F. H. Clark

THE PICTOU COAL AND IRON CO.,

NOVA SCOTIA,

DOMINION OF CANADA.

REPORTS BY

DR. J. W. DAWSON, F.R.S.; G. M. DAWSON, ASSOCIATE OF THE SCHOOL OF MINES, LONDON; WALTER SHANLY, ESQ.; KENNETT BLACKWELL, ESQ., AND EDWIN GILPIN, ESQ., M.A., F.G.S., MINING ENGINEER.

TOGETHER WITH

ESTIMATES AND TABLES OF ANALYSES.

J. D. CRAWFORD & CO.
Brokers.

OFFICES PICTOU COAL & IRON CO.,
Hospital Street, Montreal.

Montreal:
PRINTED BY THE LOVELL PRINTING AND PUBLISHING COMPANY,
1875.

McGILL UNIVERSITY
ARCHIVES
ACC. NO. 1670
REF. 1

MAP

SHEWING POSITION OF PROPERTY & COMMUNICATIONS BY RAIL AND WATER OF THE

PICTOU COAL & IRON COMPANY

Scale of English Miles

0 10 20 30 40 50 60 70 80 90 100

Railways in operation ——————

Do proposed - - - - - - -

Pictou Coal & Iron Company's Property ■

Coal Mines contiguous to and in direct communication therewith ■

The Burland-Desbarats Lithographic Company.

PLAN SHOWING THE RELATIVE POSITIONS OF THE PICTOU COAL & IRON FIELDS, COLLIERIES & COAL RAILWAYS, ORE DEPOSITS & MINING AREAS COVERING THEM & LIMESTONE QUARRIES, SURVEYED LINE OF RAILWAY TO TAP IRON DEPOSITS OF THE EAST RIVER MARKED IN RED.

THE PICTOU COAL AND IRON CO.,

NOVA SCOTIA,

DOMINION OF CANADA.

REPORTS BY

DR. J. W. DAWSON, F.R.S.; G. M. DAWSON, ASSOCIATE OF THE SCHOOL OF MINES, LONDON; WALTER SHANLY, ESQ.; KENNETT BLACKWELL, ESQ., AND EDWIN GILPIN, ESQ., M.A., F.G.S., MINING ENGINEER.

TOGETHER WITH

ESTIMATES AND TABLES OF ANALYSES.

J. D. CRAWFORD & Co.
Brokers.

OFFICES PICTOU COAL & IRON CO.,
Hospital Street, Montreal.

Montreal:
PRINTED BY THE LOVELL PRINTING AND PUBLISHING COMPANY,
1875.

THE PICTOU

COAL AND IRON COMPANY,

NOVA SCOTIA,

DOMINION OF CANADA.

This Company is formed for the purpose of acquiring and developing certain deposits of iron ores in the County of Pictou, Nova Scotia, held under Mining Rights and Leases, from the Government of Nova Scotia, for a term of 21 years, renewable for three further periods of 20 years each, subject to a nominal royalty of 3 cents per ton, the whole embracing an area exceeding 20 square miles.

These ores are of great value from their quantity, variety, richness, accessibility, and proximity to large deposits of coal now being extensively worked. The coals of the Pictou Mines, as described in the Government Geological Reports, are peculiarly free from sulphur, and according to Mr. S. B. Coxon, F.G.S., F.R.G.S., manager of the Usworth Colliery, Durham, and Director of the Albion Coal Mining Co., Nova Scotia, among other eminent authorities, coke equal to the best North Durham coke has been made from them.

The Nova Scotia Government Railway from Halifax to Pictou Harbour crosses the property, and connects with the railway system of Canada and the United States. The Harbour of Pictou, where Atlantic steamers take in coal, is 24 miles distant, and Halifax Harbour, open all the year, is 89 miles distant by rail.

The Iron and Coal Fields of Pictou are described in the Reports to Government by Sir William Logan, F.R.S., F.G.S., Alfred Selwyn, F.R.S., F.G.S., Directors of the Geological Survey of Canada.

They had been previously described and have been more recently visited and reported on for this Company, by Dr. J. W. Dawson, F.R.S., F.G.S., Principal of the University, Montreal, and by Mr. G. M. Dawson, Associate of the Royal School of Mines, London, Walter Shanly, Esq., and Edwin Gilpin Esq., M.A., F.G.S., member of the Newcastle Institute of Mining Engineers.

These reports (except Mr. Gilpin's) have been submitted to David Forbes, Esq., F.R.S., Member of the Council of the Institute of Civil Engineers, who states that this Property possesses all the elements of success.

The Iron Ore deposits, which Dr. Dawson states to be the most valuable at present known on the Eastern coast of North America, consist of—

1. Spathic iron ore, containing 42 per cent. of metallic iron, in a bed 6 to 10 feet in thickness.

2. Red Hematite, 10 to 30 feet in thickness, containing 50 per cent. of metallic iron.

3. Specular iron ore, 10 to 20 feet thick, containing 60 to 68 per cent. of metallic iron.

4. Brown Hematite, 15 to 25 feet thick, giving 62 to 65 per cent. of metallic iron.

Careful and complete assays have been made by Dr. Stevenson MacAdam, F.R.S.E., Professor of Chemistry, Edinburgh, and by Dr. T. E. Thorpe, F.R.S.E., Professor of Chemistry, and Public Analyst for the City of Glasgow. Other Analyses are to be found in the Government of Canada Official Reports.

The supply of these ores, which are remarkably *free from Sulphur and phosphorus* is practically inexhaustible. Dr. Dawson estimates the quantity of ore to be won at a depth of 200 feet only, which can scarcely be called mining, to be not less than nine millions of tons.

The quantity already *proved* is estimated at two millions of tons, or sufficient to supply three furnaces for thirty years, reckoning the requirements of each furnace at 700,000 tons of ore. These estimates are corroborated by Mr. Shanly.

The ores crop out on the surface, and are in most instances from 200 to 400 feet *above drainage level*, thus saving the cost of artificial drainage; and admitting of their being won by open-cast workings. Mr. G. M. Dawson estimates the cost of raising the ore

at 80 cents to 1 dollar, or 4*s*. per ton. Mr. Forbes considers half this cost sufficient.

The price of coal in Pictou is $2 to $2.50 per ton of 2,240 lbs. Small coal for coking is $1 to $1.50 per ton. Many of the coal seams make an excellent hard coke, which can be supplied in any quantity.

Wood for purposes of construction, and for charcoal-making, is abundant and cheap. Limestone is abundant in the vicinity, and is quarried and sold for 40 cts. per ton. Excellent fire-bricks have been manufactured in the neighbourhood.

The County of Pictou, being one of the most populous in Nova Scotia, and already the seat of considerable mining industries, presents great facilities for obtaining skilled labour, machinery, and supplies; labour ranges from 4*s* to 6*s* per diem.

There is a large and growing market in Canada for iron of all descriptions, there being many Railways in course of construction, and to be built, including the Pacific Railway through British Territory, for which the Parliament of Canada have voted large land grants, and thirty millions of dollars. The total value of the exports of pig iron and manufactured iron from ports of the United Kingdom to Canada during 1872 amounted to over $11,000,000. For 1873 to over $8,000,000. There is also a large importation of iron and rails from the United States.

The high character of Nova Scotia iron is well known in England, and is thus described by Sir Wm. Fairbairn in his "History of Iron:"—"In Nova Scotia some of the richest ores yet discovered, occur in exhaustless abundance. The iron manufactured from them is of the very best quality, and is equal to the finest Swedish metal. Several specimens have been submitted to direct experiment, and the results prove its high powers of resistance to strain, durability, and the adaptation to all those processes by which the finest descriptions of iron and steel are manufactured."

From the richness of the ores of Nova Scotia, and the abundance and cheapness of fuel, coal, coke and charcoal, it is confidently asserted that the highest class of iron can be manufactured for less than the cost of ordinary English pig iron.

The cost of producing Bessemer pig iron in Nova Scotia, for which some of the Pictou ores are suitable, will not exceed $15 per ton. In this estimate an allowance of 50 per cent. over actual cost is made for contingencies. From the great variety of the ores, Bessemer as well as ordinary Foundry pig can be made at Pictou.

Estimated cost of making a ton of pig iron in Pictou:

2 Tons of Ore, at $1 per ton	$2 00
30 Cwts of Coke	4 00
10 Cwts of Limestone	0 50
Labour	1 25
Wear and Tear and interest	1 00
General Management and other charges	1 25
	$10 00
To which add 50 per cent. for contingencies	5 00
	$15 00

Present price in Canada, $30.

Leaving a good margin of profit in the most distant Canadian markets.

It is intended to erect two blast furnaces, fitted for an output of 400 to 500 tons each per week, which, with all appurtenances complete, may be estimated to cost $75,000 each; and it will be seen from the costs and prices as detailed above, that a very moderate profit will yield a large return on the capital required.

The output of two Furnaces should not be less, at a fair estimate, than 40,000 tons per annum. Taking as a basis the average price of iron for the last five years, this would give a large return on capital required.

During the construction of the works it is proposed to raise the ores, which, from their richness, will admit of shipment to England and the neighbouring States of America, where there is a large demand for such ores, for admixture.

Copies of the Memorandum and Articles of Association and original Reports, may be seen at the Offices of the Company, where also specimens of the ores, coals, coke, lime-stone and fire-clays may be inspected.

We have submitted the estimates of cost of furnaces and cost of making pig iron to practical smelters and furnace managers with whom we are personally acquainted, and in whose judgment and experience we have confidence, and by them we are assured that more than an ample margin has been allowed for all contingencies.

J. D. CRAWFORD & CO.,
Brokers.

Offices of the Pictou Coal and Iron Company.
Hospital street, Montreal, 31*st Dec.*, 1874.

MEMORANDUM

ON

IRON ORES IN THE COUNTY OF PICTOU, NOVA SCOTIA,

BY J. W. DAWSON, LL.D., F.R.S.,

Principal of the University, Montreal.

THESE Ores, from their variety, richness, accessibility, and proximity to large deposits of coal already extensively worked, are in my opinion the most valuable at present known on the Eastern Coast of North America. They were examined and in part described by me as early as 1855, and I have since revisited the localities on several occasions, and have kept myself informed as to the new discoveries which have been made.

The areas referred to in this Memorandum, amounting to about 20 square miles, are believed to include the whole or nearly the whole of the more important Pictou County deposits, as follows:—

1.—SPATHIC ORE.

This is a bed of crystalline *Spathic iron* or Siderite, occurring in the Lower Carboniferous series, near Sutherland's River in the County of Pictou. As described by Mr. G. M. Dawson, who prosecuted works of exploration in it last year, it is a conformable bed, occurring in the Lower Carboniferous red sandstones, and varying from 6 feet 6 inches to 10 feet 6 inches in thickness. It is accompanied with smaller bands of the same mineral, and is associated with limestone and gypsum. This ore is a true Spathic Iron, granular and crystalline in texture, and, when unweathered, of a light grey colour. It affords from 42 to 43 per cent. of iron, and contains from 2 to 8 per cent. of manganese. This bed is only 4 miles distant from the "Vale" colliery.

(See annexed reports by Messrs. G. M. Dawson, Walter Shanly, K. Blackwell, and E. Gilpin, also Tables of Analyses.)

2.—RED HEMATITE.

This ore-bed where most largely developed attains a thickness of about 30 feet, and in places where it has been opened up by exploratory works, it has been found to afford from 10 to 30 feet

in thickness of good ore. The ore is a red hematite, sometimes compact and laminated, but more frequently of an oolitic character, occasioned by the arrangement of the peroxide of iron in minute concretions enveloping grains of sand. It crops out on several anticlinal lines traversing the property, and along these different lines of outcrop the bed has been traced for several miles, and, being of a hard and resisting character, it rises into some of the higher elevations of the country. Though not one of the richest ores of the district, its great quantity and accessibility render it highly important for practical purposes. The analyses made of it show a per-centage of metal varying from 43 to 54 per cent. The foreign matter is principally Silica, and the proportions of Phosphorus and Sulphur are small—one of the specimens analyzed affording none whatever, another .22 Phosphoric Acid and .29 Sulphur.

(See annexed reports and Tables of Analyses.)

3.—SPECULAR IRON.

This deposit is a vein of rich Specular Iron Ore associated with Magnetic Iron, and running through slates and quartz rock. It is of great extent and value, and will afford a quality of Ore adapted for making the best kinds of wrought iron and steel. The vein in some parts of its course attains to a thickness of 20 ft., and has now been proved for more than a mile. Average samples taken from the thickest part of the vein yielded on an analysis 64 to 68 per cent. of metallic iron.

(See annexed reports and Tables of Analyses.)

4.—BROWN HEMATITE, OR LIMONITE.

This is a thick vein of Crystalline Brown Hematite or Limonite occurring at the Junction of the Carboniferous and Silurian Rocks. The ore is capable of affording 59 per cent. of metallic iron, and is free from all injurious impurities. It extends through the areas covered by one of the mining rights for about three-quarters of a mile, and appears to extend over a second area on which it has not yet been opened. As is usually the case with veins of this mineral, its thickness is variable; but, in two places where it has been opened, it has shown a thickness ranging from fifteen to twenty-five feet.

Another deposit of Limonite, apparently of great magnitude, occurs on a mining area secured on the West Branch of the East River, near the Provincial Railway.

(See annexed reports and Tables of Analyses.)

McGILL COLLEGE, MONTREAL, May, 1873.

REPORT

ON

EXPLORATIONS OF THE IRON ORE DEPOSITS OF PICTOU COUNTY,

NOVA SCOTIA.

By Mr. G. M. Dawson, *Associate of the Royal School of Mines, Jermyn Street, London.*

The following Statements relate to exploratory works conducted in October last on the iron deposits of Pictou County. The object of these explorations was more fully to open up the deposits and to ascertain their precise extent and value. I shall confine myself in the main to results of these examinations, referring for other facts to previous reports on the properties.

Spathic Iron Ore, near Sutherland's River, Merigomish. This very pure ore occurs as a bed in Lower Carboniferous rocks. The surface of the country is very deeply and uniformly covered by drift material, and explorations on the area have been attended with considerable difficulty, it having been necessary to sink and cross cut in the enclosing rocks. The ore is very well exposed in the bank of a brook. At this point, and near the level of the brook, a shaft 14 ft. deep has been made, and the ore proven to that depth, and its general character more clearly defined. It is evidently somewhat nodular in structure, being softer and harder in some places, and its junction with the overlying and underlying rocks having an undulating character.

At the brook level the bed has a thickness of 10 ft. 6 in. At the bottom of the shaft this has decreased to 6 ft. 6 in., and it is probable that the ore, as followed, will continue thinning and thickening alternately.

The dip of the ore and surrounding rocks is about S. 25 E., at an angle of 60°, and underlying the main bed of ore about 4 ft. was a small ore bed 6 in. in thickness. A small shaft was sunk both East and W st of t e brook exposure, and at distances from it of 941 and 215 ft. respectively. The measures have been cross-cut several feet North and South in each, but as yet without discovering the ore bed. Small strings and layers of carbonate of

iron contained in reddish clayey sandstone were passed through in both places, showing that the bed was not far off; and in the North level from the West shaft, when we were obliged to suspend operations, the prospect seemed very good.

This ore is a very pure crystalline carbonate of iron. Surface specimens are of a rusty colour, but in depth and where it is unacted on by the weather, it has a pearly-grey appearance. It would yield a very superior quality of iron, and will be specially valuable for mixture with the more silicious ores from others of the areas.

Red Hematite.—This deposit is situated on area 101, and has, by its outcrop and surface masses of ore, been traced completely across the area in a general direction nearly East and West. The ore occurs as a bed in greyish and black slates, and on the whole dips Northward, generally at a high angle. The Western end of the outcrop, being on high ground and easy of access, was chosen as the part of the bed where information concerning its general character and thickness could be most easily obtained. In the course of the operations, about a mile of the outcrop has been well defined by trenching, and openings in the substance of the ore itself, from which a considerable quantity of ore has been blasted out, and now lies in heaps at the surface.

In the furthest East trench made on the outcrop of the ore bed (marked A in Plan), it is nearly vertical, and shows 22 ft. of ore, the greater part of which is of excellent quality, and almost free from intercalated layers of slate. At a distance of 594 ft. Westward from this trench, an opening of some size, and going down about 10 ft. on the ore, has been made (section I). The dip of the bed is here N. 29° E. at an angle of 58°. The upper layer of ore is 4 ft. 4 in. thick, and rests upon a second layer 3 ft. in thickness. Below this is a parting of slate 2 ft. 11 in., and underlying this a third bench of very good ore 3 ft. 3 in. thick. There is thus altogether, and deducting the slate parting, 10 ft. 7 in. of ore. At 198 ft. West of this opening is a trench completely crossing the outcrop, and showing a section of the bed, measuring on the surface and including some small slate partings 27 ft. across. The dip is here N. 15° E. at an angle of 62°. Near this trench the outcrop changes its course, and bends sharply off to the North, passes round the nose of an anticlinal, returns nearly South, and then resumes its old East-West course. Both sides of this anticlinal have been explored, and the appearance of the ore is here specially good, both as regards its quality and thickness. In the opening

on the East side (section II., and marked in Plan), in which the ore bed was followed down about 15 ft. on the dip, the lowest bench of ore is of very excellent quality and 6 ft. in thickness. Above this lies 3 ft. 10 in. of slate and slatey ore. Then 3 ft. of ore. Next a bench of 2 ft. 6 in. of ore, and above this three contiguous layers of ore, each about a foot thick. The slate roof was not actually reached, as the rock fell away rapidly under the drift material. The total thickness proven amounted to 14 ft. 6 in.

On the West side of the anticlinal a considerable length of outcrop has been bared of trees and soil, and shows ore of good quality and great surface breadth (about 30 ft.) though the dip, not being distinctly shown, the precise thickness remained undetermined.

At the exposure (marked D in Plan) the ore has resumed its old course, and runs nearly East and West. It is nearly vertical, and about 15 ft. in width.

In the woods to the West of this last opening numerous fragments of ore occur in the line of the outcrop of the bed, as indicated by the general strike of the slates. At the Western end of these indications a trench has been made and the ore exposed, though in the place chosen the bed is considerably fractured by small faults.

The ore itself is a very compact, somewhat silicious, Red Hematite. As the ground slopes rapidly away to the South, drainage of any workings upon it will be easy. The ore might first be extracted, by open cast, on the outcrop, and a vast quantity would in this way be easily obtainable. The ore, though hard under the drill, yields easily to powder, and might, I believe, at the present value of labour, be extracted at from 80c. to $1 per ton.

It will be observed that the ore has a general tendency to improve in proceeding Eastward, and in this direction is shown to exist quite across area 101 by exposures of outcrop and surface masses, as indicated in the General Plan attached to previous reports.

Specular Iron Ore.—This ore occurs on the square mile marked 100 on the Government Plan. The country rock is a blackish slate with occasional beds of quartzite, and it is with one of the latter beds that the ore is most closely associated. The strata are in general undulating, and in places somewhat contorted, but preserve a pretty uniform Southerly dip at an angle of from 60° to 70°.

The ore deposit occurs as a true lode but following very nearly

the strike of the containing rocks, and, so far as our explorations have gone, appearing to be as nearly as possible vertical. It has been exposed by trenching and proved by small shafts from the Eastern boundary of the area Westward for a considerable distance, though as yet not quite across to the Western line. Of its extension across the entire area, however, there can be no doubt from the indications, and the ore is known to occur on some of the other areas both East and West of this, though its value has not yet been proven by actual exposure of its thickness and quality.

At the Eastern boundary of area 100 the outcrop of the lode is exhibited in a trench (marked A in Plan) and shows a thickness of 12 ft. of ore, though with some thin leaves of intercalated slate. A short distance West of this is another costening trench in which the lode is shown to have a thickness of 5 ft. 6 in. of good and pure ore.

About 900 feet Westward from this a shaft 18 ft. deep has been sunk on the crop of the lode. At a short distance from the surface a horse of hard quartzite rock, more or less impregnated with ore, encroached on the Southern side, but at the bottom this was passed through and the ore found passing under and cutting it out. The lode was cross-cut at a depth of 13 ft. and the thickness found to be 10 ft., including, however, about a foot of slate. At the bottom of the shaft the lode was widening. From this shaft alone about 40 tons of good ore were extracted. In connection with the quartzite horse and wall a small quantity of iron pyrites was found in association with the ore.

From this shaft 1086 ft. Westward on the course of the lode a second opening (marked C on Plan) was made and carried down to a depth of about 13 ft. At this place the true lode was missed, and quartzite and hard slate impregnated with ore continued to the bottom. By subsequent trenching (marked D) the lode was discovered to lie about 30 ft. South of the shaft, and it there exhibited a very favourable appearance, and showed 20 ft., of good and very pure ore. The southern wall was not found, as the rock dipped away fast, and the water was troublesome.

This deposit of Specular and Micaceous iron ore is situated like the Red Hematite on high ground, and the course of the lode is cut across in several places by deep brook valleys, which, though encumbered by drift and presenting no good exposures of the deposit at present, will offer great advantages by allowing free drainage to a very considerable depth.

Limonite or Brown Hematite.—This valuable ore is situated

on the North side of the East River, about 2 miles above Springville, and covered by the area marked 5 on the Government Plan.

The deposit is indicated by a great quantity of surface masses of ore, some of them of considerable size; and these indications extend in a nearly North and South direction for a considerable distance on the North side of the river. Explorations on this deposit have been unavoidably detained to the last, but a few days' work has given a much better knowledge of its character and extent. The lode itself has been exposed in a small brook, and appears to run in a direction nearly at right angles to the general line of the indications. It would, therefore, appear probable that its course will be found to change considerably, or that it has been shifted by small faults. The lode where exposed shows a thickness of about 15 ft. of solid ore, or nearly double that ascertained by the first opening in which measurements spoken of in previous reports were taken. One side of the ore is bounded by a wall of solid slate, while at the other side the cheek of the solid ore is followed down by a deposit of concretionary ore 2 ft. 8 in. in width and thickening downward. The South wall of the concretionary ore, or "ore gravel," is formed of very stiff red and white clay, apparently formed from slate rock decomposed in place. The "ore gravel" was excavated from between the solid ore and the clay to a depth of 8 ft., and for several feet in length; and the South cheek of the solid ore, thus exposed, was found to be almost precisely vertical. (See section 4).

The indications, in the form of boulders, which induced search in this brook, are small compared with those that exist on other parts of the property, on which we have as yet been unable to do any work. At one place a great quantity of very large masses of ore, some of them weighing several tons, are to be seen partly exposed; and ore masses, of greater or less size, extend quite across the area.

At a place (marked C in Plan) a large show of surface fragments attracted attention; and pits and costeaning proved the persistence of fragments to 25 and 30 ft. in depth in the alluvial matter. At this place the ore contained a considerable quantity of crystalline black oxide of manganese in admixture with it.

The various ores above described are in the neighbourhood of the great coal deposits of Pictou County, and are therefore very favourably situated for the manufacture of iron on a large scale. The Specular Ore, Hematite and Limonite are all in the vicinity of the East River, and so situated that they might be connected by

branches with a single railway following the course of the river valley. The valley is admirably suited for such a railway, being flat, and in great part consisting of "intervale" land. The proposed railway would strike the Government railway near Hopewell, at the forks of the East River, and here it might be best to erect furnaces.

Broad gauge colliery railways have cost in this vicinity from $15,000 to $20,000 per mile, but should it be decided to erect furnaces at the Forks, and there to meet the coal brought by the provincial railway, a narrow gauge road would be quite suitable for the transport of the iron ores, and could be completed for a very much smaller sum.

Limestone of good quality and in great abundance exists in the valley of the East River, and quarries could be opened in immediate proximity to the railway. In a quarry just above Springville, 15 ft. of very pure limestone is worked. Another bed not worked, but said to be 6 ft., underlies this, and still lower in the series is an immense bed of blackish limestone, said to yield a very strong lime.

Any railway passing down the valley of the river would have to pass over the out-crop of those beds. The limestone at present worked is quarried free for 40 cents per ton.

The coal of Pictou County has been shown by numerous analyses to be very free from sulphur, and is adapted for the manufacture of good hard coke. There are at present four coal mines in active operation, and others preparing for work. The price has now for some time remained at $2 (8*s.*) per ton delivered on board ship at the various loading grounds.

In connection with the coal beds are fire clays, and should a demand for fire bricks arise, in all probability some of these will prove well suited for their manufacture. Fire bricks formerly manufactured from a clay in the neighbourhood of New Glasgow were considered to be of excellent quality.

Labour at present commands from $1 to $1.50 (4*s.* to 6*s.*) per diem.

GEORGE M. DAWSON.

McGill College, Montreal,
Nov. 18, 1872.

TO THE PROPRIETORS OF

THE PICTOU IRON DEPOSITS, NOVA SCOTIA.

REPORT OF WALTER SHANLY, ESQ., C.E.

NEW GLASGOW, N.S.,
12*th May*, 1873.

I have made a full and careful examination of the several veins or deposits of iron-ore specified in the reports of Principal Dawson, F.R.S., and of Mr. G. M. Dawson.

The exposition and calculable quantity of the several beds described in the Reports are in no respect over-stated.

SPATHIC ORE.—The Spathic ore, openings on which have been made on a small brook tributary to Sutherland's River, and about 8½ miles due East of New Glasgow, is a very remarkable deposit, and will be of great value for mixing with the other ores embraced in the Pictou "areas," more particularly the Red Hematite. Since Mr. Dawson's Report was made, another pit has been sunk some distance to the Eastward of the bed specially referred to by him, and proving the extension of the vein in that direction. The exposure of ore at both places is in the highest degree satisfactory and encouraging. Apart from the lime held in the matrix of this ore, pure limestone will, in all probability, be obtained in considerable quantities from the workings of the mine, as it seems to exist in bands or intrusive masses along with the ore. The selected area here is about one mile square, not encumbered by royalty or rent.

RED HEMATITE.—The Red Hematite ore, as exposed by natural and artificial openings on the "Webster farm," situated on the height of land between McLellan's Brook and Sutherland's River, makes a very fine exhibit. The quantity of this ore even within the secured area (about one square mile), is almost illimitable. Dr. MacAdam, of Edinburgh, calls it a "high class ore," a character fully borne out by external indications. It is a great ore bed, with excellent facilities for being worked to a depth, if necessary, of 300 feet with adit drainage.

LIMONITE.—The Brown Hematite, or "Limonite" Ore-bed has been proved on the "Fraser Saddler Farm," in the valley of the East River, six miles in a direct line S. 45° W. from the Red Hematite at Webster's. The principal opening made here by Mr. G. M. Dawson uncovers a vein of 17 ft. in width, "of the very best quality of the class" (Dr. MacAdam). It makes a most promising "show," and requires only to be carefully followed, it is my belief, to establish the existence of a vast and continuous deposit of this most valuable ore. The bed is on the East side of East River, and, for facilities of access, drainage and shipment, is the most favourably circumstanced of all the several deposits which are the subject of this letter.

SPECULAR ORE.—The area (one mile square) on which openings to prove the Specular ore vein have been made, lies on the West side of East River some 450 ft. above the level of the valley. Three openings at distances of 900 ft. and 1,086 ft. apart respectively, have been sunk upon the bed, showing a vein of 10·12 and 20 ft. in width. It is beautiful ore, "a very fine, rich, specular ore," as pronounced by Dr. MacAdam. The existence of a continuous vein, angling across the area, is undoubted; the quantity of ore practically inexhaustible.

(Since this was written explorations during the summer of 1874 have been continued under Mr. E. Gilpin, M.A., F.G.S., Mining Engineer, who has also made a survey of the proposed tramway to connect the coal and iron deposits. These explorations have proved still further the extensive character of the iron deposits, and also the existence of a highly magnetic ore adjoining the principal Specular deposit, but not yet proved to any extent.)

ACCESSIBILITY.—With the exception of the Spathic, all the ore beds here treated of lie in the water-shed of the East River. The Red Hematite and Specular outcrops at high elevations above the valley, but to be reached by rail or tramways without extraordinary difficulty or expense. The length of main line to be constructed to bring the Red Hematite (the furthest-off deposit) to the Pictou and Halifax Railway will be from twelve to fifteen miles; the other "East River deposits" being served by short spurs or branches from the main track. The Spathic bed is on the water-shed of the Sutherland River (falling into Merigomish Bay). It will require a separate and distinct railway from that in the East Valley, but it seems probable that the line contemplated (and

already surveyed) by the proprietors of the MacBean coal areas can, by mutual arrangement, be made to subserve the transport of the ore for one-half the distance between the mine and the Pictou and Halifax line, near New Glasgow. However this may eventually be determined, the Spathic is an ore which, at the worst, can bear a good deal of extraordinary handling and carriage.

Surveys.—I would recommend that a surveying party be organised and put into the field early in the summer, as well to ascertain the most feasible line for the railways to the several ore beds as for determining the salient topographical features of each of the already selected areas. Some skill and experience will be needed in the selection of the most fitting route for what may be termed the "main line" from the point of junction with the Halifax and Pictou line to the Red Hematite beds. A survey should also be made in connection with the Spathic deposit. (Since this was written the Vale Colliery Railway has been completed to within two miles of this deposit, and the survey recommended by Mr. Shanly satisfactorily completed by Mr. Gilpin.)

Exploration.—The four already chosen "locations"—aggregating about four square miles—are but isolated spots in your wide extent of territory. The developments made on those areas are certainly of most promising character, but there can be no good reason for concluding that equally rich deposits or veins have not still to be discovered *somewhere* within the twenty square miles of territory still to be explored. Strong indications of a vein of Limonite exist on area 105 near by where the junction of the Iron Mines Railway with the Halifax and Pictou line is likely to be.

Furnaces.—I would not yet venture an opinion on the selection of a site for the Smelting Furnaces. It is a matter to be very carefully considered, and should be submitted to the judgment of some one of large experience in the bringing together of coal and ores.

Limestone.—Limestone of fine quality is abundant in the valley of the East River; it is easily worked, and lies conveniently near to where the main line of railway will have to run. As already observed with regard to the Spathic deposit, limestone will probably there be found in juxtaposition with the ore.

In conclusion—It would be hard to find in any part of the world so rich and varied an assortment of iron-ore in such con-

venient association with one another and with coal. Other conditions, such as facilities for getting out the ore and advantages of shipment by sea and rail, are also highly favourable. "The whole, or nearly the whole, of the Pictou deposits," says Dr. Dawson, "are included in this property," and I cannot see any reason to doubt but that New Glasgow is destined to become the centre of a vast iron-making district, as it already is of the coal-mining industry of Nova Scotia.

Mr. Kennet Blackwell accompanied me in my examination of the property and has rendered efficient assistance. His knowledge of the Londonderry Mines (which I have not seen) enables him to make a comparison between the ore beds there and those in the Pictou areas, and generally as to the other features of the two properties. I enclose his notes on the result of our joint exploration, and which have been drawn up wholly independently of my own remarks.

I am,

Yours faithfully,

W. SHANLY.

NOTES AND MEMORANDA ON PICTOU IRON DEPOSITS made by Mr. Kennet Blackwell while assisting Mr. Walter Shanly in his examination of the above property, the examination being made with the chief object in view of confirming and verifying the information contained in the reports of Principal Dawson, F.R.S., and Mr. G. M. Dawson on the same.

The question of the quantity of the ore need only be briefly alluded to. The openings on the several deposits show the ores to be of a very uniform character and composition, and the samples taken therefrom have given the most satisfactory results in the analysis made, entitling them to the highest rank in the class of ore to which they belong.

As regards the quantity of ore on the property, it would be impossible even to approximate a limit to the probable yield of the various deposits until further and more extensive explorations have been made, although the natural exposures and indications, as well as the openings already made, do now most certainly warrant the expectation of a yield to a certain amount, the extent of which may readily be assumed from the following :—

SPATHIC ORE.—This is the first deposit referred to by the Messrs. Dawson in their reports; the position, character and dimensions of the bed was found to be exactly as they describe it, and since the

continuance of the bed has been satisfactorily proved, by a second shaft which has been sunk on it to the Eastward of the first shaft on the opposite side of the brook, both at this point as well as in the shaft that Mr. Dawson caused to be sunk. A thick streak of Limestone was found to exist in the middle of the bed of Spathic; this fact, of course, by no means decreases the value of the ore. From an inspection of the shaft and the small tunnel therefrom it could easily be seen that the bed is well-defined, although somewhat irregular in width, and could be easily worked as the material yields readily to blasting, and is not of a very hard texture throughout; portions of it, however, are of a very gritty texture. This ore will, no doubt, prove a most valuable feature of this property.

Hematite, Red.— This the next deposit referred to by Mr. Dawson after having made thorough examination along the entire line of the "out-crop" of this vein, and visited all the openings made on the same; the general character and dimensions as described in the report were found to be perfectly correct. This "selected" area embraced the Eastern slope as well as the flat ground on the summit; the vein is here so well defined and proved in its general character and size that an approximate estimate may readily be arrived at of the probable amount of ore contained in that portion of the vein that lies above the level of the bottom of the valleys on either side of McLellan's Mountain. After taking the fact into consideration that this vein re-appears both East and West of this area at elevations considerably lower than the summit on area "101," and that the vein at these points is of a far greater width than it is on the summit, it will then be quite reasonable to take the average width of the vein on the higher ground as a basis for a calculation; such a calculation would show as much ore as would yield one million and a-half tons of metallic iron. The most advantageous way of working this vein would be to drive a "level" in along the course of the vein from a point as low down as possible on the Eastern slope of the mountain, while at the same time a very large quantity of ore might be quarried from along the entire line of the out-crop of the vein on the higher ground.

Specular Ore.—The evidence revealed by the openings made by Mr. Dawson, and marked "A" "B" "C" "D" on his supplementary plan of this vein, reveal a well-defined and regular vein for a distance of about 2,100 feet varying from 6 to 30 feet in width, having a southerly dip at an angle of about 65°. The

first opening, marked "A" on plan, has been made at the extreme East of the selected area, and the surface indications exist between the last opening made, marked "C" on plan, and the extreme Western boundary of the area, thus proving beyond a doubt that the vein traverses the entire length of the selected area. The direction of the line of this vein extends along an oval-shaped hill nearly parallel to its major axis, the highest point of the vein being about 440 ft. above the level of the bed of the East River; these facts would, therefore, probably render it necessary, in opening out the vein, to do so by sinking a shaft on the summit directly on the vein; the ores might then be conveyed from the summit to the valley of the East River by means of a shoot.

Limonite.—The openings made by Mr. Dawson to show the existence of this deposit, as well as the natural indications spoken of by him in his report, were visited and carefully examined. The only point where Mr. Dawson has actually exposed a vein of this ore was in the bed of a brook on the "Fraser Saddler" lot in the area "No. 5;" here the vein was found to be 17 ft. in width and of unusual compactness and uniformity. It would appear that Mr. Dawson was of opinion that a vein of this exists in a line crossing the base of the selected area running nearly parallel to the East River; but the more recent finding of some ore gravel on the same area to the North-west of this first opening, together with the general position of the drift in this vicinity, would indicate that there were several "finger" like veins running at right angles to the course of the East River. The fact of this theory being proved would, of course, considerably increase the value of area "No. 5;" this, however, is a question that can only be proved by more extensive explorations. The samples of Limonite that I have seen from this locality compare very favourably with the best ores from the great Londonderry Brown Hematite vein, while at the same time the circumstances and peculiarities under which they both occur are very similar; this leads me to a comparison between the relative important features of the two properties, and I am of opinion that the subject might be pursued to he advantage of the Pictou district. In the first place it must be admitted that in the aggregate amount of ore already proven on the two properties Londonderry has the advantage; but Londonderry, on the other hand, does not possess any other class of ore in sufficient quantities than the Brown Hematite; there is there most certainly a great superabundance of this class of ore, while

Pictou will undoubtedly have abundance of this class of ore, and at the same time a great abundance of Red Hematite and Specular, as well as the bed of Spathic. As regards the proximity of the two properties to the coal, and the facilities for shipment of the manufactured article, Pictou has again immense advantages over the other. Until the Spring Hill coal areas are more fully developed, and a communication established between that and Londonderry, coal would have to be taken from Pictou to the works at Londonderry (a distance of 62 miles), while, on the other hand, the Pictou ores would simply have to be hauled about 10 miles, on an average, to the smelting furnaces, which would, of course, be situated as near as possible to the coal pits.

With Pictou, the shipping point by sea would be Pictou Harbour available to the largest ship afloat, while Londonderry would have to look to Great Village as a shipping point; this place is situated at the entrance of a small tidal river to the Cobequid Branch of the Bay of Fundy; the navigation up to the entrance of this river is bad, and the river can only be entered at high tide by vessels drawing not more than 12 ft. of water.

KENNETT BLACKWEL.

New Glasgow,
May 11th, 1873.

EXTRACTS FROM A MEMORANDUM

FURNISHED TO

MR. POOLE, GOVERNMENT INSPECTOR OF MINES, NOVA SCOTIA,

BY

MR. EDWIN GILPIN, MINING ENGINEER,

Being a summary of exploratory work done and new deposits discovered in the summer of 1874.

MINING AREA NO. 5.

Limonite.—The Great Limonite vein has been traced along the East bank of the East River across this area. Trial pits have been sunk at several places, and the width of the vein proved to vary from 8 to 17 feet. The pits sunk this summer have been substantially barred so that further work can be done in them. The vein of Red Hematite subsequently found on this area has been opened by a cross-cut. The width of the vein at the South extremity was 14 inches; it gradually increases to the North, preserving in the Silurian slates a course roughly parallel to the Limonite. Work has been commenced at a spot where from surface indications it would appear to have largely increased, but unfavourable weather prevented the work from being carried far enough to furnish data as to its size at that point.

MINING AREA NO. 13.

Limonite.—The surface coverin gis unusually deep at this place. After a good deal of prospecting the point of junction of the Silurian and Carboniferous systems, considered the seat of the Limonite, was limited to a width of about 50 yards. At this point operations were closed for the year.

MINING AREA NO. 12.

Hematite.—A bed of Red Hematite has been traced obliquely across this area. Beginning at the centre of the North West line with a width of 6 feet 9 inches it extends nearly to the centre of the area and then turns toward the North East line, where it is exposed on the property of J. H. Kennedy, where its width is 3 feet 6 inches. Another overlying ferriferous band 12 feet wide was proved in three places. Apparently underlying these two

beds was another with 8 feet of Red Hematite. The relation of this bed to those already mentioned was not clearly ascertained.

MINING AREA NO. 6.

Specular.—The vein already proved on the Eastern side of this area was examined in two places by pits sunk about 30 feet. The pidth of the vein varying, as proved by last year's work, from 6 to 20 feet. The ore was found to improve in quality to the dip. A set of levels have been run and a suitable place marked for beginning a tunnel, which would give a vertical lift of about 200 feet of vein rock.

On the West side of the property a new metallic vein possessing magnetic and polar properties was discovered and traced a short distance, its width did not exceed 2 feet where uncovered. It was accompanied by much decomposed Carbonate of Iron.

MINING AREA NO. 22.

Specular ore.—A deposit of Specular ore, of the same variety as that already known as the Weaver ore was discovered. There was also a second deposit of the same variety uncovered on this area; they appear to be separate, but explorations were not extended enough to settle this. The width of the first deposit appeared to be about 20 feet, the second was not proved to any extent.

PROSPECTING AREA NO. 102.

Hematite.—A careful search for the selection of mining rights was made on this area. A five foot vein of Red Hematite was traced over a considerable part of the right, and cross-cut in several places; it appeared of good uniform quality. Its general course was North and South, and followed the bank of the brook, emptying into the East River at the Upper Settlements.

MINING AREA NO. 21.

Hematite.—What appeared to be the continuation of the last mentioned bed was traced into this area, but no openings were made.

MINING AREA NO. 7.

Indications of the continuation of the Blanchard Hematite ore bed were found, and the crop of a 4 feet 6 inches vein of Red Hematite proved near its North East corner, also pursuing the N°. 10 E. course of the Blanchard ore. A right to work will be taken out to cover the Northerly extension of these deposits near the foot of Lake Murdoch.

Slight excavations were made in the bed of ore known as *the Webster* (mining areas 18 and 8). The discovery at the depth of a few feet of a 10 inch seam of the same ore of very superior quality leads to the expectation that the deposit will improve away from the surface.

SUTHERLAND RIVER AREA.

Spathic ore.—An opening was made in this deposit and about 60 tons of ore extracted, it was found to maintain its uniform quality.

Several areas have been surveyed and lines run to establish the relative positions of the various areas to the East River.

RAILWAY SURVEY.

A preliminary survey for a Railway to connect the East River Areas with the Intercolonial Railway below Hopewell has been made during the fall. A feasible route has been found following the West bank of the East Branch. A branch line of $2\frac{1}{2}$ miles, starting from Bridgeville, connects the Specular areas with the main (proposed) line near the Limonite on area No. 5. A line of ten and a half miles will reach the three varieties of ore.

The above is a summary of the work done and deposits discovered by me during the season of 1874 in the Springville iron deposits.

EDWIN GILPIN,
Engineer in charge,
Halifax, Nova Scotia.

H. S. POOLE, ESQ.,
Government Inspector Mines,
Nova Scotia.

DECEMBER 12th, 1874.

TABLES OF ANALYSES OF PICTOU IRON ORES,

By Dr. STEVENSON MACADAM.

(*See also pages* 44 *and* 45 *Geological Survey of Canada*, 1874, *for Corroborative Analyses.*)

Analytical Laboratory,

Surgeons' Hall,

Edinburgh, 14th December, 1872.

ANALYSIS OF HEMATITE ORE,

Received in enclosed box, signed on the lid "J. W. Dawson."

* Oxides of Iron	75·67
Oxide of Manganese	0·52
Alumina	0·45
Carbonate of Lime	2·44
Carbonate of Magnesia	0·98
Phosphoric Acid	0·22
Sulphur	0·29
Titanic Acid	trace.
Silica	19·43
	100·00

* Equal to Metallic Iron, 54·36.

An excellent red iron ore, containing fully 75 per cent. of the oxides of iron, principally the red oxide, and capable of yielding 54⅓ per cent. of metallic iron.

ANALYSIS OF SPATHIC ORE.

* Iron, Carbonate	88·48
Manganese, Carbonate	1·85
Lime, Carbonate	2·34
Magnesia, Carbonate	5·82
Silica	1·51
	100·00

* Capable of yielding Metallic Iron, 42·71.

This is a Spathic Carbonate or Sparry iron ore, being

very rich in Carbonate of iron; with a good proportion of carbonate of manganese, and practically free from impurities. It is of the best quality of the class.

ANALYSIS OF SPECULAR ORE.

* Oxide of Iron	92·01
Oxide of Manganese	2·16
Alumina	0·21
Carbonate of Lime	1·27
Carbonate of Magnesia	0·43
Phosphoric Acid	0·08
Sulphur	0·16
Titanic Acid	trace.
Silica	3·68
	100·00

* Equal to Metallic Iron, 64·41.

This is a very fine and rich Specular iron ore. It is of the best quality and will undoubtedly yield the finest iron.

ANALYSIS OF LIMONITE ORE.

* Oxide of Iron	88·92
Oxide of Manganese	0·78
Alumina	0·71
Carbonate of Lime	1·44
Carbonate of Magnesia	0·82
Phosphoric Acid	0·34
Sulphur	0·24
Titanic Acid	trace.
Silica	2·14
Moisture	4·61
	100·00

* Equal to Metallic Iron, 62·24.

A Crystalline Hematite, containing (88·92) 89 per cent. of red oxide of iron, which is equal to 62¼ per cent. of metallic iron. There is nearly five per cent. of combined water in this sample, so that the actual proportions of oxide of iron and metal-

lic iron in the dry ore are 1-20th higher than those given in the analysis. A high class ore.

(Signed,) STEVENSON MACADAM, Ph.D., F.R.S.E., F.C.S.,
Lecturer in Chemistry.

ANALYSES BY DR. T. E. THORPE.

Andersonian University, Glasgow,
December 20th, 1872.

ANALYSIS OF THE RED HEMATITE ORE.

Metallic Iron	43·4
Oxides of Iron	65·26*
Oxide of Manganese	traces.
Sulphur	none.
Phosphorus	none.
Alumina	5·59
Lime	1·88
Magnesia	1·05
Silica	23·68
Loss on ignition	2·54
	100·00

* Containing 9·20 per cent. Protoxide.

ANALYSIS OF SPATHIC IRON ORE.

Carbonate of Iron	88·59
Carbonate of Manganese	2.85
Carbonate of Lime	1·53
Sulphate of Lime	0·55
Carbonate of Magnesium	3·48
Insoluble matter	2·70
	99·70

Metallic iron = 42·76 per cent.

This ore bears great similarity to the Durham Spathic Carbonate; it contains no phosphorus, and but a small quantity of Sulphur, as sulphate of lime, and is suitable for making the finest quality of steel.

ANALYSIS OF THE SPECULAR ORE.

Protoxide of Iron	0·89
Peroxide of Iron	96·63
Sulphide of Iron	0·06
Phosphorus	none.
Silica and Insoluble Matter	3·20
	100·78

Per-centage of Metallic Iron = 68·33.

This is an exceedingly rich ore, consisting almost entirely of pure oxide of iron. It is capable of yielding iron of the finest quality.

ANALYSIS OF THE LIMONITE ORE.

Peroxide of Iron	93·09
Manganese Oxide	1·10
Ferrous Sulphide	0·04
Phosphorus	none.
Lime	0·91
Insoluble Matter	4·80
	99·94

This is one of the finest Iron ores. It yields 65·2 per cent. of metal. It should afford iron of great purity.

(Signed,) T. E. THORPE, F.R.S.E.,

Professor of Chemistry.

ANALYSIS OF LIMESTONE, made at Newcastle, England, by order of S. B. Coxon, Esq., F.G.S., one of the proprietors

of the Albion Coal Mine, Nova Scotia.

Carbonate of Lime	93.90	96.26
" " Magnesia	2.45	2.33
Peroxide Iron	.59	.57
" Manganese	.56	.55
Alumina	.12	,10
Sulphur	.03	,02
Phosphoric Acid	.03	.03
Silica	2.10	1.99
Moisture	,18	.17

For analysis of the different coals of the Pictou Coal Field, see the Government Geological Survey Reports, *passim.*

ANALYSES OF FOUR SAMPLES OF PICTOU IRON ORE,

made at the Works of Messrs. Vickers, Sons & Co., Sheffield, by request of Mr. E. L. S. Benzon, of the firm of Naylor, Benzon & Co.

No. 1—LIMONITE ORE.

Peroxide of Iron	= 81·19 per cent	= 56·83 Pure Iron.
Moisture	= 13·60 "	"
Lime	= ·63 "	"
Oxide of Manganese	= ·20 "	"
Phosphoric Acid	= ·15 "	"
Sulphur	Traces.	
Insoluble Residue	= 4.26 "	"

No. 2—SPATHIC IRON ORE.

Carbonate of Iron	= 82·11 per cent.	= 39·64 Pure Iron.
" " Manganese	= 4·70 "	"
" " Lime	= 2·37 "	"
" " Magnesia	= 9·06 "	"
Sulphur	= ·10 "	"
Phosphorus	None.	
Insoluble Residue	= 1·69 "	"

No. 3—HEMATITE ORE.

Pure Iron	= 45·47 per cent.
Manganese	None.
Lime	= 3·03 " "
Sulphur	None.
Phosphoric Acid	= ·20 " "
Insoluble Residue	= 25·82 " "

Analysis Incomplete.

No. 4—SPECULAR IRON ORE.

Pure Iron	= 61·06 per cent.
Phosphorus	None.
Sulphur	Traces.

Analysis Incomplete.

J. H. HUXLEY,
School of Mines,
London.

Nova Scotia
Leases