

PROJECT DETAILS

The Bend site nonferrous metallic mineral exploration drilling project is located west of the Town of Westboro in Taylor County. The explorer, Green Light Wisconsin, acquired all permits and approvals to pursue exploration drilling on a 40-acre parcel within the Chequamegon-Nicolet National Forest. The surface of the parcel is managed by the U.S. Forest Service, but the mineral rights are privately owned. The project was completed after drilling 6 boreholes on 3 sites, totaling a maximum of 7,190 linear feet, to collect rock cores to define and characterize the mineral deposit. The site has been reseeded and restoration is ongoing.

Project details, including the exploration plan and DNR conditional approval, can be found on the DNR metallic mining website under the Bend tab: <https://dnr.wisconsin.gov/topic/Mines/Projects.html>.

EXPLORATION VS MINING

The Bend site project is a metallic mineral exploration drilling project conducted to inform the feasibility of siting a potential mining operation. In Wisconsin, exploration and mining are statutorily distinct activities, with exploration defined as drilling boreholes of 18 inches or less and mining as the commercial extraction of nonferrous metallic minerals. If a metallic mine were proposed, an extensive multi-year study, regulatory review, public input, and environmental impact statement and permitting processes would follow.

LAND & WILDLIFE IMPACT

Exploration activities proposed for the Soo Line 40 parcel involved less than 0.7 acres of land disturbance. This land disturbance was reduced as the number of drill sites and access routes was decreased from 6 to 3. The nearest waterway, the North Fork of the Yellow River, was more than 900 feet from the closest drill site.

Land disturbing activities were regulated under a construction site storm water runoff general permit (WPDES General Permit: WI-S067831-06) for sedimentation and erosion control and the site was stabilized post-project completion. As part of the best management practices, fencing to prevent amphibians from entering the working area was maintained.

Site inspections to ensure compliance with the exploration and erosion control plans were conducted regularly and as needed for the duration of the project.

GROUNDWATER ELEVATION

The water table is considered to be the elevation below which all soil is saturated. This elevation can vary at a microtopographic scale depending on the subsurface material. There is saturated soil present near the surface in some locations of the project site due to the presence of lenses of low permeability materials in the soil profile. Saturation does not extend beneath the lens of fine-grained materials and these areas are not representative of the groundwater table.

The U.S. Forest Service and Wisconsin Geologic and Natural History Survey have collected several years of monitoring well data that estimates the groundwater in the project area to be greater than 15 feet below ground surface and provides a depiction of the normal local groundwater system in the area.

WATER USE

A maximum of 12,000 gallons per day was proposed to be withdrawn from the North Fork of the Yellow River during drilling operations. On average while drilling, less than 1,500 gallons of water were withdrawn from the river per day. The operator re-circulated water from established sumps during drilling operations. Accumulated rainwater was also used to reduce the amount of water withdrawn from the river.

TOOLING & CASING

The project utilized a diamond core drill rig that allowed for the alternating advancement of the drill string with a coring bit and the casing with a casing shoe. This allowed the drill string to drill a pilot hole and the casing shoe to follow behind, cutting the sediment around the pilot hole and drilling the casing into place. The holes were drilled to a prescribed depth using the coring bit and rods. Then while leaving the drill rods and coring bit in place, a similar length of larger diameter casing was installed over the outside of the coring rods using a casing shoe. This process was repeated until the casing was firmly set into competent bedrock, at which point the remainder of the drillhole was drilled using the coring bit and rods. This drilling method does not utilize a casing advancer.

For the portion of each drillhole through bedrock, the drill bit was the widest tool sent down hole and therefore represented the diameter of the greatest length of the drillhole. Each drill rod had a specific outer diameter and the bit was slightly larger. The drill string used to advance the core barrel utilized tools in the N-series with a hole diameter of ~3 inches. For the casing through the overburden, the size of the tools was in the H-series with a hole diameter of ~3.75 inches.

Casing must be drilled through the glacial overburden and set into competent bedrock before core drilling through the bedrock can commence. The casing stabilized the hole through the overburden and acted to prevent drilling fluids contacting groundwater in the unconsolidated aquifer. The casing was planned to be removed during drillhole abandonment but was left in place when unable to be removed after reasonable effort.

DRILLING LUBRICANTS

The DNR maintains a list of approved drilling fluid additives approved for use during well construction activities. The DNR has reviewed the ingredient lists and safety data sheets for these additives and found no evidence that they contain PFAS.

Drilling fluid additives are utilized to provide lubrication for the bit and drill string when encountering different types of geologic material and enhance the recovery of drill cuttings from down hole. Fluid

additive needs vary based on drilling purpose and the material encountered while drilling. Drillers in Wisconsin often do not use drilling fluid additives, as most wells are constructed using air or water to remove drill cuttings and maintain an open drillhole during casing.

The proposed drilling fluid for the Bend project consisted of treated water and bentonite, a clay material, with minor additives from the list of DNR-approved drilling products, if any. The first hole drilled at the Bend site did not utilize additives from the approved list, only bentonite and water.

SUMPS

While drilling, residual drilling fluids were retained in lined sumps. Once the drilling each site was complete, the solids in the lined sumps was allowed to settle and the decanted water was pumped out for reuse at the next drill site. At the end of the drill campaign any remaining water (free of solids) was permitted to drain around the liner into the subsoil as prescribed by the project's dewatering operations permit (WPDES General Permit: WI-0049344-05-0). The solid material left in each liner was mixed with cement, wrapped in the liner, covered with stockpiled soil material, and the surface was revegetated according to the site restoration plan.

The DNR inspected the sumps after construction, during drilling, during abandonment, and post-abandonment. The DNR determined that the water in the sump at Site 5 after construction was a result of percolating rainwater accumulating within a confining soil layer and flowing laterally into the sump and was not representative of the normal local groundwater elevation, which in this area has an average depth of at least 15 feet below the ground surface. Previous site inspections and documentation provided by GLW confirmed that the sump as Site 5 and a second sump, at Site 3, were dry at the time of excavation.

WETLANDS

GLW provided a wetland determination that identified two wetlands with their project application materials. The project area was dominated by uplands with a normal depth to groundwater of 15 feet or more.

The DNR visited the site during staging operations and noted the presence of subtle depressional areas lacking persistent vegetation, which may indicate the presence of wetlands within the specific soil type present at the Bend site. The DNR returned the following week (6/25/25) to sample and assess soils at nine locations and identified the potential presence of small areas of hydric soils and hydrology at two sites, indicating the potential presence of ephemeral wetlands and the need for a more detailed evaluation of the site.

Ephemeral wetlands are by definition intermittent, sporadic, and dependent upon precipitation, geomorphology, and hydrology. It is likely that the wetlands were not evident during GLW's wetland determination (September 2022) and the DNR's review of the wetland determination (September 2022), as these determinations were focused on review of the presence of wetland vegetation indicators that were not present in this type of wetland.

On July 8, 2025, the DNR conducted a site assessment and sampled 28 mostly unvegetated depressions. Of the 28, DNR identified five separate ephemeral wetlands found in closed depressional areas that are within, or in proximity to, proposed access routes and drill pads where work had not yet begun.

A wetland permit was not required when wetland impacts were to be avoided through the proposed scope of work. Two of the five wetland areas were avoided with the approved work plan, and the remaining three wetlands were able to be avoided through slight access route and drill site adjustments.

Erosion control measures were installed along disturbance areas upslope of nearby wetlands to ensure wetlands were not adversely affected by nearby construction activities.

CEMENT FILLING & SEALING PROCEDURE

The project utilized the steel drill rod as a conductor pipe. The drill rod was a slightly smaller diameter than the drill bit which allowed for cement to be pumped down the center of the rod to the bottom of the hole and push any drilling fluid up around the outside of the rod to the surface, as was done with the cuttings while drilling. GLW used a narrower drill rod, in the B-series, as the conductor pipe, when available.

The weight of the cement was measured for compliance with the conditionally approved exploration plan. The use of a tool called a 'mud balance', although not required by state law as long as the cement weight is accurately measured and recorded by other means, was utilized. The exact cement volume required to fill each drillhole was determined by using the hole diameter and depth per drill rod type to calculate the cylindrical volume of each hole after completion.

For example, the volume of a 1,000 ft hole with 130 ft of surface casing is calculated as follows:

$Volume = \pi r^2 * length$, where $r=0.157$ ft for the surface casing and 0.125 ft for the drill rods.

Surface portion – Volume = $\pi*(0.157'*0.157')*130' = 10.1 \text{ ft}^3$

Cored portion – Volume = $\pi*(0.125'*0.125')*870' = 42.7 \text{ ft}^3$

Total volume = $10.1 \text{ ft}^3 + 42.7 \text{ ft}^3 = 52.8 \text{ ft}^3$

Required bags of cement = $52.8 \text{ ft}^3 \div 1.28 \text{ ft}^3/\text{bag of cement} = 41.25$ bags of cement

Cement bags were transported to the project site when needed. The state's metallic mineral exploration rules do not require cement bags to be stored onsite for the duration of the project.

The DNR conducted regular site inspections to ensure compliance with the well abandonment plan for the duration of the project.

DRILLHOLE ABANDONMENT

GLW drilled and abandoned the first 2 drillholes for the project in accordance with the state code requirements. On July 25, 2025, GLW's drilling contractor had, after several days of drilling, advanced borehole B25-003 to a depth of 908 feet below ground surface. When pulling the rods to replace the coring drill bit, GLW reported that the steel casing, drilled through the unconsolidated glacial overburden and seated into bedrock at 150 feet below ground surface, had become detached at a depth of 50 feet below ground surface. Unlike the first two drillholes completed in the project area, the B25-003 casing was drilled with a tricone bit that can, at times, push boulders within the overburden to the side instead of drilling through them like a coring drill bit. The drilling contractor encountered a blockage downhole at 50 feet due to the boulders moving back and knocking the detached upper 50 feet of casing out of alignment with the lower portion of the hole.

The drilling contractor spent 48 hours attempting multiple methods for dislodging the blockage and reattaching the casing downhole. These attempts were unsuccessful. On July 27, 2025, with DNR concurrence that filling the lower portion of the drillhole below the detached casing would likely not be possible, the drilling contractor permanently abandoned the upper 50 feet of the drillhole and filled it with cement and subsequently removed the 50 foot section of casing. The detached lower drillhole casing, installed below the 50 feet of cemented upper drillhole, was left in place unfilled and will continue to serve as a barrier between the unconsolidated aquifer and the uncased lowermost segment of drillhole. The cored drillhole that extends through crystalline bedrock from 150 feet to 908 feet below ground surface and will also remain unfilled.

GLW notified the DNR on July 25, 2025, of the casing blockage and was in communication with DNR through abandonment. The DNR was onsite on July 25, 2025, while GLW's drilling contractor attempted to clear the blockage and again on July 27, 2025, for the upper drillhole abandonment and cementing process. On August 1, 2025, GLW provided the DNR documentation of the sequence of events involving the detached drillhole casing and the action taken and included a suggested corrective action plan to avoid future instances of noncompliance.

As the proper permanent abandonment was not accomplished in B25-003, in subsequent drillholes the DNR required GLW to drill the overburden with a coring drill bit and casing shoe as was used in holes B25-001 and B25-002, instead of a tricone bit as was used in B25-003, to reduce pressure on the casing and reduce the risk of the casing unthreading.

On August 8, 2025, DNR issued a Notice of Noncompliance Letter to GLW citing the details provided above. Since the steel casing remains downhole seated firmly into bedrock and sealing the borehole from the aquifer, the DNR has determined that groundwater resources are sufficiently protected and will require no further action from GLW for the abandonment of B25-003.

The final drillholes B25-004, B25-005, and B25-006 were temporarily abandoned with threaded caps, in accordance with state code requirements, and will remain open for continued data collection until permanent abandonment.