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April 10, 2023

Lake Auburn Watershed Protection Commission  
c/o Camille Parish, Chair  
268 Court Street  
Auburn, Maine 04212  
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**Re: New Development in the Lake Auburn Watershed after L.D. 2003, a New  
Maine Law**

Members of the Lake Auburn Watershed Protection Commission,

The City of Lewiston writes to address a serious issue that could significantly increase development throughout the Lake Auburn Watershed, specifically, the passage of a new state law which significantly constrains municipal regulation of housing — one which has not been expressly considered in the environmental reports prepared to date.

The Lake Auburn Watershed Protection Commission recently recommended that the Trustees of the Auburn Water District develop rules and policies within the Watershed of Lake Auburn to implement 13 specific recommendations, based on the LAWPC's review of two recent reports by FB Environmental<sup>1</sup> and two peer reviews. Problematically, none of the reports discuss LD 2003, a new state law that will critically affect land use in the Lake Auburn Watershed. FB Environmental has specifically noted the effect of nutrient loading on Lake Auburn water quality but, to date, has not considered or at least discussed the impact of LD 2003.

**Analysis of FB Environmental Associates**

In its October 2021 report, FB Environmental Associates found that Lake Auburn “cannot handle much more additional nutrient load [e.g., phosphorous] without diminishing water quality and its associated benefits, . . . [and that] any additional development in Auburn has an

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<sup>1</sup> FB Environmental authored three additional memoranda in December 2022, which are enclosed.

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outsized negative impact since its drainage area goes directly to the lake.”<sup>2</sup> It found that “a key constraint to development is the onsite septic system requirements in the Lake Auburn Watershed Overlay District Ordinance, which have been interpreted as a de facto prohibition of the installation of septic systems on sites with certain geologic and soil conditions.”<sup>3</sup> “When combined with other zoning lot sizes and allowable use restrictions, the regulations have the effect of limiting new residential development in much of the watershed.”<sup>4</sup> However, FB Environmental recommended removing the “key constraint to development” by revising the Auburn septic design standard in such a way that will allow previously non-buildable sites to become buildable.

FB Environmental acknowledged the “contradiction between 1) the recommended ordinance revision . . . that the septic design standard should be revised in such a way that will allow previously non-buildable sites to become buildable and 2) the conclusion from the environmental analysis that Lake Auburn will arrive at a tipping point of declining water quality by 2100 even in the absence of any pro-development changes (i.e., the “Business As Usual” scenario).”<sup>5</sup> Finally, FB Environmental recommended that Auburn counteract the additional development by changing other ordinances.<sup>6</sup>

Since then, FB Environmental issued a Technical Memorandum to review ordinances proposed by the City of Auburn in May 2022.<sup>7</sup> On October 17, 2022, Comprehensive Environmental Incorporated (CEI) published a peer review of the estimated phosphorus loads to the lake under various buildout scenarios that FB Environmental considered. CEI agreed with FB Environmental that no net environmental, economic, or social benefit supports the expansion of development in the Lake Auburn Watershed, and that more development cannot be allowed in the Auburn portion of the Watershed.<sup>8</sup> Among other things, CEI recommended maintaining

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<sup>2</sup> FB Environmental Associates *et al.*, *A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine*, 59 (revised October 2021).

<sup>3</sup> *Id.* at 7.

<sup>4</sup> *Id.*

<sup>5</sup> *Id.* at 59 - 60.

<sup>6</sup> *Id.* at 58.

<sup>7</sup> FB Environmental Associates, *Technical Memorandum on Modeling 2022 Proposed Ordinance Change* (August 1, 2022).

<sup>8</sup> Comprehensive Environmental Inc., *Peer Review of FB Environmental Associates A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine dated October 2021 and*

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the current septic system ordinance and made three additional recommendations.<sup>9</sup> On December 20, 2022, FB Environmental responded to the CEI peer review.<sup>10</sup> FB Environmental continued to support its October 2021 recommendation to update the septic ordinance.<sup>11</sup> However, FB Environmental did recommend three additional ordinances to protect Lake Auburn water quality that it had not recommended in October 2021.

### **L.D. 2003**

After FB Environmental completed its October 2021 report, the State Legislature passed LD 2003 to increase availability and affordability of all types of housing in all parts of the State.<sup>12</sup> LD 2003 contains two new sections of state law that prevent municipalities from constraining housing development. The most critical new provision requires that a municipality “shall allow” an accessory dwelling unit on any lot with a single-family dwelling unit.<sup>13</sup> By its terms, the new accessory dwelling unit statute applies to lots located in watersheds of water sources that have a waiver from the filtration requirements, and states that an accessory dwelling unit shall be exempted from any density requirements or calculations related to the area in which the accessory dwelling unit is constructed.<sup>14</sup> The second new provision requires up to three dwelling units on a lot that is zoned for housing, though under this statute the municipality has some ability to establish density standards for dwelling units.<sup>15</sup>

### **Risk to the Waivers from Filtration Requirements**

According to FB Environmental, the existing onsite septic system requirements constrain development in the Lake Auburn Watershed Overlay District. In October 2021, FB Environmental suggested that Auburn remove that constraint and adopt new ordinances to limit future development. After FB Environmental made this recommendation, however, the

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*the supplemental Lake Auburn Model Technical Memorandum dated August 1, 2022 at 1 (October 17, 2022) [the CEI 2022 Report].*

<sup>9</sup> *Id.* at 2-3.

<sup>10</sup> FB Environmental Associates, *Response to CEI Peer Review of October 2021 Lake Auburn Study by FB Environmental Associates, Horsley Witten Group, and the University of Maine*, (December 20, 2022).

<sup>11</sup> *Id.* at 4.

<sup>12</sup> P.L. 2021, ch. 672, (L.D. 2003).

<sup>13</sup> 30-A M.R.S. § 4364-B.

<sup>14</sup> *Id.*

<sup>15</sup> *Id.* § 4364-A.

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Legislature removed a municipality's ability to limit development in areas where housing is allowed. The effect is that Auburn may not have the power to limit future development as FB Environmental suggests.

The portion of the Watershed located in the City of Auburn currently contains 419 dwellings.<sup>16</sup> The changes proposed by FB Environmental could result in the construction of an additional 85 to 390 dwellings, depending on which FB Environmental report is followed.<sup>17</sup> These increases do not include any account of the effects of LD 2003. Critically, if the City of Auburn were to adopt the changes to the septic design standards proposed by FB Environmental, there could be an additional 500 to 800 accessory dwelling units in the Watershed plus additional dwelling units pursuant to 30-A M.R.S. § 4364-A.

The Lake Auburn Watershed Protection Commission should initiate a CEI review of the effects of LD 2003 on future development in the Lake Auburn Watershed, if the City of Auburn were to adopt the changes to the septic design standards proposed by FB Environmental.

Very truly yours,  
BRANN & ISAACSON



Michael Carey

Enclosures are available at:

<https://brannlaw.sharefile.com/d-s64df85b73873493fa490c41ce2d30846>

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<sup>16</sup> CEI 2022 Report at 13 (Table 1) to 15 (Table 3).

<sup>17</sup> *Id.*

## Index of Relevant Documents (Partial)

The following documents are available at:

<https://brannlaw.sharefile.com/d-s64df85b73873493fa490c41ce2d30846>

1. Comprehensive Environmental Incorporated, *Lake Auburn Watershed Septic System Analysis*, October 29, 2009.
2. FB Environmental Associates, et. al., “A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine,” updated October 2021.
3. FB Environmental Associates, *Technical Memorandum on Modeling 2022 Proposed Ordinance Change*, August 1, 2022.
4. Comprehensive Environmental Inc., *Peer Review of FB Environmental Associates A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine dated October 2021 and the supplemental Lake Auburn Model Technical Memorandum dated August 1, 2022* at 1 (October 17, 2022).
5. Comprehensive Environmental Inc., *Peer Review of FB Environmental Associates – Background Information*, (October 17, 2022).
6. v Comprehensive Environmental Inc., *CEI Evaluations of AWD Questions 8/8/2022 Memo & City of Auburn Responses 8/18/22 email* (October 17, 2022).
7. FB Environmental Associates, *Revised Lake Auburn Watershed Delineation – Response to Peer Review*, December 14, 2022.
8. FB Environmental Associates, *Revised Lake Auburn Watershed Delineation – New Topographic Data Review*, December 14, 2022.
9. FB Environmental Associates, *Response to CEI Peer Review of October 2021 Lake Auburn Study by FB Environmental Associates, Horsley Witten Group, and the University of Maine*, December 20, 2022.
10. P.L. 2021, ch. 672, (L.D. 2003).



# MEMORANDUM

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**To:** Norm Lamie, P.E., Lake Auburn Watershed  
Protection Commission

**From:** Rebecca Balke

**Subject:** Lake Auburn Watershed Septic System Analysis

**Job No.** 222-2

**Date:** October 29, 2009

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The purpose of this memorandum is to present CEI's findings on whether the Lake Auburn Overlay District ordinance should be modified in regards to its septic system design criteria. The existing criteria are more stringent than the State's criteria because of the lake's status as the unfiltered water supply for the cities of Auburn and Lewiston. Also, the geology of the Lake Auburn watershed is characterized by coarse soils and some gravel, unlike the lodgement (basal) tills (characterized by dense and generally shallow restrictive layers with perched seasonal groundwater tables) found in much of Maine. Are the existing criteria adequate or should they be made more or less stringent considering this precious and sensitive source of drinking water? This memo report describes a logical approach to dissecting the issue so that an informed decision can be made.

## LAWPC's Approach to Source Water Protection

To better understand why the Lake Auburn Watershed Protection Commission (LAWPC) has more stringent requirements than the State, it is important to recognize the significance of source water and watershed protection. The delivery of safe drinking water is the primary goal of the Lake Auburn Watershed Protection Commission (LAWPC), a commission formed to ensure that Lake Auburn remains as the source of drinking water for the cities of Auburn and Lewiston. To maintain this goal, the LAWPC follows the "Multiple Barrier Approach to Public Health Protection" (see Attachment A), which was initiated with the 1996 Safe Drinking Water Act Amendment, through the creation of a coordinated set of programs and requirements to help water systems maintain a safe supply of drinking water. These programs and requirements form a Multiple Barrier Approach that looks at all the components of a drinking water system and identifies safeguards or barriers needed to provide safe drinking water from the source to the consumer at the tap. This approach focuses on four key barriers:

1. Risk Prevention – Risk prevention focuses on implementing source water protection strategies to prevent contaminants from reaching the source. Protecting the water source is almost always more cost-effective than removing or inactivating contamination that has reached the source through treatment. Watershed management and protection is the primary mechanism for implementing risk prevention.
2. Risk Management – Risk management focuses on providing adequate treatment and system operations to remove any contamination that is present in the source water.
3. Monitoring and Compliance – Monitoring and compliance focuses on testing to detect and fix problems in the source and/or distribution system as early as possible.



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4. Individual Action – Individual action focuses on consumer awareness and participation, both about the condition and quality of the source water and of violations that pose health risks.

The Lake Auburn Overlay District Ordinance (LAO) and septic requirements are one of the “Risk Prevention” barriers placed by the LAWPC and Cities to prevent contaminants from reaching Lake Auburn and were one of the factors considered in granting the Cities a filtration waiver. It is not in the LAWPC’s best interests to try and lessen restrictions or embrace alternative technology that will break down these barriers.

## Background

The Lake Auburn Watershed Overlay District ordinance has requirements for private subsurface sewage disposal systems that are more stringent than the State of Maine’s requirements. The largest difference between the State requirements and the Lake Auburn Watershed Overlay District ordinance requirements are the vertical separation requirements between the bottom of the disposal field and restricting layer (e.g., seasonal high groundwater) and the requirements for suitable soil. The State of Maine allows a vertical separation of 12” to 18” on some soils, whereas the Lake Auburn Watershed Overlay District ordinance requires 24” separation in all cases. The State only requires 9” (proposed) of suitable soil be present on the site, whereas the Lake Auburn Watershed Overlay District ordinance requires 36” of suitable soil. Refer to Figure 1 for a comparison of depth, vertical separation and suitable soil requirements between the Lake Auburn Watershed Overlay District ordinance and the State of Maine requirements. Figure 2 provides a comparison of setback and suitable soil requirements between the Lake Auburn Watershed Overlay District ordinance and the State of Maine. Suitable soil refers to natural, undisturbed site soils (no fill) present on the site below the organic horizon.

Under the State’s requirements, a mounded septic system can be built to meet the required vertical separation for the specific on-site soils as long as the minimum suitable soil criteria is met. For example, based on soil testing, a site is required to have a 24” separation to seasonal high groundwater, but there is only 9” of natural soil to seasonal high groundwater. The owner may bring in 15” of acceptable fill material to create the required 24” vertical separation distance. In doing so, a mounded septic system is created. The primary reason that Maine allows this is the clay soils that are predominant in much of the state.

Under the Lake Auburn Watershed Overlay District ordinance requirements, the bottom of the absorption area must be a minimum of 12” below the bottom of the organic horizon with a minimum of 36” of suitable soil beneath the organic horizon. These requirements do not allow for the construction of mounded systems.

## How Does a Mound System Differ from a Conventional Subsurface System?

Conventional subsurface septic systems generally consist of a septic tank and a subsurface leach field or absorption area. Wastewater from the house enters the septic tank where it receives preliminary treatment to remove large particles. From there, it is typically gravity fed into a subsurface absorption field where it filters through existing soils, preferably 24-48” of soil (U.S. EPA, 1980) before reaching high groundwater, to complete the treatment process. The soil filters out smaller particles, removing some chemicals and nutrients and acts as a site for pathogens to be inactivated. These are simple systems that work well.



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Mounded systems differ from conventional subsurface systems in that the absorption field is built at or above grade level to overcome site restrictions such as high water table or bad soils such as those with too much clay content. To overcome this elevation difference, homes may be built upslope of the mounded system or a dosing chamber is used to pump wastewater flows to the mounded absorption area. Thus, a mounded system often has three principle components: 1) a pretreatment unit (septic tank); 2) a dosing chamber (a second tank that is fed by the septic tank and which contains a pump to pump the wastewater into the mound); and 3) the elevated mound (absorption field).

The dosing chamber contains a pump, pump control floats and a high-water alarm float. The pump control floats activate the pump at high water levels, pumping it into the mounded absorption field and shut the pump off at low water levels. If equipped, the alarm is triggered if the effluent rises above the float level that activates the pump.

The mound is a raised drainfield consisting of a sand fill material containing a network of small diameter pipes to distribute the effluent. Effluent is pumped to the distribution system. Thus, the mound acts as a pressure-dosed sand filter to treat the effluent. The pressurized system distributes effluent evenly throughout the mound, where it trickles through the sand layer providing filtration of large particles and destroying some pathogens. The suitable naturally occurring soil beneath the constructed mound completes the treatment process, filtering smaller particles, removing some chemicals and nutrients, and acts as a site for pathogens to be inactivated. The table on the following page compares the advantages and disadvantages of mounded systems.

The bottom line is that mounded systems may be able to perform as well as conventional subsurface systems if designed, installed and maintained properly with adequate natural soils beneath the constructed fill, typically between 12 and 48 inches (U.S. EPA, 1999). However, because mounded systems are designed to be installed in otherwise unsuitable soils (e.g., high groundwater, low permeability), there is increased wastewater reaching groundwater and ultimately the surface water supply due to the increased number of septic systems that would otherwise not be allowed. Pollutants such as viruses and nitrates that are soluble can and will reach the lake in much larger quantities due to the increased number of systems, and depending on their proximity to the Lake, increased phosphorus loads can also occur. Since lake watershed management focuses on the limiting nutrient phosphorus, the quantification and significance of other pollutants tends to get lost. Nitrates are still a nutrient source for algal growth and increases could lead to increased algal blooms. Viruses can cause illness and are difficult and expensive to treat. Preventing these contaminants from reaching the lake is key to maintaining good raw water quality.





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Advantages and Disadvantages to Mound Systems (Hygnstrom, revised 2008)	
Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Can be used on land that is unsuitable for a conventional subsurface septic tank/drainfield system</li><li>• Uses the top layer of naturally occurring soil, which is typically the most permeable and biologically active for treatment</li><li>• Construction damage is minimized since minimal excavation is required</li><li>• Can be used in most climates</li></ul>	<ul style="list-style-type: none"><li>• Higher design and construction costs</li><li>• Quality of construction materials is extremely important to the success or failure of the system</li><li>• Requires a more highly skilled installer – installers must be careful not to damage the limited permeable topsoil and organic zone</li><li>• Lateral transport of contaminants may be more likely with high rain events since there is the potential for greater layering and compaction</li><li>• The mound may have to be partially rebuilt if seepage occurs</li><li>• Many systems require a pump instead of gravity to move wastewater through the system. The system will not work if there is no power.</li><li>• High water use can overload the mounds, resulting in breakouts, repair and sometimes replacement</li><li>• Increased maintenance – annual inspection of pump and mound to ensure proper operation</li></ul>

## Vertical Separation

There are two considerations regarding separation from the seasonal high water table. One is the amount of natural soil available to remove pollutants and the second is the total vertical separation distance, including fill, between the bottom of the adsorption field and seasonal high groundwater (used for designing mounded systems).

Table 1 provides a comparison of state regulations for several New England States, including requirements for vertical separation to the seasonal high water table, the method required to define the seasonal high water table, the required suitable or naturally occurring soils (required as part of the vertical separation distance) and the soil percolation requirements for siting a septic system.



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**Table 1. Comparison of State Regulations**

	<b>Final Vertical Separation to SHWT from bottom of Disposal Field</b>	<b>Method of Identifying SHWT</b>	<b>Naturally Occurring Ground Surface (Site Suitability)</b>	<b>Percolation Rates</b>
<b>Maine</b>	12-24" depending on soil profile and design class	Soil mottling – presence of 2% low chroma mottles	<ul style="list-style-type: none"> <li>9" outside shoreland zone area (proposed)</li> <li>15" within Variances to 9" for all (proposed)</li> </ul>	Use site soil evaluation
<b>New Hampshire</b>	48" unless approved alternative system with lesser separation – allow 30" separation with Presby system	Soil mottling – 2% or more distinct or prominent redoximorphic features that increase in % with depth	<ul style="list-style-type: none"> <li>15" above SHWT</li> <li>18" above bedrock</li> </ul>	2 to 60 min/inch
<b>Massachusetts</b>	<ul style="list-style-type: none"> <li>48" with &gt;2min/inch</li> <li>60" with &lt;2min/inch (Include GW mounding for &gt;2000 gpd)</li> </ul>	Soil color using Munsell supplemented by observation during annual high water table, USGS correlations		2 to 60 min/inch
<b>Vermont</b>	<ul style="list-style-type: none"> <li>36" Septic tank effluent system</li> <li>24" Filtrate effluent</li> <li>24" and 18" to induced GW mound – Filtrate &gt;4.5gpd/lf &amp; performance based</li> <li>36" to induced GW – Mound systems &gt;1000 gpd &amp; in-ground/at grade systems &gt;2000 gpd</li> </ul>	Soil mottling or GW level monitoring	<ul style="list-style-type: none"> <li>24" at &lt;120 min/inch - Prescriptive</li> <li>18" at &lt;120 min/inch – Enhanced Prescriptive</li> <li>Induced GW Level plus 6" – Performance Based</li> </ul>	4 – 60 min/inch – Absorption trenches/beds – (soil modifications allowed for perc rates faster than 1 min/inch)
<b>Connecticut</b>	<ul style="list-style-type: none"> <li>48" over ledge (24" must be natural)</li> <li>18" over impervious soil or SHWT</li> <li>96" over ledge and 24" over SHWT – when perc faster than &lt;1 min/inch</li> </ul>	Site testing or monitoring (5 consecutive weekly readings in most restrictive 30-day wet season)		1 – 60 min/inch when GW is min 18" below test hole
<b>Rhode Island</b>	<ul style="list-style-type: none"> <li>36" over SHWT</li> <li>48" over SHWT for certain soil categories within specified critical resource areas and drinking water watersheds</li> <li>60" over bedrock</li> </ul>	Hydromorphic soil features – redox depletions & concentrations occupy 2% or more, vary 2 or more units in chroma or presence of depleted horizon	<ul style="list-style-type: none"> <li>24" over SHWT</li> <li>18" if using bottomless sand filter</li> <li>48" over bedrock</li> </ul> <p>Within Specified Critical Resource Areas</p> <ul style="list-style-type: none"> <li>60" over SHWT</li> <li>84" over bedrock</li> </ul>	For sites without soil evaluation (data prior to new rules), perc rates were used. >40 min/inch unsuitable <10 min/inch unsuitable



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Based on this review of six states, Maine has the least stringent vertical separation and suitable soil requirements, requiring only 12-24" vertical separation and 9 to 15" suitable soil, whereas the other states require 36-60" vertical separation with a minimum of 15" or more of suitable soil. Discussions with the Maine Subsurface Wastewater Program reveal that most Maine systems are built at or above the ground surface with the required 12-24" separation and that a 4-5 foot separation from seasonal high groundwater using the State standards for identifying the seasonal high water table (2% low chroma mottles) would result in a finished grade 6-8 feet above the existing ground. This indicates that the Maine standards are also based on development/growth considerations to work with restrictive layers common throughout Maine.

## **Pollutant Removal**

Phosphorus is an element that can turn pristine lakes like Lake Auburn from clear to green, weedy and polluted in a relatively short period of time. Too much phosphorus promotes algal blooms that cause hard to remove taste and odor problems in drinking water. Lake Auburn is even more sensitive to increased phosphorus because it is an unfiltered water supply and must meet stringent turbidity and bacteria criteria that would be encouraged by even minor increases in phosphorus loading from the watershed.

Regarding the removal of phosphorus, near surface soils have more phosphorus removal capabilities than deeper soil horizons. With phosphorus, soil surface area is very important. More soil weathering has occurred closer to soil surface and therefore more surface area is present and more soil coatings of iron, aluminum, manganese, and calcium which react with phosphorus and pull it out of solution. Keeping wastewater application as shallow as possible also helps with phosphorus and nitrogen uptake by plants (grasses are best). While it does not provide long-term removal, it does create long-term recycling of these nutrients so they stay in the near surface soil ecosystem where there is lots of competition for nutrients. These near surface soil zones are also highly biochemically reactive, so they can promote degradation of wastewater microbes, protecting water supplies (George Loomis, personal communication).<sup>1</sup>

Pollutant removal should be the key consideration for setting a vertical separation distance. EPA recommends 24-48 inches for adequate pollutant removal (U.S. EPA, 1980). The greater the depth, the better the removal. Greater vertical separation is especially important in highly permeable soils, where wastewater flows quickly through the soil media, resulting in less effective treatment. The following discusses vertical separation as it pertains to specific pollutants.

## **Nitrogen**

In most aerobic soils, nitrates move quickly and readily into groundwater without reduction. Dilution is often the only form of reduction. Several studies indicated that nitrification occurred within mounds and subsequent denitrification (reduction of nitrates) occurred at the mound-soil interface. However, the amount of denitrification decreased with time as the carbon within the soil surface was exhausted. Other alternative systems have shown a reduction in nitrogen concentration. (Stolt and Reneau, 1991).

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<sup>1</sup> George Loomis, Program Director, New England Onsite Wastewater Training Program Cooperative Extension at URI, Email Communication 4/21/2009.



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## **Phosphorus**

Phosphorus (P) readily adsorbs to soils containing reactive iron (Fe), aluminum (Al) and calcium (Ca). The primary processes in phosphorus attenuation are adsorption and precipitation with adsorption acting as the primary removal mechanism followed by the slower precipitation reaction. Phosphorus is more likely to reach groundwater with high water tables, coarse textured soils, increased flow rates, high loading rates, soils with low phosphorus adsorption capacity or when phosphorus capacity is met. Studies have suggested a minimum 60 cm (2 foot) separation distance for adequate phosphorus removal. In time, the adsorbing capacity of the filter media will eventually be filled and the degree in which phosphorus is attenuated will be reduced. (Stolt and Reneau, 1991).

The *Scope Newsletter* compiled a review of a number of papers covering nutrient contamination from septic tanks and other decentralized sewage treatment systems. Overall, phosphorus contamination from septic tanks appeared to be limited, due to retainage in septic tanks and soils. However, some studies did find long-term migration of phosphorus in the groundwater zone over long periods of use, with phosphorus above background levels detected up to 75 meters (~250 feet) away from the septic system. This was more apparent in sand substrates. (Scope Newsletter Number 63, January 2006).

## **Bacteria**

The primary process for bacteria attenuation in soil is adsorption and filtration. Movement of bacteria through well drained, fine and medium textured soils is minimal; however numerous studies show significant movement of bacteria in soils with coarse textures, considerable structure, or high water tables. (Stolt and Reneau, 1991).

A compilation of research prepared by Selden Hall indicated that substantial bacterial and viral removal occur within the first foot of unsaturated soil, and removal is nearly complete within 60 to 120 centimeters (24 to 48 inches) beneath the adsorption field (Hall, 1990), depending on soil conditions, with sandier soils requiring the greater depths. This is consistent with the U.S. EPA's findings and recommendations.

## **Viruses**

Viruses are very small microbes, smaller than any bacteria. Due to their small size, filtration by soils is minimal and adsorption is the primary process for removal. Viruses move more rapidly in coarse textured soils. Several studies indicated that survival rates, and degree of movement were greater for viruses than those of fecal bacteria. U.S. EPA identified research showing significant (e.g., 3-log) removal of viruses in 60 to 90 cm (24 to 36 inches) of sandy media (U.S.EPA, 2002).

Based on the compiled research, a vertical separation of between 24 and 48 inches is recommended for adequate pollutant removal. The Town of York, ME requires a minimum of 24 inches of original soil present between the bottom of the subsurface disposal area and the most limiting factor (Town of York, ME Zoning Ordinance. 2008).



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## Emerging Contaminants

Concerns over the fate and transport of other less studied contaminants, such as endocrine disruptors and pharmaceutical and personal care products (PPCPs), have recently been raised. The endocrine system, also referred to as hormone system, regulates biological processes in the body, including brain and nervous system development, reproductive systems, metabolism and blood sugar levels. Endocrine disruptors are compounds that cause adverse effects to this system in wildlife and humans and include man-made substances including synthetically-produced hormones (pharmaceuticals) and chemicals for industrial use (e.g., cleaning agents, pesticides, plastics).

Endocrine disruptors and PPCPs typically find their way into source waters by sewage outflows (American Water Works Association. Retrieved September 14, 2009). USGS has performed multiple investigations throughout the country on the presence of endocrine disruptors in surface waters and their effects on fish. Many examples of endocrine disruption in the environment have been observed and USGS is continuing to study its prevalence (USGS. Retrieved September 14, 2009).

As an emerging contaminant, there is still a great deal of ongoing research on the health effects and prevalence of endocrine disruptors. However, existing research on the removal of other wastewater contaminants, as outlined above, shows us that greater vertical separation between leaching beds and restrictive layers results in greater pollutant removal. This same logic is expected to apply to these emerging contaminants and less stringent criteria are not likely to provide adequate treatment.

## Should the LAO Requirements be Modified?

No. There are several reasons why. First, it is important to note that water quality impacts associated with changes to septic system design criteria must include all net impacts, not those just associated directly with the septic system. For example, if the use of mounded systems allowed for more development to occur, then there would be an additional pollutant loading associated with that development, both from the additional septic load and through stormwater runoff. Thus, it is the net loadings over existing conditions that requires attention.

As noted earlier, the biggest differences between the State requirements and the Lake Auburn Watershed Overlay District ordinance requirements are that the Lake Auburn Watershed Overlay District ordinance requires 1) a greater vertical separation distance (in some cases); 2) a greater depth of suitable soil; and 3) the absorption field to be located completely below the surface (no mounding).

The use of less stringent criteria, such as those allowed by the State of Maine, in the Lake Auburn watershed would allow for more development in the watershed, as parcels that can't meet the Lake Auburn Watershed Overlay District ordinance criteria for a septic system would be able to meet more lenient requirements. In fact there is little to be gained from less stringent criteria yet potential risks that are untenable. New contaminants like viruses, endocrine disruptors and others are likely to result in more treatment in the future, not less, and although it is too early to predict what will be needed in terms of greater treatment, it is much more likely to be called for in the future. High quality drinking water sources such as Lake Auburn are particularly worthy of even greater protection.



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The potential associated impacts would include: 1) increased pollutant loadings from septic systems, particularly nitrogen which is extremely soluble and difficult to remove (nitrates); and 2) increased pollutant loadings from increased stormwater runoff associated with the development, which is expected to have greater impacts than the septic systems alone, especially for phosphorus. It is the combined net loading over existing conditions that is of concern.

To evaluate these impacts, CEI performed a simplified buildout analysis within the Lake Auburn watershed within the Town of Auburn. The simplified analysis used United States Department of Agriculture (USDA) natural Resources Conservation Service (NRCS) soils data to identify depths to groundwater. It was assumed that all areas with a depth to groundwater between 12 and 36 inches could not support a septic system under the Lake Auburn Watershed Overlay District ordinance, therefore could not support a home under the existing regulations. These areas were then assumed to be developable under State regulations since these areas would meet the site suitability criteria for a mounded system. A 100 foot shoreland buffer was removed from these areas and the remaining land was considered developable under the existing zoning. Lot frontage and setbacks were not considered as these can change over the years and/or property transfer could occur to meet setbacks.

Septic systems within 300 feet of the shoreline were used to determine phosphorus loads from septic systems to the Lake. Phosphorus loads carried with stormwater runoff were considered for all development under the less stringent requirements, regardless of its proximity to the shoreline. The results revealed the potential for an additional 290 septic systems within 300 feet of the Lake from buildout following the existing septic system requirements.

Based on a residential design flow of 270 gallons per day per three bedroom dwelling, the less stringent State standards would result in an additional 78,300 gallons per day of residential wastewater flow within 300 feet of the shoreline. This would result in an additional 225 pounds of phosphorus to the Lake from septic systems and an additional 125 pounds of phosphorus from stormwater runoff associated with the development. This an overall 7% increase in phosphorus loads to the Lake from buildout under the existing ordinance.

## **Cost of Degraded Water Quality**

The Cities of Auburn and Lewiston received a waiver from filtration from the State of Maine and U.S. EPA when filtration was originally required of most surface water systems. The reason was that Lake Auburn is pristine and has high clarity and very low levels of phosphorus, pathogens and other pollutants. This is an enviable situation enabled by the long history of protection of the lake, a situation that has saved the two cities millions of dollars in treatment and operation costs. Diligent monitoring of water quality and extensive land and easement purchases over time have allowed the cities to maintain this waiver since 1993, resulting in a huge cost savings and improved public safety of the drinking water.

The LAWPC follows a multi-barrier approach to safe drinking water. This approach ensures that “barriers” are in place from the source to the consumer to eliminate threats or minimize their impacts. Watershed protection is the first line of defense or first “barrier”, with the overall goal of preventing contamination from the watershed from reaching the water supply. It is more cost effective to prevent contaminants from entering the water supply than it is to allow the contaminants to enter the supply and then try to remove them through treatment. This approach is consistent with the criteria for avoiding filtration, which includes maintaining a watershed control program which minimizes the potential for contamination by *Giardia*



# MEMORANDUM

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*lamblia* cysts and viruses, as outlined in 40 CFR 141.71. The State determines whether the program is adequate based on the comprehensiveness of the watershed review; the effectiveness of the system's program to monitor and control detrimental activities occurring in the watershed; and the extent to which the water system has maximized land ownership and/or controlled land use within the watershed. The ordinances and programs in place at the time the waiver was granted were key factors in granting this waiver and changes to these programs, particularly changes that allow for more growth and net loadings to the Lake, could risk the losing of that waiver.

## **Should the Lake Auburn Watershed Protection Commission (LAWPC) Allow Mounded Systems in the Lake Auburn Watershed?**

No. In addition to the higher potential for failure of mounded systems if they are not designed, installed and maintained correctly, there is a significant impact associated with the increased development and number of septic systems that the use of mounded systems would allow within the watershed.

To avoid these impacts, the Lake Auburn Watershed Protection Commission (LAWPC) has the following options:

- 1) Maintain ordinance as is not allowing the use of mounded systems;
- 2) Allow mounded systems and use zoning to control the density of development in the watershed to avoid the increase associated with the use of mounded systems under existing zoning. This would involve a significant reduction in the allowable density, particularly in the Rural Residential District; and
- 3) Require controls that result in no net increase in pollutant loadings from the proposed development. This may include more stringent stormwater controls associated with new development that require all stormwater runoff to be handled on-site, eliminating the stormwater impacts to the Lake associated with the new development.

## **Does a Tiered Set of Requirements Make Sense for the Lake Auburn Watershed?**

Considering that most of the increased phosphorus load (the limiting nutrient for algal growth which can lead to taste and odor problems requiring treatment) is expected to come from the increase in development, rather than from the septic systems themselves, and the entire watershed contributes to the phosphorus load to the Lake, a tiered system based on distance from the water supply or within the direct or indirect watersheds may not do much in reducing total pollutant loads to Lake Auburn. However, research shows that pollutant removal is greatly influenced by soil types, with sandy soils providing less effective pollutant removal than finer soils. Thus, the LAWPC may consider increasing the required vertical separation in sandy soils from 24" to 36", while maintaining the existing 24" separation requirement for all other soils. Note that the State of Rhode Island requires a statewide 36 inch separation, and 48 inches in critical resource areas, including surface water reservoir watersheds.



# MEMORANDUM

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## **Other Improvements/Changes to the Lake Auburn Watershed Overlay District Ordinance**

The Auburn Water District and Lewiston Water Division are responsible for providing clean, affordable water to their customers. Maintaining the filtration waiver is an important component to meeting this responsibility. The LAWPC should consider the following recommendations to strengthen the existing ordinance and improve protection of the Lake.

Setback – The Lake Auburn Watershed Overlay District ordinance currently requires a 300 foot horizontal setback from waterbodies within the watershed in sandy soils, more where flows exceed 2,000 gallons per day. The LAWPC should consider applying this setback around the entire lake, regardless of soil types. The Town of York, Maine requires all wastewater disposal systems shall be set back a minimum of 500 feet from the normal high water mark of a public water supply and 250 feet from all streams, including tributary streams. (Town of York, ME Zoning Ordinance. 2008). The County of York, VA prohibits septic tanks and drainfields within 500 feet of the required buffer strip to a tributary stream or reservoir (County of York, VA. Retrieved March 13, 2009). This will help with the long-term removal of phosphorus associated with wastewater.

Septic Inspections – The subsurface disposal rules do not require inspection and/or replacement of systems upon property transfer, however, 30-A MRSA § 4216 – Transfers of Shoreland Property outline some requirements within the shoreland zone (250 feet). LAWPC should consider requiring periodic inspection of existing septic systems in the entire watershed on a specific schedule. The cost of the inspection could be borne by the homeowner, and any identified malfunctions would be further documented by the local plumbing inspector and referred to the elected municipal officials for correction. This would alert the homeowner and the Town to a failure that may otherwise go unnoticed (Maine DEP, 2009).

Maintenance Requirements – Consider adding system maintenance requirements to the ordinance that requires residents to pump out their septic tanks on a specific schedule. The Association of New Jersey Environmental Commissions (ANJEC) has a model septic ordinance for operation and maintenance of on-site sewage disposal systems (ANJEC. Retrieved March 18, 2009).

Reserve Area – Require a reserve area for a replacement disposal field in the event of failure. This ensures that suitable soils remain undisturbed on the site to address future concerns.

Septic Density – The State requires 20,000 square feet of land for every 300 gallons per day of wastewater flow (equivalent to about a 3 bedroom home) and also requires that the flows of systems located within 100 feet of each other be added together to determine flow related setbacks. Increased flows increase the potential for pollution to reach groundwater. LAWPC should consider a requirement to limit the number of septic systems on a lot. This could be accomplished through more restrictive flow restrictions, for example, the Town of Hanover, Massachusetts prohibits individual sewage disposal systems with flows greater than 440 gallons per day on any one acre under one ownership (Town of Hanover, MA Zoning Bylaw, 2007) (LAWPC could match flows for a typical single-family home to the existing zoning within the watershed) or simply by requiring that a septic system must be located on the same lot as the building it serves.





# MEMORANDUM

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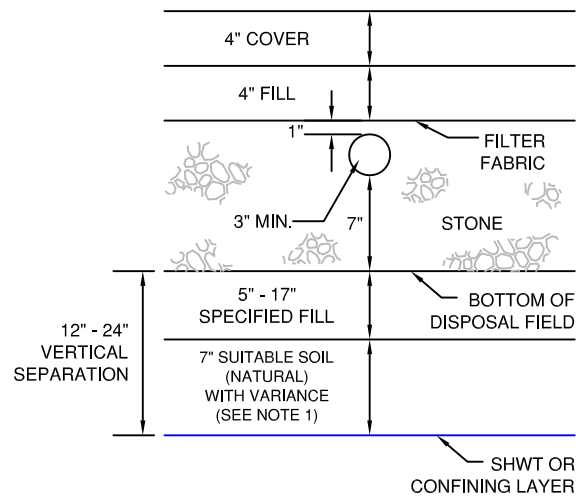
# MEMORANDUM

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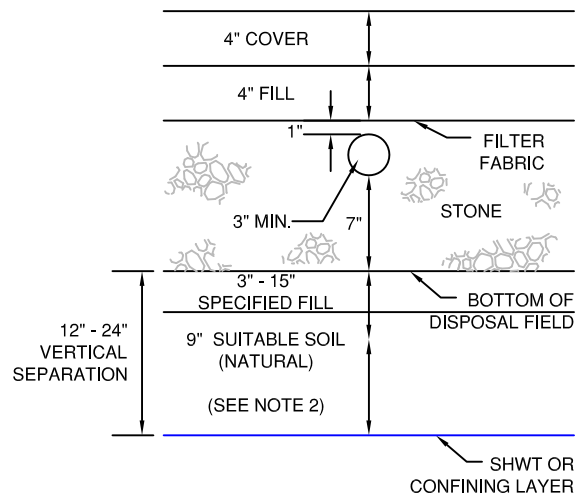
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[http://biology.usgs.gov/contaminant/endocrine\\_disruption.html](http://biology.usgs.gov/contaminant/endocrine_disruption.html)

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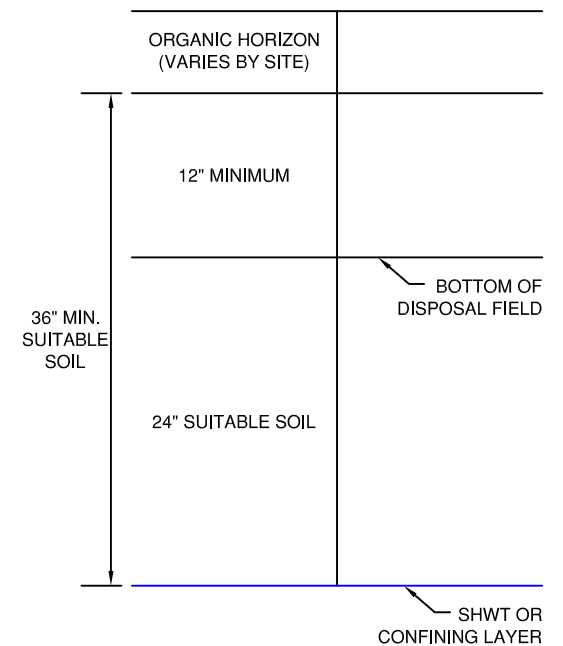
**144 CMR 241  
EXISTING**

(TYPICAL STONE DISPOSAL FIELD)



**144 CMR 241  
PROPOSED**

(TYPICAL STONE DISPOSAL FIELD)



**LAKE AUBURN  
EXISTING**

DOES NOT ALLOW FOR MOUNDING

SYSTEM MAY BE MOUNDED

**NOTES:**

1. Regulations call for 12" of suitable soil outside of the shoreland area and 15" within. 7" of suitable soil may be allowed with a variance.
2. Proposed regulations call for 9" of suitable soil outside of shoreland area and 15" within. This eliminates the need for a variance outside the shoreland area. 9" of suitable soil may be allowed within the shoreland area with a variance.

**PROFILE**



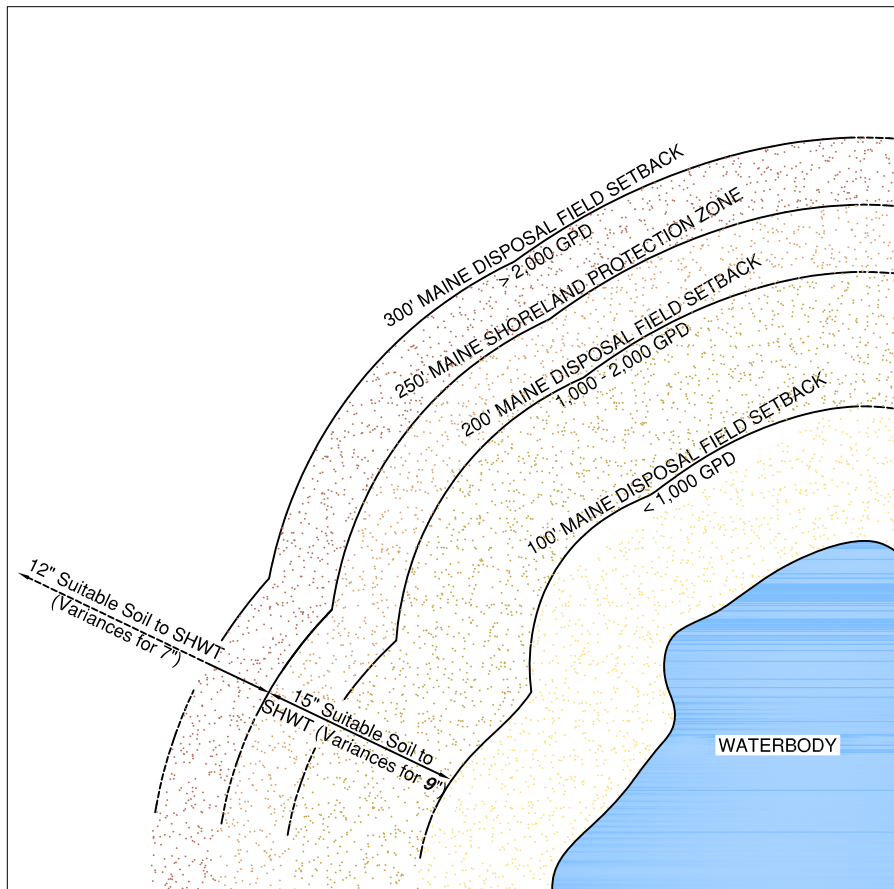
**COMPREHENSIVE  
ENVIRONMENTAL  
INCORPORATED**

21 DEPOT STREET  
MERRIMACK, NH

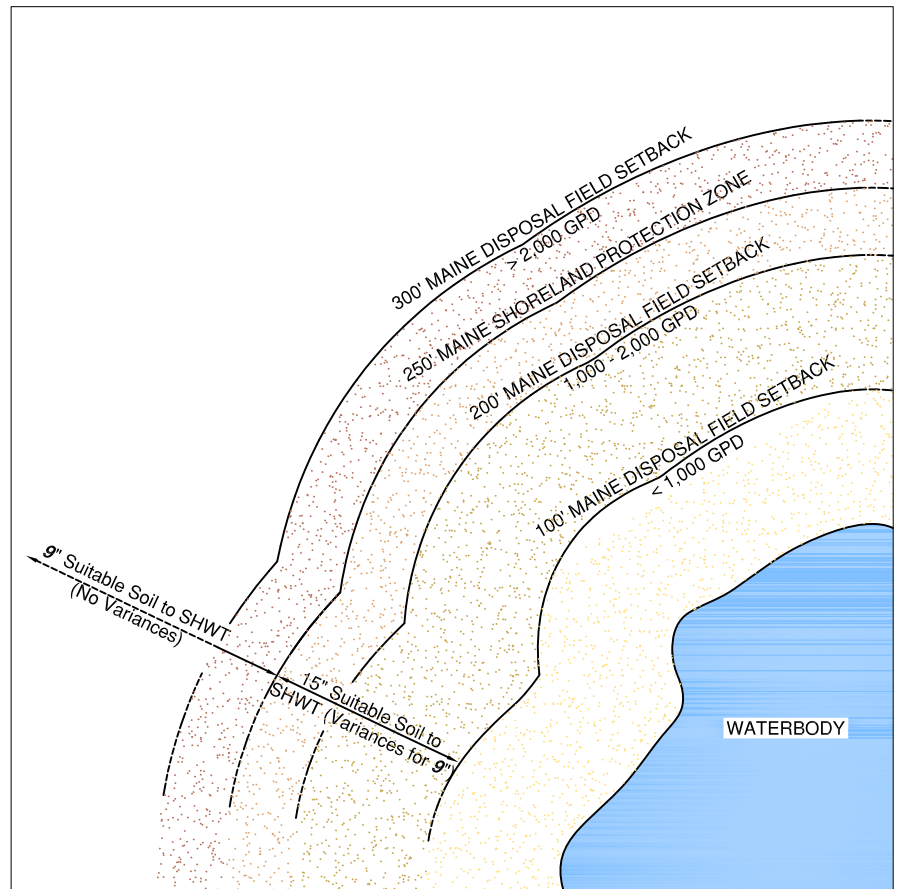
**FIGURE 1  
SUBSURFACE DISPOSAL SYSTEMS  
DEPTH AND SUITABLE SOILS REQUIREMENTS**

State of Maine and Lake Auburn Watershed, Southern Maine

**DRAFT - Do Not Cite or Quote**



**EXISTING 144 CMR 241**  
MAINE SUBSURFACE WASTEWATER DISPOSAL RULES



**PROPOSED 144 CMR 241**  
MAINE SUBSURFACE WASTEWATER DISPOSAL RULES



**EXISTING LAKE AUBURN OVERLAY DISTRICT**  
SUBSURFACE WASTEWATER DISPOSAL

**PLANVIEW**



**COMPREHENSIVE ENVIRONMENTAL  
INCORPORATED**

21 DEPOT STREET  
MERRIMACK, NH

**FIGURE 2**  
**SUBSURFACE DISPOSAL SYSTEMS**  
**SETBACK AND SUITABLE SOIL REQUIREMENTS**

State of Maine and Lake Auburn Watershed, Southern Maine

**DRAFT - Do Not Cite or Quote**

## **Attachment A**

**EPA Document 816-K-06-005 –  
The Multiple Barrier Approach to Public Health Protection**



# The Multiple Barrier Approach to Public Health Protection

Safe drinking water is essential to our physical health and to the economic health of our communities. However, drinking water is vulnerable to contamination from many potential threats. The 1996 Safe Drinking Water Act Amendments created a coordinated set of programs and requirements to help water systems make sure they have a safe supply of drinking water. These programs and requirements form a Multiple Barrier Approach that places technical and managerial barriers that help prevent contamination at the source, treatment, and tap to provide a safe supply of drinking water for consumers.

The barriers are:

**Risk Prevention:** Selecting and protecting the best source of water where possible or protecting a current source of water.

**Risk Management:** Using effective treatment technologies, properly designed and constructed facilities, and employing trained and certified operators to properly run system components.

**Monitoring and Compliance:** Detecting and fixing problems in the source and/or distribution system.

**Individual Action:** Providing customers with information on water quality and health effects so they are better informed about their water system.

By placing integrated barriers from the source to the consumer at the tap, water systems can help protect communities from the risk of contamination and waterborne disease. A successful multiple barrier approach includes:

## Barriers between potential threats and the consumer.

For example:

- Source water protection activities such as identifying and reducing contamination in watersheds.
- Appropriate source water treatment.
- Properly trained, certified operators.
- Properly designed and constructed facilities.

## Programs and activities to make sure the barriers are in place and operational.

For example:

- Sanitary surveys to evaluate the adequacy of a water system's facilities for producing and distributing safe drinking water.
- Comprehensive Performance Evaluations to identify cost-effective improvements in system performance.
- Standards for the design and construction of a system's components.
- Continuing education and training of managers and certified operators.
- Strategic and emergency response planning to make sure a system is prepared for the future and for potential crises or disasters.



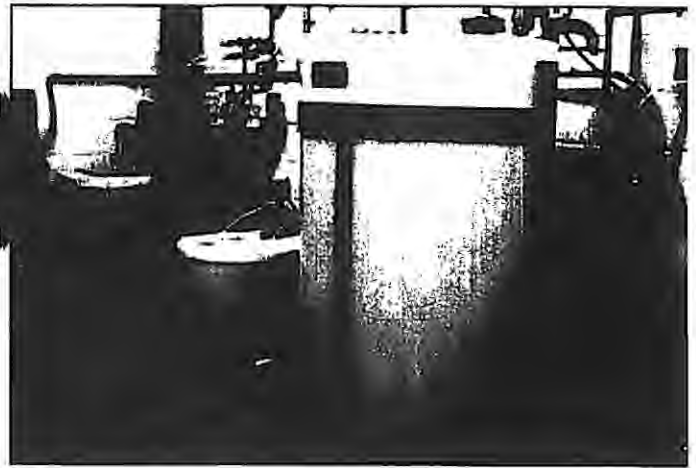
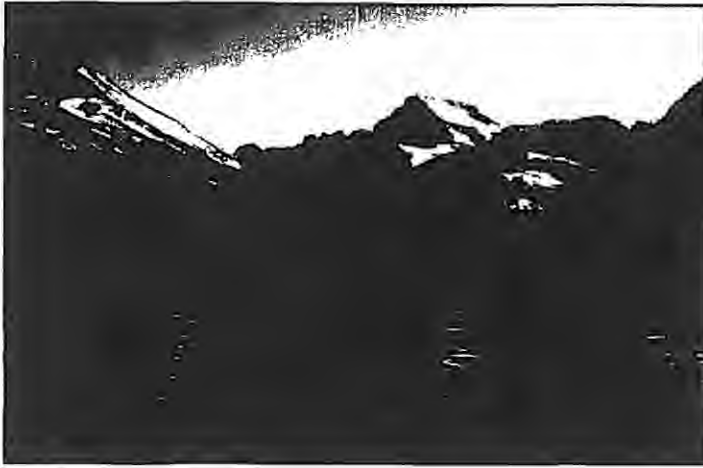
## Did You Know?

Capacity development — the development of a system's technical, managerial, and financial ability to provide safe and adequate drinking water to its customers — is the foundation of a successful multiple barrier approach for any system.

Office of Water (4606M)  
EPA 816-K-06-005  
[www.epa.gov/safewater](http://www.epa.gov/safewater)  
September 2006



# Water Systems' Multiple Ba



## Barrier #1: Risk Prevention

The first barrier in a water system's multiple barrier approach is risk prevention. Risk prevention focuses on the selection and protection of drinking water sources. Systems should be aware of potential contamination caused by agricultural drainage, urban runoff, organic materials, and other factors.

When selecting sources, systems should examine:

- The quality of the raw water (e.g., does it contain pathogens, chemicals, radionuclides, nitrates, or high turbidity?).
- The risk of contamination (e.g., will development encroach on the water source?).
- The ability of the supply to meet current and future needs.

Water systems, unless they are new systems, rarely have the opportunity to select their water source. But existing systems can and should take steps to protect their water sources, including:

- Identifying sources of contamination in watersheds and recharge areas.
- Identifying the conditions under which the risks increase.
- Developing and implementing source water protection strategies.

By properly selecting and protecting its water source, a system can reduce its need for and reliance on treatment and increase the reliability of its water quality and quantity.

The financial incentive for systems to prevent risks is significant. It is almost always more cost-effective for a water system to protect its source water from contamination than to remove or inactivate contamination during treatment.

## Barrier #2: Risk Management

Risk management barriers focus on the protection provided by water treatment and system operations. Public water systems traditionally have relied on treatment to prevent waterborne disease. Treatment continues to play a central role in protecting public health.

Water treatment:

- Removes and inactivates contaminants present in source water.
- Leads to improved finished water quality.

No single treatment technology or process can solve every water quality problem, so a water system should consider using a combination of treatment technologies and processes if necessary.

To provide adequate protection of public health, a water system:

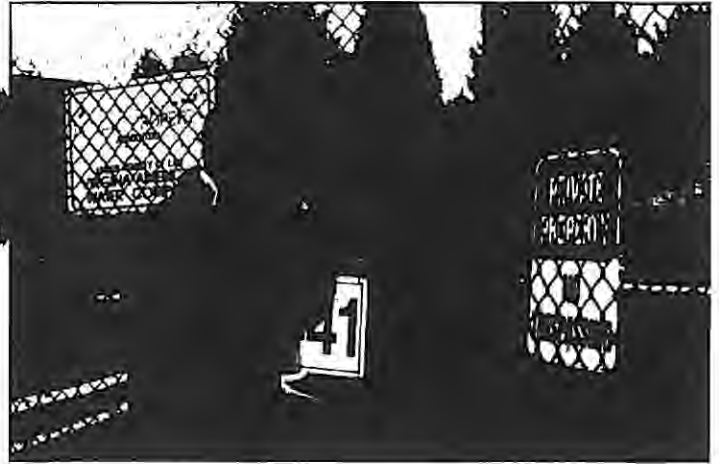
- Must meet its state's minimum design and construction standards.
- Should develop asset management plans that help provide sound infrastructure.
- Must meet federal and state drinking water standards.

In addition to using the appropriate treatment, water systems should make sure that their operators are properly certified and know how to apply treatment concepts to the specific circumstances facing their system. Water systems should also test the treatment process that they are using to be certain that the treatment is working correctly.

The risk management barrier also includes developing and putting in place appropriate security arrangements and comprehensive plans to respond to emergencies, thus reducing the risk of serious consequences from a security breach or other emergency.

A wide range of financial assistance and incentives are available to help systems fund upgrades or replacement of their treatment components. Contact information for some key providers of financial assistance is listed on the last page of this brochure.

# riers to Protect Public Health



## Barrier #3: Monitoring and Compliance

Under the monitoring and compliance barrier, systems aim to detect and fix problems in the source and/or distribution system as early as possible. They accomplish this by collecting information about:

- The presence of contaminants.
- The effectiveness of current treatment processes.
- Any deterioration in the quality of source or treated water.

Monitoring the quality of water is very important in the distribution system, as well as throughout the entire water system. Even if water from an extremely clean source is adequately treated, breakdowns in the distribution system can lead to waterborne illnesses. In particular, the contamination of treated water can result from:

- Line breaks.
- Inadequate water pressure.
- Deficiencies in storage tanks.
- Inadequate separation of water supply lines and sewers.

Part of the strategy for this barrier should include a cross-connection detection and control program as well as efforts to make sure that all distribution system components are properly sized and maintained. Water systems must also monitor water in the distribution system for the formation of byproducts from disinfection and for the leaching of lead and copper from household plumbing.

Monitoring programs should be developed around the needs and characteristics of individual water systems, and they should comply with all regulatory requirements. The monitoring and compliance barrier helps a system maintain the physical integrity of its components and make adjustments as necessary to provide a consistent, safe supply of water.

From a financial perspective, operators who have data on the performance and condition of their system's components (as part of an asset management plan) can increase the useful life of system components and quickly identify and respond to small problems before they become large and expensive.

## Barrier #4: Individual Action

Consumer awareness and participation are key components in the multiple barrier approach.

A community water system is required to prepare and provide to their customers, at least annually, Consumer Confidence Reports (Annual Water Quality Reports) that discuss:

- The condition of the system's source water.
- The level of contaminants in the system's drinking water.

The reports are a way to raise consumer awareness about drinking water, and they can be used as a tool to encourage dialogue between consumers and the water system.

Water systems are also required to notify the public of any violations of national drinking water standards. Public notification makes sure that:

- Consumers are informed of any health risks in a timely manner.
- Water systems build trust with consumers by sharing information.

Beyond information sharing, systems can benefit greatly from involving the public in a variety of activities. For example:

- Systems can further their source water protection efforts by helping the public form watershed associations.
- Systems can encourage the public to notice and report activities that could represent contamination or sabotage threats to the water system.

Informed and involved consumers can become advocates for improvements in their water system's operations. Public education and participation can also help consumers become more aware of the true cost and value of water.

From a financial perspective, customers who have a better understanding of their water system, the true cost and value of water, and the role they play will be more likely to support rate increases and bond issues needed to fund multiple barrier approach activities.



## Sources of additional information

For additional information, contact your state drinking water program.

## General information

- Safe Drinking Water Hotline - (800) 426-4791
- EPA's Office of Ground Water and Drinking Water - <http://www.epa.gov/safewater>
- EPA's Capacity Development Program - <http://www.epa.gov/safewater/smallsys/small.htm>

## Technical Assistance Providers

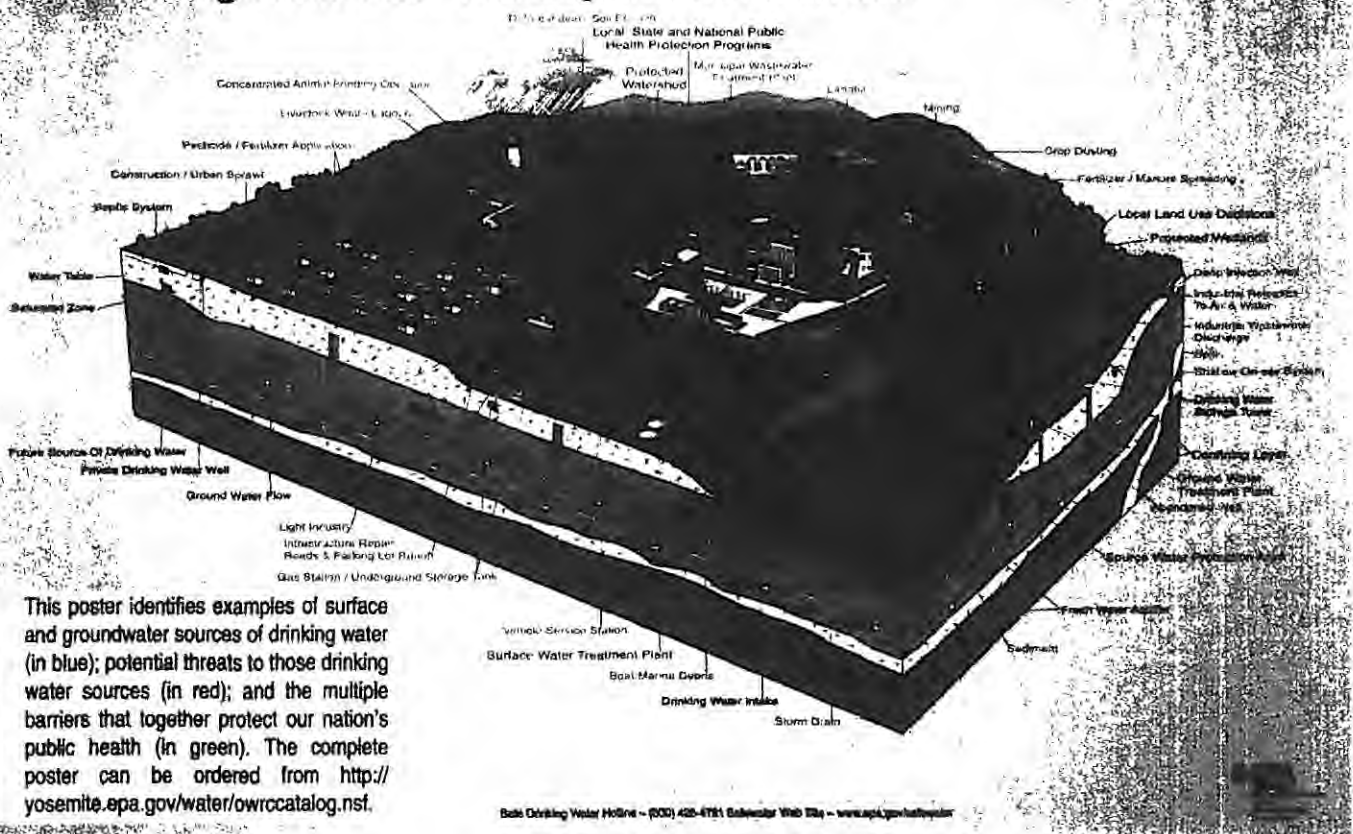
- National Rural Water Association (NRWA) - <http://www.nrwa.org>
- Rural Community Assistance Partnership (RCAP) - <http://www.rcap.org>
- National Environmental Services Center (NESC) - <http://www.nesc.wvu.edu>
- Technology Assistance Centers (TACs) - <http://www.tacnet.info>

## Financial Assistance Providers

There are many sources of financial assistance and incentives to help systems fund multiple barrier approach programs and activities. Some of the key providers of financial assistance are:

- Drinking Water State Revolving Fund (DWSRF) - <http://www.epa.gov/safewater/dwsrf.html>
- Rural Development Water and Wastewater Loan and Grant Program - <http://www.usda.gov/rus/water/states/usamap.htm>
- Community Development Block Grants (CDBG) - <http://www.hud.gov/offices/cpd/communitydevelopment/programs/>

## Safe Drinking Water Act - Protecting America's Public Health



This poster identifies examples of surface and groundwater sources of drinking water (in blue); potential threats to those drinking water sources (in red); and the multiple barriers that together protect our nation's public health (in green). The complete poster can be ordered from <http://yosemite.epa.gov/water/owrcatalog.nsf>.

# MEMORANDUM | REVISED LAKE AUBURN WATERSHED DELINEATION



**TO:** Eric Cousens, City of Auburn, Maine  
**FROM:** Laura Diemer, FB Environmental Associates  
**SUBJECT:** Revised Lake Auburn Watershed Delineation – Response to Peer Review  
**DATE:** December 14, 2022  
**CC:** Forrest Bell, FB Environmental Associates

The City of Auburn requested FB Environmental Associates (FBE) to respond to a peer review by CDM Smith for the Lake Auburn Watershed Protection Commission (LAWPC), “*Watershed Delineation Rezoning Review – Gravel Pit Parcel*,” dated October 5, 2022 (revised). As part of a larger study by FBE, “*A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine*,” dated October 2021, a revised watershed boundary was delineated for Lake Auburn based on 2-ft contour data and previous hydrogeologic studies in the Gracelawn gravel pit area near the southeast shore of the lake. The revised watershed boundary accounted for both surface water and groundwater flows and reduced the original watershed area by 148 acres. LAWPC requested CDM Smith to independently review the previous studies and FBE’s revised watershed boundary.

## REVIEW & FINDINGS

In short, CDM Smith found that the previous studies on groundwater flow “support the revised watershed delineation in some areas, and in other areas the data are insufficient to confirm a precise delineation.” CDM Smith notes three major segments along the watershed boundary line in question (refer to Figure ES-1 from CDM Smith’s October 5, 2022 memorandum copied here on pg. 3 for ease of comparison and FBE’s Figure 1 on pg. 4):

1. **Segment A to B (Figure 1):** The revised watershed delineation along the west side of the gravel pit from near MW-8 (Summit) to just before MW-1 (Summit) and MW-4 (E.C. Jordan) follows surface drainage topography. **CDM Smith concurs with FBE’s revised watershed boundary for this segment.**
2. **Segment B to C (Figure 1):** The revised watershed delineation around MW-1 (Summit) and MW-4 (E.C. Jordan) diverges from surface drainage topography to include a portion of the gravel pit depression. CDM Smith continues to follow surface drainage topography up to MW-1 (Summit) and MW-4 (E.C. Jordan). MW-1 (Summit) and MW-4 (E.C. Jordan) both showed groundwater levels below the lake surface elevation of 260 feet MSL, indicating that the direction of groundwater flow is likely to the south and away from the lake. **FBE concurs with CDM Smith that this segment of the watershed boundary should likely continue to follow surface drainage topography which would exclude the groundwater flow from around those two wells. Figure 1 provides a revised watershed delineation for this segment, which excludes an additional 4 acres from the Lake Auburn watershed (for a total of 152 acres from the original watershed boundary).**
3. **Segment C to D (Figure 1):** Near the middle of the gravel pit, there are a cluster of three triangles identifying an area of bedrock outcrop, called the “bedrock knob” in previous studies. CDM Smith notes that the well data from previous studies suggest that the bedrock outcrop is above lake level and contains groundwater within the bedrock; however, CDM Smith notes that it is unclear from the well data what direction(s) the bedrock groundwater flows. Water level data from E.C. Jordan well sites MW-1, MW-10, MW-301, and MW-206 indicate groundwater levels above lake level that flow in a northeastern direction, potentially to Lake Auburn or to a tributary stream of the Androscoggin River or some portion to both. For this segment of the watershed boundary line, CDM Smith indicates a “band of uncertainty” or a range of area (including FBE’s revised watershed boundary for this segment) that the watershed boundary line may reside. According to CDM Smith, the northern limit of their “band of uncertainty” follows surface drainage topography<sup>1</sup>. The southern limit of their “band of uncertainty” lies north of MW/PZ-203, P-1, MW-205, MW-102/P-2, and MW-101/P-3, all of which have well data that indicate groundwater flow away (south) from the lake. Summit well sites MW-2 and MW-5 showed water levels above

<sup>1</sup> FBE notes a possible minor discrepancy that may need further clarification by CDM Smith. CDM Smith indicates that the northern limit of their “band of uncertainty” follows surface drainage topography, which is slightly more northern than FBE’s revised watershed delineation, which CDM Smith indicates, on pg. 4-5 of their October 5, 2022 memorandum, follows “topographic high points” except in a narrow area between bedrock outcrops labeled 325 and 320.

lake level. With water levels and bedrock elevations rising steeply moving to the east of those two wells, the outer extent of groundwater flow toward the lake is likely near these two wells (and just to the northeast), close to the start of the southern limit of CDM Smith’s “band of uncertainty” for at least a portion to the east of the “bedrock knob.” FBE based the revised watershed boundary primarily on surface drainage topography while also accounting for significant groundwater contributions from the gravel pit and “bedrock knob” area. To account for groundwater flow from the gravel pit, FBE relied on the groundwater contour map showing inferred overburden groundwater elevation and flow direction from E.C. Jordan (1990) with supplemental groundwater level information from additional Summit (2007) wells. FBE understands from CDM Smith’s review that the bedrock groundwater flow may not be captured in this map or in the revised watershed boundary (refer to Figure 2 on pg. 5). **FBE concurs with CDM Smith that the overburden/bedrock groundwater watershed boundary likely lies within their “band of uncertainty,” which includes the revised watershed boundary as it currently exists, and that additional data are needed to more precisely define this segment of the watershed boundary.**

## CONCLUDING REMARKS

FBE concurs with CDM Smith that additional investigation of surface and groundwater flows (both overburden and bedrock) in the Gracelawn gravel pit area is warranted to more precisely define the Lake Auburn watershed boundary. FBE agrees that creating a 3D geometric visualization model to integrate existing data on surface and groundwater flows would be immensely helpful in generating more accurate spatial estimates of flows and identifying needs for additional field data collection. CDM Smith notes that installation of new monitoring wells and additional field investigations are likely needed to complete the 3D model. If the revised watershed boundary were to be adjusted based on these investigations, then FBE recommends completing an update to the baseline Lake Auburn land use and water quality model.

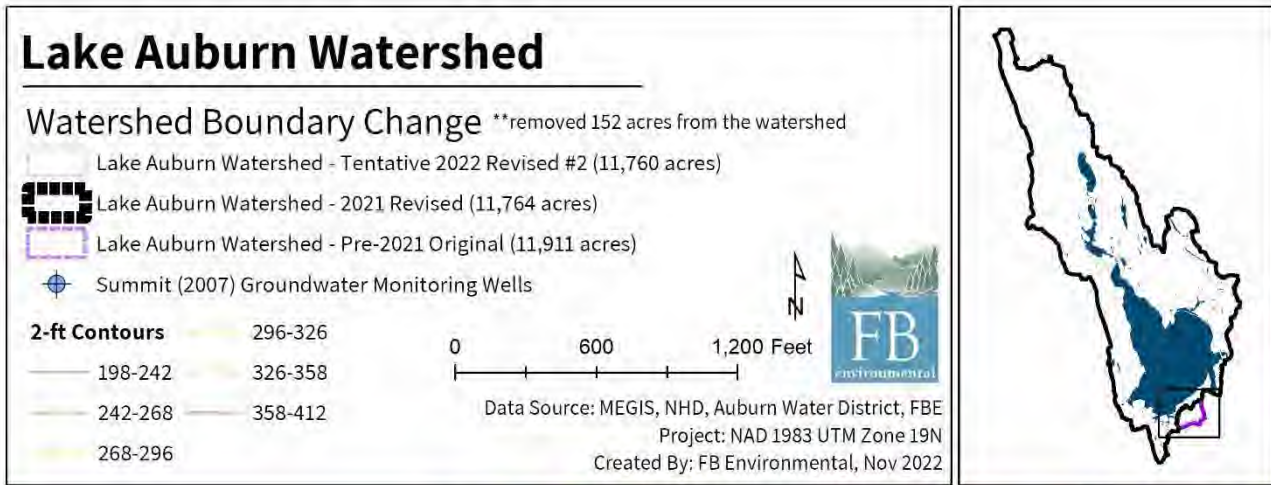
It is important to note that the Lake Auburn watershed boundary is based on surface drainage topography, which is a common practice in watershed management and modeling; however, we recommend making an exception to consider groundwater flow in the Gracelawn gravel pit area because of the area’s active and potential future uses under the proposed Auburn’s General Business zoning and those uses’ potential impact to the highly sensitive water quality of Lake Auburn. The previous hydrogeologic studies showed that groundwater discharge from the Gracelawn gravel pit area (largely from the “bedrock knob”) was reaching Lake Auburn; thus, extending the revised watershed boundary to include the area of bedrock groundwater flow to Lake Auburn will be important to protecting Lake Auburn’s water quality. **Given this, we recommend that segment B to C be modified as shown in Figure 1 and that segment C to D be adjusted to the southernmost boundary line drawn by CDM Smith to conservatively account for both surface drainage topography and bedrock groundwater flow to Lake Auburn. Any further adjustments to the Lake Auburn watershed boundary can be made based on additional or updated information related to surface drainage topography and groundwater flow in the area as it becomes available.**





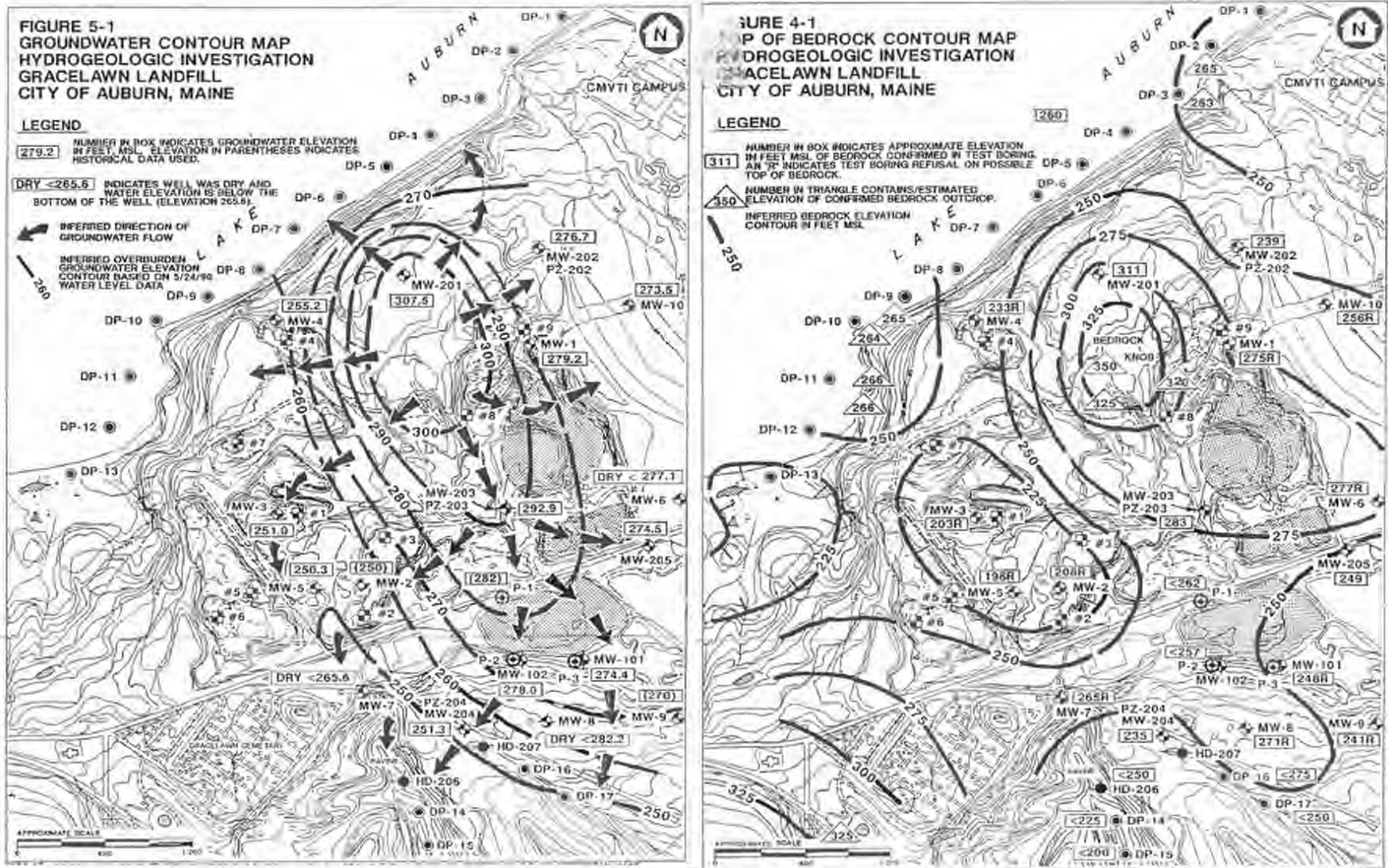
Figure ES-1. Summary of estimated watershed boundary review by CDM Smith in their October 5, 2022 memorandum.





**Figure 1.** Tentative 2022 revision #2 (white dashed line) of the 2021 revised watershed boundary (black dashed line) compared to the pre-2021 original watershed boundary (purple dashed line) for Lake Auburn. Letters A, B, C, and D indicate start and end points of segments described in the text.





**Figure 2.** Overburden groundwater (left) and bedrock (right) elevation contour maps from E.C. Jordan (1990). To delineate the revised watershed boundary, FBE relied on the groundwater contour map showing inferred overburden groundwater elevation and flow direction from E.C. Jordan (1990) with supplemental groundwater level information from additional Summit (2007) wells. While the overburden groundwater flow directions appear to be driven by bedrock elevations, there are insufficient data accounting for the flow direction of groundwater within the bedrock to delineate the extent of bedrock groundwater reaching Lake Auburn. Bedrock groundwater can disperse in any number of directions depending on bedrock types, layering, and fracturing.

# MEMORANDUM | REVISED LAKE AUBURN WATERSHED DELINEATION



**TO:** Eric Cousens, City of Auburn, Maine  
**FROM:** Laura Diemer, FB Environmental Associates  
**SUBJECT:** Revised Lake Auburn Watershed Delineation – New Topographic Data Review  
**DATE:** December 14, 2022  
**CC:** Forrest Bell, FB Environmental Associates

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The City of Auburn requested FB Environmental Associates (FBE) to review the LiDAR topographic data collected in June 2022 by Jones Associates (PDF map file: Gracelawn Existing Conditions Plan 6-23-22; GIS files: lidar contours.shp, survey contours.shp), along with an estimated surface watershed boundary around the gravel pit delineated by Stoneybrook Land Use, Inc. (PDF map file: 11-043A WATERSHED 2022 200). As part of a larger study by FBE, “*A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine*” dated October 2021, a revised watershed boundary was delineated for Lake Auburn based on 2-ft contour data and previous hydrogeologic studies in the Gracelawn gravel pit area near the southeast shore of the lake. The revised watershed boundary accounted for both surface water and groundwater flows and reduced the original watershed area by 148 acres. In a memorandum titled “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” dated December 14, 2022, FBE responded to a peer review “*Watershed Delineation Rezoning Review – Gravel Pit Parcel*” dated October 5, 2022 (revised) by CDM Smith who independently reviewed the previous studies and FBE’s revised watershed boundary. For this memorandum, FBE examined how the new topographic data for the gravel pit may or may not impact the conclusions in either of these memorandums.

**Note:** FBE’s review of the Lake Auburn watershed boundary in and around the gravel pit using the 2022 LiDAR topographic data was based solely on surface drainage topography and not groundwater.

## REVIEW & FINDINGS

Overall, we found that the surface elevations near the edges of the gravel pit area did not substantially change with the 2022 LiDAR topographic data compared to previous topographic data used to delineate around the gravel pit area for the revised watershed boundary; thus, the 2022 LiDAR topographic data do not substantially change the revised watershed boundary. Our review relied on the two PDF maps provided. The GIS files provided did not contain the attribute information necessary to label or color code each contour’s elevation for mapping. The 2022 LiDAR topographic data were also only collected for a portion of the revised watershed boundary in question. We divided the watershed boundary line in question into multiple segments (refer to Figure 1), which expands on the segment lettering used in FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn:

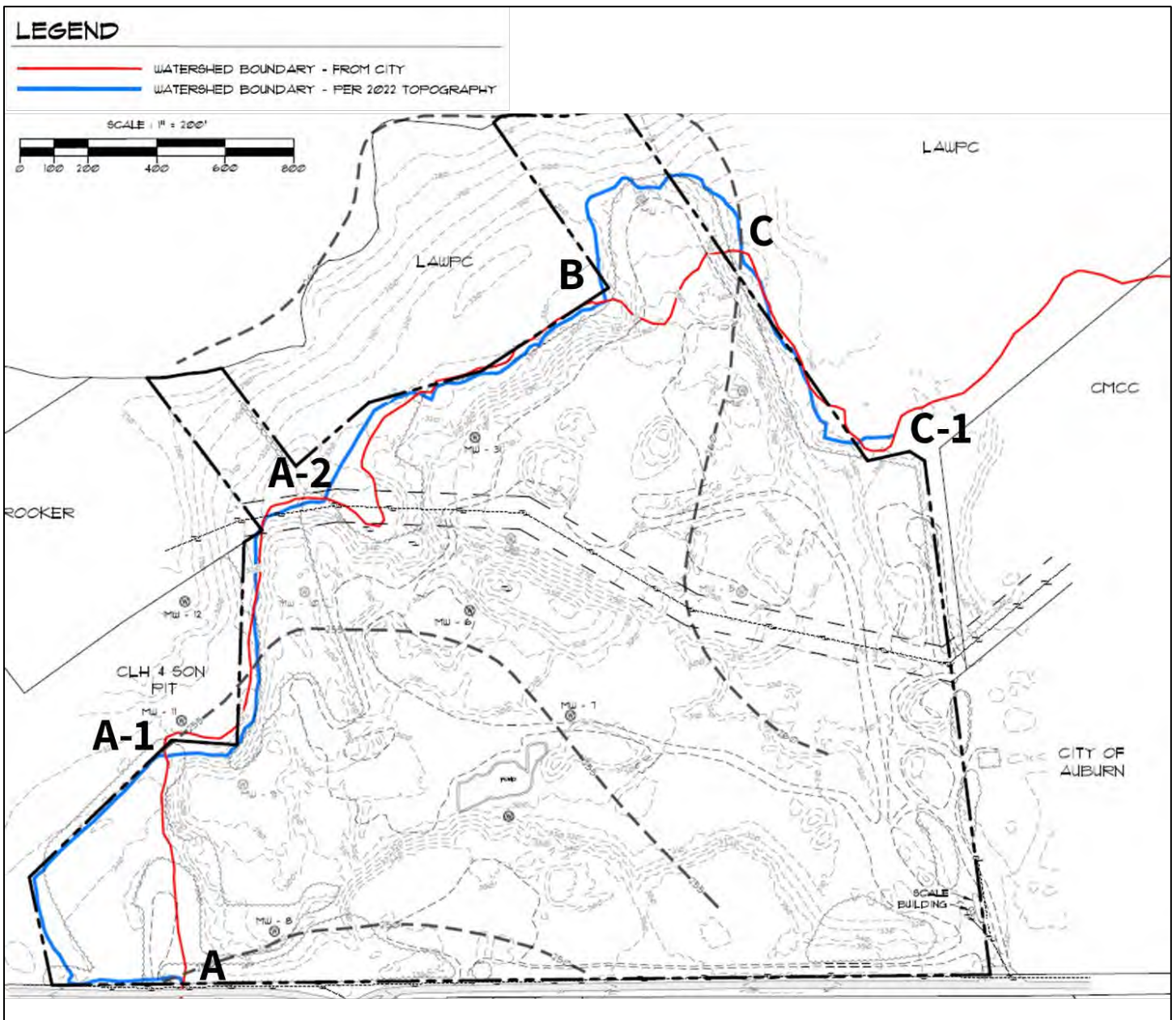
- **Segment A to A-1 (Figure 1):** Stoneybrook Land Use, Inc appears to follow the parcel boundary for this segment and not the surface drainage topography indicated on the map. The revised watershed boundary nearly follows the 2022 LiDAR topographic data and could be adjusted to more accurately follow surface drainage topography following field verification.
- **Segment A-1 to A-2 (Figure 1):** The revised watershed boundary and the watershed boundary drawn by Stoneybrook Land Use, Inc based on 2022 LiDAR topographic data generally match well for this segment but could be adjusted to more accurately follow surface drainage topography following field verification.
- **Segment A-2 to B (Figure 1):** The revised watershed boundary at the beginning of this segment follows the 350’ elevation high point plateau, but the 2022 LiDAR topographic data show descending elevations to the northeast that may drain into the gravel pit, outside of the Lake Auburn watershed. The remainder of the segment matches well between the revised watershed boundary and the watershed boundary drawn by Stoneybrook Land Use, Inc. We recommend that the revised watershed boundary be reviewed in the field and adjusted accordingly.
- **Segment B to C (Figure 1):** FBE concurs with the watershed boundary drawn by Stoneybrook Land Use, Inc based on the 2022 LiDAR topographic data, as per FBE’s tentative revised #2 watershed boundary in FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn. We recommend that this segment be verified in the field and adjusted accordingly.
- **Segment C to C-1 (Figure 1):** The revised watershed boundary and the watershed boundary drawn by Stoneybrook Land Use, Inc based on 2022 LiDAR topographic data generally match well for this segment but could be adjusted to more accurately follow surface drainage topography following field verification.



- Segment C-1 to D (Figure 1):** The 2022 LiDAR topographic data were collected for a portion of the revised watershed boundary in question and do not cover this segment, which was part of FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn.

## CONCLUDING REMARKS

The 2022 LiDAR topographic data provide more accurate surface drainage topography depictions for the area around the gravel pit. We recommend that the revised watershed boundary be adjusted to account for the 2022 LiDAR topographic data and verified in the field prior to or in conjunction with the additional adjustment recommendations made in FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn. Any adjustments to the revised watershed boundary (outside of Segment B to C), based on the 2022 LiDAR topographic data alone and not groundwater data, would be minor and likely less than one acre total in net change to the Lake Auburn watershed.



**Figure 1.** Map adapted from Stoneybrook Land Use, Inc. Letters denote the start and end points of segments along the Lake Auburn watershed boundary line (refer to text).



# MEMORANDUM | RESPONSE TO CEI PEER REVIEW



**TO:** Eric Cousens, City of Auburn, Maine  
**FROM:** Laura Diemer, FB Environmental Associates  
**SUBJECT:** Response to CEI Peer Review of October 2021 Lake Auburn Study by FB Environmental Associates, Horsley Witten Group, and the University of Maine  
**DATE:** December 20, 2022  
**CC:** Forrest Bell, FB Environmental Associates  
**ATTCH:** *AWD Questions and Responses – Background (04378125xAE394) – FBE.docx*

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The City of Auburn requested FB Environmental Associates (FBE) to respond to a peer review by Comprehensive Environmental Inc. (CEI), “*FBE Lake Auburn Peer Review Memo – Background (04378124xAE394)*” dated October 17, 2022 and “*FBE Lake Auburn Peer Review Memo- 10.17.22 final draft (04378122xAE394)*” dated October 17, 2022. The first memorandum provides CEI’s overview of “*A Regulatory, Environmental, and Economic Analysis of Water Supply Protection in Auburn, Maine*” by FBE, Horsley Witten Group, and the University of Maine, dated October 2021 (hereafter, October 2021 Lake Auburn Study). The second memorandum provides a summation of CEI’s peer review findings from the first memorandum. The focus of CEI’s peer review was to “evaluate the conclusions drawn [from the October 2021 Lake Auburn Study] as they pertain to development and water quality impacts on Lake Auburn.” In addition, FBE responded directly within a document “*AWD Questions and Responses – Background (04378125xAE394)*,” which contains questions from the Auburn Water District and responses from the City of Auburn and CEI.

## REVIEW & FINDINGS

Overall, CEI agrees with FBE’s conclusions from the October 2021 Lake Auburn Study that 1) “Lake Auburn is nearing its assimilative capacity for nutrient load (even with the partial alum treatment) and cannot handle much more additional nutrient load without diminishing water quality and its associated benefits,” 2) there are “no net environmental, economic, or social benefit supporting expansion of development in the Lake Auburn watershed,” 3) “more development cannot be allowed in the Auburn portion of the watershed even with LID requirements implemented in Auburn,” and 4) “even if reduced development through conservation or other means is achieved in the headwater towns, any additional development in Auburn has an outsized negative impact” to the lake.

The following bolded topics correspond to the main topics used in CEI’s peer review.

**Gracelawn Road Area Boundary Change** – CEI points out that revising the Lake Auburn watershed to exclude much of the gravel pit may not reflect future surface and groundwater flow conditions should the gravel pit be restored and developed. FBE agrees that the gravel pit area’s active and potential future uses under Auburn’s proposed General Business (GB) zoning have a potential to impact the highly sensitive water quality of Lake Auburn. In FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn, FBE recommended that until additional information is collected to more precisely define surface drainage topography and bedrock groundwater flow in the gravel pit area, the Lake Auburn watershed boundary (segment C to D) should be “adjusted to the southernmost boundary line drawn by CDM Smith, [as part of their “*Watershed Delineation Rezoning Review – Gravel Pit Parcel*,” dated October 5, 2022 (revised) memorandum to the Lake Auburn Watershed Protection Commission (LAWPC)], to conservatively account for both surface drainage topography and bedrock groundwater flow to Lake Auburn.” This approach serves to conservatively expand the Lake Auburn watershed (and its protections) to a portion of the gravel pit area. As for future development activities that may alter surface and groundwater flow conditions near any portion of the Lake Auburn watershed boundary (within City limits), the City of Auburn already has a process in place to closely review the hydrologic impacts of site plans and will not approve any site plans that divert surface or groundwater flow to Lake Auburn (which would otherwise effectively increase the watershed area).

**Buildout Assumptions** – CEI disagrees with the assumption that no additional development will occur in the Agriculture and Resource Protection (AG) zone in the Auburn portion of the Lake Auburn watershed. This assumption effectively removed 74 projected new buildings from the watershed. FBE included this assumption in the 2022 Ordinance Changes Baseline Buildout per direction by the City of Auburn based on their experience and interpretation of existing relevant ordinances. Since the City also enforces the zoning ordinance, we considered the City’s direction to be authoritative. FBE disagrees with CEI’s statement that “there is nothing preventing future development from occurring” in the AG zone, because there are restrictive standards for new

development which must be approved by the City on a case-by-case basis. However, FBE agrees with CEI that future development is not expressly prohibited in the AG zone, making the buildout assumption of no future development in the AG zone questionable.

To standardize assumptions across several buildout scenarios and directly compare net changes in projected new buildings among the Business As Usual, Max Development-LAWPC Lands Remain Protected (matches FBE's Max Development Not Allowing Building on LAWPC Lands scenario), and 2022 Ordinance Changes Baseline Buildout scenarios, CEI created a series of tables with the number of projected new buildings by zone and buildout scenario for values as presented in FBE documents (CEI's Table 1), values adjusted assuming no new development in the AG zone (CEI's Table 2), and values adjusted assuming new development in the AG zone (CEI's Table 3). Removing (CEI's Table 2) or keeping (CEI's Table 3) the 74 projected new buildings for the Business As Usual scenario is an acceptable assumption for comparison to the 2022 Ordinance Changes Baseline Buildout scenario. For the Max Development-LAWPC Lands Remain Protected scenario, the three village nodes were created by rezoning 51 parcels from the AG, Low Density Country Residential (LDCR), Rural Residential (RR), Suburban Residential (SR), and Neighborhood Business (NB) zones to the GB and NB zones (the latter mislabeled as New Business in CEI's Tables 1-3). Therefore, it is not as simple as removing all development from the AG, GB, and/or NB zones in CEI's Tables 2 and 3 because 23, 9, 7, and 1 of those 51 rezoned parcels were in the RR, SR, LDCR, and NB zones, respectively, and would be counted toward potential new development.

Based on review of CEI's memorandums, FBE notes the following:

- To account for the conservative limitation of using the Table 4D soil profiles for prohibiting septic system siting on gravel outwash or stratified drift within 400 feet of a surface water in the Auburn portion of the Lake Auburn watershed, it would be more appropriate to add the 23 projected new buildings to the 2022 Ordinance Changes Baseline Buildout scenario than to subtract the 23 projected new buildings from the other two scenarios in CEI's Tables 2 and 3. FBE made this corrected adjustment in Table 1 (below).
- FBE requests a correction to footnote 3 in CEI's Table 3 noting that "FBE's October 2021 study predicted an additional 174 buildings in Auburn if the septic restrictions are relaxed (390-216=174)." This statement should be adjusted to indicate that the 174 buildings estimate came directly from CEI's Table 3. FBE's October 2021 Lake Auburn Study indicated an estimate of "more than 100 additional new homes could be built in the watershed if the septic system siting requirement for 36 inches of suitable in-situ soil were revised." Further, by FBE's estimate (refer to Table 1, below), adjusting a septic system siting restriction from 36" to 12" depth to a restrictive layer increases the number of projected new buildings in the Auburn portion of the watershed by 26 (assuming no new development in the AG zone) or 35 (assuming new development in the AG zone). CEI's estimate of 174 projected new buildings was based on a scenario with no soil restrictions.
- Assuming no new development in the AG zone, CEI's Table 2 estimated a reduction of 57 projected new buildings in the Lake Auburn watershed with the 2022 ordinance changes (compared to FBE's estimate of 58 fewer projected new buildings). The difference of one projected new building is due to the removal of one projected new building from Turner's Rural I zone in the 2022 Ordinance Changes Baseline Buildout because of the inherent variability in the spatial distribution of projected new buildings employed by the model. The model places new buildings randomly based on input assumptions regarding zoning ordinances and many other restrictions, therefore there may be slight differences from one model run to another.
- CEI asserts that when accounting for new development in the AG zone, the offset of loosening septic system siting restrictions by rezoning 1-acre RR lots to 3-acre LDCR lots is maintained but to a lesser degree. By FBE's estimate (refer to Table 1, below), there would be 48 less projected new buildings (compared to 57 less) assuming new development in the AG zone, which is less but not as low as CEI's rough estimate of 30 less projected new buildings. The discrepancy comes largely from CEI's Table 3 assumption of using 101 projected new buildings in the AG zone for the 2022 Ordinance Changes Baseline Buildout scenario, copying from FBE's Max Development-LAWPC Lands Remain Protected scenario. The Max Development-LAWPC Lands Remain Protected scenario is an overestimate and not comparable because it removed all soil restrictions for septic system siting, when the 2022 Ordinance Changes Baseline Buildout scenario accounts for prohibiting installation on gravel outwash and stratified drift soils within 400 feet of surface waters and requiring 12" depth to a restrictive layer.

**LID Assumptions** – CEI agrees with FBE's LID assumptions used in the model. FBE concurs with CEI's note cautioning the potential discrepancy between implementation of phosphorus control requirements at the time of development and long-term enforcement of those requirements.

**Relaxing Septic Restrictions** - CEI offers some alternatives to the 2022 ordinance changes related to septic system and zoning regulations that would improve septic system siting “without creating potential new buildable areas.” FBE agrees that achieving the desired goal of water quality protection presents many challenges with no one right path to follow. Below FBE presents our understanding of the best science supporting or not supporting CEI’s suggested alternatives.

1. Maintain the existing depth restrictions (36” inches of native soil to limiting factor) but allow for amendment in sandy soils.

The argument in the October 2021 Lake Auburn Study in favor of lifting the 36” of native soil requirement was based on the fact that coarse sand and gravel soils are dominant in the Lake Auburn watershed. Coarse sand and gravel soils do not filter and remove nutrients and other pollutants as effectively as finer soils because wastewater drains rapidly through coarse soils into the groundwater. The coarse native soils with 36” depth to a restrictive layer around Lake Auburn are not effective at nutrient removal, and importing more suitable reactive soils (or some other nutrient removal approach) is needed to achieve adequate nutrient removal efficiencies to protect Lake Auburn. In an April 12, 2022 memorandum “*Lake Auburn Watershed Septic System Ordinance*” by retired Maine State Soil Scientist David Rocque, Mr. Rocque expressly supports the installation of disposal fields “on or above the original ground surface” (i.e., mounded systems) because “the majority of the biological activity in a soil [along with plant roots] is in the upper 6 inches,” which help to “remove and utilize many of the constituents in wastewater including nutrients and pathogens.” He argues that “installing disposal fields deep into the ground, particularly [in] coarse textured soil,” can result in “short circuiting” or “when the effluent moves through the soil without being treated.”

While CEI agrees that “coarse sand and gravels do not filter as well as fine materials and amendment of these soils may be appropriate,” a change to the native soil requirement “does not have to be tied to a relaxation of the existing depth restrictions.” FBE points out that in essence the 36” depth to a restrictive layer requirement restricts development only because those conditions are rarely met in Maine. Those rare conditions also tend to be inherently poor at treating nutrients from septic effluent, as is the case for the Lake Auburn area. Based on recommendations from the October 2021 Lake Auburn Study, the City devised the 2022 ordinance changes to remove the native soil requirement for septic system siting and restrict development more directly through zoning.

The 2022 ordinance changes retain the 36” depth to a restrictive layer but allow for the importation of suitable reactive soils to achieve the vertical separation, which permits the use of mounded systems in areas between 12” and 36” depth to a restrictive layer. CEI indicates that mounded systems “require more consideration and care during installation and to ensure they are maintained to continue functioning properly and to prevent breakouts.” A brief literature search by FBE revealed no studies showing mounded systems as inferior to conventional systems in their effluent treatment effectiveness; one study showed mounded systems outperformed conventional systems in regard to fecal indicator bacteria removal (Forbis-Stokes et al., 2016<sup>1</sup>). All wastewater systems require maintenance and care to function. A mounded system can be more protective of water quality not only because it adequately removes nutrients by ensuring correct soil media in the disposal field but also because failures tend to be more visible and more readily repaired. Mr. Rocque’s analysis of Auburn’s ordinances suggests that the current 36” native soil requirements are counter-productive to their intended purpose of protecting Lake Auburn. They tend to result in septic system installation in coarse, rapidly draining soils which are unable to adequately remove nutrients from wastewater. When these systems fail, the location of the failure is deep below the ground surface where nutrient pollution can enter groundwater and ultimately surface waters essentially unseen and likely uncorrected for the four-decade service life of the system. In short, we found no evidence supporting CEI’s claim that mounded systems represent a greater risk to water quality and instead find they can offer some important advantages.

CEI notes concerns about jeopardizing Lake Auburn’s ‘Filtration Avoidance’ waiver with “loosening existing restrictions.” Based on FBE’s prior discussions with the Maine Drinking Water Program about potential filtration waiver violation scenarios as part of the October 2021 Lake Auburn Study, FBE does not believe that the 2022 ordinance changes would jeopardize the waiver. However, the Maine Drinking Water Program in coordination with the EPA are the ultimate authorities on those determinations, and we recommend that the City of Auburn initiate those conversations with those entities to confirm, if the City has not done so already.

In addition, FBE argues that the change in septic system siting requirements coupled with the rezoning does not expand buildable area in the watershed but rather alters where new buildings can be added in the future, and importantly, reduces the total buildable area and number of new buildings in the Auburn portion of the Lake Auburn watershed.

<sup>1</sup> Forbis-Stokes, A., Munster, C., Karthikeyan, R. *et al.* Modeling Onsite Wastewater Treatment Systems in a Coastal Texas Watershed. *Water Air Soil Pollut* **227**, 430 (2016). <https://doi.org/10.1007/s11270-016-3120-8>

2. Allow only one septic system per lot to avoid clustering.

According to CEI, the City indicates that the “existing septic requirements encourage people interested in building a home within the watershed boundary to sell easements to their suitable soil site, clustering wastewater disposal systems in a relatively small area where very little wastewater treatment occurs.” The City avoids this issue in the future with the 2022 ordinance changes, but CEI argues that this issue could instead be remedied through an ordinance revision that permits only one septic system per lot. FBE concurs that either approach to remediating this particular issue can achieve similar outcomes.

3. Prohibit development within 300 feet of surface water.

CEI notes that “systems closest to the lake pose the greatest risk of passing contaminants such as nutrient, pathogens, and viruses” and “consideration should be given to prohibiting systems within a certain distance to surface waters in the watershed, such as the 300-foot buffer.” The City of Auburn partially addressed this in the 2022 ordinance changes by increasing the septic system siting prohibition on gravel outwash and stratified drift from 300 feet to 400 feet from all surface waters in the Auburn portion of the Lake Auburn watershed. However, the 2022 Ordinance Changes Baseline Buildout scenario likely underestimated the number of projected new buildings within 400 feet of surface waters<sup>2</sup> and were not accounted for in the phosphorus load and in-lake total phosphorus concentration model predictions. Adjusting the model to better account for these potential projected new buildings will provide better water quality predictions as a result of the 2022 ordinance changes. Certainly, ensuring no new development in critical areas such as the 300- or 400-foot buffer around surface waters would have a positive impact to water quality protection.

4. Reduce development density by rezoning RR to LDCR.

CEI supports this part of the 2022 ordinance changes to rezone RR to LDCR to reduce new development density in the Auburn portion of the Lake Auburn watershed.

## CONCLUDING REMARKS

CEI’s peer review raises reasonable questions that FBE’s team had internally deliberated during development of the October 2021 Lake Auburn Study. These are complex and controversial water quality protection topics with recommendations based on literature case studies and often best professional judgement, which can generate multiple pathways to achieving a similar outcome. FBE provides the following recommendations:

- Per FBE’s “*Revised Lake Auburn Watershed Delineation – Response to Peer Review*” December 14, 2022 memorandum to the City of Auburn, FBE recommends that the watershed boundary be adjusted to the most conservative extent accounting for both surface drainage topography and bedrock groundwater flow in the gravel pit area and that the City of Auburn continues to closely review the hydrologic impacts of site plans so that new development does not increase the watershed area to Lake Auburn.
- FBE continues to support the October 2021 Lake Auburn Study findings that Maine State Standards, including mounded systems, are acceptable for water quality protection when sited, designed, and installed properly, by utilizing suitable reactive soil amendments to remove nutrients through a 36” deep vertical separation before reaching groundwater.
- FBE maintains that the change in septic system siting requirements coupled with the rezoning reduces the total buildable area and number of new buildings in the Auburn portion of the Lake Auburn watershed and thus protects Lake Auburn water quality. FBE recommends that the City of Auburn consider some additional ordinance changes or modeling:
  - Consider expressly prohibiting new development in the AG zone if that is the City’s intention and current interpretation of existing relevant ordinances, which already severely restrict new development in the AG zone.
  - Rerun buildout analyses to fully reflect planning decisions, such as the future development potential of the AG zone and the septic system siting restrictions within the 300- or 400-foot buffer zone of surface waters.
  - Consider permitting only one septic system per lot to avoid clustering of septic systems via easements on lots with suitable soils.
  - Consider prohibiting all new development in the 300- or 400-foot buffer zone of surface waters in the watershed. This approach is both effective and straightforward in implementation and enforcement.

<sup>2</sup> As a limitation to the model input assumptions, using the Maine State Standards Table 4D soil profiles for gravel outwash and stratified drift conservatively excluded much of the 400-foot buffer zone around surface waters; field evaluation by a Licensed Site Evaluator would likely be far less restrictive in locating non-sandy soil areas for septic system siting.

**Table 1.** Standardized CEI/FBE-adjusted count of projected new buildings for the Business As Usual, Max Development-LAWPC Lands Remain Protected (matches FBE’s Max Development Not Allowing Building on LAWPC Lands scenario), and 2022 Ordinance Changes Baseline Buildout scenarios as presented in FBE documents (1), assuming no new development in the AG zone (2), and assuming new development in the AG zone (3). The Max Development-LAWPC Lands Remain Protected scenario presented in this table to achieve CEI’s approach is more accurately the Business As Usual scenario with septic system siting standards relaxed from 36” to 12” depth to a restrictive layer.

<b>Development Scenario:</b>	<b>Existing</b>	<b>Business as Usual</b>	<b>Max Development – LAWPC Lands Remain Protected</b>	<b>2022 Ordinance Changes Baseline Buildout</b>
<b>1. Assumptions: Original Values from FBE<sup>1</sup></b>		<b>Existing ordinances.</b>	<b>Removed all septic restrictions. Includes rezoning 51 parcels from AG, LDCR, SB, GB, and RR to NB and GB.</b>	<b>Proposed 2022 ordinance changes. No future development in AG.</b>
Agriculture and Resource Protection (AG)	77	74	101	0
General Business (GB)	2	0	44	0
Low Density Country Residential (LDCR)	47	16	24	79
Neighborhood Business (NB)	0	0	130	0
Rural Residential (RR)	218	143	279	0
Suburban Residential (SR)	75	6	9	6
<b>Total</b>	<b>419</b>	<b>239</b>	<b>587</b>	<b>85</b>
<b>2. Assumptions: CEI/FBE Adjusted Values Assuming No AG Zone Development</b>		<b>Existing ordinances.</b>	<b>Removed parcel rezoning (to match Business As Usual). No future development in AG.</b>	<b>Proposed 2022 ordinance changes. No future development in AG.</b>
		<b>Adjusted to remove buildings from AG for comparison with 2022.</b>	<b>Adjusted septic restrictions for a 12" depth to restrictive layer and sandy soil restriction for septic system siting within 300 feet of surface waters.</b>	<b>Adjusted for 400 foot buffer septic siting ordinance change limitations.</b>
Agriculture and Resource Protection (AG)	77	0	0	0
General Business (GB)	2	0	0	0
Low Density Country Residential (LDCR)	47	16	22	79
Neighborhood Business (NB)	0	0	0	0
Rural Residential (RR)	218	143	161	0
Suburban Residential (SR)	75	6	8	6
Additional Adjustments <sup>2</sup>	--	--	--	23
<b>Total</b>	<b>419</b>	<b>165</b>	<b>191</b>	<b>108</b>
<b>3. Assumptions: CEI/FBE Adjusted Values Assuming AG Zone Development</b>		<b>Existing ordinances.</b>	<b>Removed parcel rezoning (to match Business As Usual).</b>	<b>Proposed 2022 ordinance changes.</b>
			<b>Adjusted septic restrictions for a 12" depth to restrictive layer and sandy soil restriction for septic system siting within 300 feet of surface waters.</b>	<b>Adjusted to add buildings to AG. Adjusted for 400 foot buffer septic siting ordinance change limitations.</b>
Agriculture and Resource Protection (AG)	77	74	83	83
General Business (GB)	2	0	0	0
Low Density Country Residential (LDCR)	47	16	22	79
Neighborhood Business (NB)	0	0	0	0
Rural Residential (RR)	218	143	161	0
Suburban Residential (SR)	75	6	8	6
Additional Adjustment <sup>2</sup>	--	--	--	23
<b>Total</b>	<b>419</b>	<b>239</b>	<b>274</b>	<b>191</b>

<sup>1</sup>FBE updated its buildout assumptions for the AG zone in its 2022 modeling update. These updates assumed no new development would occur in the AG zone due to the restrictive zoning. Updates were not made to the “Business as Usual” scenario to reflect this but were discussed as limitation for comparing the phosphorus loads between the two scenarios.

<sup>2</sup>There were 23 projected new buildings identified within the 300-foot buffer under the “Business as Usual” scenario that the 2022 ordinance changes conservatively excluded due to the limitations of using the Table 4D soil profiles. Those 23 projected new buildings were added here for more accurate comparison to the 2021 buildout scenarios.

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-TWO

H.P. 1489 - L.D. 2003

**An Act To Implement the Recommendations of the Commission To Increase  
Housing Opportunities in Maine by Studying Zoning and Land Use  
Restrictions**

Be it enacted by the People of the State of Maine as follows:

**Sec. 1. 5 MRSA §13056, sub-§7**, as amended by PL 2003, c. 159, §3, is further amended to read:

**7. Contract for services.** When contracting for services, to the maximum extent feasible, seek to use the State's private sector resources in conducting studies, providing services and preparing publications; and

**Sec. 2. 5 MRSA §13056, sub-§8**, as enacted by PL 2003, c. 159, §4, is amended to read:

**8. Lead agency for business assistance in response to certain events.** Be the lead agency for the State to provide information and business assistance to employers and businesses as part of the State's response to an event that causes the Department of Labor to carry out rapid-response activities as described in 29 United States Code, Sections 2801 to 2872 (2002); and

**Sec. 3. 5 MRSA §13056, sub-§9** is enacted to read:

**9. Establish statewide housing production goals.** Establish, in coordination with the Maine State Housing Authority, a statewide housing production goal that increases the availability and affordability of all types of housing in all parts of the State. The department shall establish regional housing production goals based on the statewide housing production goal. In establishing these goals, the department shall:

**A. Establish measurable standards and benchmarks for success of the goals;**

**B. Consider information submitted to the department from municipalities about current or prospective housing developments and permits issued for the construction of housing; and**

**C. Consider any other information as necessary to meet the goals pursuant to this subsection.**



Sec. 4. 30-A MRSA §4364 is enacted to read:

**§4364. Affordable housing density**

For an affordable housing development approved on or after July 1, 2023, a municipality with density requirements shall apply density requirements in accordance with this section.

**1. Definition.** For the purposes of this section, "affordable housing development" means:

**A.** For rental housing, a development in which a household whose income does not exceed 80% of the median income for the area as defined by the United States Department of Housing and Urban Development under the United States Housing Act of 1937, Public Law 75-412, 50 Stat. 888, Section 8, as amended, can afford a majority of the units that the developer designates as affordable without spending more than 30% of the household's monthly income on housing costs; and

**B.** For owned housing, a development in which a household whose income does not exceed 120% of the median income for the area as defined by the United States Department of Housing and Urban Development under the United States Housing Act of 1937, Public Law 75-412, 50 Stat. 888, Section 8, as amended, can afford a majority of the units that the developer designates as affordable without spending more than 30% of the household's monthly income on housing costs.

**2. Density requirements.** A municipality shall allow an affordable housing development where multifamily dwellings are allowed to have a dwelling unit density of at least 2 1/2 times the base density that is otherwise allowed in that location and may not require more than 2 off-street parking spaces for every 3 units. The development must be in a designated growth area of a municipality consistent with section 4349-A, subsection 1, paragraph A or B or the development must be served by a public, special district or other centrally managed water system and a public, special district or other comparable sewer system. The development must comply with minimum lot size requirements in accordance with Title 12, chapter 423- A, as applicable.

**3. Long-term affordability.** Before approving an affordable housing development, a municipality shall require that the owner of the affordable housing development have executed a restrictive covenant, recorded in the appropriate registry of deeds, for the benefit of and enforceable by a party acceptable to the municipality, to ensure that for at least 30 years after completion of construction:

**A.** For rental housing, occupancy of all of the units designated affordable in the development will remain limited to households at or below 80% of the local area median income at the time of initial occupancy; and

**B.** For owned housing, occupancy of all of the units designated affordable in the development will remain limited to households at or below 120% of the local area median income at the time of initial occupancy.

**4. Shoreland zoning.** An affordable housing development must comply with shoreland zoning requirements established by the Department of Environmental Protection under Title 38, chapter 3 and municipal shoreland zoning ordinances.

**5. Water and wastewater.** The owner of an affordable housing development shall provide written verification to the municipality that each unit of the housing development is connected to adequate water and wastewater services before the municipality may certify the development for occupancy. Written verification under this subsection must include:

A. If a housing unit is connected to a public, special district or other comparable sewer system, proof of adequate service to support any additional flow created by the unit and proof of payment for the connection to the sewer system;

B. If a housing unit is connected to a septic system, proof of adequate sewage disposal for subsurface wastewater. The septic system must be verified as adequate by a local plumbing inspector under section 4221. Plans for subsurface wastewater disposal must be prepared by a licensed site evaluator in accordance with subsurface wastewater disposal rules adopted under Title 22, section 42;

C. If a housing unit is connected to a public, special district or other centrally managed water system, proof of adequate service to support any additional flow created by the unit, proof of payment for the connection and the volume and supply of water required for the unit; and

D. If a housing unit is connected to a well, proof of access to potable water. Any tests of an existing well or proposed well must indicate that the water supply is potable and acceptable for domestic use.

**6. Subdivision requirements.** This section may not be construed to exempt a subdivider from the requirements for division of a tract or parcel of land in accordance with subchapter 4.

**7. Restrictive covenants.** This section may not be construed to interfere with, abrogate or annul the validity or enforceability of any valid and enforceable easement, covenant, deed restriction or other agreement or instrument between private parties that imposes greater restrictions than those provided in this section, as long as the agreement does not abrogate rights under the United States Constitution or the Constitution of Maine.

**8. Rules.** The Department of Economic and Community Development shall adopt rules to administer and enforce this section. The department shall consult with the Department of Agriculture, Conservation and Forestry in adopting rules pursuant to this subsection. The rules must include criteria for a municipality to use in calculating housing costs. Rules adopted pursuant to this subsection are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

**Sec. 5. 30-A MRSA §4364-A** is enacted to read:

**§4364-A. Residential areas, generally; up to 4 dwelling units allowed**

**1. Use allowed.** Notwithstanding any provision of law to the contrary, except as provided in Title 12, chapter 423-A, for any area in which housing is allowed, a municipality shall allow structures with up to 2 dwelling units per lot if that lot does not contain an existing dwelling unit, except that a municipality shall allow up to 4 dwelling units per lot if that lot does not contain an existing dwelling unit and the lot is located in a designated growth area within a municipality consistent with section 4349-A, subsection 1, paragraph A or B or if the lot is served by a public, special district or other centrally managed water system and a public, special district or other comparable sewer system in a municipality without a comprehensive plan.



A municipality shall allow on a lot with one existing dwelling unit the addition of up to 2 dwelling units: one additional dwelling unit within or attached to an existing structure or one additional detached dwelling unit, or one of each.

A municipality may allow more units than the number required to be allowed by this subsection.

**2. Zoning requirements.** With respect to dwelling units allowed under this section, municipal zoning ordinances must comply with the following conditions.

A. If more than one dwelling unit has been constructed on a lot as a result of the allowance under this section or section 4364-B, the lot is not eligible for any additional increases in density except as allowed by the municipality.

B. A municipal zoning ordinance may establish a prohibition or an allowance for lots where a dwelling unit in existence after July 1, 2023 is torn down and an empty lot results.

**3. General requirements.** A municipal ordinance may not establish dimensional requirements or setback requirements for dwelling units allowed under this section that are greater than dimensional requirements or setback requirements for single-family housing units, except that a municipal ordinance may establish requirements for a lot area per dwelling unit as long as the required lot area for subsequent units on a lot is not greater than the required lot area for the first unit.

**4. Water and wastewater.** The owner of a housing structure must provide written verification to the municipality that the structure is connected to adequate water and wastewater services before the municipality may certify the structure for occupancy. Written verification under this subsection must include:

A. If a housing structure is connected to a public, special district or other comparable sewer system, proof of adequate service to support any additional flow created by the structure and proof of payment for the connection to the sewer system;

B. If a housing structure is connected to a septic system, proof of adequate sewage disposal for subsurface wastewater. The septic system must be verified as adequate by a local plumbing inspector under section 4221. Plans for subsurface wastewater disposal must be prepared by a licensed site evaluator in accordance with subsurface wastewater disposal rules adopted under Title 22, section 42;

C. If a housing structure is connected to a public, special district or other centrally managed water system, proof of adequate service to support any additional flow created by the structure, proof of payment for the connection and the volume and supply of water required for the structure; and

D. If a housing structure is connected to a well, proof of access to potable water. Any tests of an existing well or proposed well must indicate that the water supply is potable and acceptable for domestic use.

**5. Municipal implementation.** In adopting an ordinance, a municipality may:

A. Establish an application and permitting process for housing structures;

B. Impose fines for violations of building, zoning and utility requirements for housing structures; and

C. Establish alternative criteria that are less restrictive than the requirements of subsection 4 for the approval of a housing structure only in circumstances in which the municipality would be able to provide a variance under section 4353, subsection 4, 4-A, 4-B or 4-C.

6. Shoreland zoning. A housing structure must comply with shoreland zoning requirements established by the Department of Environmental Protection under Title 38, chapter 3 and municipal shoreland zoning ordinances.

7. Subdivision requirements. This section may not be construed to exempt a subdivider from the requirements for division of a tract or parcel of land in accordance with subchapter 4.

8. Restrictive covenants. This section may not be construed to interfere with, abrogate or annul the validity or enforceability of any valid and enforceable easement, covenant, deed restriction or other agreement or instrument between private parties that imposes greater restrictions than those provided in this section, as long as the agreement does not abrogate rights under the United States Constitution or the Constitution of Maine.

9. Rules. The Department of Economic and Community Development may adopt rules to administer and enforce this section. The department shall consult with the Department of Agriculture, Conservation and Forestry in adopting rules pursuant to this subsection. Rules adopted pursuant to this section are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

10. Implementation. A municipality is not required to implement the requirements of this section until July 1, 2023.

**Sec. 6. 30-A MRSA §4364-B** is enacted to read:

**§4364-B. Accessory dwelling units**

1. Use permitted. Except as provided in Title 12, chapter 423-A, a municipality shall allow an accessory dwelling unit to be located on the same lot as a single-family dwelling unit in any area in which housing is permitted.

2. Restrictions. An accessory dwelling unit may be constructed only:

- A. Within an existing dwelling unit on the lot;
- B. Attached to or sharing a wall with a single-family dwelling unit; or
- C. As a new structure on the lot for the primary purpose of creating an accessory dwelling unit.

This subsection does not restrict the construction or permitting of accessory dwelling units constructed and certified for occupancy prior to July 1, 2023.

3. Zoning requirements. With respect to accessory dwelling units, municipal zoning ordinances must comply with the following conditions:

- A. At least one accessory dwelling unit must be allowed on any lot where a single-family dwelling unit is the principal structure; and
- B. If more than one accessory dwelling unit has been constructed on a lot as a result of the allowance under this section or section 4364-A, the lot is not eligible for any additional increases in density except as allowed by the municipality.

4. General requirements. With respect to accessory dwelling units, municipalities shall comply with the following conditions.

A. A municipality shall exempt an accessory dwelling unit from any density requirements or calculations related to the area in which the accessory dwelling unit is constructed.

B. For an accessory dwelling unit located within the same structure as a single-family dwelling unit or attached to or sharing a wall with a single-family dwelling unit, the setback requirements and dimensional requirements must be the same as the setback requirements and dimensional requirements of the single-family dwelling unit, except for an accessory dwelling unit permitted in an existing accessory building or secondary building or garage as of July 1, 2023, in which case the requisite setback requirements for such a structure apply. A municipality may establish more permissive dimensional and set back requirements for an accessory dwelling unit.

C. An accessory dwelling unit may not be subject to any additional parking requirements beyond the parking requirements of the single-family dwelling unit on the lot where the accessory dwelling unit is located.

5. Shoreland zoning. An accessory dwelling unit must comply with shoreland zoning requirements established by the Department of Environmental Protection under Title 38, chapter 3 and municipal shoreland zoning ordinances.

6. Size requirements. An accessory dwelling unit must meet a minimum size of 190 square feet. If the Technical Building Codes and Standards Board under Title 10, section 9722 adopts a different minimum size, that standard applies. A municipality may impose a maximum size for an accessory dwelling unit.

7. Water and wastewater. The owner of an accessory dwelling unit must provide written verification to the municipality that the accessory dwelling unit is connected to adequate water and wastewater services before the municipality may certify the accessory dwelling unit for occupancy. Written verification under this subsection must include:

A. If an accessory dwelling unit is connected to a public, special district or other comparable sewer system, proof of adequate service to support any additional flow created by the accessory dwelling unit and proof of payment for the connection to the sewer system;

B. If an accessory dwelling unit is connected to a septic system, proof of adequate sewage disposal for subsurface wastewater. The septic system must be verified as adequate by a local plumbing inspector under section 4221. Plans for subsurface wastewater disposal must be prepared by a licensed site evaluator in accordance with subsurface wastewater disposal rules adopted under Title 22, section 42;

C. If an accessory dwelling unit is connected to a public, special district or other centrally managed water system, proof of adequate service to support any additional flow created by the accessory dwelling unit, proof of payment for the connection and the volume and supply of water required for the accessory dwelling unit; and

D. If an accessory dwelling unit is connected to a well, proof of access to potable water. Any tests of an existing well or proposed well must indicate that the water supply is potable and acceptable for domestic use.

**8. Municipal implementation.** In adopting an ordinance under this section, a municipality may:

A. Establish an application and permitting process for accessory dwelling units;

B. Impose fines for violations of building, zoning and utility requirements for accessory dwelling units; and

C. Establish alternative criteria that are less restrictive than the requirements of subsections 4, 5, 6 and 7 for the approval of an accessory dwelling unit only in circumstances in which the municipality would be able to provide a variance under section 4353, subsection 4, 4-A, 4-B or 4-C.

**9. Rate of growth ordinance.** A permit issued by a municipality for an accessory dwelling unit does not count as a permit issued toward a municipality's rate of growth ordinance as described in section 4360.

**10. Subdivision requirements.** This section may not be construed to exempt a subdivider from the requirements for division of a tract or parcel of land in accordance with subchapter 4.

**11. Restrictive covenants.** This section may not be construed to interfere with, abrogate or annul the validity or enforceability of any valid or enforceable easement, covenant, deed restriction or other agreement or instrument between private parties that imposes greater restrictions than those provided in this section, as long as the agreement does not abrogate rights under the United States Constitution or the Constitution of Maine.

**12. Rules.** The Department of Economic and Community Development may adopt rules to administer and enforce this section. The department shall consult with the Department of Agriculture, Conservation and Forestry in adopting rules pursuant to this subsection. Rules adopted pursuant to this subsection are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

**13. Implementation.** A municipality is not required to implement the requirements of this section until July 1, 2023.

**Sec. 7. 30-A MRSA §4364-C** is enacted to read:

**§4364-C. Municipal role in statewide housing production goals**

This section governs the responsibilities and roles of municipalities in achieving the statewide and regional housing production goals set by the Department of Economic and Community Development in Title 5, section 13056, subsection 9.

**1. Fair housing and nondiscrimination.** A municipality shall ensure that ordinances and regulations are designed to affirmatively further the purposes of the federal Fair Housing Act, 42 United States Code, Chapter 45, as amended, and the Maine Human Rights Act to achieve the statewide or regional housing production goal.

**2. Municipalities may regulate short-term rentals.** A municipality may establish and enforce regulations regarding short-term rental units in order to achieve the statewide or regional housing production goal. For the purposes of this subsection, "short-term rental unit" means living quarters offered for rental through a transient rental platform as defined by Title 36, section 1752, subsection 20-C.