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GOVERNOR

STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
LAND USE PLANNING COMMISSION  
22 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-022

AMANDA E. BEAL  
COMMISSIONER

JUDY C. EAST  
EXECUTIVE DIRECTOR

February 4, 2021

***Via E-mail Only***

Jeremey Ouellette  
Wolfden Mt. Chase, LLC.  
1100 Russell St., Unit 5  
Thunder Bay, Ontario P7B 5N2  
Canada

Dear Mr. Ouellette;

The Land Use Planning Commission has continued its review of Wolfden Mt Chase, LLC.'s petition (ZP 779) to rezone 528.2 acres in T6 R6 WELS to a Planned Development subdistrict (D-PD) for the purpose of metallic mineral mining. Commission staff have also solicited review on aspects of the petition from other state agencies and independent consultants. In this review, Commission staff have identified areas where additional information is needed to complete review of the petition. Please submit the following as soon as possible, but at least within 60 days of the date of this letter. Please bear in mind that, depending on the materials that are submitted, additional questions and information requests may be forthcoming as the Commission, other state agencies, and the independent consultants reviewing the response to this letter.

**Project Scope**

1. Has Wolfden decided to change the scope of the proposal to include importation of material from a similar deposit? If yes, show that onsite facilities are sized to accommodate additional volume of materials from off-site. How will this impact other parts of the proposal- traffic projections and access travel routes, water use, waste disposal, socioeconomic impacts, etc.? Pickett Mountain Water Management Plan, 11/26/2020, p. 1.
2. The Preliminary Economic Assessment (PEA) lists several surface uses and structures that are not included in the Petition: backfill plant, mine rescue station, and compressor station. Sec. 16.6, p. 112. Also, it includes a cold storage building and a surface water pump house. Sec. 16.14.2, p. 134. And, it includes a waste oil depot and change house. Sec. 18.9, p. 145. These additional uses and structures need to be added to the Petition's project description, Exhibit D-2 Preliminary Site Plan (Site Plan), and Exhibit D-2 table. Provide the maximum height of the backfill plant.
3. The PEA lists underground facilities that are not included in the Petition: a breakdown maintenance shop with wash bay area, fuel stations, explosives and detonator magazines, water transfer stations and tanks, dirty water and clean water sumps, and electrical substations. Sec. 16.6, p. 112, p. 115, p. 116. These additional uses and structures need to be added to the Petition's project description. Figures in the PEA that show these underground facilities are too small and unclear. Larger scale conceptional drawings of all underground facilities are needed to better understand the scope, intensity and conceptual layout of these facilities.
4. The PEA indicates a possibility that an onsite quarry may be developed. Please clarify if Wolfden intends to develop a quarry to supply backfill materials for the mine. Sec. 16.14.2, p. 144. If yes, will it be located within the tailings management facility (TMF) or an alternative location within or outside of the proposed D-PD? For a quarry to be an allowed use in the proposed D-PD (i.e. not require a zoning amendment in the future), it will need to be located on the Site Plan described in the Petition and included in the development plan for the

subdistrict. Outside of the proposed D-PD subdistrict, in a General Management Subdistrict, a quarry less than 30 acres in size is an allowed use with a permit (less than 5 acres is allowed subject to standards). However, if a quarry greater than 30 acres is needed, the General Management Subdistrict would have to be rezoned to a development subdistrict for a quarry to be an allowed use. A proposed quarry within the TMF raises questions regarding compliance with Chapter 200. Consultation with the Maine Department of Environmental Protection (MDEP) would be needed for such a proposal.

5. If backfill material will be imported from offsite, describe generally where this material could come from, what impact that would have on traffic generated by the facility (Petition Attachment J), and where the materials would be stored onsite. Demonstrate that there will be sufficient area for storage onsite.
6. A diagram of how mined out stopes will be backfilled with cemented and uncemented rockfill would be helpful. According to the PEA, primary stopes will be backfilled with cemented rockfill and secondary stopes will be backfilled with uncemented rockfill. PEA, Sec. 16.7, p. 120.
7. The PEA indicates 103 employees for the mine. Sec. 16.16, p. 135. The current version of the Petition indicates approximately 60 employees. The list of positions in the Petition includes some roles that are not included in the PEA, such as concentrator and wastewater treatment plant operators, and health and safety, human resources, and IT staff. Appendix A, Section B(3)a, PDF p. 185-186. Please update the Petition regarding the total estimated number of employees, including a revised Traffic Increases section and Impacts section for Attachment J. Confirm that the proposed size for the employee parking area will be sufficient. Also, the socioeconomic assessment prepared in response to this letter should be based on the current projection of the total number of employees for the mine.

### **Soil Suitability**

8. Based on the current record for this matter, the Land Use Planning Commission has significant concerns related to soil suitability for the proposed uses. Of particular concern are the proposals to construct wastewater storage ponds in soils that are shallow to groundwater and/or bedrock, particularly if blasting will be required for pond construction, proposals to store waste rock and low value ore on soils that have been classified in the Soil Suitability Evaluation as unsuitable for development due to the soil conditions, and proposals to construct ditches for surface water management in soils that the Soil Suitability Evaluation indicates as challenging. Given that the proposal involves a risk for potential impact to surface and groundwater resources and that the soils, particularly those in Areas 4,5, and 6, appear to pose significant challenges to manage appropriately over time, please provide an analysis of available alternatives for locating waste storage and disposal in areas with soils that are more suitable for those uses. (See comments from the State Soil Scientist, dated 12/08/2020). Additional soils evaluation may be necessary to address the soil suitability concerns for any on-site alternatives.

### **Financial Practicability**

9. The Soil Suitability Evaluation for the project indicates significant limitations to overcome. It appears that the evaluation was not considered in drafting the PEA. How does the cost of overcoming soil limitations, including the needs to i. blast ledge, ii. potentially bring in a significant amount of additional fill, and iii. reclaim the site to match natural topography post operation, impact project costs? Demonstrate the cost is sufficiently covered in the PEA.
10. It appears that assay figures for gold and silver are used inconsistently in the PEA. Generally, where discussed in the text, the figure for gold is 0.79 grams/ton, and silver is 88.80 grams/ton. In Tables 1.6, p. 5 and 22.2, p. 183, these figures are reversed. Please confirm whether the tables are incorrect. Since these tables represent the inputs to the cashflow model, what are the implications of the errors for the output from the model?

11. The PEA uses a figure of \$13.7 million for the Financial Assurance Trust. This figure appears low. Please provide more information on how this figure was calculated and whether the amount is sufficient to cover the financial assurance requirements under the MDEP's Chapter 200 Rules.

### **Reclamation and Benefits**

12. If water storage ponds will be constructed by blasting ledge, how will they be restored to match natural topography following closure of the facility?
13. In addition, provide a response to MDEP comments, Section M, Closure/ Reclamation.

### **Waste Disposal**

14. Please provide a response to MDEP comments, particularly Sections G and H regarding Water Treatment. In that response, demonstrate that it is possible to discharge wastewater onsite, either in subsurface treatment units as currently proposed or using other available technology, in a manner that would not result in the functional equivalent of a direct discharge to surface waters. Additional information may be required including more detailed information on soil type, depth to bedrock, distance to nearest surface water bodies, and discharge volume.
15. Additional information is needed to demonstrate that it is possible to treat and dispose of wastewater generated at the proposed Pickett Mountain Mine in compliance with applicable State rules, particularly the requirement to treat wastewater to background levels.
16. Given the change in the water management plan, with some wastewater from the concentrator/ TMF being treated in WTP 2 and released to the environment, it appears that the wastewater treatment plant for the Half-mile Mine is not a good comparison, because the Half-mile Mine has not concentrated mineral resources onsite (and it is our understanding that the mine only operated on a trial basis and has not operated since 2012). Please provide performance data from an existing, operating wastewater treatment plant similar to the one proposed for Pickett Mountain or other credible evidence that demonstrates that wastewater from the proposed process can be treated to achieve background levels.
17. In providing that demonstration, please address all potential contaminants in the wastewater and whether the treatment plant will be able to remove all those contaminants to background levels. With mining and processing onsite, the record indicates numerous potential contaminants that could be present in the wastewater:
  - The letter from SUEZ dated June 20, 2020, does not address two analytes found above background levels at the Half-mile Mine: manganese and molybdenum.
  - The potential for antimony, arsenic, bismuth, cadmium, cyanide, lead, and mercury to be in the wastewater. SWCA report, pg. 4 & 5; Att. E, pg. 42. Note, according Suez, "Non-metal species, that carry net negative charges, such as antimony and selenium, do not respond well to MetClear products." Wolfden letter dated 11/10/2020, Wastewater Treatment Submission, MetClear\_EN, Heavy Metals Removed with MetClear Technology, PDF p. 115, report p. 9.
  - The chemicals that could potentially be used in the water and wastewater treatment plants including, Metclear, sodium hydroxide, coagulants, and flocculants, (Wolfden letter dated 11/10/2020, Wastewater Treatment Submission, Pickett MT Mine WTP Block Diagram-01-Layout1, PDF p. 128); and in the mill, including  $\text{Na}_2\text{SO}_4$ ,  $\text{NaCN}$ ,  $\text{Na}_2\text{CO}_3$ , A325,  $\text{Ca}(\text{OH})_2$ ,  $\text{ZnSO}_4$ ,  $\text{SO}_2$ ,  $\text{CuSO}_2$ , M200, Lime, MIBC,  $\text{CuSO}_4$ , and A343 (PEA, Sec. 13.1.3.1 -3, pp. 71 -73) and Aero 5100, SIPX/Aero 3418A, and PAX/AP404 (PEA, Sec. 13.3.3, p. 77).

- The SWCA report referencing "toxic surfactants used in concentrator". SWCA report, pg. 5.
  - The below ground, breakdown maintenance shop and wash bay represent significant potential for fuel/oil/grease discharges to mine water. PEA, Sec. 16.6.6, p. 115.
18. What is the basis for the WTP 2 design flow of 120 gpm? Demonstrate that the plant will be sized sufficiently to handle the anticipated process flow, as well as rain events. SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #14, p. 7.
  19. A supporting memorandum for the SWCA report indicates that sludge levels could be high and recommends additional consideration for sludge handling. Given that sludge levels could be high and that the sludge will need to be characterized as a mine waste prior to disposal, show there is sufficient space for sludge handling and provide an alternative for disposal, if disposal as cemented backfill is not approved by the MDEP. SWCA report, Att. B, Linkan Memorandum, PDF p. 18, memo p. 2.
  20. The SWCA report indicates that the conceptual wastewater treatment process needs some measure of additional treatment for RO concentrate (brine) to precipitate, "[t]his is not included and not trivial." SWCA report, Att. B, Linkan Memorandum dated December 2, 2020, Comment #23, p. 2. See also SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #14, p. 4. Please include what additional treatment could be proposed for precipitating RO concentrate, including any chemicals typically used in that treatment process. Show that the wastewater treatment process can remove those types of chemicals to background levels.
  21. Explain what "byproduct water (reject water)" from the wastewater treatment plant is and how it is generated. Given that the byproduct water will need to be characterized as a mine waste prior to disposal, provide an alternative for disposal, if disposal as cemented backfill is not approved by the MDEP. Pickett Mountain Water Management Plan, Overall Water Balance, p. 4. See also SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #16, p. 7.
  22. The clarified water pond is missing from the Site Plan and Figure 3 of the Water Management Plan. Please add this pond to the plan and figure. What is the estimated size and depth of this pond? Please explain what measures Wolfden could take if the pond is at capacity and test results show the pond is not meeting background water quality levels.
  23. What sources of waste will be generated by operation of a backfill plant onsite and how will those wastes be treated and/or disposed of in compliance with State rules? How much water will be used in that process? How does that impact the overall water balance for the site? Are there any other potential sources of contaminants from the backfill plant operation, and how will potential adverse impacts be avoided or minimized? PEA, Sec. 16.11, p. 128.
  24. Where will collected sediments dredged from both underground sumps and surface collection ponds be stored and disposed of? PEA, Sec. 16.6.5, p. 115. Also, the PEA indicates that the clear water sumps in the mine will be used to treat and store clear water. PEA, Sec. 16.6.5, p. 126. What water treatment is planned in the clear water sumps?
  25. The PEA indicates that recycled, first phase, treated wastewater will be used in the mine for drilling and ancillary activities. In terms of a ratio, how much of the partially treated wastewater will be used for process water in the mine versus how much will be discharged to the environment? Given that the wastewater will only be partially treated and seepage from the tailings management facility, that could include process chemicals, will be a component of that wastewater, what is the safety risk for employees working in the mine?

26. Provide a description and conceptual layout for WTP 1. Will any chemicals be used? Will any sludge be generated? How will any waste products of that process be treated, stored and disposed of? Where would WTP 1 fit in Figure 4 of the Water Management Plan?
27. Respond to MDEP comments regarding disposal of land clearing debris. In particular, provide an estimate on the amount of biomass to be generated from stump grinding and provide evidence that there is an alternative available for exporting and use of any excess biomass. MDEP memo, Sec. A, p. 2
28. Also, please respond to MDEP comments regarding disposal of demolition debris. Describe the options that are available for disposal of demolition debris and provide a commitment that this material will be disposed of at a licensed facility in compliance with State environmental laws, rules, and permits. MDEP memo, Sec. M, p. 9

### **Tailings Management Facility (TMF)**

29. It appears that there is an error in the revised Exhibit D-2 table submitted on 11/25/2020 for the size of the TMF. Given that the throughput for the concentrator has increased to as much as 1,300 tonnes/day, the discussion of having room for expansion in the TMF, and the plan to limit the TMF height, how can the TMF now be only 50 acres in size? Please provide a corrected Exhibit D-2 table. Alternately, if the size of the TMF has been reduced to 50 acres, provide evidence that 50 acres will be sufficient to handle the volume of tailings that will be generated.
30. Table 1 of The Pickett Mountain Water Management Plan, differentiates between “pyrite tails” and other “tailings.” Explain the difference between the two categories, including discussion of any differences in management and disposal. Pickett Mountain Water Management Plan, Table 1, p. 4
31. Provide a report including a comparative analysis that addresses the recommendations of the Maine Geological Survey in their memo dated 10/15/2020 to demonstrate that the proposed approach for development, operation, and closure of the site can be done with no undue adverse impact to Maine's ground and surface waters, particularly given the climate in northern Maine.
32. Include in the above report evidence that the tailings can be stable over the long-term in climates similar to northern Maine. In particular, demonstrate that vacuum filtration of 14 µm materials is possible (SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #08, p. 6), confirm the design moisture content for the tailings, demonstrate that other northern mines have been able to achieve that moisture content, explain the long-term stability implications from infiltration of rainwater and snowmelt into the tailings before each TMF cell is closed, describe any provisions for temporary or intermediate cover over the TMF, and describe what measures will be considered to monitor stability of the TMF. Note that the Petition indicates that once compacted, tailings will not be subject to infiltration of water and intrusion of atmospheric oxygen (Petition Sec. B(3)(d), Tailings Treatment and Management Strategy, PDF p. 203); however, the PEA indicates that infiltration will occur (for example, Sec. 18.22.6, p. 152). The fact that infiltration will occur is also supported by the Greens Creek Mine Tailing Disposal Facility Expansion [Final Environmental Impact Statement](#) and Record of Decision Volume 1, published by the United States Department of Agriculture, September 2013 (EIS). Volume I, p. 3-75.
33. The PEA states that “[t]he design dry density [of tailings] may not be achievable during the winter months and may require temporary storage until spring when the thawed tailings may be compacted.” Where will the temporary storage location be? Will that storage location be lined? How will runoff and spring melt-off from uncompacted tailings be managed/treated? What additional processing will be needed to achieve the design dry density in the spring, prior to disposal in the TMF? What would be the implications for TMF stability and decant water in the long run if the moisture content of a portion of the tailings is too high for any reason? Are Alaska’s Greens Creek mine and other mines in northern climates able to meet tailings dry density requirements during the winter? How consistent are their results? If not, how do they handle winter conditions, runoff, and

spring melt-off? How are the conditions at those mines similar to and different from Maine's climate? Sec. 18.22, p. 149.

34. The PEA states that "If adequate and consistent filtering [of tailings] cannot be achieved, the system may not work." Sec. 18.22.3, p. 151. What factors could result in inadequate or inconsistent filtering of tailings? What mitigation measures can be used to overcome those factors, and what is the risk of failure?

Include in the comparative analysis report requested above, information on the performance of liners and cover materials used for the TMF at other similar mines, particularly those in northern climates. The Greens Creek Mine Tailings Disposal Facility (TDF) Expansion EIS indicates that water draining from the TDF under all alternatives, including construction of a new TDF, would exceed water quality standards and therefore would require water treatment for at least 100 years after closure. Given that the MDEP's Chapter 200 rules require that affected areas meet water quality standards without requiring active treatment as soon as practicable, but in no case greater than 10 years post-closure, what measures are reasonably available to Wolfden to achieve better results than those reported in the Greens Creek Mine TDF Expansion EIS in terms of the quality and quantity of post-closure leachate or to provide for long-term passive treatment of the leachate from the TMF? EIS, Volume I, p. 3-38. See also SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #16, p. 4.

35. The petition proposes disposal of waste chemicals and chemical spills in the tailings management facility. Appendix A, Sec. B(3)(d), PDF p. 201. The LUPC is concerned about this proposal given that the tailings management facility is intended to be a dry stack facility and recommends alternative disposal provisions be submitted such as use of a contracted special or hazardous waste disposal contractor. If Wolfden does not propose an alternative disposal method, consultation with MDEP is recommended to determine if that disposal method complies with applicable MDEP rules.
36. The TMF collection pond is sized for 43,000 m<sup>3</sup> (151,831 ft<sup>3</sup>). PEA, Sec. 18.22.6, p. 152 and 153. The updated table from Exhibit D-2 indicates a collection pond size of 172,946 ft<sup>2</sup>. That will require an average pond depth of 8.8 feet. The nearest test pit to the collection pond, RTB-8, indicates a depth to bedrock of 22 inches. How will the necessary pond depth be achieved? If only fill and berms will be used, provide typical construction specifications and cross-sections. If blasting is required, provide evidence that the pond can be adequately lined after blasting to prevent leakage and groundwater contamination. What measures can be used to ensure that groundwater intrusion is prevented and for long-term leak detection?
37. Please describe what measures are reasonably available to minimize dust emissions from the TMF and water quality impacts from deposition on nearby vegetation. SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #12, p. 4, and Comment #19, p. 7.

### **Best Reasonably Available Site**

38. The LUPC's Chapter 10 Rules state in the purpose of a D-PD subdistrict that "[a] petition to establish a D-PD subdistrict will be granted when the Commission concludes the location of the site is the best reasonably available for the proposed use and that the goals and policies of the Comprehensive Land Use Plan are served." 01-672 Chapter 10, Sec. 10.21,H,1. In considering that conclusion, the Commission will look at mining and ore processing, waste storage, and waste disposal as separate uses. Therefore, the Petition must demonstrate that the proposed locations are the best reasonably available for each of the proposed uses. Given the concerns discussed above regarding soil suitability, wastewater disposal, and the tailings management facility, additional evidence is required to demonstrate that the best reasonably available site criterion has been met. Please complete an alternatives analysis that demonstrates the proposed onsite locations for ore processing, waste storage, and waste disposal are the best reasonably available locations for these uses. In the analysis, please consider alternative locations on the Wolfden property as well as off-site locations that may be more suitable.

## Surface Water Management

39. There appear to be significant inconsistencies between tables and figures in the Water Management Plan and the PEA. For example, the water management plan uses a concentrator throughput of 1,000 t/d (Table 1) and the PEA and other materials use 1,200- 1,300 t/d (For example, PEA Sec. 16.13, p. 131 and Table 17.3, p. 140), a 30% increase over 1,000 t/d. The difference influences the water balance, material balance (and presumably the size of the TMF), truck trips per day, and the project economics. Also, in the PEA (Sec. 16.6.3, p. 114), 1,160 m<sup>3</sup>/day of water are needed for mine process activities and 1,420 m<sup>3</sup>/day of dewatering from the mine is needed. In the Water Management Plan, at most 353 m<sup>3</sup>/day are needed for mine process activities and 353 m<sup>3</sup>/d of dewatering is needed. These are 3.3-4X differences. Similarly, the 401,285 m<sup>3</sup>/yr. of service water required for the underground mine (PEA, Table 16.2) is not consistent with the service water requirements provided in the Water Management Plan. In addition, there appear to be errors and inconsistency between Table 1 of the Water Management Plan and a similar table presented in Table 17.3 in the PEA. The water management plan should be up-to-date and consistent with the PEA.
40. In the Water Management Plan, how were the rates determined for precipitation on tailings and pond, evaporation from tailings, underground mine water seepage, and precipitation from impacted surface areas? What are the rates based on and how were those numbers determined to be a reasonable estimate? Pickett Mountain Water Management Plan, p. 4.
41. The site water balance has 100% of the process water in the tailings on the TMF lost through evaporation and decant to the tailings water collection pond. This does not seem possible on a m<sup>3</sup>/d basis. Please review and update Figure 4, the Site Water Balance, of the Water Management Plan, or explain why there would be no moisture content retained in the tailings.
42. Figure 3, Site Plan Identifying Water Management Flow Directions, will need to be updated to show flow from the TMF going to the storage pond and WTP 2, and to show flow from the WTP 2 going to the concentrator and the mine for process water. Pickett Mountain Water Management Plan, p. 3.
43. Provide additional information to demonstrate that snow/ and spring melt can be adequately managed onsite. Evidence on how this is handled at other northern mines would be helpful. SWCA Report, Att. B, Linkan Memorandum dated 11/24/2020, Comment #11, p. 3.
44. Where will impacted snow be stored until it melts in the spring? Is there sufficient area for storage? Will it be lined? Where will snow melt be collected and treated? Pickett Mountain Water Management Plan, p. 6.
45. What is the basis for the volume projected for spring melt/ runoff? What would happen if all the snow melts at once during a spring rain event instead of the estimated 2-month period for snow melt? Pickett Mountain Water Management Plan, p. 6.
46. The nearest test pit to the storage pond (Facility Item ID #27), RTP-9, indicates a depth to the hydraulically restrictive layer of 10 inches and to bedrock of 20 inches. How will the necessary pond depth be achieved? If fill and berms will be used, provide typical construction specifications and cross-sections. If blasting is required, provide evidence that the pond can be adequately lined after blasting to prevent leakage and groundwater contamination. What measures can be used to ensure that groundwater intrusion is prevented and for long-term leak detection?
47. Provide a response to comments from the MDEP regarding temporary shutdowns. In particular, demonstrate that there can be enough storage volume in onsite water storage ponds or provide alternative management practices that will be available to address temporary shutdowns of mining operations and/or the wastewater treatment plant. MDEP memo, Sec. C, p. 3.

48. The PEA indicates that contaminated stormwater from storms greater than 500-year events will be discharged to and stored in the mine shaft until the storm subsides and surface storage facilities regain storage capacity. How long would stormwater need to be stored in the mine before it could be pumped out, treated, and discharged? Will the portions of the mine that will be flooded include the mineralized zone? Would the workings be flooded above the level of groundwater? How will Wolfden prevent abandonment of portions of the workings that have been flooded? Given there is hydraulic head into the mine during operation, but that water flows through under non-working groundwater conditions, what would be the impact of introducing oxygenated water into the mine on ambient groundwater quality and the safety of mine workings?

### **Fish and Wildlife**

49. Provide evidence to show that the proposed project can be constructed, operated, and closed out without unduly altering the hydrology of downgradient natural resources. If any flowing water, significant wildlife habitat or natural area of concern will receive more or less water than pre-development, provide evidence to demonstrate that there will not be undue adverse impacts on those habitats or the species depending on those habitats. Consider in this response the possibility that water could be diverted from one sub catchment area to another, and that water from mine shaft dewatering may not have reached the streams pre-development and therefore will be a source of additional volume. (See IF&W comments dated 9/11/2020, LUPC letter dated 09/12/2020, item 11(a), and MNAP comments dated 11/17/2020).
50. Please review and provide a response to comments submitted by the US FWS, in a letter dated 1/20/21, particularly those regarding potential habitat for and impacts to the Canada lynx. Provide an analysis of potential impacts; identify measures that could be used to avoid and minimize impacts to the species and habitat, including potential impacts from direct loss of habitat, traffic, pond construction, and fenced areas; describe possible measures to mitigate for any loss of habitat, including reclaiming disturbed areas to restore habitat and managing the remaining land on the parcel to improve habitat for the species; and indicate whether Wolfden commits to implementing measures needed to ensure no undue adverse impacts to the Canada lynx.

### **Water Supply**

51. How much groundwater withdrawal will be needed to support the process until there is enough water for internal recycling? Demonstrate the cone of influence for a groundwater production well and that there will not be an undue adverse impact on any nearby streams. PEA, Sec. 1.10, p. 7.
52. The PEA indicates that potable water must be drawn from an authorized site by the State of Maine to a suitable tank, and treated for organics, TSS, and metal ions. This statement is confusing. Is it meant to say that potable water must be drawn from a site authorized by the State? Water will not be provided by the State. Given that, what are the implications for the economic conclusions made in the PEA? What factors will be used to locate a potable well? Will a water treatment plant be needed? If yes, where will this be located, what is the conceptual layout, what process chemicals are typically needed, and how will backwash water and sludge be disposed of to comply with applicable State rules? Sec. 18.5, p. 144.

### **Noise Assessment**

53. The PEA indicates that a backfill plant will be constructed onsite. This represents a noise source that was not considered in the noise assessment for the petition. The noise impact assessment must be revised to include operation of the backfill plant onsite as a noise source. Sec. 16.14.2, p. 133.

### **Socioeconomic Impact Assessment**

54. Please provide a stand-alone socioeconomic impact assessment responsive to the comments provided by rbouvier consulting, dated 12/14/2020.



## Recreation

55. Please respond to comments from the Maine Bureau of Parks and Lands, in a memo dated 11/9/2020, regarding their concerns about trail connectivity and traditional recreational activities.

## Infrastructure

56. MaineDOT indicated a number of issues that will need to be addressed to ensure safe traffic movement into and out of the proposed mine. LUPC, in a letter dated 10/24/2020, requested that Wolfden respond to MaineDOT's comments. Although detailed infrastructure designs are more appropriate for the permitting phase of the project, LUPC does need to know that providing for safe traffic movement is technically feasible and financially practicable. In the letter dated 11/10/2020, Wolfden responded to the financial practicability of widening the access roads and provided road cross-sections (Soil Suitability Assessment, Engineering Details, Appendix E, PDF pp. 110-112), indicating technical feasibility to widen the roads. However, Wolfden did not address other MaineDOT recommendations including overhead lighting at the intersection of SR 11 and the access road, the deceleration lane on SR 11, the paving of the access road entrance, the extended shoulder width at the intersection of SR 11 and SR 212, nor the portable Changeable Message Signs for SR 212.
57. Wolfden has indicated during site visits that the bridge over the outlet stream for Pickett Mountain Pond, currently only one lane wide, will not be widened to support traffic from the proposed mine. Given the volume of traffic proposed, the need to truck hazardous chemicals into the site, and the co-use of the road with logging trucks, the Commission is concerned that a one-lane bridge will not provide safe and convenient traffic movement. Provide evidence that the bridge will be able to safely handle all the expected traffic or revise the proposal to indicate that the bridge will be widened to the full width proposed for expansion of the access road.

## Security

58. Please add the gates and security building back onto the Site Plan.

In addition to the specific questions and information requests above, the LUPC recommends that Wolfden review all the State agency and contractor comments attached to this letter and ensure that all relevant matters have been addressed or are addressed in the response to this letter. If you have any questions about the ongoing review of the petition or the petition process, please feel free to contact me. I can be reached during normal business hours at telephone number 207-557-2535 or by e-mail at [stacie.r.beyer@maine.gov](mailto:stacie.r.beyer@maine.gov).

Sincerely,



Stacie R. Beyer  
Planning Manager, Land Use Planning Commission

cc. Juliet Browne, Verrill Dana, LLC.

Enclosures: Contractor and Agency Comments



Celebrating 50 years of balancing the  
unique character and vital economy of  
Maine's Unorganized Territory.

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# **CONTRACTOR TECHNICAL REVIEW MEMORANDUM ON THE WOLF DEN REZONING PETITION**

## **ZP 779, Pickett Mountain Mine, T6 R6 WELS**

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**Maine Land Use Planning Commission  
Maine Department of Agriculture, Conservation and Forestry**

This document contains all the technical review memos from contractors retained by the LUPC to review certain aspects of ZP 779. Comments from each agency are bookmarked for ease in navigation.

For more information on the Petition and LUPC's review process visit the LUPC webpage at:  
[https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden\\_rezoning.html](https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden_rezoning.html).

July 22, 2020

Stacie Beyer, Planning Manager  
Maine Land Use Planning Commission  
22 State House Station  
Augusta, ME 04333-0022

***Re: Third-Party Review of the Wolfden Mt. Chase Sound Assessment***

Dear Stacie:

Tech Environmental, Inc. (TE) has completed an initial third-party review of the Wolfden Mt. Chase mineral mine and ore milling facility sound assessment. The site is on Pickett Mountain in T6R6, north of the Town of Patten in Penobscot County. I understand an underground metallic mineral mine will be developed, with above-ground processing of the ore. The principal above-ground noise sources are two high-capacity axial fans for ventilating the mine, haul trucks moving rock out the mine portal to a surface storage pile, front-end loaders to feed the rock into one or more primary crushers, ball and/or SAG mills to process the ore, and a concentrator to pulverize the material. The application states that the milling and concentrator processes will occur inside a building. No limits on operating hours are proposed, so day and night operation is assumed.

The documents I obtained for this review are as follows:

- Wolfden Mt. Chase LLC, Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit, January 26, 2020, with Amendment dated March 21, 2020.
- Wolfden Mt. Chase LLC, Revised Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit, June 30, 2020, referred to as the “Revised Petition” in this report.

**Review Standard and Decibel Limits**

The purposes of this review of the sound assessment are: (1) to determine whether it is reasonably accurate and technically correct according to standard engineering practices, (2) to determine if the petitioner has demonstrated the proposal has a reasonable likelihood of complying with DEP’s Chapter 375.10 Rules, Control of Noise, and (3) to determine if the petitioner has demonstrated the proposal has a reasonable likelihood of complying with the Commission Rules 01-672 Chapter 10, Section 10.25, F, Noise and Lighting, and will result in no undue adverse impacts to existing uses.

DEP’s Chapter 375 regulations set an hourly sound limit of 75 dBA for the property lines of the development, and sound limits for any nearby Protected Location (including seasonal residences), depend on zoning, land use, and pre-existing sound levels. In a quiet rural area, Protected Location sound limits are 55 dBA daytime and 45 dBA at night. Locally designated recreational areas are subject to daytime sound limits. The sound level limits set in the LUPC Rules for a D-PD District are listed “As determined by the Commission.” LUPC sound limits in other districts range from 55 to 70 dBA daytime and 45 to 65 dBA at night.

**Essential Elements of a Sound Assessment and a Simple Acoustic Model**

A sound assessment must contain a complete list of the significant sound-generating sources and a complete list of nearby receptors that may be adversely affected by sound from the proposed development. Predicted maximum sound pressure levels in A-weighted decibels (dBA) at the receptors should assume simultaneous operation of all sound sources. While sound assessments provided as part of Site Location of Development (SLOD) applications typically use computerized acoustic models such as Cadna/A, a simpler spreadsheet acoustic model is acceptable for rezoning applications to the LUPC, since an LUPC applicant has to obtain a SLOD permit after the site is rezoned.

The sound power level ( $L_w$ ) of the equipment operating on the project site directly determines the predicted off-site sound pressure levels ( $L_p$ ) in decibels<sup>1</sup> at the nearby receptors, such as residences and recreational areas. The strength of a sound source is typically given as a sound power level  $L_w$  in dBA, or alternatively as a reference sound pressure level at a reference distance, say of 100 feet. For a source-to-receptor distance  $D$  in feet, the simple hemispherical wave-spreading model, with ground reflection, states:

$$L_p = L_w - 20 \cdot \log D + 2.5$$

When the sound source is specified using a reference sound pressure level  $L_o$  at reference distance  $D_o$ , the wave-spreading model states:

$$L_p = L_o - 20 \cdot \log [D_o/D] = L_o - 10 \cdot \log [D_o/D]^2$$

Thus, sound pressure level attenuates with distance according to 10 times the logarithm (base 10) of the square of the quantity of the reference distance divided by the source-receiver distance.

For example, if the reference sound level is  $L_o = 90$  dBA at  $D_o$  of 100 feet, then the sound level  $L_p$  at 200 feet from the source is  $L = 84$  dBA. This illustrates that for an ideal point source of sound, the sound pressure level is reduced 6 dBA for every doubling of distance in the “far field.” The far field

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<sup>1</sup> The sound power level is defined as  $10 \cdot \log_{10} (W/W_o)$ , where  $W$  is the sound power of the source in Watts and  $W_o$  is the reference power of  $10^{-12}$  Watts. The sound pressure level is defined as  $20 \cdot \log_{10} (P/P_o)$ , where  $P$  is the measured root-mean-square (rms) sound pressure and  $P_o$  is the reference sound pressure of 20 micro-Pascals. The sound power level (energy density) and sound pressure level (what we hear) are not the same, yet both are reported using a decibel levels scale. An acoustic model uses the sound power level of a source along with other assumptions to calculate the sound pressure level heard at a receptor located a certain distance from the source.

region is defined as starting at a distance where the actual three-dimensional source can reasonably be approximated as a point source, and is generally at least two times the longest physical dimension of the source. The region closer to the source is termed the “near field” and in that region the simple wave-spreading model (referred to by the applicant as the inverse square law) is not accurate.

### **The Applicant’s Sound Source Inventory**

Pages 25 and 26 of the Revised Petition lists two ventilation fans, each with a reference sound pressure level of 110 dBA, two haul trucks with reference levels of 88 dBA, and one front-end loader with a reference sound level of 85 dBA. Though not stated in the text, the table on page 27 reveals the reference distance for all of these source levels is assumed to be 1 foot. The applicant then states the ventilation fans can be “dampened up to 20% to operate at 88 dB”. The applicant predicts sound levels at two receptors: the nearest property line (3000 feet south) and the nearest residence (8,850 feet northeast) using the inverse square law.

There are three problems with the sound source inventory. First, several important noise sources have been left out of the calculations, namely the rock crushers and any on-site generator sets. The high-capacity axial fans used to ventilate underground mines typically generate a flow rate of 150,000 to 300,000 cfm and have a sound power level of  $L_w = 122$  to 125 dBA, which is equivalent to a reference sound pressure level of 86 to 88 dBA at a distance of 100 feet.<sup>2</sup> Rock crushers (jaw and cone) have sound power levels of  $L_w = 116$  to 126 dBA, while generator sets (unshielded) have sound power levels in the  $L_w = 120$  to 129 dBA range.<sup>3</sup> The Revised Petition states there will be rock crushers, and these need to be included in the source inventory. While no mention is made of a gen-set, it is reasonable to assume that there will need to be at least one gen-set on site, for safety reasons, to power the ventilation fans when utility power is interrupted and possibly for a period of time before the utility line power is operational. Thus, the sound from one or more gen-sets needs to be included as well. Finally, given the throughput of material from the mine, it seems likely there will be more than two haul trucks operating on the site and possibly more than one front-end loader. The maximum amount of such equipment needs to be assumed in the sound assessment.

The second problem with the source inventory is that the reference sound level for the ventilation fans corresponds to a location in the near field; that is, the Revised Petition assumes a sound pressure level of 110 dBA at a distance of only 1 foot from each of the two large ventilation fans. Any reference sound level for such a large source has to be made at a minimum distance of at least 100 feet to ensure it is in the far field. A near field measurement, such as the one used by the applicant, significantly understates the acoustic power of the fans because at a distance of only one foot the immense radiating surface of the source is not counted. As noted above, ventilation fans used for underground mines typically have a sound power level of  $L_w = 122$  to 125 dBA, which is equivalent to a reference sound pressure level of 86 to 88 dBA at a distance of 100 feet. By contrast, the Revised Petition on page 27 states the ventilation fans would produce a sound pressure level of only 70 dBA at 100 feet, which is 97-98% lower in terms

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<sup>2</sup> Dobson, A., “Acoustic Directivity of Mine Ventilation Systems, HGC Engineering, 15<sup>th</sup> North American Mine Ventilation Symposium, Blacks burg, VA, June 2015.

<sup>3</sup> Sound source measurements by Tech Environmental, Inc. at several mineral materials processing and industrial plants in the Northeast U.S.

of sound energy. Thus, the applicant has significantly understated the sound power of the ventilation fans.

The third problem with the sound source inventory is the applicant's assumption that when fan noise is "dampened up to 20%" that the reference sound pressure level is simply 80% of the number 110, or 88 dBA. The applicant is incorrectly assuming the decibel scale is linear, instead of logarithmic. Sound dampening on a large axial fan that reduced sound power by 20% would lower the reference sound pressure level by 1 dBA, not 22 dBA.

In summary, the sound source inventory needs to be redone to include all significant sources, including rock crushers and gen-sets, and a full count of haul trucks and loaders that will be on the site. Either accurate sound power levels, or accurate reference sound pressure levels, need to be assigned to each source. In the latter case, the reference distance must be at least 100 feet. Finally, any source attenuation must use a correct logarithmic calculation and should be documented with a technical reference or manufacturer guarantee.

### **The Applicant's Receptor Inventory**

Page 27 of the Revised Petition lists only two receptors for the sound assessment: the nearest project property line (3,000 feet south of the ventilation fans) and the nearest residence on the south side of Pleasant Lake (8,850 feet northeast of the ventilation fans). Since recreational use of nearby ponds is not restricted, the receptor list needs to also include Pickett Mountain Pond, Tote Road Pond, Grass Pond, Mud Lake and Pleasant Lake because the applicant needs to demonstrate no undue adverse impacts to existing recreational uses at these locations. To ensure all six nearby residences are analyzed for impacts, a receptor should be added for one of the residences on the north side of Pleasant Lake. Finally, we note there is a list of designated recreational resources on Page 50 of the Revised Petition, and to ensure a complete record the applicant should include as sound receptors Lane Brook Pond, Green Mountain Pond, Upper Shin Pond, and the closest edge of the Katahdin Woods and Waters National Monument.

### **Summary and Recommendations**

The sound assessment in the Revised Petition is not accurate and technically correct according to standard engineering practices, as discussed above. As a result, we cannot determine if the petitioner has demonstrated the proposal has a reasonable likelihood of complying with DEP's Chapter 375.10 Rules, Control of Noise, and with the Commission Rules 01-672 Chapter 10, Section 10.25, F, Noise and Lighting. Without an accurate and complete sound assessment, there is no basis for determining whether the proposed project will result in no undue adverse impacts to existing residential and recreational uses.

While the simple wave-spreading acoustic model (referred to as the inverse square law in the Revised Petition) is acceptable for the sound assessment portion of the Petition, there are significant deficiencies in the source inventory and list of receptors.

The sound assessment should be redone with the following changes:

- 1) The sound source inventory should be redone to include all significant sources, including rock crushers and gen-sets, and a full count of haul trucks and loaders that will be on the site. Either accurate sound power levels, or accurate reference sound pressure levels, need to be assigned to each source. In the latter case, the reference distance must be at least 100 feet. Finally, any source attenuation must use a correct logarithmic calculation and should be documented with a technical reference or manufacturer guarantee.
- 2) The list of receptors, for which sound pressure levels are predicted, should be expanded to include Pickett Mountain Pond, Tote Road Pond, Grass Pond, Mud Lake, Pleasant Lake, Lane Brook Pond, Green Mountain Pond, Upper Shin Pond, and the closest edge of the Katahdin Woods and Waters National Monument, as well as one residence on the north side of Pleasant Lake.
- 3) For each receptor where a maximum sound level is predicted, an applicable sound level limit should be listed as the benchmark for determining whether there is an undue adverse impact. Our recommendation for these limits draw upon DEP's Chapter 375.10 Rules, namely 75 dBA for the industrial project property lines, 45 dBA for existing residential use, and 55 dBA for existing (daytime) recreational use.

Please call if you have any questions.

Sincerely yours,

TECH ENVIRONMENTAL, INC.

A handwritten signature in black ink that reads "Peter H. Guldberg". The signature is written in a cursive style with a large, stylized initial 'P' and a long, sweeping underline.

Peter H. Guldberg, INCE, CCM  
Senior Consultant  
4575/Letter Report July 22 2020

December 8, 2020

Stacie Beyer, Planning Manager  
Maine Land Use Planning Commission  
22 State House Station  
Augusta, ME 04333-0022

***Re: Third-Party Review of the Wolfden Pickett Mountain Sound Assessment***

Dear Stacie:

Tech Environmental, Inc. (TE) has completed a third-party review of the Wolfden Pickett Mountain Noise Assessment Report prepared by Wood Environment and Infrastructure Solutions, Inc., on behalf of their client Wolfden Resources Corporation (Wolfden), and dated November 5, 2020. The Wood Environment (WEIS) report addresses issues raised in our July 22, 2020 initial peer review report to the Commission.

**Review Standard and Decibel Limits**

The purposes of this review of the WEIS sound assessment are: (1) to determine whether it is reasonably accurate and technically correct according to standard engineering practices, (2) to determine if the petitioner has demonstrated the proposal has a reasonable likelihood of complying with DEP's Chapter 375.10 Rules, Control of Noise, and (3) to determine if the petitioner has demonstrated the proposal has a reasonable likelihood of complying with the Commission Rules 01-672 Chapter 10, Section 10.25, F, Noise and Lighting, and will result in no undue adverse impacts to existing uses.

DEP's Chapter 375 regulations set an hourly sound limit of 75 dBA for the property lines of the development, and sound limits for any nearby Protected Location (including seasonal residences), depend on zoning, land use, and pre-existing sound levels. In a quiet rural area, Protected Location sound limits are 55 dBA daytime and 45 dBA at night. Locally designated recreational areas are subject to daytime sound limits. The sound level limits set in the LUPC Rules for a D-PD District are listed "As determined by the Commission." LUPC sound limits in other districts range from 55 to 70 dBA daytime, and from 45 to 65 dBA at night. The WEIS report concludes the project site is in a quiet area and thus nearby protected Locations have sound limits of 55 dBA daytime, and 45 dBA nighttime.

**The Applicant's Sound Source Inventory**

Pages 2 and 3 of the WEIS report list the above-ground, outdoor sound-producing sources, along with the expected sound power levels of each piece of equipment. For the proposed mining operation (24 hours/day) and proposed production rates, this is reasonable and complete sound source inventory. The



sound power levels are referenced to several sources: manufacturer's data, the RCNM User's Guide for construction equipment, and the ASHRAE Handbook. All sound power numbers were checked and found to be reasonable. The loudest sources are the Caterpillar gen-sets, the rock crusher and the mine ventilation fans.

### **The Applicant's Receptor Inventory**

Pages 3 and 4, and Figure 1, of the WEIS report present the 13 discrete receptor points used in the sound assessment. These include the nearest residential properties with seasonal dwellings on the south and north shores of Pleasant Lake, the nearest daytime recreational land uses, primarily ponds and lakes (Pickett Mountain Pond is the closest recreational use), and the project property lines in the four cardinal directions. The receptor set is reasonable and includes the locations where maximum sound impacts would occur. Since the acoustic modeling, discussed below, included a finely-spaced grid of additional receptors, sound levels were actually predicted at all locations within approximately three miles of the mine.

### **Acoustic Modeling Methodology**

Sound levels from the mining operation were predicted using the Cadna\A acoustic model, corresponding to the International Standard ISO 9613-2 sound propagation method. The modeling assumed all sources were operating simultaneously, and accounted for the effects of source directivity, terrain, and sound attenuation with distance, air absorption and ground absorption. This is the proper tool for accurately evaluating sound impacts.

The WEIS report does not list the Ground Factor  $G$  assumed in the Cadna\A model run. An overall assumption of  $G=0.5$  (mixed ground conditions), and  $G=0$  (hard ground surface) for the active mining area would be appropriate in this type of sound assessment. We do not know the actual assumptions made by WEIS in the model. In the worst case, if they assumed an overall absorptive surface ( $G=1$ ), it is possible that sound levels were under-estimated by 1 to 2 dBA. We also note that the modeling results do not include a sound power level uncertainty factor, and a typical uncertainty assumed in most such sound assessments is 2 dBA. Thus, in evaluating the reported model results, the possibility exists that the reported sound levels should be 3 to 4 dBA higher than what is listed in Table 6-1 of the WEIS report.

### **Acoustic Modeling Results**

The predicted sound levels at the residential, recreational and property line receptors are presented in Table 6-1 on page 6 of the WEIS report. The highest predicted sound level at a residential location is 40 dBA (dwelling on the south side of Pleasant Lake), which is 5 dBA below the nighttime sound limit for a quiet area of 45 dBA. The highest predicted sound level at a recreational receptor is 47 dBA (Pickett Mountain Pond), which is 8 dBA below the daytime recreational sound limit of 55 dBA. The highest predicted property line sound level is 46 dBA (south property line), which is 29 dBA below the property line sound limit of 75 dBA. Whereas all predicted sound levels at the receptors are at least 5 dBA below the applicable sound limits, even if 3 to 4 dBA are added to the results to account for possible uncertainties regarding sound power levels and the modeling assumptions, the resulting worst case sound levels are still below the sound limits. Thus, we concur that the modeling results presented in the

WEIS report demonstrate the Project operations are expected to meet applicable DEP sound limits for both daytime and nighttime periods.

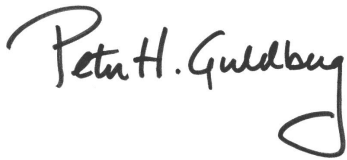
**Summary and Recommendations**

We conclude that the WEIS sound assessment: (1) is reasonably accurate and technically correct according to standard engineering practices, (2) the petitioner has demonstrated the proposal has a reasonable likelihood of complying with DEP’s Chapter 375.10 Rules, Control of Noise, and (3) petitioner has demonstrated the proposal has a reasonable likelihood of complying with the Commission Rules 01-672 Chapter 10, Section 10.25, F, Noise and Lighting, and will result in no undue adverse impacts to existing uses.

Please call if you have any questions.

Sincerely yours,

TECH ENVIRONMENTAL, INC.



Peter H. Guldberg, INCE, CCM  
Senior Consultant  
4575/Letter Report Dec 8 2020



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Portland, ME 04103  
[rachel@rbouvierconsulting.com](mailto:rachel@rbouvierconsulting.com)  
207-272-8692

To: Stacie Beyer, Land Use Manager, Land Use Planning Commission  
From: Rachel Bouvier, rbouvier consulting  
Re: Review of socioeconomic analysis, Wolfden Proposal  
December 14, 2020

## **Background**

The Maine Land Use Planning Commission is responsible for planning and zoning within the unorganized and deorganized territories of Maine. The guiding principles of the Commission, found on its website, include the following (among others):

- To encourage appropriate residential, recreational, commercial and industrial land uses;
- To prevent residential, recreational, commercial and industrial uses detrimental to the long-term health, use and value of these areas and to Maine's natural resource-based economy; and
- To preserve public health, safety and general welfare (Land Use Planning Commission 2013a)

In accordance with these principles, Chapter 12 of the Commission's Rules governs metallic mining and exploration activities within the Commission's territory. Specifically, any requests for rezoning for these purposes must include a detailed description of socio-economic impacts resulting from those activities, including, but not limited to, "impacts to regional economic viability, Maine's natural resource-based economy, local residents and property owners, ecological and natural values, recreation, and public health, safety, and general welfare" (Maine Land Use Planning Commission 2013b).

In January of 2020, Wolfden Mt. Chase LLC ("Wolfden") submitted a rezoning petition to the Land Use Planning Commission. As their petition falls under Chapter 12, Wolfden was required to submit a socio-economic analysis to the Commission. The purpose of this memo is to review Wolfden's application, ascertain whether the material submitted in the petition is sufficient and includes the necessary level of detail for an accurate socioeconomic impact assessment of the proposed development, and provide recommendations. Our primary guidance in assessing Wolfden's petition were notes resulting from a scoping meeting dated September 26, 2019, at which representatives from Wolfden, and the Commission were in attendance. At that meeting, Amanda Rector, the Maine State Economist, helped to develop the guidance for the socioeconomic impact analysis. We refer to those notes as the "Scoping Document" in what follows.

## **Justification**

A socio-economic analysis is not merely a cost assessment, nor is it a projection of potential employment without justification. A well done socio-economic assessment includes a baseline description of the socio-demographic characteristics of the area (including statistical descriptions of the existing level of economic development, labor force characteristics, educational opportunities, housing, and public health), and a description, based on rigorous and well-supported data analyses, of how the proposed project will affect the area in both the short term and the long term. The socio-economic analysis should address distributional impacts as well as absolute impacts. For example, if the employment generated is expected to go to one sub-group of the population (e.g., gender, age group, or ethnicity), that information is as important as the creation of the jobs in the first place.

A socio-economic analysis is a systematic process used to “identify and evaluate the potential socio-economic and cultural impacts of a proposed development on the lives and circumstances of people, their families, and their communities” (Mackenzie Valley Environmental Impact Review Board 2007). Ideally, then, it should not only identify positive and negative effects of a proposed project on a community (and the scale of those impacts) but recommend ways to mitigate any negative expected effects and enhance any positive ones. As such, it should be considered an aid in planning, adaptive management, and risk avoidance.

## **Review of Wolfden’s Socio-Economic Analysis**

The materials presented in Wolfden’s proposal do not meet the requirements laid out in the Scoping Document. While some of the requested data are provided, many of the items requested are not addressed to the degree of rigor necessary for a socio-economic analysis, or are not addressed at all. Furthermore, those items that are addressed are done so in several different places in the proposal, rather than in one location. This complicated the review. We organized our review based on the Scoping Document, which was roughly organized in three sections: description of geographic area; social and economic baseline conditions; and economic and social impacts of development. In the table in the Appendix, we list each requested item in the Scoping Document, its location within Wolfden’s proposal (if addressed), the criteria included in the Scoping Document, our assessment of the adequacy of the information given, and how Wolfden might address any inadequacies.

## **Conclusion and Recommendations**

We recommend that Wolfden submit a new, stand-alone socioeconomic analysis that clearly addresses all items identified in the Scoping Document and in the table in the Appendix. As noted above the analysis should, at a minimum, include:

## Review of Socio-Economic Analysis, Wolfden Proposal

- A description of the geographic area.
- A baseline description of the socio-demographic characteristics of the area (including statistical descriptions of the existing level of economic development, labor force characteristics, educational opportunities, housing, and public health)
- A description, based on rigorous and well-supported data analyses, of how the proposed project will affect the area in both the short term and the long term.
- The analysis should address distributional impacts as well as absolute impacts.
- The analysis should recommend ways to mitigate any negative expected effects and enhance any positive ones.

Upon receipt of the requested information, we will review the analysis, provide feedback and recommendations. This review may include the need to request further documentation from Wolfden.

## References

Mackenzie Valley Environmental Impact Review Board. 2007. "Socio-Economic Impact Assessment Guidelines."

Maine Land Use Planning Commission. 2013a. "About Us." *Land Use Planning Commission*. Retrieved December 15, 2020 (<https://www.maine.gov/dacf/lupc/about/index.shtml>).

Maine Land Use Planning Commission. 2013b. "Chapter 12: Land Use District Requirements For Metallic Mineral Mining."

**Appendix: Itemized Review of Socio-Economic Analysis, Wolfden Proposal**

<b>1. Geographic Area (“Communities within and adjacent to the Commission’s jurisdiction”)</b>				
	<i>Item</i>	<i>Application Location</i>	<i>Criteria</i>	<i>Remedy</i>
a.	Location of designated state service areas (determined by Municipal Planning Assistance Program)	This item is not addressed in the application.	<p>The 2019-09-26 Scoping Document, page 2 notes:</p> <p><i>“The geographic area for regional socioeconomic analysis must include minor civil divisions within the LUPC service area as well as organized towns and plantations reasonably expected to be affected by the project. This geographic level of analysis is distinct from analyses at the county and state levels. The geographic area chosen for the analysis should be well supported in the petition.”</i></p> <p>This item is noted as information that will help determine the geographic area noted above.</p> <p>Regional service centers are regional economic hubs that will likely be impacted by economic development in the region</p>	<p>Determine the local service centers for each area.</p> <p>Resource:</p> <p><a href="https://www.maine.gov/dacf/municipalplanning/service_centers.shtml">https://www.maine.gov/dacf/municipalplanning/service_centers.shtml</a></p>



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<b>b.</b>	Location of designated LUPC rural hubs	This item is not addressed in the application.	See row 1a.	Provide the location of designated LUPC rural hubs in the impact area
<b>c.</b>	List of local economic development agencies with areas/regions served	This item is not addressed in the application.	See row 1a.  This item is noted as information that will help determine the geographic area noted above.	Provide a list of economic development agencies in the impact area.
<b>d.</b>	Typical commuting distances in the area	This item is not addressed in the application.	See row 1a.  Commuting distances provide information on multiple issues including infrastructure impacts, the geographic area an employer may draw from, and other economic impacts.	Provide information on average commuting distances in the region.
<b>e.</b>	Federally determined opportunity zones in the area (if applicable)	This item is not addressed in the application.	See row 1a.	Provide a list of federally determined opportunity zones in the area.

Review of Socio-Economic Analysis, Wolfden Proposal

f,	Maps of State, county, and local transportation routes used during each phase of the project	Attachment J  The information requested is partially provided but is not broken down by project phase.	See row 1a.  This information is also needed to assist with evaluating economic impacts to nearby communities.	Provide the requested information broken down by project phase.
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<b>2. Baseline Statistics</b>				
	<i>Item</i>	<i>Application Location</i>	<i>Criteria</i>	<i>Remedy</i>
a.	Primary industry and location of existing businesses within the regional labor market area	Partially addressed in Attachment O.  Attachment O includes data on the distribution of employment, but not on wages or output. Data on location of existing businesses are not provided.	The 2019-09-26 Scoping Document, page 2 notes:  <i>“Significant social and economic baseline variables should include, but are not limited to, information on the following:</i>  <ul style="list-style-type: none"> <li>● <i>Existing Businesses (especially type and location)</i></li> <li>● <i>Tourism and Recreation</i></li> <li>● <i>Property Values</i></li> <li>● <i>Employment</i></li> <li>● <i>Human Demographics – population, density, age-structure, family structure</i></li> <li>● <i>Regional public health”</i></li> </ul> This request is part of establishing the	Provide a breakdown of the primary industries and geographic location of existing businesses within the regional labor market area. Data should include distribution of wages and output by industry as well as employment. Include information on recent trends in economic activity

Review of Socio-Economic Analysis, Wolfden Proposal

			baseline statistics as outlined in the scoping document.	
<b>b.</b>	Data on existing tourism to the region, including any statistics on outdoor recreation (including type and location)	Partially addressed on page 27, Section 19, and Attachment L  The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.	See row 2a.	Provide data on existing tourism to the region in order to determine a baseline.  Data for the Maine Highlands region (as defined by the Maine Office of Tourism) is sufficient if finer detailed statistics are not available.
<b>c.</b>	Housing statistics: Median and average rent, age of housing stock, occupancy rates, rent to income ratio (Houlton Labor Market Area). Include data on recent trends.	Mentioned but not fully addressed in Appendix A, Attachment O  The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.	See row 2a.	Provide current housing statistics for the Houlton Labor Market Area in order to determine a baseline.  Attaching a link to the Maine Housing website is not sufficient.
<b>d.</b>	Labor force characteristics: levels of training/education, labor force participation rate, number and percentage of seasonal versus year-round jobs, ethnicity, age breakdown (Houlton Labor Market Area). Include data on recent trends.	Partially addressed in Appendix A, Attachment O  The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.	See row 2a.	Provide these data in order to determine a baseline.

Review of Socio-Economic Analysis, Wolfden Proposal

<p><b>e.</b></p>	<p>Sociodemographic variables: population, density, age-structure, family structure, number of persons per household, educational attainment, poverty rate, unemployment rate (Houlton Labor Market Area). Include data on recent trends.</p>	<p>Partially addressed in Appendix A, Attachment O.</p> <p>The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.</p>	<p>See row 2a.</p>	<p>Provide the requested statistics in order to determine a baseline.</p>
<p><b>f.</b></p>	<p>Public health statistics: proportion of children living under the poverty level; number and percent of people without health insurance; rates of cancer and heart disease; obesity and smoking rates (Houlton Labor Market Area). Include data on recent trends.</p>	<p>Partially addressed in Appendix A, Attachment O</p> <p>The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.</p>	<p>See row 2a.</p>	<p>Provide public health statistics in order to determine a baseline.</p>

<b>3. Economic and social impacts of development:</b>				
	<b>Item</b>	<b>Application Location</b>	<b>Criteria</b>	<b>Remedy</b>
a.	Breakdown of the number, occupational title, and type of jobs expected to be created in each phase of the project, along with the median wage in each affected industry in the Houlton Labor Market; percentage of jobs reasonably expected to be local (along with clear justification for that expectation); comparison of skills needed in each job to profile of labor market in area	<p>Partially addressed in Appendix A, Attachment O</p> <p>The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.</p> <p>There is no detailed analysis of economic impacts. The cost modeling provided in section B(3)(a) is not sufficient for a socio-economic analysis (although some of the assumptions contained in the model may be relevant).</p>	<p>The 2019-09-26 Scoping Document, pages 2-3 note</p> <p><i>“Use the baseline information and data to inform analyses of the project impact.</i></p> <p><i>Analyses should go beyond narrative projections and should be based on rigorous analysis of data and comparisons with similar projects in similar areas to the extent reasonably possible.</i></p> <p><i>Analyses should include, but not be limited to:</i></p> <ul style="list-style-type: none"> <li>- <i>Descriptions of the jobs created for phase of the project, including a breakdown of job types/quality with associated wages and benefits as well as the source of labor (migrant, local, non-local expert, etc.)</i></li> <li>- <i>Descriptions of the materials used in each phase of the project and their sources</i></li> <li>- <i>Analysis of the economic impacts of transportation during each phase of the project. Describe the route(s) for</i></li> </ul>	<p>Provide the requested information for each phase of the project with clear justification based on rigorous data analysis. Include direct, indirect, and induced effects.</p>

			<p><i>moving materials and the businesses located along each route. Describe the type and frequency of transportation used and the population living along the route. Provide information on impact to road maintenance from transportation associated with the project.</i></p> <ul style="list-style-type: none"> <li><i>- Describe any economic incentives that the project will use, whether local, state, or federal. Examples include tax credits, grants, opportunity zones, and tax increment financing (TIF).</i></li> <li><i>- Analyze potential economic impacts on local businesses and tourism during each phase of the project</i></li> <li><i>- Analyze the effect of the project on property values</i></li> <li><i>- Analyze the effects of transportation on public health, safety, and welfare, including the effects of noise, pollution, and traffic type and frequency</i></li> <li><i>- Analyze the potential socioeconomic effects of any air, water, and soil pollution generated by all phases of the project, include socioeconomic effects on site (e.g., to health of workers) and in the broader region (e.g., public health)</i></li> <li><i>- Analyze in general terms the</i></li> </ul>	
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Review of Socio-Economic Analysis, Wolfden Proposal

			<i>socioeconomic impacts of the project to the County and State”</i>	
<b>b.</b>	Description of planned job training programs, including number and frequency, intended audience, as well as any transitional assistance for workers post-closure.	Partially addressed in Appendix A, Attachment O  The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.	See row 3a.	Provide more detail as to the planned training program, including planned outreach to difficult to reach populations who might benefit. Include descriptions and outcomes of previous training programs.
<b>c.</b>	List of consumables needed in each phase of operation (categorized); what percentage of each item available from Maine sources; percentage of each item that is expected to be sourced locally	Partially addressed in Appendix A, Attachment O  The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.  No analysis of the few values provided was completed. The petitioner must have made assumptions about the type, number, and local percentage of consumables anticipated in each phase of operation; those assumptions must be stated clearly.	See row 3a.	Clearly provide the requested information. Justify any assumptions. If a product is not available locally, or is available at low levels, consider initiatives to increase local procurement.

Review of Socio-Economic Analysis, Wolfden Proposal

<b>d.</b>	List of services needed in each phase of operation (categorized); what percentage of those services is available from Maine sources; percentage of each item that is expected to be sourced locally	<p>Partially addressed in Appendix A, Attachment O</p> <p>The report currently either does not provide this information or does not provide it at the level needed to conduct a socio-economic analysis.</p> <p>The petitioner must have made assumptions about the type, number, and local percentage of services anticipated in each phase of operation; those assumptions must be stated clearly.</p>	See row 3a.	Clearly provide the requested information. Justify any assumptions. If a product is not available locally, or is available at low levels, consider initiatives to increase local procurement.
<b>e.</b>	Population and businesses along the routes used for moving materials	This information does not appear to be provided.	See row 3a.	Provide the requested information.
<b>f.</b>	Description of any economic incentives that the project will use, whether local, state, or federal (examples include tax credits, grants, opportunity zones, and tax increment financing)	This information does not appear to be provided.	See row 3a.	Any financial support from local, state, or federal sources must be clearly stated.
<b>g.</b>	Analysis of how project is likely to affect local businesses, tourism, and recreation during each phase of the project, including any assumptions made and a plan to monitor these impacts	Currently not addressed	See row 3a.	Clearly state how project is likely to affect each of the stated areas for the life of the project, as well as any expected long-term effects. Analysis should be based upon rigorous data analysis.



Review of Socio-Economic Analysis, Wolfden Proposal

				All assumptions should be clearly stated and justified.
<b>h.</b>	Analysis of how project is likely to affect housing prices in the Houlton Labor Market area during each phase of the project, including any assumptions made regarding number and type of transactions	Currently not addressed	See row 3a.	Clearly state how project is likely to affect housing prices for the life of the project, as well as any expected long-term effects. Analysis should be based upon rigorous data analysis. All assumptions should be clearly stated and justified.
<b>i.</b>	Analysis of how the project is likely to affect economic growth in the Houlton Labor Market Area, Penobscot County, and State.	Currently not addressed	See row 3a.	Clearly state how project is likely to affect economic growth (compared to baseline trends) in each of the stated regions for the life of the project, as well as any expected long-term effects. Include direct, indirect, and induced effects. Analysis should be based upon rigorous data analysis. All assumptions should be clearly stated and justified.



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January 29, 2021

Stacie R. Beyer  
Planning Manager  
State of Maine, Department of Agriculture, Conservation & Forestry  
Land Use Planning Commission  
22 State House Station  
Augusta, Maine 04333-0022

**Re: Third-Party Review of Technical Feasibility and Financial Practicability Assessment,  
Pickett Mountain Mine Project, Wolfden Mt. Chase LLC Rezoning Petition / SWCA  
Project No. 61402**

Dear Ms. Beyer:

SWCA Environmental Consultants (SWCA) has undertaken a third-party peer review for technical feasibility and financial practicability of the Wolfden Mt. Chase LLC (Wolfden) Pickett Mountain Project in support of a State of Maine Land Use Planning Commission (LUPC) application to rezone a portion of Penobscot County to allow for development of an underground mineral deposit.

This letter report presents the results of SWCA's review. Should you have any questions pertaining to the information provided, please contact me at (720) 840-4703 or via email at [Andrew.Harley@swca.com](mailto:Andrew.Harley@swca.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Andrew Harley".

Andrew Harley, Ph.D.  
Mining Director  
Senior Geochemist/Senior Soil Scientist

Attachments

## **OBJECTIVES**

The following two documents were submitted by Wolfden in support of the LUPC rezoning application.

- The petition submitted by Wolfden to LUPC.<sup>1</sup>
- A National Instrument 43-101-compliant Preliminary Economic Assessment (PEA).<sup>2</sup>

The documents were reviewed for feasibility and impacts of the mining operation. Based on the level of data associated with these reports, the documents were reviewed to identify, based on collective experience in the mining industry and working on similar projects, issues that may affect the technical and financial viability of this project. The work did not include detailed design reviews and engineering analysis but rather an assessment based on a general understanding of mining principles.

The following areas were assessed to identify potential areas that may put the project at risk.

- Mining engineering: general mining strategies were reviewed, especially those pertaining to impact to land development, including tailings management, transportation and infrastructure, and general mine development strategies.
- Mine dewatering: evaluation of available groundwater data and adequacy of water availability and impacts to processing and water treatment.
- Management of mine waters and process waters: water issues impacting mine viability include variation in predicted and actual water volumes and underestimating water treatment costs. Volcanogenic massive sulfide (VMS) can have potential contaminants of concern, especially arsenic, and potential issues related to tailings management, water management, and impact on concentrate.
- Reclamation and closure: the potential closure issues were reviewed, including water management, habitat restoration, and long-term monitoring and management.
- For financial practicability, the following potential impacts to project viability were reviewed.
  - Infrastructure costs: plans to use existing infrastructure were reviewed to ensure sufficiency and that plans for new infrastructure are realistic. Expected capital and operating costs were also reviewed to ensure that they are reasonable. Specific focus was given to water and energy as the most critical key supplies to evaluate.
  - Marketing: the economic and financial viability of the project will depend on both a) the ability of the owner to sell the products to customers, which will be determined by the quality (chemical composition) of each of the products and the logistics required to deliver to market; and b) the metal prices for those products. Data reviewed included the metal products that the project will produce, and the quality of each of the planned metal products was assessed to confirm the marketability of each.
  - Project schedule: the project schedule will depend on the petitioner coordinating and performing, directly or through contractors, the different development and construction activities necessary for the project to achieve commercial production. The mine development strategy and high-level schedule were reviewed in terms of scope of

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<sup>1</sup> Wolfden Mt. Chase LLC (Wolfden). 2020. *Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit*. Thunder Bay, Ontario: Wolfden Mt. Chase LLC.

<sup>2</sup> Wolfden Mt. Chase LLC (Wolfden). 2020. *Preliminary Economic Assessment, Pickett Mountain Project, Penobscot County, Maine, USA*. Thunder Bay, Ontario: A-Z Mining Professionals Ltd. Effective date September 14, 2020; filing date October 29, 2020.

activities, schedule and sequencing for the individual activities, and overall project timeline.

- Project economics: the financing plan and other evidence presented by the petitioner will indicate the expected financial practicality of the project. The macroeconomic, technical, and commercial assumptions components of the financial model were reviewed, as were the financing assumptions used by the petitioner in order to present the financial practicality of the project in the petition.
- Project financing: current conditions of the junior mining market will be used in conjunction with the requirements of the mining financing community to make an assessment of the challenges and opportunities for the petitioner to achieve either a divestment to a major mining company or to secure financing that would enable the project to become a mine.
- Socioeconomic considerations: concurrent with the review of the financial model in the project economics (above), estimates provided by the petitioner were reviewed for reasonableness in the event the project becomes a mine.

## **TECHNICAL TEAM AND APPROACH**

The following senior-level review teams were engaged to provide review and evaluation of the project.

- SWCA Environmental Consultants (SWCA)
- Engineering Analytics, Inc.
- Linkan Engineering (Linkan)
- Montgomery & Associates
- Sunrise Americas LLC

Each team was provided with the documents to provide an assessment of the project overall and for their specific disciplines. Mining engineering strategy was reviewed primarily by Engineering Analytics. Linkan was the primary lead for water management, with support from SWCA on the geochemical and water balance. Montgomery & Associates reviewed mine dewatering with input from Linkan and SWCA regarding water balance. Sunrise Americas reviewed the financial viability of the mine.

Technical memoranda were prepared following independent review of the documents by each team and were used as a basis for this overall assessment report. Team technical memoranda are attached as follows.

- Attachment A: Review of the PEA for the Pickett Mountain Project, Engineering Analytics
- Attachment B: Wolfden Mining Rezoning Petition and Preliminary Economic Assessment Technical Review, Linkan Engineering
- Attachment C: PEA Review, Montgomery & Associates
- Attachment D: Assessment of Geochemistry, Soils, and Reclamation, Pickett Mountain Project, Wolfden Mt. Chase, SWCA
- Attachment E: Assessment of Financial Practicality, Sunrise Americas

## PROJECT DESCRIPTION AND CONTEXT

Pickett Mountain is a high-grade base metal deposit primarily composed of zinc, lead, copper, silver, and gold as economic minerals of interest. The intended process is to excavate valuable in-situ minerals (ore) from underground via drilling and blasting into manageable-sized fragments that can be loaded into underground trucks and hauled to the surface to be stored on a temporary stockpile for milling (crushing and grinding to a fine dust) and concentrating. Milling and concentrating will occur continuously at a nominal rate of 1,200 tonnes per day (tpd). The concentrator will use flotation technology to separate the valuable minerals (concentrate) from the non-valuable minerals (tailings). Three concentrates will be produced in sequence—copper, lead, then zinc—with each dewatered and stored separately for transportation to a selected smelter outside the state of Maine. Transportation will be facilitated using truck and trailer combinations with optimized capacity for the amount of concentrate produced. Waste byproduct (tailings) will be dewatered and thickened for delivery via trucks and dozers to an approved Tailings Management Facility (TMF) where the tailings can be shaped and contoured. Water from the dewatering of the tailings and concentrates will be recirculated in the processing plant. The TMF will be lined in such a way as to ensure that any decant water, precipitation, or other water introductions will be collected and not allowed to come in contact with the water table below. The total footprint of the TMF is expected to be approximately 78.4 acres built in five sections sequentially over the life of the operation. Each section will be approximately 15 acres and will be operated and then closed as the next section opens in order to manage the reclamation process on an ongoing basis and minimize risks and exposure. All water collected from the TMF will be pumped back into the milling circuit described above along with some make-up water. The milling process is expected to have a net negative water balance, such that some fresh groundwater will be required to keep the entire milling and concentrating process working and none of these waters will be discharged to the environment.

### Project Context with Respect to Development of Volcanogenic Massive Sulfide Deposits

VMS deposits occur in a variety of tectonic settings but are typically related to precipitation of metals from hydrothermal solutions circulating in volcanically active submarine environments. VMS deposits are major sources of zinc, copper, lead, silver, and gold, and significant sources for cobalt, tin, selenium, manganese, cadmium, indium, bismuth, tellurium, gallium, and germanium. Some also contain significant amounts of arsenic, antimony, and mercury. Because of their polymetallic content, VMS deposits continue to be one of the most desirable deposit types for security against fluctuating prices of different metals.<sup>3</sup> There are close to 850 known VMS deposits worldwide with geological reserves of over 200,000 tonnes, with successful mine development in a variety of environments. Successful development of VMS deposits includes the Greens Creek underground mine in Alaska.

Volcanic-associated massive sulfide deposits are among the most likely of all deposit types to have associated environmental problems, particularly acid mine drainage. VMS deposits have high iron- and base-metal-sulfide mineral contents and are hosted by rocks with low buffering capacity. These minerals are unstable under normal oxidizing near-surface conditions and represent potential sources of highly acid and metal-rich drainage, especially in areas disturbed by surface mining or tailings disposal. Associated high abundances of potentially toxic trace metals, including arsenic, bismuth, cadmium, mercury, lead, and antimony, are present in some deposits, particularly those associated with felsic volcanic or sedimentary source rocks.

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<sup>3</sup> Galley, A.G., M.D. Hannington, and I.R. Jonasson. 2007. Volcanogenic massive sulphide deposits. In *Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods*, edited by W.D. Goodfellow. Geological Association of Canada, Mineral Deposits Division, Special Publication No. 5:141–161.

Mining methods have a large influence on the potential environmental impacts of massive sulfide deposits. Both open-pit and underground methods have been used to mine VMS deposits in historic and modern operations. Local climatic and hydrologic conditions influence the acid-generating capacity of deposits. Most massive sulfide deposits contain a large excess of iron-sulfide minerals relative to valuable base-metal sulfide minerals. The nature of ore processing and the method of deposition of the sulfide-mineral-rich tailings and waste rocks are critical parameters that influence the scope of environmental impacts associated with mining massive sulfide deposits. Fine-grained and intergrown sulfide minerals may require very fine grinding, which can result in highly reactive tailings, for beneficiation. Many modern mines discharge fine-grained sulfide-mineral-rich tailings into surface tailings ponds underlain by a number of impermeable linings. Some active underground mines are able to dispose of essentially all tailings by backfilling and cementing mined stopes; consequently, surface contamination is virtually eliminated. Base-metal sulfide minerals are typically separated by flotation; some surfactants used in the process are toxic. Most of these surfactants are recycled and relatively minor amounts are discharged to tailings ponds.

Soluble sulfate salt minerals derived from weathering and oxidation of sulfide minerals in mine dumps and tailings piles represent a potential source of metal contamination and acid generation. Extremely fine grinding required for beneficiation of VMS ore may enhance airborne transport of lead-arsenic-cadmium-antimony-bearing dust. This phenomenon is most probable in semi-arid to arid regions in which strong winds prevail.

Tailings ponds below mills are likely to contain high abundances of lead, zinc, cadmium, bismuth, antimony, and cyanide and other reactants used in flotation and recovery circuits. Highly pyritic-pyrrhotitic orebodies that are exposed to oxidation by air circulating through open adits, manways, and exploration drill holes may evolve sulfur dioxide gas; in some cases, spontaneous combustion can cause sulfide ore to burn. Tailings that contain high percentages of non-ore iron sulfide minerals have extremely high acid-generating capacity. Surficial stockpiles of high-sulfide mineral ore are also potential sources of metal-rich mine water.

## **Project Context with Respect to a Preliminary Economic Analysis**

A preliminary economic assessment is defined as a study that includes an economic analysis of the potential viability of a project's mineral resources. Preliminary economic assessments are completed before prefeasibility and feasibility studies and are an important step in determining whether a company should develop a mineral resource project.

Generally, PEAs will include base case information on the capital costs associated with bringing a project into production, an estimate of how the mine will operate once it is built, how much metal and money it will produce and at what operating cost. The PEA helps mining companies understand risks and uncertainties associated with a project. The study can be part of exploration with both open-pit mining and underground mining and should include a mine plan. More specifically, a PEA tends to have information on pre-production capital costs, life-of-mine sustaining capital, mine life and cash flows, as well as details on processing and production methods and rates.

## **PROJECT TECHNICAL FEASIBILITY**

The proposed development is considered in line with the technical requirements of an underground development of a VMS deposit, specifically regarding the following.

- Acceptable narrow vein mining techniques.
- Mine inflows of groundwater are manageable under normal mining conditions.

- Waste rock segregation and returning to backfill mine workings, with and without cementation depending on geotechnical needs.
- Flotation mineral processing techniques to separate and concentrate metals for sale and to remove deleterious components from tailings, and to recycle reagents as appropriate.
- Adoption of dry stacking for tailings management.
- Application of appropriate water treatment techniques suitable to anticipated water quality associated with mineral processing and waste management.

As this is a PEA-level design, there are considerable issues that require additional assessment and detailed design during feasibility level studies and during the permitting phase, including the following.

- Additional drilling will be required to update the current indicated and inferred mineral resources to measured and indicated categories (Measured & Indicated mineral resources) and, subsequently, to prepare a mineral reserve that can be used to develop a mine plan.
- Segregation of waste rock has been proposed. Additional testing will be required to develop segregation criteria, materials handling, and suitability for backfilling. These data are required to ensure suitable waste management will be temporarily stored at the surface.
- Similarly, geochemical testing of material that will be placed back underground is required to ensure that deleterious constituents will not leach into groundwater in which it is contact.
- Additional metallurgical studies will be required to optimize production which will also impact tailings management and water treatment design parameters.
- The process flow diagram is based on a packaged treatment system using generic performance data. This package system will require optimization for the site-specific water.
- Solids removal will be required prior to the ultra-filtration process to optimize water treatment performance and reduce backwash volumes. Sludge levels may be high and require an appropriate management plan.
- Reverse osmosis concentrate will require additional treatment to ensure precipitation within the storage tank.
- Cyanide management within tailings will require management possibly thought detoxification or ensuring that residual concentrations within the tailings cannot be released into the environment.
- Extremely fine grinding required for beneficiation of VMS ore may enhance airborne transport of metal-bearing dust that will require management during the dry period.
- Management of pyrite during mineral processing has been minimally discussed in the PEA. Clarification of pyrite management following mineral processing is required.
- Liner and capping design is required to minimize leachate loss from these facilities. This will need to be undertaken with an updated soil survey to ensure that facilities are sited appropriately to minimize impact to water resources.
- Groundwater and surface water baseline data will be required.
- Groundwater pumping tests will need to be conducted to determine the hydraulic properties of rocks to confirm groundwater inflows.
- A strict water balance will need to be maintained to maximize use of water produced during mining.

While these issues may appear to be limiting, these are not unusual for a project of this magnitude and can be addressed by engineering controls and good management. A review of the Maine Mining Rules<sup>4</sup> indicates rigorous design requirements that are consistent with other state regulations within the United States, and include an Environmental Impact Assessment as per §3.9(G). These rules will ensure that the detailed design for the proposed project will conform to industry standards and minimize impacts to natural resources. Additionally, development of underground VMS deposits is well understood and examples of effective developments of similar scale include the Greens Creek and Red Dog projects in Alaska.

The site is technically viable, provided that detailed engineering designs, and waste management and operational procedures are in line with industry standards.

## **PROJECT FINANCIAL FEASIBILITY**

The proposed development is considered in line with the financial requirements of an underground development of a VMS deposit, specifically the following.

- Neither the power nor road infrastructure are expected to present any development difficulties.
- The estimated capital expenditure for the new transmission line from the regional grid is considered reasonable based on industry benchmarks.
- Electrical power cost is generally consistent with the delivery and supply rates for industrial customers published by the state regulator, the Maine Public Utilities Commission.
- The quantities of make-up water are relatively small due to the recycling, and errors in the assumptions would not be expected to have a material impact on the economic evaluation.
- Capital estimates for the road upgrades are relatively small in the overall capital expenditures for the project.
- Smelter charges used for assumptions in the economic evaluation were based on input from major smelters including a large, diversified resource conglomerate and commodity trader, for life of mine feed at international benchmark terms.
- Wolfden has confirmed that it expects to negotiate long-term offtake agreements with smelters.
- Copper, lead, and zinc prices used to calculate incomes from the sale of concentrates are reasonable; although similar to current prices, they are at the higher end of long-term price forecasts used within the industry to evaluate projects.
- Although the PEA has not stated smelter destinations, the road and shipping transportation costs to deliver concentrates to the smelters are considered reasonable when benchmarked against other projects and mines and considering likely smelter destinations.
- Smelter charges (deductions) for processing concentrates are reasonable and in line with standard deductions and charges applied in the industry.
- The schedules indicated or implied in the PEA and Zoning Petition for the feasibility phase, and subsequent construction and commissioning phases, appear reasonable.
- The results of the economic analysis confirm that the project could be developed into a viable, small to medium-sized mining operation; the sensitivity analysis confirms that the project returns will be reasonably robust to variances in the key assumptions.

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<sup>4</sup> Maine Department of Environmental Protection. 2017. Chapter 200: Metallic Mineral Exploration, Advanced Exploration and Mining. Available at: <http://www.maine.gov/sos/cec/rules/06/096/096c200.docx>. Accessed November 2020.



- Wolfden has demonstrated the ability to raise financing to fund development work, with an estimated \$14 million invested into the project, including the acquisition of the property.
- The involvement of a major mining company, Kinross Gold, which currently owns 9.6% of Wolfden, can be considered a third-party endorsement of the project, and a demonstration of the ability for management to attract interest from different sources of finance.
- The strategy of Wolfden to raise new funding for the project is considered both standard and reasonable for junior mining companies.

As this is a PEA-level design, there are considerable issues that require additional assessment and detailed design during feasibility level studies, including the following.

- The environmental and other permitting requirements for water have not been considered in this assessment of financial practicality of the project.
- The assumption of the build-own-operate arrangement for the proposed water treatment plant results in a reduced capital expenditure for the construction phase; however, it will not reduce the financing requirement for the project since Wolfden will be expected to provide a corporate guarantee to the supplier for the risk of any failure to use the service.
- The PEA assumes that the concentrate will be transported to the nearest deep-water port via a local logistics contractor, however there is no reference to the location of this port, nor to the destination smelters.
- No market studies have been presented and need to be undertaken during pre-feasibility and feasibility studies.
- The PEA and Zoning Petition make no reference to the timeline for Wolfden to arrange financing for the construction and commission phases, except by implication in the Gantt chart; such financing process can begin prior to completion of the feasibility study and would be expected to continue following completion of the same study.
- The capital expenditures presented in the PEA exclude costs such as tax and duties, financing costs, and legal costs.
- The results of the economic analysis presented in the PEA exclude the royalty that would be paid to Altius Minerals.
- Potential penalties have not been included in the economic analysis since the test work is at the scoping level and is not sufficiently advanced to allow any meaningful estimates.
- Further test work will be required to more accurately determine the chemical composition of the concentrates to be produced by the project, and to confirm the suitability of the concentrates for treatment and refining at the smelters.
- These net present values are significantly higher than the market capitalization of Wolfden, reflecting the use of low discount rates in the PEA and the fact that the market has factored in the risk profile of the project.

In summary, the PEA has been relied on for assessment of infrastructure requirements, and estimates of capital and operating costs for such infrastructure; the descriptions in the PEA are considered reasonable and, since the project would benefit from existing infrastructure (roads, regional grid system) and key supply resources (water, electricity) in the proximity to the project, any errors in the assumptions would not be expected to have a material impact on the economic evaluation.

## **CONCLUSIONS**

Several documents for the Wolfden Mt. Chase LLC Pickett Mountain Mine Project have been prepared to support the land use rezoning application, including the application itself and a preliminary economic assessment. At this stage, all project components are preliminary in nature and will become more detailed as the project develops. Given the level of effort for this stage of development, and compared with similar deposits, the proposed development is technically feasible with the understanding that significant detail is still required for the design of individual mine components in accordance with the State of Maine rules and regulations for development of this project. The estimates and assumptions presented in the rezoning application and preliminary economic assessment to support the financial practicality of the project are considered reasonable at this stage of development; more detailed evaluation, including establishing a mineral reserve, and conducting detailed engineering and negotiating firm contracts to improve the accuracy of capital and operating cost estimates, will be required during the next stages to confirm the economic viability of the project.

The principal challenges for the project to realize the values presented in the PEA are:

- confirming at a feasibility level the scoping level assumptions that have been used in the PEA, including the need to establish a mining reserve;
- successfully fulfilling permitting requirements; and
- arranging project financing and/or introducing a partner.

Finally, Wolfden continues to fund exploration drilling to target extensions to the existing deposits and new discoveries; if successful, this would be expected to improve the financial practicality of the project and make the project return more robust.

## **ATTACHMENT A**

**Review of the PEA for the Pickett Mountain Project,  
*Engineering Analytics, Inc.***

## **Technical Memorandum**

To:	Andrew Harley, PhD.	From:	Jason Andrews, P.E.
Company:	SWCA Environmental Consultants	Date:	December 4, 2020
EA No.:	111115		
Re:	Review of the PEA for the Pickett Mountain Project		
Reviewed by:	Daniel Overton, P.E.		

### **1.0 INTRODUCTION**

Engineering Analytics, Inc. (EA) was requested to review the mine engineering aspect of selected sections of the Preliminary Economic Assessment (PEA) for the Pickett Mountain Project. The PEA was prepared by A-Z Mining Professionals Limited for Wolfden Resources. This review was conducted in consideration of the Land Use Planning Commission (LUPC) approval criteria provided below:

- 1b - no undue adverse impact on existing uses or resources or a new district designation is more appropriate for the protection and management of existing uses and resources.
- 2a - Positive and negative impacts resulting from the change in use and development of the area. Such impacts may include, but are not limited to, impacts to regional economic viability, Maine's natural resource-based economy, local residents and property owners, ecological and natural values, recreation, and public health, safety, and general welfare.
- 2b - Positive and negative impacts upon associated transportation routes and other infrastructure
- 2c - Potential for future reclamation and beneficial use of the affected area, following closure of the site.
- 3a - Potential short and long term socioeconomic impacts, both positive and negative, upon the immediate area and communities likely to be affected by the proposed activities and resulting from the construction, operation and closure of the proposed activity
- 3b – Potential impacts on services
- 3c – Potential impacts on existing infrastructure
- 3d – Potential impacts to existing uses and natural resources

EA's reviewed the sections of the PEA provided in Table 1 were reviewed in performing our scope of work:

**Table 1: PEA Sections Reviewed**

4.0 Property Description and Location
5.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography
6.0 History of the Property
7.0 Geological Setting and Mineralization
7.1 Regional Geology
13.0 Mineral Processing and Metallurgical
14.0 Mineral Resource Estimate
15.0 Mineral Reserve Estimates
16.0 Mining Methods
16.2 Underground Mine Design
16.3 Geotechnical Considerations
16.4 Mine Access and Level Development
16.5 Rock Handling
16.6 Underground Services and Infrastructure
16.7 Mining Methods
16.8 Dilution and Extraction
16.9 Mining Operations
16.10 Mining Equipment
16.11 Mine Backfilling
16.12 Ventilation
16.13 Development and Production Schedules
16.14 Mine Surface Infrastructure
16.15 Grade Control
16.16 Underground Personnel
17.0 Recovery Methods
17.1 Conceptual Process Flowsheet
17.2 Process Design Criteria
17.3 Reagents
17.4 Process Make-Up Water
17.5 Material Balance
18.0 Infrastructure
18.12 Materials Pads
18.12.1 Rock Dump - Clean
18.12.2 Rock Dump - Acid Generating
18.12.3 Ore Pad and Temporary Stockpile
18.22 Tailings Management Facility
20.0 Environmental Studies, Permitting and Potential Impacts
20.1 Regulatory Framework
20.2 Mine Permitting Stages and Status
20.3 Environmental Studies and Impact Studies and Impact Assessments
25.0 Interpretation and Conclusions

EA has also reviewed the Petition to Rezone Portion of Township 6 Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit dated January 26, 2020 and revised June 30, 2020 for conformance with the PEA data.

EA's review was completed with the understanding that this PEA to support the petition to rezone and that a mine permit application will be submitted at a later date for detailed review.

EA's comments to the assigned sections are provided in Table 2 below. Only the sections that EA had comments on are provided in Table 2.

## **2.0 ASSESSMENT OF REASONABLENESS**

EA has reviewed the PEA as it relates to mine engineering. We have determined that the information put forth in the sections we reviewed are based on reasonable estimates. The proposed facilities and technologies are similar to those used in the industry at other mines in similar climates.

## **3.0 ISSUES AND POTENTIAL CHALLENGES**

During EA's review there are a few items that could pose challenges. The tailings management facility is a very conceptual at this stage of the project. The proposed method for dry stacking the tailings is used in the mining industry and is reasonable. However, management of tailings is an important part of the mine life cycle that requires detailed design.

The water usage and sources are discussed in general terms. The PEA indicates that they will have sufficient water for mining activities and appears reasonable. Additional details for the water usage and water source will be needed for the site water usage for startup, operations and closure. The management of water consumes a lot mine operations time and efforts. A detailed water balance will be needed to determine water treatment, storage, and usage needs during the year.

## **4.0 CONCLUSIONS**

The information put forth in the sections EA reviewed appear to be based on reasonable estimates. At this stage of the project there are additional details that would be needed for a mine permit application. However, the assumptions provided in the PEA support the concept that this project is feasible from a mine engineering standpoint.

**Table 2: Comments on PEA in Support of Rezoning Petition**

Comment Number	Section Number	Page Number	Comment
1.	Section 4.0 Property Description and Location	15	A discussion of nearest residences/structures would be helpful to determine impact to others. Additional discussion of the impacts and agreements regarding “surface rights leases on the south side of Pleasant Lake” should be discussed.
2.	Section 5.3 Local Resources	16	This section addresses the local resources and outlines roads, a town and rail line. It does not address how they will use the local resources and the impacts that the mine might have on those resources, including fire, police, solid waste, etc. These items should be addressed. The impact to local natural resources should be also be addressed.
3.	Section 5.4 Infrastructure	16	This section addresses the existing infrastructure that includes roads and electrical. A statement as to the capacity of the existing roads to support the additional mine traffic should be included and potential needs for road upgrades should be included. A statement regarding the ability for the existing utilities to support the mine should also be included.
4.	Section 5.5 Physiography	17	It would be useful to discuss surface water bodies and potential impacts to those structures.
5.	Section 7.1 Regional Geology	23	The resolution of Figure 7.2 is hard to read the geology of the region. Please improve the resolution.
6.	Section 15.0 Mineral Reserve Estimates	107	This section has not been completed. Please update.
7.	Section 16.5 Rock Handling	112	The rock handling section does not provide any detail about how the rock will be sorted or stored during the life of the mine. Additional detail should be provided about rock sorting and storage or provide a reference in the report to the sections that address this. Waste rock handling and associated ARD can be a problem if not managed correctly.
8.	Section 16.6 Underground Services and Infrastructure	112	The water supply section indicates that water will be obtained from a water storage pond and water pumped from the mine. The mine dewatering section indicates that they anticipate pumping about 1,420 m <sup>3</sup> of water from the mine each day or 518,300 m <sup>3</sup> per year. The service water needs are projected to be 401,000 m <sup>3</sup> per

Comment Number	Section Number	Page Number	Comment
			year. Thus, during full time operation the project has enough water to operate. However, additional detail should be provided to support their water source availability prior to full mine development. At full mine development it appears that they will have an excess of about 100,000 m <sup>3</sup> of water per year. Information should be provided to address where the source of the water before the shaft is developed and how the excess water is managed during full time operations. The control of and access to water is integral for development and operations.
9.	Section 16.14 Mine Surface Infrastructure	133	The mine surface infrastructure talks about a well for potable water needs. Some discussion should be provided regarding potable water needs and project well production levels.
10.	Section 18.3.1 Main Pad Preparation	143	The amount of drilling and blasting costs to level the pad was calculated. However, the costs to crush and place the material is not included in the costs. Please include these costs or reference where they are located.
11.	Section 18.5 Potable Water System	144	A potable water system should be identified.
12.	Section 18.12.1 Rock Dump -Clean	145	Section 18.12.2 calls out the liner thickness. Update this section to reflect the liner thickness.
13.	Section 18.22.2 Design Criteria	150	This section should include seismic design criteria.



**ATTACHMENT B**

**Wolfden Mining Rezoning Petition and Preliminary  
Economic Assessment Technical Review,  
*Linkan Engineering***



## MEMORANDUM

DATE: November 24, 2020  
TO: Andrew Harley, SWCA  
FROM: James J. Gusek and David A. Myers  
SUBJECT: Wolfden Mining Rezoning Petition and Preliminary Economic Assessment Technical Review  
REFERENCE NO.: 96.01\_504

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### INTRODUCTION

At the request of SWCA, Linkan Engineering (Linkan) reviewed two documents associated with the rezoning of a land parcel in Penobscot County, Maine for the development of an underground metal mine and its associated surface disturbances including a dry stack tailings facility. The Linkan review focused on technical issues related to the potential to contaminate ground and surface water and the mitigation plans proposed in the two documents:

- Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit, and
- Preliminary Economic Assessment (PEA) Pickett Mountain Project

Linkan's comments follow. For convenience, the page number locations of Linkan's comments are cited below and they are also imbedded in the two Adobe Acrobat™ bookmarked PDF files that SWCA provided to Linkan. Page numbers referenced below refer to the location of the page in the total page count in the document (Adobe Acrobat™ page count) and not the page number listed at the bottom of the page (that was not consistently provided).

### ***LINKAN ENGINEERING'S COMMENTS TO PETITION TO REZONE PORTION OF TOWNSHIP 6, RANGE 6 PENOBSCOT COUNTY, MAINE FOR DEVELOPMENT OF AN UNDERGROUND METALLIC MINERAL DEPOSIT***

#### **Linkan Comment #01, Page 163**

There is no real basis for estimate of mine dewatering flow rate. The water management plan needs to have flexibility in case flows are higher. There does not appear to be a specific plan to deal with large storm events.

### **Linkan Comment #02, Page 163**

The water quality of the seepage into the mine workings deteriorates over time as previously submerged or isolated sulfide rock (i.e., pyrite) is exposed to the mine atmosphere containing oxygen. This is an inevitable condition that either needs a mitigation plan to prevent it from happening or a water treatment plant capable of treating the additional loading or both.

### **Linkan Comment #03, Page 164**

Removing the bacterial component of pyritic dissolution is also an effective strategy for preventing acid generation, but is not mentioned. Acidophilic microbes such as *Acidithiobacillus Ferrooxidans* accelerate the kinetics of pyrite oxidation and the generation of acid rock drainage (ARD) by several orders of magnitude. This aspect of ARD production has been well understood for almost 70 years (Leathen et al., 1953).

### **Linkan Comment #04, Page 164**

Oxidation can still occur w/o Oxygen. If ferric iron ( $Fe^{+3}$ ) is present in the water in contact with pyrite, oxidation can occur even though the pyrite is submerged. Ferric iron is produced in the pyrite dissolution process and can self-sustain to a degree. When the ground water rebounds after mine dewatering pumping is suspended, it might be necessary to neutralize the rising mine pool with alkalinity to minimize the presence of ferric iron in the pore spaces in contact with sulfide-bearing mine waste.

### **Linkan Comment #05, Page 164**

Bactericides can also be effective in minimizing pyritic oxidation. Low concentrations of common anionic surfactant bactericides such as sodium lauryl sulfate, can minimize acid generation kinetic rates (Kleinmann and Ericson, 1983). Diluted milk has also been found to be an effective acidophilic bactericide (Jin, et al., 2008).

### **Linkan Comment #06, Page 164**

The longer the acidic waste rock stays on the surface, the more acidic the backfill material might become. Preventing pyritic oxidation by removing oxygen and/or water or applying a bactericide during operations could minimize ARD generation in backstowed waste rock until closure, which would minimize the presence of ferric iron in the rising mine pool.

### **Linkan Comment #07, Page 164**

#### General Comment

While Wolfden did not acknowledge the role of bacteria in the generation of ARD, it appears that they are cognizant of the problem and have taken appropriate measures (i.e., controlling water and air contact and addressing ARD in an active treatment plant) to deal with it both during operation and at closure. The use of ARD-preventive bactericides, a proven technology, might be a reasonable strategy to include in the plan.

**Linkan Comment #08, Page 166**

Tailings & waste rock co-disposal underground is a good idea. If there are reactive sulfides in the stope walls, after backstowing they would be placed in intimate contact with the very moist co-disposed tailings and that would cut off the oxygen supply. This is as close to pre-mining conditions as one could expect.

**Linkan Comment #09, Page 166**

Submergence of tailings is an acceptable practice, however it should be validated with some simple kinetic testing using drill core. The testing should be conducted in concert with planned acid-base accounting. Also, some residual flotation reagents are organic (such as A325, M200, and A343 [Table 17.2 in the PEA] which are xanthates and organic collectors). These will eventually turn the mine pool anoxic as they degrade. While arsenic is present in the waste rock and tailings as arsenopyrite and tetrahedrite which contains antimony, it is unlikely that these two constituents (As & Sb) would be mobilized by the anoxic conditions in the mine pool.

**Linkan Comment #10, Page 166**

Sub-aerial tailings deposition will encourage acid formation due to exposure to water and air. A plan for suppression of bacterial growth is needed.

**Linkan Comment #11, Page 166**

What happens to snowmelt? This is Maine... Consider a temporary sealant to increase runoff and avoid infiltration, especially on the 20% side slopes. A water-based polymer sealant was used successfully on a mine waste repository in Idaho at the end of the construction season to reduce infiltration. The photo is courtesy of Pacific Inter-Mountain Distribution LLC, Kalispell, Montana.

**Figure 1 Spraying temporary sealant on a mine waste repository**



### **Linkan Comment #12, Page 166**

The final tailings might be finer than 400 mesh (37 microns) according to the PEA executive summary. Smooth drum rolling is an appropriate compaction method. We agree that this compacted material is likely to produce a very low permeability condition. However, dust control might be a problem during the drier months and the finer grained material is likely to contain a significant fraction of respirable dust.

### **Linkan Comment #13, Page 168**

#### General Comment

An ARD mitigation plan should be in place during mine operations and not just for closure. The plan should include minimizing water and air exposure to pyritic waste rock piles such as spray-on sealant (say at the end of the fall season) and/or the inclusion of a bactericide to suppress microbial kinetics. Implementing these technologies would not add a significant cost component. As there will be a geomembrane cap as part of the closure design (i.e., complete encapsulation), the potential for ARD generation appears to be very small.

### **Linkan Comment #14, Page 169**

Returning the RO reject back to the WTP feed tank will cause a build-up of salts and potentially gypsum to form in the system. A plan to remove sulfate is needed or a disposal plan for the brine. This is not a lot different than many larger mines...but they have very large tailings ponds to put the reject into.

### **Linkan Comment #15, Page 169**

The proposed Process Flow Diagram seems credible (with possible exception of RO brine management – Linkan Comment #14). Linkan’s experience is that well mixed round reaction tanks followed by lamella or other type of clarifiers and then Microfiltration followed by RO gives a robust system with consistent results.

### **Linkan Comment #16, Page 221**

It is not reasonable to expect that all drainage water will no longer require treatment after 1 year. There should be a passive system to polish the final drainage water, and the WTP should be retained for a time as a contingency plan.

## **LINKAN ENGINEERING’S COMMENTS TO *PRELIMINARY ECONOMIC ASSESSMENT (PEA) PICKETT MOUNTAIN PROJECT***

### **Linkan Comment #01, Page 14**

The grain sizes of the concentrates and the tailings are reported to be from 14 microns ( $\mu\text{m}$ ) to 37  $\mu\text{m}$ . This is very small compared to established norms by many mining operations. For comparison, talcum powder exhibits a “...a median diameter of 26.57  $\mu\text{m}$  with a range of particle sizes from 0.399  $\mu\text{m}$  to 100.237  $\mu\text{m}$ ” (Gilbert, et al., 2018).

The assumptions used to determine dry stacking (or sub-aerial tailings deposition) capacities and characteristics need to be vetted from experience/data with similar materials. Dry stacked tailings storage will reportedly reduce the tailings moisture content to about 20%; dust control may be an operational issue in drier seasons but there are numerous technologies available such as spray-on sealants to mitigate this potential problem. This would not be an issue at closure as the tailings storage facility (TSF) will be capped.

**Linkan Comment #02, Page 18**

The presence of arsenic and antimony in the concentrates infers their presence in the tailings. Immobilization of these constituents in the final tailings and presumed exposed surfaces in the underground mine workings should be a priority. This is discussed in more detail in other comments.

**Linkan Comment #03, Page 19**

There appears to be adequate room for locating a runoff catchment basin.

**Linkan Comment #04, Page 20**

Complete geochemical characterization testing is a good idea, but it should also include a microbial testing component for the presence/ absence of acidophilic bacteria in the core samples collected from the site during the exploration program. Older samples should be tested prior to more-recent core samples.

**Linkan Comment #05, Page 20**

As revealed elsewhere in the PEA (Linkan Comment #06), the deposit contains high concentrations of pyrite and the tailings will exhibit a very fine grain size (Linkan Comment #01). Low dry stacked tailings permeability values notwithstanding, the tailings will likely be very geochemically reactive and prone to produce acid rock drainage (ARD). Amending the closure cover design to eliminate the low permeability geomembrane component is probably not a good plan.

**Linkan Comment #06, Page 38**

The presence of pyrite ( $\text{FeS}_2$ ) and calcite ( $\text{CaCO}_3$ ) in the ore constitute two end points on the ARD potential spectrum. The more calcite present in the mine waste, the less likely ARD will form. This would be confirmed in follow-up testing (Linkan Comment #04).

**Linkan Comment #07, Page 39**

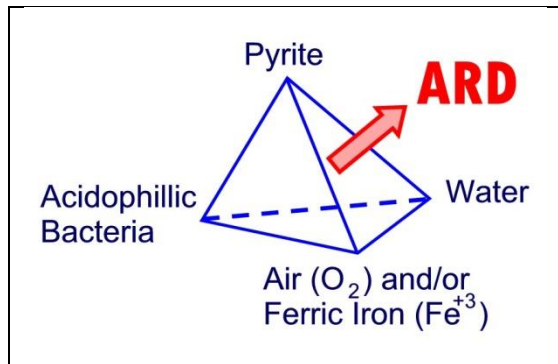
The level of pyrite in the ore (45% to 65%) will increase in the tailings when the minerals of value (chalcopyrite [Cu], galena [Pb], and sphalerite [Zn]) are recovered. By inspection, this elevated level of pyrite in the mine waste has an almost certain likelihood of generating ARD if mitigation measures (discussed elsewhere in the PEA) are not implemented. The arsenopyrite, tetrahedrite, and tennantite in the ore (and presumably the tailings) are potential sources of arsenic and antimony contamination. Mitigation measures are discussed elsewhere in the PEA.

### **Linkan Comment #08, Page 93**

The smallest grain size distribution of the tailings sample used in this test was 325 mesh or 44  $\mu\text{m}$ . Text in Section 1.4, Processing, states that regrinding to 14  $\mu\text{m}$  would be necessary to produce a suitable lead concentrate. Vacuum filtration of 14  $\mu\text{m}$  materials should be demonstrated. Vacuum filters with diatomaceous earth precoat are often used for very fine material.

### **Linkan Comment #09, Page 139**

Backfilling the stopes with mine waste and tailings (Section 16.11.1) is a good idea. The technique should be called out as “co-disposal” which is the term commonly used. Surrounding coarser-grained mine development waste (which may or may not be acid generating) with tailings that presumably contain pyrite with a grain size of about 14  $\mu\text{m}$  is an efficient use of space and geochemically sound as the moisture retention/field capacity of the tailings should keep the backfill moist (cutting off the oxygen supply leg of the ARD tetrahedron shown below) and have very low permeability.



### **Linkan Comment #10, Page 151**

Table 17.2 includes sodium cyanide and multiple organic reagents such as xanthate (A325) used in the froth flotation circuit. The ultimate fate of these reagents should be discussed in the water treatment section. Are these reagents retained in the concentrates (which are shipped off site) or the tailings? It would be easy to add this information as an extra column or two in Table 17.2.

### **Linkan Comment #11, Page 156**

This is a reasonable approach for collecting ARD. Materials above the liner might include a carbonate component to passively neutralize any ARD prior to its draining to the holding pond.

### **Linkan Comment #12, Page 157**

The water management system (page 157) does not discuss the water quality requirements for process water. If all or some of the collected water is clean enough to be directly recycled without treatment, it could save treatment costs.

**Linkan Comment #13, Page 157**

Recommend that the proposed infiltration fields for excess water not be called septic fields...suggest Rapid Infiltration Basin (RIB).

**Linkan Comment #14, Page 157**

The WTP is designated to be designed for 120 gpm, and there does not seem to be adequate background for this number. On page 125 it says that the underground dewatering requirement is 1,420 m<sup>3</sup>/day, or 260 gpm. On page 157 the text says, “the collected surface water, along with mine discharge water, is pumped to a raw water collection pond. This water is then treated through a water treatment facility”. – this makes it seem that the WTP must be significantly larger than 120 gpm. Also, the WTP needs to be sized larger to “catch up” after rain events.

**Linkan Comment #15, Page 158**

Linkan’s experience is that well mixed round reaction tanks followed by lamella or other type of clarifiers and then Microfiltration followed by RO gives a robust, system with consistent results.

**Linkan Comment #16, Page 158**

The RO reject is shown as going to “Waste/Concrete”. RO reject disposal can be a severe problem, and this should be defined better.

**Linkan Comment #17, Page 160**

The tailings moisture will be controlled with pressure filtration, referencing Mine Paste, 2020. Did this test work use a tailing sample with a minimum grain size of 14 μm?

**Linkan Comment #18, Page 161**

The tailings volume is conservatively assumed to not include underground backfill.

**Linkan Comment #19, Page 161**

The design criteria need to include considerations for dust control. The very fine-grained dry stack tailings, even after moisture control, will quickly desiccate in dry weather and could pose a blowing dust problem. This could be managed with water sprays or a spray on water-based polymer which was discussed in Comment No.’s 9 and 10 in the Zoning Petition document.

**Linkan Comment #20, Page 164**

Over time, the grasses and shrubs will yield to a forest similar to the one surrounding the site. This is inevitable. The random soil layer for the root zone might be adjusted to accommodate for this.



### **Linkan Comment #21, Page 164**

The contact water chemistry improvement timeline might be accelerated through the use of temporary sealants (see Linkan Comment #11 in the Rezoning Petition document) until the final cover is completed.

### **Linkan Comment #22, Page 177**

Sequentially closing up to five TMF cells is a good plan; it provides an opportunity to adjust the closure of subsequent TMF cells based on the performance of earlier closure events.

### **REFERENCES CITED**

Kleinmann, R.L.P. and P. M. Erickson. 1983. Control of acid drainage from coal refuse using anionic surfactants. Bureau of Mines RI 8847, 16 pp.

Leathen, W.W., S. Bradley Jr., and L.D. McIntyre. 1953. The role of bacteria in the formation of acid from certain sulfuritic constituents associated with bituminous coal, Part 2. Ferrous iron oxidizing bacteria. *Appl. Microbiol.* Vol. 1, pp.6 5-68.

Jin, S., Fallgren, P. H., Morris, J. M., and Cooper, J. S. 2008. Source Treatment of Acid Mine Drainage at a Backfilled Coal Mine Using Remote Sensing and Biogeochemistry. *Water Air Soil Poll.* 188:205–212.

Gilbert, Christopher R., B. R. Furman, D.J. Feller-Kopman, and P. Haouzi. 2018. Description of Particle Size, Distribution, and Behavior of Talc Preparations Commercially Available Within the United States. *Journal of Bronchology and Interventional Pulmonology*, 2018 Jan;25(1):25-30. doi: 10.1097/LBR.0000000000000420.

**END**



## MEMORANDUM

DATE: December 2, 2020  
TO: Andrew Harley, SWCA  
FROM: James J. Gusek and David A. Myers  
SUBJECT: Wolfden Mining Rezoning Petition and Preliminary Economic Assessment Technical Review  
REFERENCE NO.: 96.01\_504a (addendum)

---

### INTRODUCTION

At the request of SWCA, Linkan Engineering (Linkan) reviewed one additional document and one updated version of a previously reviewed document associated with the rezoning of a land parcel in Penobscot County, Maine for the development of an underground metal mine and its associated surface disturbances including a dry stack tailings facility. The Linkan review focused on technical issues related to the water treatment mitigation plans proposed:

- New Document - Ltr\_Wolfden\_Responce\_AdInfoRequest.pdf
- Updated Document - Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit, Revised June 30, 2020

Linkan's comments follow. Comments start at #23 as this is an addendum (addition) to the previously submitted Memorandum, same subject, dated NOV 24<sup>th</sup>, 2020, that ended with comment #22. References to the sections that pertain or connect with the reviewed document are provided for each comment.

Linkan has also provided a summary opinion on whether the information provided indicates that the mine is at least feasible for the purpose of rezoning to allow for detailed design and permitting to take place.

## **LINKAN'S COMMENTS TO: WOLF DEN RESPONSE INFO REQUEST**

### **Linkan Comment #23, (Comment #7 Waste Disposal)**

The process flow diagram is based on a packaged Suez treatment system using generic performance data. This package system is not optimized for the site specific water (not available yet) so there will be changes. Typically some type of solids removal step is in front of ultra-filtration (UF) process to optimize performance and reduce backwash volumes. Sludge levels could be high so more thought about sludge handling may be needed. Also a comment is made that the, "Reverse osmosis (RO) concentrate will flow to a storage tank for decant and solids removal." Some measure of additional treatment is needed for RO concentrate (brine) to precipitate. This is not included and not trivial.

### **Linkan Comment #24, (Comment 11 State Agency Review Comments, Answer 4 Streams and Wetlands)**

The statement that, "The liner below and capping and closure of the TMF will prevent any leachate from infiltrating into the groundwater below" is a bold promise assuming industry standards. Liners and caps are almost never perfect so it is probably more correct to state that it will prevent significant infiltration. To say more than this would require justification about how this system is better than industry standard.

## **LINKAN'S COMMENTS TO: PETITION TO REZONE..., REVISED JUNE 30, 2020**

On review of the text associated with Linkan's previous comments there is not any substantive changes that need to be made to the comments.

## **SUMMARY OPINION**

Overall the documents were fairly well detailed for the expected level of project development. The rezoning requestor, Wolfden Mt. Chase LLC, has covered a fairly broad range of potential issues that will drive water treatment challenges during the active life of the project and after closure. We did not find any major category gaps in the documents.

There are many issues that still must be resolved based on more realistic water quality and flow rate predictions. This would include a more refined water treatment process that is specific to the site water (with a more definitive effluent quality), more details on how wastes will be handled (precipitates, sludges, brine, etc.), and a representative closure model that can be relied on. In this process we would assume that the issues we have discussed in our comments could be resolved.

In summary the documents that Linkan reviewed indicate that Wolfden Mt. Chase LLC, has covered the main categorical issues that will be faced with the water treatment aspects of the mining project. Both water treatment during active mining and source control measures for

closure will not be trivial especially with the no impact goals stated for discharge. We believe these issues can be mitigated and the goals met if good planning, testing/proving, engineering, and execution is done behind adequate funding and good management. Thus the water treatment aspects of the project appear feasible for the purpose of rezoning.

**END**

**ATTACHMENT C**  
**PEA Review,**  
***Montgomery & Associates***



## TECHNICAL MEMORANDUM

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**DATE:** November 23, 2020

**PROJECT #:** 1683.01

**TO:** Andrew Harley, SWCA

**FROM:** Chris Cottingham, Dexter Race, Paul Pettit

**PROJECT:** PEA Review, Wolfden Resources, Picket Mountain Project,

**SUBJECT:** PEA Review

---

Montgomery & Associates (M&A) has read the A-Z Mining Professionals, LTD, Preliminary Economic Assessment Pickets Mountain Project, Prepared for Wolfden Resources Corporation, September 14, 2020. Additionally, M&A reviewed Wolfden Mtn. Chase, LLC, Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit. M&A has reviewed these materials to assesses the following:

1. The veracity of the proposed operation.
2. The viability of the mining project and an assessment of impacts, both positive and negative.
3. A determination if there is enough information to justify a rezoning for mining.

M&A determines that there is enough information and that a professional standard has been met in the preliminary economic assessment (PEA) to justify a rezoning of the property for mining.

### **SPECIFIC FINDINGS**

The specific findings are as follows:

#### **Regional Geology**

Geologic units from surface:

Chesuncook Dome

- Trout Valley Fm (mudstone-siltstone)
- Traveler Rhyolite
- Matagamon SS (sandstone)
- Seboomook Fm (sandstone-mudstone)

- Frost Pond Shale
- West Branch Volcanics
- Ripogenus Fm (sandstone)
- Dry Wall Volcanics

NW flank Shin Pond/Stacyville quads

- Metagaman SS (sandstone)
- Seboomook Fm. (sandstone-mudstone)
- Unnamed intermediate to mafic volcanics
- Unnamed calcareous siltstone
- Unnamed limestone
- Unnamed siltstone-sandstone
- Unnamed conglomerate-sandstone-siltstone
- Wassataquoik Chert
- Stacyville Volcanics

Cross section of the deposit and associated lithotypes

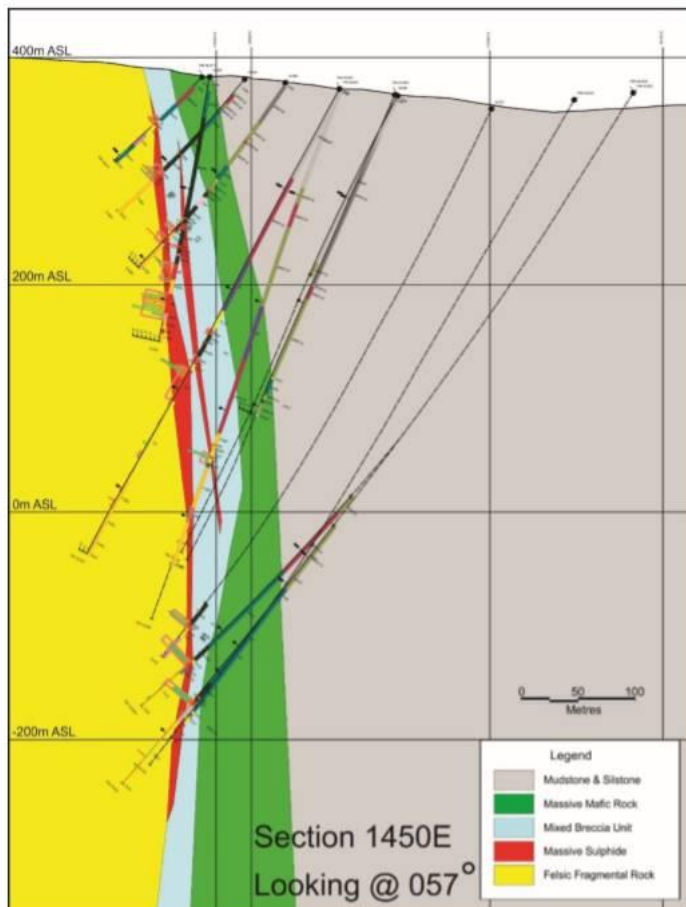


Figure 7.5 Cross Section of the Pickett Mountain Deposit

## **Dewatering and Water Management**

Although there is little to no groundwater data provided in the material reviewed, groundwater is expected to be encountered during mining. Dewatering wells are planned for the initial phases of mining to reduce the water managed during mining prior to the completion of underground piping infrastructure. The projected water produced by underground mine development activities for the project is 1,160 cubic meters (m<sup>3</sup>) per day or 260 gallons per minute (gpm). The service water required for the mine would be 401,000 m<sup>3</sup> per year or 201.55 gpm. This rate of inflow (260 gpm) is easily managed underground under normal mining conditions and would meet the service water requirements stated above.

Underground, water is planned to be managed through a series of sumps and baffles. Water will be segregated by water quality and will ultimately be pumped to the surface through a series of pipelines and stored in surface ponds for use as service water. This is a standard and acceptable water management practice.

## **FUTURE WORK TO BE CONDUCTED**

As mentioned in the PEA, hydrologic studies need to be conducted to confirm the proposed dewatering method, evaluate the TSF site, and confirm location(s) for a supply well(s).

### **Specific Water Data Needs Recommendations**

1. No groundwater elevation data has been provided in the PEA. This will need to be collected as part of the baseline environmental studies.
2. Pumping tests will need to be conducted to determine the hydraulic properties of the rock. This will allow the project hydrogeologist to confirm the inflows to be experienced during mining and verify that they will be manageable and will meet the service water needs.
3. Tailings characterization has not been completed and are recommended to confirm assumptions for the underground mining method and tailings foundation stability.
4. Waste rock characterization has not been completed. The water quality implications should be studied as part of the overall baseline environmental studies.



5. No background water chemistry is included in the PEA. However, the potential for water chemistry issues is acknowledged (As, TDS etc), and a subsequent water treatment plant is mentioned.
6. The PEA recommends that all environmental baseline studies be completed as they are necessary to meet state and federal permitting requirements.

## **FINDINGS AND CONCLUSIONS**

1. The water portion of the PEA appears to be completed to a professional standard and is based on reasonable and verifiable data as it exists to date.
2. The water management portions of the mining project appear to be viable and potential water quality or quantity impacts are acknowledged and planned to be studied.
3. The PEA meets the professional standard to justify the rezoning of the property for mining.
4. Two factors contribute to the confidence in water management at this site: 1) The need to maintain a strict water balance in order to maximize the use of water produced during mining for service water, and 2) the recognition and dedication to build a water treatment facility.

## **ATTACHMENT D**

**Assessment of Geochemistry, Soils, and Reclamation,  
Pickett Mountain Project, Wolfen Mt. Chase  
*SWCA Environmental Consultants***



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## TECHNICAL MEMORANDUM

**To:** Michael Lychwala  
SWCA Environmental Consultants  
8 Science Park Road  
Scarborough, Maine 04074

**From:** Andrew Harley, Senior Geochemist/Senior Soil Scientist

**Date:** December 1, 2020

**Re:** **Assessment of Geochemistry, Soils, and Reclamation, Pickett Mountain Project, Wolfden Mt. Chase / SWCA Project No. 61402**

---

SWCA Environmental Consultants (SWCA) has reviewed the following two documents submitted by Wolfden Mt. Chase LLC (Wolfden) in support of a State of Maine Land Use Planning Commission (LUPC) application to rezone a portion of Township 6, Range 6 of Penobscot County to allow for development of an underground mineral deposit known as the Picket Mountain Project.

- The petition submitted by Wolfden to LUPC (Wolfden 2020a)
- A National Instrument 43-101-compliant Preliminary Economic Assessment (PEA) (Wolfden 2020b)

SWCA has reviewed the documents to evaluate the technical feasibility of the geochemical, soils, and reclamation components of the project, given the preliminary development stage of this project. SWCA understands that additional studies are planned and that Wolfden will obtain a Maine Department of Environmental Protection (MEDEP) Metallic Mining Permit under Chapter 200 rules (MEDEP 2017) if rezoning is approved.

### ENVIRONMENTAL GEOCHEMISTRY

Pre-mining geochemical characterization is of critical importance to evaluate potential impacts over the life of a mine, and to develop suitable mitigation strategies. Impacts can be physical, chemical, and biological in nature. Characterization activities include pre-mining baseline conditions and the identification of risks specifically related to the manner in which the ore will be mined and processed, how water and waste products will be managed, and the final configuration of the post-mining landscape.

### Current Status and Information

The project consists of a massive sulfide deposit, described as fine-grained with potentially acid-producing minerals including pyrite (iron sulfide), sphalerite (zinc sulfide), galena (lead sulfide), and chalcopyrite (copper iron sulfide). The minerals, when exposed to air and water, react to form acidic leachate and drainage. Acidic materials can be offset through neutralizing minerals, as described in Acid-

Base Accounting (ABA) procedures. Neutralizing minerals noted in the PEA include calcite and felsic rocks. Other minerals of concern include tetrahedrite (copper antimony sulfosalt) and arsenopyrite (iron arsenic sulfide) that can potentially release antimony and arsenic into the environment. Assessment of ABA or potential metal leachate production are not reported.

Whole rock geochemistry results are based on digestion and analysis by inductively coupled plasma optical emission spectrometry (ICP OES) and are discussed in the PEA. Concentrations of zinc, lead, copper, silver, and gold are presented within the PEA. Sulfide results, commonly reported during the preliminary feasibility stage, are not mentioned in the PEA, although the data likely exist given the analytical technique.

Waste rock produced during underground development will be returned to backfill mined-out stopes to prevent caving. Primary stopes will be backfilled with cemented rockfill while secondary stopes will contain uncemented rockfill. Assessment of geochemical suitability for waste rock to be relocated below ground has not been provided.

Prior to backfilling, waste rock will be stored in two rock dumps: a clean rock dump and an acid-generating rock dump. Details regarding construction are limited, with mitigation strategies including berms, drainage collection, and in the case of the acid-generating rock dump, liners and potentially a holding pond. Similarly, stockpiles of ore will be developed with a design similar to the acid-generating rock dump. Proposed methods for segregation between the clean and acid-generating waste rock have not been discussed.

Metallurgical testing has been undertaken to evaluate processing requirements to produce a concentrate for sale. The other component of processing is the residual material from which the concentrate has been removed. This material is referred to as tailings and will be disposed in an aboveground facility as described below. Based on the geological composition of the ore, the tailings will likely contain fine-grained, reactive sulfide that can potentially produce acidic and metal leachate. A master composite sample submitted for metallurgical testing contained 27.4% total sulfur, although 21.0% of the sulfur presented as sulfate indicating that some oxidation had occurred. Floatation techniques were used to collect the remaining sulfides; however, 2.5% sulfide sulfur will remain within the tailings that will report to the tailings management facility (TMF). Additionally, reagents used in testing, including cyanide, may end up in the tailings. Characterization of reagent impacts to tailings have not been reported.

Tailings management will be via dewatering and pressure filtration to generate a filter cake to be placed into a dry stack TMF. While geochemical testing of tailings actually stored at the site has not been reported, engineering controls of any potential leachate include a containment system constructed of low permeability soil fill, a geomembrane liner, and a drainage collection layer. A berm will be constructed along the toe of the TMF to anchor the geomembrane liner and to create a collection ditch for contact water.

Water quality baseline data, both surface water and groundwater, have not been reported for the project and will be required for feasibility and permitting-level efforts.

## **Assessment of Reasonableness**

The level of environmental geochemical testing and reporting is less than would be expected for a PEA-level document. Data of interest include sulfur data for waste rock characterization and management, geochemical characterization of tailings material, and initial water quality data. However, as these are costly programs it is understandable that the proponent has not invested in these without rezoning approval. The level of effort certainly indicates that the proponent is aware of these issues and will address these during more detailed design and permitting of the project. The proponent has invested effort

into water management and water treatment designs, again indicating an awareness of potential issues on this project. The concentration of sulfides reporting to the TMF will need to be further monitored as metallurgical testing continues.

## Issues and Potential Challenges

As the project progresses, increasing levels of environmental geochemical testing will be required as per MEDEP Chapter 200 §5.20(E) with guidance such as the *Global Acid Rock Drainage Guide* (International Network for Acid Prevention 2014), and development of a Reactive Mine Waste and Designated Chemical Material Management System as per MEDEP Chapter 200 §5.20(G). Characterization will include static testing of development rock and tailings material and kinetic testing of tailings material and rock to be placed underground including cemented and uncemented components. Additionally, a water quality monitoring plan is required as per MEDEP Chapter 200 §3.9(C). As permitting will take 2 to 3 years following rezoning, this gives sufficient time to complete appropriate baseline and environmental studies.

The design and operation of a filter cake disposal facility is dependent on tailings to the specified consistency. The main challenges to tailings management include variations on tailing development that require additional reworking, drying, or re-processing before deposition and that winter conditions may impact dewatering efficiency, requiring temporary storage. Although this is of more engineering and operational concern, the geochemical nature of the material will inform operational decisions.

## SOILS

### Current Status and Information

A soil suitability evaluation undertaken by Wood Environment & Infrastructure Solutions, Inc. (Wood) (2020a) identified five soil suitability classes.

- Generally Suitable: Well drained (>16 inches to water table), deep (>40 inches) bedrock, slopes less than 15%.
- Limited Suitability: Poorly drained (7–16 inches to water table), moderately deep (20–40 inches), slopes less than 15%.
- Unsuitable: Poorly drained (<7 inches to water table), shallow (<10 inches) bedrock.
- Unsuitable – Wet: Hydric soils or mapped wetlands.
- Unsuitable Steep: Slopes >15%.

Based on these criteria, the site was divided into six areas based on broad landscape areas with similar soil characteristics (Wood 2020a:Figure 5).

- Area 1: This area is in the northeast portion of the site and slopes range from 3% to 10%. Soils in Area 1 are loams to silt loams, with bedrock greater than 16 inches. Soils are well drained to moderately well drained. Seasonal high-water table is generally greater than 15 inches below grade. The TMF and processed wastewater dispersal facility is to be located in Area 1.
- Area 2: The northern and northwestern section of the rezone area is characterized by gentle to moderate slopes and soils are loams to silty loams with a seasonal high-water table or restricted layer less than 16 inches. As such, the soils are poorly drained and contain long slopes with shallow groundwater during normal conditions.

- Area 3: The western section has moderate slopes and loam to silty loam, well-drained soils with bedrock approximately 10 to 20 inches deep. Development of the main pad is proposed in Area 3.
- Area 4: The central section has slopes ranging from 0% to 8% with some moderate slopes of 8% to 15%. The loam and silt loam soils over glacial till or bedrock result in poorly drained soils. Wetlands are prevalent in this area. Development in this area is proposed to consist of material storage pads including laydown areas for equipment, cold storage pad, containment pads for waste rock, low grade ore, and native topsoil and gravel from the grading of other development areas (i.e., main pad, TMF).
- Areas 5 and 6: This portion of the central section has a complex terrain with steep slopes, shallow ledges, and bedrock outcrops. Where silt loam soils are present, bedrock generally occurs at depths of 10 to 20 inches. The low-grade ore pad is proposed for Area 5.

A wetland delineation survey (Wood 2020b) identified 34 wetlands and eight vernal pools within the proposed rezoning area. Development is proposed such that no impacts will occur to vernal pools, delineated wetlands, and streams, with a 75-foot buffer observed on these resources. In the event that impacts cannot be avoided, compensation features will be developed. The final grading plan will include enhancement of these features during reclamation and closure activities.

### **Assessment of Reasonableness**

As with any mining development, the soil assessment identified a mixture of soil types and suitability. Generally, soils that can be considered suitable for development, or with limited suitability that can be corrected through engineering design, exist within the proposed rezoning area. The soil limitations observed include shallow bedrock conditions, and areas with a seasonal high-water table. Areas of steep slopes, greater than 20%, occur in small amounts as part of the landscape and should be avoided when possible. Areas with a high-water table include jurisdictional wetlands, and the lower slope positions with somewhat poorly drained soils are also present and should be avoided when possible. Prior to any development, more detailed surveys to better identify the most appropriate areas for site development are required prior to permitting.

### **Issues and Potential Challenges**

The most common limitations in the preliminary site plan areas are generally shallow bedrock and poorly draining soils with a high-water table at or near the surface. These poorly drained soils present limitations for roadway, parking, and laydown area construction; tailings storage facility construction and operations; building and foundation construction; and wastewater disposal construction and operations. Wood (2020a) has proposed the following hierarchy to overcome these limitations.

- Locating and maximizing development on areas with better drained soils where practical.
- Siting development areas to maximize use of the existing infrastructure including existing roads.
- When development must occur on soils that have limitations, employ the appropriate construction techniques.

Wood (2020a) has also outlined design criteria for the State of Maine to meet regulatory requirements, design criteria, and construction standards.

## **CLOSURE AND RECLAMATION**

### **Current Status and Information**

The proposed mine is designed to operate with a limited footprint throughout all phases of the project.

At the end of the mine life, buildings will be demolished and disposed. The underground portal will be closed to prevent access to underground workings while also allowing for bat entry and habitat. The site will be regraded to approximate original contours. Salvaged topsoil will be distributed for plant-growth media prior to revegetation.

Closure cover for the TMF will include a composite liner system with drainage layer and soil cover for vegetation growth. The soil cover is designed with 1.5 feet of subsoil and topsoil, and replanted with small grasses and shrubs. TMF constraints include maximum height of 22 feet to be less than the height of the trees, setback from wetlands greater than 75 feet, and setback from the project boundary greater than 400 feet.

The water management system for management of site drainage water during closure and post-closure will be maintained in place until water concentrations are at acceptable levels to meet regulatory guidelines.

### **Assessment of Reasonableness**

The preliminary closure and reclamation components are consistent with industry standards. Closure of the TMF is proposed to be progressively reclaimed which allows for evaluation of closure cover performance that can allow for modifications of the reclamation protocols as required. As concurrent closure of the TMF will occur during operations, risks to the State will also be minimized as total disturbed areas will be reduced. A final closure plan will be developed in compliance with MEDEP Chapter 200 §5.24 rules as the mining plan evolves and is finalized. The reclamation plan will include a detailed cost estimate and the associated surety bond will be filed prior to commencement of operations.

### **Issues and Potential Challenges**

The preliminary closure and reclamation components are consistent with industry standards with the following considerations.

- Material placed underground requires testing to ensure no impact to groundwater.
- Topsoil salvage for reclamation is discussed as final soil cover for regrowth and local borrow areas have been identified for subsoil. A material balance will be required to ensure that sufficient topsoil is salvaged and borrow material is available for reclamation.
- The TMF will provide the greatest long-term risk at closure to ensure that fine-grained, highly reactive sulfide minerals are not exposed to air and/or water. Seepage and geotechnical studies will be required to ensure that the TMF is designed and constructed appropriately.
- Final design for TMF closure will be in compliance with MEDEP Chapter 200 rules and the cover design appears reasonable for grasses and shrubs. Given that the climax species in the area are trees, consideration will be required for ensuring that forest encroachment does not occur during the long term with deep-rooted vegetation disturbing liners and capping materials.

## CONCLUSIONS

The review of available preliminary data has identified that several potential issues related to environmental geochemistry, soils, and reclamation and closure that will require additional investigations to ensure that the project is technically feasible. These include a robust geochemical testing program, and refined soil mapping as the facility siting is finalized. In addition, financial reclamation plans are to be refined and costed. These requirements are well documented within MEDEP Chapter 200 rules.

However, the basis of any project is to limit the negative impact to natural resources, especially water resources. While preliminary in nature, the key issues have been identified and will be developed further as detailed planning progresses to final design and permit approval. The preliminary design presented in the LUPC petition and the PEA has been developed to minimize these impacts through engineering controls such as water management and treatment, and appropriate use of liners and capping. The site will be graded to maintain, as close as possible, original contours, and the largest surface feature, the TMF, will be sited to not exceed the height of existing trees.

SWCA considers the project components received during this scope to be industry standards and that the mine can be developed such that impacts are minimized during operation, closure, and post-closure.

## LITERATURE CITED

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- Wolfden Mt. Chase LLC (Wolfden). 2020a. *Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit*. Thunder Bay, Ontario: Wolfden Mt. Chase LLC.
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**ATTACHMENT E**

**Assessment of Financial Practicality**  
***Sunrise Americas LLC***

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**PICKETT MOUNTAIN PROJECT, WOLFDEN MT. CHASE LLC**

**ASSESSMENT OF FINANCIAL PRACTICALITY**

**NOVEMBER 2020**

Prepared for SWCA Environmental Consultants for the purpose of including in a “Technical Feasibility & Financial Practicability Assessment” of the proposed Pickett Mountain metallic mineral mine to be submitted to the Land Use Planning Commission (LUPC) of the Department of Agriculture, Conservation and Forestry of the State of Maine.

Prepared by: Sunrise Americas LLC  
Date: November 30, 2020

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## 1 INTRODUCTION

The Pickett Mountain polymetallic mining project in northeastern Maine (“Pickett Mountain” or “Project”) is owned 100% by Wolfden Mountain Chase LLC (“WMC”), a wholly-owned subsidiary of Wolfden Resources Corporation (“Wolfden”), a Canadian mining company listed on the Toronto Venture Exchange.

Getty Oil discovered the Pickett Mountain copper-lead-zinc deposit in 1979. After a succession of owners, WMC purchased the Project in late 2017 and proceeded to advance exploration and development work at the property. On September 14, 2020, Wolfden announced the results of a preliminary economic assessment (“PEA”) for the Project and, on October 29, 2020, filed a technical report on the Project for the purposes of the NI 43-101 requirements of Canadian securities law.

On January 26, 2020, WMC submitted a “Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit” (“Zoning Petition”) with the Land Use Planning Commission (“LUPC”) of the Department of Agriculture, Conservation and Forestry of the State of Maine.

This report has been prepared for SWCA Environmental Consultants for the purpose of including in a “Technical Feasibility & Financial Practicability Assessment” of Pickett Mountain to be submitted to LUPC.

This report has relied solely on the assessments, reports, plans and reference sources submitted to-date by the petitioner, WMC, during the application process. The sources for such information were the following:

Wolfden Mt. Chase LLC - Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit - January 26, 2020 (Revised June 30, 2020);

- Wolfden Resources - Preliminary Economic Assessment, Pickett Mountain Project – Effective date: September 14, 2020; and
- Wolfden Resources – Website - [www.wolfdenresources.com](http://www.wolfdenresources.com) - Press Releases & Financial Statements.

More detailed references to the sources of the information reviewed by the author can be found in the contents of this report together with a complete list of References in Section 8.

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## Glossary and Abbreviations of Terms

Ag	silver
Au	gold
C\$	currency of Canada
Cu	copper
g/t	grams per tonne
k	thousand
km	kilometre
m <sup>3</sup>	cubic metre
Mt	million tonne (metric)
MW	megawatt
MWh	megawatt hour
NSR	net smelter return
oz	ounces (troy)
Pb	lead
PEA	Preliminary Economic Assessment
t	tonne (metric)
tpy	tonnes per year
US\$	currency of the United States of America
USA	United States of America
WMC	Wolfden Mountain Chase LLC
Wolfden	Wolfden Resources Corporation
Zn	zinc

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## 2 INFRASTRUCTURE & KEY SUPPLIES

### 2.1 Infrastructure Requirements

The Project is located in northeastern Maine, about 33 miles from the Canadian border and about 42 miles due west of the town of Woodstock, New Brunswick. Access to the Project for State Highway 11, and from State Highway 11 there are paved primary and secondary highways with access to Interstate 95 at Island Falls, about 22 miles from the Project (Source: PEA, Section 4.0).

The area is well supported by local infrastructure, including well maintained roads, highways, and access to rail in the town of Sherman Station 17 miles from the Project; as well, the (regional) electric grid runs along Highway 11 (Source: PEA, Section 5.4).

The development plan for the Project requires the availability of key infrastructure to support the construction and operation of the mine as follows:

<b>Water</b>	The concentrator requires 3,033m <sup>3</sup> per day of water. After recycling 89%, the net make-up fresh water is 325m <sup>3</sup> (Source: PEA, Section 17.4).
<b>Power</b>	The Project would be connected to the regional grid system (NPCC) through a new 14.6-mile transmission line that a power supplier would construct (Source: Zoning Petition, Project Description). The mine operation will require about 6MW electrical demand (Source: PEA, Section 18.4) which will be supplied by a licensed competitive supplier.
<b>Roads</b>	The Project is located in a logged area that has access roads used by foresters to reach timber lots. The rights-of-way has been established and the roads require upgrading to meet safety standards for higher volumes of traffic that will occur with construction and operation of a mine (Source: PEA, Section 18.1). The access road from the paved Highway 11 to the mine site will need to be upgraded to ensure safe reliable access year-round (Source: PEA, Section 18.2).

Mine site infrastructure, such as the site pad for the construction and operating areas and power distribution lines that step down from the main substation, are considered part of the construction of the mining facilities required to extract and process the ore.

All other infrastructure requirements, such as the port for shipment of concentrates to smelter destinations, will rely on existing infrastructure already operated by third parties who would provide such facilities on a services basis.

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## 2.2 Current Status of Development Work & Information Reviewed

The development work conducted to prepare the PEA included assessment of key infrastructure requirements and estimates of the capital expenditures to develop the infrastructure. The level of the evaluation is not stated however it is assumed that these are to a scoping study level, consistent with level of the PEA.

- Wolfden and its consultants have assessed the requirement for a potable water system that includes the process water system that needs to meet or exceed dissolved solids that may interfere in the extraction process. The water needs to be drawn from an authorized site by the state of Maine to a suitable tank, and from the tank be distributed after being treated for organics, total dissolved solids, as well as metal ions (Source: PEA, Section 18.5). No information is provided on the cost of the state of Maine delivering the water or on the expected quality of the water.
- Wolfden and its consultants have had discussions with Emera Power, the predecessor to power supplier Versant Power, who provided an indicative price of US\$7 million to deliver 6MW electrical power to the main substation at the mine site (Source: PEA, Section 18.4). The mine will have standby diesel generators of 3MW electrical demand to ensure safety of the operation during a power disruption (Source: PEA, Section 18.19). The electrical power cost delivered to the Project is estimated at US\$85/MWh (Source: PEA, Section 21.2.1). No information is provided on the scope and precision of the estimates of the power requirements.
- Wolfden and its consultants have assessed the condition of the local roads and access road, and the upgrade requirements are as described in Section 2.1.

The development plan includes construction of a water treatment facility. The structure for the development assumes a build own operate (“BOO”) arrangement that would be owned by a specialist third-party developer and operator, and includes a reverse osmosis unit to ensure the water quality meets state environmental standards (Source: PEA, Section 18.17). The cost of the service is estimated at US\$1.74 per tonne (Source: PEA, Section 20.2.3). No information is provided on the source of the estimated cost.

## 2.3 Assessment of Reasonableness

The author has relied on the PEA for description of the existing road conditions, for the assessment of the new water and power infrastructure requirements, and road upgrade requirements, and for all estimates of capital expenditures and operating costs for such infrastructure.

The estimated capital expenditure for the new transmission line from the regional grid is considered reasonable based on industry benchmarks, and the electrical power cost is generally consistent with the delivery and supply rates for industrial customers published by state regulator, the Maine Public Utilities Commission.

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The quantities of make-up water are relatively small due to the recycling, and errors in the assumptions would not be expected to have a material impact on the economic evaluation. Similarly, the capital estimates for the road upgrades are relatively small in the overall capital expenditures for the Project.

The assumption of the BOO arrangement for the proposed water treatment plant results in a reduced capital expenditure for the construction phase (instead, it is assumed the Project will pay a fixed capital charge for the supplier to receive a return on its investment), however it will not reduce the financing requirement for the Project since Wolfden will be expected to provide a corporate guarantee to the supplier for the risk of any failure to use the service.

## **2.4 Issues & Potential Challenges**

Neither the power nor road infrastructure are expected to present any development difficulties.

The environmental and other permitting requirements for water have not been considered in this assessment of financial practicality of the Project.

## **2.5 Conclusions**

The key infrastructure requirements have been identified and capital costs to develop have been estimated by Wolfden and its consultants.

The PEA has been relied on for assessment of infrastructure requirements, and estimates of capital and operating costs for such infrastructure; the descriptions in the PEA are considered reasonable and, since the Project would benefit from existing infrastructure (roads, regional grid system) and key supply resources (water, electricity) in the proximity to the Project, any errors in the assumptions would not be expected to have a material impact on the economic evaluation.

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### 3     **MARKETING**

#### 3.1   **Marketing Plan**

Based on scoping level metallurgical test work, it is planned that the Project will produce three concentrates, a copper concentrate, a lead concentrate and a zinc concentrate, that will be sold to smelters handling such products. Silver and gold by-products report principally to the copper concentrates, then to the lead concentrates (Source: PEA, Section 13.3.3).

The life-of-mine production tonnages for the three base metals are stated, but the annual production of the metals and the corresponding tonnes of concentrate are not presented in the PEA; estimates of annual tonnages of: (a) metal contained in the concentrates and (b) concentrate are calculated based on assumptions used in the economic analysis (Source: Wolfden Resources, Press Release, September 15, 2020):

Copper	3,495 tonnes per year copper in concentrate 14,092 tonnes per year copper concentrate
Lead	10,278 tonnes per year lead in concentrate 20,193 tonnes per year lead concentrate
Zinc	29,928 tonnes per year zinc in concentrate 51,868 tonnes per year zinc concentrate

The concentrate products require transportation by road to a port, and subsequent transportation by shipping vessel to destination ports used by the smelters to receive concentrates.

The concentrate products will be subject to deductions and charges imposed by the smelters for smelting and refining of the concentrates, including any charges for other payable metals contained in the concentrates and penalties for certain elements considered contaminants by the smelters.

The Project will be expected to negotiate long-term offtake (delivery and sales) agreements for each of the concentrate products in order to ensure customers for the products and to satisfy the likely requirements of financiers.



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### 3.2 Current Status of Development Work & Information Reviewed

In order to develop a preferred processing circuit for recovery of the metals, Wolfden has reviewed the test work originally performed at Lakefield Research for previous owners Getty Mining (1984) and Chevron Resources (1988), and has undertaken its own scoping level metallurgical test work during 2019 conducted by Resource Development Inc. (RDI) with the primary objective of determining metal recoveries and flotation concentrate grades from the mineralized material. The scoping level test work has indicated that a sequential flotation process will produce marketable grade copper, lead and zinc concentrates (Source: PEA, Section 13). The projected recoveries for the three metals, 80.5% for copper, 77.5% for lead and 89.5% for zinc, and their respective concentrate grades, 24.8% for copper, 50.9% for lead, and 55.7% for zinc, were used to calculate the production schedules that were included in the economic evaluation (Source; PEA, Section 17.5).

The PEA assumes that the concentrate will be transported to the nearest deep-water port via a local logistics contractor (Source: PEA, Section 19.2). There is no reference to the location of this port, nor to the destination smelters.

Estimates of commodity prices for the metals contained in the concentrates, and estimates for concentrate transportation costs and smelter charges have been used to prepare the mine plan and input to the economic analysis of the Project.

- The commodity prices for the metals contained in the concentrate are presented in Table 19.1 of the PEA and input to the economic analysis are based on industry consensus pricing provided by Wolfden (Source: PEA, Section 1.8). The sources and methodology used to determine these prices are not stated. No market studies were conducted (Source: PEA, Section 19.1).
- Transportation costs of US\$40 per tonne of concentrate have been used for assumptions in the economic analysis to cover handling on site, transportation to a port, port handling and transport by ship to smelter (Source: PEA, Section 21.6). These services would be provided by a local logistics contractor (Source: PEA, Section 19.2). There is no reference to the source for these estimates.
- Smelter charges used for assumptions in the economic evaluation were based on input from major smelters including a large, diversified resource conglomerate and commodity trader, for life of mine feed at international benchmark terms (Source: PEA, Section 19.2).

Wolfden has confirmed that it expects to negotiate long-term offtake agreements with smelters (Source: PEA, Section 19.2).

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### 3.3 Assessment of Reasonableness

Based on the results of the test work used to prepare the conceptual process flowsheet (Source: PEA, Section 17.1) and material balance (Source: PEA, Section 17.5), the chemical composition of the lead concentrate and zinc concentrate, including the concentrate grades, should be suitable for treatment and refining at smelters, and would be expected to receive standard smelter charges for the products.

Based on the same test work, the concentrate grade of 24.8% copper is slightly below the typical minimum concentrate grade of 25% copper accepted by smelters. If the final process flowsheet does not increase the concentrate grade of the copper above the minimum, this does not mean that the product cannot be marketed, however it may be subject to smelter terms that are not considered international benchmark terms.

The annual tonnages of each of the concentrates are not considered significant in terms of creating challenges for road and shipping logistics, nor would they be expected to have any material impact on the availability of smelter capacity. There are smelters operating in North America for each of the three metals, and Europe and Asia could be alternative smelter destinations, although these would be expected to result in higher transportation costs.

The commodity prices for the metals contained in the concentrates, and estimates for concentrate transportation costs and smelter charges have been used to prepare the economic analysis of the Project in the PEA.

- Copper, lead and zinc prices used to calculate incomes from the sale of concentrates are reasonable; although similar to current prices, they are at the higher-end of long-term price forecasts used within the industry to evaluate projects. The sources and methodology used to determine the industry consensus pricing is not known.
- Although the PEA has not stated smelter destinations, the road and shipping transportation costs to deliver concentrates to the smelters are considered reasonable when benchmarked against other projects and mines, and considering likely smelter destinations.
- Smelter charges (deductions) for processing concentrates are reasonable and in-line with standard deductions and charges applied in the industry. Potential penalties have not been included in the economic analysis since the test work is at scoping level and not sufficiently advanced to allow any meaningful estimates.

For the purposes of ensuring customers for the concentrates and for the purposes of securing financing, it would be expected that long-term offtake contracts will be negotiated with the smelters. Wolfden has confirmed this is part of the marketing plan.

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### **3.4 Observations & Potential Challenges**

The author of the PEA has identified high levels of arsenic and antimony in the test work samples for the copper concentrate; these are considered deleterious elements by the smelters and may be subject to penalties or even result in the product not being accepted by smelters. Since the test work is at scoping level and further test work is planned that will provide additional information on the impurities, including investigation of possibilities to blend the ores from different areas of the mine to keep the impurities below penalty levels, this is highlighted but not considered a fatal flaw (Source: PEA, Section 13.4).

A recent trend is containerized transportation of concentrates, where the concentrate is placed in a container at the mine and delivered to the customer in a sealed form, thereby avoiding multiple transfer points, reducing environmental impact, and avoiding loss of product. It is expected that Wolfden will consider this option during the feasibility phase when the products are better defined and smelter destinations are identified.

### **3.5 Conclusions**

The key factors impacting the marketing of the concentrates to be produced by the Project have been identified and assessed by Wolfden at a scoping level. Based on the information reviewed, the marketing plan and assumptions appear reasonable.

Further test work will be required to more accurately determine the chemical composition of the concentrates to be produced by the Project, and to confirm the suitability of the concentrates for treatment and refining at the smelters. Since the process flowsheet remains under review and has not been finalized, this confirmation will not be possible until further development work has been completed. At this stage, it is premature for the Project to advance any discussions with potential customers (smelters) until the final products are better understood and samples can be provided to the smelters.

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## **4 PROJECT SCHEDULE**

### **4.1 Development Timeline**

Wolfden and its consultants have prepared a PEA which provides a scoping level assessment of the development plan to advance the Project through a feasibility phase, and subsequent construction and commissioning phases to achieve commercial operation.

The development plan is based on an underground mining operation and processing plant with a sequential flotation circuit that will process 1,200 tonne per day of ore to produce three separate metal concentrate products.

The development timeline is based on completion of a feasibility study, including establishing a mining reserve and securing all required permits, to enable a feasibility study to be completed. In addition, it will be necessary to arrange all contracts, including the EPC or EPCM contract, and secure financing for the construction and commissioning phases.

### **4.2 Current Status of Development Work & Information Reviewed**

The Zoning Petition and PEA provide the most recent updates on the current status of the Project in terms of the development work completed.

- The final version of the Zoning Petition is dated June 30, 2020.
- The PEA was prepared effective September 14, 2020.
- Further development work will require a mining reserve to be established, all permits to be secured and a feasibility study to be completed to enable financing to be arranged and an investment decision to construct and operate a mine.

#### Feasibility Phase

The PEA does not provide information on the timeline to complete the feasibility work however the Zoning Petition includes a high-level Gantt chart showing a three (3) year timeline to complete approval of rezoning, baseline study work and final approval of a mining permit (Source: Zoning Petition, Project Description - Phase 4).

Wolfden has made no public statements on the timetable to advance further development work at the Project.

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### Construction Phase

The PEA indicates a pre-production period of 21 months (Source: PEA, Section 21.1.4). There is no information provided on the timeline for individual construction activities or the commissioning phase required to achieve commercial production. The PEA indicates that working capital estimates are based on four months of operating costs which implies a four-month period for commissioning from mechanical completion to commercial production.

The high-level Gantt chart in the Zoning Petition shows a similar two-year timeline to complete construction, including mine production ramp-up and commissioning, and achieve commercial production. Most of the construction activities have a timeline of no more than 12 months from the full notice to proceed issued to contractors for construction, except for the excavation of ventilation raise to the surface, installation of the electric substation and interconnection to the regional grid, and construction of the concentrator and supporting facilities, which the Gantt chart indicates would be completed within the two-year timeline for construction (Source; Zoning Petition, Project Description – Phase 4).

Neither the PEA nor the Zoning Petition make reference to the timeline for Wolfden to arrange financing for the construction and commission phases.

## **4.3 Assessment of Reasonableness**

### Feasibility Phase

The author of the PEA has described the need to conduct additional drilling and establish a mining reserve, to complete metallurgical and other work programs and enter into contracts that will be required to complete a feasibility study. Although no schedule is provided in the PEA for completion of these development activities, assuming funding is available, it should be possible to complete the work within the three-year timeframe indicated to secure all permits indicated in the Gantt chart in the Zoning Petition. No assessment is made in this report of the likelihood of Wolfden to secure all permits within that schedule.

The PEA and Zoning Petition make no reference to the timeline for Wolfden to arrange financing for the construction and commission phases, except by implication in the Gantt chart; such financing process can begin prior to completion of the feasibility study and would be expected to continue following completion of the same study.

### Construction Phase

The PEA indicates a pre-production period of 21 months and, by inference, a further 4-month timeline for commissioning to achieve steady-state operations and commercial production. The author has relied on the PEA on for the estimated schedule however, although the Project is at an early development stage and more detailed work needs to be completed to refine the schedule, the construction and commissioning schedule appears reasonable.

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#### **4.4 Observations & Potential Challenges**

All mining development projects are faced with technical, commercial, legal, permitting, financing and other challenges, which combined are unique for each project. Many of these activities are interdependent, and difficulties to meet timetables to complete the various development activities and programs will often result in delays to project schedules.

A different set of challenges are presented with the construction and commissioning of a mining project however, if a project has a completed feasibility study, arranged financing and has made an investment decision, this will be a strong indication of that the project is solid since the subsequent phases will have been reviewed in detail by third-parties, such as independent engineers, financiers and regulatory environmental and other authorities.

The Project can be considered in the same situation. A PEA has been completed which outlines the potential to develop a technically and economically viable mining operation. There are challenges to maintain the timetable, complete the feasibility study and reach an investment decision – most notably the challenges to secure all necessary permits, to secure continued funding for the development work, and to arrange financing for the construction and commissioning phases – but these are typical for a mining development project and would not be considered fatal flaws at this stage of the development schedule.

#### **4.5 Conclusions**

The schedules indicated or implied in the PEA and Zoning Petition for the feasibility phase, and subsequent construction and commissioning phases, appear reasonable.

The complexities of advancing a mining project to an investment decision, including the requirement to schedule many different interdependent development activities and programs, often result in delays to the project schedule.

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## **5 PROJECT ECONOMICS**

### **5.1 Assessment of Financial Practicality of a Mining Project**

Assessment of the financial practicality of a mining project requires an economic evaluation, including developing an economic model using a financial computer software with inputs for key parameters and assumptions for expected macroeconomic conditions, capital expenditures, production, operating performance and costs, closure costs and bonding requirements, and tax and financing costs. In addition, the economic model will be used to assess the sensitivity of the project economics to variations in the values estimated for the key parameters and to assist in the risk assessment of the project. Inputs for the economic model will be based on internal estimates, principally using technical assumptions developed from both in-house and third-party work and reviews, and external estimates, principally for macroeconomics and commercial assumptions provided by recognized institutions, corporations or industry specialists. As a project advances towards an investment decision, inputs will include firm quotes for capital equipment, and capital and operating cost estimates derived from commercial terms in contracts entered into by the mining company.

During the feasibility phase, the mining company will continue economic evaluation of the project and, if public companies, will likely periodically report the results in regulatory filings in the form of a PEA, prefeasibility study or feasibility study. Other groups, such as analysts for brokerage houses, regulators and other parties interested in the project may make independent evaluations, which will typically be private or with restricted access.

As the mining project advances, other groups such as potential investors and/or financiers will likely make detailed due diligence and assess the financial practicality of the project. Although the results from such investigations are unlikely to become public, the decisions made by such groups based on their evaluations will provide good indications of the financial practicality as assessed by groups willing to invest into the project.

### **5.2 Current Status of Development Work & Information Reviewed**

The PEA includes a Section 22 titled “Economic Analysis”. Although the methodology to prepare the economic evaluation is not specifically stated, the section references the calculation of expected cash flow estimates, and provides the results and financial analysis. The Zoning Petition provides a general description of the preparation of a cash flow (economic) model to evaluate the cost estimates and produce economic forecasts (Source: Zoning Petition, Appendix A-B3a).

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The economic analysis includes estimates of metal prices and some key parameters for production and capital costs (Source: PEA, Section 22), which can be referenced back to estimates determined in other sections of the PEA.

### Production Estimates

The potentially mineable underground resource used in the economic analysis is estimated at 4.2 million tonnes at a grade of 8.56% Zn, 1.11% Cu, 3.40% Pb, 0.79 g/t Au and 88,8 g/t Ag. The PEA relies on indicated mineral resources (approximately 48.7% of the total resource) and inferred mineral resources. The author of the PEA notes that the inferred mineral resources are considered highly speculative geologically (Source: PEA, Section 22).

Schedules for mine production and ore throughput to the processing plant were prepared for the PEA. The mine ore throughput planned is 1,200 tpd, or 432,000 tpy (Source: PEA, Section 16.13). The metallurgical recoveries, and capital and operating cost estimates are considered to be at least PEA level accuracy (Source: PEA, Section 22).

### Capital & Operating Costs Estimates

The PEA states that the initial capital expenditures totaling US\$147.4 million and sustaining capital totaling US\$100.0 million are based on budget pricing from supplier from critical components, consultants, contractors, studies and local benchmarks, and a review of other Canadian projects. Further, that capital expenditure estimates are within +/- 40% and include working capital and contribution to the Financial Assurance Trust fund (Source: PEA, Section 21.1.11). The same section provides more specific details on the sources of the estimates for individual cost areas. It is assumed that initial underground construction, ramp-up and operation of the underground for up to 3 years will be conducted by mining contractors (Source: PEA, Section 19.2).

The working capital is estimated at US\$11.5 million based on 4 months of estimate operating costs (Source: PEA, Section 21.1.9).

The all-in operating costs of US\$93.08 per tonne of ore production are based on US and overseas prices from suppliers and other similar type projects for consumables and parts. The source or basis for the cost of electricity and fuels are not stated. Labor rates are based on local rates where available, and/or contractor costs in the region and country for similar types of work (Source: PEA, Section 22.1). The same section provides more specific details on the sources of the estimates for individual cost areas.

The author of the PEA states that the overall level of accuracy of the study is +/- 40% (PEA, Section 22.2).

No contracts currently exist for construction, operation, supplies or consumables, however budgetary quotations and estimates have been provided by potential candidates for input into the economic analysis (Source: PEA, Section 19.2).



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## Economic Evaluation – Results & Analysis

The PEA includes summary tables for the results and analysis. The expected life-of-mine returns for the Project are presented for revenues net of marketing costs (transportation and smelter charges), undiscounted cash flows, net present returns at 5% and 8% discount rate, the internal rate of return and the payback period, on a real (not inflated) pre-tax and after-tax basis (Source: PEA, Section 22.2). All results are presented in United States dollar terms.

The PEA does not include tables to illustrate the production, capital and operating costs, and cash flows for the Project on an annual basis. The Zoning Petition includes annual cash flow estimates for employment, consumables, services and energy to show the amount and schedule of expenditures within the local communities (Source: Zoning Petition, Appendix A-B3a).

The PEA includes sensitivity analysis of the impact of percentage changes to the key parameters (mining grade, recovery, smelter charges, metal prices, operating costs and capital costs) on the net present value at 8% discount rate and the internal rate of return (Source: PEA, Section 22.3).

In addition, a corporate presentation by Wolfden Resources includes an estimate of the unit revenue value of a tonne of ore produced, a standard metric used to analyze the value of a project (Source, Wolfden Resources, Corporate Presentation, October 30, 2020).

### **5.3 Assessment of Reasonableness**

The author has relied on the PEA for the assumptions for the key technical parameters, together with any observations and concerns expressed in the same document.

The economic analysis in the PEA is not based on a mining reserves, which would require more certainty on the mineral resources (i.e., it would not include inferred mineral resources) and the technical and economic assumptions included to develop the block model for the mine plan; however, this methodology is standard and acceptable based on the current status of the Project as an early stage development project at a PEA level.

The National Instrument 43-101 Standards of Disclosure for Mineral Projects issued by the Canadian Securities Administrators consider the confidence in inferred mineral resources is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. However, Wolfden has met the criteria to disclose the results of an economic analysis by stating that the economic assessment is preliminary in nature, that it includes inferred mineral resources

The sources of the estimates used to prepare the assumptions for the key capital and operating costs, and commercial parameters are considered standard for economic analysis in a PEA.

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- As described in Section 3.3, the copper, lead and zinc prices used to calculate incomes from the sale of concentrates are reasonable; although similar to current market prices, they are at the higher-end of long-term price forecasts used within the industry to evaluate projects.
  - The PEA has been relied on for the estimates for capital costs and operating costs used in the economic analysis; these are considered generally within industry benchmark ranges for an underground mine and flotation plant at the planned production levels. The relatively low infrastructure capital costs reflect the proximity and availability to key supplies such as water and power.
  - As described in Section 2.3, the estimates used for transportation costs and smelter charges are considered reasonable.

The methodology used to prepare the economic analysis, including the use of real terms and discount rates, and the output measures of value (net present value, internal rate of return, payback) are considered standard for the mining industry. A minimum discount rate for a base metal project would be 8% (the PEA includes valuations at 5%), and reasonable arguments can be made that a higher discount rate should be used to reflect the risk profile of the Project.

Since annual production and cash flows are not presented in the PEA, the author has prepared a simplified financial model using the key parameters indicated in Section 2.20 of the PEA to confirm that the results of the economic analysis presented in the PEA have been correctly calculated and appear reasonable.

#### **5.4 Observations & Potential Challenges**

The capital expenditures presented in the PEA exclude costs such as tax and duties, financing costs, and legal costs. These exclusions are highlighted but, at this early stage of the development of the Project, these are not a focus and can be estimated as the development work is advanced.

The results of the economic analysis presented in the PEA exclude the royalty that would be paid to Altius Minerals (see Section 6.2).

As described in other sections, the financial practicality of the Project will depend not only on the results of the feasibility study but will depend on the ability of Wolfden to successfully fulfil permitting requirements and arrange project financing and/or introduce a partner.

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## 5.5 Conclusions

These results of the economic analysis confirm that the Project could be developed into a viable, small to medium-sized mining operation; the sensitivity analysis confirms that the Project returns will be reasonably robust to variances in the key assumptions.

These net present values are significantly higher than the market capitalization of Wolfden, reflecting the use of low discount rates in the PEA and the fact that the market has factored in the risk profile of the Project.

The principal challenges for the Project to realize the values presented in the PEA are: (a) confirming at a feasibility level the scoping level assumptions that have been used in the PEA, including the need to establish a mining reserve, (b) successfully fulfilling permitting requirements and (c) arranging project financing and/or introduce a partner.

Finally, Wolfden continues to fund exploration drilling to target extensions to the existing deposits and new discoveries; if successful, this would be expected to improve the financial practicality of the Project, and make the Project return more robust.

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## **6 FINANCIAL CONSIDERATIONS**

### **6.1 Junior Mining Companies & Financing for Mining Projects**

A mining development project requires funding for: (a) the feasibility phase to complete the work and studies necessary to appraise the technical and economic viability of the project and make an investment decision, and subsequently (b) the construction and commission phases of the project until it becomes a commercially operating mine.

For junior mining companies, the ability to successfully fund the development phases of a mining project will depend on many factors including, but not limited to, the quality and viability of the mining project, the relationship of management with brokerage houses, financial institutions, investments funds and other groups accustomed to investing into the mining industry, the ability of management to raise funding at specific times in the project development schedule, the market environment for both metals and the overall economy, and the general vagaries and sentiment of the investment community at any point in time. The challenges for a junior mining company to fund the development of a mining project become acutely difficult when seeking to financing the construction phase, when financiers will not only consider the economic viability of the project but will consider a wider range of criteria including the likely requirement for the company to have the financial capacity to manage issues such as project capital cost overruns, and to provide corporate guarantees in the event the mining project cannot be commissioned.

The financing plan will be further influenced by the strategy of the junior mining company; in some cases, the company will focus on its core exploration and technical skills to advance a project before seeking a partner or divesting to a company with the technical and financial capacity to develop the mine; in more rare cases, the other cases, the junior mining company can develop those capacities and seek to develop the mine itself.

### **6.2 Current Financial Status of Wolfden Resources & Information Reviewed**

The Project was acquired by Wolfden in November 2017 from a private seller for US\$8.5 million. The assets included timberland and all minerals, mining, subsurface and surface rights owned by the seller in an area referred to as the Pickett Mountain property, which included the Pickett Mountain base metal deposit. (Source: Wolfden Resources, Press Release, November 16, 2017).

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The acquisition was financed through: (a) the granting of a 1.35% royalty interest in the future gross revenues from the Project for US\$6 million to Altius Minerals, and (b) a non-brokered private placement (share purchase) in Wolfden made by Altius Minerals for gross proceeds of C\$5.1 million, equivalent to US\$4.0 million at the closing date (Source: Wolfden Resources, Press Release, November 16, 2017). The surplus of funds from these transactions was used to conduct exploration and development work on the Project during 2018 (Source: Wolfden Resources, Financial Statements, Fourth Quarter 2018).

Since the acquisition, Wolfden has been successful to raise funds to advance development work on the Project. In December 2017, the company raised C\$675k (US\$537k) from a non-brokered private placement; in March 2019, the company raised C\$2.5 million (US\$1.9 million) from a non-brokered private placement with Kinross Gold, a major Canadian gold company with mines in Nevada, and; in January 2020, the company raised an initial C\$3.0 million (US\$2.3 million) by selling forward timber from the Pickett Mountain property (Sources: Various Wolfden Resource Press Releases).

As of June 30, 2020, Wolfden Resources (consolidated) had a cash balance of C\$2.9 million (US\$2.1 million), and current assets of C\$3.0 million (US\$2.2 million). The company has only C\$259k (US\$199k) current liabilities and no debt to financial institutions. The royalty held by Altius Resources is a contingent liability payable only if and when Wolfden commences operations at the Project.

In terms of future expenditures, the Project is considered at an early development stage with further development work required to establish a mining reserve, obtain all permits required, prepare a feasibility study and make an investment decision, and subsequently to construct and commission a mine operation (see Section 26).

- The author of the PEA estimates that US\$3-5 million will be required to complete a feasibility study for the Project, excluding drilling costs (Source: PEA, Section 26).

WMC indicates the expenditure during the feasibility phase may be US\$10-15 million (Source: Zoning Petition, Wolfden letter dated November 13, 2020). This second estimate is considered the most realistic.

- The author of the PEA estimates that US\$147.4 million will be required for initial capital costs and working capital to achieve commercial production (Source: PEA, Section 21.1.6). Based on benchmarking of the capital costs and the unit capital cost (US\$340 per tonne of annual ore production), the estimate is considered reasonable.

In the Zoning Petition, Wolfden references the requirement to continue to raise funds through further private placements and, when possible and appropriate, to consider partnering to improve the ownership capacity to finance the Project or divest the Project to a larger mining company to continue development work (Source: Zoning Petition, Exhibit H – Financial Capacity; Wolfden letter dated November 13, 2020).

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As of November 24, 2020, Wolfden has 129.9 million shares issued (148.4 million shares on a fully diluted basis, a share price of C\$0.205 (US\$0.16) and a market capitalization of C\$26.7 million (US\$20.5 million). Since the Project is substantially the principal asset of Wolfden, the current market value of the Project is approximately US\$17.0-18.5 million.

### **6.3 Assessment of Reasonableness**

Wolfden has demonstrated the ability to raise financing to fund development work, with an estimated US\$14 million invested into the Project, including the acquisition of the property (Source: Wolfden Resources, Financial Statements, 2017-2020).

Further, Wolfden was able to raise US\$1.9 million from Kinross Gold in March 2019 (Source: Wolfden Resources, Press Release, March 29, 2019). The involvement of a major mining company, which currently owns 9.6% of Wolfden, can be considered a third-party endorsement of the Project, and a demonstration of the ability for management to attract interest from different sources of finance.

Based on the current liquidity of Wolfden described in Section 6.2 and the future expenditure requirements estimated by the author of the PEA, Wolfden will need to secure new financing to complete a feasibility study for the Project. Although financing in the junior market space is currently challenging, especially for non-precious metal investment opportunities, base metals prices have proved resilient since the initial weeks of the COVID-19 pandemic and prices for the three base metals that would be produced by the Project have increased significantly in the past months: as of November 24, 2020, the copper price is US\$3.30 per pound, the lead price is US\$0.99 per pound, and the zinc price is US\$1.24 per pound, representing increases of 20%, 10% and 21% respectively since December 31, 2019. These increases in prices for the base metals will have a positive impact on any financing initiative pursued by Wolfden.

The strategy of Wolfden to raise new funding for the Project, as referenced by the company in the Zoning Petition, is considered both standard and reasonable for junior mining companies; the author has not evaluated the likelihood of Wolfden to raise such funds in the future.

### **6.4 Observations & Potential Challenges**

As described in Section 6.1, the ability of a junior mining company to fund the construction phase of a mining project is challenging. There are examples of junior mining companies, such as Bema Gold (Kupol, Russia) and Gibraltar Mines (Lomas Bayas, Chile), who have successfully funded development projects through to mine operations; others, such as Baja Mining (Boleo, Mexico) and Apex Silver (San Cristobel, Bolivia), have successfully funded development projects but failed to achieve commission of mining operations; and many others have funded development projects but failed to finance the construction of mining projects.

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The challenge to finance the construction and commissioning phases of the Project is highlighted but, at this early stage of the development of the Project, no assessment can be made of the likelihood of Wolfden arranging financing and/or introducing a partner to the Project to support these future development phases.

## **6.5 Conclusions**

Wolfden acquired the Project in late 2017, and has been successful to raise the financing necessary to advance the Project and complete a PEA (estimated expenditure to June 30, 2020, is US\$14 million).

Wolfden requires an estimated US\$10-15 million (WMC estimate) to complete a feasibility study and, subsequently, it will require an estimated \$147 million plus financing costs to construct and commission a mine operation. No assessment can be made of the likelihood that Wolfden can raise such financings however the potential strategies to raise financing described by WMC in the Zoning Petition are considered standard and reasonable.

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## **7 VALUE OF PROJECT FOR LOCAL COMMUNITY & STATE OF MAINE**

### **7.1 Value of Mining Projects to Local Communities & States**

It is a requirement of the rezoning petition that the petitioner provide assessment of the potential economic benefits of a project. Such application should outline details and potential impacts of the plan, including outcomes such as economics and anticipated impacts on the environment, population, economy, infrastructure.

### **7.2 Current Status & Information Reviewed**

The Zoning Petition includes assessment prepared by WMC of the short-term and long-term socioeconomic impacts of the Project.

WMC states that the project will provide direct and substantial economic benefit to the local communities in the form of job skills training, primary wages to local employees, wages that are spent in the local economy, an increase in property tax revenue, and indirect wages at secondary jobs that help support the mining operations (mechanical equipment repair, vehicle maintenance, road maintenance, solid waste management, and other specialized services (Zoning Petition, Economic Development).

The Zoning Petition describes the preparation of a cash flow model to evaluate the cost estimates and produce economic forecasts. The cash flow model has been used to evaluate socioeconomic considerations, such as employment, consumables, services and energy, to estimate the amount and schedule of expenditures within the local communities (Source: Zoning Petition, Appendix A-B3a). Potential tax benefits are highlighted but not stated.

In the Zoning Petition, WMC has presented estimated investment in the local communities of \$164.5 million, \$230.6 million in the impacted counties, \$413.4 million in the state of Maine and US\$477.8 million in the USA. These estimates are categorized by four cost-types: employment, supplies, energy and services. Other potential indirect economic benefits of local hiring of \$44.4 million are highlighted in the petition. About 25% of the estimated investment will be made during construction phase and 70% during operations.

### **7.3 Assessment of Reasonableness**

The author has made comment on the planned infrastructure, estimated capital investments, expenditure for mine site and marketing costs, and overall projected economic returns elsewhere in this report.



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The author has relied on the information provided by WMC in Zoning Petition for the estimates of economic investment in the local community, impacted counties and the state of Maine and in the USA. Based on the intention of Wolfden to prioritize the use of local employment and local services, the estimates generally appear reasonable.

The author has made no assessment of the cost-benefit of the Project, nor the tax benefits to the state of Maine and the USA, nor the strategic impact to the USA of the Project developing US-produced supply of base metals and precious metals.

#### **7.4 Observations**

The assessment by WMC in the Zoning Petition does not include estimates of potential indirect benefits that may occur with the development of a mine in northeastern Maine, such as economic multipliers.

#### **7.5 Conclusions**

The estimates of economic investment in the local community, impacted counties, the state of Maine and the USA presented by WMC in the Zoning Petition appear reasonable. These estimates would be expected to be evaluated in more detail during the preparation of the feasibility study and permitting applications.

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## 8 REFERENCES

Wolfden Mt. Chase LLC - Petition to Rezone Portion of Township 6, Range 6 Penobscot County, Maine for Development of an Underground Metallic Mineral Deposit - January 26, 2020

Wolfden Resources - Annual Information Form for the Year Ended December 31, 2019 - April 28, 2020

Wolfden Resources - Consolidated Financial Statements for the years ended December 31, 2019 and 2018 - April 15, 2020

Wolfden Resources - Condensed Consolidated Interim Financial Statements for the three and six months ended June 30, 2020 and 2019 - August 24, 2020

Wolfden Resources - Management's Discussion & Analysis of Financial Condition and Results of Operations Form 51-102F1 for the years ended December 31, 2019 and 2018 - April 15, 2020

Wolfden Resources - Management's Discussion & Analysis of Financial Condition and Results of Operations Form 51-102F1 for the three and six months ended June 30, 2020 - August 24, 2020

Wolfden Resources - National Instrument 43-101 Technical Report - Pickett Mountain Project, Resource Estimation Report - January 7, 2019

Wolfden Resources - News Release – November 17, 2017 - Wolfden Completes Financing and Purchase of the Pickett Mountain Base-Metal Property in Penobscot County, Maine, USA

Wolfden Resources - News Release - March 29, 2019 - Wolfden Completes \$2.5M Financing with Kinross Gold Corporation

Wolfden Resources - News Release - January 15, 2020 - Wolfden Secures USD 4.5M in Non-Dilutive Funding

Wolfden Resources - News Release - February 19, 2020 - Wolfden Applies for Rezoning at Pickett Mt. Project

Wolfden Resources - News Release - July 28, 2020 - Wolfden Announces Positive Update on its Pickett Mt. Project Rezoning Process

Wolfden Resources - News Release - August 11, 2020 - July 28, 2020 - Wolfden Announces Update on Pickett Mt. Exploration Program in Maine

Wolfden Resources - News Release - September 14, 2020 - Wolfden Announces Robust Preliminary Economic Assessment for Pickett Mt. Project in Maine

Wolfden Resources - News Release - November 2, 2020 - Wolfden Files NI-43-101 Technical Report for the Pickett Mt. Project in Maine

Wolfden Resources - News Release - November 5, 2020 - Wolfden Reports Encouraging Drill Results at Pickett Mt. Project in Maine

Wolfden Resources - Preliminary Economic Assessment, Pickett Mountain Project - October 29, 2020

Wolfden Resources - Presentation (November 1, 2020) - "One of America's Highest Grade Deposits"

Wolfden Resources - Website - [www.wolfdenresources.com](http://www.wolfdenresources.com)

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# **GOVERNMENT AGENCY COMMENTS RECEIVED ON THE WOLFDEN REZONING PETITION**

## **ZP 779, Pickett Mountain Mine, T6 R6 WELS**

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**Maine Land Use Planning Commission  
Maine Department of Agriculture, Conservation and Forestry**

This document contains all the government agency comments received in response to ZP 779 as of February 4, 2021. Comments from each agency are bookmarked for ease in navigation.

For more information on the Petition and LUPC's review process visit the LUPC webpage at:  
[https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden\\_rezoning.html](https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden_rezoning.html).

**From:** [Turner, Rex](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** RE: Wolfden Rezoning Petition\_ Request for Review: Outdoor Recreation  
**Date:** Wednesday, August 05, 2020 12:23:51 PM

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Stacie,

MEDIFW and BPL's Boating Facilities Division both have no information of the Pleasant Lake sites. FYI. See you (virtually) this afternoon.

Rex Turner  
Outdoor Recreation Planner  
Maine Department of Agriculture, Conservation, and Forestry  
Bureau of Parks and Lands  
22 State House Station  
Augusta, ME 04333-0022  
(207) 441-9152  
[www.parksandlands.com](http://www.parksandlands.com)

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**From:** Beyer, Stacie R <Stacie.R.Beyer@maine.gov>  
**Sent:** Tuesday, August 04, 2020 4:26 PM  
**To:** Turner, Rex <Rex.Turner@maine.gov>  
**Subject:** Wolfden Rezoning Petition\_ Request for Review: Outdoor Recreation

Rex,

The Land Use Planning Commission is requesting review of the pending zoning petition submitted by Wolfden Mt. Chase, LLC., ZP 779. The petition requests rezoning to a custom, Planned Development Subdistrict that would allow the company to move forward to the permitting stage for their proposed underground metallic mineral mine in T6 R6 WELS.

Please review the petition and submit any comments that you have regarding the potential impacts of the proposal on recreational resources.

The petition identifies the following recreational activities within a 3-mile radius:

- Motorized recreation including ATVs and snowmobiles,
- Hunting and fishing, and
- Hiking. Of note is a hiking trail up to the summit of Mt. Chase.

The LUPC has requested that Wolfden Mt. Chase provide additional information on the usage of Picket Pond, Pleasant and Mud Ponds, and the Mt. Chase trail.

The Delorme map shows a boat ramp and camp sites on Pleasant Lake, but the ramp is not listed as a State ramp. Do you have any information on the ownership and public usage of the boat ramp and camp sites?

A request for review form is attached that includes links to the Commission's rules, the project specific webpage, the current version of the petition, and other helpful information. If you have any questions about this request for review or the Wolfden Mt. Chase proposal, please let me know.

Thank you.

Stacie R. Beyer  
Planning Manager  
Land Use Planning Commission  
22 State House Station,  
Augusta, Maine 04333-0022  
Cell- 207-557-2535



JANET T. MILLS  
GOVERNOR

STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
LAND USE PLANNING COMMISSION  
22 SHS, 18 ELKINS LANE  
AUGUSTA, MAINE 04333-0022

AMANDA E. BEAL  
COMMISSIONER

JUDY C. EAST  
EXECUTIVE DIRECTOR

REQUEST FOR REVIEW AND COMMENT ON PENDING APPLICATION

Date: August 04, 2020 Permit #: ZP 779 Tr#: 51512 Analyst: Stacie Beyer

Applicant: Wolfden Mt. Chase, LLC Location: T6 R6 WELS

Project: Rezoning to D-PD Subdistrict for the Pickett Mountain Metallic Mineral Mine

**Special Notes:** This is a petition for a *zone change* that would allow the landowner to move forward to the permitting stage. If the zone change is approved by the Commission, DEP would be the lead agency for permitting and LUPC would have a certifying role. Links to the petition, supporting materials, and references are attached.

TO BE CONSIDERED,  
COMMENTS DUE BY:  
**09-01-2020**

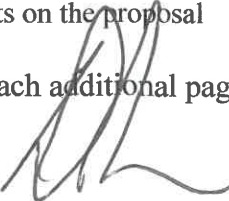
**Please use this form to submit comments & recommendations regarding the petition. Those indicated below have been requested to review this petition.**

Bureau of Parks and Lands, SHS #22 Attn.: <b>Outdoor Recreation, Rex Turner</b>	Maine Forest Service Attn.: <b>Don Mansius</b>
DEP, SHS #17 or 312 Canco Rd. Portland, ME 04103 Attn.: <b>Mining Review, Mark Stebbins and Mike Clark</b>	Natural Areas Program, SHS #93 Attn.: <b>Lisa St. Hilaire</b>
DEP, SHS #17 Attn.: <b>Groundwater Review, John Hopeck</b>	State Geologist, NRIMC, SHS #22 Attn.: <b>Daniel Locke</b>
DEP, SHS #17 Attn.: <b>Surface Water Review, Tom Danielson</b>	State Soil Scientist, SHS #28 Attn.: <b>David C. Rocque</b>
DEP, SHS #17 Attn.: <b>Waste Water Treatment, Gregg Wood and Cindy Dione</b>	DOT, Traffic, SHS #16 Attn.: <b>Steve Landry</b>
DEP, SHS #17 Attn.: <b>Air Quality Review, Jeff Crawford</b>	County Commissioners Attn.: <b>Shaw Weeks</b>
DEP, 106 Hogan Road, Bangor Attn.: <b>Solid Waste Review, Karen Knuuti</b>	
Historic Preservation Commission, SHS #65 Attn.: <b>Art Spiess</b>	
DIF&W, SHS #41 (email: IFWEnvironmentalreview@maine.gov) Attn.: <b>John Perry, Environmental Review Coordinator</b>	

**After review of the petition and consideration of the proposal's probable impacts, we have:**

No comments on the proposal  Comments on the proposal are attached

Comments (attach additional pages as necessary):

Signature:  DONALD J. MANSIUS  
DIRECTOR, GREAT POLICY Date: 05 AUGUST 2020

Reports of staff permitting decisions, can be found here: <http://www.maine.gov/dacf/lupc/reports/>

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## Review Materials

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All pertinent materials for review of the petition are found on the LUPC's website.

Review Criteria, Commission Rules Chapter 12:

[https://www.maine.gov/dacf/lupc/laws\\_rules/rule\\_chapters/Chapter12\\_ver2013.pdf](https://www.maine.gov/dacf/lupc/laws_rules/rule_chapters/Chapter12_ver2013.pdf)

Current Version of the Petition:

[https://www.maine.gov/dacf/lupc/projects/wolfden/notice/Woldfen\\_MtChaseLLC\\_Petition\\_Rev\\_Final.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/notice/Woldfen_MtChaseLLC_Petition_Rev_Final.pdf)

Project Specific Webpage:

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Overview of Estimated Time Line:

[https://www.maine.gov/dacf/lupc/projects/wolfden/preview/Updated\\_Wolfden\\_TimelineGraphic.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/preview/Updated_Wolfden_TimelineGraphic.pdf)

Last Request for Additional Information:

[https://www.maine.gov/dacf/lupc/projects/wolfden/hearing\\_record/4.7\\_2020-05-27\\_LUPC\\_Ltr\\_AdInfo\\_Request3.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/hearing_record/4.7_2020-05-27_LUPC_Ltr_AdInfo_Request3.pdf)

(Please note the LUPC expects to send a follow-up letter requesting more information. This letter will be posted on the project specific webpage shortly. We will notify all agencies, when we receive any new information from the petitioner.)

**From:** [Shaw Weeks](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** Wolfden Rezoning Petition - Penobscot County Commissioners  
**Date:** Thursday, August 20, 2020 3:40:45 PM

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**EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.**

Good Afternoon Stacie,

Over the last two weeks I've presented some of the basic information to the Penobscot County Commissioners regarding the Wolfden Rezoning Petition. I've also relayed information to our Sheriff's department mostly the workforce and traffic outlined in Wolfden's petition. The Sheriff and I seem to be in agreement that the project would minimally affect our Sheriff's office operation.

The County Commissioners have requested that you come before them to present the basics of the project and answer any further questions they may have. They meet weekly on Tuesday mornings from 9am usually until 10:30. We would greatly appreciate your knowledge and expertise regarding this project.

Thank you in advance.

*Shaw Weeks*

Director, Penobscot County  
Unorganized Territory Administration  
97 Hammond Street  
Bangor, ME 04401

Phone: 207-942-8566  
Fax: 207-561-6181

*Please visit us on the web at [www.ut.penobscot-county.net](http://www.ut.penobscot-county.net)*



**From:** [Rocque, David](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** RE: Wolfden Rezoning Petition-Time Sensitive\_Soil Suitability  
**Date:** Friday, September 11, 2020 8:00:53 AM

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Hi Stacie:

Just to reiterate our discussion this morning, this is what I think is needed for soils information, at a minimum:

The term “generally suitable for the proposed project” is a relative term which may have a different meaning depending on your perspective. For me, as a soil scientist, the most limiting soil conditions would be slope and wetness. Depth to bedrock and hardpan, which are limiting factors for a number of other uses, are not limiting for the proposed mining project. I do not need to know the extent of poorly drained soils as they should have already been identified in the wetlands mapping. It is rare to have poorly drained soils in areas that are not wetlands. I am most interested in the extent and location of somewhat poorly drained soils and soils with shallow oxyaquic (oxygenated groundwater table) conditions. Both of these soil conditions have a shallow groundwater table that can cause significant use and management issues if not properly identified and deal with. The somewhat poorly drained soils have typical redoximorphic features (red and gray drainage mottles) due to alternating anaerobic and aerobic conditions during the growing season so they are easily recognized and classified. Soils with oxygenated groundwater tables do not have redoximorphic features because they do not become anaerobic during the growing season. They typically occur on long slopes in soils with a hardpan or shallow depth to bedrock. Rainfall and snow melt enter the soil and move down to the hardpan and/or bedrock where they flow downslope. Since they are moving and not stagnant, they contain oxygen. These soils can usually be identified by not having bright subsoil colors and streaks of organic matter that has been translocated from above. They are also called enriched soils because they carry organic matter and nutrients from above. They also tend to have a shorter duration groundwater table than soils in low lands where water accumulates and can't dissipate quickly. The duration of the groundwater table depends on the extent of upslope contributing watershed and the slope of the land. My concern is with proposed construction activities that will result in excavations into and/or below either of these groundwater tables. If not diverted, they will impact the activity which may contain hazardous materials. If diverted (curtain drain or diversion ditches) those diversions will need to be maintained or they will likely fail over time. I would also be concerned with activities that divert the groundwater table impacting the natural hydrology down gradient of those activities (wetlands, nursery streams etc.) It is preferable, in soils with a shallow groundwater table, to build above the groundwater table as you do not have to be concerned with diverting the groundwater table away from the site or altering the natural hydrology.

Slope is another concern, particularly slopes above 10% because of increased erosion potential.

I would like to know the extent of wet soils and sloping soils and which sections of the area

to be re-zoned has the greatest extent of them. If there are large, extensive areas of wet or steep soils, it would be appropriate for the developer to show how the project will be sited to minimize construction on them without significantly altering the natural hydrology.

David Rocque

State Soil Scientist, Department of Agriculture, Conservation, and Forestry

Bureau of Agriculture, Food & Rural Resources

Division of Agricultural Resource Development

207-287-2666

---



JANET T. MILLS  
GOVERNOR

STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
LAND USE PLANNING COMMISSION  
22 SHS, 18 ELKINS LANE  
AUGUSTA, MAINE 04333-0022

AMANDA E. BEAL  
COMMISSIONER

JUDY C. EAST  
EXECUTIVE DIRECTOR

REQUEST FOR REVIEW AND COMMENT ON PENDING APPLICATION

Date: August 04, 2020 Permit #: ZP 779 Tr#: 51512 Analyst: Stacie Beyer

Applicant: Wolfden Mt. Chase, LLC Location: T6 R6 WELS

Project: Rezoning to D-PD Subdistrict for the Pickett Mountain Metallic Mineral Mine

**Special Notes:** This is a petition for a *zone change* that would allow the landowner to move forward to the permitting stage. If the zone change is approved by the Commission, DEP would be the lead agency for permitting and LUPC would have a certifying role. Links to the petition, supporting materials, and references are attached.

TO BE CONSIDERED,  
COMMENTS DUE BY:  
**09-01-2020**

**Please use this form to submit comments & recommendations regarding the petition. Those indicated below have been requested to review this petition.**

Bureau of Parks and Lands, SHS #22 <b>Attn.: Outdoor Recreation, Rex Turner</b>	Maine Forest Service <b>Attn.: Don Mansius</b>
DEP, SHS #17 or 312 Canco Rd. Portland, ME 04103 <b>Attn.: Mining Review, Mark Stebbins and Mike Clark</b>	Natural Areas Program, SHS #93 <b>Attn.: Lisa St. Hilaire</b>
DEP, SHS #17 <b>Attn.: Groundwater Review, John Hopeck</b>	State Geologist, NRIMC, SHS #22 <b>Attn.: Daniel Locke</b>
DEP, SHS #17 <b>Attn.: Surface Water Review, Tom Danielson</b>	State Soil Scientist, SHS #28 <b>Attn.: David C. Rocque</b>
DEP, SHS #17 <b>Attn.: Waste Water Treatment, Gregg Wood and Cindy Dione</b>	DOT, Traffic, SHS #16 <b>Attn.: Steve Landry</b>
DEP, SHS #17 <b>Attn.: Air Quality Review, Jeff Crawford</b>	County Commissioners <b>Attn: Shaw Weeks</b>
DEP, 106 Hogan Road, Bangor <b>Attn.: Solid Waste Review, Karen Knuuti</b>	
Historic Preservation Commission, SHS #65 <b>Attn.: Art Spiess</b>	
DIF&W, SHS #41 (email: <a href="mailto:IFWEnvironmentalreview@maine.gov">IFWEnvironmentalreview@maine.gov</a> ) <b>Attn.: John Perry, Environmental Review Coordinator</b>	

**After review of the petition and consideration of the proposal's probable impacts, we have:**

No comments on the proposal  Comments on the proposal are attached

Comments (attach additional pages as necessary):

Signature: 

Date: September 11, 2020

Reports of staff permitting decisions, can be found here: <http://www.maine.gov/dacf/lupc/reports/>

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(Please note the LUPC expects to send a follow-up letter requesting more information. This letter will be posted on the project specific webpage shortly. We will notify all agencies, when we receive any new information from the petitioner.)



STATE OF MAINE  
DEPARTMENT OF  
INLAND FISHERIES & WILDLIFE  
284 STATE STREET  
41 STATE HOUSE STATION  
AUGUSTA ME 04333-0041



September 11, 2020

Ms. Stacie J. Beyer  
Planning Manager  
Maine Land Use Planning Commission  
22 State House Station,  
Augusta, Maine 04333-0022

**RE: Wolfden Resources Mineral Mining Rezoning Petition, T6R6 WELS; Additional Resource Information.**

Dear Stacie,

Per your request, and as a follow up to the site visit conducted on September 3, 2020, the Maine Department of Inland Fisheries and Wildlife (MDIFW) offers the following additional observations and recommendations related to Wolfden Resources' petition to rezone 528 acres in T6R6 WELS to allow for an application to construct a metallic mineral mine. We appreciate the opportunity to attend the site visit, which was very informative and provided an opportunity to discuss resource concerns with the applicant and other parties present.

In MDIFW's letter of November 25, 2019, we described our agency's focus on Rare, Threatened, and Endangered Species and Habitats; Significant Wildlife Habitats; and Protected Natural Resources. Based on preliminary information provided, we also noted several resources for further investigation and of particular concern, some of which are further addressed below. The following is in response to your request for additional information related to the presence, use, and concerns for potential impacts to natural resources in the vicinity of the proposed project.

Significant Wildlife Habitat, Potential for Maine Threatened Species

It is noted that a designated Inland Waterfowl and Wading Bird Habitat (IWWH) is located on the inlet on the western end of Pickett Mountain Pond, adjacent to the proposed project site. MDIFW anticipates receiving and reviewing additional project information in the future to ensure that there are no unreasonable, adverse impacts to this resource, which is a Significant Wildlife Habitat (SWH) pursuant to the Natural Resources Protection Act (38 M.R.S., §480-B.10) and SWH Rules (06-096 CMR 335; 09-137 CMR 10). In addition, MDIFW recommends investigation of the IWWH for presence / absence of shrubby cinquefoil, the host plant for the State Threatened Clayton's copper butterfly. Aerial photo interpretation suggests that the IWWH may have conditions that favor this plant and there is an existing population of Clayton's copper butterflies in nearby Crystal. The Clayton's copper butterfly is currently known from only ten sites in Maine, including four in a ten square mile area of eastern Penobscot County in the vicinity of Lee and Springfield, and three sites in northern Piscataquis and eastern Aroostook Counties. Clayton's copper is found only in association with its larval host plant, the shrubby cinquefoil. This uncommon shrub requires limestone soils and has a scattered distribution throughout Maine, however, there are relatively few stands large enough to support viable Clayton's copper populations. Shrubby cinquefoil is intolerant of shade and can only thrive in open areas. It

PHONE: (207) 287-8000

FISH AND WILDLIFE ON THE WEB:  
[www.maine.gov/ifw](http://www.maine.gov/ifw)

EMAIL ADDRESS:  
[ifw.webmaster@maine.gov](mailto:ifw.webmaster@maine.gov)

typically occurs along the edge of calcareous (limestone) wetlands. It can also be found in old fields, but these stands are typically short-lived because of forest succession. All of the currently known occurrences for Clayton's copper are in enriched fens and bogs, and streamside shrublands or meadows. Please contact MDIFW's Reptile, Amphibian, and Invertebrate Biologist, Beth Swartz ([beth.swartz@maine.gov](mailto:beth.swartz@maine.gov), 207- 941-4476), for further guidance. If MDIFW-approved surveys are conducted and indicate that shrubby cinquefoil is not present, or if it can be demonstrated that the Wolfden proposal will not adversely affect shrubby cinquefoil and will avoid Take or Harassment of the Maine Threatened Clayton's copper butterfly, MDIFW anticipates having no concerns for this species.

#### Bat Habitat Creation, Post-Closure

During the September 3, 2020 site visit, we briefly explored the potential to create habitat for at-risk bat species as part of the post-operational site remediation plan. As I understand it, the main underground portal will consist of an approximately 16-foot x 16-foot opening surrounded by a larger rock face. There will also be both east and west ventilation raises with approximately 10-foot x 10-foot openings. Wolfden intends to fill and add concrete around the openings to prevent water intrusion after closure. We briefly discussed the potential to slope and berm around the openings to discourage water entry and to leave gated openings as possible caves for bat hibernacula. We also discussed the possibility of installing some piles of rock rubble on the closed tailings storage area as potential hibernacula. These discussions were conceptual but, Wolfden expressed interest in further exploring the concept to determine the potential for creating viable habitat conditions while also meeting site closure needs.

#### Aquatic Resources

The proposed project site is located in the Rockabema Lake subwatershed (HUC 12), in proximity and west of Pickett Mountain Pond, which flows to Grass Pond, then to Mud Lake, and other waters downstream. It is also east and south of the West Branch of the Mattawamkeag River, which flows to Pleasant Lake, Mud Lake, Duck Pond, Rockabema Lake, and other downstream resources along the West Branch of the Mattawamkeag River. The watershed contains other resources including intermittent and perennial streams, associated riparian habitats, and freshwater wetlands, and is considered important for brook trout.

Pickett Mountain Pond has a maximum depth of seven feet, with warm, well oxygenated water. The initial fisheries survey (1958) indicated that the inlet tributary had no potential for brook trout spawning, rearing, or adults, and the outlet had little potential. One trout was captured during the initial survey, none in subsequent samples (1996, 2004). MDIFW Regional Fisheries Biologist Kevin Dunham indicates that Pickett Mountain Pond contains white sucker, fine-scale dace, red-belly dace, fallfish, creek chub, golden shiner, common shiner, red-breasted sunfish, black-nose dace, and pearl dace, and would make a great place to harvest bait fish.

Pleasant Lake, Mud Lake, and Grass Pond are all designated as Heritage Fish Waters. Maine Heritage Fish Waters are native and wild brook trout lakes and ponds which represent unique, valuable, and irreplaceable ecological and angling resources. MDIFW recognizes the unrivaled historic and economic importance of Maine's wild and native brook trout resource and focuses on the conservation and protection of this uniquely valuable resource. MDIFW's primary intent for managing wild brook trout in lakes and ponds is the protection and conservation of these self-sustaining fisheries. The inlets of these lakes originate in the West Branch of the Mattawamkeag River as well as Picket Mountain Pond, positioned west and east of the proposed project site, respectively.

MDIFW regional fisheries staff consider Pleasant Lake and Mud Lake to be some of the best brook trout and landlock salmon waters available in the Region. Kevin Dunham notes, *“Though the initial survey of the lakes in 1953 describes them as being shallow and having warm water throughout, it does go on to say, ‘trout and salmon seek the cool water of spring holes...’. Pleasant Lake has an adequate amount of cool-water spring holes to support an excellent trout and salmon fishery. Subsequent fishery surveys, the most recent conducted in June 2019, found extraordinary growth of one-year old wild brook trout averaging 9.1”, most of which probably took place in a cooler tributary stream. Additionally, while the lake does not stratify and temperatures remain homogenous throughout the water column, dissolved oxygen levels also remain ideal from top to bottom. Multiple age-classes of brook trout were captured during recent surveys as well, indicating year to year holdover is taking place at Pleasant and Mud Lakes.”* Anecdotal evidence suggests moderate angling pressure in these waters and the fisheries resources are protected and managed through specialized regulations. *“The landlocked salmon fishery is not as robust as the trout fishery, but past surveys have sampled multiple age-classes in the 7-17” size ranges. While the lakes are somewhat limiting in cold-water refugia they do support healthy populations of salmonids (and other fish including smelt) and it is vitally important to protect the tributaries as well as the lakes since they contain an abundance of spawning and rearing habitat.”*

Merry Gallagher, MDIFW’s Native Fish Conservation Biologist, provided the attached map of preliminary stream resources, and noted that the orange stream lines *“signify streams that are of medium/moderate value for wild brook trout conservation according to (MDIFW’s) recent effort to classify streams.”* As noted during our November 5, 2019 meeting, brook trout streams are plentiful throughout this region. During surveys conducted in September 2008, one survey site indicated on the map yielded 16 wild brook trout, while the second site provided two wild brook trout, along with common shiner, black nose dace, creek chub, white sucker, and black nose shiner.

MDIFW requests additional information on the proposed mining operation and associated activities to ensure that it will not result in unreasonable adverse impacts to these valuable resources.

#### Streams and Wetlands

Wolfden’s plan during the mining operation includes capturing water from runoff and infiltration on site, treating it to equal to or better than ambient conditions, and discharging treated water into bedrock aquifers. During the September 3, 2020 site visit, MDIFW noted that intermittent and perennial streams and freshwater wetlands in the area are likely supplied by water from shallow features that flow through the overburden and less likely from bedrock sources. MDIFW expressed concern with the potential for these natural resources to be adversely affected by removing water from surficial and shallow horizons and discharging it to bedrock aquifers. The concern is with a potential dewatering and/or change in water chemistry, temperature, etc. of these natural resources that are important habitats by themselves as well as through their contributions to the larger resources described above. Also, additional information is necessary to demonstrate that the proposed mining operation and associated activities will not cause physical interruptions in subsurface flow patterns that supply these resources, even if Wolfden is able to maintain recommended undisturbed, forested buffer distances. During the site visit, we discussed investigating spray irrigation of the treated water to the ground surface during operation, allowing it to infiltrate the overburden and potentially provide flows to surface water resources. However, even if this is determined feasible and beneficial, the question remains of potential long term/permanent effects as this practice will not be in use after operations cease. MDIFW requests additional information to address concerns for potential direct and indirect impacts to surface and groundwater features and flow patterns that contribute to these resources.

We hope that this information is valuable to your process. If you have any questions or concerns, please feel free to contact me at [robert.d.stratton@maine.gov](mailto:robert.d.stratton@maine.gov) or (207) 287-5659.

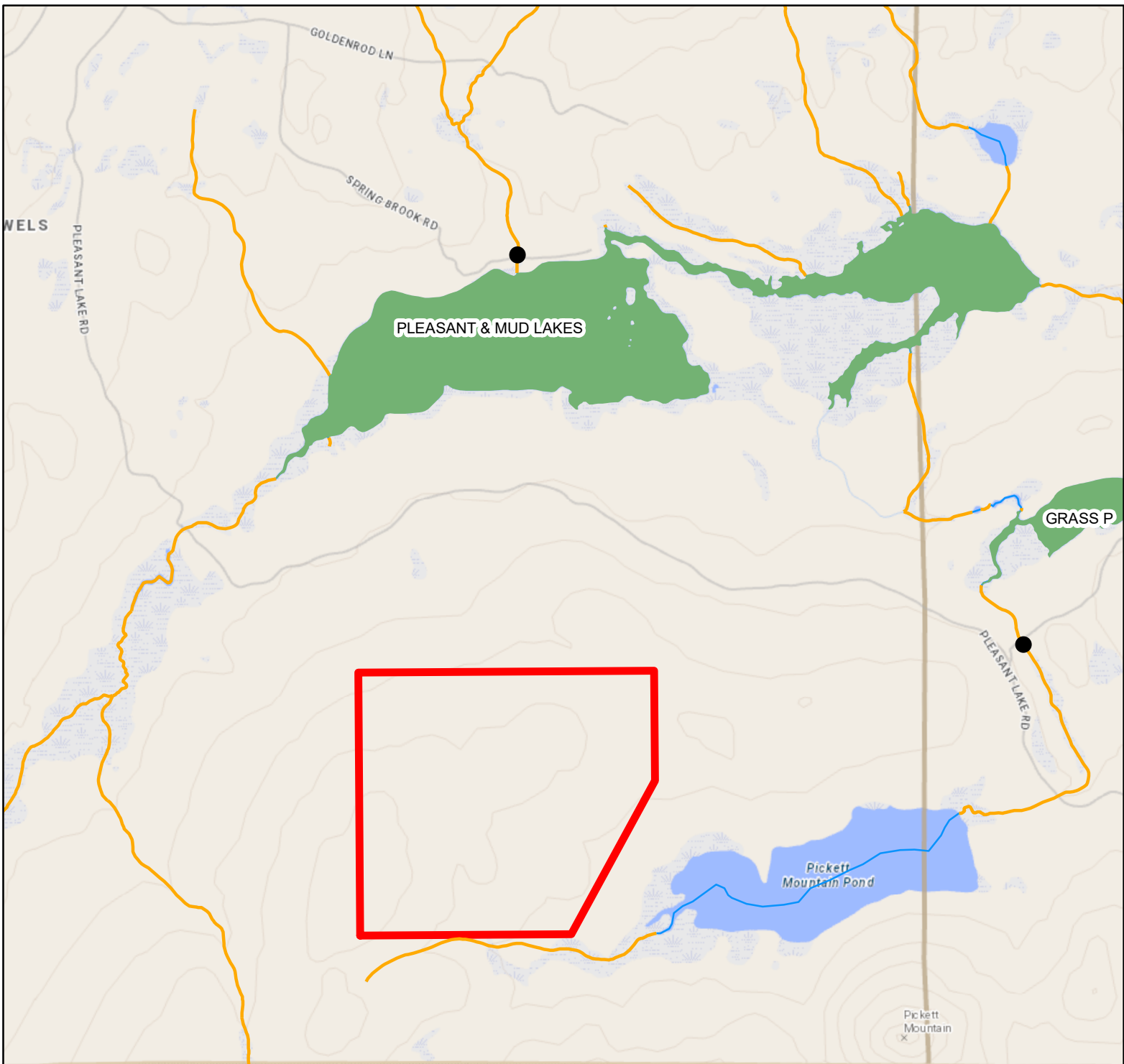
Thank you,

A handwritten signature in black ink that reads "Bob Stratton" with a small "IFW" written below the name.

Robert D. Stratton  
Environmental Program Manager  
Maine Department of Inland Fisheries & Wildlife

Cc: Jim Connolly, Director, Bureau of Resource Management, MDIFW





- StrmSrvyLocationID
- Maine\_Heritage\_Fish\_Waters
- IFW\_BKT\_Habitat\_Rating\_2020**
- <all other values>
- IFW\_PRTY**
- Very High
- High
- Medium
- Low
- Not
- IFW\_Wild\_BKT\_Priority\_Conservation\_Areas
- WolfdenRezone

**From:** [Landry, Stephen](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** RE: First look at the petition for Wolfden Mt. Chase LLC  
**Date:** Wednesday, September 16, 2020 3:16:45 PM  
**Attachments:** [Wolfden Mt. Chase LLCMaineDOTtrafficcomments.docx](#)

---

Attached are an updated copy of my findings.

Stephen Landry  
State Traffic Engineer  
MaineDOT

Phone 207-624-3632  
Fax 207-624-3621

## **Wolfden Mt. Chase LLC – MaineDOT traffic comments**

### Logging Rd Access

1. Petition says looking to make road 24 feet wide – are they planning on adding ditching for drainage and room for snow cast-off.
2. MaineDOT may allow for 24 foot wide roadways on our system, but MaineDOT also includes accommodations for snow storage, 24 foot total width will not work if it includes the snow storage/drainage, especially with large trucks
3. Are they going to crown the roadway at the center of the road? If not snow melt will accumulate in the road and freeze. Further reason for ditching and drainage.
4. Intersection of access road and route 11 needs to have overhead lighting, full IES cut-off or zero BUG rating whichever terminology is being used today.
5. Construct a 12 foot wide shoulder with full depth pavement to act as decel lane on route 11 coming into the site drive a minimum of 250 feet long with a taper that is appropriate for the posted speed.
6. Access road shall be paved for a distance equal to 1.5 times the length of the largest vehicle expected to use the site. (ie 70 foot long truck and trailer would need to be paved back 105 feet)

### Intersection of Route 11 and 212

1. Construct a 12 foot wide shoulder with full depth pavement, for 250 feet prior to Route 212 and extend onto Route 212 an additional 250 feet with appropriate tapers at both ends. This will help ensure the roadway maintains shoulder pavement integrity as trucks make the turn from route 11 onto Route 212. It also allows trucks to slow down for the turn without impeding Route 11 traffic.

The sections of I-95, Route 11 and Route 212 to be used by the applicant have a significant crash history. The section of I-95 is currently served by portable Changeable Message Signs (CMS) to warn motorists of crashes, weather related incidents or other safety related warnings. MaineDOT is requesting that two CMS boards be placed along route 212 (one heading eastbound near route 11 and 1 heading WB near Route 2) for the purpose of providing the same types of warnings being conveyed to I-95 motorists. These CMS would need to meet MaineDOT standards and connect to our Transportation Management Center (TMC) via cell modems and be able to communicate to our ATMS software.

**From:** [Spiess, Arthur](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** Wolfden Pickett Mtn rezoning ZP 779  
**Date:** Thursday, September 24, 2020 1:13:33 PM

---

Hello Stacie:

My apologies – I do not have any emails exchanged after our phone conversation about the project on August 4<sup>th</sup>.

The Phase 0 report submitted by Northeast Archaeology Research Center is acceptable as written, and quite useful. It indicates that there are some limited stone outcrops that might have been used as tool stone sources that require further archaeological work before construction. And the Phase 0 report also locates a glacial landform close to Pickett Mtn Pond stream that does need field testing in advance of development.

The project area examined by NEARC is the older 295 acre proposed area. However, that 295 acre area is more or less congruent with the area in the revised June 30, 2020 Wolfden rezoning filing designated for “location of buildings and facilities.” We can deal with archaeological issues on the additional 200+ acres (to make up 500 acres), if there is going to be development on them, at the time of the development application.

Conditional upon doing further archeological work, basically Phase I and if necessary follow-up work to focus on the resource areas (bedrock outcrops, glacial landforms) identified in the Phase 0 report, and any other areas proposed for ground disturbance, at the time of the development permit application, the rezoning permit will have no effect on archaeological sites.

Regards, Art Spiess

*Dr. Arthur Spiess*  
Senior Archaeologist, Maine Historic Preservation  
State House Station 65  
Augusta, ME 04333  
desk phone: 207-287-2789

**From:** [Swartz, Beth](#)  
**To:** [Stratton, Robert D](#)  
**Cc:** [Puryear, Kristen](#); [Beyer, Stacie R](#); [deMaynadier, Phillip](#); [Caron, Mark](#)  
**Subject:** Pickett Mountain Pond site visit  
**Date:** Friday, October 02, 2020 1:57:43 PM

---

Bob,

Yesterday, Stacie Beyer (DEP), Kristin Puryear (MNAP), and I - along with Jeremy Ouellette from Wolfden - conducted a site visit to the wetland located along the western shore and inlet stream to Pickett Mountain Pond (T6 R6 WELS) to check for presence of shrubby cinquefoil, the host plant for Clayton's copper (state-threatened). We did not find any and determined the wetland was not appropriate habitat for either the host plant or the butterfly, therefore any concerns for Clayton's copper related to the re-zoning proposal are no longer relevant.

beth

~~~~~  
**Beth I. Swartz, Wildlife Biologist**

Reptile, Amphibian and Invertebrate Group  
Maine Department of Inland Fisheries and Wildlife  
650 State Street, Bangor, ME 04401  
(207) 941-4476

[mefishwildlife.com](http://mefishwildlife.com) | [facebook](#) | [twitter](#)

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*Information that you wish to keep confidential should not be included in email correspondence.*

**STATE OF MAINE  
INTER-DEPARTMENTAL MEMORANDUM**

Department of Agriculture, Conservation and Forestry  
Bureau of Geology, Natural Areas, and Coastal Resources  
Maine Geological Survey  
#93 State House Station  
Augusta, ME 04333-0022  
Tel. (207) 287-2801/FAX (207) 287-2353

DATE: October 15, 2020

TO: Stacie R. Beyer, Planning Manager, Land Use Planning  
Commission

FROM: Daniel B. Locke, Hydrogeologist, Maine Geological Survey,  
Licensed Professional Geologist, Maine #240, Professional  
Hydrogeologist (AIH) #1501

SUBJECT: Rezoning to D-PD Subdistrict for the (proposed) Pickett Mountain  
Metallic Mineral Mine, ZP 779, Wolfden Mt. Chase, LLC, T6 R6  
WELS -**Request for additional information**

\*\*\*\*\*

As a part of the Maine Geological Survey's (MGS's) agreement with the Land Use Planning Commission (LUPC) concerning technical review assistance, I am providing review comments on the following document as well as supporting documents to this permit as provided by LUPC:

*Rezoning to D-PD Subdistrict for the (proposed) Pickett Mountain  
Metallic Mineral Mine, ZP 779, Wolfden Mt. Chase, LLC,  
T6 R6 WELS – (Request for additional information)*

After an examination of the submitted materials and supporting documentation, I respectfully offer the following comments and requests for additional information:

In considering the viability of a zoning change to allow for a polymetallic mine at the Pickett Mountain site, it is important for the State of Maine to be presented with evidential information of other mine sites throughout the world (mining for massive sulfide ore bodies for the same or similar metals) which have used the same or very similar approach to the mining and ore processing as is being proposed here (discussions of similarities and dissimilarities of the ore deposits and approach to mining, processing and waste storage). Also, it is important to note the climate of the mine sites and compare/contrast it to that of the Pickett Mountain site in northern Maine. It is our understanding that Hecla Mining Company has been mining for silver, gold, lead, and zinc at their Greens Creek Mine since 1989 (<https://www.hecla-mining.com/greens->

creek/). The Greens Creek Mine utilizes a dry-stack tailings storage approach which is thought to be the same or similar to what Wolfden Resources proposes. A discussion comparing and contrasting what Hecla is doing and what Wolfden proposes is in order. What issues and challenges have they (Greens Creek Mine) had pertaining to ground water and surface water quality? I understand that with the Greens Creek Mine, Hecla ceased operations for a few years in the mid 1990's because of low metal prices. Similarly, a discussion of how adverse metal prices would impact the continuity of operations (and environmental monitoring) with a Pickett Mountain mine is in order.

I appreciate the opportunity of making these preliminary comments. It is hoped that the requests for additional information can be reasonably addressed and that If there are any questions, please call me at 207-287-7171 or e-mail me at [Daniel.B.Locke@maine.gov](mailto:Daniel.B.Locke@maine.gov) .

STATE OF MAINE  
COUNTY OF PENOBSCOT  
COURT OF COUNTY COMMISSIONERS



PETER K. BALDACCI  
LAURA J. SANBORN  
ANDRE' E. CUSHING, III

BANGOR, MAINE  
(207) 942-8535

William Collins, County Administrator

COURTHOUSE  
97 Hammond Street – Bangor, Maine 04401-4998

November 10, 2020

Maine Land Use Planning Commission  
191 Main Street  
East Millinocket, ME 04430

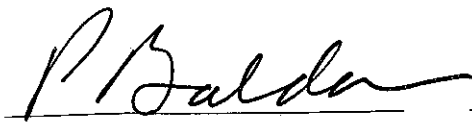
To whom it may concern,

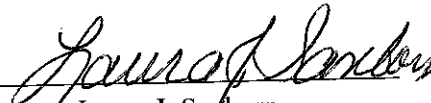
The Penobscot County Commissioners, during their public meeting on November 3, 2020, have expressed concern with the Wolfden Rezoning Petition. The Commissioners are concerned with the ability of the company to finance the project. Further, the Commissioners have concerns over the environmental impacts of the project.

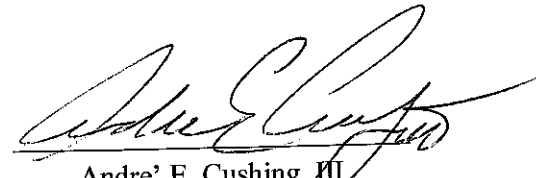
Wolfden has failed to prove it can treat polluted wastewater adequately, has proposed disposing of mine waste in violation of Maine's mining law, and has not documented sufficient financial capacity to operate a mine of this type. Wolfden's inability or avoidance of answering LUPC staff questions about the viability of the proposed mine is also concerning to the County Commissioners.

Ultimately, while the Commissioners do recognize the positive impact the project would have on employment in the area, they do not believe the project to be in the best interest of Penobscot County.

Respectfully,  
Penobscot County Commissioner's

  
Peter K. Baldacci, Chairman

  
Laura J. Sanborn

  
Andre' E. Cushing, III





STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
BUREAU OF PARKS AND LANDS  
22 STATE HOUSE STATION  
AUGUSTA, MAINE 04333

JANET T. MILLS  
GOVERNOR

AMANDA E. BEAL  
COMMISSIONER

November 9, 2020

Ms. Stacie J. Beyer  
Planning Manager  
Maine Land Use Planning Commission  
22 State House Station  
Augusta, Maine 04333-0022

RE: Wolfden Resources Mineral Mining Rezoning Petition, T6R6 WELS; Resource Information.

Dear Ms. Beyer,

The Maine Department of Agriculture, Conservation and Forestry, Bureau of Parks and Lands has reviewed the Land Use Planning Commission Zoning Permit 779 by Wolfden Mt. Chase, LLC, and has several specific comments shared below. As a preface to the comments, it is important to note that the Bureau does not directly own and manage lands in the immediate vicinity of the proposed mining area. As such, the Bureau's comments center on ATV and snowmobile trail connectivity and general access to private lands for traditional recreational activities.

ATV and Snowmobile Trail Connectivity

The Bureau's Off-Road Vehicle program provides grant funding and works with snowmobile and ATV clubs across Maine to develop and maintain interconnected trail linkages. ATV and snowmobile trail connections on private lands in the general vicinity of the project provide important links and experiences. Motorized trail use in the region is instrumental to the local businesses and others who cater to trail use. Trails in T6R6 WELS are a major connection for Millinocket, East Millinocket, Patten, and Shin Pond. The Bureau would like to see the existing trail connectivity retained.

Access for Traditional Recreational Activities

It is reasonable to assume the area supports traditional recreational activities, including but not limited to hunting, fishing, and wildlife observation. Supporting and upholding Maine's tradition of public access to private lands for outdoor recreation is regularly identified as a significant issue in reports, most notably the Maine State Comprehensive

ANDREW R. CUTKO, DIRECTOR  
BUREAU OF PARKS AND LANDS  
18 ELKINS LANE, HARLOW BUILDING



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FAX: (207) 287-6170

Outdoor Recreation Plan. The Bureau would appreciate commitments to continued public recreational access, with reasonable exceptions associated with public safety.

The Bureau also notes and references the Maine Department of Inland Fisheries and Wildlife's (MDIFW) observations and recommendations submitted on September 11, 2020. MDIFW notes the aquatic resources, with particular reference to the significance of native brook trout and the quality of landlocked salmon and brook trout fisheries in Pleasant and Mud Lakes. This reporting on the quality of the fishery resource supports the lands in the vicinity of the proposed mining area having recreational value for traditional recreational activity.

Thank you for the opportunity to provide these comments. If you have any questions on the comments, please do not hesitate to contact me at 207-441-9152 or at [rex.turner@maine.gov](mailto:rex.turner@maine.gov).

Sincerely,

A handwritten signature in black ink, appearing to read 'Rex Turner', with a long horizontal line extending to the right.

Rex Turner  
Outdoor Recreation Planner, Maine Bureau of Parks and Lands

Cc: Andrew Cutko, Director, Maine Bureau of Parks and Lands



JANET T. MILLS  
GOVERNOR

STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
LAND USE PLANNING COMMISSION  
22 SHS, 18 ELKINS LANE  
AUGUSTA, MAINE 04333-0022

AMANDA E. BEAL  
COMMISSIONER

JUDY C. EAST  
EXECUTIVE DIRECTOR

REQUEST FOR REVIEW AND COMMENT ON PENDING APPLICATION

Date: August 04, 2020 Permit #: ZP 779 Tr#: 51512 Analyst: Stacie Beyer

Applicant: Wolfden Mt. Chase, LLC Location: T6 R6 WELS

Project: Rezoning to D-PD Subdistrict for the Pickett Mountain Metallic Mineral Mine

**Special Notes:** This is a petition for a *zone change* that would allow the landowner to move forward to the permitting stage. If the zone change is approved by the Commission, DEP would be the lead agency for permitting and LUPC would have a certifying role. Links to the petition, supporting materials, and references are attached.

TO BE CONSIDERED,  
COMMENTS DUE BY:  
**09-01-2020**

**Please use this form to submit comments & recommendations regarding the petition. Those indicated below have been requested to review this petition.**

|                                                                                                                                                                        |                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Bureau of Parks and Lands, SHS #22<br>Attn.: Outdoor Recreation, Rex Turner                                                                                            | Maine Forest Service<br>Attn.: Don Mansius                |
| DEP, SHS #17 or 312 Canco Rd. Portland, ME 04103<br>Attn.: Mining Review, Mark Stebbins and Mike Clark                                                                 | Natural Areas Program, SHS #93<br>Attn.: Lisa St. Hilaire |
| DEP, SHS #17<br>Attn.: Groundwater Review, John Hopeck                                                                                                                 | State Geologist, NRIMC, SHS #22<br>Attn.: Daniel Locke    |
| DEP, SHS #17<br>Attn.: Surface Water Review, Tom Danielson                                                                                                             | State Soil Scientist, SHS #28<br>Attn.: David C. Rocque   |
| DEP, SHS #17<br>Attn.: Waste Water Treatment, Gregg Wood and Cindy Dione                                                                                               | DOT, Traffic, SHS #16<br>Attn.: Steve Landry              |
| DEP, SHS #17<br>Attn.: Air Quality Review, Jeff Crawford                                                                                                               | County Commissioners<br>Attn: Shaw Weeks                  |
| DEP, 106 Hogan Road, Bangor<br>Attn.: Solid Waste Review, Karen Knuuti                                                                                                 |                                                           |
| Historic Preservation Commission, SHS #65<br>Attn.: Art Spiess                                                                                                         |                                                           |
| DIF&W, SHS #41 (email: <a href="mailto:IFWEnvironmentalreview@maine.gov">IFWEnvironmentalreview@maine.gov</a> )<br>Attn.: John Perry, Environmental Review Coordinator |                                                           |

**After review of the petition and consideration of the proposal's probable impacts, we have:**

- No comments on the proposal  Comments on the proposal are attached

Comments (attach additional pages as necessary):

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Reports of staff permitting decisions, can be found here: <http://www.maine.gov/dacf/lupc/reports/>

## **Review Materials**

All pertinent materials for review of the petition are found on the LUPC's website.

Review Criteria, Commission Rules Chapter 12:

[https://www.maine.gov/dacf/lupc/laws\\_rules/rule\\_chapters/Chapter12\\_ver2013.pdf](https://www.maine.gov/dacf/lupc/laws_rules/rule_chapters/Chapter12_ver2013.pdf)

Current Version of the Petition:

[https://www.maine.gov/dacf/lupc/projects/wolfden/notice/Woldfen\\_MtChaseLLC\\_Petition\\_Rev\\_Final.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/notice/Woldfen_MtChaseLLC_Petition_Rev_Final.pdf)

Project Specific Webpage:

[https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden\\_rezoning.html](https://www.maine.gov/dacf/lupc/projects/wolfden/wolfden_rezoning.html)

Overview of Estimated Time Line:

[https://www.maine.gov/dacf/lupc/projects/wolfden/preview/Updated\\_Wolfden\\_TimelineGraphic.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/preview/Updated_Wolfden_TimelineGraphic.pdf)

Last Request for Additional Information:

[https://www.maine.gov/dacf/lupc/projects/wolfden/hearing\\_record/4.7\\_2020-05-27\\_LUPC\\_Ltr\\_AdInfo\\_Request3.pdf](https://www.maine.gov/dacf/lupc/projects/wolfden/hearing_record/4.7_2020-05-27_LUPC_Ltr_AdInfo_Request3.pdf)

(Please note the LUPC expects to send a follow-up letter requesting more information. This letter will be posted on the project specific webpage shortly. We will notify all agencies, when we receive any new information from the petitioner.)

# MEMORANDUM

## Maine Natural Areas Program

Department of Agriculture, Conservation and Forestry  
State House Station #177, Augusta, Maine 04333

---

**Date:** November 17, 2020  
**To:** Stacie Beyer, LUPC Planning Manager  
**From:** Kristen Puryear, Ecologist  
**Re:** Rare and exemplary botanical features, ZP 779, Wolfden Mt. Chase, LLC, Rezoning to D-PD Subdistrict for the Pickett Mountain Metallic Mineral Mine, and Follow up for Additional Information for Same, T6 R6 WELS, Maine.

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I have searched the Maine Natural Areas Program's (MNAP's) Biological and Conservation Data System files in response to your request received August 4, 2020 for review and comment on the Wolfden Mt. Chase, LLC rezoning petition for 528 acres in T6R6 WELS, Maine.

This search included a review of documented rare and unique botanical features, including the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Please refer to MNAP's initial January 22, 2020 response to Wood Environment & Infrastructure Solutions (attached). In that response, MNAP identified a priority area for botanical survey to the north and downslope of the project area, around Pleasant Lake and Mud Pond. This area is a lakeside graminoid/shrub fen that is located downhill and downstream from the proposed project site near Pickett Mountain. Due to concerns related to changes in hydrology, runoff, and water quality, MNAP strongly recommends survey of this fen by a qualified ecologist during the growing season to determine presence/absence of rare plants and natural community type(s) that may be present at that location (using the Maine natural community classification *Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems* by Gawler and Cutko, 2018 revised edition). The MNAP requests the opportunity to review and approve the credentials of any field/botanical contractor identified by Wolfden Mt. Chase LLC. The MNAP is also available to conduct this survey, for a fee, if Wolfden Mt. Chase LLC or its contractors cannot identify a qualified ecologist.

On October 1, 2020, Beth Swartz (MDIFW Wildlife Biologist), you (Stacie Beyer, LUPC Planner), Jeremy Ouellette (Wolfden), and I (Kristen Puryear, MNAP Ecologist) visited the wetland located along the western shore and inlet stream to Pickett Mountain Pond in T6 R6 WELS to check for presence of shrubby cinquefoil, the host plant for the Clayton's Copper butterfly (State-Threatened). Shrubby cinquefoil was not found during this visit, and this wetland did not meet criteria for mapping as a rare or exemplary natural community.

The January 22, 2020 response also identifies botanical features within four miles of the original rezoning petition. These features are: Orono Sedge at Hersey Route 11 Roadside, Montane Spruce Fir Forest and Spruce – Pine Woodland at Mount Chase, and Spruce – Fir – Northern Hardwoods Ecosystem at Hay Brook Mountain. This larger rezone area includes an additional natural community at Hay Brook Mountain, Enriched Northern Hardwoods Forest.

None of these features is expected to occur within the 528-acre area under consideration for this rezoning petition.

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all natural areas in Maine, and in the absence of a specific field investigation, MNAP cannot provide a definitive statement on the presence or absence of unusual natural features at this site. MNAP recommends that rare plant surveys and recommended ecological inventory be included within baseline surveys during the growing season and therefore planned for in-advance within any Work Plan developed for the Pickett Mountain project.

The Maine Natural Areas Program is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We welcome the contribution of any information collected if an additional site survey is performed.

Thank you for using the Maine Natural Areas Program in the environmental review process. Please do not hesitate to contact our office if you have further questions about the Natural Areas Program or about rare or unique botanical features at this site.



**STATE OF MAINE**  
**DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY**

177 STATE HOUSE STATION  
AUGUSTA, MAINE 04333

**JANET T. MILLS**  
GOVERNOR

**AMANDA E. BEAL**  
COMMISSIONER

January 22, 2020

Peter Thompson  
wood., Wood Environment & Infrastructure Solutions  
11 Congress Street, Suite 200  
Portland, ME 04101

Via email: [peter.thompson@woodplc.com](mailto:peter.thompson@woodplc.com)

Re: Rare and exemplary botanical features in proximity to: Wolfden Pickett Mountain Site, T6 R6 WELS, Maine

Dear Mr. Thompson:

I have searched the Maine Natural Areas Program's (MNAP's) Biological and Conservation Data System files in response to your request received December 4, 2019 for information on the presence of rare or unique botanical features documented from the vicinity of the project in T6R6 WELS, Maine. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Our official response covers only botanical features. For authoritative information and official response for zoological features you must make a similar request to the Maine Department of Inland Fisheries and Wildlife, 284 State Street, Augusta, Maine 04333.

According to the information currently in our Biological and Conservation Data System files, there are no rare botanical features documented specifically within the project area. This lack of data may indicate minimal survey efforts rather than confirm the absence of rare botanical features. You may want to have the site inventoried by a qualified field biologist to ensure that no undocumented rare features are inadvertently harmed.

Please refer to the attached supplemental information regarding rare and exemplary botanical features documented to occur within four miles of the project site. The list includes information on one feature, Orono Sedge, known to occur historically in the area. MNAP does not expect that this rare sedge species would be found at the Pickett Mountain site. Also attached is a map showing the features that occur within three miles of the project site. MNAP has received landowner permission to release this map which shows exemplary Montane Spruce – Fir Forest and exemplary Spruce – Pine Woodland at Mount Chase south of the project site. Please also refer to the attached factsheets for more information about these natural community types.

MNAP has also identified a priority area for botanical survey on the property owned by Wolfden Mt. Chase LLC. This area is a lakeside graminoid/shrub fen between Pleasant and Mud Lakes. As this fen is downhill and downstream from the proposed project site near Pickett Mountain, MNAP strongly recommends survey by a qualified ecologist to determine presence/absence of rare plants and natural community type(s) that may be

**MOLLY DOCHERTY, DIRECTOR**  
MAINE NATURAL AREAS PROGRAM  
BLOSSOM LANE, DEERING BUILDING



PHONE: (207) 287-804490  
WWW.MAINE.GOV/DACF/MNAP

present at that location per the Maine natural community classification (*Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems* by Gawler and Cutko, 2018 revised edition). The MNAP is available to conduct this survey, for a fee, if you cannot identify a qualified ecologist. Please contact me at 207-287-8043, [kristen.puryear@maine.gov](mailto:kristen.puryear@maine.gov), if you are interested in MNAP conducting this survey.

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all natural areas in Maine, and in the absence of a specific field investigation, the Maine Natural Areas Program cannot provide a definitive statement on the presence or absence of unusual natural features at this site.

The Maine Natural Areas Program (MNAP) is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We would appreciate the contribution of any information obtained should you decide to do field work. MNAP welcomes coordination with individuals or organizations proposing environmental alteration, or conducting environmental assessments. If, however, data provided by MNAP are to be published in any form, the Program should be informed at the outset and credited as the source.

The Maine Natural Areas Program has instituted a fee structure of \$75.00 an hour to recover the actual cost of processing your request for information. You will receive an invoice for \$375.00 for five hours of our services.

Thank you for using MNAP in the environmental review process. Please do not hesitate to contact me if you have further questions about the Natural Areas Program or about rare or unique botanical features on this site.


Sincerely,




Kristen Puryear | Ecologist | Maine Natural Areas Program  
207-287-8043 | [kristen.puryear@maine.gov](mailto:kristen.puryear@maine.gov)



**Wolfden Pickett Mountain Site  
T6 R6 WELS, Maine**

 Approximate Project Location

 Montane Spruce - Fir Forest

 Spruce - Pine Woodland

 Town



0 0.25 0.5 Miles

Maine Natural Areas Program, December 2019

**T6 R6 WELS**



**Mount Chase**

**Spruce - Pine Woodland**

**Montane Spruce - Fir Forest**

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## Rare and Exemplary Botanical Features within 4 miles of Project: Wolfden Pickett Mountain Site, T6 R6 WELS, Maine

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| Common Name                                        | State Status | State Rank | Global Rank | Date Last Observed | Occurrence Number | Habitat                                                                                 |
|----------------------------------------------------|--------------|------------|-------------|--------------------|-------------------|-----------------------------------------------------------------------------------------|
| <b>Montane Spruce - Fir Forest</b>                 |              |            |             |                    |                   |                                                                                         |
| <null>                                             |              | S5         | G3G5        | 2005-07-18         | 9                 | Conifer forest (forest, upland)                                                         |
| <b>Orono Sedge</b>                                 |              |            |             |                    |                   |                                                                                         |
| T                                                  |              | S3         | G3          | 1989-06-27         | 31                | Old field/roadside (non-forested, wetland or upland)                                    |
| <b>Spruce - Fir - Northern Hardwoods Ecosystem</b> |              |            |             |                    |                   |                                                                                         |
| <null>                                             |              | S5         | GNR         | 2003-06-05         | 16                | Conifer forest (forest, upland),Hardwood to mixed forest (forest, upland)               |
| <b>Spruce - Pine Woodland</b>                      |              |            |             |                    |                   |                                                                                         |
| <null>                                             |              | S4         | G3G5        | 2005-07-18         | 8                 | Dry barrens (partly forested, upland),Rocky summits and outcrops (non-forested, upland) |

# Spruce - Pine Woodland

## State Rank S4

### Community Description

This type is a mixed canopy woodland (25-70% closure) in which red spruce and/or white pine is always present and associated species vary. Red spruce or white pine is strongly dominant at some sites; at others, the canopy is mixed, with no one tree species strongly dominant. White spruce may rarely replace red spruce at coastal sites. The shrub layer is typically very sparse (and variable in composition), and the herb layer has mostly 15-50% cover. Heath shrubs are the dominant feature of the herb layer; herb species rarely exceed 8% cover. The bryoid layer is sparse at some sites (<25%) and well developed at others (35-70%). Fruticose lichens typically make up half or more of the bryoid cover.

### Soil and Site Characteristics

Sites occur on mid to upper slopes (usually 10-20% slope) and low summits at elevations up to 2000'. Soils are thin (<25 cm), consisting of coarse mineral soil or poorly decomposed duff, and form patches over the bedrock substrate. The very well drained soils are acidic

(pH 4.6-5.2) and nutrient poor. Some sites show evidence of past fire, but many do not.

### Diagnostics

Sites are woodlands on bedrock, with conifer cover exceeding deciduous cover. Red spruce is typically dominant, or occasionally co-dominant with white pine or red spruce.

### Similar Types

Other upland coniferous woodlands may include red spruce but will have other tree species (northern white cedar, pitch pine, red pine, jack pine, or black spruce) in greater abundance. Oak - Pine Woodlands may have considerable red



Spruce - Pine Woodland

spruce (an oak - spruce mix), but have more deciduous than coniferous tree cover. Moving downslope, or into areas of greater soil development, these woodlands can grade into spruce or pine forests, but those have more continuous canopy and less shrub and herb cover.

### Conservation, Wildlife, and Management Considerations

Most sites have little pressure from development or timbering; the primary impacts are from recreational use. Communications towers or wind turbines could have an impact on some of these woodlands on mid-elevation summits. Several sites are in public or private conservation ownership.

Birds that may nest in this habitat include the sharp-shinned hawk, gray jay, yellow-bellied flycatcher, boreal chickadee, Blackburnian warbler, red crossbill, and northern parula.

### Distribution

New England - Adirondack Province and Laurentian Mixed Forest Province, extending eastward, westward, and northward from Maine.

Landscape Pattern: Small Patch

### Characteristic Plants

These plants are frequently found in this community type. Those with an asterisk are often diagnostic of this community.

#### Canopy

- Balsam fir\*
- Black spruce\*
- Northern white cedar\*
- Paper birch\*
- Red spruce\*
- White pine\*
- White spruce\*

#### Sapling/shrub

- Bayberry\*
- Shadbush
- Wild-raisin\*

#### Dwarf Shrub

- Black huckleberry\*
- Lowbush blueberry\*
- Sheep laurel\*

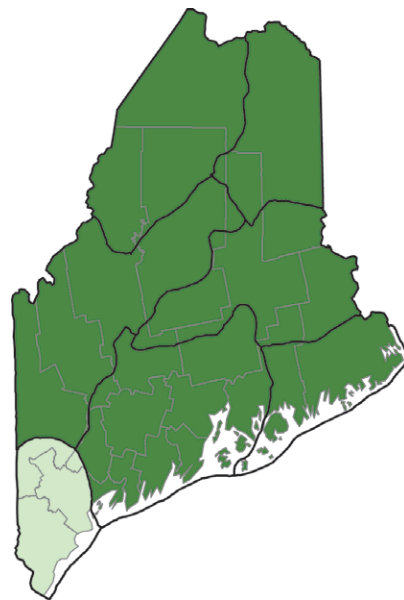
#### Herb

- Bracken fern

#### Bryoid

- Dicranum moss
- Red-stemmed moss
- Reindeer lichen\*

### Location Map



- Community is known from this Ecoregion
- Community may occur in this Ecoregion
- Bailey's Ecoregion
- County



Wild Raisin

### Examples on Conservation Lands You Can Visit

- Holbrook Island Sanctuary State Park - Hancock Co.
- Mahoosuc Mountain, Mahoosuc Public Lands - Oxford Co.
- Mansell Mountain, Acadia National Park - Hancock Co.
- Nahmakanta Public Lands - Piscataquis Co.
- Petit Manan Point, Petit Manan National Wildlife - Washington Co.

# Montane Spruce - Fir Forest

State Rank S5

## Community Description

These closed canopy or sometimes patchy canopy forests are dominated by red spruce (50-95% cover); fir is a common associate (up to 35% cover) in younger stands and in canopy gaps, and yellow birch is the most common hardwood. Other conifers (northern white cedar, hemlock, or white pine) occasionally reduce the spruce dominance to as low as 40% cover. Striped maple is typical in the shrub layer, along with tree saplings. The herb layer is well developed (>15% cover, and often >30%), with tree regeneration and an assortment of herbs. Dwarf shrubs are conspicuously absent, except for a bit of velvet-leaf blueberry. Most of the ground surface is a lush mosaic of feather-mosses and leafy liverworts.

## Soil and Site Characteristics

These forests occur on cool and moist microsites at moderate elevations (600'-2500', perhaps slightly higher), and north of 45 degrees latitude. Slopes are moderate to steep (5-50%), and usually north, west, or east facing. Soils are mostly well drained (some imperfectly drained), sandy to loamy, of moderate depth (25-50 cm), with pH 5.0-5.5.

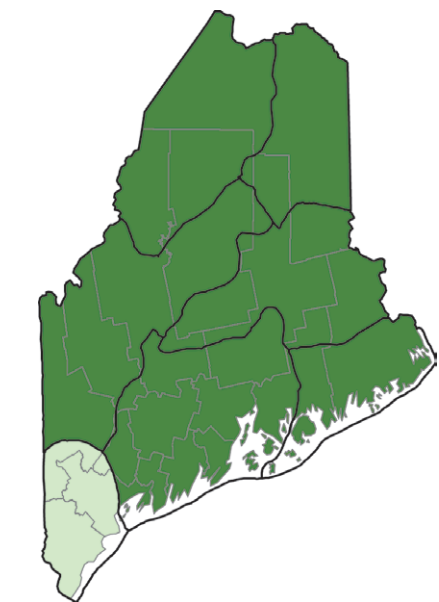
## Diagnostics

Red spruce is dominant, and yellow birch is the most abundant hardwood. Herbaceous species exceed 15% cover, with montane/boreal herbs such as bluebead lily, northern wood-sorrel, creeping snowberry, mountain wood fern, and/or rose twisted stalk locally common. Bryoids exceed 40% cover, with a large proportion of feather-mosses.

## Similar Types

Fir - Heart-leaved Birch Subalpine Forests can share many species and often grade into this type as elevation decreases, but will have fir more abundant than spruce in the canopy, shorter trees, and canopy gaps more frequent. Spruce - Fir - Broom-moss Forests have similar canopies but much more depauperate herb and bryoid layers. They usually occur on somewhat drier sites and lack the assortment of montane/boreal herbs and the most common mosses will be broom-mosses rather than feather-mosses. Some Maritime Spruce - Fir Forests have a similar herb layer, but if so they have more canopy fir and occur along the immediate coast.

## Location Map



Community is known from this Ecoregion  
Community may occur in this Ecoregion  
Bailey's Ecoregion  
County



Montane Spruce - Fir Forest

## Conservation, Wildlife, and Management Considerations

This is the characteristic spruce - fir type of mountain slopes just below the subalpine zone, and it is extensively harvested and managed. Spruce budworm has impacted many sites as well, creating patchy forest structure. Some areas of high ecological quality, in the hundreds of acres, are known but not necessarily designated as areas reserved from harvesting. Almost all are within a landscape of managed forest rather than surrounded by land that has been permanently cleared and converted to other uses.

This community type may be utilized as nesting habitat by a number of coniferous forest specialist bird species, such as the sharp-shinned hawk, yellow-bellied flycatcher, bay-breasted warbler, Cape May warbler, blackpoll warbler, northern parula, blackburnian warbler, boreal chickadee, Swainson's thrush, red crossbill, white-winged crossbill, gray jay, and spruce grouse.

## Distribution

Western Maine westward (New England - Adirondack Province).

Landscape Pattern: Large Patch, mostly as hundreds of acres.

## Characteristic Plants

These plants are frequently found in this community type. Those with an asterisk are often diagnostic of this community.

### Canopy

Balsam fir\*  
Red spruce\*  
Yellow birch\*

### Sapling/shrub

Balsam fir\*  
Red maple  
Striped maple

### Dwarf Shrub

Velvet-leaf blueberry

### Herb

Bluebead lily\*  
Bunchberry  
Canada mayflower  
Creeping snowberry\*  
Goldthread  
Northern wood-sorrel\*  
Painted trillium  
Starflower

### Bryoid

Common broom-moss\*  
Mountain fern moss  
Red-stemmed moss  
Three-lobed bazzania

## Associated Rare Plants

Boreal bedstraw  
Lesser wintergreen

## Associated Rare Animals

Bicknell's thrush

## Examples on Conservation Lands You Can Visit

- Deboullie Ponds Public Lands - Aroostook Co.
- Elephant Mountain, Appalachian Trail - Franklin Co.
- Lower Horns Pond Trail, Bigelow Preserve - Franklin Co.
- Traveler Mountain, Baxter State Park - Piscataquis Co.
- Whitecap Mountain, Appalachian Trail - Piscataquis Co.

## STATE RARITY RANKS

- S1** Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.
- S2** Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
- S3** Rare in Maine (20-100 occurrences).
- S4** Apparently secure in Maine.
- S5** Demonstrably secure in Maine.
- SU** Under consideration for assigning rarity status; more information needed on threats or distribution.
- SNR** Not yet ranked.
- SNA** Rank not applicable.
- S#?** Current occurrence data suggests assigned rank, but lack of survey effort along with amount of potential habitat create uncertainty (e.g. S3?).

**Note:** **State Rarity Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines State Rarity Ranks for animals.

## GLOBAL RARITY RANKS

- G1** Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extinction.
- G2** Globally imperiled because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
- G3** Globally rare (20-100 occurrences).
- G4** Apparently secure globally.
- G5** Demonstrably secure globally.
- GNR** Not yet ranked.

**Note:** **Global Ranks** are determined by NatureServe.

## STATE LEGAL STATUS

**Note:** State legal status is according to 5 M.R.S.A. § 13076-13079, which mandates the Department of Conservation to produce and biennially update the official list of Maine's **Endangered and Threatened** plants. The list is derived by a technical advisory committee of botanists who use data in the Natural Areas Program's database to recommend status changes to the Department of Conservation.

- E** ENDANGERED; Rare and in danger of being lost from the state in the foreseeable future; or federally listed as Endangered.
- T** THREATENED; Rare and, with further decline, could become endangered; or federally listed as Threatened.

## NON-LEGAL STATUS

- SC** SPECIAL CONCERN; Rare in Maine, based on available information, but not sufficiently rare to be considered Threatened or Endangered.
- PE** Potentially Extirpated; Species has not been documented in Maine in past 20 years or loss of last known occurrence has been documented.

## ELEMENT OCCURRENCE RANKS - EO RANKS

Element Occurrence ranks are used to describe the quality of a rare plant population or natural community based on three factors:

- **Size:** Size of community or population relative to other known examples in Maine. Community or population's viability, capability to maintain itself.
- **Condition:** For communities, condition includes presence of representative species, maturity of species, and evidence of human-caused disturbance. For plants, factors include species vigor and evidence of human-caused disturbance.
- **Landscape context:** Land uses and/or condition of natural communities surrounding the observed area. Ability of the observed community or population to be protected from effects of adjacent land uses.

These three factors are combined into an overall ranking of the feature of **A**, **B**, **C**, or **D**, where **A** indicates an **excellent** example of the community or population and **D** indicates a **poor** example of the community or population. A rank of **E** indicates that the community or population is **extant** but there is not enough data to assign a quality rank. The Maine Natural Areas Program tracks all occurrences of rare (S1-S3) plants and natural communities as well as A and B ranked common (S4-S5) natural communities.

**Note:** **Element Occurrence Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines Element Occurrence ranks for animals.

Visit our website for more information on rare, threatened, and endangered species!  
<http://www.maine.gov/dacf/mnap>

**From:** [Rocque, David](#)  
**To:** [Beyer, Stacie R](#)  
**Subject:** RE: Wolfden  
**Date:** Tuesday, December 08, 2020 2:06:20 PM

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Hi Stacie:

After reviewing the new soil characterization survey, I have the following comments. I call this a characterization soil survey because it is not a standard soil survey complete with soil map units. That level of soil survey will be needed for the development permit, provided that the re-zoning application is approved. For the purpose of re-zoning, this characterization survey is appropriate and sufficient to determine the overall suitability of the site and proposed layout for the re-zoning review.

As I understand it, this proposed project is designed to make significant alterations to the area in order to extract and process valuable minerals. I also believe that the applicant intends to restore the site to as near the original condition as possible, after the mining operation is completed. That would include the natural hydrology and landforms. The more suitable the site, the less alteration is needed and the easier it will be to restore the site. The poorer the suitability, the more significant the alteration is required and the more difficult it will be to restore the site to its pre-construction condition it will be.

Based on the soil characterization survey, sites 2 and 4 have significant wetness limitations while sites 1 and 3 have bedrock depth and some slope limitations. Bedrock depth limitations, particularly on slopes, can be overcome by blasting and/or fill, both of which significantly alter the terrain but do not affect the natural hydrology to any great extent. Wet soils are a more significant concern as they will need to be overcome in order to accommodate the proposed development and will affect the natural hydrology. Bedrock depth is an issue that, once overcome, it is no longer a problem. Groundwater however, is a more significant concern in that it is always present and may affect the project at any time. I am particularly concerned about the waste rock storage and treatment ponds being constructed on sites where there is a high seasonal groundwater table. Any failure of the mechanism used to lower or divert the groundwater table have the potential to result in serious groundwater quality impacts. The waste water storage ponds will eventually be closed, after the mining operation is complete. The waste rock storage areas however, will be there forever and so the groundwater diversion or lowering will need to remain in place equally as long. Over time, if proper maintenance is not regularly provided, the groundwater table diversion or lowering will fail and impact the waste rock storage. If possible, waste rock storage areas and treatment ponds should be located on soils that are more suitable for that purpose and do not require regular and continual maintenance not control the high groundwater table.

Regarding domestic wastewater disposal and treatment, I prefer spray irrigation over a conventional subsurface disposal system. The site is naturally forested with an excellent organic duff layer making it well suited to treat the wastewater. Using spray irrigation will require very little alteration of the soils on the site whereas a subsurface system will require significant soil alteration.

Let me know if you have any questions.

David Rocque

State Soil Scientist, Department of Agriculture, Conservation, and Forestry

Bureau of Agriculture, Food & Rural Resources

Division of Agricultural Resource Development

207-287-2666

---



**From:** [Bronson, Brian N.](#)  
**To:** [Beyer, Stacie R](#)  
**Cc:** [Higgins, Joe](#); [Turner, Rex](#)  
**Subject:** FW: Patten ATV Trails East of Rt. 11  
**Date:** Wednesday, January 20, 2021 12:18:06 PM  
**Attachments:** [Patten ATV Map East of Rt 11.pdf](#)

---

Additional information from local. I wasn't aware of Moos outlook and didn't have it on the map I sent originally.

Brian Bronson  
Supervisor Off Road Recreational Vehicle Program  
Bureau of Parks and Lands  
State House Station 22  
Augusta, Me 04333-0022  
207-287-4958

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**From:** Hurteau, George L <George.L.Hurteau@maine.gov>  
**Sent:** Wednesday, January 20, 2021 11:39 AM  
**To:** Bronson, Brian N. <Brian.N.Bronson@maine.gov>  
**Subject:** Patten ATV Trails East of Rt. 11

I'm having problems with my mapping software so hopefully this will work for now.

The following are points of interest or lookouts in the area in question:

A: Roberts Mtn Lookout

B: Noah's Ark

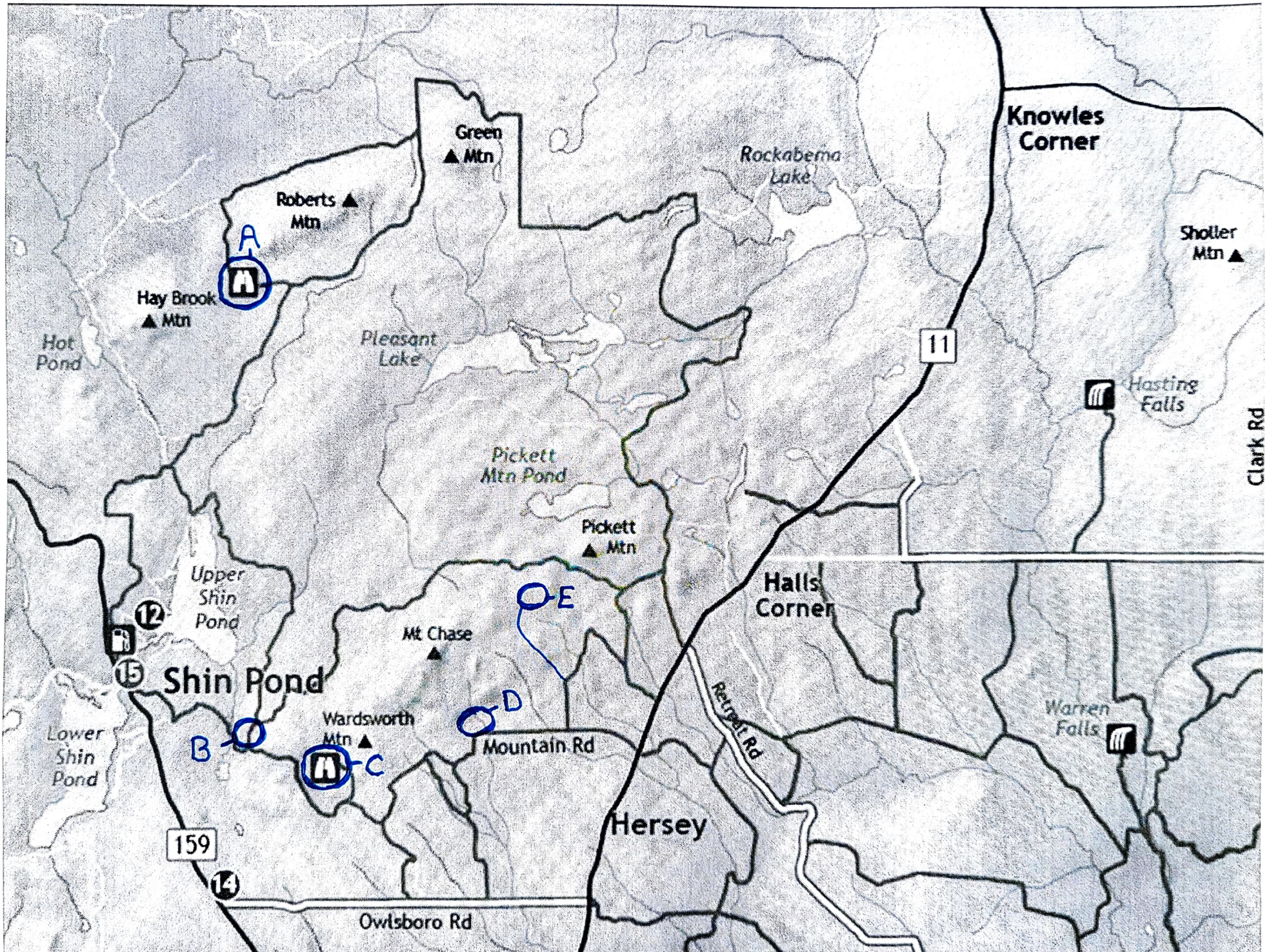
C: Wardsworth Mtn Lookout

D: Mt. Chase Mtn Trailhead

E: Moos Lookout

Most of these areas have picnic tables for riders.

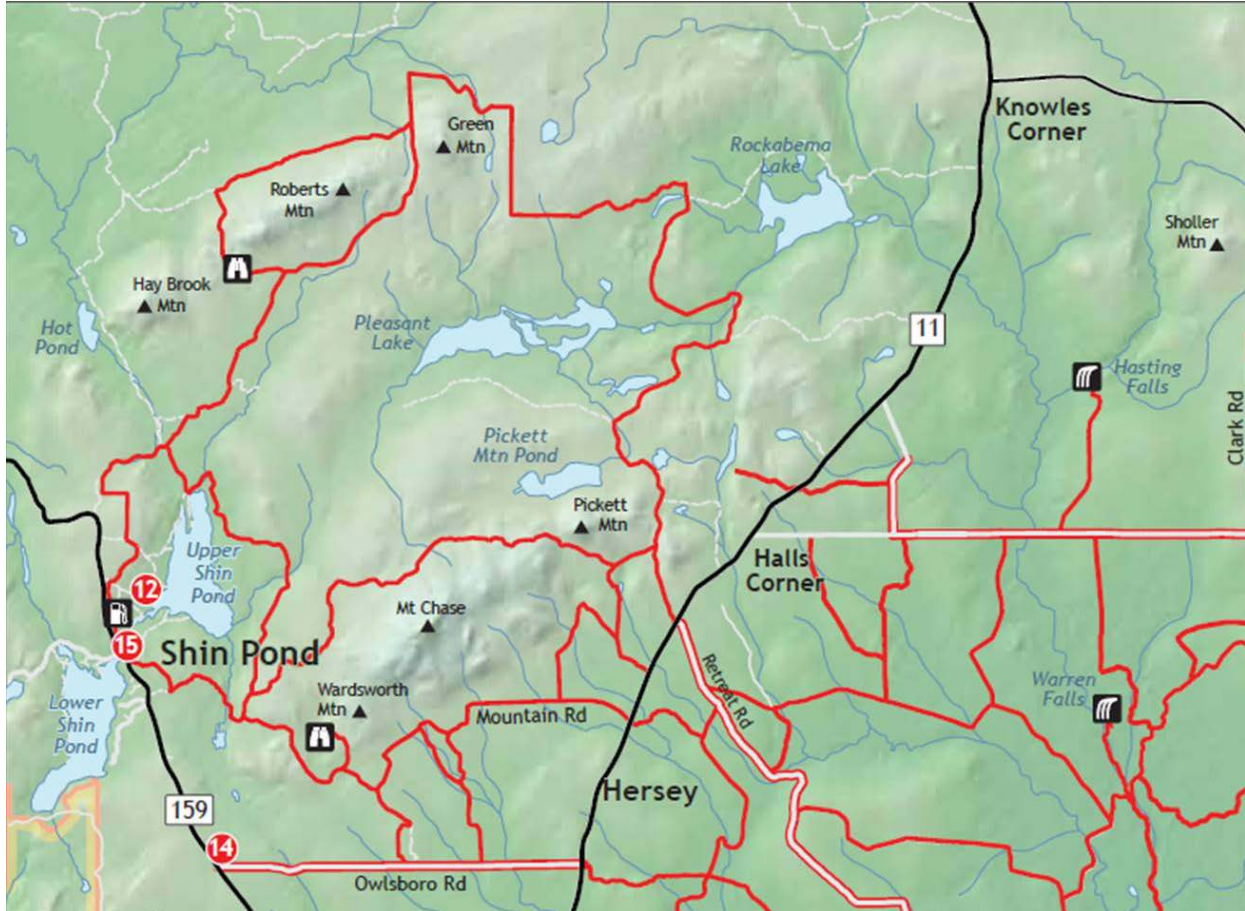
George Hurteau  
Recreational Trail Coordinator  
Off-Road Recreational Vehicle Program  
Bureau of Parks and Lands  
207-557-2476



From: [Bronson, Brian N.](mailto:Bronson_Brian_N)  
To: [Beyer, Stacie R.](mailto:Beyer_Stacie_R); [Higgins, Joe](mailto:Higgins_Joe); [Turner, Rex](mailto:Turner_Rex)  
Cc: [Hurtaw, George I.](mailto:Hurtaw_George_I)  
Subject: RE: Wolfden Rezoning Petition  
Date: Wednesday, January 20, 2021 6:44:31 AM  
Attachments: [image005.png](#)  
[image010.png](#)  
[image011.png](#)  
[image012.png](#)

There are two vista areas that are designated on this map with binoculars. Between Haybrook and Roberts mountains and up on Wardsworth Mountain. These are the only two destination vistas that I am aware of but as Joe said there are several locations along the trails where you get good views. It is unclear to me if this would be visible from those vistas or not but I am assuming it would be at least partially visible?

Brian



From: Beyer, Stacie R <[Stacie.R.Beyer@maine.gov](mailto:Stacie.R.Beyer@maine.gov)>  
Sent: Tuesday, January 19, 2021 4:54 PM  
To: Higgins, Joe <[Joe.Higgins@maine.gov](mailto:Joe.Higgins@maine.gov)>; Turner, Rex <[Rex.Turner@maine.gov](mailto:Rex.Turner@maine.gov)>; Bronson, Brian N. <[Brian.N.Bronson@maine.gov](mailto:Brian.N.Bronson@maine.gov)>  
Subject: RE: Wolfden Rezoning Petition

Thanks, Joe.

We are looking specifically for areas along that section that have been developed as or actively used for places to stop and rest, eat lunch, or meet up with other riders.

Brian, do you know if there is an informal or formal pull-off on that trail section?

Stacie

From: Higgins, Joe <[Joe.Higgins@maine.gov](mailto:Joe.Higgins@maine.gov)>  
Sent: Tuesday, January 19, 2021 3:07 PM  
To: Turner, Rex <[Rex.Turner@maine.gov](mailto:Rex.Turner@maine.gov)>; Bronson, Brian N. <[Brian.N.Bronson@maine.gov](mailto:Brian.N.Bronson@maine.gov)>  
Cc: Beyer, Stacie R <[Stacie.R.Beyer@maine.gov](mailto:Stacie.R.Beyer@maine.gov)>  
Subject: RE: Wolfden Rezoning Petition

Hello Stacy,

The Snowmobile trail is a trail that is used for a great view as you are riding along. Not sure how many riders go and stop for pictures and that sort of thing. May want to reach out to Shin Pond Village as people stay at their cabins and they have more of a firsthand thought on the type of trail this is.

I can't speak for the ATV riders, but Brain Bronson may have some knowledge on that.

Joe Higgins  
Supervisor Off-Road Vehicle Snowmobile Program  
State of Maine  
Dept. of Agriculture Conservation and Forestry  
Bureau of Parks and Public Lands  
Off Road Vehicle Office  
(207) 287-4959  
Fax (207) 287-8111



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Ecological Services  
Maine Field Office  
306 Hatchery Road  
East Orland, Maine 04431  
Telephone: 207/469-7300 Fax: 207/902-1588

January 20, 2021

Stacie R. Beyer  
Planning Manager  
Land Use Planning Commission  
22 State House Station  
Augusta, Maine 04333

**REF: Request for U.S. Fish and Wildlife Service Review, Wolfden Rezoning Petition,  
ZP 779, T6 R6 WELS**

Dear Ms. Beyer:

This letter responds to the Maine Land Use Planning Commission's (LUPC) December 4, 2020, letter requesting technical assistance from the U.S. Fish and Wildlife Service (Service) on the potential impacts the Wolfden Mt. Chase proposal could have on federally listed fish and wildlife species and their habitat.

Section 7 of the Endangered Species Act (ESA) and associated regulations, requires that if there is a federal nexus for a project, federal agencies, in consultation with the Service, will determine the effects of the construction, operation, and post-operation (e.g., restoration) of the proposed project on federally listed species and designated critical habitat. This is defined as all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. For large or complex projects, the effects to federally listed species and critical habitat are analyzed by a consulting federal agency in a biological evaluation document. Effects to designated critical habitat for listed species would be separate from the analysis of effects to individuals. Critical habitat are specific areas within the geographic area that contain the physical or biological features that are essential to the conservation of endangered and threatened species.

Federal agencies request formal consultation with the Service when projects have adverse effects (i.e., the likely take of listed species). In a formal consultation, the Service prepares a biological opinion document that evaluates these effects and ensures that project does not jeopardize the continued existence of listed species or causes adverse modification of the critical habitat. Measures to avoid and minimize adverse effects to listed species and designated critical habitat would be considered during a section 7 consultation.

Based on the project description and location of the Wolfden Mt. Chase proposal provided by LUPC, this project has the potential to affect Canada lynx (*Lynx canadensis*), northern long-eared bat (*Myotis septentrionalis*), and Atlantic salmon (*Salmo salar*), though this list is subject to change and the potential listed species affected by project activities should be reexamined if there is a federal nexus created.

The Service is uncertain whether this project will have a federal nexus (require a federal permit or uses federal funding) and whether the Maine Field Office will review this project under the ESA. The Army Corps of Engineers or other federal agencies that may have jurisdiction concerning wetlands, mining, and environmental regulations have not contacted our office concerning ESA consultation. Federal agencies nor the Service have fully evaluated the effects of the Wolfden Mt. Chase proposal and the following is a preliminary review by the Service. If the proposal has a federal nexus in the future the federal agencies and the Service will complete a more thorough examination and analysis of the effects to listed species and critical habitat.

### Canada Lynx

Canada lynx occur in T6 R6 and adjacent townships (Figure 1, data from Maine Inland Fisheries and Wildlife [MDIFW]). MDIFW has documented lynx tracks, locations of radio-tagged lynx, and lynx incidentally trapped in T6 R6 and surrounding townships. Forested habitat described in the Wolfden Mt. Chase petition includes recently logged (in the last 7 to 10 years) sapling and

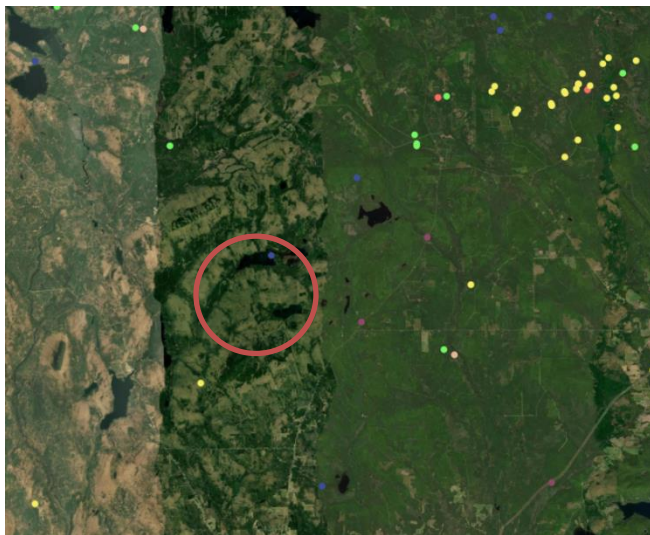


Figure 1. Canada lynx occurrences, indicated by the colored dots, in the vicinity of the Wolfden Mt. Chase proposal location, indicated by the colored circle.

pole stage spruce-fir stands, habitat that is considered high quality for snowshoe hare, the primary prey for Canada lynx. Aerial photography of the project location confirms recent logging activity. Based on this information, it is likely that resident lynx have established home ranges that include or are near the proposed Wolfden project. Additionally, the proposed project location overlaps with Canada lynx designated critical habitat. Loss of habitat due to project related activities would typically be considered in relation to the value of the foraging habitat and size of lynx home range (average home range for females is about 6,550 acres, males 14,300 acres).

### Atlantic Salmon

Although species specific occurrence data is not available for the proposed location of the Wolfden Mt. Chase project, the location does overlap designated critical habitat and several streams in the immediate vicinity have been modeled as suitable Atlantic salmon rearing streams. These streams include the West Branch Mattawamkeag, which flows from south to north along the west side of the project into Pleasant Lake and Mud Pond; the unnamed stream flowing west to east along the south portion of the project into Pickett Mountain Pond; and the unnamed streams flowing south to north along the east portion of the project connecting Pickett Mountain Pond with Grass Pond, Mud Lake, and the West Branch Mattawamkeag.

Without doing site specific surveys and requesting data from the Maine Department of Marine Resources, it is difficult to say with any confidence whether these streams are or aren't occupied by Atlantic salmon. Atlantic salmon have been observed spawning in the East Branch Mattawamkeag, approximately 30 river miles from the project vicinity, though there is a potential barrier to fish passage on the West Branch Mattawamkeag in the town of Island Falls, approximately 15 miles downstream of the project vicinity.

### **Northern Long-eared Bat**

Although critical habitat has not been designated for the northern long-eared bat, they have the potential to occur throughout Maine, including the proposed location of the project. Though there are no known hibernacula in the immediate vicinity and the closest known hibernacula is approximately 50 miles west of project, northern long-eared bats are known to travel great distances from hibernacula, sometimes hundreds of miles, to summer roosts, a distance that would overlap the proposed project location. In general, the northern long-eared bat is considered a habitat generalist, and has flexible habitat requirements when it comes to the breeding season, which lasts from approximately April through October. The easiest way to minimize impacts to northern long-eared bats in the project vicinity would be to prohibit tree removal activities within these dates.

### **Potential Effects to Listed Species**

Potential effects to Canada lynx, Atlantic salmon, or northern long-eared bat from the proposed Wolfden Mt. Chase project may include:

- effects to quality and status of habitat
- anticipated management of the acreage, including the areas beyond where ground disturbance will occur, during construction and future operations
- effects of construction activities including noise, lighting, road building, pedestrian and vehicular traffic
- extent of new infrastructure; including road, buildings, gates, fencing, and equipment housing and pads
- vehicle traffic to and from the mine and risk of road mortality
- possible barriers to terrestrial and aquatic movements, such as fencing or inadequate water crossing structures
- risks posed by contaminated materials, settling ponds, ore washing areas, flotation ponds, wastewater storage and open septic systems, various types of equipment used in mining operations, both above and below ground
- sources of human disturbance from mine operations, including lighting, noise, waste
- frequency and duration of above- or below-ground blasting, crushing, use of compressed air and attenuation of this noise
- possible entrapment animals in fenced areas, open slurry ponds, other infrastructure
- possible plans for future expansion
- reclamation plans and effects on listed species and its habitat
- nature of any land conservation offered by the applicant

This list is not exhaustive and other factors may exist that have not been addressed or mentioned in this letter. A more thorough examination of potential impacts to listed species and their habitat from the proposed project would take place between the Service and the consulting federal agencies if a federal nexus is created. Please contact Patrick Dockens at 207/902-1586 or by email at *Patrick\_Dockens@fws.gov* if you have any questions.

Sincerely,

Nate Carle,  
Acting Project Leader  
Maine Field Office  
Maine Fish and Wildlife Service Complex



STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



JANET T. MILLS  
GOVERNER

MELANIE LOYZIM  
ACTING COMMISSIONER

**MEMORANDUM**

**To:** Stacie Beyer, Planning Manager, Land Use Planning Commission  
**From:** Michael Clark, Mining Coordinator, Bureau of Land Resources *MJC*  
**Date:** January 28, 2021  
**Re:** Department comments on Wolfden Mt. Chase, LLC's petition to rezone portion of Township 6, Range 6 Penobscot County, Maine for development of an underground metallic mineral deposit, Revised June 30, 2020

The Department of Environmental Protection (Department or DEP) has reviewed the above noted zoning petition (the Petition), submitted to the Land Use Planning Commission (Commission or LUPC) by Wolfden Mt. Chase, LLC (Wolfden). The Petition provides information in support of Wolfden's request to rezone 528.2 acres that are currently within the General Management subdistrict, in order to allow construction, mining, milling, closure and reclamation activities over an estimated 10-15 years. The project is named Pickett Mountain and is located north of Patten, in Penobscot County near the border with Aroostook County. The Department's comments on the Petition follow.

In preparing these comments, the Department has attempted to (a) provide observation based on its experience and expertise that may assist the LUPC in its review, (b) identify any obvious issues with the proposed project that, if not addressed, would preclude Department permitting of the project under the Maine Metallic Mineral Mining Act (Mining Act), and (c) note obvious areas where the Department would require additional information if Wolfden moves forward with a permit application to the Department.

When reviewing the Department's comments, it is important to understand that the Department conducted a high-level review of the Petition. This is far more limited than the type of review the Department conducts when reviewing permit applications. Recognizing this, there may be important environmental considerations associated with the project, including considerations that could be identified from a closer review of the Petition, that are not reflected in the comments below.

Also important to recognize is that far more information would be required as part of any permit application filed pursuant to Maine's Mining Act and the Department's accompanying rules, 06-096 CMR ch. 200, *Metallic Mineral Exploration, Advanced Exploration and Mining* (Chapter 200). This is inherent in the difference between a zoning petition and a metallic mineral mining permit application. The Department recognizes, however, that the Commission may require some similar information and that there is overlap between the information needed by the Commission to review a zoning petition and by the Department to review a permit application. Therefore, the Department includes references to Chapter 200 and notes some of the information that a permit applicant would be required to provide pursuant to this rule. This may help the Commission when evaluating its own information needs and assessing whether similar information, or a subset of similar information, is necessary as part of the rezoning process or more appropriately deferred to any subsequent permitting process.

**AUGUSTA**  
17 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0017  
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**PORTLAND**  
312 CANCO ROAD  
PORTLAND, MAINE 04103  
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**PRESQUE ISLE**  
1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04769  
(207) 764-0477 FAX: (207) 760-3143



Finally, should an application for a mining permit ever be filed with the Department by Wolfden or any other person, the Department would review that application under the governing statute and rules based on the information in that application and the accompanying record materials. Nothing in these comments is intended to prejudge any future application, should one be filed.

### **A. Land Clearing and Stump Management**

Wolfden proposes to clear approximately 135 acres, grind everything except large stumps, and use the ground material for erosion control. This would likely generate a large volume of biomass, which may be more than is useable on site. Large stumps will not decompose over the proposed 10-15-year project span and may need to be disposed offsite at a licensed Solid Waste Facility if onsite disposal is not permissible, which would depend on the total stump volume. Alternatives for ground stumps include exporting for biomass fuel, landfill disposal, or compost amendment.

### **B. Mine Development Strategy**

#### Appendix A - Mine Development Strategy

This appendix states: “Typically, waste rock outside of the Pickett Mountain deposit is non acid generating and in fact carries significant neutralizing potential.” The nature and extent of testing that has been performed to substantiate this statement is not clear to the Department.

The Mine Development Strategy discussion in Section B(3)(d) of the Petition states that “waste rock will be mined separately and segregated from the mill feed, temporarily stored, and then returned underground as backfill on an ongoing basis.” Such waste rock may include Group A, Group B, and Group C wastes (Ch. 200, § 20(F)), which have different requirements relevant to their temporary storage and permanent disposal. The applicant may need to segregate these wastes based on their characteristics, stabilization requirements, and the suitability of different storage and long-term disposal options; the specific storage and disposal procedures for each type of waste rock must be described in detail in any permit application. (See Ch. 200, § 20 (G)(1), § 20(I), and § 21).

### **C. Site Layout / Exhibits with Potential Inconsistencies**

Exhibit D-2A-Rev1, dated 11/03/20, shows a storage pond downgradient of the tailings facility and a “4 Acre Pond” upgradient of this facility. The “4 Acre Pond” does not appear to be discussed elsewhere in the text and its function is not clear. Is this pond to capture stormwater from upgradient of the site for use at the site or for later discharge to maintain pre-development hydrology, or will this pond also be used for runoff from the site or other potentially impacted waters? The function of all impoundments is important to understand and should be clearly described, since this will significantly affect the design of those impoundments and potentially the volume of potential discharges to the treatment plant and disposal system, as well as the available storage volume for wastewater in the event of breakdown of the treatment plant or other possible causes of wastewater accumulation.

Note that the Figure “pickett\_design\_v2”, dated 20/08/28 and included in the recent submission, is not consistent with Exhibit D-2A-Rev1. The “pickett\_design\_v2” figure apparently identifies the “4 Acre Pond” as a runoff catchment pond, as suggested above, but also shows another stormwater management pond north of the tailings facility and identifies the subsurface wastewater disposal systems as “run-off

catchments,” as well. The proposed storage pond in the vicinity of the treatment plant is not shown in this figure.

The Mine Water Management and Treatment discussion in Section B(3)(d) of the Petition states that “process and seepage water...as well as precipitation landing outside of the tailings facility footprint are collected...and routed to the south eastern (down gradient) corner of the project site into a lined raw water pond.” From this description, this pond is apparently different from the Waste Water Storage unit shown in Exhibit D-2, which would appear to be for storage of only water from the area of the tailings facility, although this is not explicitly stated, so that this raw water pond does not appear to be shown on the site plan; at least the location and approximate footprint of this pond should be shown, although more detailed sizing information on this pond and the Waste Water Storage Pond will be required as part of the water budget and water management discussion in any application. From Exhibit D-2 and other parts of the site description, it appears that at least some of this water discharged to the raw water pond will have come in contact with Group A and Group B wastes. If all of this water is returned to the mill as makeup water, that may be acceptable, but both this pond and the structure receiving runoff from the tailing area must be sized with adequate storage to prevent discharge of such waters to the environment, particularly in the event of temporary shutdown of the mill, treatment plant, or one or more of the wastewater disposal systems. In particular, measures to prevent discharges of impacted water from these ponds must be included in any plan for suspension of mining. (Ch. 200, Subchapter 7).

#### **D. Text / Descriptions with Potential Inconsistencies**

Page 5 of the Petition states that the tailings management facility “is expected to be approximately 78.4 acres built in 5 sections sequentially over the life of the operation.”

Note also that this description of the tailings facility from page 5 of the Petition appears to be inconsistent with that on page 12, which states that a “series of three tailings cells will be constructed throughout the project life.”

#### **Appendix A - Hydrologic Water Budget – Overburden and Bedrock Groundwater Resources**

There is a discrepancy between values reported for the total tailings area open at a given time. In the footnotes to the Hydrologic Budget Table it states “Assumes 15 Acres of the Total Tailings Area open at a given time” while on the following page it states “Precipitation over much of this area (approximately 92 acres) will be managed to control run-off of non-contact waters, and water that potentially contact waste materials including waste rock and exposed tailings in the TMF (approximately 20 acres at any given time).

#### **Natural and Cultural Resources and Policies – Scenic Resources (page 36)**

This section states that “[t]he property will not be visible from anywhere along route 11 nor from any State Park or State managed trail” but then contradicts this statement on page 41 (Subdivision or Development Zoning Proposal) by stating that “[t]here may be windows of visibility to this portion of the site along SR 11.”

#### **Attachment A – Wetland Determination Data Form**

Under remarks it states: “Area has been forested and there is evidence of disturbance from this activity. Old skidder roads are present that appear to have been bulldozed as they have oil piles along the road

edges.” This maybe a typo, but the Department is not familiar with “oil piles.”

### **E. Surface Water Protection**

Overall, the Preliminary Site Plan (Exhibit D-2) shows that the proposed alterations would have little direct impact to surface waters, including streams, wetlands, and vernal pools. As presented in the application and during the site visit, the proposed rezoning would have few direct impacts to surface waters and required buffer zones of natural vegetation. As part of any permit application, the applicant would need to demonstrate that the mining operation would maintain water quality and healthy aquatic life communities of surface waters on the property and further downstream.

In Attachment M, the petitioner states that, if “monitoring identifies an adverse impact, mitigation plans would be developed and implemented in consultation with the DEP.” Note, however, that Chapter 200, § 22(B)(10), (12), and (14) require that this response plan be prepared and approved by the Department prior to the confirmation of any failure to meet applicable water quality standards. Consequently, any applicant would have to submit specific proposals to address any potential failure to meet applicable water quality standards in any potentially impacted waterbody as part of the permit application process.

Construction Standard c(v) (page 4-9 of the Wood soil report) refers to setbacks from watercourses in the Subsurface Wastewater Disposal Rules; note that different setbacks apply to major and minor watercourses, and that other setbacks may apply depending on the size of the disposal system and other features in the vicinity (see Table 7B of the subsurface wastewater disposal rules).

### **F. Tailings Management Facility (TMF)**

Note: Comments exist in other sections of this memorandum that refer to basic aspects of the TMF and associated monitoring. The Petition and supporting documents to date do not provide an engineering plan for the TMF, therefore, the Department cannot comment on the effectiveness or integrity of crucial aspects of the TMF that will be required, such as liners and caps.

Discussion questions have been raised about how dewatered tailings will be prevented from regaining moisture from precipitation prior to being capped. These and other important questions would have to be addressed in order to ensure that mine tailings would not be a source of leachate during operations or after the facility is closed. Tailings management would be reviewed in detail by the Department in any permitting process. Threshold questions related to the basic feasibility of the proposed tailings management, such as how dewatered tailings will be prevented from regaining moisture from precipitation, also would be addressed during any permitting process, but may be relevant to the Commission during the rezoning process, as well.

#### **Phase 4 – Reclamation/Remediation (page 13)**

The Gantt chart indicates three phases of tailings management facility construction. These phases are not well detailed in the Petition. The LUPC may find it helpful to better understand the phases with anticipated production volumes and how this conforms to the proposed plan that no more than 20 acres of tailings will be exposed at any given timeframe in the Hydrologic Water Budget portion of the rezoning application (Appendix A - Section B(3)(d) Potential Impacts to Existing Uses and Natural Resources). The total acreage of the TMF is 78 acres, which would require a minimum of 4 phases if not to exceed 20 acres of exposed tailings at any given time.

If additional resources are identified within the deposit, what plan for tailings management expansion has been considered?

### **G. Water Treatment (permitting)**

Water resources within the area of the requested rezoning are currently classified as described in 38 M.R.S. § 464, *Classification of Maine waters* and 38 M.R.S. § 470, *Classification of ground water*. Standards associated with each of these waterbodies can be found in 38 M.R.S. § 465, *Standards for classification of fresh surface waters*; 38 M.R.S. § 465-A, *Standards for classification of lakes and ponds*; and 38 M.R.S. § 465-C, *Standards of classification of ground water*.

Based on the Department's review of the limited information submitted by Wolfden to the Commission with regard to ambient water quality, relevant soil data, and wastewater treatment technology, wastewater discharge volumes, and other details, the Department expects that the proposed facility would discharge pollutants at levels requiring Wolfden to apply for and obtain a Waste Discharge License, and potentially a Maine Pollutant Discharge Elimination System Permit, (WDL/MEPDES) in accordance with 38 M.R.S. § 413, *Waste discharge licenses*. See also 38 M.R.S. §§ 420 and 451. The WDL/MEPDES process would require Wolfden to provide additional information to the Department that would allow the Department to determine applicable requirements to eliminate or reduce pollutants pursuant to state and federal laws and regulations.

At this time, the limited information provided by Wolfden to the Commission raises several concerns for the Department, which are summarized in the non-exhaustive list below.

- Wolfden proposes to discharge treated wastewater via four subsurface units. The Department does not currently know whether this discharge would comply with existing ambient groundwater conditions. To make such a determination, the Department would require additional information such as the current ambient groundwater lab analysis and lab analysis for similar facilities that attain the ambient levels of pollutants Wolfden believes it may attain. If there are other facilities that Wolfden can point to that similarly treat ground water, the Commission might find that information helpful in its review of the Petition.
- Effluent discharged to groundwater via the subsurface treatment units proposed by Wolfden may reach certain surface waters to which discharges are prohibited or limited. In that event, the Department may not be able to issue a WDL/MEPDES for such a discharge. See *County of Maui, Hawaii v. Hawaii Wildlife Fund*, 140 S. Ct. 1462 (2020); 38 M.R.S. §§ 464(4)(A)(1), 465(1)(C), 465(2)(C), 465-A. Presently, however, the Department cannot determine whether Wolfden's proposed plans would result in the functional equivalent of a direct discharge to certain surface waters and, if it did, whether the proposed discharge would be permissible. The Department would require additional subsurface investigations and information on a number of parameters, including soil type, depth to bedrock, and distance to nearest surface water body at each of the subsurface unit locations, to make such a determination.
- Additionally, should effluent discharged to groundwater via the proposed subsurface treatment units reach surface waters that must be characterized as natural, the Department may or may not be able to issue a permit for such a discharge depending on whether the discharge alters the flow or the habitat of the surface waters. See 38 M.R.S. §§ 465(1 & 2), 465-A. Again, the Department

cannot currently make such a determination and would require additional information to do so.

As noted, should Wolfden apply to the Department for a WDL/MEPDES, the licensing process would enable the Department to obtain the information it needs to determine which state and federal requirements apply to the proposed facility and to resolve issues such as those raised above. The Department has the authority and regulatory programs to address wastewater discharges from Wolfden's proposed facility, as well as the authority to deny a WDL/MEPDES for any facility that would have an unreasonable or undue adverse impact on their receiving waters pursuant to the federal Clean Water Act and Maine law.

#### **H. Water Treatment (proposal and site considerations)**

##### **Exhibit K – Wastewater Disposal**

Although much of the engineering and design work will come at a later date, more information could be provided regarding the wastewater disposal technology and potential for groundwater flow alterations. Based on anticipated volumes of produced water from mining, ore concentration, and impervious surfaces requiring stormwater management, a system can be hypothetically described to allow for conceptualization at this stage.

Drawing 428090-AM-01 is a flow chart showing the pathways for wastewater through the treatment train proposed for the site. Following reverse osmosis treatment, the discharge may go either to "Waste/Concrete" or to "Outfall," presumably the subsurface disposal system. Criteria for which pathway the water will take are not indicated in this chart or described in the accompanying text. Process water may be used in concrete for the purpose of neutralizing waste rock disposed in the subsurface, provided that it does not need additional chemical adjustment, but raw or treated wastewater cannot simply be discharged to the mine or elsewhere without specific approval.

Note the limitations on use of MetClear products on page 9 of the product description; although the composition of the wastewater is not known at present, the petitioner should be prepared to specifically address the applicability of these limitations should this process be chosen for use at the site.

The petitioner states in Exhibit K that the locations of the four proposed subsurface disposal fields for treated non-sanitary wastewater "will be determined based on field investigations conducted for the baseline characterization." However, several figures included with the application, such as Exhibit D-2, Preliminary Site Plan, show locations for the proposed disposal areas. Soils information demonstrating, at a minimum, the general suitability of soils in the proposed areas might be helpful to the LUPC in its review. Given the size of the proposed areas shown on these figures, logs of multiple explorations showing suitable soils are recommended at this stage; several deep explorations within each proposed disposal area, along with other subsurface information, will be required as part of any permitting process in order to permit any of these disposal areas. Similarly, no test pit logs are presented for the site of any possibly sanitary wastewater from the proposed facility. Inspection of the site indicates that suitable sites can be found in the area of the proposed structures, but no soils data are included in the Petition reviewed by the Department.

The Mineralized Rock Milling and Floatation Strategy discussion in Section B(3)(d) of the Petition states that "potential waste chemicals or spills are collected and pumped to the tailings facility." Although Department rules include provisions for management and disposal of Designated Chemical Materials at

the site (Ch. 200, § 2(HH)), any permit application would have to specifically describe the contaminated or potentially contaminated materials, possibly including spill cleanup material and other wastes generated during spill response, that will be disposed of in the tailings facility, to ensure that the management and treatment systems for drainage from that area are capable of meeting the required level of treatment for water impacted by such wastes.

## **I. Groundwater**

The Groundwater Hydrogeology discussion under Section B(3)(d) of the Petition discusses the likely permeability of the till soils at the site and possible travel times to surface water based on general literature values for till soils. Calculations of travel time, loading rate, potential mounding, and other significant elements for evaluating the likely performance and potential impacts of the wastewater disposal systems needed for a Chapter 200 permit application will require site-specific evaluation of the soils and overburden including, but not limited to, gradations, more detailed mapping (as noted in the Petition), assessment of the vertical and horizontal uniformity of these materials, and locations of points of possible groundwater discharge to the surface, if any, between the proposed disposal areas and wetland or surface water body. Similarly, a much more detailed water budget than that outlined in the Hydrologic Water Budget discussion of the Petition will be required as part of the baseline report. (See Ch. 200, § 9(C)(2) and (D)(11).) Any discussion of the location of groundwater divides and flow directions in the Petition (for example, that under Water Supplies and Mapped Aquifer Description in Section B(3)(d)) should be considered as only approximately correct at this time and requiring further refinement as part of the DEP baseline assessment process.

The petitioner should note Chapter 200, § 22(B)(1)(a)(i), which requires that compliance points for groundwater quality “are the downgradient boundaries of all mining operations as they exist at the time any sample is collected.” That is, the boundary of the mining area, for purposes of compliance with the groundwater contamination limitation defined in Ch. 200, § 2(BB), is the downgradient boundary or boundaries of those sections of the tailings management facility currently accepting or containing tailings or other Group A or Group B wastes as defined in Ch. 2, § 20(F), and not the downgradient boundary or boundaries of the remaining portion of the anticipated footprint (see also Ch. 200, § 2(KKK)). This should be reflected in any proposed monitoring plan that may be submitted to the Department, which also should include provisions for the phasing of monitoring well installation and abandonment, as also described in Ch. 200, § 22(B)(1)(a)(i).

According to Page 6 of the Petition, there will be an electrical substation on the property with an estimated area of 10,000 square feet. The petitioner should note that any oil-filled transformers or other storage of liquid petroleum or other materials presenting a potential risk to water quality in this substation or elsewhere on the site must be included in the facility contingency plan (Ch. 200, § 9(K)).

Note: The Department’s comments on the Mineralized Rock Milling and Flotation Strategy discussed above in the section on Water Treatment, relates to groundwater, as well, which is the topic of this section of the comment memo.

## **J. Soils**

Page 4-6 of the Wood soil report describes measures that can be used to improve soil conditions in areas proposed for subsurface wastewater disposal. Information submitted to date indicates that soil conditions

are generally appropriate at the test pit locations shown within the proposed disposal areas, but, given the large size of the proposed disposal beds, it will be necessary in any future permitting to demonstrate that generally comparable and suitable soil conditions exist within the entire footprint of any proposed field receiving water from the treatment plant. For a frame of reference, current Department guidance (see Site Location application Section 17(4)(d)) suggests that at least 2 passing test pits would be required within any areas of approximately 60' x 60'. This guidance, along with other information regarding soil explorations in Section 17 of the Site Location Application, reflect the approach the Department likely would apply when determining the minimum number of explorations required within any of the proposed wastewater disposal beds for the proposed facility. Additional soils information may be helpful to the Commission, as well, at the rezoning phase.

Page 4-7 of the Wood soil report states that "runoff from most of the development areas will discharge to a series of ...vegetated under drained soil filter fields." Runoff from many portions of the site is likely not suitable for discharge outside of the facility and may not be treated appropriately in such systems; such waters may need to be directed to the wastewater treatment plant, or to lined storage ponds for use at the site.

The materials submitted include a Soil Conditions Summary Table, Form E from the Site Location Application, but do not include graphic or other more descriptive and complete logs of the soil conditions observed. Complete logs of all explorations would be required by the Department when reviewing any permit application and could be helpful to the Commission, as well, to the extent soil suitability is being considered as part of the rezoning process.

#### **K. Blasting**

Page 26 of the Petition states that open-air blasting for construction of the portal "is only expected to last two or three weeks" and that, following construction of the portal, "sound from the underground blasting will no longer be heard at the property boundary." The petitioner should note that both surface and underground blasting are subject to all requirements of Chapter 200, § 20(K), although the potential adverse impacts of airblast and flyrock are obviously greatly reduced or eliminated with underground blasting. Underground blasting is exempted only from the limits on timing and number of blasts per day as described in Chapter 200, § 20(K)(5).

#### **L. Air Quality**

The air quality within the area of the requested rezoning is currently designated as attainment/unclassifiable for all national ambient air quality standards (NAAQS), meaning the existing levels of air contaminants for which NAAQS have been established are below the levels which would trigger air quality concerns. Based on the Department's review of the limited information submitted by Wolfden to the LUPC with regard to air emissions, the equipment, activities, and operations associated with the development and operation of a metallic mineral mining facility that may impact air quality include, but may not be limited to, construction equipment and activities, drilling and blasting operations, crushing and grinding equipment and operations, material handling, transport and storage, electricity generating equipment, and facility roadways. Regulated air pollutants expected to be emitted from such equipment and activities include particulate matter (PM), particulate matter less than 10 microns (PM<sub>10</sub>), particulate matter less than 2.5 microns (PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon

monoxide (CO), volatile organic compounds (VOC), and lead (Pb), as well as hazardous air pollutants (HAP).

Based on the limited information provided by Wolfden to the LUPC with regard to air emissions, the Department expects that the proposed facility would emit regulated air pollutants at levels requiring Wolfden to apply for and obtain an air emission license in accordance with *Major and Minor Air Emission License Regulations*, 06-096 C.M.R. ch. 115 (Chapter 115). Chapter 115 provides for different application and licensing procedures depending on whether the proposed facility would be a minor source or a major source of emissions. The Chapter 115 licensing process would require Wolfden to provide additional information to the Department that would allow the Department to determine applicable requirements to control air pollution pursuant to state and federal laws and regulations, including control technology, emission standards and limitations, ambient air quality standard compliance demonstration, monitoring, equipment and operational restrictions, and recordkeeping and reporting.

### **M. Closure / Reclamation**

Wolfden expects to be able to decommission its water management facility shortly after site closure, excavate it and dispose of “inert material (demolition debris)” underground. Demolition debris is not the same as inert material. If Wolfden has used 1 acre for onsite disposal of land clearing debris, another disposal area for demolition debris would not be exempt. Demolition debris will need to be taken to an appropriately licensed landfill for disposal. (Note: Pursuant to 38 M.R.S. § 490-NN(1)(A), Department Rules Ch. 13 (Waste Management Rules) do not apply to an application reviewed under Chapter 200. Those rules may serve as a basis for review and may inform conditions in any approval that may be granted.)

On page 21 and in similar language at several other locations in the Petition, the petitioner notes that the tailings management facility will be “revegetated and designed to allow regrowth of natural ground cover.” Certain types of natural vegetation, particularly deep-rooted woody vegetation, may not be suitable for growth on the cover system of a tailings facility and the site must be maintained to exclude such growth, which will result in some change when compared to existing views from some locations. The Forest Resources discussion under Appendix A, Section B(3)(d) of the Petition suggests that the petitioner is not considering tree growth on the tailings cover but has not yet identified the type of vegetative cover to be used. The apparent proposed topography of the tailings pile and cover suggests that it may be difficult to sustain one of the design options suggested in this section of the petition, described as a “wet cap...able to sustain a wetland like condition where large tree growth is naturally discouraged” at this site. In addition, the petitioner should note that Chapter 200, § 24(A)(3)(c)(iii) states, in relevant part: “Closed mine waste units must be graded and maintained to prevent ponding and to divert surface water drainage from covered wastes.” Therefore, the Petition reference to a “wet cap” design intended to discourage large tree growth (i.e., prevent root intrusion into the cap) likely would not be a permissible design under Chapter 200.

#### **Phase 4 – Reclamation/Remediation (page 13)**

Long term monitoring will be required following the proposed Gantt chart timeframe. It is recommended a new column be added to the chart indicating “12+ years” and should include LTM monitoring.

#### **Attachment Q – Description of Anticipated Site Conditions Following Closure**

It is highly likely following acid generating potential tests of mine waste that it will be classified as Group



January 28, 2021  
Memorandum to the LUPC

A Waste defined in Chapter 200. This designation will require a composite liner with a leachate collection and removal system as a base layer to the TMF. Maintenance of the TMF following closure will require periodic inspections of the dry stack and removal of leachate if it is found to be present. Once the water treatment systems have been removed, it is unclear how Wolfden will dispose of TMF leachate.