feet.

NICOLA VALLEY.

Nicola Valley, or that portion lying to the west and on the right bank of the Nicola River, contains some 1,400 acres of good land, but entirely without water for irrigation or domestic purposes. This flat of land is, in one unbroken bench, on the right bank, at an elevation of about 80 feet above the river. Above this bench, to the west, rise the main range of mountains, with undulating foot-hills rising to the upper plateau. On this plateau are numbers of swampy lakes, which give rise to Mill Creek, which flows into the Nicola River near the western end of the lake. At a point about one or one and a half miles above the junction of Mill Creek and Nicola River, a small stream enters Mill Creek from the north-west. Both these creeks, at the time of my visit (May 1st), were running bank full; but I was assured by Mr. Clapperton that in an average year, in July, the creeks do not carry much more than the already recorded number of inches of water. A scheme was on foot to bring water from Mill Creek on to the bench mentioned, by fluming and ditching. I went over the line of ditch (which had been surveyed) in company with Messrs. Clapperton and Dalley. The length of ditch would be some four or five miles, and the greater portion would have to be fluming, as the sides of the creek are steep and have not holding ground for a ditch, and the gravelly nature of the soil would require puddling in places. At the point where the ditch would leave the valley of the creek, it would come out on a side-hill of gravel on a rocky bottom, where the depth of soil nowhere exceeds six feet. This side-hill is cut up by numerous ravines, which during melting snow carry heavy streams. Each of these ravines would need to be flumed, or the ditch would be cut out every spring. I considered, in face of these drawbacks, that a ditch which would have to carry 300 inches of water would be much more costly than a trial boring, which would, on the easterly line of Corbett's ranch, be quite likely to strike water at a depth of less than 300 feet.

Further to the west, between the Coldwater River and the Nicola River, there is an extensive flat of good land where water could be obtained by boring, at no great depth—I should say under 100 feet.

CACHE CREEK.

Cache Creek was my next in order, and, leaving Ashcroft, I drove over to Cache Creek. Between Ashcroft and Cache Creek there is an extensive flat of land known as "Boston's" farm. A ditch was started some eight miles up the Bonaparte river, for the purpose of taking water from the river on to the flat, which must be some four hundred feet above the river. After an expenditure which must have been in the neighbourhood of ten thousand (10,000) dollars, the ditch proved a failure, from some mistake in the levelling, and was abandoned.

On this piece of land I am confident that water would be obtained near the eastern end of the valley. There is to the north an extensive range of rocky ridges rising in terraces, and several small lakes; and between this flat and the Thompson River there is a mountain forming a considerable water-shed into the valley in which "Boston's" farm lies.

The valley which branches from Cache Creek is almost a basin, being closed by a slightly rising ridge at its westerly end, and running parallel to the Thompson River is shut off from it by a high ridge of undulating hills, rising to a considerable height.

At the time of my visit (May 9th) Cache Creek was running bank full, as were all the ditches; but Mr. Semlin assures me that during the months of July and August water is much needed. The Harper ranch, at the easterly end of the valley, has to ditch water five miles, and in the light soil of the side-hills the loss is considerable.

A bore on the north-easterly foot-hill beyond this ranch would strike water at a reasonable depth, as near this ranch there is a strong spring, which forms quite a meadow and continues to run all summer. The occurrence of these springs all point to an underground supply which, if tapped at the proper place, will, I feel sure, yield an abundant supply of water.

Before closing this report, I must express my thanks to the farmers and others in the upper country for many acts of kindness received at their hands. Every one appears to be anxious to help the Government to solve this problem. Offers of assistance have been many, and should the boring prove successful the parties benefited have in every case offered to defray the entire cost of the work, if water was struck in sufficient quantities to be useful.

Subjoined, I enclose summary of report, naming district, depth approximately, and nature of soil to be bored through, &c.

I have, &c.,
(Signed) E. B. McKAY.

SUMMARY OF REPORT.

THOMPSON RIVER.

The right, or north, bank of the Thompson River, from Tranquille to the junction with the North Thompson, contains much the largest area in block of good land where water is entirely wanting. This flat is from one mile to one and a half miles wide and some five miles long. Boring on this flat would not, I think, exceed over four hundred feet (400). Its proximity to Kamloops and the C. P. R. would make it a good point for a trial boring.

SOUTH THOMPSON.

On the north bank of this river is much good land in extensive flats, ranging from eighty to six hundred acres in blocks, and entirely without water on the lower benches. The higher benches, or terrace flats, have small streams which are used for irrigation, but are not sufficient for both.

South bank of same river has also large areas of good land with, in some cases, water for irrigation, but mostly with but an indifferent supply.

The line of the C. P. R. passes along these flats, and material could be placed on the ground within a short distance of the work.

Grand Prairie.

Any boring undertaken here would not, in my opinion, raise the water to the surface, owing to the formation of this part of the country being gravel subsoil, the water of Salmon River passing away below and again issuing from the north-easterly end of the valley.

Mission Valley.

Mission Valley, Okanagan, contains a large area of land where irrigation cannot be carried out, owing to scarcity of water. The largest area in block where water would, I think, be obtained, is along the base of the Blue Mountain, in Township 26, Sections 22, 23, and 26, and in Sections 29 or 32, same township.

Vernon.

Boring here (except in the town) would be at a much greater elevation above the general water level of the country; but in Township 9, Sections 35, 3, 2, water would command a large area of high land.

Pleasant Valley.

In Township 7, Sections 34, 35, 2, 3, 10, 11, 14, 9, 16. The average depth in 2, 35, 11, 14 would be from 150 feet to 250 feet; in 9 and 16 from 400 to 500 feet; and in 34, 3, 4, say from 500 to 600 feet. Boring here would be in hard clay, and at a great depth boulders might be met with.

Round Prairie.

At Schubert's a well is already sunk to a depth of 125 feet and is in good order, and would reduce the cost of boring. Boring here would go to a depth of about 300 feet.

Lansdowne, Spallumcheen.

In the town of Lansdowne, or on the Bennett and Lumby ranch, a boring would test the whole of the valley from Lansdowne to Enderby, as the formation is much the same.

Nicola.

Nicola offers a large area of splendid land in block (about 1,200 acres) on a bench about 80 feet above the right bank of the river. Boring would be through clay, and boulder clay would be met with after 100 feet is reached; depth about 300 to 350 feet.

Cache Creek.

The area of land in Cache Creek valley is small, but when "Boston's" flat of about 300 acres is included it is considerable. At the eastern end of the valley, on Harper's ranch, would be a most likely point for a boring, and boring here would not exceed 159 to 200 feet.

Cost of Boring.

Boring in the average strata which I noted (and which is in places exposed to a great depth) would not cost more than from $2 to $2.50 per foot, and in places this, I feel sure, would be reduced.

Boring Tackle.

I may here draw your Honour's attention to the fact that you have in Victoria a good set of boring rods and all material for sinking wells of this description; also the tubing for lining same. With a small outlay for repairs and the purchase of one or more augurs of the most modern pattern, the outfit is complete.

E. B. McKay.

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