Discovery hole W90-1 intersected 128 feet of zinc-rich massive sulfides followed by a second hole, drilled 150 feet to the north of the first hole, which intersected 375 feet of massive sulfide.

On June 19, 1990, Noranda publicly announced the discovery of the Lynne deposit. Noranda reported reserves of 5.61 million tons grading 9.27% Zn, 0.47% Cu, 1.71% Pb, 2.38 opt Ag and 0.021 opt Au, recoverable by open pit methods.

In 1990, Noranda flew a more detailed airborne E.M. survey over the Lynne deposit and surrounding region to define additional targets. No other discoveries were made although the results of the E.M. survey suggested that the exploration potential was favorable.

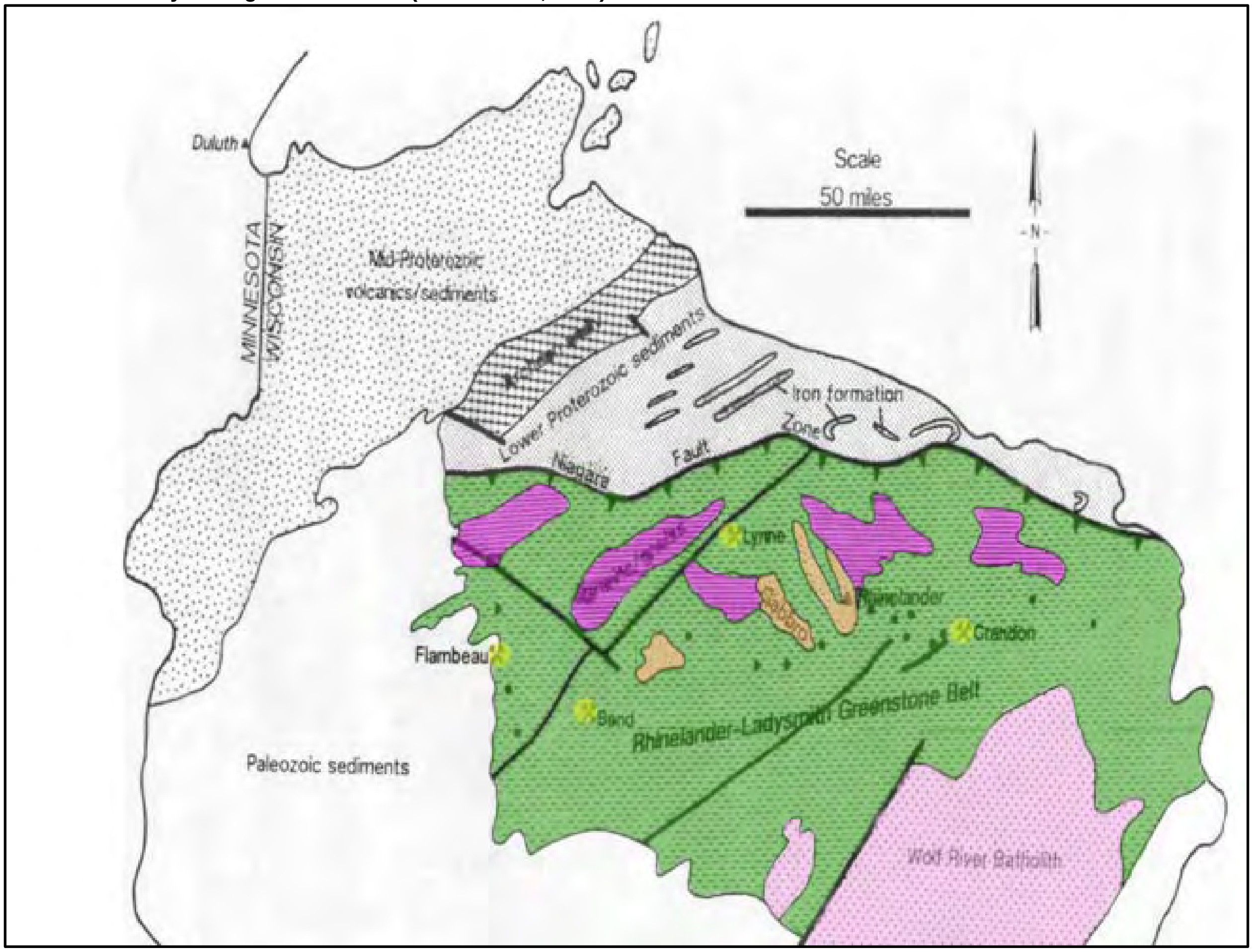
In January, 1992, Noranda filed a Notice of Intent To Collect Data and a Proposed Scope of Study with the Wisconsin DNR as the initial step in the Wisconsin mine permitting process. The deposit is overlain by an area of wetlands that would be disturbed by mining. On October 23, 1993, Noranda suspended all permitting activity, citing uncertainties surrounding DNR wetlands and lake-bed designation issues and low metal prices. All surface disturbances related to the exploration and initial permitting processes were reclaimed as of January, 1996.

4.0 Geology

4.1 Regional Geology

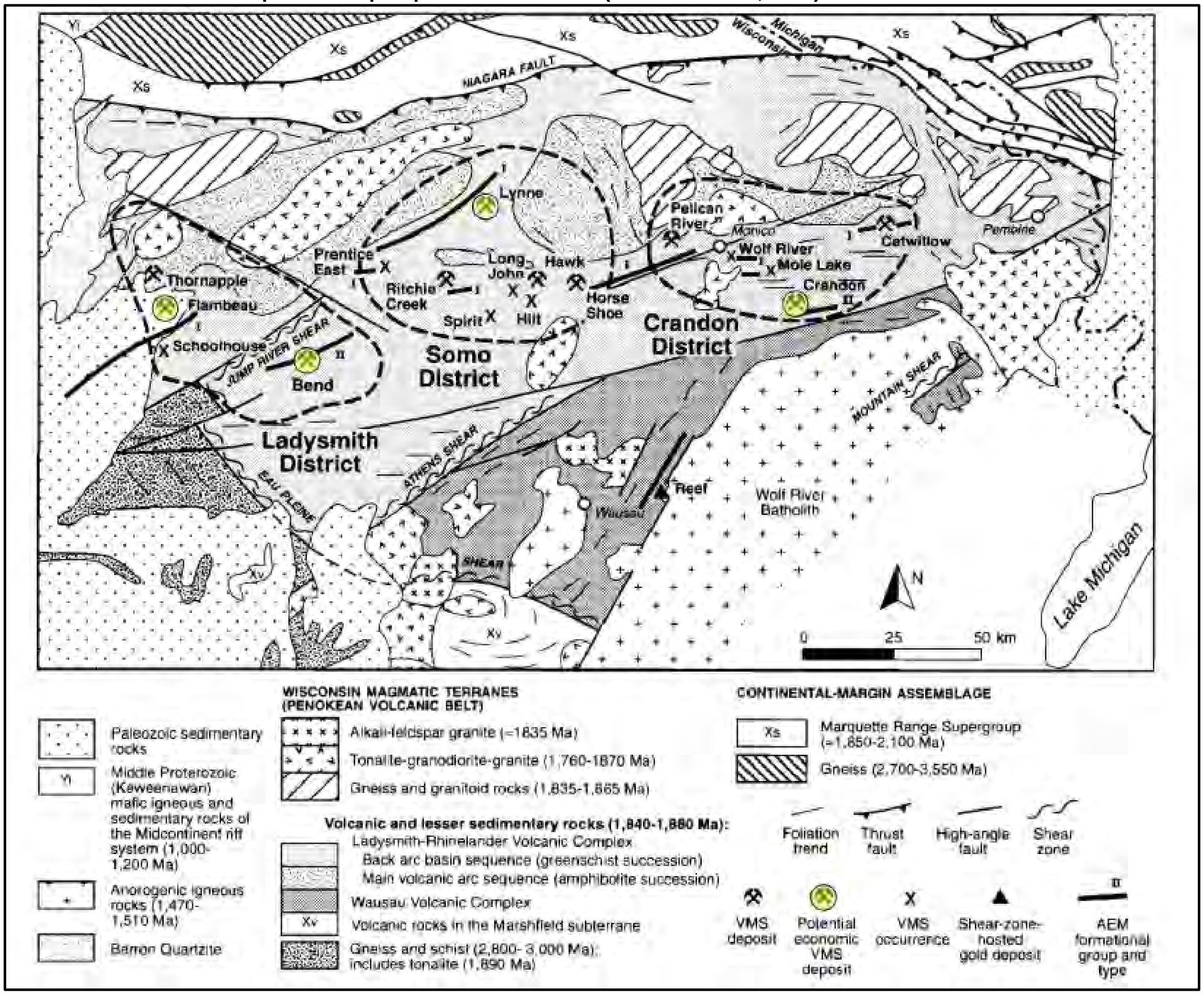
The Lynne deposit is located in the central part of the Rhinelander-Ladysmith greenstone belt, a belt of Proterozoic, volcanic and sedimentary rocks within the Southern Province of the Canadian Shield (Figure 4.1.1). The Rhinelander-Ladysmith greenstone belt is an informal designation for the northern part of the Pembine-Wausau terrane of Sims et al (1989). It is approximately 50 miles wide and extends roughly 150 miles in an east-west direction across northern Wisconsin and the central Upper Peninsula of Michigan. Rocks within the belt range in age from 1,860 Ma to 1,889 Ma (Sims et al, 1989), and have been affected by the Penokean Orogeny, resulting in locally intense folding, major faulting, thermal metamorphism and granitic plutonism. Widespread Pleistocene glacial deposits mantle much of the greenstone terrane resulting in minimal outcrop exposure. On the west the greenstone belt is overlain by Late Proterozoic quartzite and Paleozoic sandstones, while on the east there is an on lap of Early Paleozoic sandstone and carbonate rocks.

Figure 4.1.1
Rhinelander-Ladysmith greenstone Belt (from Adams, 1996)



Mineral exploration over the past 30+ years, dominated by airborne geophysical surveys, has identified over two dozen significant base-metal massive sulfide occurrences scattered throughout the Rhinelander-Ladysmith greenstone belt (Figure 4.1.2). The Flambeau mine, currently mined out, and three other potentially economic occurrences, the Crandon, Bend and Lynne deposits, all occur within the Rhinelander-Ladysmith greenstone belt.

Figure 4.1.2
Location of known VMS deposits and prospects in Wisconsin (from DeMatties, 1994)

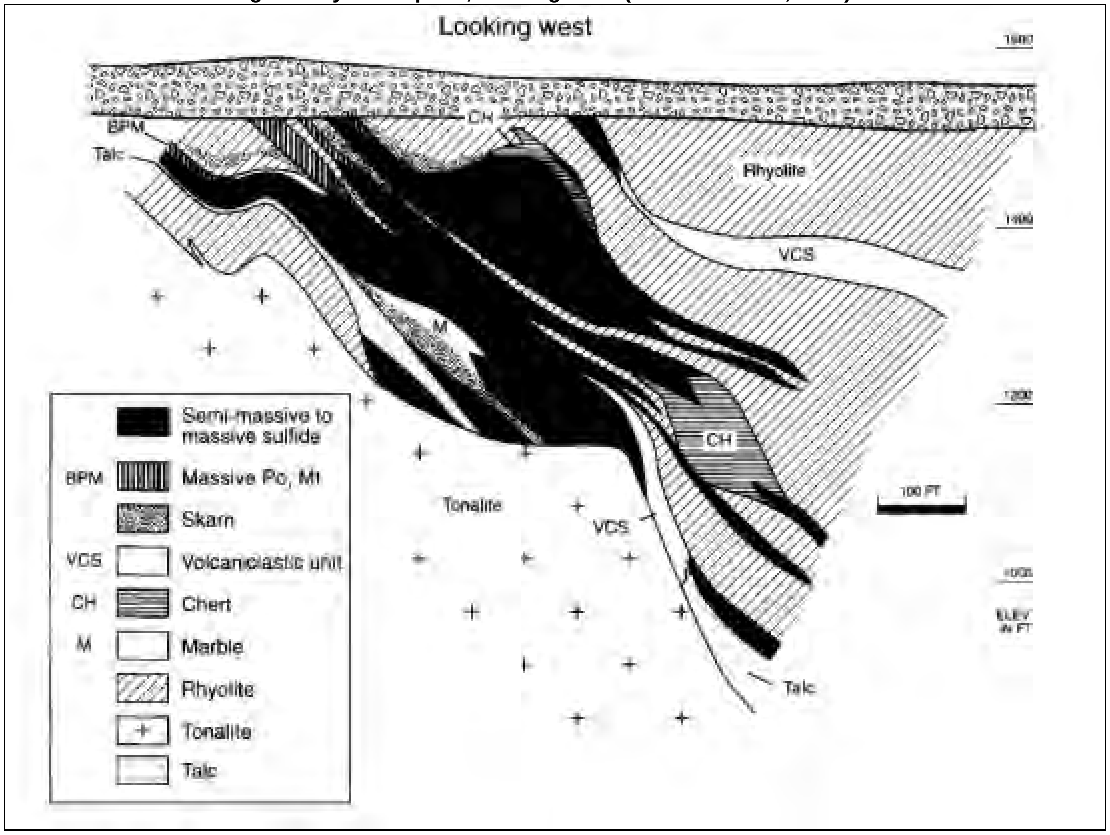


Geologic knowledge of the Lynne deposit area is very limited due to poor outcrop exposure. Regional airborne E.M. and magnetic data and scattered drill hole information suggest that the general geology of the Lynne area consists predominantly of mafic to intermediate volcanic rocks with at least one felsic eruptive and intrusive event, represented by the lithologies in the immediate Lynne deposit area. The felsic volcanic-related rocks associated with the Lynne deposit predominate over mafic to intermediate rocks by a significant amount. The increase of felsic volcanic rocks in the Lynne deposit area is common to other significant base-metal occurrences in northern Wisconsin.

4.2 Deposit Geology

The Lynne deposit is covered by 40 to 75 feet of unconsolidated glacial till. The ore body itself consists of four stratiform, massive to semi-massive, stacked bodies with an aggregate thickness of approximately 325 feet in the central part of the ore zone (Figure 4.2.1) (Adams, 1996). The sulfide bodies exhibit abrupt thickening and coalescing in the core of the ore zone that quickly become disseminated along the flanks. Sphalerite is the predominant sulfide followed by pyrrhotite, pyrite, galena and chalcopyrite. Gold occurs in the lower sulfide body and also with skarn mineralization along the flanks of the deposit. Silver mineralization occurs in the central to upper part of the ore body. The ore zone has a strike length of approximately 1300 feet and strikes in a general east-southeast direction. It dips to the northeast at about 40^{0}. Graded bedding of the host rocks suggests that the stratigraphy is upright with tops to the northeast. The ore body itself is hosted within a subaqueous, volcaniclastic, sedimentary and carbonate-rich sequence of rocks. Drill hole data from host rocks indicate a general coarsening of pyroclastic material to the north, or down dip, suggesting a more proximal location to a possible volcanic eruptive source (Adams, 1996). The bottom of the deposit is underlain and cut off by a tonalite intrusive body.

Figure 4.2.1
N-S Cross-section through the Lynne Deposit, Looking West (from DeMatties, 1994)



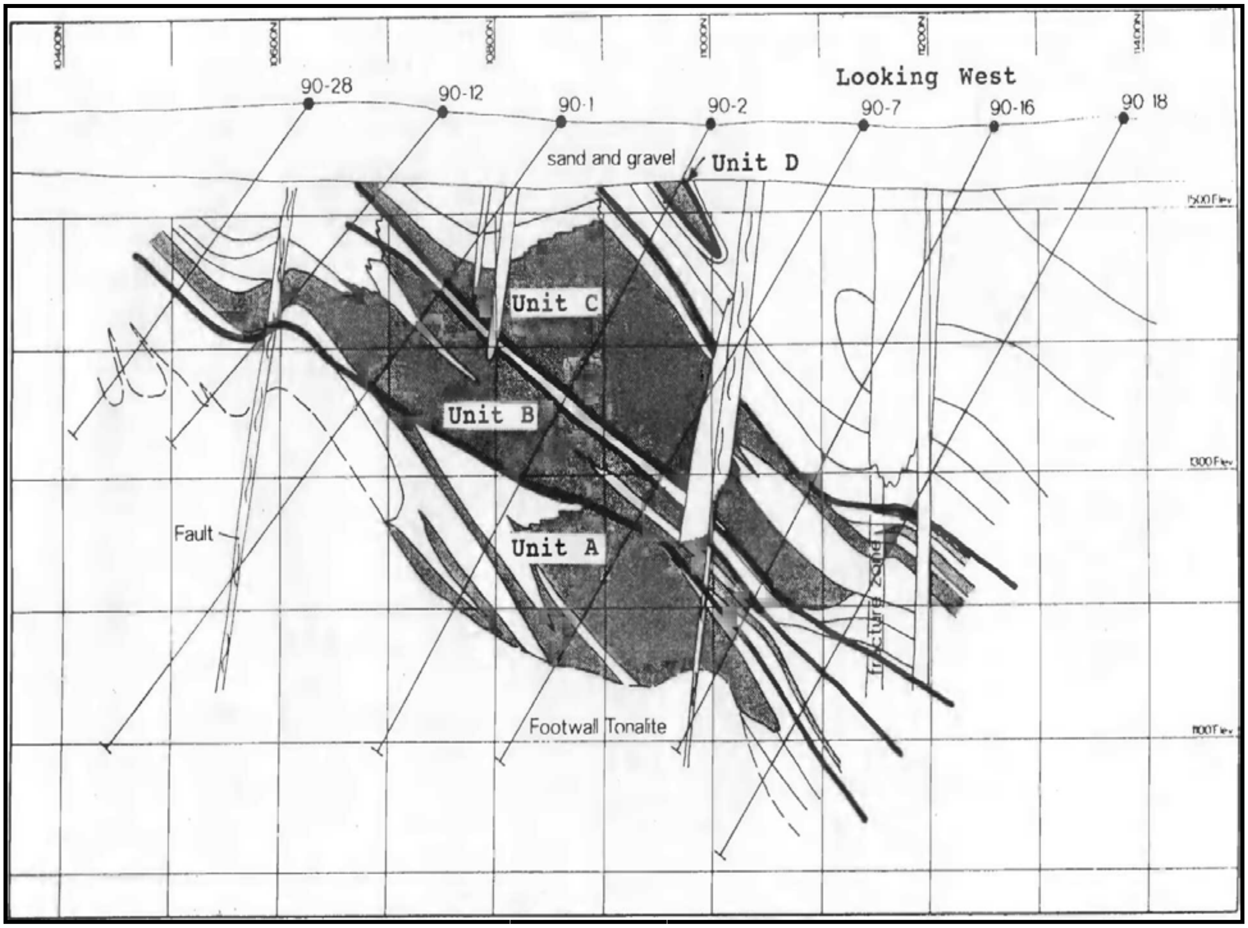
The deposit is structurally simple. East to southeast striking, vertical to sub-vertical, fracture zones exhibit minor movement in stratigraphy within and down-dip form the ore zones. These fractures postdate the tonalite intrusive (Kennedy, 1992 *in Adams, 1996*). The fracture zones are commonly intruded with rhyodacite dikes and lesser basaltic dikes. A shallow depression or trough is present in the tonalite beneath the thickest part of the deposit. Adams (1991) suggests that the fracture zones may be, in part, responsible for the trough like feature, and together, the two may be genetically related to the deposition of sulfide mineralization.

Alteration within the Lynne deposit and of the surrounding host rocks is variable and locally affected by contact metamorphism and skarnification, although the overall metamorphic grade lies within the greenschist facies. Evidence of retrograde alteration is prevalent. No evidence of a stringer zone or alteration pipe has been recorded, although the stratigraphy below the ore deposit has been altered to chlorite and talc-bearing assemblages. Because of the unusual combination of base-metal and alteration assemblages, and host rock lithologies, the Lynne deposit exhibits characteristics common to both volcanogenic massive sulfide and carbonate-related skarn deposits (Adams 1996).

4.2.1 Mineralization

The massive and semi-massive stratiform lenses of the Lynne ore deposit are divided into four separate zones or units based on physical, or discrete compositional, differences (Adams, 1990; Adams, 1991). The sulfide lenses are designated as units A through D with A being the lower-most, and progressing stratigraphically upward to units B, C, and D (Figure 4.2.1.1).

Figure 4.2.1.1
Lynne mineralized stratiform lenses (from Adams, 1996)



Unit A

Sulfide Unit A exhibits the greatest lateral extent of all the zones and reaches up to 60 feet in thickness, although it is locally disrupted and intruded by the foot-wall tonalite. The zone is a pyritic, massive sphalerite body enriched in chalcopyrite and pyrrhotite relative to the other zones. Over 50 percent of the copper and over 30 percent of the gold content of the ore deposit occurs in cherty, chloritic, pyrrhotitic massive to semi-massive sulfide portions of this unit (Kennedy, 1992 *in Adams*, *1996*). Partially enveloping the unit is a talc-rich assemblage containing disseminated to massive sulfides with Mg-chlorite, phlogopite and lesser tourmaline, serpentine, cummingtonite, and galena (Kennedy ***et al.,*** 1991). Also present locally within the alteration envelope is stringer-like and disseminated sphalerite and pyrrhotite. An extensive barren zone of this alteration assemblage, with laminated cherts containing disseminated pyrrhotite, pyrite and minor magnetite laminae, continues up to 300 feet along strike and down-dip from Unit A.

Unit B

Narrow intervals of carbonate rock, with local skarn-type mineralization, separate units B and A. Sulfide mineralization in Unit B differs strongly from Unit A in that it occurs in association with lenticular masses of chemical sedimentary rocks including calcareous and siliceous facies. Disseminated sphalerite and pyrite is ubiquitous to the carbonate host rocks, and massive to semi-massive sphalerite, with lesser galena and subordinate chalcopyrite, forms lenses up to 50 feet thick. The composite thickness of Unit B reaches approximately 150 feet in the central part of the ore body. Unit B contains over 50 percent of the total deposit tonnage and almost 60 percent of the total zinc content of the deposit (Kennedy, 1992 *in Adams, 1996*). Thin beds of carbonate-rich volcaniclastic and sedimentary rocks within the unit are pervasively replaced by calc-silicate minerals. Sphalerite, and to a lesser extent pyrrhotite and pyrite, are disseminated throughout the carbonate host rocks. The carbonate rocks are relatively planar bedded near the base of the unit becoming increasingly disrupted toward the top. Carbonate beds tend to be finer grained and well bedded off the flanks of Unit B.

Unit C

Narrow beds of barren volcaniclastic wackes or tuffs and a rhyolitic sill separate units B and C. Unit C is approximately 160 feet thick and consists predominantly of contorted, folded, or disrupted calcareous chemical sediments that can be divided into two zones. The lower calcareous zone is about 50 feet thick and consists of marble with massive to semi-massive sphalerite and galena. The upper 110 feet of the unit is calcareous, but within the upper 50 feet it becomes extremely siliceous containing cherty layers and diopside-rich cherts. Sulfide mineralization in the upper part of Unit C consists of disseminated to semi-massive sphalerite, pyrite and galena. A large proportion of the deposit's silver content occurs in the upper siliceous part of Unit C in the form of native silver, tetrahedrite, and argentiferous galena. Here, silver content averages over 100 ounces per ton for several tens of feet. As with Unit B, this unit shows a relative abundance of chalcopyrite toward the base of the sulfide assemblages. An envelope of diopside-garnet-pyrrhotite-magnetite skarn mineralization occurs on the south side of the lower part of Unit C and on the upper part of Unit C in association with rhyolite sills (Kennedy, 1992 *in Adams, 1996*).

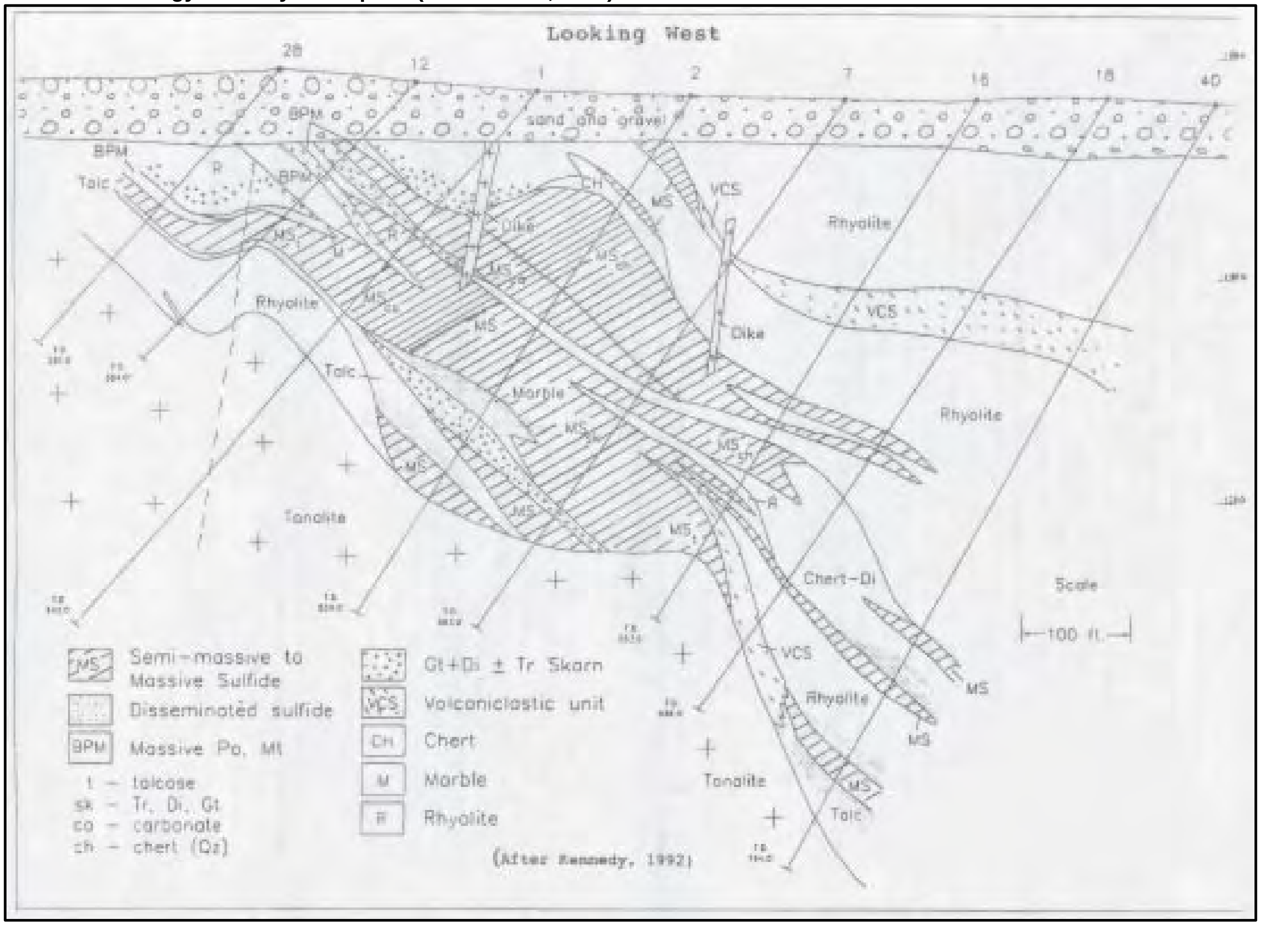
Unit D

Unit D, the uppermost sulfide unit, is a massive to semi-massive zone of sphalerite with accessory galena and appreciable chalcopyrite in siliceous, cherty, chemical sediments. This unit is truncated by the bedrock surface and grades rapidly down-dip into barren volcaniclastic sediments. The unit is separated from the underlying unit C by a 50-foot thick, rhyolitic sill.

4.2.2 Lithology

The rocks hosting the Lynne deposit (Figure 4.2.2.1) have had little in-depth investigation with the exception of work done by Kennedy (1992 *in Adams, 1996*), who, in conjunction with Noranda's predevelopment staff, studied the immediate host-rocks and their alteration assemblages as part of the deposit delineation drilling program.

Figure 4.2.2.1
Host rock lithology of the Lynne deposit (from Adams, 1996)



Kennedy (1992 *in Adams, 1996*) has divided the Lynne deposit host rocks into five units consisting of, in ascending order, the Lower Rhyolite, the ore-bearing Lynne Horizon, the Upper Rhyolite, the Upper VCS and the Hanging Wall Unit. Subsequent to the deposition of this felsic volcanic-rich sequence, the rocks were intruded by a probable subvolcanic tonalite body that partially ingested and disrupted the lower surface of sulfide Unit A.

Lower Rhyolite

The Lower Rhyolite consists of massive to poorly sorted, rhyolitic lapilli to ash tuff containing abundant pumice fragments and locally poorly graded beds of fine ash tuff. Dark green to black chloritic material is common as veinlets and irregular masses. Kennedy (1992 *in Adams*, *1996*) interprets this lithologic package as a sequence of subaqueous debris flows. Angular and shattered coarser felsic lapilli fragments suggest possible local autobrecciation of rhyolitic flow rocks.

The Lower Rhyolite interfingers with the stratigraphically higher Lynne Horizon north of the orebody but is absent from the immediate vicinity of the orebody either due to non-deposition or incorporation into the intruding tonalite. Rhyolitic tuffs with distinctive angular lapilli clasts occur north of the orebody and approximately one mile south of the orebody, suggesting that this unit may be relatively widespread.

Lynne Horizon

The Lynne Horizon hosts the Lynne ore deposit and consists of a sequence of predominantly volcaniclastic, detrital, and chemical sedimentary rocks with lesser interlayered intermediate to felsic volcanic flow rocks and minor rhyolitic crystal tuffs. The horizon is up to 320 feet thick and extends over one-half mile east of the ore deposit. The volcaniclastic rocks consist of greywackes and laminated siltstones of volcaniclastic or reworked volcanic material interbedded with and grading into crystal to crystal-lithic tuffs.

Carbonate-rich sediments, characteristic to this horizon, and lesser laminated cherts occur over 1300 feet away from the orebody and increase in abundance and thickness toward the orebody where they exceed 200 feet thick in the center of the ore deposit (Kennedy, 1992 *in Adams, 1996*). The bulk of the carbonate rocks are directly associated with the massive to disseminated parts of the sulfide ore zones where they are partially or mostly replaced by sulfide minerals. Some partial replacement continues for a considerable distance away from the main orebody to the north and east where it is often associated with an envelope of potassic and magnesium alteration. On the flanks of the Lynne Horizon the carbonates are often well bedded, while less sulfide-rich carbonate zones within and between the main ore zones are commonly laminated though often disrupted and contorted. The carbonate rocks form sharp contacts with overlying volcaniclastic horizons.

Descriptions by Kennedy ***et al.*** (1991), Kennedy (1992 *in Adams, 1996*), and Kennedy and Donnelly (1992 *in Adams, 1996*), suggest that the carbonate assemblages at Lynne show considerable compositional variations. Dolomitic rocks are the most abundant, and directly associated with base-metal mineralization, while limestones are associated with barren or poorly developed sulfide mineralization on the eastern and western flanks of the deposit. The tendency of more Mg-carbonate toward the central part of the orebody, combined with Mg-silicate alteration assemblages in the immediate host rocks, could denote Mg-metasomatism related to carbonate build-up and ore formation. Since the initial drill holes into the ore body, it has been speculated that the buildup of carbonate material is directly associated with ore deposition (Adams, 1990). The carbonate rocks are relatively restricted to a north-northeast-trending basinal feature (Kennedy, 1992 *in Adams, 1996*), which coincides with the thickest part of the sulfide ore body, suggesting a direct relationship between the ore body and a carbonate build-up.

Upper Rhyolite

The Upper Rhyolite unit consists of rhyolite crystal and crystal lithic, lapilli tuffs and massive rhyolite with minor interlayers of dacite and andesite, and thin basal horizons of greywacke and chert. The unit is over 300 feet thick north of the orebody and thins southward where it becomes interlayered with the ore stratigraphy. Rhyolitic sills that intrude the ore body are similar to massive rhyolites in the Upper Rhyolite. Epidote-rich skarn is associated with some of the rhyolitic sills on the west edge of the ore body, suggesting a possible correlation between the intrusion of narrow rhyolite sills of the Upper Rhyolite and the formation of skarn mineralization.

The Upper VCS Unit

The Upper VCS Unit consists of volcanic-derived greywacke and laminated siltstone with increasing amounts of andesite as the horizon is traced northward. The updip southerly projection of the horizon is represented by the narrow, upper-most, siliceous sulfide Unit D. In the immediate vicinity of the orebody, the Upper VCS Unit is less than 100 feet thick but thickens to over 200 feet to the north and west. Iron sulfides commonly occur in this unit as fracture fillings within 100 feet of the orebody, and form sulfide-rich laminae associated with magnetite in siltstones. Chlorite, epidote and minor actinolite alteration minerals are common.

Hanging Wall Unit

The Hanging Wall Unit is a mixture of felsic to mafic tuffs, heterolithic wackes and agglomerates, or conglomerates. Characteristic to this unit are clast-supported agglomerates containing beige to pink lapilli-sized rhyolitic clasts. The wackes contain lapilli-sized rhyolitic to andesitic clasts and plagioclase and quartz crystals in a mafic groundmass. Interpretations by the Noranda pre-development team suggest that the unit may be a series of debris flows that appear to dissipate to the north and are therefore derived from a southerly source area.

Tonalite

The tonalite underlies the Lynne ore and host-rock stratigraphy. It has an irregular upper contact that dips at a shallow angle to the northeast. The tonalite intrudes and disrupts the lower part of sulfide Unit A, displacing and enclosing parts of the unit. Flexures in the overlying stratigraphy appear to be associated with a northeast-striking trough in the tonalite surface. The intrusive is often porphyritic with quartz ovoids and euhedral, zoned plagioclase crystals in a fine-grained, commonly graphic, matrix (Kennedy and Donnelly, 1992 *in Adams, 1996*). Within 50 feet of the contact, the tonalite is characterized by a granophyric texture. Low temperature alteration is common in the tonalite, but is strongest in association with local fracturing or faulting. Within 35 feet of the tonalite, local recrystallization of adjacent volcanic and volcaniclastic rocks occurs and a hornfels texture is sometimes present (Kennedy and Donnelly, 1992 *in Adams, 1996*). The magnetic response associated with the known area of tonalite grades into a relatively constant regional magnetic low south of the deposit that is interpreted as a large granitic body.

4.2.3 Alteration

There does not appear to be a distinct alteration pipe, or stringer zone, beneath or adjacent to the Lynne deposit as is common to other volcanogenic massive sulfide deposits (Franklin ***et al.,*** 1975; Franklin ***et al.*** 1981). It is possible that the subvolcanic tonalite body has engulfed and destroyed any pre-existing alteration stringer zone. There is, however, an alteration mineral assemblage associated with the lower Lynne ore stratigraphy and the stratigraphically higher encompassing host rocks.

Talc-rich zones up to 25 feet thick occur beneath and grade into the lower massive sulfide Unit A, and talc-rich zones up to 15 feet thick separate zinc-rich ore from skarn and marble units along the northern flank of the orebody (Kennedy, 1992 *in Adams, 1996*). Local stringer-like veins and disseminations of sphalerite and pyrrhotite occur within Mg-chlorite and muscovite-rich talcose rocks associated with the lower parts of sulfide Unit A (Adams, 1990; Kennedy, 1992 *in Adams, 1996*). Observations by the Noranda predevelopment team (Adams, 1996) reveal a Mg- and K-rich secondary mineral assemblage extending laterally up to 1300 feet down-dip, and over 2000 feet east, in the footwall rocks of the orebody. Within several hundred feet of the orebody, feldspar in tuffs of the Upper Rhyolite and the Upper VCS Unit are altered to muscovite and chlorite. These criteria support a broad alteration assemblage similar to semi-conformable alteration zones found in conjunction with several world-wide volcanogenic massive sulfide occurrences described by Franklin ***et al.*** (1981). Tonalite in contact with the orebody, on the other hand, appears to be little altered, suggesting a post-alteration intrusive event.

4.2.4 Skarn Mineralization

The abundant calc-silicate mineral assemblage associated with the Lynne deposit is uncommon to volcanic-related massive sulfide deposits. It is apparent that the skarn-style of mineralization is directly related to the anomalous amount of carbonate rock associated with the orebody. The most intensive skarn mineralization is associated with the extensive replacement of carbonate along the up-dip flanks or projected edges of the orebody. Here pyrrhotite and magnetite are also locally abundant, especially along the southern edges of the orebody. Quartz-diopside skarn assemblages are characteristic of the upper parts of the deposit and epidote skarn occurs in conjunction with intrusive rhyolitic sills within the orebody (Adams, 1996). Skarn mineralization is seldom associated with base-metal ore, but the highest ore-grade gold concentrations have a direct skarn relationship (Adams, 1991).

4.2.5 Genetic Model

Although the Lynne deposit has characteristics of both volcanogenic massive sulfide and skarn-related deposits, it is believed that the supporting evidence is sufficient to suggest a volcanogenic origin for deposit (Adams, 1996). A sulfide depositional scenario is proposed whereby a graben-like depression, perhaps developed in conjunction with a caldera collapse feature, forms on the flank of a felsic volcanic complex centered to the northeast of the present-day Lynne deposit. The association of the near-vertical fracture zones in the Lynne stratigraphy, and the trough-like depression in the tonalite surface, with the rapid thickening of the core of the ore deposit, may represent remnant features of the postulated graben. Within the confines of the down-dropped block of felsic volcanic rocks, and using bounding growth faults as conduits, volcanic vents may have begun an effusive build-up of carbonate-rich chemical sediments. Either syn-depositionally, or closely following the carbonate build-up, solutions rich in zinc, with subordinate lead, silver, copper and gold, replaced much of the central portion of the carbonate mound. At least four episodes of metal infusion prevailed over the deposition of volcaniclastic and chemical sedimentary material within the graben complex. As the sulfide deposition evolved, the relatively abundant copper and iron dropped out of solution, both at the onset of each sulfide event, and throughout the entire sulfide depositional period, and was supplanted by zinc with progressively increasing amounts of lead and then silver. Coincident with the evolution of metal-bearing solutions was the progression from carbonate-rich toward silica-rich chemical sedimentary facies. The confines of the proposed graben feature may account for the stacked layering of chemical sedimentation and sulfide deposition.

Associated with a resurgence of volcanic activity, the sulfide-bearing stratigraphy was covered with a sequence of felsic to intermediate, volcanic flow, pyroclastic, and epiclastic rocks, and intruded by rhyolitic sills. At the same relative time, or subsequent to this point in the volcanic history of the area, a subvolcanic, tonalitic mass intruded the base of the graben feature and its metal-rich sequence of volcanics and chemical sediments. During its intrusion, the tonalite could have engulfed an alteration pipe associated with the graben-bounding fracture system leaving only the more widespread wall rock alteration assemblage. Associated either with the intrusion of the tonalite, the intrusion of higher level rhyolitic sills, or a combination of both, a skarn-style alteration assemblage developed in the flanks of the carbonate mound in which sulfide mineralization was less pronounced. Pyrrhotite, magnetite and gold mineralization was produced or remobilized in association with this event. Later movement reactivated the bounding faults and subsequent bimodal intrusive activity filled some of the fault zones with dikes. It is of course unknown if additional massive sulfide bodies were deposited in this graben feature prior to, or following, the formation of the current Lynne sulfide units, their possible existence being either destroyed by the intruding tonalite or erosion. Since the geological environment favored the deposition of the Lynne deposit, it is likely, as substantiated by base-metal camps throughout the world, that additional massive sulfide deposits formed in conjunction with the Lynne felsic build-up of the prolific Rhinelander-Ladysmith greenstone belt.

5.0 Environmental

Planned work will have negligible impact on the environment. Work will be confined, if possible, to existing roads, trails, cut-lines and structures with minor work to clear overgrowth where needed. All work will be conducted in such a manner as to mitigate any environmental impact on nearby streams and rivers; conducting work under winter conditions further negates any environmental impact. Drill core will be collected and transported on a daily basis. Fuel spill kits will be maintained at the drill sites. Drilling additives will be used as a last resort and will consist of environmentally benign substances. Drill sites will be kept clean and refuse removed when the drilling on any given site is completed. Drill sites, drillholes and access roads will be reclaimed and re-seeding conducted based on County Forest and Parks Service and WIDNR recommendations.

5.1 Historical and Social Impacts

Disturbance of archeological resources will be negated by use of pre-existing access and work sites where possible. The Lynne deposit was originally drill tested by Noranda Exploration, and it is assumed that prior to the start of their drilling program, an archeological survey of the area had been conducted with no know areas of archeological resources identified.

Drill contractors, support and supervisory personnel will be housed in local motels minimizing the economic impact on existing community infrastructures.

All local community, government and regulatory representatives will be contacted prior to the start of any drilling program. Tamerlane will maintain a proactive dialogue with all representatives.