Site-Specific Music Composition and the Soniferous Garden

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ABSTRACT: Imagine strolling through a garden that, in addition to the usual sights, scents and sounds, contains strange constructions: a steel canyon; a stepped pyramid; two giant concave dishes. Now imagine taking out a flute and playing with sounds that echo and amplify, whisper and reverberate back to you from these odd objects.

Music composed for a naturalistic garden designed with acoustical properties, as if it were an organic orchestra, would demonstrate site-specificity of the highest order. Such music would only be effective in that one place. How to accomplish this integration of landscape and sound is the object of this paper.

The uniqueness of this proposed project, an extension of composer R. Murray Schafer's "soniferous garden" concept, would have benefits to composers, landscape designers and the public. But what is more, perhaps we will begin to rediscover the magic and mystery our prehistoric ancestors experienced with sound in the landscape.

KEYWORDS: soniferous garden, soundscape, site-specific, music composition, acoustical park.

1. Introduction

From the moment music-making began, music has always necessarily taken place in a space. Just as certain kinds of spaces have been created for the performance of certain kinds of music (e.g. concert halls for symphonic music, opera houses for opera), some music has been and is being created especially for certain specific pre-existing and specially built spaces. No one is certain how far back "site-specific" music-making originates, but the term "site-specific," at least in theatrical use, has been around only since the 1980s. (Field 2008)

Originally the term meant "a performance specifically generated from or for one site."(Ibid) However, more recently the term has been expanding to include any performance not in a traditionally recognized performance space such as a concert hall or theater, and as Andy Field states in his article "'Site-Specific Theatre? Please Be More Specific," "[t]hat's missing the point…And as this understanding of site-specificity grows ever more bloated, its original meaning becomes fainter and more diluted." (Ibid.)

When the term "site-specific" is used in its most inclusive sense there is a very wide range of "site-specific" compositions, indeed. From the poly-ensemble work *In Ecclesiis* (pub. 1615) by Giovanni Gabrieli (1554?-1612) which uses the existing spatial opportunities of the architecture of St. Mark's Basilica in Venice, (Selfridge-Field 1975, 99) but which can be effectively performed in any concert hall, to Edgard Varèse's (1883–1965) *Poème électronique* (1958), specifically designed for the effect of 300 loudspeakers surrounding the audience with projected images in the dark, (Xenakis 2001, 107) and which sounds flat when heard in stereo in lighted music history classrooms, site-specific music associated with interior spaces may either use existing spaces for dramatic effect, or be so linked to a space that performance anywhere else adversely affects the result.

Site-specific music may also be linked loosely or vitally to an outdoor place. For example, *Water Music* (Op. 82) (1964), by Sir Malcolm Arnold (1921–2006), composed for the opening ceremony of the Stratford Canal and meant to be performed on a barge, does not appear to be tailor-made for outdoor performance, as Arnold uses woodwinds at low volume and even a muted trumpet. Such orchestration seems much better suited for indoor performance. (Arnold "Water Music" 2014) On the other hand, there is *Playing Outside* (2001) for chorus, orchestra, gamelan and improvisers by Robert Morris (b. 1943) written to be performed in Rochester, New York's Webster Park, a ¾ square-mile space containing a variety of geography including fields, woodland paths, picnic areas, streams, hills, stands of pine, little valleys and wetlands. "Because of the specificity of the composition," says Morris in his program notes, "the piece can only be played in the park, and all future performances will be mounted there." (Morris 2001) Morris composed the various parts exactly where they would be performed. Animals he encountered, named locations in the park and natural elements at each site sometimes suggested titles: "Hidden Frogs," "Canon at Cattaraugus," and "Concerto by the Brook." (Morris 2001) The compositional importance of this kind of site-specificity was not lost on the press which, according to Morris, "were complimentary, one of them making the point that this work, if performed indoors, would probably not please; what would have been strange sounds and unusual musical processes seemed perfectly appropriate outdoors." (Morris 2010, 286)

The highest order of site-specificity therefore, is one in which the music, if removed from its intended location, would lose musical effectiveness to such an extent that the performance would be a failure. Consideration for acoustical effects would have to be integrated into a landscape design to a degree beyond anything currently in existence, for true, high-order, outdoor site-specific music. Composer R. Murray Schafer (b. 1933) hints at this in his book *The Soundscape* (1994). This paper will demonstrate how a true "soniferous garden" can be designed.

2. Design for an Acoustical Landscape

R. Murray Schafer begins his book *The Soundscape* (1994) by lamenting the changing sonic environment, or soundscape, as a result of increased modernization. The rising level of ambient noise all around us, he claims, has negative health repercussions. Schafer says, "Noise pollution is now a world problem. It would seem that the world soundscape has reached an apex of vulgarity in our time, and many experts have predicted universal deafness as the ultimate consequence unless the problem can be brought quickly under control." (Schafer 1994, 1)

The task of rescuing our more naturally compatible acoustic environment from the escalating threats of continuous human-produced noise falls upon the shoulders of the acoustic designer, a new interdisciplinary profession which seeks to find ways to preserve and improve the quality of our environmental sounds, not just to fight the bad ones. (Ibid., 271) One way to achieve this is the design of public gardens and parks free from encroaching noise, noxious fumes and amplified music. But where true gardens are "feast[s] for all the senses" and well-designed parks allow for multiple community activities, typically the locations are badly chosen and subject to increasing noise and air pollution which defeat the senses. (Ibid., 246) Schafer declares:

> With good reason then do we insist on the necessity today to throw the emphasis back to the acoustically designed park, or what we might more poetically call the soniferous garden. There is but one principle to guide us in this purpose: always to let nature speak for itself. Water, wind, birds, wood and stone, these are the natural materials which like the trees and shrubs must

> be organically molded and shaped to bring forth their most characteristic harmonies. (Schafer 1994, 247)

This paper's hypothetical outdoor space, called herein a "sound garden" or "acoustical park," is therefore an extension of Schafer's "soniferous garden" only with more examples of hardscape and sculptural elements with musical and acoustical properties for the purpose of encouraging site-specific outdoor acoustic music compositions. This "model environment," a result of acoustic design's "imaginative placement of sounds to create attractive and stimulating acoustic environments for the future," is in the same way, according to Schafer, "contiguous with contemporary musical composition." (Ibid., 271) While a complete design process in creating an outdoor public space may involve many important steps, this section will demonstrate acoustic design by limiting itself, for the purpose of this paper, to the more relevant steps of site selection, soundscape survey and master plan.

2.1. Site Selection

Ideally, the site for a sound garden/acoustical park should be located in an area where the ambient decibel level does not regularly exceed that of human speech (60–65 dB (A)) (Galen Carol Audio 2015) so that quiet natural and musical sounds can be appreciated in close proximity. Louder sounds can occur on-site and off-site occasionally or on a predictable schedule so that they can be incorporated into a musical composition, a process termed in this paper "acoustical alignment."

Whereas locating the sound garden/acoustical park too close to urban and industrial development can be sonically overwhelming to the project, locating it too far from easy visitor access and interesting off-site sounds can also weaken its appeal by disconnection to the community's citizens and its "soundmarks." (A "soundmark" is defined by Schafer as a natural or human-made sound that a community identifies as being unique to that community). (Schafer 1994, 10) Therefore, the ideal location for an outdoor space with designed acoustical properties intended for high level site-specific music composition should be in or near a quiet residential, mixed-use or university campus setting where periodically audible off-site sounds can be heard and used by composers as sound sources. This is the setting chosen as a model for this paper's hypothetical project.

2.2. Soundscape Survey

In order to identify the optimal location for a sound garden/acoustical park (ignoring for the sake of this demonstration the limitations of cost and land availability), the acoustic designer, who most likely would be a landscape architect by profession, should do an acoustical survey of the prospective sites' neighborhoods for analysis (in addition to all the other site surveys necessary for the usual landscape project implementation but which will be assumed to have taken place in this hypothetical case). All things being equal, the site with the most interesting soundscape, comprised of on-site and off-site sound sources, should be chosen as the project site. A sound map or "sonograph" (Schafer 1994, 274) will aid the designer in the same way as a hydrological or topographical survey aids landscape architecture projects: feasibilities can be judged, comparisons between sites can be made and design ideas can be stimulated.

Sound maps/sonographs can be made in virtually any style, as long as they communicate all necessary information as accurately as required by the designer. Maps can show numerical data (Figure 1) and comparisons (Figure 2). They can be sketch-like (Figure 3) or use icons overlayed onto aerial maps. Of course, other styles and methods are also possible.

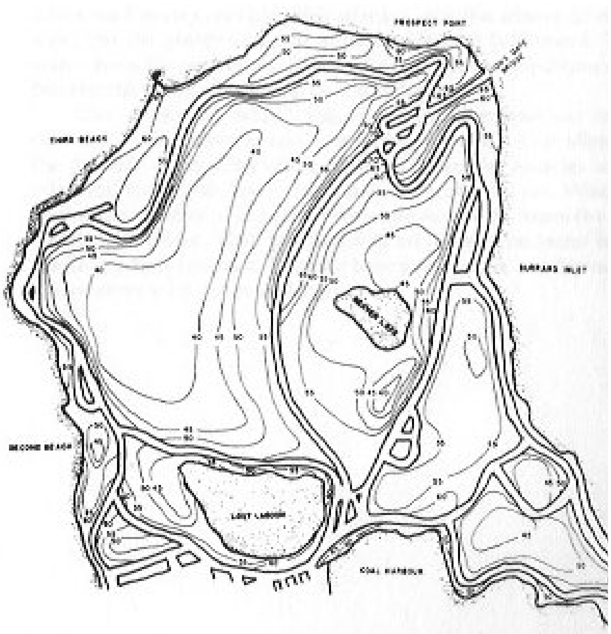

Figure 1. Sound map showing lines of similar decibel levels (isobels); Image: R. Murray Schafer.

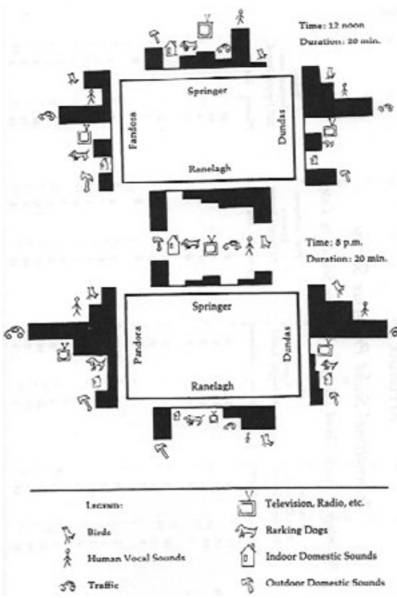

Figure 2. Sound map showing comparative sound activity and levels; Image: R. Murray Schafer.

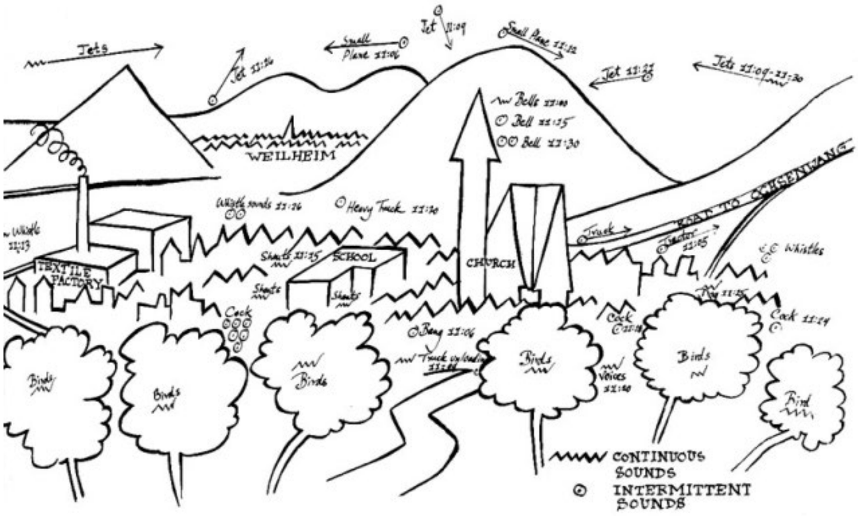

Figure 3. A line drawing sketch of a landscape with acoustic indications; Image: R. Murray Schafer.

A sound map for this thesis' chosen location shows that the site is rich in existing off-site musical sound sources (Figure 4). Were this an actual site, the designer might choose it as an ideal location to place the project based upon the advantages shown in the survey. (For the purposes of this paper, this imaginary and ideal location will be the test site). This sound map shows the existence of natural sound-makers such as acorn-dropping trees, predictable musical sounds (the carillon) and the more variable and less reliable industrial noises of trains and planes. Although there is traffic noise, it is low-level residential, not highway, below the decibel level of normal speech and can be moderated with sound barriers. There is nothing that would appear to be a sonic detriment to the site.

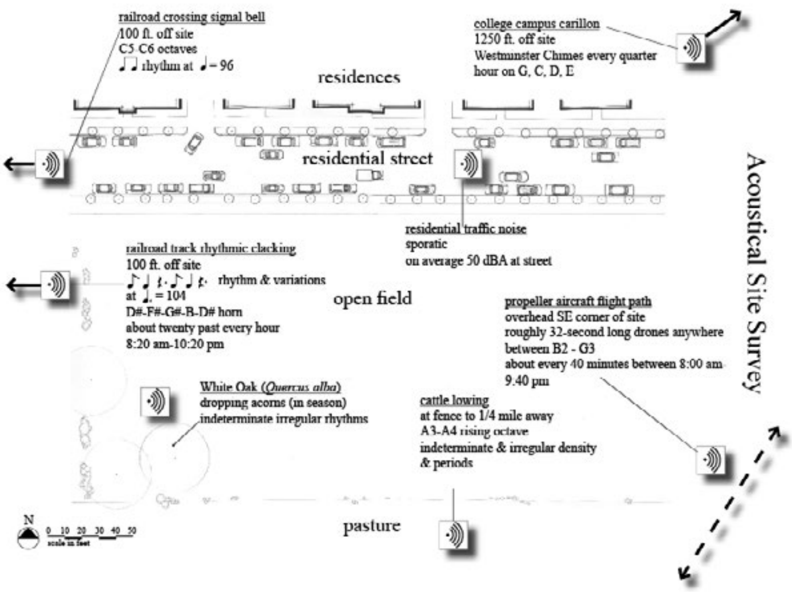

Figure 4. Acoustical site survey of hypothetical site.

2.3. Master Plan and Description of its Acoustical Properties

The landscape master plan shows in detail what a completed project will look like from a bird's-eye view, complete with physical topography, plantings and even color and shadows. In addition, this project's master plan contains elements, natural and constructed, with acoustical properties (Figures 5 and 6). A description of those elements, numbered in the master plan below, now follows.

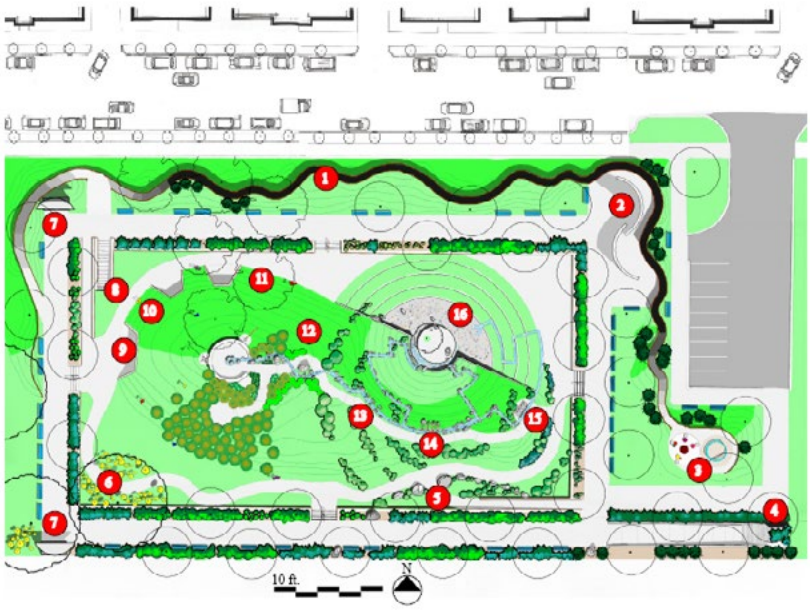

Figure 5. Final project master plan; Image: author.

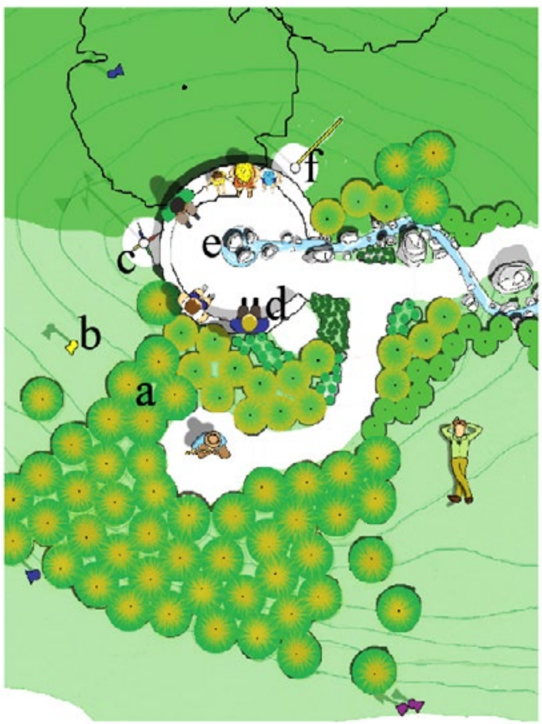

Figure 6. Detail of Wind Hill showing a). tall ornamental grasses, b). Tone Tube (speaking tube), c). musical wind chime sculpture, d). seat wall, e). spring/fountain and f). aeolian harp wind sculpture; Image: author.

1. **Echo Canyon.** This very long feature serves as noise barrier, (New York State Department of Transportation 1998, 3.1.F) site enclosure (to control pedestrian circulation) and acoustical sculpture. As a sound sculpture, the Echo Canyon would function much the same way as does Richard Serra's "Snake" (1997), which serves as a direct model (Figure 7). In *The Sound Book*, Trevor Cox describes his experience inside "Snake":

   Best of all was *Snake*, a work made of three long, tall, twisting metal sheets forming two narrow corridors about 30 meters (100 feet) long. The passageways were only about a meter wide, and resonances across the narrow width colored my voice. When I stood in just the right place, with a flat bit of ceiling high above the sculpture, the sound would ricochet back and forth between the ceiling and floor. Sound would also go along the narrow channel and be reflected from other sculptures at the end, before it returned as a diffuse echo. Stamping my feet on the floor was very satisfying because in just the right place I could impersonate a rifle shot. (Cox 2014, 259)

Figure 7. "Snake" by Richard Serra, Guggenheim Museum, Bilbao, Spain; Photo: myhome-improvement.org.

Like "Snake", the Echo Canyon has tall walls (13'2" for "Snake", 14' for the Canyon), is long (104' compared to 450'), is made of two-inch-thick steel panels which are three feet apart and wavers reducing straight sight lines. (The Solomon R. Guggenheim Foundation 2015) Unlike "Snake", however, the Echo Canyon is buried partially underground with only seven feet of its top half above grade. Access is by an entrance on either end with descending stairs. For those visitors with claustrophobia or needing access by wheelchair, a shorter, wider, at-grade portion is provided at the far western end. Most significantly, however, is the fact that there is no ceiling to the Echo Canyon, unlike "Snake" in the Guggenheim Museum, Bilbao, Spain. How this may reduce the echo effects experienced by Cox may have to be left to physical experimentation. A top could always be added if necessary.

2. **Whisper Wall.** This is a realization of Trevor Cox's double curved whispering wall (Figure8). (Cox 2014, 175–176) Comprised of two tall, hard concrete arcs, the Whisper Wall allows a speaker or musician at the far interior end of an arc to speak, whisper or play soft music and, out of sight of the listener at the far interior end of the second arc, to be clearly heard only in that spot. It should be noted that this effect might work at several locations along the inner panel of the Echo Canyon as well.

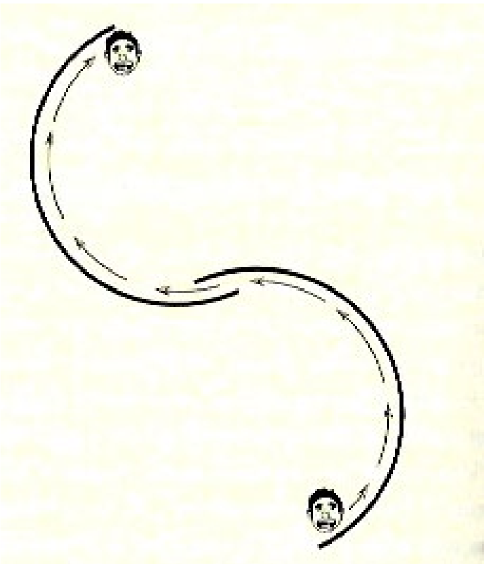

Figure 8. Double curved whisper wall by Trevor Cox; Image: Trevor Cox.

3. **Percussion Circle and Round-Go-Round.** The Percussion Circle is similar to the "Pompano Drum Circle" of Bill and Mary Buchen (both b. 1949) (Figure 9). It can be integrated into site-specific music composition performances or used "off-season" by the general public.

   The Round-Go-Round is a circular musical fence of loose vertical metal rods which vibrate when struck by a percussion mallet or stick and resonate within the horizontal hollow rails on either end of the rods. Each of the 23 rods is pitched to a note of the children's song "Row, Row, Row Your Boat." When someone runs around the outside of the fence rattling the rods with a stick or mallet, the song plays. Because the song is a "round," children can chase each other around the installation starting at different times to create the polyphony of a round or experiment with retrograde musical movement (by running in the opposite direction) or any number of canonic intervals by following the "wrong" spacing.

Figure 9. "Pompano Drum Circle" by Bill and Mary Buchen showing bata, tambor, djembe with seat and earthdrum, Pompano Beach, Florida; Photo: unidentified, sonicarchitecture.com.

4. **Mini-Mayan Pyramid.** A 15-foot-tall stepped wall of hard concrete, 10 feet of which is below grade and approached by a sloping passage. Although a far cry from the much bigger Mayan pyramids that produce the most famous chirp echoes, this 15-foot-high wall may produce a similar effect. (Declercq et al. 2004, 3328) According to Trevor Cox ordinary staircases may produce many different kinds of sonic effects. (Cox 2014, 140–141)
5. **Music Rocks.** Hollow, artificial boulders placed upon resonating chambers will produce pitches when hit with mallets or slapped with the hands. They may be tuned to any kind of scale. The seven rocks closest to the paved walkway may be tuned to a pentatonic C-D-E-G-A-C-E scale, for example. Again, this installation may be used for both specific musical compositions or by the general public whenever concerts are not happening.
6. **Cymbal Garden.** Many suspended cymbals of all sizes can be planted *en masse* under the canopy of the existing mature White Oak trees (*Quercus alba*) so that, in season, falling acorns are sure to hit them creating a random percussion performance.
7. **Sound Mirror-Sound Mirror.** Large acoustical mirrors made of concrete, similar to the ones at Denge, England (Figure 10) which were used to hear incoming aircraft before they could be seen, bookend the western promenade north and south. (YouTube "Sound Mirrors-BBC Documentary" 2015) In performance, one quiet musical sound at the right spot in front of one mirror should be clearly heard at the right spot in front of the other mirror for only one listener at a time resulting in a kind of acoustical induced perspective.

Figure 10. Denge acoustic mirror, Denge, Kent, England; Photo: unidentified, www.karl-davies-talktalk.net.

8. **Sound Cavern.** A large 50-foot-wide, 100-foot-long, 12-foot-high concrete room is buried five feet below grade under the Wind Hill. It is accessed by a subway entrance-like staircase at the northwest corner of the garden. The reverberating and resonating characteristics of large cisterns were used in 1989 by American composers and performers Pauline Oliveros (1932–2016), Stuart Dempster (b. 1936) and composer and vocalist Peter Ward (aka Panaiotis) to record an album of ambient music called *Deep Listening*. (von Glahn, 122) In this situation, however, listening/speaking tubes connecting the Cavern with the surface allow the general public to hear what is going on without having to enter the dark space below. Conversely, the public can also sing into the listening/speaking tubes and hear the effect the Cavern has on their voices as with the Buchen "Listening Dishes" (Figure 11) in Brooklyn, New York. (Sonicarchitecture 2015)

Figure 11. "Listening Dishes" by Bill and Mary Buchen, Brooklyn, New York; Photo: unidentified, sonicarchitecture.com.

9. **Droning Caves.** These are four, four-foot diameter concrete culverts with lengths of 6,9, 12 and 15 feet with one closed end buried into the Wind Hill. Working with the same principle of resonance as John Grayson's (b. 1943) "Big Boomer" installation (Figure 12), people can climb inside the culverts and hum, sing or play instruments which will resonate at frequencies determined by the lengths of each tube according to an acoustical formula. (Grayson 1976, 19–24)

Figure 12. Big Boomers by John Grayson; Photo: John Grayson.

10. **Tone Tubes.** Located around the west end of the Wind Hill are metal "speaking tubes" protruding from the ground and bearing wide trumpet-like bells. (Figure 13) Some of these are paired together with Tubes located out of sight on the other side of the Hill.

Figure 13. Speaking tube;Photo: unidentified, treehouseaccessories.com.

Music or speech sounded into one horn will be heard at the other end. (Wikipedia "Speaking Tube" 2015) Other Tubes are connected to the Sound Cavern below which allow listeners to hear the effects of reverberation on musicians in the Cavern or which will allow visitors to hear the effects of the Cavern on their own voices (see above). Some of the listening stations feature two horns: one is placed low to the ground for children and wheelchair-bound visitors while the other is at adult height.

11. **Aspen Grove.** Several Quaking Aspen trees (*Populus tremuloides*) form a small grove north of the Wind Hill. This deciduous tree is famous for its rustling and trembling leaves.
12. **Wind Hill.** The Wind Hill is the main topographical feature of the acoustical park although it only rises to eight feet above grade. This is enough, however, to catch the prevailing southwest wind and stimulate wind-powered movement. On the summit there is room for up to three wind-powered sound sculptures. One sculpture is an aeolian harp not unlike American artist Doug Hollis' (b. 1948) "Aeolian Harp" (1976) which stands 27 feet tall and has seven strings attached to metal disc amplifiers (Figure 14).

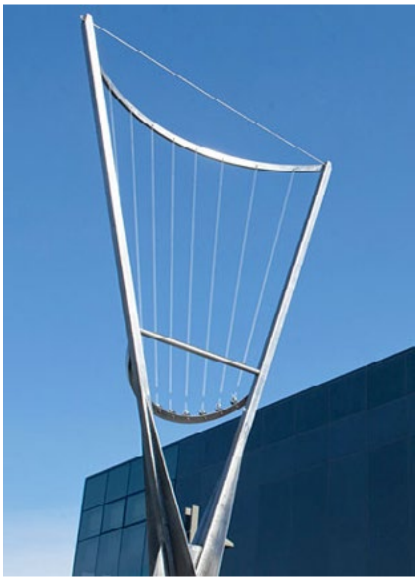

Figure 14. "Aeolian Harp" by Doug Hollis, San Francisco; Photo: unidentified, www.exploratorium.edu.

It is situated at San Francisco's Exploratorium between two buildings forming a kind of wind tunnel through which, in the mid-afternoon, the rising winds are funneled. Says Exploratorium curator Shawn Lani, "That's when it really sings." (Exploratorium 2015) (YouTube "Aeolian Harp" 2015)

The summit and south side of the Hill are covered in plants which are known for making sound in the wind: Love-in-a-mist (*Nigella damascene*), Blue False Indigo (*Baptisia australis*), New Zealand flax (*Phormium* 'Yellow Wave'), Quaking grass (*Briza maxima*) and Plume grass (*Saccharum ravennae*). (Figure 15) A flat, circular, open area provides musicians and visitors a place in the middle of tall Plume grass to enjoy the sounds of the wind in the grass.

Figure 15. Plume grass (*Saacharum ravennae*), Photo: unidentified. www.missouribotani-calgarden.org.

13. **Music Mill(s).** Placed along the stream running down from the "spring" on the summit of Wind Hill is one or more Music Mills, a kind of waterwheel-powered music box, as built by traditional woodworker Roy Underhill (b. 1950) and demonstrated in the season five episode 11 PBS broadcast of "The Woodwright's Shop" (1985) (Figure 16). (YouTube "Music Mill" 1985)

Figure 16. Music mill; Photo: unidentified, www.shopwoodworking.com.

The shallow stream moves water wheels which turn, lifting hammers via a rotating drum with pegs in the fashion of a music box. The hammers fall back when released, tapping tuned glass bottles. A simple wooden toggle can be used to prevent each water wheel from turning thus silencing them if they are not needed in a performance. By adding or pouring water out, bottles can be custom tuned to any composition.

14. **Stone Tappers.** Several Japanese *sozu*, sound-producing water features found in many Japanese gardens, form an ensemble of water-activated, random stone tapping percussion instruments (Figure 17). Water from the stream trickles through openings in its side, flowing into the up-ended hollow bamboo (or PVC pipe) tubes of each "deer chaser" (*sozu*). When the weight of the water in each tube shifts the tube's balance point, the tube tips down emptying the water into a secondary sluice. The empty tube then flips back to its upright position tapping a stone at the tube's heavy lower end in the process.

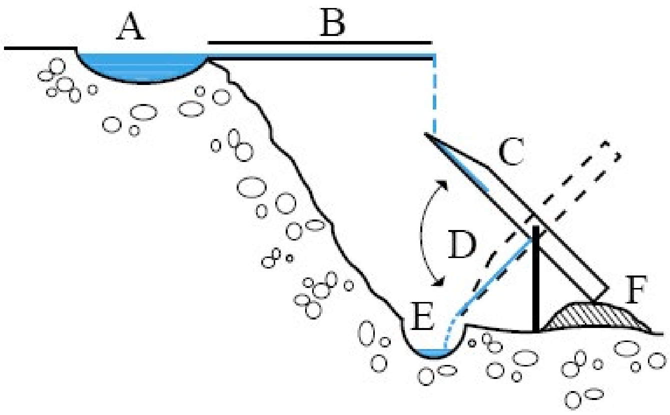

Figure 17. Diagram of *sozu* showing stream (A), PVC pipe (B), which drips water into up-ended bamboo tube (C), which tips down (D) when heavy emptying into drain or sluice (E). Empty unbalanced bamboo tube tips upright striking lower end on stone (F); Image: author.

As these tapping sounds can be quite loud and audible from "about 100 feet away," (Bier, James in conversation with the author, 2015) a mechanism such as a toggle can be used to prevent each *sozu* from tipping and therefore turn off the instrument when more quiet is needed.

15. **Water Organ.** When stream water reaches this station, small gates can be lifted allowing water to flow into gravel filled boxes with tuned pipes inserted vertically (Figure 18). The water displaces air in the gravel which, if tightly covered, forces air into the pipe sounding a pitch. A second latch is opened allowing the water in the box to drain out restoring air to the box.

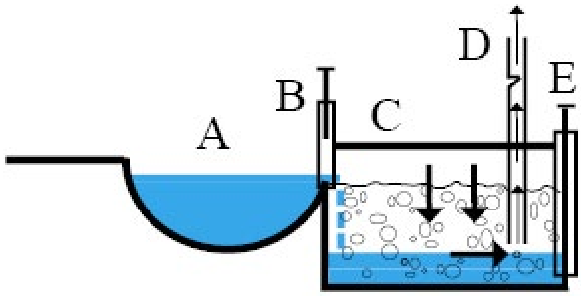

Figure 18. Diagram of water organ showing stream (A), gate (B) which allows water into airtight chamber (C). Water pressure forces air into musical pipe (D). Gate (E) drains water from chamber after pipe sounds; Image: author.

This is a simplified model of the great Renaissance water organs, the most famous of which is the one at Villa d'Este in Tivoli central Italy (1572), designed and built for Cardinal Ippolito II d'Este (1509–72), and was apparently programmed to play "madrigals and many other things" (Figure 19). (Jeans and Ord-Hume 2015)

Figure 19. Water organ at Villa d'Este, Tivoli, Italy; Photo: unidentified, https://quietcassandra.wordpress.com.

16. Double Amphitheater Water Basin. Run-off from storms as well as all the stream water empties into the gravel-filled basin at the lowest level of the double amphitheater. A pump buried below returns most of the water to the fountain "spring" at the top of Windy Hill. In addition, several *suikinkutsu*, Japanese water pots of various sizes, are also buried under the gravel. After water drains into the holes at the top of each ceramic pot, it drips into a pool contained within and resonates within the chamber (Figure 20).

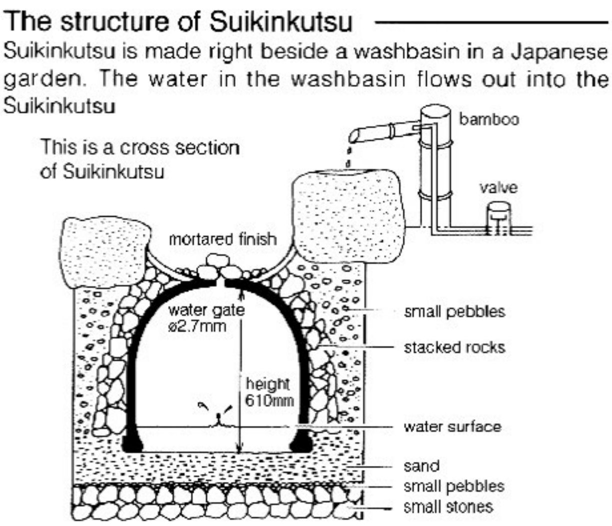

Figure 20. *Suikinkutsu* diagram; Image: www.ceramicstoday.com.

English musician and composer Jem Finer (b. 1955) designed and built an installation in the woods of Challock, Kent, England, directly inspired by the rain-induced meditative sounds of the Japanese *suikinkutsu*. Called “Score for a Hole in the Ground” (2006), it consists of a 21-foot-deep concrete well, seven feet in diameter, containing suspended metallic percussion instruments such as discs and bowls which chime and reverberate when rain water or water from a small constructed supply pond drips on them from above. The shaft is covered by a metal perforated cover. Standing high above the buried chamber is a 21-foot-tall metal gramophone-like acoustic horn to amplify the sounds underground (Figure 21).

Figure 21. “Score for a Hole In the Ground,” Challock, Kent, England; Photo: unidentified, www.scoreforaholeinthegroundground.

(Finer 2015) Finer describes how Nature “plays” the installation, “Weather changes the music. In a torrential downpour it reaches a crescendo, while the summer’s drought rendered it silent, save for the effects of the breeze gently brushing the instruments as it eddies around the chamber. It becomes one with the climatic forces of the forest, relying purely on gravity, water and wind for its energy.” (Finer 2006) Several dozen buried echo chambers in the double amphitheatre would have quite a similar effect.

With the design of the sound garden/acoustical park completed, it is now time to consider the composition of music for this specific site and its designed acoustical properties.

3. Site-Specific Music Composition and the Soniferous Garden

In composing music for outdoor places with designed acoustical properties, there are several important pre-compositional factors to be considered which would probably not affect the composer of indoor concert music. Once these have been taken into account the actual composition may begin.

3.1. Acoustical Alignment

In landscape design, architecture and art, visual elements are sometimes arranged such that when viewed from a particular pre-determined angle the elements seem to come together or are aligned. In French Baroque landscape, allées and sight lines are used to draw attention to distant objects and extend the illusion of great space (Figure 22). (Pregill and Volkman 1999, 236)

Figure 22. View from Hercules to the Chateau de Vaux-le-Vicompte, Maincy, France (17th century); Photo: unidentified, journals.worldnomads.com.

In English landscape of the picturesque, points of interest within the garden are framed by structures or plantings to direct the eye that way (Figure 23). In Japanese landscape, the artificial garden design incorporates distant natural scenery for a “borrowed landscape” (*shakkei*) when viewed from one pre-determined viewing station (Figure 24). Architecture, too, draws connections between the structure and distant natural objects as in the astronomical alignments of Stonehenge and in Xenakis’ architecture. (Xenakis 2001 23, 49–50)

Figure 23. Framed view of the Rotunda at Stowe House, Stowe, Buckinghamshire, England (18th century); Photo: unidentified, www.geograph.org.uk.

Figure 24. View of Adachi Museum garden (20th century), showing borrowed landscape of distant mountains, Yasugi, Shimane Prefecture, Japan; Photo: unidentified, bonsaiunearthed.com.

Marcel Duchamp's (1887–1968) *Étant donnés* (1966) is an example of art restricted to just one viewer at a time, being a painting viewable only through duel peep holes (one for each eye) in a wooden door (Figure 25). (Philadelphia Museum of Art 2015)

Figure 25. "Étant donnés" (1966) by Duchamp showing door with peepholes (left) and view through peepholes (right); Photos: www.philamuseum.org.

For the sound garden/acoustic park design presented in this paper, alignments are of an acoustical nature and can be separated into two distinctly different types: acoustical alignment and acoustical induced perspective. Acoustical alignment in this case is when a performer connects musically with an off-site sound source such as a carillon or passing train. The connection can be imitative or accompanimental and can be heard, if not everywhere in the park, at least from whole areas as the sounds are dispersed and not focused. There are several opportunities for acoustical alignment in this paper's master plan as identified on the acoustical site survey map above (Figure 4).

3.2. Acoustical Induced Perspective

Acoustical induced perspective is different from acoustical alignment in that acoustical induced perspective requires that in order for a particular sound to be heard best or at all, both musician and listener must be in specific locations. The sound is focused to one point. Examples of acoustical induced perspective are the whisper wall and acoustical mirrors above (Figures 8 and 10). It will be noticed that acoustical induced perspective is exactly analogous to forced perspective in landscape where only one or a very few people at a time can experience a given view.

3.3. Acoustical Dispersal

One of the problems of playing music outdoors over a large area is that musical sounds do not always carry well or evenly, depending upon the loudness of the instrument and atmospheric conditions such as temperature and wind. If instrumentalists and vocalists are spread out over a large area they may never hear each other and the audience may never hear all the performers. This is one characteristic of Robert Morris's *Playing Outside* mentioned in the Introduction. The composer of music for any large outdoor place must decide if this characteristic will be a disadvantage or an advantage to the musical experience.

3.4. Flexibility

One of the ways that performing outdoors can be challenging is in all the uncontrollable things that can happen: rain, wind (when one doesn't want it or no wind when one does), passing vehicles, acoustical dispersal (above), heat, cold, animals, etc. Sonic events that are supposed to occur on a predictable schedule (trains, planes, carillons, etc.) may be early or late for their "entrances" or never happen. For these and other reasons the composer and musicians need to decide how flexible the music will be to accommodate such an organic performance. Flexibility can be produced by levels of improvisation, a score which allows for "vamping" and indeterminate notation and graphic scores.

3.5. Coordination

Another challenging aspect of outdoor performance, especially for musical forces spread out over wide areas or in places which obscure sight-lines, is how to synchronize performers with each other and with sonic events. Robert Morris solved this problem by having each group follow stopwatch timings for general coordination, such as when different groups should gather by the flagpole. (Morris 2001) Nevertheless, each group was musically independent of other groups. R. Murray Schafer conducted his *Music for Wilderness Lake* (1979) from a floating raft using colored signal flags. (Schafer 1979) In this case all the musicians could see the conductor. Each composition for the sound garden/acoustic park presented in this paper will have to be carefully considered with this in mind. Ideally, the composer should visit the site beforehand, but because this is not always possible, a good description of sight lines should be included in the site plans for composers. Once the site is actually built, such specifications can be better calculated.

3.6. Number of Elements

The composer will also need to decide how many of the given acoustical elements in the landscape design to use. A composition for large forces may use nearly all available acoustical elements while a solo instrument piece may only use one (a solo for flute with music mill accompaniment, for example). One must be careful, of course, not to become so diverse that the music loses its coherence (the "kitchen sink" syndrome).

3.7. Instrumentation

As with all composition, how to score a work is an important consideration. For a sound garden/acoustic park design, however, some additional consideration may be necessary. For example, should the composer try to match timbres with known sonic effects such as mooing cows or rustling grass? Should the composer try to dominate the space with "outdoor" instruments such as brass and marching percussion or risk having a violin and flute duo obscured by the wind? Will a light rain shower damage an instrument? These questions will have to be answered before composition can begin.

For the purposes of this paper a number of assumptions have to be made since the actual site does not yet exist: actual pitches of airplanes have to be imagined, schedules of trains and carillons are fictitious and precise effects of the echo canyon can only be extrapolated from what little is known of its model. Once the site is actually built, experimentation will fine tune many acoustical effects and precise transcription will capture actual pitches, rhythms and timings which will be described in the design plans for composers without access to the site to accurately write high-order site-specific music for this place's designed acoustical properties.

3.8. *Trio for the Wind*

One possible example of site-specific music for this paper's hypothetical outdoor space is *Trio for the Wind* (Figure 26) for flute, shakuhachi, glockenspiel and the site's acoustical amenities of two sound mirrors, tall grass and a musical wind chime sound sculpture. This small-scale "chamber" work illustrates the idea that not every acoustical aspect of the site needs to be used all the time. It also demonstrates several of the above listed acoustical and compositional considerations. For example, the flute's use of the sound mirrors to project sound to one specific spot which can only be occupied by one or very few listeners at a time demonstrates acoustical induced perspective.

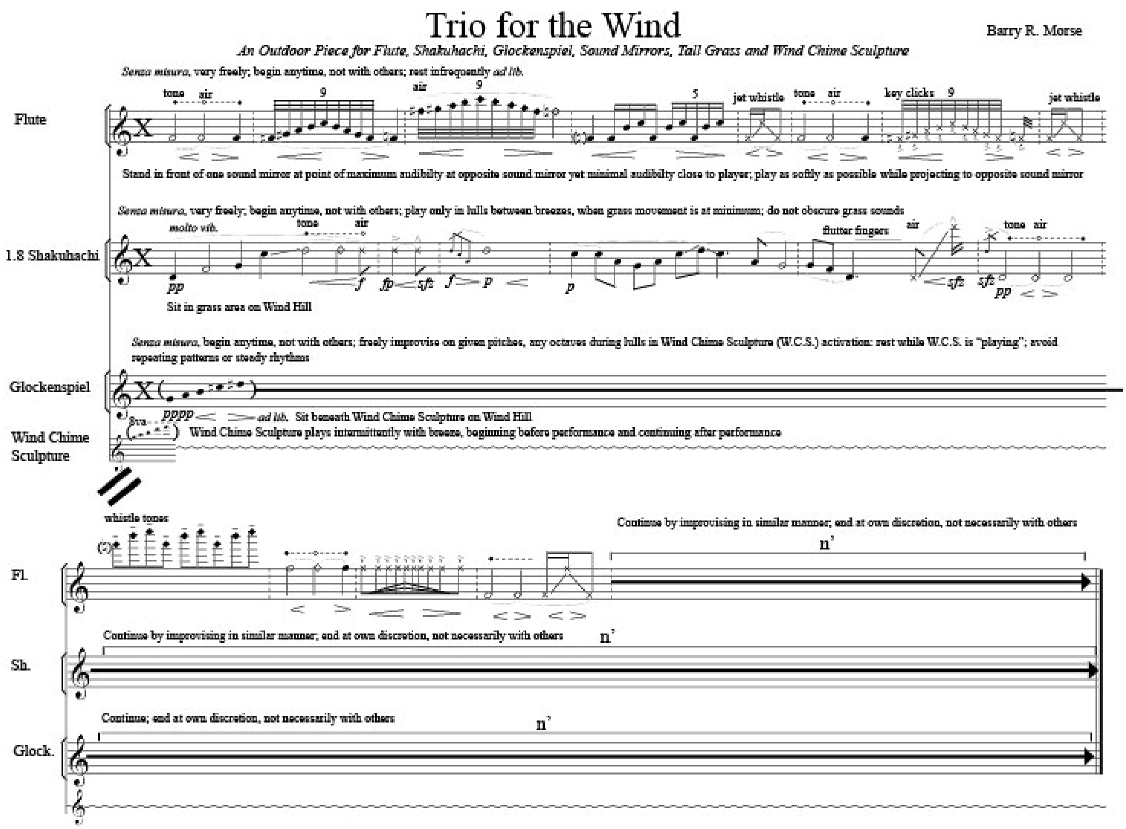

Figure 26. A Site-specific music composition for an outdoor space with designed acoustical properties; Image: the author.

The generally quiet nature of each instrument and their physical separation in outdoor space (especially considering the use of sound mirrors' acoustical induced perspective) create acoustical dispersal which, when combined with the possibility of poor sight lines among players, can present performance problems of coordination. These were solved in *Trio for the Wind* by allowing each player total freedom from any synchronization whatsoever including starting and ending times. Instrumentation as well was partly determined by the sonic elements in the landscape: a breathy shakuhachi to interact with the ebb and flow of wind in the tall grass and the metallic bells of the glockenspiel to extend the (assumed) metallic tones of the wind chime sculpture into performed music. It should be noted that this piece is also weather dependent: it should only be performed when breezes will rustle the tall grass and move the wind chime sculpture in waves.

Larger, more involved compositions can draw upon more acoustical properties of the site. Nevertheless, even small pieces such as *Trio for the Wind* can be composed to be entirely high-order site-specific to this one physical location.

4. Conclusion

Why do people create site-specific art? This is difficult to say on an individual basis unless artists come forth with their motivations. Some general categories of site-specificity, however, might shed light on artistic reasons and show commonalities among examples. One noticeable feature of site-specific outdoor music is the relatively high number of Canadian composers involved (Schafer, Westerkamp, Truax among others). What is it about this genre that attracts so many Canadians? In the book *Canada and the Idea of North*, author Sherrill E. Grace explains that R. Murray Schafer's motivation is to create "a Canadian music shaped by climate and geography," which, for Canadians, is embodied in the idea of "our nordicity as inherent in the natural environment." In other words, living as intimately to such a vast wilderness of cold, silent, empty expanses, some Canadian composers naturally will use that unique resource to inform their musical character. (Grace 2002, 136)

Another reason for using specific locations for performance could be social/historical/institutional criticism. According to art curator and educator Miwon Kwon, " [T]he possibilities to conceive the site as something more than a place – as repressed ethnic history, a political cause, a disenfranchised social group – is a crucial conceptual leap in redefining the 'public' role of art and artist." (Kwon 1997, 96) Meredith Monk feels this impetus about her *American Archeology No. 1: Roosevelt Island*: (1994)"This is a young country...We have a sense of the future, of speed, of not having to carry around on our backs a lot of the past. That leads to a fragmented and violent contemporary reality. The present moment has to incorporate the past. This is my attempt to do something about it, I guess." (Dunning 1994)

For others, site-specificity in relation to a building might be inspired by the idea of sonically extending the architecture. The various works of Henry Brant come to mind, especially when considering his attempts to design a special acoustical theater. (Brant 2002)

My own motivation for creating high-order site-specific music composition for acoustically designed landscapes lies in fascinating discoveries in the new field of acoustical archaeology. In his book *Stone Age Soundtracks*, researcher Paul Devereux discusses the role of natural acoustical effects and Paleolithic music ritual performed in the landscape and constructed spaces: "Indeed, in the light of the long prehistory of human interaction with sound, it becomes unreasonably conservative to doubt that there would be important acoustic aspects to megalithic monuments, or that the dramatic resonance of caves would have been ignored by Stone Age people." (Devereux 2001)

Could it be that the accidental discovery by early people of naturally occurring acoustical effects in the landscape, believed to be "magical" and thus of special significance, actually encouraged the development of human vocal and instrumental interactions with them later known as music? If this hypothesis is true then site-specific music composition for the soniferous garden brings us full circle, after 100,000 years, back to the fusion of music and landscape.

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