Natural Burials in HRM
A Sustainable Alternative to the Modern Cemetery

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"From my rotting body, flowers shall grow and I am in them and that is eternity."

~Edvard Munch

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Executive Summary

The Halifax Regional Municipality (HRM) is a leading sustainable city for a medium sized municipality in Canada (Shin, 2009). HRM established the Sustainable Environmental Management Office (SEMO) in 2004 to take an integrated approach to matters of environmental sustainability that focuses on clean land, energy, air and water. HRM reaffirmed their commitment to environmental practices in January 2009 (HRM, 2009b). Recent evidence suggests that modern western cemeteries, are not environmentally sustainable and alternative practices, such as natural burials, are a sustainable alternative. The HRM; however, does not have a natural burial cemetery and current policies do not provide for one. HRM Cemeteries are expected to reach capacity within the next five to seven years (HRM, 2009, personal communication); therefore, new cemetery land needs to be located and developed. The need for additional cemetery space presents a good opportunity for HRM to adopt natural burial practices and meet their sustainability directives.

Research on cemeteries throughout the United States, South America, Australia and parts of Europe indicate soil and groundwater contamination result from modern burial practices. Much of this contamination results from organic chemicals and heavy metals leaching into the burial environment. Embalming fluid, principally formaldehyde, leaches through decaying caskets into the soil environment and negatively impacts soil biota, thus reducing microorganism activity and reducing the rate of decay. Similarly, heavy metals from casket adornments and varnishes leach into the soil, causing localized toxicity that inhibits microbial activity and plant communities. Furthermore, hardwood trees are harvested from a finite supply to make caskets, and fertilizers and pesticides are applied to cemeteries to contribute to beautification and perpetual care. Cremation is not a sustainable option, as it involves large amounts of fuel, which contributes to smog and greenhouse gas emissions, and the combustion of bodies contributes to air quality deterioration.

Natural burials, however, are a sustainable alternative to the modern cemetery, and they are growing in popularity across the United Kingdom, the United States

and Canada. People interred in natural burial cemeteries are not embalmed, and are not enclosed in a traditional casket. In place of modern caskets, the deceased may be wrapped in a shroud or laid to rest in a readily biodegradable casket made of cardboard or wicker. The bodies are laid in environments with conditions that promote rapid decomposition, while limiting environmental impacts. Natural burials also promote wildlife habitat and secondary recreational use, by replacing sprawling manicured, headstone-laden properties with reusable plots that are planted with native vegetation.

Adhering to siting standards will further minimize environmental impacts resulting from natural burial cemeteries. A phase one preliminary site assessment checklist considers all aspects of cemetery site selection, including minimum distances to water sources and water wells, soil drainage, soil depth and slope (see Appendix C). Assessing these criteria at the preliminary stage involves a site visit, and review of topographic, soil and aerial maps. Additional criteria in the checklist include scenic views from the site, recreation trails at or near the site, and accessibility to the site from major roads. These additional criteria are not necessary; however, they ensure that the cemetery is consistent with natural burial principles. After completing the phase one preliminary site assessment, a phase two site assessment should occur that would involve technical tests to ensure minimum environmental criteria is in fact met. If minimum criteria are not met during the phase one site assessment, the site would not be recommended for a natural burial cemetery.

The HRM has identified a 38-acre piece of land off Bisset Road in Cole Harbour as a potential location for a new cemetery. This location was evaluated using the phase one preliminary site assessment checklist. All required criteria were met and most recommended were met criteria, indicating that the more detailed phase two site assessment can occur. Should phase two be successful, the site would be recommended for a natural burial cemetery.

The current Nova Scotia statute, *Cemeteries Protection Act*, 1998, and the HRM by-law, *Cemeteries By-law*, 2008, do not provide for natural burials. Policy changes are required before establishing a natural burial cemetery in the HRM. The definition of "cemeteries" in the *Cemeteries Protection Act* should indicate that not all burial grounds are identified as cemeteries through the use of headstones. By amending the definition, natural burial cemeteries would be recognized as a burial ground. The *Cemeteries By-law* should be amended to include a separate section that specifically outlines what can and cannot occur in natural burial cemeteries in the HRM.

Natural burial cemeteries have been promoted as an environmentally sustainable burial practice. It is recommended that the HRM adopt natural burial practices to advance their sustainability directives and to address concerns of limited cemetery capacity.

1.0 Introduction

Death is an inevitable end to life, marked by a type of 'universal rite' that transcends all cultural boundaries. Death, a shared experience, is celebrated, embraced and feared around the world (Ariss, 2004). Mortuary ritual is a meaningful expression of a particular philosophical belief system and values of a given society. It varies widely across cultures and time periods. The duty to bury a body extends from religious beliefs (Ariss, 2004). Everyone has the right to a decent burial because of two generally accepted notions: to provide dignity to the deceased, including a final resting place; and to null societal fears surrounding the spread of disease from decaying bodies (Conway, 2003).

Until the late 19th century, death was a personal experience. In western societies, namely Canada, the United States (US) and the United Kingdom (UK), death occurred at home, with a notable social presence during the first hours following death (Ariss, 2004). Customary rituals typically included washing the body of the deceased, laying it in a box or casket, performing prayer rituals or reflecting over it, and finally, placing it into the earth. Once the body was buried, a marker was erected over the final resting place as a means of commemorating the person who lay beneath (Stowe Jr. et al., 2001).

By the 20th century, customary rituals associated with death became institutionalized and depersonalized (Ariss, 2004), becoming an expensive and ecologically harmful process (Stowe Jr. et al., 2001). Modern cemeteries and funeral practices in North America are arguably unsustainable, posing unnecessary environmental impacts. However, an emerging sustainable alternative to modern practices known as natural burials is becoming available in many communities across the UK, the US, and to a lesser extent, Canada.

Although natural burials are becoming an increasingly popular option, the Halifax Regional Municipality (HRM) does not have a natural burial cemetery, and current municipal by-laws and provincial policies do not provide for them. There is a need to address this lack of policy, as it is anticipated that existing HRM cemeteries will reach capacity between 2014 and 2016 (HRM, 2009, personal communication).

Offering an opportunity for natural burials will allow for additional options for HRM citizens to hold funerals according to their value system and will coincide with HRM's sustainability directives.

In 2004, the HRM established the Sustainable Environmental Management Office (SEMO) to take an integrated systems approach to environmental sustainability, focusing on clean land, energy, air and water (HRM, 2009a). In January 2009, the HRM reaffirmed its endorsement of participation and encouragement in environmentally sustainable practices in the municipality (HRM, 2009b). Additionally, the HRM is considered a leading sustainable city according to the 2009 Sustainable Cities report from Corporate Knights, a Canadian magazine that focuses on environmental and social responsibility in commerce. According to the report, the HRM ranked first overall on sustainability matters for a medium sized city in Canada (Shin, 2009).

The HRM environmental initiative, the Sustainable Cities report ranking, and the growing interest suggest that the HRM should encourage and support the establishment of natural burial cemeteries.

People will continue to die and cemetery space is required for burial. The HRM has a finite number of cemetery plots; thus, finding new cemetery space is required. Ideally, principles of environmental sustainability that HRM subscribes to will be applied to a new cemetery. In this research report, I discuss environmental impacts associated with traditional burials, identify ways that natural burials contribute to environmental sustainability, propose a list of land capability criteria recommended for siting a natural burial cemetery, evaluate a potential location in the HRM using the proposed criteria, and suggest changes to the provincial statute and HRM by-law to enable the practice.

2.0 Modern Cemetery Practices

Modern cemeteries are sprawling landscapes of tombstones. The current cemetery practice began in Western Europe in the 19th century when small churchyard cemeteries were reaching capacity. As the population grew in Western Europe, burial space became scarce: corpses were left partially buried and the fluids, gases and smells from decomposition were feared as sources of disease (Francis et al., 2005). The modern cemetery concept grew from the ideas of reformists such as Dr. George Walker, George Milner and John Strang, who suggested that burials should take place outside of populated city limits, and in aesthetically pleasing areas that would be appropriate for quiet reflection (Francis et al., 2005). The modern cemetery was sometimes used as a public park, and was a popular place where people could "escape the bustle and clangor of the city - for strolling, for solitude, and even for family picnics" (Newton, 1978, p. 268).

Modern cemetery design was brought to North America during European colonization. With the current trend of increasing mortality rates, modern cemeteries have become dense clusters of headstones to accommodate the large numbre of deceased. Questions regarding the sustainability of this burial practice are beginning to emerge.

Environmental sustainability can be defined as the "ability to maintain the qualities that are valued in the physical environment" (Sutton, 2004). Studies have shown that modern burial practices have negative impacts on the natural environment. Case studies in Australia, the UK, Germany, South America and the United States indicate that modern burial practices can cause soil and water contamination of cemetery sites and adjacent areas (Young et al., 2002; Spongberg and Beck, 2000). The greatest contamination is within the burial field and diminishes rapidly as the distance from the cemetery increases (Young et al., 2002).

Processes controlling the release of potential contaminants into the burial field are complex, involving the interaction of hydrogeological and climatic factors, cemetery management practices, and practices associated with the preparation of bodies for burial (Young et al., 2002). Alternatives

to modern burials, such as cremation, also contribute to environmental contamination. The following sections address ways in which environmental impacts result from modern burial practices, including land contamination from the burial of embalmed bodies and associated materials, the unsustainable use of land for cemeteries, and atmospheric pollution resulting from cremation.

2.1 The Body

Embalming a body after death is common practice in North America. The intent of this practice is to slow down the decay process and present an aesthetically pleasing body for grieving family and friends to reflect over (Chiappelli and Chiappelli, 2008).

Only Canada and the US actively practice embalming, and occasionally, the UK and Australia (Chiappelli and Chiappelli, 2008). In Canada, approximately 15 litres of embalming fluid is injected into an average sized deceased adult (Natural Burial Association, 2009, personal communication). With approximately 236,000 deaths in Canada in 2006 (Statistics Canada, 2006), there is potential for approximately 3.5 million litres of embalming fluid to leach into soil and groundwater, causing unnecessary environmental contamination.

Formaldehyde is the main ingredient in embalming fluid, followed by methanol and ethanol (Welton, 2003). Once the body begins to decompose, the chemicals that make up the embalming fluid begin to break down. For example, formaldehyde breaks down into formic acid and then into carbon dioxide. Once embalming fluid seeps through decaying caskets, soil contamination occurs (Chiappelli and Chiappelli, 2008). Formaldehyde products serve as a biocide, affecting microbial composition of soils by reducing diversity and abundance of soil biota (Rossmoore and Sondossi, 1988; Trevors, 1996). The loss of soil organisms reduces decomposition rates and nutrient cycling, which, in turn, disrupts plant community structure (De Deyn et al. 2004) and the decomposition of bodies (Mann et al, 1990).

Embalming fluids are not only an environmental hazard, but are an occupational health and safety hazard. In 2004, formaldehyde was upgraded from a probable human carcinogen to a known human carcinogen (IARC, 2004). Occupational health hazards of formaldehyde exposure can be serious. Nasopharyngeal cancer is the most common health hazard; levels as low as 10 parts per million (ppm) can cause severe reactions in people (IARC, 2004). Embalmers are typically exposed to 9 ppm of formaldehyde while embalming an average size body (Chiappelli and Chiappelli, 2008).

Although embalming is commonly practiced, misconceptions about it exist. The first misconception is that embalming is necessary to prevent the spread of disease. In fact, when the body dies, disease causing bacteria will die with it, or shortly thereafter, as most pathogenic bacteria are dependent on the survival of the host (Morgan, 2004). A second misconception about embalming is that it is a requirement for burial. In most cases, embalming is not required. It may be necessary; however, when there is an extended period of time

between death and burial (e.g. weeks or months), or if the body will be crossing provincial or national borders (Industry Canada, 2009). Thus, embalming is not a necessary procedure in the context of human health or for most burials.

Some cultural and religious groups refrain from embalming practices, with no adverse environmental or health affects documented. Jewish and Islamic customs, for example, prohibit desecration of the body, which includes the practice of embalming. However, burial of Jews or Muslims must occur as soon as possible after death, typically within 24 hours (Beck and Goldberg, 1996; Islamic Society of North America, 2007).

2.2 Burial Materials

In North America, burying the deceased in caskets is common practice, but not all countries in the world require casket burial, such as where Islam is the dominant religion (Islamic Society of North America, 2007). Jewish traditions use a simple pine box with no varnishes or adornments (Beck and Goldberg, 1996). Materials associated with casket construction vary depending on how ornate the casket is. Hardwood, softwood, stainless steel, copper, bronze or fiberboard are some of the most common materials used for construction, and they are often lined with fabric, commonly cotton or silk, and finished with varnishes and adornments (Casket and Funeral Supply Association of America, n.d.).

Hardwood caskets, typically made with poplar, willow, oak, birch, maple, cherry, black walnut or mahogany, require between 130 and 150 board feet of lumber per casket, and often more for extra large caskets (Casket and Funeral Supply Association of America, n.d.). In 2007, approximately 300,000 hardwood caskets were made in the United States, equaling approximately 45 million board feet. Hardwood is harvested from a finite supply and then buried in the ground a short time later (Casket and Funeral Supply Association of America, n.d.). Canadian statistics are not currently available; however, there is no reason to believe they would not be similar.

Satin or gloss varnishes are often applied to the exterior of the casket, and metal adornments are often added for aesthetic appeal (Ashley, 2004). Varnishes and metal ions can leach into the soil surrounding a grave. Localized concentrations of these products can lead to conditions of toxicity that inhibit microbial activity, thereby reducing decomposition (Janaway, 1996).

The fabric that lines caskets may not be readily decomposable. Chemical dyes and bleach may leach during the decomposition process, adding further contaminants to the surrounding soil environment (Janaway, 2008). Silk is a natural fibre that decomposes readily in aerobic environments, but can survive for centuries in anaerobic conditions (Janaway, 2008). By contrast, undyed cotton is highly vulnerable to decomposition in any type of soil environment (Janaway, 2008). Synthetic fibre, such as nylon, will not decompose because it is hydrophobic and resistant to insect and microbial breakdown (Janaway, 2008).

Hardwood caskets are not completely impenetrable to organisms entering or decomposition matter leaking out. Though the timeline will vary depending on the burial environment, hardwood caskets will eventually decompose, but at a slower rate than fibreboard or cardboard caskets. Steel, copper and bronze caskets are airtight, which prevents decomposition matter from entering the soil. Metal caskets can last for millennia; however, they begin to corrode and metal ions can contaminate the soil and groundwater environment (Spongberg and Becks, 2000). Caskets that take millennia to decompose introduce issues of land availability.

2.3 The Land

Land suitable for cemetery development is also suitable for urban development or agricultural land, and competing interests for space can arise. With an increased need for cemetery space in Canada, and increased urban development, appropriate cemetery space is difficult to secure. In Canada, once land has been used as a cemetery, no further uses can occur in that location, regardless of the age of the cemetery (Blair, 2005). While individual grave lots do not take up a lot of space (approximately 2′ x 6′), over time the cumulative area of grave lots can be substantial.

Many cemeteries in Canada require grave lots to be lined with a concrete vault or liner to prevent the ground from shifting and settling, or to limit decomposition products from leaching into soil and groundwater. Once the casket is lowered into the grave space, a concrete lid may be placed over top before the soil is replaced (Ashley, 2004). Once liners are in place, the grave lot becomes unusable for future burials.

Figure 1: A cemetery in downtown Halifax that illustrates well-manicured lawns and sprawling headstones. (Source: Theresa Piorkowski, 2008).

Grave markers, usually made from stone, granite or marble, are required in most burial grounds and are meant to last in perpetuity. The marker provides a memorial for the deceased, and allows family and friends to locate the grave (Ashley, 2004). However, grave markers clutter the landscape, and often foster a solemn feeling in people who pass by, a stark difference from the image of the cemetery as a place for family picnics. In addition, wildlife will not inhabit the modern cemetery, because few trees and places of cover exist among the rows of grave markers (Thomas and Dixon, 1973).

Cemeteries are beautified through perpetual care, which may involve the application of fertilizers and pesticides to lawns, as well as irrigation when necessary. If used, fertilizers and pesticides can run off into nearby watercourses encouraging excess algal and vegetation growth (Stowe Jr. et al., 2001). Tree and shrub removal, and pruning are also performed as required (Stowe Jr. et al., 2001). Figure 1 presents an image of a beautified cemetery through perpetual care.

2.4 The Atmosphere

Modern burial practices can impact air quality. Cremation has become an increasingly popular option for disposing of deceased bodies, primarily due to scarcity in land and resources or lower financial costs of the funeral service. In Canada, cremation accounts for approximately 55% of human disposal, and in countries such as the UK and Japan, cremation rates are 71% and 99% respectively (Funeral Service Association of Canada, 2009). Where Roman Catholicism is strong, cremation percentages are lower due to the emphasis on the resurrection of the body (Memorial Society of British Columbia, n.d.). Islam and Jewish religious traditions do not support cremation (Beck and Goldberg, 1996 and Islamic Society of North America, 2007).

Although burying a small urn or scattering ashes (prohibited by law in some places) requires significantly less land than traditional burials, cremation itself, is environmentally unsustainable, as it is energy intensive and contributes to smog and greenhouse gas emissions (Memorial Society of British Columbia, n.d). Cremation of an average human body takes between two and three hours in a sealed chamber with temperatures ranging between 760-1149°C, requiring approximately 180 litres of natural gas to reduce the body to ash (Memorial Society of British Columbia, n.d.). During cremation, emissions such as nitrogen oxides, carbon monoxide, sulfur dioxide, particulate matter, mercury, hydrogen fluoride, hydrogen chloride, persistent organic pollutants, and other heavy metals are released into the atmosphere (Memorial Society of British Columbia, n.d.).

Mercury is a particular problem. Approximately 0.9 to 3.41 grams of mercury, primarily from dental amalgam, is emitted during each cremation, depending on the individual body and whether there was dental fillings. This translates to approximately 109 kg to 411 kilograms of annual mercury emissions in Canada, or 1.4 to 5.0 percent of the national mercury emissions average (Memorial Society of British Columbia, n.d.). Mercury does not break down in the atmosphere, and when depos-

ited on land or in water, it can transform into methylmercury, a toxin that bioaccumulates in ecological and human food chains (Hollabaugh, 2006).

2.5 Modern Cemetery Conclusions

Modern cemeteries are not a sustainable method of burying the deceased. Soil contamination occurs in the burial field from embalming fluid, varnishes, metals, and fertilizers. Hardwood trees are felled to construct caskets, grave markers in cemeteries interrupt habitat, and cremation contributes to greenhouse gas and air pollution. Natural burials provide a sustainable alternative to modern burials by reducing soil and groundwater contamination, eliminating fugitive air emissions associated with cremation, and providing a more appropriate use of land and resources.

3.0 Natural Burials

A natural burial cemetery offers a sustainable solution to many environmental issues associated with the modern cemetery. It is a means of returning the body to the earth to decompose within the natural cycles of the planet without the use of environmentally degrading chemicals (Memorial Society of British Columbia, n.d.). Bodies are laid to rest in a minimally disturbed natural environment, where native vegetation is encouraged to grow with the help of human remains that fertilize the ground (Stowe Jr. et al., 2001). The intention behind natural burials is to create a meaningful and dignified burial, and to protect and enhance the environment (PSA, 2008). Advocates of natural burials share an environmental paradigm of ecological consciousness and the desire for sustainable practices in all facets of life, including end of life.

Natural burials are becoming increasingly popular in western nations (Natural Burial Association, n.d.). The first natural burial ground opened in 1993 as an extension to an established Victorian cemetery in Carlisle, UK (Clayden and Dixon, 2007). Since then, over 200 natural burials grounds have opened throughout the UK (Natural Burial Association, n.d.), accounting for approximately 10 percent of all current interments (PSA, 2008). The first natural burial ground opened in the United States in 2001 in South Carolina, and an additional 11 have opened throughout the country in more recent years. In Canada, the first natural burial cemetery opened in October 2008, in Victoria, British Columbia. It has already interred 16 bodies, and sold an additional 42 grave plots in advance of death (Royal Oak Burial Park, 2009, personal communication). A second natural

> *Natural burial is about how your death can help to create a sacred and protected green space called a natural burial ground, full of native plants and trees, and birds and butterflies, where your friends and family will come to remember you. Our bodies, returned to the soil, through decomposition, can help create new life.*
>
> ~ Janet McCausland
> First Unitarian Congregation of Toronto
> March 9, 2008

burial ground opened in Cobourg, Ontario in June 2009 (Natural Burial Association, n.d.). Both of the natural burial grounds in Canada are extensions of existing modern cemeteries.

In the United States, the Green Burial Council (2009) identifies a four-tier classification system for natural burial cemeteries, known as green burial grounds in the US. This system reflects the degree of adherence to sustainability principles. The four tiers include hybrid burial grounds, low-impact burial grounds, natural burial grounds and conservation burial grounds (Green Burial Council, 2009). Each tier builds on the previous one with increased standards of environmental sustainability. For a description of each tier, please refer to Appendix A.

The following sections discuss principles of natural burials and ways in which natural burials contribute to environmental sustainability. Land suitability criteria for natural burials are discussed, and a checklist outlining required and recommended land suitability criteria for determining site selection is developed.

3.1 Principles

Natural burials express of an environmental ethic. Environmental sustainability underlines the principles commonly associated with natural burials, suggesting that every aspect of the burial process should contribute to environmental sustainability. The principal aim is to minimize environmental degradation associated with burial practices. Natural burial does not use embalming fluid, caskets, or grave liners. Graves are not marked with headstones, and fertilizers and pesticides are not added to the cemetery grounds (Natural Burial Association, n. d.). Practices may vary from one natural burial ground to another, and jurisdictional legislation may influence what principles are adhered to, but environmental sustainability remains the focus of natural burials.

Embalming fluid slows down the decay process, and embalming fluid that leaches into the burial environment will contaminate soil and groundwater. However, embalming is not necessary if bodies can be interred immediately. Refrigerating the deceased between two and four degrees Celsius, or applying dry ice should sufficiently delay the decay process for up to 72 hours (Green Burial Council, 2009). Thus, advanced refrigeration practices can facilitate natural burials.

Natural burials do not use traditional caskets. However, to help facilitate a meaningful and dignified burial for the deceased, the body may be wrapped in a cotton shroud or blanket, and may be placed in a readily decomposable casket, such as cardboard, wicker or other rapidly decomposing materials that are free of adhesives, varnishes and metals (Natural Burial Company, 2004). Concrete grave liners are not used in natural burials because they reduce microbial activity during the decay process and prevent the body from decomposing back into the natural environment. Grave liners also prevent the plot from being reused once the previous remains have decomposed.

Ideal soil conditions suitable for cemetery land are often ideal for urban develop-

ment. To avoid potential land-use conflicts, reusing the burial plot for subsequent burials will minimize the amount of land required for cemetery space and allow perpetual use of the site. Bodies will decompose to a skeleton in approximately one to two years, depending on a range of environmental conditions discussed in Section 3.2. Once the body decomposes, and adequate grieving time for family members has elapsed, a second burial is encouraged in the same lot. Any remaining bones from the previous burial could be removed and placed in a facility designed to inter bones, such as catacombs. It is estimated that a grave space can be reused after 100 years as this time period ensures that all immediate decedents of the deceased will have also died (Ministry of Justice, 2007).

To maximize burial capacity in natural burial cemeteries, graves should be dug directly next to each other. One acre of land can accommodate up to 750 grave plots (Royal Oak Burial Ground, 2009, personal communication). For example, the first section of the natural burial cemetery at Royal Oak Burial Park in Victoria covers one-third acre of land and can accommodate 255 burials, because bodies are placed immediately adjacent to each other (Royal Oak Burial Park, 2009, personal communication). Figure 2 illustrates a one-third acre natural burial section at Royal Oak Burial Park. Graves are situated within a woodland setting and plots are adjacent to each other.

Modern headstones, typically made of stone, granite or marble, are not used in natural burial cemeteries because they visually interfere with the natural landscape. Individual grave locations in

Figure 2: Grave lot plan for the first phase (one-third acre) of the natural burial section at Royal Oak Burial Park, Victoria, B.C. (Source: Royal Oak Burial Park, n.d.)

natural burial cemeteries are documented using geographic coordinates. However, family and friends of the deceased may want a tangible means of remembering the deceased, and some cemeteries may permit alternatives to the modern headstone, provided it coincides with the principles of environmental sustainability. Many natural burial grounds permit the placement of an engraved flat stone found within the landscape overtop of the grave (Memorial Ecosystems, n.d.). Alternatively, a native tree or shrub may be planted overtop of the grave to serve as a living reminder of the deceased (Natural Burial Company, 2004). Other memorials such as a memorial bench or bird feeder can be placed at selected locations around the natural burial grounds (Natural Burial Company, 2004). Some natural burial grounds have a memorial wall near the entrance where the names of the deceased can be engraved along with an inscription (Natural Burial Company, 2004).

Principles of Natural Burials

no embalming
no headstones
no traditional caskets
no fertilizers
no greenhouse gas emissions
minimal use of land
reuse of land

Every aspect of the burial process should contribute to environmental sustainability. Graves should be dug by hand as heavy machinery contributes to greenhouse gas emissions and has the potential to cause unnecessary damage to the surrounding natural environment (Memorial Ecosystems, n.d.). All soil overturned during the excavation of a grave is carefully replaced after placing the deceased (Royal Oak Burial Park, n.d.). Natural burial cemeteries do not require the application of fertilizers and pesticides. The land is left to regenerate with wildflowers, grasses, shrubs and trees that will eventually restore the natural habitat.

3.2 Criteria for Siting Natural Burial Cemeteries

Several environmental factors influence the speed at which bodies decompose, including temperature, soil moisture, microorganisms, and soil pH (Hopkins, 2008). Environmental conditions vary from one location to the next; however, certain minimum standards should be adhered to in order to ensure rapid decomposition. The following section identifies environmental conditions that should be considered when siting a natural burial cemetery, and outlines other considerations such as accessibility concerns and burial practices. A checklist has been developed to ensure that appropriate environmental conditions are met, and potential environmental contamination is minimized.

Temperature, soil moisture content, microorganisms, soil depth, soil pH, burial practices, accessibility and the distance to water courses must all be considered

when siting a natural burial cemetery. These criteria will either affect the rate at which bodies decompose or will facilitate a meaningful and dignified burial in line with environmental sustainability principles of natural burials.

Temperature

Temperature is the most influential factor in the decomposition of bodies (Carter and Tibbett, 2008). Higher temperatures are related to an increase in biological activity and chemical reaction rates. As a result, bodies buried in the warmer summer months have a faster decomposition rate than those buried in the winter. Because of naturally occurring salt levels in bodies, decomposition still occurs at temperatures as low as 0°C, but at a slower rate (Carter and Tibbett, 2008).

The placement of the body in the landscape in terms of slope aspect and burial depth also affects the decomposition temperature. Bodies buried on south facing slopes have potential to decompose at a faster rate than bodies buried on north facing slopes due to the amount of heat the slope receives from direct sunlight (Forbes, 2008). Burial depth also influences decomposition temperature because soil temperature decreases as depth from the surface increases. Therefore, deeper burials have slower decomposition rates due to lower soil temperature (Forbes, 2008).

Soil Moisture Content

Soil moisture influences the rate at which bodies decompose due to its effect on chemical and biological factors in the soil environment. In dry environments, desiccation often occurs, whereas in wet environments, water-logging and adipocere formation occurs. Both of these situations inhibit body decomposition, and in extreme situations, bodies could be preserved for centuries (Carter and Tibbett, 2008).

A coarse-textured, sandy soil with low moisture content will often promote desiccation. This process is related to the diffusion of gases through the soil matrix, whereby coarse-textured soils are typically associated with a high rate of gas diffusivity, allowing gases and moisture to move relatively rapidly through the soil matrix (Carter and Tibbett, 2008). Thus, water evaporates from the body, leading to dehydration and desiccation, since the enzymes required for decomposition are inhibited by low moisture content.

Conversely, soils with high water content, typically fine-textured, clayey soils, can inhibit decomposition because the rate at which oxygen is exchanged with carbon dioxide might not be sufficient to meet aerobic microbial demand (Carter and Tibbett, 2008). The resulting conditions are associated with slower decomposition rates, because anaerobic organisms are less efficient decomposers (Carter and Tibbett, 2008).

Soils for natural burial cemeteries should be well-drained without occurrences of water-logging. They should have a relatively high porosity and gas diffusivity rate to promote efficient oxygen transfer into the soil, but not so high that desiccation is promoted.

Microorganisms and Soil Depth

Soil organisms, including insects, fungi, and bacteria play a key role in the decomposition of human remains. Beginning immediately after burial, they invade the body, breaking down tissue and bone (Hopkins, 2008). Microorganisms, such as fungi and bacteria, are necessary for the complete degradation of body tissues, and are most active in aerobic conditions that exist closer to the surface of the soil (Susyan et al., 2006). In anaerobic soils, microorganisms are still active, but less efficient. As a result, decomposition takes longer (Carter and Tibbett, 2008).

A body buried at a depth between 0.6 to 0.9 metres can become a skeleton within one year, whereas bodies buried at 0.9 to 1.2 metres can take many years to decompose (Mann et al, 1990). This is likely due to the greater microbial activity in the rooting zone of surface soils, resulting from a higher concentration of organic detritus and root exudates (Susyan et al. 2006). At greater depths, microorganisms are in lower abundance and are less active due to reduced temperatures (Forbes, 2008).

Ideal natural burial depth is one metre below the surface level. At this depth, microorganisms are still active, but the soil is deep enough to prevent wildlife from unearthing human remains (Memorial Ecosystems, n.d.).

Soil pH

Acidic soils may reduce the rate of decomposition because of the greater production of tannins (Carter and Tibbett, 2008). Tannins, in turn, combine with protein and carbohydrates in organic matter, which results in decreased microbial activity due to lower biological decomposability of these compounds (Carter and Tibbett, 2008). Skeletal remains will decompose faster in highly acidic soil because of the dissolution of the inorganic matrix of the calcium-phosphate-carbonate mineral (Forbes, 2008). Thus, in an acidic environment, mineral compounds (bones) dissolve faster (Dent et al., 2004).

Burial Practices

Burial practices may include placing foreign materials, such as clothing, metal artefacts (e.g. jewelry, casket adornments or varnishes) and plant materials into the grave, which affect the rate of decomposition. Clothing can inhibit microorganisms from reaching the body, and potentially change the soil chemistry (Janaway, 1996). Metal artefacts increase the concentration of metal ions in the burial environment, leading to localized toxicity that can prevent microbial activity (Janaway, 1996).

Conversely, adding plant material, such as straw or branches, can promote decomposition. The plant material may introduce additional bacteria and microorganisms into the burial environment while providing a layer of air between the body and the soil. Promoting aeration increases the rate at which bodies will decompose as aerobic decomposition proceeds at a faster rate (Janaway, 1996). Ideal practices would be to minimize non-degradable fabrics and artefacts, and bury the body in organic materials that stimulate microbial decomposition.

Accessibility

Environmental sustainability principles surrounding natural burials can be an expression of a "return to nature" ethic. Accessibility to the natural burial cemetery encourages people to use the facilities for reflection or leisure. As such, natural burial cemeteries should be within a reasonable commuting distance for people to access the burial grounds. A recommended distance is within 25 kilometres from the edge of an urban centre (Native Woodland Ltd., n.d.).

To accommodate accessibility, natural burial cemeteries should be adjacent to a major road and signage should clearly identify the site as a cemetery (Natural Burial Association, 2009, personal communication). Scenic views from the natural burial cemetery and/or access to scenic views should be an important consideration in siting a natural burial cemetery. Scenic views attract more people to the site, and can help grieving family and friends of the deceased cope with death (Stephens, 2002).

Slope is another consideration for accessibility. Natural burial cemeteries should be accessible by the majority of the population, including people with reduced mobility or other disabilities. Slopes should have an easy to moderately difficult incline, where a moderate running slope is 5.0 percent (Longmuir et al., 2003). Most manual wheelchair users can manage a slope of 8.3 percent if the run does not exceed 10 metres; however, any slope distance of more than 10 metres should not exceed a 5.0 percent slope (Longmuir et al., 2003).

Distance to watercourses

Watercourse contamination is unlikely to occur if appropriate soil conditions are met and principles of natural burials are adhered to. Guidelines that establish minimum distances from the burial field to watercourses would ensure that the risk of contaminating water bodies from body decomposition is minimized. The literature does not indicate standards; therefore, comparable standards have been adopted from Nova Scotia Environment standards for constructing an on-site sewage treatment system. On-site sewage treatment system standards are designed to prevent the contamination of water bodies from household wastewater, which contains comparable environmental contaminates to body decomposition, such as organic matter, pathogens and nutrients (Nova Scotia Environment, 2008). Streams, rivers, wetlands, lakes and oceans should be at minimum 30.5 metres from the edge of the burial field (Nova Scotia Environment, 2008). Drilled wells should have a minimum distance of 15.2 metres from the edge of the burial field and the minimum distance for dug wells should be 30.5 metres (Nova Scotia Environment, 2008).

3.3 Site Assessment Checklist

Temperature, soil moisture content, microorganisms, soil depth, soil pH, burial practices, accessibility and distance to water courses are criteria that will facilitate body decomposition, or will permit a meaningful and dignified burial. However, soil moisture content, soil depth and distance to watercourses should be required criteria when siting a natural burial cemetery.

Natural burial cemeteries that meet these criteria will produce minimal, if any, environmental contamination.

To ensure that natural burial cemeteries meet the minimum criteria, a two-phase site assessment is required. Phase one is a preliminary site assessment, whereas phase two is a detailed site assessment. Phase one is designed as a preliminary screening tool for planners to determine if a particular site meets minimum requirements necessary for siting a natural burial cemetery. Phase two represents a detailed technical site assessment of candidate sites performed by environmental practitioners, which involves soil analysis and depth to water table tests.

Phase One

Within the scope of this report, only phase one of the site assessment is discussed. A phase one site assessment checklist was developed that will ensure minimum standards for safe natural burial ground selection. The checklist is divided into three sections: required criteria, recommended criteria, and recommendations. To complete the three sections, a site visit should be performed to confirm that the site meets minimum standards. Consulting soil, topographic and aerial maps may be of assistance; however, professional environmental expertise is not required at this phase. All criteria on the checklist can be determined through visual inspection. Please refer to Appendix B for the phase one checklist.

Section one is required criteria relating to environmental issues. All criteria must be met before continuing with phase two. The criteria in this section include minimum distances that should separate the edge of the burial field from any watercourse or water well. Minimum distance to any watercourse is 30.5 metres, 15.2 metres to drilled well, and 30.5 metres to a dug well. Soil depth and soil drainage specifications should be reasonably estimated through a review os soil and topographic maps before proceeding with phase two. Soil depth should be a minimum 2.0 metres to ensure adequate burial depth below and above the body. Soil drainage potential will minimize risks of contamination if soil drainage is between moderately-well-drained to well-drained soil. A maximum slope of 8.3 percent will facilitate accessibility for the majority of the population. All criteria in this section must be met.

Section two is recommended criteria. Recommended criteria include social issues such as scenic views and recreation trails at or near the natural burial cemetery, and may include a woodland setting. Recommended criteria also include accessibility to the site from major urban centres, and access to the site from a major highway or road. Not all criteria in this section must be satisfied; however, the more criteria that can be met, the more closely the location adheres to natural burial principles. It is recommended that a minimum of three criteria in section two be met.

Section three provides recommendations about the study site. If the site does not meet all the criteria in section one, the site should not be approved for future analysis. If some of the criteria in section one cannot be determined by a basic site visit or though map interpretation, the site can

be recommended for further phase one assessment. If the site meets all the criteria in section one and a minimum of three criteria in section two, the site assessment can continue with phase two. Comment space is provided to assist with phase two analyses.

Phase Two

If phase one is successfully completed, environmental practitioners can proceed with phase two. In-depth soil analysis and depth to water table tests can be performed to ensure the study site does indeed meet minimal environmental criteria. After successful completion of phase two, the study site can be developed into a natural burial cemetery.

By completing the two-phase site assessment during site selection, and by adhering to natural burial principles during cemetery operations, natural burial cemeteries will be environmentally sustainable, and the natural environment will be protected.

4.0 Proposed Natural Burial Site in the HRM

Halifax Regional Municipality (HRM) has expressed a need for additional cemetery space, as current HRM operated cemeteries will reach capacity in five to seven years (HRM, 2009, personal communication). The HRM operates seven cemeteries: Fairview Lawn, Halifax; Camp Hill, Halifax; Mount Hermon, Dartmouth; St. Paul's, Dartmouth; Dartmouth Common, Dartmouth; St. Peter's, Dartmouth; and the Old Burying Grounds, Halifax (closed to new burials) (HRM, 2007). Private entities and religious institutions operate approximately 184 other cemeteries in HRM, most of which are small, or restricted to members of a particular faith (Canadian Genealogy Records, n.d.).

Fairview Lawn and St. Paul's cemeteries are the two most active cemeteries operated by HRM. They both have an average of 300 interments per year, while the four other HRM-operated cemeteries receive less than a dozen interments combined (HRM, 2009, personal communication). In 2008, Fairview Lawn cemetery was expanded to accommodate an additional 1200 grave plots (HRM, 2009, personal communication). HRM By-Law C700 Cemeteries By-Law was revised in 2008 to include the possibility of interring the remains of more than one body in a grave plot. If the soil depth permits, two caskets can be buried in one plot before the plot is deemed full (provided that the caskets are not made of steel), or there can be one casket and up to six cremated remains in one plot before deemed full (HRM, 2009, personal communication).

Even with the expansion of Fairview Lawn cemetery and the revised by-law that accommodates additional burials, cemetery space is declining and a new cemetery is necessary. HRM staff have identified a potential new cemetery location in Cole Harbour (HRM, 2009, personal communication). This section describes the site location, and includes planning considerations and physical geography. The site is evaluated using the checklist from Section 3.3 to determine if it is suitable for use as a natural burial cemetery.

4.1 The Location

The study site is situated in Cole Harbour, Nova Scotia beside Bissett Road and includes approximately 15 hectares (38 acres) of land. Bissett Lake is located to the west, large private lots are located to the north and south, and Cole Harbour Heritage Park (Provincial Park) is located to the east, with Cole Harbour located east of the park. The residential lots located to the south of the study site are large acreages serviced by on-site well and septic systems. HRM owns the site, which is the location of the former Halifax County Rehabilitation Centre. The former rehabilitation centre still stands on site; however, it remains derelict and will be decommissioned prior to cemetery development. Figure 3 situates the study site in the greater context of HRM.

The site is located within Cole Harbour; therefore, the Cole Harbour/Westphal Land Use By-law applies. The study site is zoned Community Uses, P-2: community facility zone (HRM, 1993). Under institutional uses, the zone permits fu-

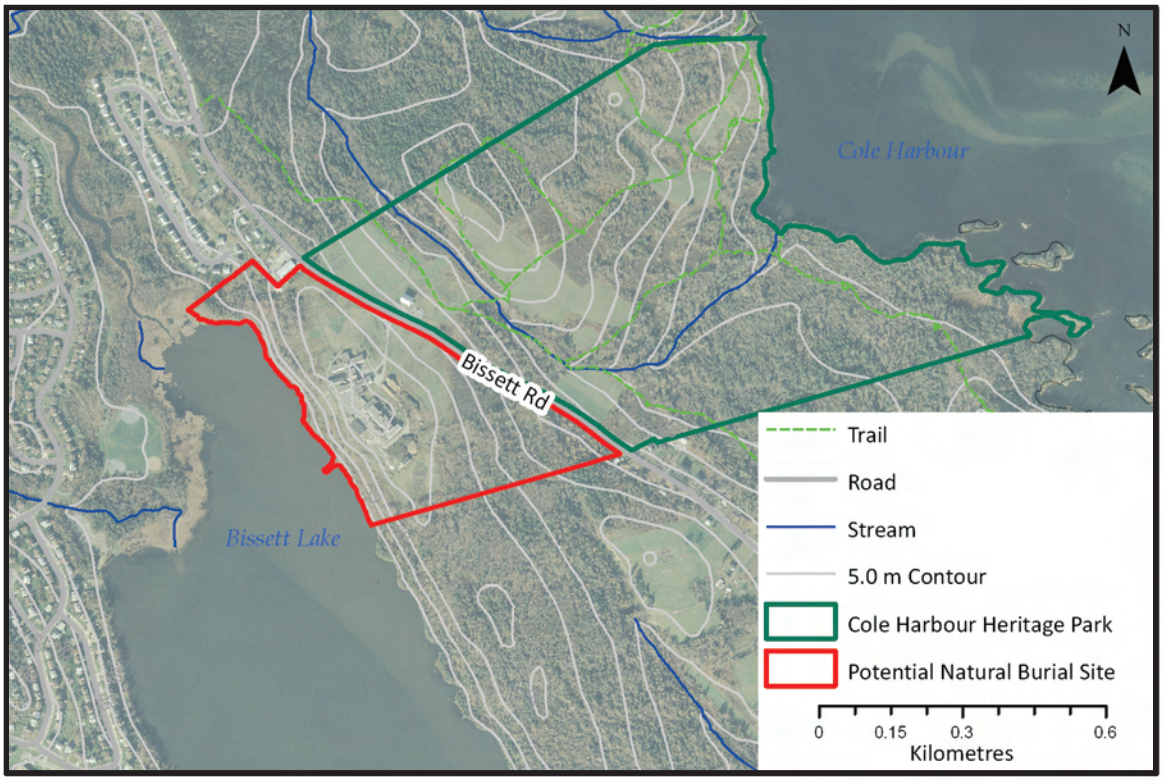

Figure 3: Study site for potential natural burial cemetery. The site is situated within Cole Harbour, Halifax Regional Municipality. (Source: GeoNova database, 2009. Compiled by Theresa Piorkowski).

Figure 4: Study site for potential natural burial cemetery. (Source: Google Street View, 2009).

neral establishments in conjunction with a cemetery, and under open space uses, the zone permits cemeteries, as well as public and private parks and playgrounds (HRM, 1993). Refer to Appendix C for an excerpt from the Cole Harbour/Westphal Land Use By-law regarding P-2 zones.

Bedrock and Surficial Geology

The bedrock at the study site is of the Goldenville Formation, a metasandstone from the Meguma Group (Lewis et al., 1998). The Goldenville Formation is interlaced with slate and minor metasiltstone (Lewis et al., 1998). Fracture spacing in the Goldenville Formation can be close or wide, ranging between 100 and 1000 millimetres; however, where it is interlaced with slate and minor metasiltstone, fractures may be closer together, ranging between 20 and 200 millimetres. Fractures in the bedrock may indicate the presence of groundwater. The Goldenville Formation is a competent rock capable of providing a good foundation for development (Lewis et al., 1998).

In Nova Scotia, surficial geology is largely a product of glacial activity. As glaciers moved across the continent as recently as 10,000 years ago, they transported surface material. The surficial geology of the study site is Silty Till Plain with drumlins, deposited during the last glaciation (Stea et al., 1992). Silty Till Plain is compact till material derived from both local and distant sources. Drumlins found within the Silty Till Plain are generally silty, with a high percentage of distant source material including red clay. In general, Silty Till Plain overburden is between three to thirty metres thick (Stea et al., 1992).

Drumlins are glacial deposits and are common features of Nova Scotia's landscape (MacDougall et al., 1963). The study site exhibits drumlin formation. The topography, orientation with respect to glacial movement, and egg-shape of the 'hill', corresponds with drumlin characteristics (Davis et al., 1996). Drumlin till is between four and thirty metres thick (Stea et al, 1992).

The bedrock and surficial geology that make up the study site is adequate to support natural burials. It is expected that enough till is present on site to support the minimum 2.0 metre burial depth for a natural burial cemetery. Figure 5 illustrates the bedrock and surficial geology of the study site.

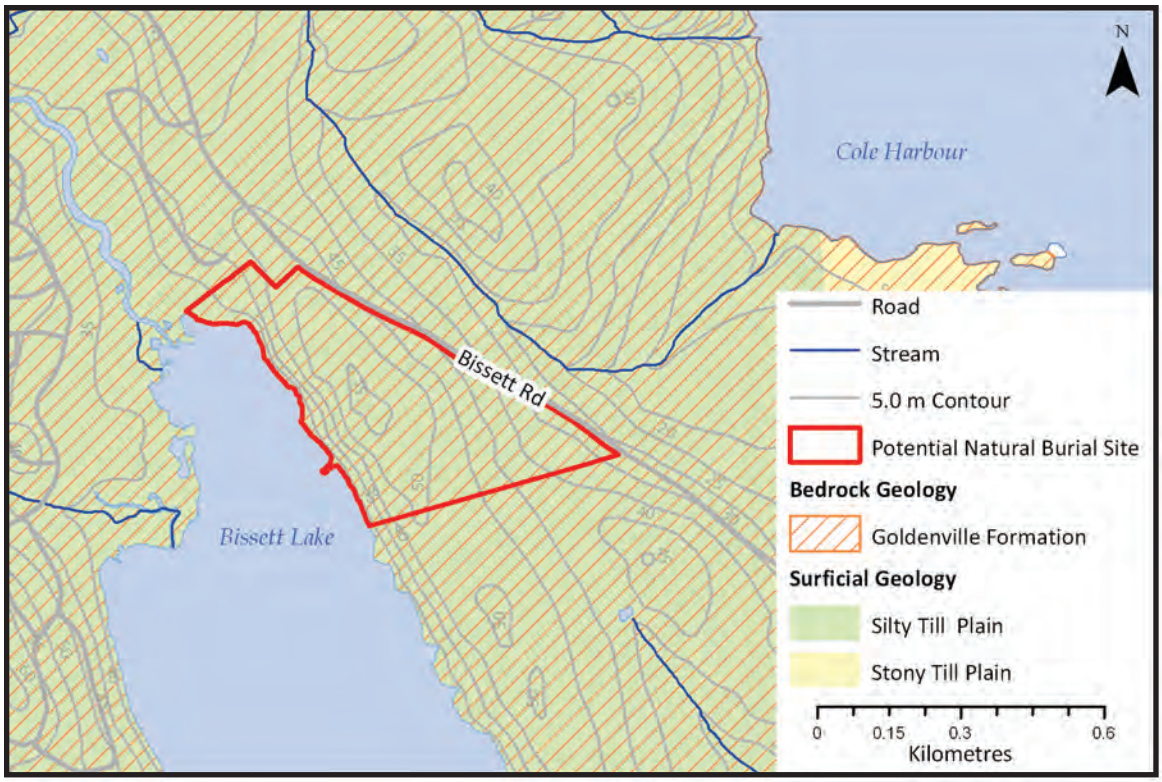

Figure 5: Bedrock and surficial geology of the study site. (Source: GeoNova database, 2009. Compiled by Theresa Piorkowski).

Ecosite Characteristics

Soils in the HRM have developed almost entirely from glacial drift (MacDougall et al., 1963). The dominant soil type found on the study site consists of Wolfville series soil, which is developed from moderately fine-textured parent materials, consistent with the glacial till (MacDougall et al., 1963). Wolfville series soil is a fine to medium-textured soil of reddish-brown loam to sandy-clay loam (Keys, 2007). The soil is considered acidic with pH levels ranging between 5.1 and 6.0 (MacDougall et al., 1963). The principle trees associated with Wolfville series soil are red spruce, balsam fir, birch, maple, hemlock and alder, consistent with well-drained acidic soil conditions (MacDougall et al., 1963). Currently, the site has no trees; however, the adjacent lot to the south has a coniferous forest.

Soil drainage is affected by slope and aspect, soil texture, depth to impermeable layer, compaction, coarse fragment content, and abundance and type of vegetation (Keys, 2007). Soil drainage is considered well to moderately-well-drained on the study site; water moves through the soils readily, but not rapidly (Keys, 2007). The gently rolling topography has slopes that range between two and seven percent, and are predominantly east and west facing (MacDougall et al., 1963).

Wolfville series soil is a recommended soil type for natural burial cemeteries because it is well to moderately-well-drained, consistent with the recommended soils criteria. The slope meets natural burial criteria of accessibility. Figure 6 illustrates the soil and slope of the study site.

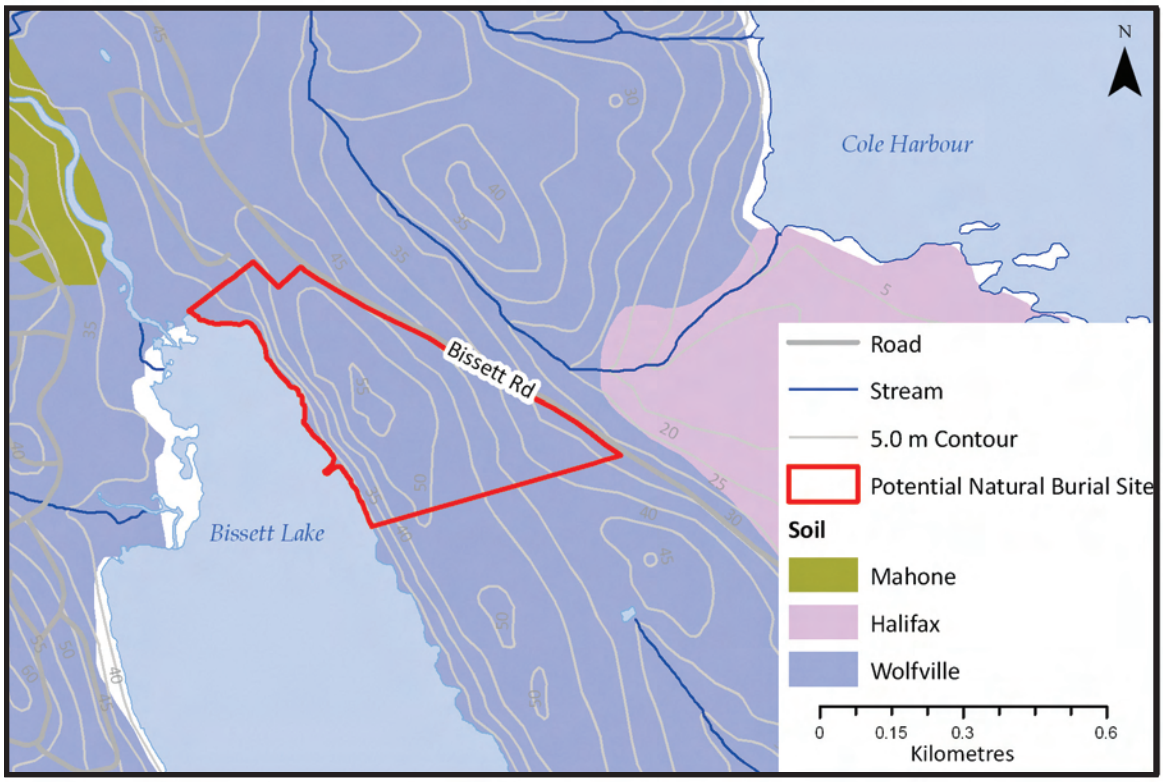

Figure 6: Soil type at the study site. (Source: GeoNova database, 2009. Compiled by Theresa Piorkowski).

Hydrology

Bissett Lake is adjacent to the study site. The lake is approximately half a kilometre wide and two kilometres long, and covers about 85 hectares. It is a shallow urban lake with a maximum depth of about nine metres, and an average shallow depth of 4.5 metres (HRM, 2002). The lake has experienced high levels of siltation and exposure to nutrients as a result of nearby urban development, resulting in an increase in aquatic vegetation.

The closest stream to the study site is approximately 100 metres from the site boundary. Cole Harbour (the ocean) is approximately one kilometre away from the centre of the study site. No stream or water course, aside from Bissett Lake, is found within the 30.5 metre recommended distance to water courses criteria. Bissett Lake is adjacent to the study site; however, slopes of 27 percent rising from the edge of the lake are too steep for accessibility to the burial field. It is recommended that this section of the study site not accommodate burials so that it can serve as a buffer between the cemetery and the lake. The distance from the edge of the burial field to Bissett Lake is at minimum 40 metres, which exceeds the minimum 30.5 metre standard. The closest drilled water well from the edge of the burial field exceeds the minimum 15.2 metre recommended distance. Figure 7 illustrates the location of the drilled wells and illustrates the recommended buffer from Bissett Lake.

Scenic Views and Recreation Opportunities

The study site is located on a drumlin that provides visitors with scenic views of Cole Harbour, Cole Harbour Heritage Park and

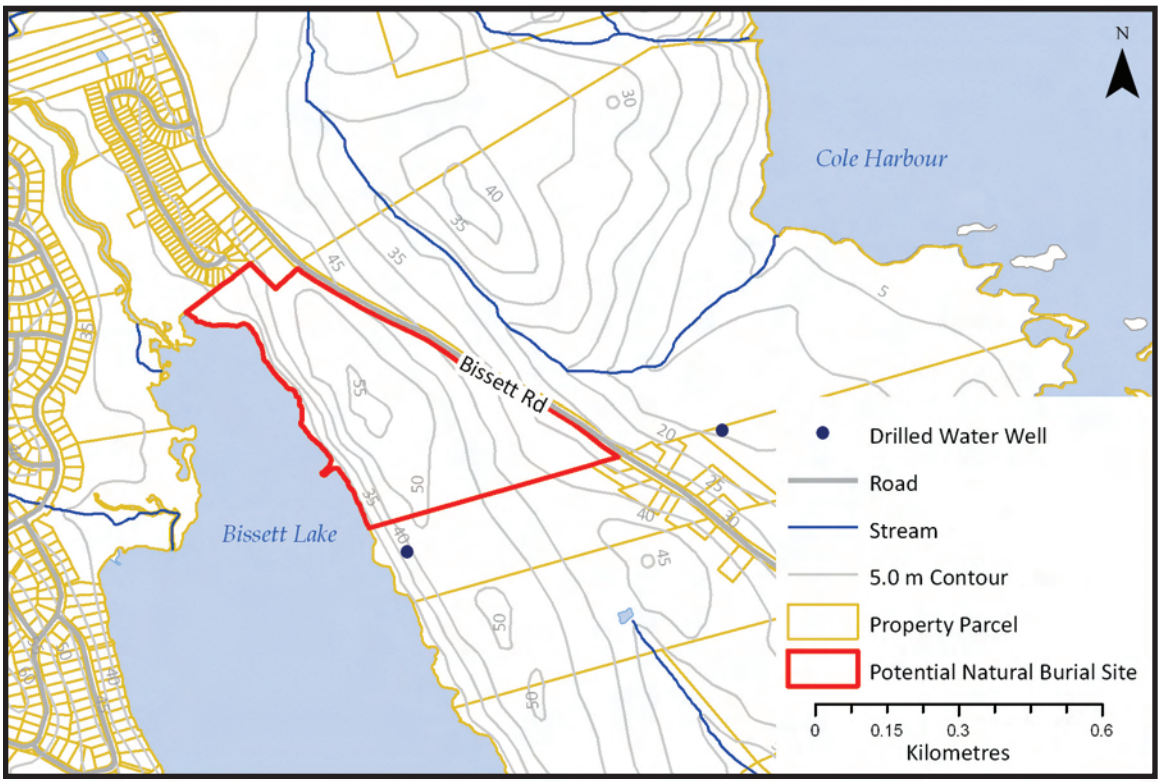

Figure 7: Hydological systems at or near the study site. (Source: GeoNova database, 2009. Compiled by Theresa Piorkowski).

Bissett Lake. Cole Harbour Heritage Park is across Bissett Road from the study site. The provincial park provides approximately 30 kilometres of looped trails of easy to moderate difficulty (HRM, 2009c). Recreation trails and scenic views are two recommended criteria for natural burial cemeteries.

4.2 Applying the Phase One Checklist

The phase one site assessment checklist discussed in Section 3.3 was used to determine if the HRM-proposed cemetery location would be suitable for natural burials. All criteria in Section 1 of the checklist are satisfied. Four of the five recommended criteria in Section 2 of the checklist are satisfied. Section 3 recommends the site to continue with the phase two site assessment (refer to Appendix D for the completed checklist).

5.0 Political Context of Cemeteries in the HRM

In Canada, provincial authorities regulate cemeteries because they have constitutional authority over property and civil rights (Blair, 2005). Cemetery regulations provide cemetery owners, operators and plot owners with various rights associated with the cemetery. In Nova Scotia, no provisions are stated within applicable provincial legislation or municipal by-laws that enable natural burials. The following sections highlight aspects of a relevant provincial statute and municipal by-law that has unclear interpretations and will suggest recommendations for policy revisions that would enable natural burials.

5.1 Current Policies in Nova Scotia and HRM

The Nova Scotia Legislature governs cemeteries in Nova Scotia though the *Cemeteries Protection Act,* 1998, and the HRM enforced *By-law C700: By-Law Respecting Municipal Cemeteries* in 2007, known as the *Cemeteries By-law*, to regulate municipal cemeteries (HRM, 2007). This statute and by-law presents vague statements that do not make it clear that natural burial practices are permissible.

Cemeteries Protection Act

The *Cemeteries Protection Act* came into force in 1998, with amendments in 2001, to address concerns from the public that cemeteries in Nova Scotia have no protection against neglect, vandalism or property development (Nova Scotia House of Assembly, 1998). The *Cemeteries Protection Act* (1998) establishes three objectives (Nova Scotia House of Assembly, 1998):

- Protect the piece of property from other uses once it has been used for human burial,
- Permit groups to maintain a grave site through the use of a permit system, and
- Protect graves and memorials from vandalism by declaring any disturbance to a grave or memorial a crime unless a permit allows appropriate procedures on the site to occur.

No sections in the *Cemeteries Protection Act* (1998) indicate natural burials are permissible, and various sections are vague in its

interpretation. Under the *Cemeteries Protection Act* (1998), "Cemeteries" are defined as:

> "…land that is set apart or used as a place for the burial of human remains and, for greater certainty, includes all tombstones, gravemarkers and other monuments located thereon and any buildings or structures located thereon for the permanent placement of human remains"

The *Cemeteries Protection Act* (1998) establishes that cemeteries and gravesites marked with memorials are protected from offences; however, it does not imply that gravesites without memorial markers are provided the same level of protection.

Section 7 (1) of the *Cemeteries Protection Act* (1998) states:

> **7 (1)** No person may use a cemetery for any purpose other than for the burial or permanent placement of human remains or memorialization.

This statement is unclear in its application and interpretation. It can apply to the entire cemetery, to individual grave lots or to both. One possible interpretation of this statement is that once land for a cemetery is established and burials occur, the land cannot be used for other uses, such as commercial or residential development. A second possible interpretation of this statement is that once a deceased body is placed in a grave, the lot cannot be disturbed, and subsequent burials in the same lot cannot occur.

Cemeteries By-Law

Under the *Cemeteries By-Law*, the Halifax Regional Municipality (HRM) operates seven cemeteries within the municipality: Camp Hill, Halifax; Fairview Lawn, Halifax; Saint Paul's (Old Burying Grounds), Halifax; Mount Hermon, Dartmouth; Saint Paul's, Dartmouth; Dartmouth Common, Dartmouth; and Saint Peter's, Dartmouth. The *Cemeteries By-law* enables plot owners to various rights:

> **5 (1)** The lot or niche owner has the right:
> (a) to reasonable access to the lot;
> (b) to use the lot for human burial;
> (c) to erect a memorial or plaque on the lot subject to any specifications provided herein.

Restrictions to memorials on grave plots include the type of material used, the size, and the placement, so as not to interfere with cemetery maintenance (HRM, 2007). An excerpt of the specific restrictions for memorials appears in Appendix E. The By-law does not indicate that memorials must be erected.

The *Cemeteries By-law* indicates the maximum number of interments each grave plot can accommodate. A single grave space can accommodate two caskets stacked on top of each other; however, the first casket cannot be made of steel, it must be buried at double depth (12 feet), and there must be a 40 year time lapse from the first burial to the second. Instead of a double casket burial, a single grave space can have one casket and up to three urns containing cremated remains (double depth of

the casket is not required). Alternatively, if there is no casket burial, six urns with cremated remains may be buried in one grave plot (HRM, 2007). For a complete list of permitted grave uses, please refer to Appendix F. The By-law does not indicate that bodies must be buried in a casket.

The *Cemeteries By-law* prohibits people from having picnics in an HRM operated cemetery, and prohibits pets from entering the cemetery, unless they are registered service dogs (HRM, 2007).

> **29** No person shall hold a picnic in a cemetery

Though the *Cemeteries Protection Act* (1998) of Nova Scotia and the *Cemeteries By-law* (2007) of HRM does not explicitly prohibit natural burial cemeteries, the legislation and by-law is not specific enough to readily permit natural burials. Recommendations for changes to the legislation and by-law are therefore required.

5.2 Recommendations for Policy Revisions

The Sustainable Environmental Management Office (SEMO), established in 2004 by HRM, acts as the corporate lead for sustainability and environmental policy on issues that focus on clean land, energy, air and water (HRM, 2009a). In keeping with the sustainability directives of HRM, cemetery legislation and municipal by-laws could permit natural burials. The following section suggests additions to the *Cemeteries Protection Act* and the *Cemeteries By-law* that will permit natural burial cemeteries in the HRM.

Cemeteries Protection Act

The *Cemeteries Protection Act* should be clearer about what constitutes a cemetery. The Act defines a cemetery as a place that includes grave markers; however, in keeping with the principles of natural burials, grave markers should not be erected. Adding a definition for natural burial cemeteries into the definition section of the *Cemeteries Protection Act* would clarify any ambiguity surrounding the "cemeteries" definition. A suggestion for an appropriate definition is:

> Land, set apart or used for the burial of human remains, but not necessarily including tombstones, gravemarkers and other permanent monuments thereon; it may include the planting of native vegetation on the land.

Section 7 (1) of the *Cemeteries Protection Act* is not clear as to whether it applies to the entire cemetery or to individual grave plots. This section should be in line with natural burial principles that encourage subsequent burials in the same grave plot. One possible suggestion for this could be a recommendation for the grave lot to be leased on a 100 year time period. Once 100 years following burial, the grave lot can be leased to another individual. This recommendation should also include a clause permitting that any remaining bones discovered during excavation be placed in a facility at the cemetery designed to inter bones.

Cemeteries By-Law

The HRM *Cemeteries By-law*, 2007 requires additions that would permit natural burials to occur. A new section titled "Natural Burial Cemeteries" should list specific regulations for natural burial. The current *Cemeteries By-law*, 2007 includes section 23 "Fairview Cemetery Cremation Garden" that outlines specific requirements concerning cremated remains lot size, and monument type and size. A suggested recommendation is to add a new section entitled "Natural Burial Cemetery" that regulates practices consistent with natural burial principles. The section can be outlined as follows:

Natural Burial Cemeteries

(1) Bodies must be buried
   a. without embalming fluid
   b. without being cremated

(2) Caskets are not required for burial; however, if caskets are used, caskets should be
   a. rapidly biodegradable (cardboard, wicker or pine)
   b. free of steel and/or metal adornments
   c. free of varnishes

(3) Grave plots should be free of grave liners

(4) Permitted memorials are limited to
   a. native trees or shrubs
   b. flat stones
   c. engraving on the memorial wall
   d. park benches at predetermined locations

(5) Grave plots should be
   a. dug by hand
   b. immediately adjacent to neighbouring graves
   c. leased for a maximum 100 years

(6) Picnics are acceptable in the cemetery

(7) Recreation trails permit non-disruptive hiking

(8) Perpetual care of the cemetery
   a. does not involve fertilizers and pesticides
   b. permits wild grasses, shrubs and trees to grow naturally

Schedule B of the *Cemeteries By-law* should be amended to include a list of fees specific to the natural burial cemetery. These fees will be lower than modern cemeteries because graves are dug by hand, graves are smaller in size, and application of fertilizers to the cemetery is not required, thereby reducing burial costs.

Through changes to the *Cemeteries Protection Act,* 1998 and the *Cemeteries By-law*, 2007, natural burials can occur in the HRM. Natural burials can contribute to the sustainability directives set out by the HRM and the Sustainable Environmental Management Office.

6.0 Conclusions and Recommendations

Modern cemeteries are environmentally unsustainable. The modern cemetery's sprawling landscapes of headstones contributes to habitat loss, while toxic chemicals and metals associated with embalming fluids, fertilizers, casket varnishes and metal adornments contaminates the soil at the burial site, and can leach into groundwater systems. Microorganisms that assist in the decay process are less active in a toxic environment, thereby reducing the rate at which bodies decompose.

Natural burials provide a sustainable alternative to the modern cemetery. Natural burial principles maintain that embalming fluid, caskets with varnishes and metals, grave liners and grave markers should not be used. Without toxic inputs to the natural environment, microorganisms are more active and the decay process of the deceased is more rapid. Sustainable land use is also permitted as plot reuse reduces cemetery footprints and native vegetation facilitates wildlife habitat development and secondary recreational uses of the site.

The Halifax Regional Municipality (HRM) maintains a sustainability directive that encourages and supports projects that focus on clean land, energy, air and water. The HRM has identified a need for additional cemetery space because current HRM-operated cemeteries are likely to reach capacity in five to seven years (HRM, 2009, personal communication). A natural burial cemetery in the HRM would address the need for more cemetery space, while supporting the sustainability directive.

A location in Cole Harbour has been identified by HRM as a potential site for a new cemetery. This study assessed the site using the proposed phase one preliminary checklist to determine if the site meets minimum standards for natural burial cemeteries. The required criteria of minimum distances to watercourses and water wells, minimum soil depth, a range of soil drainage and a maximum slope were met. Recommended criteria include scenic views, recreation trails, woodland settings and site accessibility, and were also met. Based on this assessment, the site was recommended as a potential natural burial cemetery, and for a more detailed phase-two site assessment of involving technical standards to occur.

The site meets minimum criteria suitable for natural burials, but the political context in Nova Scotia and HRM is ambiguous about enabling natural burials. Therefore, policy concerns should be addressed and changes should be made that would facilitate the implementation and operation of natural burial cemeteries. Recommendations to amend the *Cemeteries Protection Act* include a definition for 'natural burials cemetery', and a clause that allows plots in a cemetery to be reused after 100 years from the previous burial.

Changes to the HRM *Cemeteries By-law*, should include the addition of a section dedicated to natural burial regulations, such as permissible caskets and memorials, and the reuse of grave plots after 100 years. Prohibited practices should be listed including embalming fluid and graveliners. The Cemeteries By-law should also include a cost schedule for natural burials.

Finally, it is recommended that the site in Cole Harbour be developed as a natural burial cemetery. The site meets all required and most recommended criteria outlined on the checklist. By creating a natural burial cemetery in the HRM, the sustainability directives can be adhered to and the need for future cemetery space is addressed. Natural burials are becoming an increasingly popular form of burial throughout North America, and the HRM could benefit through the addition of one.

References

Ariss, R. (2004). Bring out your dead: Law, human remains and memory. In *Canadian Journal of Law and Society.* 19(1). p. 33-54.

Ashley, G. (2004). You can't take it with you. In *Onearth*. 25(4) p. 6-7.

Beck, S. and E. Goldberg. (1996). Jewish beliefs, values, and practices: Implications for culturally sensitive nursing care. In *Advanced Practice Nursing Quarterly*. 2(2) p. 15-22.

Blair, P. (2005). The non-protection of Canadian Aboriginal heritage (burial sites and artifacts). Retrieved November 14, 2009 from www.scowinstitute.ca/library/documents/HeritageSitesFacts.pdf.

Canadian Genealogy Resources. (no date). Halifax County, Nova Scotia Cemetery Records. Retrieved November 19, 2009 from http://www.canadiangenealogy.net/novascotia/cemeteries/halifax_county_cemeteries.htm.

Carter, D. and M. Tibbett. (2008). Cadaver decomposition and soil: Processes. In *Soil Analysis in Forensic Taphonomy: Chemical and Biological Effects of Buried Human Remains.* (M. Tibbett, and D. Carter, Eds). Boca Raton, Florida: Taylor and Francis Group, p. 29-51.

Casket and Funeral Supply Association of America (n.d.). Casket design. Retrieved October 2, 2009 from http://www.cfsaa.org/design.php.

Cemeteries Protection Act. 1998, c. 9, s. 1.

Chiappelli, J., and T. Chiappelli (2008). Drinking Grandma: The problem of embalming. In *Journal of Environmental Health*. 71(5) p. 24-28.

Clayden, A. and K. Dixon (2007). Woodland burial: Memorial arboretum versus natural native woodland? In *Mortality* 12(3) p. 240-260).

Conway, H. (2003). Dead, but not buried: Bodies, burial and family conflicts. In *Legal Studies.* 23 p. 423-452.

Davis, D. Browne, S., & Nova Scotia Museum (Eds.). (1996). T12.4 Glacial Deposits and Resources [PDF file]. Natural history of Nova Scotia (Rev. ed.) (Vols. 1-2). Halifax: The Nova Scotia Museum in partnership with Communications Nova Scotia, co-published with Nimbus Publishing. Retrieved October 27 from http://museum.gov.ns.ca/mnh/nature/nhns/t12/t12-4.pdf.

De Deyn, G., C. Raaijmakers, and W. van der Putten (2004). Plant community development is affected by nutrients and soil biota. In *Journal of Ecology* 92(5) p. 824-834.

Dent, B., S. Forbes, and B. Stuart (2004). Review of human decomposition processes in soil. In *Environmental Geology*. 45 p. 576-585.

Forbes, S. (2008). Decomposition chemistry in a burial environment. In *Soil Analysis in Forensic Taphonomy: Chemical and Biological Effects of Buried Human Remains.* (M. Tibbett, and D. Carter, Eds). Boca Raton, Florida: Taylor and Francis Group, p. 203-223.

Francis, D., L. Kellaher, and G. Neophytou. (2005). *The Secret Cemetery*. Berg Publishers: Oxford, UK.

Funeral Association of Canada. (2009). Retrieved November 11, 2009 from http://www.fsac.ca/home.html.

Green Burial Council (2009). Welcome to the Green Burial Council. Retrieved July 10, 2009 from http://www.greenburialcouncil.org/.

HRM [Halifax Regional Municipality] (1993). L*and use by-law for Cole Harbour/Westphal.* Retrieved October 27, 2009 from http://www.halifax.ca/planning/documents/ColeHarbour/Westphal_LUB.pdf.

HRM [Halifax Regional Municipality] (2002). Information report: Deteriorating condition of Bissett Lake. Submitted by K.S. Dhillon, P. Eng., Director, Public Works and Transportation. Retrieved October 27, 2009 from http://www.chebucto.ns.ca/ccn/info/Science/SWCS/WATERSHEDS/COWBAYR/BISSETT/hrm.html.

HRM [Halifax Regional Municipality] (2007). By-law Number C-700: By-law respecting municipal cemeteries. Retrieved March 9, 2009 from http://www.halifax.ca/legislation/bylaws/hrm/documents/By-LawC-700.pdf.

HRM [Halifax Regional Municipality] (2009a). Sustainable Environmental Management Office. Retrieved October 17, 2009 from http://www.halifax.ca/environment/semo.html.

HRM [Halifax Regional Municipality] (2009b). Sustainability in HRM. Retrieved October 17, 2009 from http://www.halifax.ca/environment/Sustainability.html.

HRM [Halifax Regional Municipality] (2009c). Trails in the Cole Harbour area. Retrieved November 17, 2009 from http://www.halifax.ca/rec/TrailsColeHarbour.html.

Hollabaugh, C. (2005). Arsenic, mercury, and lead as hydrophile and biophile elements; implications for healthy watersheds and humans. In *Geological Society of America.* 38(7) p. 153.

Hopkins, D. (2008). The role of soil organisms in terrestrial decomposition. In *Soil Analysis in Forensic Taphonomy: Chemical and Biological Effects of Buried Human Remains.* (M. Tibbett, and D. Carter, Eds). Boca Raton, Florida: Taylor and Francis Group, p. 53-66.

Hopkins, L. (1977). Methods for generating land suitability maps: A comparative evaluation. In *AIP Journal*. p. 386-400.

Industry Canada (2009). Funerals. Retrieved November 7, 2009 from http://www.ic.gc.ca/eic/site/oca-bc.nsf/eng/ca02368.html.

IRAC [International Agency for Research on Cancer] (2004). Press Release 153. IARC classifies formaldehyde as carcinogenic to humans. Retrieved July 12, 2009 from http://www.iarc.fr/en/media-centre/pr/2004/pr153.html.

Islamic Society of North America. (2007). A guide for the Muslim funeral. Retrieved November 12, 2009 from http://www.isna.net/Services/pages/A-Guide-for-the-Muslim-Funeral.aspx.

Janaway, R. (1996). The decay of buried remains and their associated materials. In *Studies in Crime: An Introduction to Forensic Archaeology.* (J. Hunter, C. Roberts, and A. Martin, Eds). London: Routledge, p. 58-85.

Janaway, R. (2008). The decomposition of materials associates with buried cadavers. In *Soil Analysis in Forensic Taphonomy: Chemical and Biological Effects of Buried Human Remains.* (M. Tibbett, and D. Carter, Eds). Boca Raton, Florida: Taylor and Francis Group, p. 153-201.

Keys, K. (2007). Forest Soil Types of Nova Scotia: Identification, Description, and Interpretation. Nova Scotia Department of Natural Resources Manual FOR 2007-2 [PDF file]. Retrieved October 1, 2009 from http://www.gov.ns.ca/natr/forestry/reports/NS-Soils.pdf .

Lewis, C., B. Taylor, R. Stea, G. Fader, R. Horne, S. MacNeill, and J. Moore (1998). Urban Geology of Canadian Cities. P.F. Karrow and O.L. White (eds). Department of Earth Science and Quaternary Sciences Institute. University of Waterloo, Waterloo, Ontario.

Longmuir, P., M. Freeland, S. Fitzgerald, D. Yamada and P. Axelson (2003). Impact of running slope and cross slope on the difficulty level of outdoor pathways: A comparison of proposed design guidelines and user perceptions. In *Environment and Behaviour.* 35(3) p. 376-399.

MacDougall, J., D. Cann and J. Hilchey (1963). Soil Survey of Halifax County: Nova Scotia. Report N. 13. Canada Department of Agriculture and Nova Scotia Department of Agriculture and Marketing: Ottawa, Ontario.

Mann, R., W. Bass and L. Meadows (1990). Time since death and decomposition of the human body: Variables in case and experimental studies. In *Journal of Forensic Sciences.* 35(1) p. 103-111.

Memorial Ecosystems. (no date). Conservation burials. Retrieved July 11, 2009 from http://www.memorialecosystems.com/ConservationBurial/tabid/110/Default.aspx.

Memorial Society of British Columbia (no date). Public health impact of crematoria. Retrieved July 11, 2009 from http://www.memorialsocietybc.org/c/g/cremtion-report.html.

Ministry of Justice (2007). Burial law and policy in the 21st century: The way forward. Retrieved November 15, 2009 from http://webarchive.nationalarchives.gov.uk/+/http:/www.justice.gov.uk/docs/burial-law-policy.pdf.

Morgan, O. (2004). Infectious disease risks from dead bodies following natural disasters. In *Pan Am Journal of Public Health*. 15(5) p. 307-312.

Native Woodland Ltd. (no date). Future sites. Retrieved October 12, 2009 from http://www.greenburialgrounds.com/index.php?page=future-sites.

Natural Burial Association. (no date). Welcome to the Natural Burial Association. Retrieved July 10, 2009 from http://www.naturalburialassoc.ca.

Natural Burial Company (2004). Retrieved October 13, 2009 from http://www.naturalburialcompany.com/.

Newton, N. (1976). *Design on the Land.* The Belknap Press of Harvard Univeristy Press: Cambridge, Massachusetts and London England.

Nova Scotia Environment (2008). Before you construct an on-site sewage system: Facts a homeowner should know. Retrieved November 2, 2009 from www.gov.ns.ca/water/docs/OnsiteSewageConstruction.pdf.

Nova Scotia House of Assembly (1998). Debates and Proceedings- Bill No. 58- Cemeteries Protection Act- November 12, 1998. Nova Scotia Hansard Reporting Services, Halifax, NS: Queen's Printer, 1851-.

PSA [Parliament of South Australia] (2008). Natural Burial Grounds: Sixty Second Report of the Environment, Resources and Development Committee. Retrieved November 11, 2009 from www.naturalearthburial.com/uploads/62ReportNaturalBurialGrounds.pdf.

Rossmoore, H.W., and M. Sondossi (1988). Applications and mode of action of formaldehyde condensate biocides. In *Advances in Applied Microbiology.* 33 p. 223-277.

Royal Oak Burial Park. (no date). Natural/green burial. Retrieved July 12, 2009 from http://www.robp.ca/our-services/natural-green-burial/.

Shin, M. (2009). Corporate Knight's third annual sustainable cities ranking: Green Space. Retrieved August 6, 2009 from http://static.corporateknights.ca/SustainableCities2009.pdf.

Spongberg A. and P. Becks (2000). Inorganic soil contamination form cemetery leachate. In *Water, Air, and Soil Pollution.* 117 p. 313-327.

Statistics Canada (2006). Estat database. Retrieved September 20, 2009 from www.statcan.ca/english/estat.

Stea, R., H. Conley and Y. Brown (1992). Map 92-3 Surficial Geology of the Province of Nova Scotia. Scale 1:500,000. Department of Natural Resources: Halifax, Nova Scotia.

Stephens, K. (2002). A time to mourn: Helping children cope with family death. In *Parenting Exchange.* 3 p. 1-2.

Stowe Jr., J, E. Vernon Schmidt, and D. Green (2001). Toxic burials: The final insult. In *Conservation Biology.* 15(6) p. 1817-1819.

Susyan, E., D. Rybyanets and N. Ananyeva (2006). Microbial activities in the profiles of gray chernozems. In *Eurasian Soil Science*. 39(8) p. 859-867.

Sutton, P. (2004). A perspective on environmental sustainability? A paper for the Victorian Commissioner for Environmental Sustainability. Retrieved October 17, 2009 from http://www.ces.vic.gov.au/CES/wcmn301.nsf/childdocs/-441BB07721D61152CA256F250028C5FB?open.

Thomas, J. and R. Dixon (1973). Cemetery ecology. In *Natural History.* 82(3) p. 60-67.

Trevors, J. (1996). Sterilization and inhibition of microbial activity in soil. In J*ournal of Microbiological Methods*. 26 p. 53-59.

Welton, N. (2003). Embalming toxins. In *E- The Environmental Magazine.* 14(2) p. 13.

Young, C., K. Blackmore, P. Reynolds and A. Leavens. (2002). Pollution potential of cemeteries. R & D Technical Report P223. Environmental Agency. Retrieved October 14, 2009 from http://publications.environment-agency.gov.uk/pdf/STR-P223-e-e.pdf.

Appendix A

Four Tier Natural Burial Classification System

The Green Burial council in the United States has identified a four-tier classification system that recognizes various degrees of natural burial cemeteries. Each tier builds on the previous tier. Certification is awarded to the burial grounds based on what level of natural burial they adhere to. The four tiers include hybrid burial grounds, low-impact burial grounds, natural burial grounds and conservation burial grounds (Green Burial Council, 2009). Each tier builds on the previous one with increased standards of environmental sustainability.

Hybrid Burials

Hybrid burial grounds are usually extensions of modern cemeteries. They provide environmentally minded individuals an option to choose a more environmentally sustainable form of burial in a cemetery resembling a modern cemetery. Grave liners, embalmed bodies and caskets with adhesives, varnishes or metals are not permitted in hybrid burial grounds; however, modern headstones are used as a memorial to identify the location of the grave (Green Burial Council, 2009).

Low-impact Burials

Low-impact burial grounds follow the same principles of hybrid burial grounds; however, they must integrate a pest management program and avoid the application of toxic pesticides and fertilizers to the grounds (Green Burial Council, 2009).

Natural Burials

Natural burial grounds maintain similar principles as hybrid and low-impact burial grounds, but they prohibit the use of modern headstones and must be designed and maintained to produce a naturalistic appearance (Green Burial Council, 2009). These burial grounds may be part of a larger reclamation project with the reintroduction of native species to the area (Green Burial Council, 2009).

Conservation Burials

Conservation burial grounds are the highest level of natural burials in the United States. These burial grounds meet all the required principles of the third tier, but must further legitimate land conservation. The land used for conservation burials must facilitate ecological restoration and it should involve an established organization that holds a conservation easement guaranteeing long-term stewardship (Green Burial Council, 2009).

Appendix B

Phase One Site Assessment for Natural Burial Cemetery Capability in the HRM

Location Address: _____ Name: _____

GPS Coordinates: _____ Date: _____

Section 1: Required Criteria

Place a check mark (√) beside each environmental criterion if it has been met. All criteria in this section must be satisfied before recommending the Phase Two Site Assessment. Add notes or comments to clarify the site assessment.

Criteria	Comments
Distance to water from edge of burial field: ☐ streams (min 30.5 metres) ☐ rivers (min 30.5 metres) ☐ wetlands (min 30.5 metres) ☐ lakes (min 30.5 metres) ☐ ocean (min 30.5 metres) ☐ other: _____ Distance to water wells from edge of burial field: ☐ drilled well (min 15.2 metres) ☐ dug well (min 30.5 metres) ☐ other: _____ ☐ Soil depth (min 2.0 metres) ☐ Soil drainage (moderately-well to well drained) ☐ Slope (maximum 8.3%)	

Section 2: Recommended Criteria

Place a check mark (√) beside each social criterion if it has been met. Satisfying all criteria in this section is not mandatory; however, it is recommended that a minimum of 3 criteria be met in order to achieve some natural burial principles. Add notes or comments to clarify the site assessment.

Criteria	Comments
☐ Scenic views from the site ☐ Recreation trails at or nearby the site ☐ Woodland setting Accessibility: ☐ near residential community ☐ adjacent to major road	

Section 3: Recommendation

Comments: _____

_____

Select one of the following:

☐ Additional Phase One site assessment required

☐ Proceed with Phase Two site assessment

☐ Not recommended as natural burial cemetery

Appendix C

Excerpt of P-2 Zone from the 1993 *Cole Harbour/Westphal Land Use By-Law*.

Part 21: P-2 (COMMUNITY FACILITY) ZONE

21.1 P-2 USES PERMITTED

No development permit shall be issued in any P-2 (Community Facility) Zone except for the following:

Institutional Uses

Educational institutions and uses;
Denominational institutions and uses;
Day care facilities;
A single dwelling unit in conjunction with a denomination institution or day care facility;
Fire and policy stations;
Government offices and public works;
Hospitals and medical clinics;
Public libraries, museums and galleries;
Community centres and halls;
Recreation uses;
Funeral establishments in conjunction with a cemetery (CHWEPCBCC-Aug/19/96;E-Sep15/96).

Open Space Uses

Public and private parks and playgrounds;
Cemeteries;
Historic sites and monuments.

21.2 P-2 ZONE REQUIREMENTS: INTSTITUTIONAL USES

In any P-2 Zone, where uses are permitted as Institutional Uses, no development permit shall be issued except in conformity with the following:

Minimum Lot Area:	central services	929.0 m2
	on-site services	1858.1 m2
Minimum Frontage:		30.5 metres
Minimum Front or Flankage Yard		9.1 metres
Minimum Rear or Side Yard		½ the height of the main building
Maximum Lot Coverage		50 percent

21.2A OTHER REQUIREMENTS: FUNERAL ESTABLISHMENTS AND CEMETERIES:

Where funeral establishments and cemeteries are permitted in any P-2 Zone, the following shall apply:

(a) The funeral establishments shall be located on the same lot as a cemetery, and the gross floor area of the building shall not exceed ten (10) percent of the lot area;
(b) Vehicle access to any property which is to contain a funeral establishment shall be from a designated collector or arterial street only;
(c) Any building used for the purposes of a funeral establishment or cemetery maintenance (including an equipment or storage area) shall be located a minimum of fifty (50) feet from any abutting residentially zoned property;
(d) Where a funeral establishment or a parking lot (inclusive of driveways and driving aisles) for a funeral establishment is to be located on a lot which is adjacent to property which is zoned for residential use, a landscaped yard of at least six (6) feet in height is provided along the common property boundary the landscaped yard may be reduced to fifteen (15) feet. For the purposes of this section, landscaping shall consist of either the retention of existing tree cover, or the planting of a mix of nursery-stock trees and shrubs.

(CHWEPCBCC-Aug 19/96;E-Sep 15/96).

21.3 **P-2 ZONE REQUIREMENT: OPEN SPACE USES**

In any P-2 Zone, where uses are permitted as Open Space Uses, no development permit shall be issued except in conformity with the provisions of Part 20.

Appendix D

Phase One Site Assessment for Natural Burial Cemetery Capability in the HRM

Location Address: 255 Bissett Road, Cole Harbour
GPS Coordinates: 44 39'45 N, 63 28'10 W
Name: Theresa Piorkowski
Date: October 31, 2009

Section 1: Required Criteria

Place a check mark (√) beside each environmental criterion if it has been met. All criteria in this section must be satisfied before recommending the Phase Two Site Assessment. Add notes or comments to clarify the site assessment.

Criteria	Comments
Distance to water from edge of burial field: ☑ streams (min 30.5 metres) ☑ rivers (min 30.5 metres) ☑ wetlands (min 30.5 metres) ☑ lakes (min 30.5 metres) ☑ ocean (min 30.5 metres) ☐ other: _____ Distance to water wells from edge of burial field: ☑ drilled well (min 15.2 metres) ☐ dug well (min 30.5 metres) ☐ other: _____ ☑ Soil depth (min 2.0 metres) ☑ Soil drainage (moderately-well to well drained) ☑ Slope (maximum 8.3%)	• the closest water body to the site is a stream, approximately 100 metres from the property edge. Bissett Lake is immediately adjacent to the site; however, steep slopes can act as a buffer- no burial to take place here. • the closest drilled well is approximately 70 metres from the property edge. • no dug wells located nearby. • soil type is Wolfville (according to soil map). Wolfville soil and Surficial geology- Silty Till Plain (on surficial geology map) indicate that soil depth exceeds 2.0 metres. • Maximum slope is 7% on east facing slope, and is maximum 27% on west facing slope- this could be a buffer zone from the lake.

Section 2: Recommended Criteria

Place a check mark (√) beside each social criterion if it has been met. Satisfying all criteria in this section is not mandatory; however, it is recommended that a minimum of 3 criteria be met in order to achieve some natural burial principles. Add notes or comments to clarify the site assessment.

Criteria	Comments
☑ Scenic views from the site ☑ Recreation trails at or nearby the site ☐ Woodland setting Accessibility: ☑ near residential community ☑ adjacent to major road	• scenic views of Cole Harbour and Cole Harbour Heritage Park. Top of drumlin overlooks Bissett Lake. • Cole Harbour Heritage Park is across Bissett Road with 30+ trails for hiking • access from Bissett Road and nearby Cole Harbour Community.

Section 3: Recommendation

Comments: The site meets all required environmental criteria and four of five recommended criteria. Phase two, detailed site assessment is recommended.

Select one of the following:

- ☐ Additional Phase One site assessment required
- ☑ Proceed with Phase Two site assessment
- ☐ Not recommended as natural burial cemetery

Appendix E

Excerpt on memorials and monuments from the 2007 Cemeteries By-law.

Memorials

12 (1) One monument only shall be permitted on each grave space. No person shall erect a monument which does not conform to the requirements of this bylaw.

(2) All monuments shall be constructed of granite, cut stone or marble.

(3) No monument less than five inches in thickness shall be erected.

(4) Monuments of five inches in thickness shall not exceed two feet two inches in height, including the base.

(5) Monuments of six inches in thickness shall not exceed two feet six inches in height, including the base.

(6) Monuments erected on single grave lots shall have a maximum base size of 32 inches x 12 inches and shall have a maximum height of 28 inches including the base.

(7) Monuments erected on two grave lots shall have a maximum base size of 50 inches x 14 inches and shall have a maximum height of 32" including the base.

(8) Only upright or slant monuments shall be placed at the head of a grave.

(9) The placing of lettered boards or wooden crosses is prohibited.

Slant Marker Dimensions

13 Slant markers or wedges shall not exceed the following dimensions:

a) Single Grave Lot - 30" long x 18" wide x 12" high including base;
b) Two Grave Lot - 48" long x 20" wide x 14" high including base.

Flat Marker Dimensions

14 (1) Individual graves may be marked by flat markers installed as foot markers which shall be set in-ground, flush to ground level without foundations, and must be not more than six (6) inches nor less than four (4) inches in thickness; and a maximum size of 22 inches long x 12 inches wide.

(2) Single grave lots that do not have monuments shall be permitted to have a flat marker at the head of the grave with maximum dimensions of 30

inches long x 18 inches wide.

(3) Double grave lots that do not have monuments shall be permitted to have a flat marker at the head of the grave with maximum dimensions of 30 inches long x 18 inches wide.

(4) All markers shall be constructed of granite, cut stone, or marble.

Monuments on Lots with Two or More Graves

15 Monuments or flat markers for lots containing more than two grave spaces shall not be of a size or situated in a manner which would interfere with the maintenance of a lot.

Monuments on Undersized Lots

16 The size of monuments or flat markers on undersized lots shall not be of a size or situated in a manner which would interfere with the maintenance of a lot or with existing monuments on adjoining lots.

Lettering and Markings

17 (1) Lettering is permitted on the side of any monument placed at the boundary of any lot, and family names only are permitted on the back of any monument placed at the head of any lot.

(2) If a memorial has an inscription which in the opinion of the Supervisor is offensive to the public, such offensive or improper markings may be re moved by the Supervisor.

Appendix F

Excerpt of "Permitted Uses of Grave" from the 2007 Cemeteries By-law.

Permitted Uses of Grave

20 (1) Each grave may be used for more than one burial, in accordance with this by-law, unless otherwise indicated by the lot owner.

(2) Where a single grave space is to be used more than once, the following criteria must be observed:

(i) A second full length interment shall be permitted in the same grave space at any time following the double depth interment of the first remains, should such double depth interment be possible.

(ii) A second full length interment shall be permitted in the same grave space at any time following the passage of forty years since the interment of the first remains, unless the first interment was in a vault or steel casket.

(iii) A single grave space designed for a full length burial may be used for a maximum of six cremation interments, subject to the grave space not being used for a full length burial at any time.

(iv) A single grave space designed for a full length burial can be used for a maximum of three cremation interments at any time following the full length interment of the first remains. The forty year rule does not apply to the full length interment.

(v) A single grave space that has been used for two full length interments shall be considered full. With the approval of the Supervisor, two cremations can be added if space is available.

(vi) If a single grave space is to be used for more than one burial, the standard grave opening fee shall apply for each interment. Perpetual care charges will apply to each interment following the initial burial.

(vii) A maximum of two cremation urns or a companion urn may be included in one opening and closing at the same time and in the same grave space for a single opening and closing fee. However, the two urns or companion urn shall be deemed to be two cremation interments.

(viii) The size of a lot shall be 40 inches x 120 inches.

(ix) Mausoleums shall be permitted at the Fairview Cemetery and the Mount Herman Cemetery. The space size of each mausoleum shall be determined by the Supervisor.

(x) Lots shall not be traded from one cemetery to another without the approval of the Supervisor.

(xi) A single mausoleum shall sit on three lots, and a double mausoleum shall sit on four lots.