

# PLUMBAGO

## The North Elmsley Graphite Mine

Graphite is not a rare mineral, but its appearance in deposits sufficiently large and concentrated to make extraction economically feasible is exceptionally rare. Nevertheless, such a deposit was discovered in 1870, about seven kilometers (four miles) southeast of Perth, on North Elmsley Township C-6/Lot-21 & 22, near the intersection of Rideau Ferry Road and what is now County Road #18. Two years later, the first recorded graphite mine in Ontario was in operation.<sup>1</sup>

That deposit of plumbago or 'black lead', as graphite was then commonly known, was first identified by Dr. James Wilson (1798-1881). Wilson was a graduate of Edinburgh University Medical School and practiced medicine at Perth from 1821 to 1869. Although he had no formal training in geology, he was also Canada's most knowledgeable and best-known amateur mineralogist and geologist of his day and made many significant contributions to the Geological Survey of Canada. In addition to being the first to find graphite in the Perth area, he was first to identify the semi-precious mineral 'Wilsonite' (a bluish opalescent variety of Albite), 'Perthite' (an intergrowth of two feldspars), and the fossil of a slug from the Cambrian period, 'Climactichnites Wilsoni' (one of the first creatures to exit the ocean and 'walk' on land).<sup>2</sup> Wilson's work also contributed to the development of phosphate mines that operated in North Burgess Township from the 1850s into the 1920s.

The North Elmsley Township graphite deposit was first exploited in 1872 by the International Mining Company of New York. Dug from open pits, the ore was hauled by horse-drawn wagons to a mill the company built at Oliver's (Rideau) Ferry.



*A buddle for washing ore*  
(Courtesy of mindat.org)



*Ten stamp mill battery mill*  
(Courtesy of Central Nevada Museum)

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<sup>1</sup> The first graphite mine in Canada was the Miller (Keystone) mine at Grenville, Quebec, first worked in about 1845.

<sup>2</sup> Dr. Wilson's mineral collection may be seen at the Perth Matheson House Museum.

The 60'X160' two-storey timber structure housed a 20-ton, ten-stamp, battery mill operated by a five horse-power steam engine. Ore crushed in the stamp mill was concentrated first by washing in buddles and finally in a settling tank. The concentrated graphite was then roasted in a reverberatory furnace and classified into four grades on revolving screens. Graphite failing to pass through a 60 mesh sieve was further polished and purified by treatment in tumblers. The refining mill employed nearly 50 people and at full operation processed three to four tons of ore per day. The finished product was shipped to market via the Rideau Canal. In its later life the mill crushed ore from both the North Elmsley Township pit and from deposits in Bastard Township, on the south side of Big Rideau Lake in Leeds County.<sup>3</sup>

The North Elmsley mine and the Oliver's Ferry mill closed down in 1875 and remained inactive for 27 years.

In 1892 Montreal mining engineer J. Fraser Torrance (1852-1908)<sup>4</sup> of the Northern Graphite Company took out an option on the North Elmsley pit. He sunk drill holes that showed the existence of graphite to the depth of 50 to 100 feet, but no actual mining was undertaken, and he dropped the option in 1897.

In 1901 the mine and mill were purchased by Dr. Robert Allan Pyne (1853-1931)<sup>5</sup>. Pyne conducted further test drilling but, like Torrance, did not resume production. He sold the holding to Rinaldo Walter McConnell (1851-1931) in 1902<sup>6</sup> but, although McConnell briefly resumed mining and milling, operations ceased again in 1904 when McConnell took out a lease on the more productive Black Donald graphite mine near Calabogie.



**Rinaldo McConnell c1899**  
(Courtesy of Rita Quilty)

Then, in 1906, McConnell formed the Globe Refining Company with Rannell Sawyer, Thomas Gauthier, and Dr. Smilie/Smylie, all of Montreal, and James E. H. Barnet (1870-1915) of Renfrew to exploit the North Elmsley mine. The mill at Oliver's Ferry was closed down and replaced by purchasing and repurposing a former woolen mill at Port Elmsley. The three-storey stone structure was located close to the Canadian Pacific Railway line and came with 200 horsepower of Tay River waterpower. Nearly \$100,000 in new crushing and processing equipment was installed.

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<sup>3</sup> Later developed as the Cornell Mine.

<sup>4</sup> Torrance graduated from McGill University in 1873 with a B.A. in Mining and Assaying. He was a member of the Canadian Society of Civil Engineers and the American Institute of Mining Engineers. He published several papers including *Plumbago and Some of Its Uses* (1892).

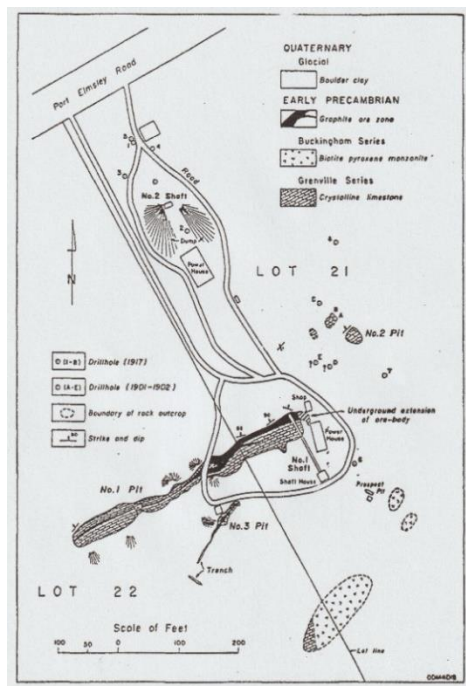
<sup>5</sup> Dr. Robert Allan Pyne, a Toronto physician, was also Clerk of York County, Governor of the University of Toronto, MPP for Toronto East and Toronto Northeast 1898-1918, Minister of Education 1905-1918, secretary-treasurer of the Ontario College of Physicians and Surgeons, and during WW1 served as Lieutenant Colonel in charge of the Ontario Military Hospital at Orpington, Kent, England.

<sup>6</sup> As a prospector and mine developer McConnell had his hand in many of the Sudbury and Copper Cliff mining ventures that later became the International Nickel Company of Canada (INCO) - the Lavack, Dennison, Whistle, and McConnell mines and others. According to a 1950 INCO newsletter, Rinaldo McConnell "*blazed across the mining frontier like a meteor. A man of tremendous energy, a reckless plunger, and a lavish spender where large sums were concerned, he was one of the most vivid personalities of the old prospecting days*".

For the next six years, through 1912, the mill turned out as much as two tons of refined graphite per day, selling its entire production to buyers in the United States. Its product was “*said to be as good as any in the world, fully equaling the famous graphite of Austria and Ceylon*”<sup>7</sup>.

Production ceased yet again in 1912, but in 1915 McConnell reorganized the operation under the name ‘Globe Graphite Refining and Milling Co.’ and in August 1916 sold the enterprise for \$150,000 to an American syndicate led by President Charles A. Lux<sup>8</sup>, Secretary-Treasurer George G. Fryer<sup>9</sup>, and General Manager George H. Beebe<sup>10</sup>, all of Syracuse, New York. Daily operations were placed under the direction of Superintendent George Nathan Brewer (1876-1958), of Buckingham, Quebec, who had “*unlimited experience in the mining and refining of graphite ... a designer of several new machines on the market for refining graphite*”.<sup>11</sup> Brewer, a mining engineer, seems to have previously been associated with the Bell and New Quebec graphite mines at Buckingham.<sup>12</sup>

Under its new owners, who again re-named the company as the ‘Globe Graphite Mining and Refining Company’, the plant underwent extensive upgrades, replacing old machinery with \$23,000 worth of new of gear, and, by 1917, employed 25 men.



**Geological Survey of Canada Map - 1917**

Before 1917 the mine consisted of three surface pits or quarries and a single shaft. The main pit was about 400 feet long, ranging from 10 to 30 feet in width. At one end of that pit, the original shaft had been sunk to follow the ore to greater depth. From the surface it sloped down at 60 degrees, but steepened to vertical with depth, extending to a vertical depth of 170 feet (or 250 feet measured on the incline of the shaft). There were four lateral levels at 100, 150, 200 and 250 feet. The first three levels extended about 200 feet from the shaft in both directions along the seam of the orebody, while the fourth ran only in an easterly direction.

The new owners added a second shaft, located about 400 feet north of the main pit. It was sunk to a depth of 106 feet with drifts of about 40 feet running to the north at the 50-foot and 100-foot levels.

Other improvements made at the mine included installation of a new power plant.

<sup>7</sup> Perth Courier, April 17, 1906.

<sup>8</sup> Lux was a key player in the establishment of the Rochester, Syracuse & Eastern Railroad in 1909.

<sup>9</sup> Fryer was an engineer at the Solway Process Company of Syracuse, NY, producing sodium carbonate (soda ash) from limestone and salt brine.

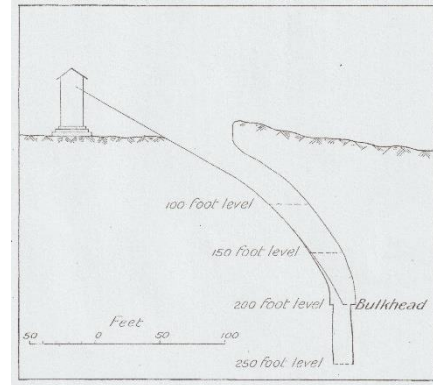
<sup>10</sup> Probably associated with the ‘Beebe Syndicate’ that controlled 28 individual companies, including the Rochester, Syracuse & Eastern Railroad.

<sup>11</sup> Perth Courier, November 24, 1916.

<sup>12</sup> Between 1906 and 1912 the Bell Mine there produced 6,700 tons of graphite and between 1912 and 1920 the New Quebec Mine produced 2,500 tons of graphite.

Improvement and enlargement of the mine increased daily ore production from about 50 tons to nearly 100 tons. At peak production about 40 miners worked two shifts, day-and-night. A dozen horse teams hauled ore from mine to mill, augmented by a Ford truck purchased from James & Reid at Perth in September 1916.

Ore arrived at the mill in large chunks, where it was subjected to the dry refining process<sup>13</sup>. This consisted of first heating the ore in the roast kiln before it was put through heavy, coarse crushers, breaking it into pieces about an inch square. It was then sent through three sets of heavy rollers, reducing it to about 1/3 of an inch, and finally reduced further by fine grinding rollers. That output was then 'dusted' by an air system, after which all the remaining large pieces were removed by a scalper. The finer 'sands' and graphite powder were then separated on 'jig tables'. The graphite passed through a final process of graders and dusters and, having been completely refined, went through polishing rollers making it ready for sale by the pound.



Geological Survey of Canada - 1917

In profiling the Globe Graphite Mining and Refining Company operation in North Elmsley Township in 1906, the *Perth Courier* explained that,

*The uses of this graphite, after it has been refined, are many and various, but it is by far most commonly and widely known as a component of that misnomer – the ever familiar 'lead' pencil. Yet, out of the world's total consumption in the year 1903, when certain graphite statistics were compiled, it was estimated that out of 75,000 tons of graphite, no more than 4% was consumed in the manufacture of lead pencils.*

*Refractory articles such as crucibles, stoppers, nozzles, etc., accounted for 35% of the consumption, stove polish for 30%, and lubricating graphite and greases 16%. Foundry facings, graphite packing and graphite paint, consumed 14% of the product ...*

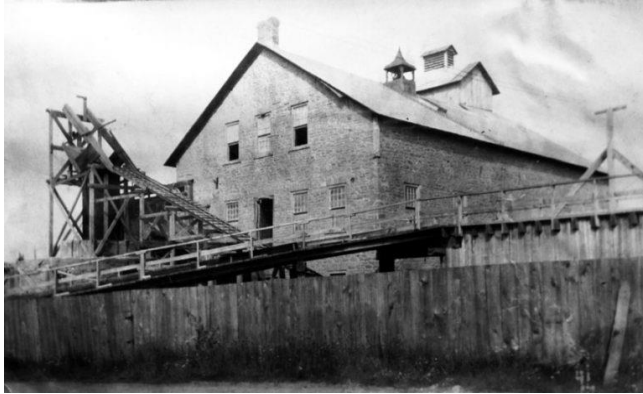
At the turn of the 20<sup>th</sup> century graphite also found use in electrotyping,<sup>14</sup> lubricant-boot polish, and carbon paper.

*New lines of use are also constantly being found for graphite. Although known by the ancients, and even used by them as a paint for pottery, the common use of graphite may be rated as modern, although its general use as a 'lead' pencil dates from the discovery at the Borrowdale mines at Cumberland, England, in about the year 1550.<sup>15</sup>*

<sup>13</sup> From 1902 graphite mills shifted from the 'wet' method of processing ore (as used at the Oliver's Ferry mill), which required crushing, screening, and washing to produce flakes, to the 'dry' method (used at the Port Elmsley mill), which crushed and dried the ore prior to putting it through millstones for processing. This development improved processing efficiency.

<sup>14</sup> A method for producing plates for letterpress printing developed in the late 1800s.

<sup>15</sup> *Perth Courier*, November 24, 1916.



**Graphite Mill, Port Elmsley, c1917**  
(Courtesy of Perth Remembered)

In addition to improvement and expansion of the mine and mill, the company brought other changes. In the village of Port Elmsley, an out-of-business hotel was renovated and re-opened as a boarding house, while another boarding house was built at the mine site. Horse stables were built at both locations and, during his tenure, mine manager Rinaldo McConnell built himself a new house on Mill Street, on the south side of the village.

Graphite production in North Elmsley Township ended in 1919, however, never to be resumed. Between 1930 and 1936, the mill property and its machinery were sold by the Township to cover back-taxes.<sup>16</sup>

From 1895 the North Elmsley operation had found itself in competition with another Ontario producer, the Black Donald Mine, on Whitefish Lake in Brougham Township, Renfrew County, about 13 miles (21 Km) west of Calabogie<sup>17</sup>. Operated by the Ontario Graphite Company until 1908 and then by the Black Donald Graphite Company, from the outset the mine produced in excess of 100 tons of refined graphite annually. More importantly it did so from ore that was as much as 65% pure while the North Elmsley Township ore yielded only 8% to 17% refined product.

Another local graphite deposit was discovered in 1917 in North Burgess Township, southwest of Black Lake (C-5/L-24 & 25). A mine and experimental on-site mill were opened by Noah Timmins (1867-1936)<sup>18</sup>, and worked 1918-1923, but the operation did not prove economically viable.

A large graphite deposit was also discovered in 1934, six kilometers northeast of Portland in Bastard & Burgess Township, Leeds & Grenville County. Although the reserve is estimated at 295,000 tons, to a depth of 20 metres, at about 6% graphite, several attempts to establish an operating mine and refinery have come to naught.

In recent years, however, demand for graphite has exploded. It is used in refractory products (heat resistant bricks and mortar), foundries, crucibles, lubricants, brake linings, pencils, steel alloys, oil-drilling mud, plastics, and as a moderator in gas-cooled nuclear reactors. Moreover, demand continues to expand exponentially for use in the manufacture of batteries and fuel cells for electric vehicles and batteries for everything from smartphones to 3D printers. Graphite is the largest mineral component of a battery pack by volume. The World Bank has forecast that graphite demand would increase by 500% between 2018 and 2050.

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<sup>16</sup> In Canada, property owners own only surface rights while the mineral rights are held by the Province and leased for time-limited periods (3-10 years) to companies wishing to exploit a deposit who file a 'claim'. Thus, the mine could not be sold by the Township.

<sup>17</sup> The high-grade graphite seam had been discovered in 1889 but financing for a mine was not secured until 1895. By the mid-1920s the Black Donald output represented 90% of Canada's total graphite production. With some minor shutdowns it remained in production for over a half-century until a cave-in and flooding ended its operation in 1950.

<sup>18</sup> Noah Timmins, for whom Timmins, Ontario, is named, a founder of the Canadian Mining and Finance Company Ltd. that evolved into Hollinger Mines Inc., made his fortune in silver at Cobalt and gold at Timmins

The Tesla Motors' lithium-ion battery 'gigafactory' at Sparks, Nevada, launched in 2017, is estimated to require up to 95,000 tonnes of flake graphite per year. There are currently no producing graphite mines in the United States and only two in Canada.<sup>19</sup> Canada's annual production of about 8,500 tons stands tenth in world production far behind China (820,000 tons), Brazil (68,000 tons), Mozambique (30,000 tons), Russia (27,000 tons), Madagascar (22,000 tons), Ukraine (17,000 tons), Norway (13,000 tons), North Korea (8,700 tons).<sup>20</sup>

Since the mid 20<sup>th</sup> century, several companies have conducted exploratory work at the North Elmsley mine site, including geological mapping, geophysical surveys, and diamond drilling. In 1999 an Ontario Ministry of Northern Development and Mines report estimated that the North Elmsley Township deposit still holds 500,000 tons in ore reserves, grading about 7% graphite, lying below the mined-out portion of the deposit to a depth of 90 meters (295 feet). As demand for graphite grows, a resumption of mining in North Elmsley Township remains a distinct possibility.<sup>21</sup>

- *Ron W. Shaw (2022)*

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<sup>19</sup> In British Columbia and Quebec.

<sup>20</sup> 2021 world production data.

<sup>21</sup> Large reserves also remain at the site of the Timmins Mine in North Burgess Township.