

## REVIEW MEMORANDUM

January 14, 2020  
Revised January 27, 2020

To: Beth Callahan, Project Manager, Bureau of Land Resources  
From: John Hopeck, Ph.D., Division of Environmental Assessment

Re: Nordic Aquafarms, Belfast

### 1) Monitoring Program

- a) The applicant states that automated data-logging equipment, including equipment with the capacity for in-situ conductivity measurement, will be installed “[w]here practical”, and that data will be compiled in an accessible electronic format. Prior to construction, the applicant must submit for review and approval a specific program identifying the instrumentation to be installed at specific locations by specific dates, and the proposed monitoring parameters and frequencies at each location. The applicant correctly notes that there will be a lengthy initial period of construction at the site, followed by a period of gradual buildout to full production. Some monitoring points may be in locations that could be damaged by construction, and so it might be acceptable to delay installation of these instruments until after grading and other major construction in the relevant area is nearly complete, however, any other monitoring point, and any monitoring location that could be protected during construction, should be established and used for collection of background data during this period. During this initial non-pumping period, collection of groundwater level and quality data should be no less often than monthly; drinking water wells and shallow groundwater wells are likely to show more rapid fluctuation in water level, and must therefore be measured more frequently. As previously noted, surface water levels may vary rapidly and so should be measured in near real-time to the extent practical. Shorter intervals between collection of groundwater level data will be necessary during the period ramping up to full production and for some period afterward, possibly as short as the 12 months suggested by the applicant, depending on the amount and rate of groundwater withdrawal, climatic factors, and the Department’s assessment of the data to that point. It may also be appropriate to reduce data collection and reporting frequency at some or all monitoring points if groundwater usage by the facility stabilizes at some level less than the anticipated full production volume, due to market demand, more efficient water usage, or other factors, provided that the Department determines that data collected to that point show no unreasonable adverse impacts, or threats of such impacts, on groundwater or surface water quality and quantity. Increases in usage beyond this lower rate and amount, however, would then require approval by the Department and would trigger return to the original monitoring program. Data must be submitted to the Department within fourteen days of its receipt by the applicant, unless the Department requires more frequent reporting if it observes evidence of possible adverse impacts or other factors. Data must be submitted electronically using the most recent format accepted by the Department (see <https://www.maine.gov/dep/maps-data/egad/#ed> for current requirements) and in hard copy.

- b) The applicant has agreed to install new overburden monitoring wells OVB-101, OVB-102, and OVB-103 as pairs of shallow and deep wells, with shallow wells screened in the silty overburden and deeper wells extending to and below the overburden/weathered rock transition. It is understood that groundwater elevations at the locations of the deeper wells may be below the elevation of bedrock – overburden interface during at least some of the year (in which case the bedrock aquifer monitoring locations may be sufficient to define the approximate water table elevation at the paired-well locations) and that it may be difficult to obtain water quality samples from the shallow wells screened in fine sediments. However, the Department considers that the primary purpose of these well pairs is to assess the effects of groundwater withdrawal from the bedrock aquifer, and consequent significant localized drawdown of water level in that aquifer, on water levels at the bedrock – overburden interface and in the overburden, that may be more relevant to supporting the smaller streams and wetlands in the area. Water quality data from these shallow wells will be valuable but not necessarily as significant as water levels, so that, if standard sampling protocols must be modified in some cases, the Department may find that such modifications are acceptable as long as they do not prevent accurate measurement of water levels at required times and intervals.
- c) The applicant proposes to install shallow and deep piezometers “in the vicinity of wetland W7”; as noted previously, these should be installed as close as possible to a wetland monitoring tract. Proposed piezometer locations and wetland monitoring tract locations should be shown in the revised plan to be submitted for review and approval. Shallow wells in particular could be subject to freezing, but pressure transducers should be used unless the applicant can demonstrate specific reasons that they cannot be used. Water levels in shallow piezometers could be expected to fluctuate relatively rapidly, as also noted above, so that monthly monitoring will not be sufficient to assess the range of normal conditions during the background monitoring phase, although quarterly data reporting should be acceptable during the background data collection phase. Automated data collection would allow frequent measurements sufficient to assess conditions before and during operation of the pumping well. If the rate of variation in the wetland piezometers is shown to be relatively slow during operation of the facility, the applicant may apply to reduce the measurement frequency.
- d) The relevant section of the Little River channel presents certain problems for collection of accurate flow data at some times of year and under certain flow conditions. However, instrumentation can be installed to obtain real-time and continuous data during most of the year at a measured cross section, particularly since the bedrock channel minimizes the risk of major changes in channel cross-section; as previously noted, an appropriate location for such measurement should be defined as part of the background monitoring plan. Use of surrogate watersheds is possible, but the applicant has presented no information demonstrating that the watershed of the Ducktrap River above the USGS gauging station is equivalent to or can be effectively scaled to that of the relevant watershed of the Little River. Annual flow statistics should not be used as bases for comparison or for setting performance standards, since these mask important seasonal and short-term variations. As also previously noted, monthly or even weekly stage measurements are not adequate to accurately assess pumping impacts on surface water systems, which are subject to rapid changes due to precipitation and other factors. Consider 2019 data from the Ducktrap River, on which the applicant proposes to measure

stage at monthly intervals. The lowest stage height for the year (1.14 feet, approximately 0.19 cfs) was measured on August 7<sup>th</sup>; data from August 8<sup>th</sup> show a stage height more than twice that value (3.35 feet, approximately 127 cfs), while data from the same time on the 9<sup>th</sup> indicate a stage height of 2.23 feet and a flow of 16.2 cfs. Monthly stage measurements are not adequate to capture the possible range of flow conditions in this system, although monthly download frequency may be acceptable during non-pumping periods, provided that data storage is sufficient to allow automated data collection at a frequency acceptable to the Department.

- e) The applicant has agreed to record intake data daily “on a source-specific basis”. Such usage prior to operational-level usage can be reported to the Department monthly, but more frequent reporting and possibly a more detailed breakdown to identify peak usage times could be required at some point if the Department finds such information useful in interpreting streamflow, stage, or groundwater elevation data.
- f) The applicant has agreed that any changes to the monitoring program, other than those necessary to address damage to a monitoring point or loss of access to a monitoring location due to decisions of a property owner not subject to this permit, must be approved by the Department. Any locations lost due to damage must be replaced as soon as possible and as closely as possible, in location and design, to the damaged point. The Department should be notified of the loss of such points as soon as possible, and may require installation of additional monitoring locations on accessible property to replace monitoring locations lost for either cause. Replacement of monitoring locations may require specific approval by the Department and modification of the permit.
- g) The applicant proposes to use an offsite weather station to obtain meteorological data for the site, stating that this station is located “approximately 3.1 miles to the north of the Site” and that “comparison of monthly statistical descriptors for the Belfast station and other nearby stations...does not suggest significant local variability.” However, no analysis of these data is presented to support this statement, the proposed station does not appear to be in the same watershed as the proposed development, and the applicant does not control the operation, data content, or data quality at this station. Assessment of local influences, many of which may be shorter-term than a month, is important to assess the short-term variations that may be observed, particularly in streamflow, at the site. Consequently, the applicant should establish an on-site station, or station at a location owned or controlled by the applicant, within the Little River watershed and near the areas potentially impacted by the development. Potential locations for this station should be proposed in the revised monitoring plan. Note that other large groundwater users are generally required to establish similar monitoring stations for measurement of conditions in the area affected by their operations; recharge patterns as this site will differ from those at many other large groundwater extraction sites due to the different nature of the overburden and other factors, however, data from within a suitable location within the area potentially affected are still preferable to those from outside the area, particularly in the absence of detailed comparisons and lack of control over these existing monitoring locations.
- h) The applicant has agreed that it is necessary to establish warning levels that are “indicative of conditions trending toward a potential adverse impact, as opposed to being confirmation of occurrence”, and that these levels must be defined by analysis of the baseline data and approved by the Department prior to operation. The applicant suggests

that language in the monitoring plan be interpreted to read that remedial actions may be required under “extreme” events; rather than use an undefined term such as “extreme”, the plan should establish specific quantifiable measures of adverse impact that would require one or more of the actions specified, based on statistical analysis of the background data. Since warning and action levels must be set conservatively, it is important that the background data set capture the range of pre-operational variation and extreme values as completely as possible. It is understood that, particularly with groundwater, this does not always require the largest possible data set, but, as indicated above, data must be collected with sufficient frequency to capture this information to the extent practical.

## 2) Blasting

- a) The applicant has agreed to apply Department standards for adverse effects of blasting and has clarified their understanding of the Department’s air overpressure standard regarding the number of blasts per day. Note, however, that the Department’s minimum air overpressure limit applies to four or more blasts per day, and does not limit the applicant to four blasts per day, although the applicant may voluntarily limit the number of blasts to no more than four per day.
- b) The applicant indicates that the Department standards for pre-blast surveys will be applied. (Note that there is a minor typographical error in the copy of the review memo text provided by the applicant and in the applicant’s response; the correct reference is to 38 MRS §490-Z(14), rather than 38 MRS §490-2(14).) Use of the 2000-foot pre-blast survey radius is likely to include both dams and associated structures in the pre-blast survey area. The record indicates that the Maine Emergency Management Agency, among others, has raised questions, although not necessarily related to the proposed development, regarding the structural integrity of the dams. Consequently, the applicant should confer with the Maine Emergency Management Agency prior to the pre-blast survey of the dams, to identify particular concerns of that agency, if any, which must be addressed in the pre-blast surveys. If any such issues are identified, MEMA staff should review the completed surveys to determine that those issues have been addressed properly, and the applicant should follow any recommendations of MEMA staff regarding blast monitoring or related issues at the dams.

## 3) Geotechnical Survey

- a) The applicant states that boring B303 was not performed.
- b) The applicant states that “no additional design parameters have been provided to the geotechnical engineer...nor have any additional geotechnical evaluations been conducted.” Consequently, the applicant must submit for review and approval prior to construction a final geotechnical report, once the “structural loads, tolerable settlement amounts, and grading and drainage plans” have been finalized.

## 4) Groundwater

- a) The applicant has agreed to submit for review and approval prior to construction a site-specific construction Spill Prevention, Control, and Countermeasures Plan, and, prior to operation, a site-specific Spill Prevention, Control, and Countermeasures Plan for operation of the facility.

- b) The applicant indicates that the “environmental due diligence” and “environmental tests” performed on the property identified areas of the site in which PAHs “exceeded MEDEP standards for commercial workers.” If the applicant has not already done so, copies of the relevant reports should be provided to the Bureau of Remediation and Waste Management for their assessment as to whether additional action is required prior to development of other use of the area in which this contamination was found.

## 5) Water Supply

- a) As indicated previously, there are reasons to believe that the model submitted underestimates the potential for loss of surface water to the fractured bedrock aquifer; the applicant has not explicitly addressed this in the response, and, while the submitted water budget may be internally consistent increased leakage from the Little River may change elements of that budget. However, the Department considers that, in general, the residence time of water in the reach of the Little River between the two reservoirs, which is also the reach in the which the effects of greatest drawdown in the bedrock aquifer will occur and which is largely exposed bedrock, will be small, and so the increased leakage could be a relatively small portion of the flow under most conditions. The Department considers the existing model to be sufficient proof-of-concept with regard to the possible volume of water to be obtained, but notes, as described above, that the monitoring program must be implemented to assess impacts on existing wells, including possible effects of salt-water intrusion and lower water levels, and reduced groundwater discharge to wetlands and surface waters; effects of groundwater withdrawal on these latter resources are expected to relate largely to the extent to which they receive discharge from the weathered bedrock or deeper bedrock aquifer, and the effectiveness of the marine sediments at separating flow in the surficial aquifer from that in the bedrock aquifers. In any event, this plan must be finalized as soon as possible so that sufficient background data can be collected to adequately characterize pre-operational conditions; the Department notes that significant amounts of information, as outlined in this memo, must still be submitted for review and approval before the plan to collect this information can be considered complete.
- b) The applicant states that the utility “currently monitors both water quantity and water quality in the Goose River aquifer” and that “additional information regarding flows and flow measurements locations” will be provided to the Department “prior to initiation of the project.” However, the previous memorandum requested this information, along with a determination of minimum flows required in the Goose River to maintain flows consistent with Department requirements. This information has not been provided. Such information is necessary to define the operational monitoring standards for the proposed development, and must be submitted for review and approval sufficiently far in advance of the operational phase of the development for adequate background data to be obtained and for effective performance standards and warning and action levels to be determined. The Department cannot determine, without the requested information, whether the existing data can be used toward these goals or whether alternate monitoring locations and methods will need to be established for adequate baseline and operational monitoring. The applicant should anticipate, however, that the monitoring program and other requirements will be similar to those that will be required for the Little River, as described above and in the previous memorandum.

