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A thesis in Historic Preservation Presented to the Faculties of the University of Pennsylvania in Partial Fulfillment of the Requirements of the Degree of Master of Science in Historic Preservation 2008.

Advisor: Randall Mason

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Reinterpreting the Laurel Hill Cemetery Using Geographic Information Systems (GIS)

Abstract

Laurel Hill Cemetery is an ideal candidate for an investigation of an innovative interpretation regime. It is a complex landscape that contains a wide variety of resources. Those resources cover a range of interests, holding an appeal for a broad potential audience. Importantly, the site is also recognized as one of great national and cultural significance.

Formal recognition of Laurel Hill Cemetery's cultural significance and contribution to the rural cemetery movement came when it was designated as a National Historic Landmark (NHL) in 1998. It was the first cemetery in the nation to be so designated and remains today an impressive 78-acre sculpture garden and historical resource. Like so many of America's cultural resources, however, the promotion and interpretation of the Laurel Hill Cemetery is not without difficulty.

Comments

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Advisor: Randall Mason

Reinterpreting the Laurel Hill Cemetery Using Geographic Information Systems (GIS)

Catherine Ann Rossetti

A THESIS

in

Historic Preservation

Presented to the Faculties of the University of Pennsylvania in

Partial Fulfillment of the Requirements of the Degree of

MASTER OF SCIENCE IN HISTORIC PRESERVATION

2008

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Dedication

I dedicate this work to my mother, Marie G. Rossetti, who would surely
have enjoyed this journey of discovery.

She lived for her family.

I dedicate this also to my father, Angelo H. Rossetti. His strength and
determination are an inspiration.

Acknowledgements

First, I would like to thank my advisor, Randy Mason, for his patience and understanding throughout a very difficult year. His direction, encouragement, and thoughtfulness made climbing this mountain seem possible. It really is done. I can hardly believe it.

Thanks also to my reader, Amy Hillier, for her unwavering guidance and support for my ideas and for her dedication to helping me get it right. Her enthusiasm for her work is infectious and an inspiration to those around her.

I would like to express my gratitude for the many other professors with whom I've studied during my time at Penn. Without fail over the years, they have offered selflessly and enthusiastically to share their wisdom. It is this that I will miss the most upon graduation. I'd sign up to do it all again if it weren't for the thesis requirement!

Thank you to Mary Curtis for continuing to answer my calls over the years. With the patience of a saint, she helped me through project after project, offering design guidance and moral support. I gratefully share this accomplishment with you.

Most importantly, thank you to my family. Without your patience and understanding, this adventure would not have been possible. No more homework. Time to peek over the horizon.

Table of Contents

DEDICATION.....	II
ACKNOWLEDGEMENTS.....	III
TABLE OF CONTENTS.....	IV
LIST OF FIGURES	VI
CHAPTER ONE: INTRODUCTION.....	1
CHAPTER TWO: A BRIEF HISTORY OF THE LAUREL HILL CEMETERY.....	4
DEVELOPMENT AND GROWTH.....	4
SITE CHARACTERIZATION	8
CHAPTER THREE: LITERATURE REVIEW – DEVELOPMENT OF INTELLIGENT, LOCATION-BASED TECHNOLOGY IN THE TOURISM INDUSTRY	11
INTERPRETATION ISSUES AND TRENDS.....	11
FUNCTIONAL GOALS	15
TECHNOLOGICAL LIMITATIONS.....	21
FACILITATING LEARNING THROUGH TECHNOLOGY	23
EDUTAINMENT	25
CONCLUSIONS	28
CHAPTER FOUR: CASE STUDY #1 – WEB-BASED TOURS	31
DESCRIPTION.....	31
BACKGROUND AND INTENT.....	32
BENEFITS AND CHALLENGES.....	34
CHAPTER FIVE: CASE STUDY #2 - PODCAST BASED TOURS	37
DESCRIPTION.....	37
BACKGROUND AND INTENT.....	38
BENEFITS AND CHALLENGES.....	39
CHAPTER SIX: CASE STUDY #3 – CELL PHONE TOURS.....	42
DESCRIPTION.....	42
BACKGROUND AND INTENT.....	42
BENEFITS AND CHALLENGES.....	44
CHAPTER SEVEN: CASE STUDY #4 – MULTI-MEDIA BASED TOURS	46
DESCRIPTION.....	46
BACKGROUND AND INTENT.....	47
BENEFITS AND CHALLENGES.....	49
CHAPTER EIGHT: GOALS AND ANALYSIS	52
LAUREL HILL CEMETERY GOALS FOR 2008	52
THE AUDIENCE.....	54
THE MESSAGE	57
<i>Ensuring Consistency</i>	<i>57</i>

<i>Key Themes</i>	57
RESOURCE CONSTRAINTS	59
<i>Scalability</i>	59
<i>Updatability and Maintenance</i>	60
NAVIGATING THE SITE	62
AVAILABILITY AND USABILITY	63
CONCLUSION	65
CHAPTER NINE: SOLUTION DESIGN	67
THE FOUNDATION	67
THE CONCEPT	68
USAGE SCENARIO	69
CHAPTER TEN: DESIGN DETAILS	71
WEB DESIGN	71
<i>Tour Route</i>	71
<i>Research Route</i>	72
TECHNOLOGY SELECTION	73
<i>Database Technology</i>	73
<i>Mapping Technology</i>	75
DATABASE CONTENT	76
IMPLEMENTATION PLAN	78
ADMINISTRATION NEEDS	79
SUCCESS MEASURES	80
CHAPTER ELEVEN: CONCLUSIONS	82
BIBLIOGRAPHY	85
APPENDIX A: FIGURES	87
APPENDIX B: INTERPRETIVE GOALS V. TECHNOLOGICAL APPROACH MATRIX	121
INDEX	128

List of Figures

FIGURE 1 - EVOLUTION OF LAUREL HILL CEMETERY (SOURCE: T. APHALE, 2007)	87
FIGURE 2 - LAUREL HILL CEMETERY'S MAIN GATEHOUSE AS IT APPEARS TODAY (SOURCE: C. ROSSETTI, FALL 2007).....	88
FIGURE 3 - THE LAUREL HILL NEIGHBORHOOD CIRCA 1860 (SOURCE: C. ROSSETTI, FALL 2007)	89
FIGURE 4 - THE LAUREL HILL NEIGHBORHOOD CIRCA 1875 (SOURCE: C. ROSSETTI, FALL 2007)	90
FIGURE 5 - THE LAUREL HILL NEIGHBORHOOD CIRCA 1923 (SOURCE: C. ROSSETTI, FALL 2007)	91
FIGURE 6 - THE LAUREL HILL NEIGHBORHOOD CIRCA 1951 (SOURCE: C. ROSSETTI, FALL 2007)	92
FIGURE 7 - THE LAUREL HILL NEIGHBORHOOD CIRCA 2005 (SOURCE: C. ROSSETTI, FALL 2007)	93
FIGURE 8 - THE LAUREL HILL CEMETERY (SOURCE: C. ROSSETTI, FALL 2007).....	94
FIGURE 9 - NEW RESIDENTIAL DEVELOPMENT IN THE EAST FALLS NEIGHBORHOOD (SOURCE: C. ROSSETTI, FALL 2007).....	95
FIGURE 10 - VIEW ACROSS KELLY DRIVE OF LAUREL HILL CEMETERY FROM FAIRMOUNT PARK (SOURCE: M. GOEKE, FALL 2007)	96
FIGURE 11 - VIEW SOUTH ALONG RIDGE AVENUE. THE CHAIN LINK FENCE TO THE RIGHT OF THE IMAGE FURTHER CUTS LAUREL HILL CEMETERY OFF FROM ITS NEIGHBORS. (SOURCE: C. ROSSETTI, FALL 2007).....	97
FIGURE 12 - VIEW WEST OF THE HUNTING PARK AVENUE DIVISION BETWEEN CENTRAL AND SOUTH LAUREL HILL. (SOURCE: C. ROSSETTI, FALL 2007)	98
FIGURE 13 - ADVERTISEMENT FOR SHERMAN MILLS, AN ADAPTIVE REUSE COMMUNITY IN EAST FALLS (SOURCE: C. ROSSETTI, FALL 2007).....	99
FIGURE 14 - MEDIAN HOME PRICES IN THE NEIGHBORHOODS ADJACENT TO LAUREL HILL CEMETERY (SOURCE: PHILADELPHIA NEIGHBORHOODBASE: CML.UPENN.EDU/NBASE/).....	100
FIGURE 15 - RATE OF PROPERTY VACANCIES IN THE NEIGHBORHOODS ADJACENT TO LAUREL HILL CEMETERY (SOURCE: PHILADELPHIA NEIGHBORHOODBASE: CML.UPENN.EDU/NBASE/)	100
FIGURE 16 - RATES OF SERIOUS CRIME IN THE NEIGHBORHOODS ADJACENT TO LAUREL HILL CEMETERY (SOURCE: PHILADELPHIA CRIMEBASE: CML.UPENN.EDU/CRIMEBASE/).....	101
FIGURE 17 - CENTRAL LAUREL HILL (SOURCE: M. GOEKE, FALL 2007).....	101
FIGURE 18 - LAUREL HILL CEMETERY LANDSCAPE (SOURCE: T. APHALE, 2007)	102
FIGURE 19 - SHAPE WALKS CONTEMPORARY ARCHITECTURE TOUR PAGE (SOURCE: SHAPE EAST WEBSITE: WWW.SHAPE-EAST.ORG.UK)	103
FIGURE 20 – SHAPE WALKS CONTEMPORARY ARCHITECTURE SAMPLE STORY SHEET (SOURCE: SHAPE EAST WEBSITE: WWW.SHAPE-EAST.ORG.UK)	104
FIGURE 21 – SHAPE WALKS CHANGE IN THE CITY TOUR MAP PAGE (SOURCE: SHAPE EAST WEBSITE: WWW.SHAPE-EAST.ORG.UK)	105
FIGURE 22 – SHAPE WALKS SAMPLE AUDIO STREAMING PAGE (SOURCE: SHAPE EAST WEBSITE: WWW.SHAPE-EAST.ORG.UK)	106
FIGURE 23 - STOURHEAD GARDENS - VIEW ACROSS THE BRIDGE TO THE PANTHEON. (SOURCE: C. ROSSETTI, JUNE 2007).....	107
FIGURE 24 - STOURHEAD GARDENS - VIEW ACROSS THE LAKE TO THE TEMPLE OF APOLLO. (SOURCE: C. ROSSETTI, JUNE 2007).....	108
FIGURE 25 - STOURHEAD GARDENS - VIEW OF THE COLORFUL FOLIAGE. (SOURCE: C. ROSSETTI, JUNE 2007)	109
FIGURE 26 - NODE EXPLORER WEBSITE SHOWING THE HANDHELD UNIT WITH GRAPHIC GPS-GUIDED MAP. (SOURCE: NODE WEBSITE: WWW.NODEEXPLORE.COM)	110
FIGURE 27 - SAMPLE ADVERTISEMENT FROM LHC'S SPRING 08 MARKETING CAMPAIGN. THESE SIMULATED OUTLETS ARE TO BE PLACED IN PUBLIC SPACES ACROSS CENTRAL PHILADELPHIA. (SOURCE: LAUREL HILL CEMETERY).....	111

FIGURE 28 - SAMPLE ADVERTISEMENT FROM LHC'S SPRING 08 MARKETING CAMPAIGN. TOASTERS ARE TO BE PLACED IN PUBLIC FOUNTAINS ACROSS CENTRAL PHILADELPHIA. (SOURCE: LAUREL HILL CEMETERY)	112
FIGURE 29 - EXISTING WEB PAGE FOR LAUREL HILL CEMETERY'S SELF-GUIDED TOURS. (SOURCE: LAUREL HILL CEMETERY WEBSITE: HTTP://WWW.THELAURELHILLCEMETERY.ORG)	113
FIGURE 30 - SUGGESTED WEB PAGE DESIGN FOR ACCESSING TOUR INFORMATION. SELECTING A TOUR FROM THE LIST CHANGES THE STOPS INDICATED ON THE MAP ABOVE. STOPS ARE COLOR CODED BY TOUR TYPE (E.G., CIVIL WAR, POLITICS, ETC). IN THE OVERVIEW TOUR SELECTED ABOVE, MANY TYPES ARE REPRESENTED.	114
FIGURE 31 - SUGGESTED WEB PAGE DESIGN FOR TOUR DETAILS. TOUR STOPS CAN BE DOWNLOADED INDIVIDUALLY OR AS A GROUP. CLICKING ON A SPECIFIC TOUR STOP AS HIGHLIGHTED ON THE MAP ABOVE BRINGS THE USER TO THE INFORMATION PAGE SPECIFIC TO THAT STOP.	115
FIGURE 32 - SUGGESTED WEB PAGE DESIGN FOR DETAILS ON A PARTICULAR TOUR STOP. FOLLOWING CURRENT LHC WEB SITE BEHAVIOR, USER WOULD SCROLL DOWN TO SEE ADDITIONAL INFORMATION.	116
FIGURE 33 - EXISTING WEB PAGE FOR LAUREL HILL CEMETERY'S RESEARCH TOPIC. THIS BLANK SLATE IS THE PROPOSED ENTRY POINT FOR ACCESS TO LAUREL HILL'S ELECTRONIC ARCHIVE. (SOURCE: LAUREL HILL CEMETERY WEBSITE: HTTP://WWW.THELAURELHILLCEMETERY.ORG)	117
FIGURE 34 - SUGGESTED WEB PAGE DESIGN FOR THE MAIN SEARCH FUNCTION. COMPLETING THE FORM WITH SEARCH CRITERIA AND CLICKING SEARCH PROVIDES ANY ASSOCIATED RESULTS FROM THE DATABASE.	118
FIGURE 35 - SUGGESTED WEB PAGE DESIGN FOR A SEARCH RESULTING IN MULTIPLE RECORDS. THIS PAGE APPEARS WHEN MULTIPLE RESULTS ARE RETURNED FOR A SEARCH. IN THIS CASE, THE SEARCH WAS FOR OCCUPANTS IN THE DATABASE LOCATED IN SECTION G. SELECTING A SPECIFIC RESULT, SUCH AS ISAAC HULL ABOVE BRINGS THE USER TO THE INFORMATION PAGE SPECIFIC TO THAT RECORD.	119
FIGURE 36 - SUGGESTED WEB PAGE DESIGN FOR A SEARCH RESULTING IN A SINGLE RECORD. FOLLOWING CURRENT LHC WEB SITE BEHAVIOR, USER WOULD SCROLL DOWN TO SEE ADDITIONAL INFORMATION.	120

Chapter One: Introduction

Laurel Hill Cemetery is an ideal candidate for an investigation of an innovative interpretation regime. It is a complex landscape that contains a wide variety of resources. Those resources cover a range of interests, holding an appeal for a broad potential audience. Importantly, the site is also recognized as one of great national and cultural significance.

Formal recognition of Laurel Hill Cemetery's cultural significance and contribution to the rural cemetery movement came when it was designated as a National Historic Landmark (NHL) in 1998. It was the first cemetery in the nation to be so designated and remains today an impressive 78-acre sculpture garden and historical resource. Like so many of America's cultural resources, however, the promotion and interpretation of the Laurel Hill Cemetery is not without difficulty.

In spite of the existing issues, there is a sense of tremendous opportunity here. In this beautiful setting within the confines of a decaying section of Philadelphia is a cultural and historic resource unlike any other in the nation. Who visits the Laurel Hill Cemetery and what do they want? Perhaps not surprisingly for a cemetery that primarily contains the remains of wealthy, white Anglo-Saxon Protestants, the site draws visitors of much the same heritage. Based on informal observation by Laurel Hill staff and others, visitors tend to be well educated, middle-aged Caucasians with no family ties to the cemetery. They may visit for recreational purposes or out of a more general interest in history. When they

arrive, they are looking for guidance on who might be buried there and something of their story. Others visit out of a love of art or architecture. The site is filled with prime examples of the works of notable artists and their stories are waiting to be told. So, the information needs of the visitor are quite simple. The questions they are asking are: Who / what is here; why should I be interested; where can I find them; and what are their stories?

In addressing these needs, it is important to clarify the issues that should be overcome and the opportunities that technology will address. First, those subjects that will not be addressed in this research include elements external to the cemetery. That is, transportation / navigation to the site, remediation of the isolation caused by the site's physical boundaries, improving the site's link to the surrounding community, and the like. Areas that will be addressed include definition of deeper and more accessible interpretive materials, improved navigation aids within Laurel Hill and contributions to improve awareness and uptake of the site among the public. As is the case with many historic landmarks around the United States, improving visitation rates and revenues is a key driver for the site's management. The situation at Laurel Hill is no different.

The question investigated in this paper is "How can geographic information technology be used to improve the visitor's experience at an historic site like Laurel Hill cemetery?" Ultimately, the focus of this research is to improve the site's interpretation and propose new mechanisms to improve public awareness of Laurel Hill Cemetery and the number of visitors it welcomes each

year. This task begins with a brief look into the history and development of the cemetery. Next, there is a review of the literature discussing the application of geographic information technology to historic site interpretation. Following this will be case studies examining four key technological approaches to site interpretation. Finally, the design of a technology-based interpretation system for Laurel Hill will be proposed. It is with this framework in mind, then, that we examine the site's history.

Chapter Two: A Brief History of the Laurel Hill Cemetery

Development and Growth

The rural cemetery movement developed in an era when Europe was undergoing the Age of Enlightenment. Wealthy Americans were engrossed in the study of the sciences, including botany and health issues. The rural cemetery movement was intended to capture the pastoral beauty and Romantic aesthetic of carefully staged naturalism, not unlike that seen in the English garden movement. Much of the impetus for the movement was the search for better health and the desire to treat the departed with greater dignity. Within the tight confines of the cities, the living coexisted alongside overcrowded churchyards, creating a disease-prone environment. In addition, the overcrowding of these city churchyards often meant disinterment or haphazard stacking of graves. By contrast, rural cemeteries were non-sectarian and plots were privately held, so wealthy city residents could be assured that their loved ones would rest undisturbed in a serene environment.

In 1836, as a reaction to the dire conditions at his daughter's burial site, John Jay Smith led a group of investors to purchase Laurel Hill, the 32-acre former country home and estate of Joseph Sims, in order to create the Laurel Hill

Cemetery (LHC) (see Fig 1).¹ Situated in a rural landscape to the northwest of Philadelphia and along the banks of the Schuylkill River, the cemetery site contrasted starkly with the foul-smelling and ill-kempt environment of the traditional church burial ground. In making the purchase, the group founded what was to be the second rural cemetery in the United States, following in the footsteps of Mount Auburn Cemetery just outside of Boston.

John Notman was engaged as the project's architect, planning the layout of the original 20-acre parcel in what is now North Laurel Hill. Notman incorporated the Sims mansion and many of the outbuildings and original plantings into his design. However, the outbuildings were soon destroyed by fire and the cemetery's success within its first decade led to the removal of the original Sims villa to provide more space for burials.

As was typical for the rural cemetery movement, Smith and his colleagues targeted the wealthy, going so far as to move the remains of notable figures to the site to increase its respectability and appeal. Among these was the secretary of the Continental Congress, Charles Thomson, who was reburied in Laurel Hill's 'River' section in 1838.²

By 1848, the cemetery was growing in popularity and when Harleigh, the 27-acre former estate of jurist William Rawle became available, it was acquired to form South Laurel Hill.

¹ (Wunsch 1999)

² (Wunsch 1999)

By 1854, the design for South Laurel Hill had been completed by engineer James Sidney and architect James Neff and a year later, the Stoeever Tract was purchased, adding to North Laurel Hill, extending it to the tracks of the Philadelphia and Reading Railroad.

Fairy Hill, the 21-acre Pepper estate was purchased next in 1861 and served to link the north and south portions of Laurel Hill. Shortly thereafter, a stone bridge was constructed across Nicetown Lane (Hunting Park Avenue) to allow easy access between the Central and South sections of Laurel Hill.³

With John Jay Smith's departure from the Laurel Hill Cemetery Company in 1874, commercial considerations took precedence and adherence to Notman's original design was largely lost. By 1836, the Gothic Chapel and several of his other original structures were gone, making more room for burials.⁴

By 1892, the cemetery had reached its current proportions and changes within the site were minimal. The main gatehouse was remodeled, gates were closed and fences changed, but the heart of the cemetery remained largely undisturbed (see Fig 2).

Outside the cemetery walls, much has changed since Laurel Hill Cemetery was founded. The pastoral country setting John Jay Smith chose for his rural cemetery has grown into what is today a dense working- and middle-class area with the deteriorating remnants of a commercial and industrial past. During

³ (Wunsch 1998)

⁴ (Wunsch 1999)

Laurel Hill Cemetery's heyday, the surrounding area was home to many supporting commercial and industrial operations, including marble and brick-works, greenhouses and nurseries (see Figs 3-4).

In the early part of the 20th century, residential density increased in the area, particularly to the south of the cemetery in the Strawberry Mansion area (see Figs 5-6), becoming an affluent Jewish neighborhood. As industry died out, commercial and residential occupancy became more prevalent (see Fig 7). Today, the population is over 95% African-American, with over 43% of the population living below the poverty level.⁵ Property vacancies are common. The abandoned commercial and industrial buildings are packed tightly alongside aging row homes, awaiting rejuvenation from the middle-classes who are increasingly attracted to the nearby East Falls and Allegheny West neighborhoods (see Figs 8-9).

Laurel Hill Cemetery is now nearing capacity as a commercial enterprise, with nearly 100,000 people interred there. Current management is split into two organizations, including a commercial burial company, the Laurel Hill Cemetery Company, and a non-profit group, the Friends of Laurel Hill Cemetery (FLHC). De facto management of both is currently held under one Executive Director. Recognizing the importance of the site to America's history, the Friends of Laurel Hill Cemetery (FLHC) was established in 1978 with the expectation that it would develop over time into a fully self-sufficient operation. In creating this

⁵ (Social Explorer: Census Reference 1940-2000 2008)

organization, the Laurel Hill Cemetery Company set in motion the drivers and tools necessary to create interpretative guidance for the site's new life as a non-profit tourist destination.

Site Characterization

As an historic site, Laurel Hill Cemetery has a variety of challenges. These include balancing the differing goals of the two management organizations, site accessibility, public perception and awareness, navigation within the site, and the availability of interpretive materials. This paper will focus specifically on improving the availability of interpretive materials and facilitating visitor navigation once on site.

Several circumstances conspire to make Laurel Hill's interpretive concerns unique. Not the least of these is geography (see Fig 8). To the west, the site is cut off from Fairmount Park by a steep drop and busy highway (see Fig 10). To the east, Ridge Avenue cuts Laurel Hill off from the nearby neighborhoods (see Fig 11). Encircling the site here and elsewhere is a combination of massive stone walls and chain link fencing, presenting an unwelcoming façade to the public. Still another highway cuts a path directly across the cemetery, dividing the Central and South sections (see Fig 12).

There is positive news in the area, however, as working class neighborhoods and industrial architectural infrastructure to the north and east of Laurel Hill in the East Falls and Allegheny West neighborhoods are undergoing a renaissance. In these areas, new residences, artist's lofts and retail outlets

springing up (see Figs 9, 13). Along with this increased development, median home prices in East Falls have more than doubled in the last five years (see Fig 14).⁶

To the south, conditions still await improvement. The Strawberry Mansion neighborhood is in decay, with a median household income below \$15,000.⁷ Property vacancies there are on the rise as compared with the other neighborhoods abutting Laurel Hill (see Fig 15), growing to more than triple the percentage of Philadelphia as a whole in 2006.⁸ In addition to the outward signs of decay in the area, potential visitors may be off-put by area's reputation for crime. Although serious crime has dropped in Strawberry Mansion over the last five years, the numbers are still high as compared with nearby neighborhoods (see Fig 16).⁹

Directional signage to the site from major highways is poor, but it is improving under the guidance of current management. Accessibility to the site via public transportation is possible from the traditional tourist centers of Philadelphia, but difficult. Each of these elements presents an obstacle to the Laurel Hill Cemetery Company's intent to improve the site's appeal to visitors.

Once inside the cemetery, the environment is transformed. The isolation that is so foreboding from the exterior is more than welcome once inside. The

⁶ (City of Philadelphia, Department of Licenses and Inspections. 2 February 2008)

⁷ (2000 Population Survey 2008)

⁸ (City of Philadelphia, Department of Licenses and Inspections. 2 February 2008)

⁹ (City of Philadelphia, Department of Licenses and Inspections. 2 February 2008)

monuments stretch across 78 acres of rolling lawn and greenery. While there are certainly condition problems among the tombs, the atmosphere within the gates is more of history than of neglect, as is felt outside (see Figs 17-18).

Signage is scarce within the cemetery and interpretive resources are limited. There is an interpretive brochure available for sale in the office with notable occupants identified, but the outdated 1920's map makes navigation to specific gravesites difficult and information about the occupants is limited to a few sentences at most. Guided tours are given monthly by dedicated volunteers, though no standards have been set and their quality varies. With these goals and challenges in mind, we turn now to a review of the literature.

Chapter Three: Literature Review – Development of Intelligent, Location-based Technology in the Tourism Industry

Exploration of various interpretation technologies is a phenomenon that is revolutionizing the interpretation of historic sites around the world. This chapter reviews the literature assessing the goals of many of these information technologies. First, thought leadership around the use of technology in interpretation will be reviewed in the form of issues and trends in the use of technology in site interpretation. Next, the functions these technologies serve will be described, along with their limitations. Finally, before conclusions are drawn, technology's ability to influence learning and its suitability to address various learning styles will be discussed and the related phenomenon of Edutainment will be considered.

Interpretation Issues and Trends

As one might expect, the convergence of technology and interpretation is a particularly active topic in the museum literature. There are, of course, the traditionalists, who believe that minimalism (e.g., providing little or no interpretation) is best. Lord (2006) presents the minimalist trend, reflecting that it has been caused by a growing desire to leave the visitor with a sense of awe and wonder as well as allowing for a pluralism of responses. By not providing an interpretation, the museum is not dictating the response the visitor must have.

The negative, as Lord reports, is that it can leave the visitor uninformed and frustrated.

In one of the stronger reactions against the implementation of technologies in interpretation, Kesner (2006) argues that it threatens a dumbing-down of the cultural museum experience. As he puts it: "Under the pressure of marketing and economic priorities, contemporary museums have increasingly been offering their visitors opportunities to enjoy complex museum experiences, which integrate a whole range of activities, but where the experience of an object often becomes marginalized." He sees the new technologies as a trivialization of the museum experience and a threat to the "cultural competence" of the museum-going public.

The subject of funding is widely discussed among museum leadership as a trigger for the use of multi-media and technology-driven interpretive tools. In these reports, this strain between education and entertainment is echoed repeatedly. Economic forces such as dwindling government funding have instigated a new market-oriented philosophy and have coincided with the adoption of new hyper-media technologies that have wow-ed the public and drawn in new audiences. The struggle between the funding needs and the idealism of museum trustees has long been debated. Christopher Nash (1992) reflects that the high entertainment value of audio-visual media and their ability to penetrate the population made them attractive to sponsors. Therefore, he reasoned, museums would find sponsorship of high quality interactive media to

be a more attractive and successful way of acquiring funding than traditional methods. As Nash put it, "Museums generally have a very high standing within the community, and it is this standing which sponsors want to buy an association with when targeting their chosen markets." He goes on to conclude, "The factors which will determine the environment in which museums will operate during the next century will be primarily economic and social, not technological."

Nearly a decade later, Gayle McPherson (2006) notes that the change has indeed occurred. She reports an ideological change whereby the roles of museum and visitor become provider and customer rather than educator and student. She proposes that in the struggle between museums' original missions to preserve and educate and the trend toward museum experience as entertainment, museums will necessarily become 'hybrid places', where recreation and learning will be combined. McPherson (2006) concludes that the technology provides a valuable function that should be embraced for its ability to educate and attract a larger and more diversified audience. The trick will be to hold onto those new visitors after the blush of the new technology has worn off.

Detractors of the use of technology in interpretation have echoed the suggestion that the impact of this new technology might be short-lived. There has also been concern that the 'lure of the screen' may distract from the true interpretive or educational experience of the artifacts and exhibits themselves. As Nancy Proctor puts it (2005), "...what will happen when the technology is no

longer cutting-edge and visitors no longer feel privileged participants in a paradigm-shifting pilot?" She proposes that the new interpretive technologies will become commonplace, leaving the focus once again on the materials and places being explored. Regarding the anticipated costs, Proctor (2005) says: "Delivering rich, interactive multimedia experiences to the visitor, these systems require a much larger investment from the institution than traditional audio tour technologies in terms of infrastructure, maintenance and content development..." However, she goes on to say, they "also promise greater returns in terms of quality of interpretation, engagement with the visitor, and outreach to new audiences."

Michael Fopp (1997) sees technology as a threat, but one that can be mitigated, even harnessed, if applied judiciously. Fopp believes that digital technology and the internet will have a significant impact on the museum-going public, projecting that the majority of connections to museum collections will be virtual within 20 years. Given that projection, he cautions that museum leaders should embark on their own digitization programs, rather than enlisting corporations like Bill Gates' CORBIS, in order that they should maintain copyrights to the digital material that will no doubt be used in their interpretive programs. Echoing the importance of digitizing our cultural heritage, Olga Hadžić (2004) quotes DigiCult 2003 (Digital Heritage and Digital Content), saying: "Digitization contributes to the conservation and preservation of heritage and scientific resources; it creates new educational opportunities; it can be used to

encourage tourism; and it provides ways of improving access by citizen to their patrimony". She goes on to discuss the value digital technology can have on tourism and virtual tourism via the WWW and multi-media technologies. As Fopp (1997) says, the challenge will be in finding new ways for the museums to derive income from their virtual visitors and digital assets.

David Martin wrote about the use of the web and wireless application protocol (WAP) cell-phone technology by the London Canal Museum in 2001. While neither has yet to become a significant profit center, both technologies are seen by museum trustees as a potential source of funding both local and foreign and are being vigorously pursued. In fact, the web site is already drawing significant interest from foreign visitors, some of whom have offered their services as volunteers during their holidays in the UK.

Functional Goals

Considerable research has been conducted within the tourism, computing, and museum disciplines on the use of information technologies in tourism. For most of the prototype systems developed to date, their goal is to provide a mobile context-aware tourist information guide for a museum, cultural site, city, or etc. Context-aware technology uses data about the visitor's geographic location to provide pertinent interpretive information. Gregory Abowd and others (1997) sum up the variety of functions addressed by their Cyberguide system with the following role categories:

- Cartographer (map component)

- Navigator (positioning component)
- Librarian (information component)
- Messenger (communications component).

Margaret Fleck and colleagues describe the information and communications components in somewhat greater detail for their Cooltown project. The roles proposed by Fleck et al. (2002) include:

- Informer – provides exhibit or site-related information
- Suggester – provides ideas or suggestions on what to try at an exhibit
- Guider – provides more specific suggestions on what to see next, along with navigational advice
- Communicator – provides exhibit or site context
- Rememberer – facilitates recall by allowing a record of experiences to be captured for later recall.

The two schemas seem to hold true across the literature, although various studies incorporate differing combinations of these roles. Within these roles, specific functionality can include enabling translation tools to aid the traveler in navigating an unfamiliar city (see Aslan 2005) providing a traveler with information to prepare for a future visit (See Davies 2005), or enabling the capture of memories via personal web pages (see Aslan 2005; Fleck 2002; Fujii 2005). Achievement of the technical goals is seemingly straightforward, but grasping the variety and complexity of the possibilities and the burden they place on the interpretive task is anything but.

Some of the simpler implementations in the literature have map-centric goals. This is exemplified in the writings of Curran and Smith (2006) as well as Dunstall et al. (2003), where the focus of study is directing the visitor from points A to B and providing limited static information on nearby attractions like restaurants and hotels. Schmidt-Belz and Hermann (2004) direct some attention to consideration of the visitor experience in their analysis of a mobile exhibition guide for trade fair visitors by comparing the usability of egocentric versus north-oriented maps, but here again, navigation is the key focus of research.

The user experience has come to the fore only recently as central to the goals of an interpretive tool. One of Tilden's (1967) fundamental principles of interpretation is personalization of the visitor experience. That is, making the content relevant to the individual. While prototypes have yet to tailor messages about all points of interest to the experience of a particular visitor, researchers are working to develop electronic guides that select those items that would appeal to an individual's specific interests.

Personalizing the visitor experience can be problematic, however, as it can strike at the heart of usability concerns. Both Opperman and Specht's Hippy project (2000) as well as the CRUMPET project (Poslad et al. 2001), incorporate this dimension of complexity to the system by learning and adaptively tailoring the information and suggestions for each visitor based on their past selections. In making the decision to use implicit versus explicit information gathering techniques, Poslad et al. determined that requesting explicit feedback through a

series of personal questions could alienate users not only because of the time constraints it might impose on a tourist with a tight schedule, but more importantly, because it raises fundamental privacy concerns on the part of the tourists.

The philosophy behind targeting real-time context-awareness in interpretive technologies is that knowledge of a visitor's present location allows more timely and appropriate information to be made available to that visitor. Nearby points of interest can be highlighted and navigation support to those points provided. iJADE FreeWalker, as discussed by Lam and Lee (2006) is an ontology-based tourist guide system designed to use real-time web data and the visitor's geographic location to provide pertinent information to the tourist. By capturing GPS information for the visitor's current location and referencing a central database, the system is able to provide pertinent recommendations for the tourist such as nearby sights, shopping, and currently available entertainment options.

While Lam and Lee (2006) provide one of the few examples where the system looks beyond itself to gather information from the broader world in real-time, another example, presented by Edwards et al. (2004), demonstrates external communication with a rather different intent. The goal of the prototype in the IMAGE project is to act as an electronic travel agent, integrating information services with e-commerce transactions such as buying tickets, booking hotels and making restaurant reservations. While results indicate that this

is an attractive use of technology for tourists, usability, security concerns and an assessment of willingness to pay for the services rendered are hurdles still to be addressed.

Albertini et al. (2005) experiment with contextualizing information through the use of a webcam and image recognition. The goal was to provide specific contextual information to the visitor based on the visitor's photograph of sections of the 15th century fresco "The Cycle of the Months" at Torre Aquila in Trento, Italy. By using a PDA equipped with a webcam and headphones, a visitor interested in learning more about a painting, or a detail, would aim the webcam toward the object of interest and related interpretive information would be pulled from the database based on recognizable elements within the image's frame and conveyed back to the visitor. In the end, the complexity of the scope was too great for the available technology, but the group found the principle to be sound.

Web-based tools have become popular for tourism information and visit planning over recent years. Shape WALKS Cambridge is a route-planning site that aims to provide an educational architectural and historical tour of the city. Until recently, the resulting route map was intended for use in a printed form. The introduction of podcasts has made the tool more portable, albeit not location-aware, relying on written and verbal direction, as well as the user's recognition of their surroundings to drive the tour.

Perhaps the most prominent of the intelligent travel guides is the GUIDE system (Cheverst et al. 2000, "Developing"; Cheverst et al. 2000, "Experiences"; Cheverst et al. 2002; Davies et al. 2005). Although it has undergone several iterations of prototyping, in its earliest stages the GUIDE system was designed as a context-aware tour guide to help visitors overcome a dependence upon the local tourist information center for information, interpretation, directions, tickets, reservations and the like (Cheverst et al. 2000, "Developing"; Cheverst et al. 2000, "Experiences"). The founding presumption was that travelers in an unfamiliar place will gravitate around the better-known places because they feel uncomfortable moving beyond them into the unfamiliar. They are thus 'tethered' psychologically and unable to move about freely to explore the culture. As Manes et al. (2003) explain, technology should help to remove that tether by providing a continuity of information and provide context for the traveler. Davies et al. clarify further in 2005, writing that this system was designed to accompany visitors as a personal guide while they explored the city of Lancaster, England asking the question "What's that?". With that goal in mind, the GUIDE work considers contextual information such as location and visitor preferences and provides a level of site interpretation comparable to that of a traditional paper-based guidebook with lists of nearby attractions, overview information on points of interest, and navigation guidance.

Through its iterations, GUIDE's scope has evolved to include messaging and interactive services (e.g., to allow booking tickets / events) as well as up-to-

date hypermedia information about the surrounding environment. In its latest iteration, researchers on the GUIDE project have begun to explore the acceptance of visual recognition as a navigation / context locator aid (see Davies et al. 2005). Similar to the work of Albertini et al. (2005), the study reported by Davies et al. made use of cameras built into the visitor's PDAs to photograph points of interest as they toured the city. From a user's perspective, these photographs were then matched to records within the GUIDE system and the appropriate information was provided. In practice, because the complex algorithms and technologies were not yet in place (as noted from Albertini et al. (2005) above), a human observer followed the visitors in the trial, supplying the system with their location information. In spite of the technical gaps, the study has shown great promise in the acceptance of this type of technology and its ability to cater to the different types of learning styles. As Davies et al. (2005) put it, "Tourists appear to be classifiable by their underlying approach to information discovery: those who wish to discover new information about objects they find in the physical world and those that wish to browse information and then find corresponding objects in the physical world."

Technological Limitations

Perhaps because the technology is comparatively new to the tourism field, much focus in the current literature on GPS location-aware sightseeing support systems is placed on the technology and its limitations. Kim et al (2005) are among these, describing in detail the architecture and behavior of the

system's infrastructure, the communication protocols, and the logic by which the system identifies the user's location and interests. Edwards et al. (2004) and Schmidt-Belz and Hermann (2004) are among those who've outlined the technological constraints of current personal GPS technology, including limitations of GPS enabled cell-phone technology, screen size / legibility, and accuracy of positioning. For indoor systems, RFID, Infrared, WiFi, and Bluetooth capabilities have been exercised and their flaws and benefits revealed in a variety of different studies. These include Angliss (2006), Cheverst et al. (2002), Proctor (2005), leong et al. (2005) and others.

Usability concerns for the mobile units themselves were uncovered by Sarah Angliss (2006), who reports that visitors in her study felt more comfortable and less isolated without earphones, leading to the conclusion that a handheld device is preferable. However, in some environments she notes that it was important to have hands free for mobility, such as aboard the SS Great Britain, where both hands are required to ascend / descend the ship's staircases. Fleck et al. (2002) are in alignment, saying that at times, the PDA gets in the way. In their work with the Exploratorium in San Francisco, they note that the mobile unit needed to be robust and unobtrusive because, "When children see an exhibit they like, they often just throw to the ground whatever they are carrying and start playing with the exhibit." There were also issues with use of PDA's in an outdoor environment, as often the small screens and poor contrast in bright sunlight made the devices difficult or impossible to use (Umlauft et al. 2003).

In *Implementing Tour Guides for Travelers*, Bellotti et al. (2005) discuss a mobile tour guide deployed for the Castellon region of Spain. Though the tool's content includes a discussion of the culturally and historically important structures and sites of the region, their research is focused on the complexities and safety constraints of designing a user-interface for the driver of a moving vehicle.

Facilitating Learning Through Technology

With that foundation in mind, it is appropriate now to review how intelligent tourist services are seen to influence learning and learning facilitation. By nature, museums exhibits and cultural sites typically foster learning in an informal way. That is, though interpretive displays are carefully scripted, there is no fixed textbook or curriculum to follow when moving through the exhibits. Children and adult visitors alike, move through the exhibits in different ways, interacting and exchanging thoughts, questions and observations along the way. Frequently, they will return to their friends or families with information or photographs of what they've seen, enabling additional discussion and discovery after the event. As Chou et al. (2004) explain, the benefit of their PDA based museum guide is that it provides freedom from isolation. In their words, the mobility of the PDA affords the ability to foster learning anytime and anywhere. Several other studies discussed below have explored and exploited these elements.

Johnston and Rennie (1995) report on a study of the perception of learning by visitors to an Interactive Science and Technology Centre (ISTC) in

Australia. In their report, they identify six general perceptions from their analysis.

These include:

- Perception 1: Members of the visiting public have fun at the center
- Perception 2: Learning is not the main purpose of the visit
- Perception 3: The role of an explainer is to facilitate of the exhibits, not to teach
- Perception 4: Learning occurs when visitors relate experiences at the centre to experiences in the outside world
- Perception 5: Analogies facilitate understanding
- Perception 6: Incidental learning, unrelated to the intention of an exhibit, often occurs

These results indicate, as Tilden (1967) has suggested, that people do learn by relating concepts they're seeing in the exhibits to their own experiences.

Bamberger et al. (2007) studied patterns of learning in natural history museums. In their report, they identify four types of learning provided to selected school groups visiting these museums. These include:

- No choice – Lecture or guide centered. The participants had no choice or control.
- Limited choice 1 – Small group learning task allowing exploration of the exhibit within a specific area of the museum to address a specific task. Students chose teams and order tasks were addressed.

- Limited choice 2 – Small group learning task allowing exploration of an unrestricted area. Students had control over teams, order of tasks and objects used within the exhibit to respond to those tasks.
- Free choice – Free exploration with no direction or assignment.

Results showed that the limited choice options provided the best scaffold for learning, allowing for some control over the student's environment, but forming a structure around which learning activities, discussion and exploration could be built.

With this information in hand, one wonders how learning style and interpretation style might be aligned. Morna Hinton (1998) published just such a study conducted at the Victoria & Albert Museum. Unfortunately for museum curators and site managers, clear relationships did not emerge. In the end, however, she reports, "a successful interpretive device can transcend individual learning style preference." Looking back further, we can find support for Bamberger's outcome in another of Tilden's principles that interpretation should be provocation, rather than instruction (Tilden 1997).

Edutainment

The financial pressures to draw in new audiences have coincided with changes in travel habits. As Poslad et al. (2001) report, increasing numbers of people are taking shorter breaks many times a year. In doing so, they are combining goals such as business, leisure, education or entertainment. Poslad et al. call these activities "edutainment" and "busitainment". If "edutainment" is to

be the wave of the future, there are many who are preparing to facilitate the trend.

On the simplest level, several studies use games to engage players in an interactive and sometimes educational exchange while they are immersed in a virtual environment. Though not aimed at specifically at the tourist industry, aspects of the Backseat Playground (Gustafsson et al. 2006) study should prove useful to it in the future. It is a mobile augmented reality game being developed in Sweden to take advantage of the movement of the car through an environment to enhance the gaming experience. In this case, the game uses GPS technology to adjust the gameplay and narratives to the real-world location of the participants. While the Backseat Playground team makes no claims of a cultural or historic learning link, several projects in Europe and Asia are doing just that.

The goal of the ChiKho EU project (Bellotti et al. 2005), is to allow high school students from around Europe to engage in virtual cultural exploration, thereby arousing curiosity and fostering learning in a non-traditional way. Early results have shown great interest among participants, perhaps because the tool allows them to use habits and technologies with which the students are already comfortable.

Tarumi et al. (2006) apply technology to development of a virtual reality game in an historic setting and incorporating animated characters. Their Kotohiragu Navigator's focus is on entertainment with consideration of

interpretation, education and the impact of the tool on visitor perception as secondary. Visitors to the Kotohiragu Shrine engage with the location-aware sightseeing support game through their mobile phones, pulling information from the source system as they reach each new destination. Results showed great interest on the part of study participants, but highlighted technical difficulties with GPS accuracy, availability of compatible phones. More importantly, though, the story itself was too closely linked to the virtual world, leaving some visitors feeling an imbalance between the real and virtual information provided.

The Musex system addresses the visitor's experience in a Japanese science museum in Japan, where the goal was to understand the impact of an interactive PDA-based interpretation tool on children's motivation to learn (Yatani et al. 2004). Perhaps not surprisingly, the researchers found that the collaborative and sometimes competitive game nature of the tool had a positive effect on the children's focus on exhibits.

Gower, Moat, and Morley (2000) document their very compelling work on GIS and visualization. They developed a web-based virtual tour of the Princess of Wales Conservatory, Royal Botanic Gardens, Kew. As intriguing and engaging as the work is, the tool is not location-aware and is intended largely for use as a virtual tour / navigation tool rather than an interpretive device.

Three applications attempt to employ high-end graphics and 3D technology to engage visitors in augmented reality mobile tours. From Heidelberg, there are the GEIST (Kretschmer et al. 2001) and Deep (Malaka and

Zipf 2000) applications and from Olympia, Greece there is ARCHEOGUIDE (Vlahakis et al. 2001). GEIST is a learning game whereby players can unleash a ghost who leads them through old city Heidelberg engaging them in a geographically and historically based digital story. Deep Map aims to answer all of the questions posed by other personal tour guide devices, such as "Where am I?" and "Where can I find a restaurant / hotel?", but it also allows the visitor to ask, "What did that look like in the past?" ARCHEOGUIDE is the Augmented Reality-based Cultural Heritage On-site GUIDE. It presents before and after images and video of Olympia, the site of the first Olympic Games, complete with javelin throw competition and footraces. In Vlahakis et al.'s report, "The system bridges the gap between recreation and science and renders culture and history more accessible to a wider public." As one might imagine, the system proved quite popular among the younger trial participants who "viewed ARCHEOGUIDE mainly as a video game or leisure activity."

Conclusions

The use of GIS and GPS technology in interpretation is in its infancy. The focus is largely on getting visitors around, not with providing a full and rich experience or on helping to interpret a site. Perhaps because of its novelty and lack of standardization at this early stage of its development, research on location-based technologies tends to be focused on the functional obstacles. Even in commercially deployed applications, consideration of varying layers of

interpretation is largely missing, as is discussion of its potential interpretive power of the new tool and ability to improve the visitors' experience.

With much research underway around the world into the technical feasibility and usability of mobile location-aware tools for tourism, opportunity exists to begin an exploration of the media as an interpretive tool for visitors to an important historic site in this country. The impact of the trend toward "edutainment" and "busitainment" is that travelers, or "Advanced tourists" as Poslad et al. (2001) put it, are spending less time in preplanning and have more pragmatic, location-aware information needs than a traditional tourist. An exploration of the possibilities is in order.

Four case studies will be considered that encompass a range of technologies emerging in the marketplace today. These include web-based applications, podcasting, cell phone based tours and handheld multi-media technology. Given the environmental differences between deployment within the confines of a museum and the open landscape of Laurel Hill Cemetery, some of the typical museum-based technologies will not be considered. Approaches such as interactive kiosk-based media, radio-frequency triggered PDA devices and handheld audio devices are complex and problematic to deploy out of doors. Rather than investigate each of these in detail, and given the significant financial investment required by such devices, the location aware multi-media technology included in Case Study #4 serves as a representative

example of these technologies and a stretch target for LHC's future interpretive development.

Chapter Four: Case Study #1 – Web-Based Tours

Description

Web-based tours are the web presence of historic and cultural sites. They provide an opportunity for a prospective visitor to conceptualize the property without being physically present. They can include virtual tours, maps, and descriptive text, and are typically marketing tools used to pique the interest of prospective visitors. The Shape WALKS site discussed here was selected for its exceptional usability as well as its intriguing combination of technology, graphic maps, images and narrative in the interpretation of a cultural and historic landscape.

Shape WALKS are a collection of six web-based tours of the City of Cambridge, England.¹⁰ Launched by Shape Cambridge (now Shape East) on 30 September 2004, the tours cover a diverse range of interests, including Contemporary Architecture, Historic Highlights, Green Spaces, Victorian architecture, Clocks & Sundials, and Tudor Cambridge. The online WALKS tours are unique in their combination of interactive, navigable maps, high-resolution images and links to detailed information about the sites and architecture of the city. With these elements in place, visitors are able to select the specific tour or tours of interest to them, familiarize themselves with the route and details of the

¹⁰ (*ShapeWALKS Cambridge* 2004)

sites and then print their own guidebooks before moving out into the environment.

When navigating the website, the prospective visitor selects the tour of choice and is presented with the tour's map. Clicking upon the interactive map or images opens a printable story sheet for the selected site that provides its historic or architectural background. Each story sheet is accompanied by a collection of photographs to help orient the visitor and provide different perspectives or greater detail than might be visible to the visitor on site. The visitor is able to customize their visit not only by selecting the tour of interest, but also by printing only those story sheets for sites they wish to visit. In theory, they could also create their own tour by combining sites from the various tours and mapping their own routes on the maps provided.

Background and Intent

Shape East, the founder of Shape WALKS, is the trading name of the Built Environment Education Trust Ltd., a charity funded by the Commission for Architecture and the Built Environment (CABE) and the Cambridge City Council. Shape East's mission is to "help people make better places".¹¹ City planning practice often goes without notice among the public until it hits them personally. Once a problem is resolved, their attention is again quickly drawn away. As an organization, Shape East has identified a set of objectives that include raising the

¹¹ (*Shape East* 2008)

level of public awareness and understanding of city planning issues and engaging them in a debate about issues concerning the built environment.¹² The belief is that once the public is better informed, they are able to make better decisions and are likely to have higher expectations of the built environment around them.

The web tour helps enable this mission by engaging the public in an interactive experience that is at once educational and fun. In the press release for the site's launch, Ben Koralek, Director of Shape Cambridge, indicated that the walks were an integral part of the service that his organization provided. As he reported at the time: "Shape Cambridge's mission is to raise awareness of the city in which we live and the buildings and spaces around us" adding, "These interactive walks allow visitors the freedom to plan their own day, and effectively to create their own guide books – all free of charge."¹³

For the casual visitor to Cambridge, the walks provide historical information, a feel for the layout of the city, background and context for the structures, an understanding of how and why they relate to one another, and perhaps a primer in architecture. In so doing, the visitor gains insight into more than just the architecture. Something of the people of Cambridge is also conveyed via the decisions that were made and the resulting environment that the visitor sees and feels around him or her. This 'insider' information provides a

¹² (*Shape East* 2008)

¹³ (*Shape East* 2008)

feeling of connection to the place that is typically missing from the traditional tourist guidebook.

In the case of Shape WALKS in Cambridge, education was the primary driver. This is not the web's only value, however. According to Simon Ruffle, Technical Director of Stride Design Ltd and co-creator of Shape WALKS, other municipalities have employed the same web-based approach as part of a more general program of attraction to their city in the hopes that once there the visitor will stay and spend money in town.¹⁴ For those municipalities keen to play up their vitality can also be used as a demonstration of their modernity and technical savvy.

Benefits and Challenges

A preliminary investigation of the positive and negative aspects of the case study as it is described, and the web-based tool in general can begin to help inform our ultimate design choices. A web-based environment can provide a user-friendly environment and a rich interactive experience. There is great opportunity to provide high-resolution graphic maps and images. Given the appropriate content, the user can be drawn into a site and made to feel a part of the environment, as if they had 'insider' information. Users are able to print out free, customized tour packets directing them to sites that are geared directly to their interests. The detailed maps also allow visitors to vary their path once on site

¹⁴ (Ruffle 2008)

to accommodate their preferences, the amount of time they are prepared to spend on site, and other sites that might draw their attention along the way. From the perspective of the site or organization offering the tour(s), the website can pique the interest of virtual visitors who may not have heard of them otherwise or who may have not had enough understanding of the place to warrant a visit. The appeal of and details provided by the website can change those perceptions.

Cost is always a consideration when evaluating interpretation paths. According to Simon Ruffle (2008), Stride Design Ltd uses a custom-built "tours content management system" that associates specific sites on a map to a set of data along an ordered route. Content is drafted after painstaking research from original sources. Maps and plans are drawn specifically for each web site and each stop on the tour is professionally photographed.¹⁵ All of these steps equate to a labor-intensive process that requires constant validation with the client and considerable expertise on the part of the design and development teams. The development process runs a minimum of two months.¹⁶ Although prototypes have been created, costs for this sort of service have proven beyond the reach of non-profit organizations to date.

In addition to the initial development costs, ongoing maintenance and annual hosting fees are incurred. Maintenance and upkeep costs include

¹⁵ (Ruffle 2008)

¹⁶ (Ruffle 2008)

management of context-sensitive updates (e.g., annual or seasonal changes to opening times and admission charges) as well as technical updates. As browser versions change, the website must be continually retested and updated to maintain viability. These responsibilities can add thousands of dollars to the lifetime cost of a website. However, for an organization already maintaining a website, ongoing costs may be minimized.

There are also two considerations from a usability perspective. First, web-based systems assume some element of preplanning on the part of the visitor. In order to be aware of the web-based tour, the visitor to the destination must have logged onto the internet in advance, found the website, and selected and printed their tour materials. This drawback can be mitigated to some degree by making the materials (either printouts or computer access) available at the venue. Another potential consideration is that newer technologies have greater appeal. Podcasts, cell-phone tours, multi-media / GIS based technologies appear to offer greater cache, at least among some audiences. In fact, after several years of use Shape East added Podcasts to its on-line offerings. These will be investigated next.

Chapter Five: Case Study #2 - Podcast Based Tours

Description

Podcast tours are audio guides to sites such as cities, museums and cultural landscapes that allow visitors to move through the space while listening to the story of the place unfold around them. The podcast tours discussed here were selected because they are the next step in the evolution of the web tours discussed in Case Study #1.

What began as a collection of six web-based tours of the City of Cambridge, England developed over time to include a duo of Podcast tours: Cambridge Past and Present and Change in the City.¹⁷ Released in 2006 by Stride Design Ltd, the podcast tours are accessed via the web and exhibit the same clean and distinctive graphic style as the company's web-based tours. The audio-tours can be streamed directly from the web or downloaded to an iPod or other MP3 player. With this new technology comes greater opportunity to convey the interpreter's message. The dialog is written with a social conscience, as befits the client's founding principles, while the music and narrator's dry wit reflect the lighthearted tone they wish to project.

¹⁷ (*ShapeWALKS Cambridge* 2004)

Background and Intent

Since the deployment of the Cambridge podcasts, other cities have followed suit, including the City of Ware, about two hours drive north of London.¹⁸ While the implementations follow the same patterns, the impetus and goals for the two cities are different. As with the web-based tours, the intent for Shape WALKS podcasts in Cambridge was to align with the goals of Shape East around education and the social responsibility of the built environment. These messages are clearly demonstrated in the sites chosen along the walks as well as in their corresponding narratives. The use of the iPod or MP3 technology was perhaps intended by Shape East to attract a younger audience to cultural tourism and engage them in the debate about the urban environment.¹⁹

Although promoting education and social dialogue were not priorities in their implementation of Ware Audiowalks, like Shape East, the East Herts Council was attracted by the novelty of the technology and its potential appeal to the public. The council saw the podcast technology as a marketing tool that would bestow on the city a sense of modernism and technological currency for both residents and visitors.

As with the web format, the sense of place is well conveyed. The addition of the audio component and the subtle nuances it can convey through tone of

¹⁸ (Ware Audiowalks: *Two Thousand Years of History* 2007)

¹⁹ (Ruffle 2008)

voice and sound effects only serves to heighten the experience and connection to the place.

Determining whether the podcasts have delivered their intended value has been something of a subjective matter to date, given the limited metrics available. No concerted measurement initiative has yet been undertaken. However, there is an acknowledgement that opportunity for improvement exists, as neither the Cambridge nor Ware sites have been supported by marketing. Both rely on visitors to have found the sites in advance of their visit and downloaded the tours.²⁰

Benefits and Challenges

The benefits of the podcast approach are many. Like the web-based tours, they offer the opportunity of a free guide to the place being visited. They utilize a ubiquitous technology with an appeal to a young demographic. When done well, they can be engaging, enlightening and fun. The audio format provides opportunity for a greater interpretive experience than a simple printed map, as music, sound effects, changes in narrators and speech patterns can be used together to create a unique visitor experience. With all of these positives, there are a number of drawbacks to consider, however.

Some of the issues with podcasts align with those of the web-based tours. First, visitors must be aware of the tour and they must plan their visit in advance.

²⁰ (Ruffle 2008)

David Asheim of Guide By Cell, Inc recounts an experience where one large museum offered free admission to those who'd brought their own MP3 player with the museum's podcast. After receiving ~10k inquiries, fewer than five people actually partook of the offer.²¹ In addition, there will be annual costs incurred in hosting and maintaining the web site.

Given the added complexity, it is not surprising that podcasts have their own set of considerations, with financing being among the most difficult for a non-profit organization to overcome. The cost of the podcasts as delivered in the Cambridge and Ware examples is double that of the web-based tour, taking nearly a third longer to produce, leaving open the question of how the initial investment might be recouped.²² According to Simon Ruffle at Stride Design, it has proven difficult for purveyors of the WALKS tours to charge for podcast downloads.²³ Updates are costly and difficult, requiring the logistics of maintaining a consistent narrator, re-recording the narration, mixing the audio and preparing the downloadable files. For some locations, details such as entrance fees or opening times may be seasonal or changeable, necessitating frequent updates. That said, Stride Design has had little success preparing similar sites for non-profit organizations. One project being prepared for a British

²¹ (Asheim 2008)

²² (Ruffle 2008)

²³ (Ruffle 2008)

national charitable organization was cancelled in the pilot stage, presumably due to financial constraints.²⁴

From a usability perspective, where a printed map is easy to share, a podcast is more difficult. In addition, a concern for both visitors and site management are the dangers of moving about while wearing headphones. Similar concerns exist for cell phone users, which shall be considered next.

²⁴ (Ruffle 2008)

Chapter Six: Case Study #3 – Cell Phone Tours

Description

Cell phone tours offer an alternative to podcast tours for site managers those looking to implement an audio tour program. In contrast to the podcast, which is downloaded from the internet prior to a visit, the cell tour is accessed by dialing a phone number while on site and entering a site-specific code. The cell tour described here is currently under development by the Friends of Laurel Hill Cemetery.

Cell phone based tours operate by offering a link to prerecorded audio descriptions of the various stops along a tour via a single telephone number. The Education and Outreach Committee at LHC have entered into discussions with a large provider of phone-based audio tours and have begun preparing such a tour for Laurel Hill. The tour will serve as a prototype, while the feasibility and appropriateness of the technology is tested. The cell tour represents a departure for LHC, in that it is the first formal, structured, technology-based approach to interpreting the site.

Background and Intent

Beginning in the summer of 2007, FLHC volunteers and staff came together to consider feasibility and content for an audio tour of the Laurel Hill Cemetery. The group's goal was simple. It was to develop an audio tour for the

casual visitor to the cemetery, using the cell phone, MP3 or similar technology, provided that it did not require purchase of technical equipment by LHC.²⁵ The group further expressed that the tour should be a way for visitors to get an informative introduction to Laurel Hill Cemetery, encouraging them to return for special events and special subject tours led by LHC guides.²⁶ In bypassing other alternatives, members of the team cited three benefits of the cell phone tour over other options. The cell phone tour:

- Is more easily updated by staff,
- Generally does not require investment in technology that is often quickly outdated,
- Can accommodate a variety of thematic threads.²⁷

Although the group agreed that this was a reasonable option, a "test run" or prototype would be a pragmatic starting point. Key stories, sites and topics were identified among the thousands available at LHC. These were arranged along a preferred path and grouped into "interpretive clusters" where appropriate. These interpretive clusters represent stops along the route where related stories or several stories might be told. Professional assistance has been brought in to help prepare the narration. Next steps involve commitment to implement, recording of the narration and ultimately deployment.

²⁵ (Lloyd 2007)

²⁶ (Lloyd 2007)

²⁷ (Beardsley 2007)

Benefits and Challenges

Cell tours offer a cost effective approach for those looking to implement interpretation technologies for the first time. According to Dave Asheim, founder and President of Guide By Cell, Inc, site managers can have rudimentary cell tours available within days for a few hundred dollars per month.²⁸ Templates are available for marker signs to be placed around the landscape and audio recordings can be made as simply as recording a message on an answering machine. Should there be concern over disrupting the landscape with a series of signs, appropriate information can be included with the maps.

As with other audio tour technologies, cell phone format can provide a greater interpretive experience than a simple printed map, with the addition of music, sound effects, or changes in narrators and speech. Most practitioners start simple and then enhance their audio files as they become more comfortable and more proficient. For example, one Guide By Cell, Inc customer, an aquarium, has had the fish do the talking. At another site, a botanic garden, the various plants narrate the tour. Re-enactors are another popular technique, particularly at historic sites like Valley Forge Park.²⁹ In an adventurous and offbeat location like Laurel Hill, this could be an attractive approach. New technology now allows the possibility of incorporating text messaging into a cell tour. With this

²⁸ (Asheim 2008)

²⁹ (Asheim 2008)

development, URL's can be sent to tech-savvy visitors with web-enabled phones, allowing even greater levels of access.

The down side to cell tours is limited as compared with the other technologies. First, the tours are unavailable to those off site unless they have the phone numbers to dial. Also, the cache of the technology is less than that for the multi-media experience or the podcast. Next, they are not location aware, requiring the visitor to initiate the call. This last item is arguably a benefit, however, as the visitor who is passing through the historic site can dial for information if a stop piques their interest. They are not encumbered with the responsibility of determining what will be of interest in advance of their visit. Funding is a concern. Although it is possible to charge a nominal fee for each call, most sites have found this impractical, opting instead to raise funds through grants and sponsorship. Although this adds to LHC's existing fundraising burden, the operating costs are minimal. Lastly, as with podcasts, cell tours are difficult to share and the dangers of moving about while wearing headphones must be considered.

Where web-based tours offer a primarily visual and text-based interpretation experience, podcast and cell tours offer an auditory experience. Location based multi-media incorporates both of these. We move to this more complex technology in the next and final case study.

Chapter Seven: Case Study #4 – Multi-Media Based Tours

Description

Location-based multi-media is a comparatively new class of tools available for use in site interpretation. Such tools include hand-held GPS-enabled equipment such as PDA's or custom-built devices such as the Node Explorer discussed here. Through these devices, the visitor experience is delivered through video, audio, graphics and navigational assistance. The Node system discussed below is the premiere example on the commercial market today. The author's experience with the tool following its deployment in Stourhead during the summer of 2007 helped formulate the concepts investigated in this thesis.

Stourhead is the 2600-acre former estate of the Hoare family in Wiltshire, England. Bequeathed to England's National Trust for Places of Historic Interest or Natural Beauty (a.k.a. The National Trust) in 1946, the estate includes a magnificent Palladian villa and a garden that is often cited as one of the premiere examples of the 18th century English Landscape movement (see Figs 23-25). In September of 2007, The National Trust launched Stourhead Explorer, a location-based media guide to the Stourhead Gardens. Stourhead Explorer provides a compelling and immersive multi-media interpretive experience that combines interactive video, audio, text, graphics, and GPS-guided maps. Created by Node, a UK based firm, the device delivers broadcast quality media

via a small handheld device (see Fig 26). Available for hire on entry to the gardens, the £5 fee is in addition to the £4-7 entry fee charged by the National Trust. The Explorer fees help to offset the cost of the hardware, maintenance, and content hosting, all of which are provided by Node, the product's creators.

After hiring the Explorer, the visitor views a brief introduction to the site via the tool that is filled with the background of the property, views of the site in all seasons, instructions on how to use the tool, and an overview of the tour to be taken. The visitor is then guided to the first stop along the tour. By monitoring the graphic, GPS enabled map, the visitor is able to monitor progress along the route, seeing clearly when he or she has gone off-track. Once within range of the next stop, the presentation is triggered and the visitor is immersed in a cinematic journey. The site's history is brought to life through virtual reconstructions, garden temple doors are unlocked and the visitor is drawn inside to spaces off-limits to the general public. Aerial views provide unique perspectives. Behind the scenes insights and greater depth of detail on the plants and architecture of the landscape are available on demand, should the visitor choose to view them. In this way, Node's Explorer offers a tremendous ability to accommodate the varied learning and touring styles of the visitors and their particular interests.

Background and Intent

In their original designs, the management at Stourhead was reluctant to stray far from a conservative approach to the media developed for the site.

They were intent on providing a new approach to interpreting the gardens and enhancing the public's experience without affecting the natural beauty of the gardens with obtrusive signage. The potential of multilingualism was attractive, as was the opportunity to provide a more direct vehicle through which the garden's experts could communicate with the visitors.

Over time, as the product and its content evolve, more experimentation is being considered. There is some discussion under way of creating an adventure game that allows users to assume the role of characters in the development of Stourhead's development. As was discussed in the literature review in Chapter 2, this is often a clever and very effective way of engaging audiences while simultaneously communicating and educating. Node and Stourhead management are also considering creation of multi-themed and multi-lingual tours that cover the same geographical space.

As it is arguably the most technically sophisticated location-based media technology on the commercial market, one might expect that the Node Explorer was developed and marketed specifically to draw a tech-savvy audience. However, that could not be further from the truth. In practice, the company has actively sought to be inclusive. According to Tom Brammar, Node's Chief Executive, "We try and make our addressable audience as large as possible, and I really enjoy tailoring it specifically to engage the older users who traditionally are technophobes. We built our hardware with this in mind (Braille based buttons etc.) as well as designing our software so that it was as simple and

as intuitive as a cash machine to use."³⁰ Technical usability is also a strong consideration from a maintenance and updatability perspective, as Node is determined to allow the site management to focus on the more important goal of content development.

Benefits and Challenges

Having considered the tools discussed in the literature review (Chapter 2), it is clear that Node's Explorer is one of the most unique interpretive devices on the commercial market today. It provides allowances for an assortment of visitor types (e.g. those sometimes categorized as Students, Strollers, and Streakers) through the varying levels of available information and the ability for the visitor to bypass stops altogether in favor of others. While there are still some challenges to be overcome around GPS technology and its accuracy, the interactivity of the media and high quality hardware reflect well on the professionalism and management of the host organizations.

An intriguing aspect of location-based media, as presented by Node, is the tertiary business paradigm that it enables. Because the site can be used over large geographical areas, several sites can be together to create a themed multi-site experience.

With all of that being said, Node's solution is at the top end of what is possible in the location-based media arena. According to Tom Brammar, one of

³⁰ (Brammar 2008)

the most important factors in preparing for success is a strong “focus on the identification of the correct content experience for the audience and the development of an effective and well thought through distribution and marketing plan.” He adds, “In this sense the challenges faced are not dissimilar from a standard franchise / partnership business.”³¹ This suggests that those not armed with this level of preparation and engagement would do well to consider other options and prototypes until such time as they are prepared to make such a commitment. This is echoed again in Brammar's assessment that the key to the system's longevity is a “continued investment in the ongoing content experience to ensure that it is fresh and dynamic for all users.”³² In addition, he adds that it is important to continue investing in the marketing and distribution networks to drive interest. With such requirements, the technology seems a sensible approach for larger organizations such as the National Trust in the UK, the National Park Service in the US, or a metropolitan area's collected sites, rather than for a small or isolated site or attraction.

Creation of the multi-media content is more demanding for a multi-media system than for a web or audio implementation, as images, both moving and still need to be added to the research and production plans. At 12 weeks, however, the typical incubation period reported by Node is the same as that reported by Stride Design for a podcast.

³¹ (Brammar 2008)

³² (Brammar 2008)

In contrast to the other options being assessed, it is reasonable and logistically possible to charge a fee for a multi-media based service. However, the need for expensive dedicated hardware to be rented at a venue requires that staff be available at all times to monitor the rental and return of equipment. This constraint does not apply to the web, podcast or cell phone alternatives.

Cost of ownership is an important consideration for each of the technologies under consideration, but that is particularly true for a technology that requires a hardware purchase up front. Node has sought to overcome the cost challenges by incorporating a finance arm into their business model. In doing so, they are then able to finance the site's capital costs up front, recouping them through the revenue generated from the hire fee later on.

Having now looked at each of the technologies and their application in the real world, now it is possible to assess their fit for application at Laurel Hill Cemetery.

Chapter Eight: Goals and Analysis

It is only by understanding the goals of the Laurel Hill leadership that an appropriate assessment of next steps can be made. Following a brief review of the goals, the four key technologies will be assessed against their fit with those goals and conclusions will be drawn.

Laurel Hill Cemetery Goals for 2008

The Education and Outreach Committee, a sub-team of the Friends of Laurel Hill Cemetery (FLHC) has identified a clear set of interpretive goals for 2008. It is their intention that current and planned publicity about LHC will draw an influx of new visitors into the cemetery in the coming year. This expectation, as well as limits on the availability of tour development funds drives some of the goals. One of the first items to be considered is the need to balance existing resources with the demand for tours. This will be managed in the near term by defining and implementing an alternative to live-person guides. The FLHC team had originally hoped to produce a fully developed tour of the entire site potentially for delivery via a traditional audio-guide format. However, resource constraints necessitate a more restrained, scalable approach. In addition, the Education and Outreach Committee now believes that pursuing a full-scale interpretive production at this stage is premature given the pending development of long-term planning documents. Regardless of the interpretation

vehicle, the definition of a core narrative will be essential. This will focus on a handful of central themes as well as "interpretive clusters", or areas within the cemetery where key related stories can be told. Other interpretation concerns for the FLHC team in 2008 include guided tour availability, tour consistency, guide recruitment and training, and the need for directional signage within the site. An underlying concern for FLHC is the accessibility of data from their vast archives for use by visitors and researchers. Given resource constraints, broad access to this resource is managed indirectly through inclusion in tour content. There are currently no plans to make it accessible electronically in its raw form.

With regard to alternatives to live-person guides, FLHC management and staff in the form of the Education and Outreach Committee are hard at work on the development of a cell-phone based tour for the casual visitor to Laurel Hill Cemetery. Because the audio tour cannot be comprehensive, they agree that it should be intended as an introduction to Laurel Hill Cemetery and used to encourage visitors to come back for special events and special subject tours led by FLHC guides. This aligns with their desire to address the needs and expectations of the anticipated new audience.

To summarize, then, the FLHC interpretive goals are clearly defined. The design for a new interpretive tool for Laurel Hill Cemetery will need to consider the following:

- Anticipation of a new audience and encouraging return visits
- Ensuring tour consistency

- A set of key themes and “interpretive clusters” to be defined by FLHC management
- Scalability of implementation
- Resource constraints (e.g., financial resources and limited availability of live-person guides)
- Visitor navigation through the site

These areas of concern can be grouped into several categories: the audience, the message, resource constraints, and navigation. With any interpretive tool, availability and usability should also be considered.

With these things in mind, then, analysis of the four target technologies (web, podcast, cell phone, and multi-media) can begin.³³ Each of the key themes will be reviewed in turn (i.e., the audience, the message, resource constraints, and navigation, availability and usability) and will be followed by the final analysis and conclusions. It must be said that within each of the four target technologies, there is a range of detail and complexity of implementation possible. For the purposes of analysis here, the materials presented in the Case Studies will form the basis by which each is examined.

The Audience

In the spring of 2008, an innovative advertising campaign will be launched by Laurel Hill Cemetery. They include props such as an electrical

³³ See Appendix B – Interpretive Goals V. Technological Approach Matrix for a summary of the positive and negative aspects of each goal and technology.

socket with a fork wedged inside and the label "There are better ways to get to Laurel Hill" (see Figs 27-28). The playful ads will be located across Philadelphia and are intended to stimulate discussion and curiosity, provoking the public to view the historic cemetery as a worthwhile tourist destination. In anticipation of this new audience, new and equally intriguing interpretive resources are needed in order to validate their decision to visit the site and to encourage their return.

The web approach can play a key role in drawing visitors to the site and giving them a rich interpretive experience. By providing a graphic map, high quality images and text describing the stops along the various tours, prospective visitors are able to quickly get the feel of the environment and select the tour or tours that are right for them. Users are then able to print out free, customized tour packets prior to arrival on site. This makes it unique among the technologies under scrutiny in that it requires no special technology once at the cemetery. The printed guide is all that is needed.

Among the most appealing technologies under scrutiny is the podcast. As a ubiquitous technology with a strong following among the same young demographic likely to be attracted to an offbeat destination like Laurel Hill, interpretive programs conveyed via the iPod or other MP3 player can be engaging, enlightening and fun. While not offering the glamour and fascination of a multi-media application, the audio format still provides opportunity for a greater depth in the interpretive experience than a printed map alone through the inclusion of music, sound effects, historic recordings and voice

characterizations. As always, personalization of the tour experience is important to visitors and, with the podcast, preferred tours can be selected and downloaded and associated maps printed prior to arrival on site.

The cell-phone tour can provide a similar auditory opportunity to the podcast, though the technology's allure is somewhat less than for the iPod or other MP3 player. As with the iPod, the cell phone is a ubiquitous technology, though arguably popular among a wider audience. Because of the ease of updatability by FLHC staff, the cell tour could be considered an entry-level technology. It can be a simple narration read by a volunteer guide and a map provided on entry to the site indicating tour types and stops.

Almost any new technology when brought into the context of a cultural landscape can produce the 'wow factor'. That is never more true, however, than with a handheld multi-media device like the Node Explorer. The availability of moving images, graphics, sound effects and context-sensitivity is sure to impress even the most jaded observer. Images that dissolve from historic photographs to current video or recordings of voices from the past can produce a greater sense of place than other technologies. If time and money was no object and the 'wow-factor' was an important criterion, a hand-held multi-media device would be the clear choice. The prospect of combining a Laurel Hill tour with other historic destinations in the city is also intriguing. Perhaps an LHC tour might one day be combined with outings to Fairmount Park mansions or

visits to the historic heart of Philadelphia. For the near term, however, small steps toward a new interpretation program are prudent.

The Message

Ensuring Consistency

Currently, volunteer guides lead tours several times per month. Topics and guides vary, as does the content of their narratives and quality of the research. Guides are typically dedicated volunteers who have undergone little, if any formal training in interpretation. Tour content is developed by the guides themselves and, while some content may be shared, it is not out of the question for differing stories to emerge about the same tombs or their occupants. While training of the volunteers is in the plans, an alternative to live-person guides would be a useful approach to ensuring consistency, at least for first-time visitors.

Because each of the technologies under scrutiny in this paper is technology-based, they are all well suited to address the need for consistency. Technology solutions provide a valuable adjunct to live-person guides by being available when volunteer guides are not. In addition, the content they deliver can be carefully crafted and edited for accuracy and consistency in advance of release.

Key Themes

Three key themes have been roughly drafted by FLHC. These include:

The People of Laurel Hill – LHC is a place created by people in response to their time and environment. It is a place where people of all kinds are buried. The story of Laurel Hill Cemetery really is about all these people and their many stories.

In Remembrance – LHC is about memories. LHC was created to honor the dead and to remember them. It is a place of history that speaks to broad themes and movements in the nineteenth and early twentieth century Philadelphia (and America). It is also a place where the living can create personal memories, by walking through and appreciating this beautiful and historic place.

The Landscape – LHC is a place of physical beauty, both natural and manmade. Its natural beauty was intended to inspire and offer respite to the living, even while creating a final resting place for loved ones. Then and now it is cherished green space set in an urban environment.³⁴

The stories that are told around the site are to be built around these themes. In developing the cell-phone tour, the FLHC team has identified the interpretive clusters and personal stories that align with these themes, at least for the first phase of deployment. With this in place, the task of a new interpretive tool will be to convey effectively these messages to the public.

In each of the interpretation technology case studies reviewed, content was carefully drafted after painstaking research from original sources. Each of the technologies under review will allow for this level of quality delivery. The web tool requires location only of printed material, while both the podcast and cell

³⁴ Themes excerpted from FLHC meeting minutes: (Lloyd 2007)

tour can also entail location of audio clips and other recordings. Audio, video and still images and graphics are all required for the multi-media approach, making this the most labor-intensive of the four solutions.

Resource Constraints

Like most non-profit organizations, Laurel Hill Cemetery has limited operating revenue and staff. Relying heavily on volunteers to interpret the site for visitors, LHC also contends with financial constraints that dictate the type of interpretive vehicles deployed. A suitable design approach would ideally be a small proof-of-concept that can be scaled up as the funds become available. LHC has already shown its intent to deploy a cell phone tour on a small scale, with the ultimate goal to define a mechanism that could be used across the entire 78-acre site.

Scalability

In each case under examination, the tour components are easily reusable. That is, within each technology, the narrative for a stop on one themed tour can be reused without change for other tours making a stop at the same point or interpretive cluster. In fact, cell tours may be a suitable stepping-stone for podcasting, as the same audio recordings prepared for cell phone tours could transitioned to delivery via podcast technology.

With regard to reusability, the web and podcast options would require editing of the website and maps. Where a new tour used existing stops with pre-

recorded narration, the cell-phone tour would have the advantage. Since the user simply dials the phone number posted at each stop, only the maps require alteration to define different tours. In the case of multi-media, the software would also require modification, making it the most costly to revise in spite of the reusability of its components.

Costs for scalability vary. Provided that an appropriately scaled web-server is used at the outset, web and podcast tours would see no increase until the server reached capacity. That could be years or never if the server is properly sized at the outset. For cell tours, increased demand would command increases in hosting fees from the provider. Increased demand for multi-media tours would necessitate increased purchase of additional handheld units, headphones and chargers.

Updatability and Maintenance

Maintenance and updateability of the web-based tour is of moderate complexity and cost in comparison with the other technologies. It requires updates to the written content, maps and images, tasks that could be managed by professional service provider or a skilled FLHC staff member or volunteer. While hosting of a website can add thousands of dollars to the lifetime costs of a website, these costs would not be additive for organizations already sustaining a sufficient web presence. Maintenance is an added cost, however, as with each new release, retesting on new versions of operating systems and web browsers is required.

The audio programs (both podcast and cell phone) require significant effort, though to a lesser degree than for multi-media. Updates to a podcast such as described in Case Study #2 involves maintaining the consistency of the narrator, recording of narration, mixing audio, modification to the web map and preparation of the audio files for downloading. Stride Design Ltd, the developers cited in the case study, found that the costs of maintenance for podcasts have been beyond the reach of non-profit organizations to date.³⁵ The cost of the podcasts as delivered in the Case Study #2 examples is double that of the web-based tour in Case Study #1, taking nearly a third longer to produce, leaving open to organizations like LHC the question of how the initial investment might be recouped.³⁶

Like the web and podcast tours, the cell tour would require map modifications, though these would be in printed form for availability on site. Whereas updating all of the components of a podcast would require professional assistance, with the cell tour, updates could well be completed by a member of FLHC staff. With a cell tour, work can progress without purchase of technical equipment.

Among the four options being considered, a multi-media application could require the greatest amount of time, energy and funding to update and maintain. Requiring reproduction of the visual and audio components,

³⁵ (Ruffle 2008)

³⁶ (Ruffle 2008)

distribution to the handheld devices and updating the content on such a device is a process that requires professional assistance and is likely beyond the reach of most smaller non-profit organizations.

Navigating the Site

Clearly, one of the key elements missing from LHC's current interpretive framework is an accurate way-finding system. Current maps available to visitors are circa 1920's and are missing significant route changes installed in the intervening years. All four technologies provide an accommodation for accurate way finding.

Web and podcast tours offer the opportunity for high quality imagery and maps to be made available to the prospective visitor before arrival on site. Photographs of landmarks and the ability to take a virtual walk through the landscape via the map before arrival can help orient the visitor, allowing them to vary their route once on site to accommodate their preferences and the amount of time they are able to spend on site. The one caution raised about navigating with the podcast approach is the potential danger of moving about while wearing headphones. Given the limited traffic in Laurel Hill and the propensity of most tour stops to be deep in the landscape away from car or bicycle traffic, this risk is minimized.

The simplest form of way finding system is provided by the cell phone tour, which calls for a simple update of the existing printed map, with signage placed around the grounds to help direct visitors to the various stops along the tour. At

each stop, a sign is required indicating the phone number to dial for information. One printed map may include several tours, perhaps varied by color or other graphic device. Alternatively, several distinct maps may be preferred.

The most complex system is provided by the location-aware technology of the multi-media system. Using the Global Positioning System, location aware technologies can provide a visitor with highly accurate feedback on their current location and specific directions to their next stop on a tour. One might argue that such technology's value on an open landscape such as Laurel Hill would be limited, as one can never be too far lost. However, finding one's way out and locating a specific tomb are very different needs. Given the existing state of way-finding systems in Laurel Hill, some additional guidance is important. The proximity of tombs on a tour might challenge the accuracy possible with GPS, but accurate maps can be made available.

Availability and Usability

Other obvious considerations include availability and ease of use. In terms of availability, the web and podcast options have an advantage over cell phone and multi-media tours in that they are available to view or download even outside LHC's normal operating hours.

In terms of usability, the web-based environment can be user-friendly when properly designed, offering a rich interactive experience and high-resolution graphic maps and images. Web-based systems assume some element of preplanning on the part of the visitor, however. This can be mitigated in part

by provision of either printed maps and guidebooks or a web-enabled kiosk on site at Laurel Hill. As with any printed guidebook, web tour packets are easily shared among visitors traveling together.

Podcasts provide a rich interpretive experience both on-site and off, but are difficult to share among those traveling together. Cell phones and multi-media applications also suffer from this concern. It is worth noting that Stride Design reports it has found it difficult to define a successful model by which a site can charge a fee for the web service or Podcast downloads.³⁷ The services must stand up in their own right, providing value to the subject landscape in other ways.

Cell tours are simple and convenient to use, assuming each visitor has a phone. Given the need to redial at each location, usability of the cell phone is not as seamless as for the other tours. It is possible that some users may balk at having to pay phone charges for the experience. From LHC's perspective, the concern would be that while visitors' funds are being spent, they are not being directed to Laurel Hill. Again, the service must stand up in its own right, providing value to the subject landscape in other ways.

Multi-media location-aware technologies clearly provide the most interactive and engaging interpretive experience. GPS technology ensures that simply arriving near a site will trigger the narrative. Issues around sun glare and loss of signal will improve over time as technology evolves.

³⁷ (Ruffle 2008)

Conclusion

Clearly, the multi-media approach provides the greatest opportunity for place making and navigation improvement at Laurel Hill and it may ultimately have a role there, but the primary goal at present should be to take the first steps toward improving the site's interpretation. Assuming the appropriate financial arrangements could be made with the vendor, the key to a successful multi-media implementation, as described in Case Study #4, is a high degree of preparation in the distribution / marketing plan and a commitment to the product and its upkeep. Until such time as LHC is able to undertake the preparation and accept such a commitment, the multi-media approach should be removed from consideration, leaving three remaining technologies.

For Laurel Hill Cemetery, the web, podcast, and cell approaches offer a good balance of interpretive experience and audience appeal given the financial constraints of a non-profit organization. The web is able to reach beyond the walls of the cemetery to draw new audiences and the podcast adds the technological appeal. All three also afford ample opportunity to deliver the cemetery's message effectively.

For scalability and maintenance, the cell phone tour outweighs the other options. It requires no investment in hardware or software and is easy for the FLHC staff and volunteers to operate and maintain. Because the audio files prepared for delivery via the cell phone service can be transferred to podcast technology, the podcast is an intriguing next step option for Laurel Hill.

Navigation is a genuine concern at Laurel Hill today and each of the technologies offers some improvement. The web tour allows the opportunity for an advance look at the map and images and the podcast provides access to the narration in advance of the visit. Because both are delivered via the internet, the virtual cemetery is always open for tours.

When the goals are considered in total, no single tool comes through as the clear winner for the future of Laurel Hill Cemetery. FLHC has made a sound decision to proceed with cell phone tour first, as it allows them to make the important decisions about which messages to deliver in what order, to pull together the best research on those messages, and to understand the audience and their reaction to interpretation technologies. The next step should build on these accomplishments by adding some of the benefits of the web and podcast technologies.

Chapter Nine: Solution Design

Thus far, we have investigated the state of play for technology in the tourism industry, reviewed in greater detail an example of each of the four key technologies in the space, and investigated the advantages and disadvantages of each as they relate to Laurel Hill's goals. Finally, it is time now to turn to the proposed solution. First, the foundation for the design must be laid by outlining the benefits to be gleaned from the selected technologies. Next, the concept will be revealed and finally, an example of the system's use will be examined.

The Foundation

The ideal solution to be considered here is one that must be plausible for implementation given the unique constraints and needs of the management at Laurel Hill Cemetery in the near term. Longer-term solutions should be considered only after FLHC management has completed their strategic planning exercise. A near term solution should make the most of each technology considered thus far.

Earlier, podcasting demonstrated the best balance of interpretive experience, audience appeal, and financial considerations. The ubiquity of the technology, user-friendliness, and 24/7 availability add to the appeal of the podcast technology. Finally, the cell tour provider's capability to transfer easily

the existing cell phone tour audio files to a podcast format takes advantage of work already under way by FLHC and makes the podcast a suitable next step.

Web-based technology demonstrated its utility at engaging prospective visitors outside normal operating hours. Similarly, its ability to provide access to high quality maps and images, make it worthy of consideration. The web approach also affords an opportunity for the public to explore the history of the cemetery in greater detail than they might otherwise take the time to do on-site, perhaps making use of the extensive archives available at LHC. Neither the podcast nor the web provides sufficient benefit to justify completely turning away from cell-phone technology, however. They require preplanning on the part of the visitor that the cell tour does not. So, the ideal near-term design, then, would build upon the existing cell tour approach by including a podcast downloaded from a web site offering access to maps images and other useful information.

The Concept

The concept is comparatively simple. The existing cell phone tours are maintained and the audio files are converted for use as podcasts. The podcasts are made available on an augmented LHC web site, giving tour access to prospective visitors outside normal LHC visiting hours. These audio tools are supplemented by a web-enabled geodatabase offering unprecedented access to a wealth of data from LHC archives in order to pique the interest of prospective visitors and to facilitate greater levels of exploration and research.

Usage Scenario

When a visitor to the LHC web site is interested in learning about available tours, they access the appropriate section of the web site. This allows the prospective visitor to identify their area of interest and explore the cemetery in detail before arriving at LHC. Every tour is associated with a particular theme or tour (e.g., Civil War heroes, captains of industry, famous women, politicians, etc) and for each, a variety of images and information is displayed. Podcast files are available for download and maps with tour stops highlighted are available. For each of the tour stops, descriptive narrative is provided along with access to data from the LHC archives. The web site visitor is able to view various images of the stop, facilitating familiarity with the surroundings and helping to locate the stop's position within the landscape. For those seeking more detailed information than the overviews provided by the tours, a research component is available to link the web site user directly to the electronic records pulled from the LHC Archives.

By providing several layers and methods of interpretation, the tools available can help LHC cater to a variety of visitor types, the so-called strollers, streakers and studiers. The strollers can briefly browse the web site to choose their preferred tour, download the podcast, print the associated map, and then casually walk the landscape, stopping for audio tour descriptions as they see fit along the way. Streakers can grab a map on their way in the gate, much as they always have, or bypass the map altogether, stopping to dial the cell tour when

they see something specific of interest. Studiers can engage the audio tour as well as investigate the depth of information available in the archives before or after their visit. How then would such a thing be built? This will be considered in the next chapter.

Chapter Ten: Design Details

The design will be outlined in several parts. Creation of the podcast files is a simple conversion action offered through the cell tour vendor, so extensive analysis and discussion is unnecessary. Changes will be needed to the existing LHC web site and these will be discussed first. As the geodatabase and map are the most significant additions, they require a more detailed review. This will begin with a discussion of the technology considerations, followed by a look at the type of data that may be contained within the database. Implementation will be discussed next through a review of the implementation plan and administration needs. Finally, success measures will be discussed.

Web Design

The web interface will be built to accommodate two primary paths or uses. The first is the user interested in investigating available walking tours. The second is the researcher interested in delving deeper into the LHC archives. By reviewing each path and viewing the paper prototype, or screen mock-ups, the remaining design discussion can be put into better context.

Tour Route

In this hypothetical scenario, the prospective visitor to LHC enters the LHC web site through the Home page and selects "Tours and Programs" from the

existing list of menu options available on the left side of the page. "Self Guided Tours" is an option that appears along the top of the page. The new design will be plugged into the web site here. Currently, a static page with a bit of text outlining LHC hours and admission policies (see Fig 29), the page will be altered to include a selectable list of tour types and an associated aerial view of the site with tour stops indicated (see Fig 30). Changing the tour selection changes the stops indicated on the map. By using color-coded pins on the map, the visitor can more easily identify stops of interest and can better locate themselves on the site (through associated cell tour signage).

Once a specific tour is selected, the user is taken to the information page for that tour (see Fig 31). Here, a brief description of the tour is provided along with the map or aerial view of the site with stops indicated, print functionality, and access to podcast download files for the entire tour or for the individual stops.

Selecting an individual stop either on the map or on the podcast list opens the page describing that individual tour stop (see Fig 32). This page includes a collection of images and the archived data for that stop, along with the personal history or narrative included in the podcast or cell tour audio file.

Research Route

In this hypothetical scenario, the prospective visitor to LHC enters the LHC web site through the Home page and selects "Research" from the existing list of menu options available on the left side of the page. Currently, "Records" is an

option that appears along the top of the page (see Fig 33). The new design will be plugged into the web site here. Renaming this section “Search”, the page will include search access to the LHC electronic archive via a variety of predefined parameters (see Fig 34). These parameters will be discussed in more detail during the review of the database itself.

When performing a search, it is likely that more than one result will be returned for a given query. In this case, the results will be returned in a list with a few key parameters to enable identification of the preferred option (see Fig 35). Selecting a preferred result from the list brings the user to the “Records” page, where the full record for that individual or tomb is displayed (see Fig 36).

Technology Selection

With the user experience and process requirements defined, the underlying technology can be selected. The database and the mapping technology represent the two components for which such a decision must be made. Each must be assessed for their fit with LHC’s goals and constraints. Greater constraints exist on the database technology, so it will be examined first.

Database Technology

Identifying the appropriate technologies for the database requires an assessment of the system’s requirements. First, a relational database with spatial support is fundamental, as is a link to mapping technology. Guiding the selection of each of these are the financial constraints of a non-profit organization. While

Oracle is often the database technology of choice in a professional environment, it is cost prohibitive for small-scale and non-profit organizations. The same can be said for ArcGIS, the mapping technology standard. Cost considerations, then, point toward open source, or freely available, technologies.

Several options exist in this space, but for the purposes of building a robust and supportable system for the long term, the field is narrowed to the two most popular databases for geospatial data. Building a system with the latest 'gee-whiz' platform will be of no value if it quickly falls out of favor and no one with the appropriate skills remains to maintain it. With that in mind, the two most viable options are SQL Server and PostgreSQL. SQL Server is a powerful Microsoft product that is available in two open source versions, Compact and Express. It has the advantage of tight alignment with Microsoft's other tools, including Visual Studio, a standard development tool, and Virtual Earth, a mapping tool. The advantage of using Microsoft tools is their ubiquity and, therefore, availability of associated tools and expertise required to maintain the resultant systems.

In spite of the supremacy of the Microsoft suite in the commercial arena, there are several disadvantages that preclude it from consideration for the LHC project. First, although SQL Server offers two open source versions, neither is suitable for the type and scale of the application contemplated here. In addition, the spatial extension tool Microsoft has developed for SQL Server is not freely available. A spatial extension allows the database to store geometric and

geographic data and allows retrieval of this information through the same type of query used to access a traditional database. Finally, because this spatial extension was released in February 2008, it is still quite new to market. Functionality is lacking and it will take some time before the product's rough edges are smoothed and stability is ensured.

An alternative to SQL Server is PostgreSQL with the PostGIS spatial extension. The two are a popular platform combination for municipalities and commercial establishments seeking open source geodatabase technology. Because these tools are freely available, they are independent of large software houses like Microsoft. As such, they can be simpler to maintain and typically do not incur the same frequent version changes. This can reduce the maintenance burden on firms that use the tools.

Very often in the software development world, competing technologies will develop similar functionality with each vendor rushing to release first. For the moment, the PostgreSQL / PostGIS combination has an edge on SQL Server in the world of open source software. In addition, because it is commonly used, skilled resources are widely available to help build and support the system as necessary. For these reasons, it is the appropriate database technology choice for the Laurel Hill project.

Mapping Technology

With the database technology identified, the mapping technology can be selected. Again, open source technology is indicated for this application.

Although ArcGIS is the industry standard tool, its cost precludes it from consideration. Google Maps and Virtual Earth provide API's, or development links, that are freely available for public use. Yahoo and MapQuest also have mapping API's. All of these tools will integrate with PostgreSQL. At one time, the difference between these products was great, as they leapfrogged one another with new functionality. Today, most mapping tools offer comparable functionality. As Google Maps is the most clearly documented and has arguably the greater familiarity among the general public who would be viewing the resultant maps, it is suitable for use in the LHC design.

Database Content

With technology decisions made, the type of records that will be managed can be considered. Information held within the database would include greater detail than that provided in the narrative scripts written for the cell phone tour. This data can be grouped into three general categories. The first is Occupant data. Occupant data is biographical information about the people buried at LHC and can include name, age, birth and death dates, cause of death, occupation, photographs and other data currently captured in LHC's archives. Location information is the second category. LHC's 78-acre landscape is the final resting place for nearly 100,000 people. LHC maps and records locate each of these resting places through uniquely named sections and numbered lots. Often, hand drawn maps of the lots are included in the archives. These can be scanned and included in the electronic record. To the LHC location records,

the GIS coordinates will be added. With the occupants and their locations recorded, their tombs are the final piece of the puzzle. Each tomb has a unique story that can include not only a narrative description, but also photographs, information about the tomb's architect or artist, construction details, and other information from the LHC archives.

Although the FLHC has expressed no plans to date to digitize their archives, the effort required to do so is limited. Once the repository is designed and built, entry of the data may be tedious, but it is not expensive and is well within the reach of a handful of dedicated volunteers. In a matter of hours, enough data can be gathered and entered to populate a complete tour in such an archive.

The database can serve two functions. It is useful in advance of a visit as a way of piquing one's interest in the site and its occupants, but a secondary benefit would be its use in facilitating research. For those visitors looking to delve into the site in greater detail after their visit, more information is available than was presented during the cell phone tour. For genealogy researchers who may be at a distance or are otherwise unable to visit the LHC archives in person, it can provide an avenue for further research without requiring travel to the site. At some point, FLHC management may also choose to expand the use of the database by incorporating physical condition and conservation records.

Implementation Plan

Because the same scarce labor resources are to be applied to each step of the process, an iterative rather than 'big bang' approach to implementation is recommended. The first stage, cell phone tour development, is already under way. Development and population of the database can proceed next.

Although the resources needed at this stage would require specific technical expertise, and will likely be sourced from outside the existing FLHC team, some consultancy and input is required of FLHC staff. To the degree that FLHC resources are needed and funding is available for specific expertise, technical resources can be engaged to begin the work in parallel with cell tour development. Population of the database once complete will likely be an ongoing activity for FLHC staff and volunteers. The primary focus, of course, is existing tour stops, with the remainder of the archives added as resource availability permits. The first step in development of the database would be agreement on the data to be captured and a clear definition of the data model.

Following development of the cell phone tour and the startup of the database development, the web site can be built. As the web site is a likely entry mechanism for data, its completion is required for data entry to begin in earnest. The first step in development of the web site is an agreement on the goals of the changes to the site and the navigation paths followed to achieve those goals.

At some point before the revised web site is launched, the cell tour files can be converted to MP3 downloadable files and posted on the web site.

Once the database is complete and sufficient data points are identified within it, development of the mapping link can be completed. The first step would be locating each tour stop with a GPS receiver and pinpointing it onto the map. Maps can be posted to the web site upon completion.

Time and resources must be set aside prior to release of the new web site and database to ensure that it has been tested thoroughly. It will not do to have the carefully laid marketing and design plans thwarted by faulty implementation.

As funding and resource availability are an unknown quantity, it is impossible to define a timeline for the above activities with specificity. However, they are intended augment the existing cell phone tour plans, which can proceed unhindered during development of this second phase.

Administration Needs

As the web site is the primary data entry mechanism for the geodatabase as well as management of tour information, secure access must be ensured. Over time, the FLHC team will define new tours and tour stops and uncover new information about existing tours. The web site will need to be updated with tour details, podcast files, and map coordinates. To facilitate these changes, a simple, password protected user interface is required.

Once in place, the database should remain comparatively stable. Updated versions of the PostgreSQL software may be applied periodically in

order to maintain currency and security, however compulsive attention to maintaining currency is not required. Annual or bi-annual updates should be sufficient. Periodically, revisions to the existing database will be required. The complexity of these changes will vary, but in general, it is best to thoroughly test the design's logic prior to implementation in order to mitigate later data migration issues.

Web site maintenance is expected to be minimal beyond that already incurred by LHC. Little, if any, additional processing power or hardware will be required to support the new design. Over time, additional disk storage space will be needed to accommodate the planned database.

Success Measures

Measures of increased visitors at site would be a key success factor. Currently, this process is managed through informal observation by LHC staff and counts of ticket sales for guided tours. It may be that nothing more formal is desired or required. However, the use of the web site can be helpful. With a web site, it is possible to identify the number of users accessing particular areas of the site (e.g., Search or Tours) as well as the number of podcast downloads. Free tools like Google Analytics can even provide general information on the location of those hitting the site. Numbers drawn to LHC via the web site could be managed either informally or through a simple questionnaire or survey on site.

Over time, as more data is added to the database, the research-focused audience may develop. It may be helpful to implement a scheme for visitor

registration whereby access to greater levels of data is granted for registered visitors. Measures of these registrations could provide valuable insight into that audience. This could draw interest from a greater distance and may well be a small source of increased revenue.

Chapter Eleven: Conclusions

While the Laurel Hill Cemetery was intended from its outset as a tourist destination, the dwindling capacity and rising costs of maintenance have left the cemetery more dependent than ever on alternative revenue streams like tourism. Fortunately, with so much change in society and in the landscape beyond the cemetery walls, the peaceful atmosphere within its boundaries remains largely unchanged from its early days. It is certainly more crowded, but the pastoral beauty and scenic views of the river remain. These qualities may well hold the key to its survival.

Recognizing the criticality of drawing visitors to the site, the FLHC Education and Outreach Committee has identified improved interpretation as a means to that end. They have selected cell phone technology as the appropriate delivery mechanism. As was discussed in the literature review above, technology's use in landscape and museum interpretation is in its early stages. A variety of different tools and techniques are in development and many show promise into the future. Because the field is in its infancy, standard tools and techniques have yet to emerge, leaving open the possibility of experimentation and innovation. Laurel Hill is in prime position to capitalize on this situation by marrying the best elements of the most promising technologies to suit their needs.

Following on the heels of the case studies and technology / goals analysis, this paper defines a viable next step for LHC and in so doing, an evolution in the development of technology's use in tourism. In augmenting the existing cell phone tour with web enabled virtual visits, podcasts and access to an electronic archive, LHC is removing boundaries to accessibility, making the cemetery broadly available to prospective visitors and researchers from a distance and outside normal operating hours. Whereas in the past, visitors needed to commit themselves to the journey out to the site to learn something about the cemetery's tombs and occupants, the new tools can open the virtual doors to prospective visitors at the spur of the moment. Making the breadth of the site's offerings available for review can also give visitors reasons to return to learn more about the site or to become engaged in volunteer work or research.

With the ongoing development of technology in the tourism field, new tools and techniques will be built and tested until a pattern emerges. For the moment, a small group of ubiquitous technologies has the fore. It is within this framework that LHC's goals have been assessed. As technology costs decline and Laurel Hill's needs and goals evolve, the Goals v. Approach matrix will need to be revisited. In the near and medium term, a careful and iterative approach to incorporating technology into the cemetery's interpretive plans will set the best foundation for longer-term developments.

Beyond the confines of Laurel Hill Cemetery, the future of the technology in the tourism industry is evolving. It is through not only ongoing development of

existing tools, but also through the application of creative and unique combinations of these tools such as is described here that technology will ultimately demonstrate its impact on the tourism industry. Although the leap to multi-media was found to be too great a step for this stage of Laurel Hill's development, future plans may include a move to palm-based tools, multi-media or other as yet unforeseen technologies. As location-based tools become increasingly ubiquitous, media production is simplified, and services become more readily accessible, technology will become more prevalent. It remains to be seen whether it will also become more of an expectation, putting even greater pressures on interpreters and site managers. It is wise, then, as Laurel Hill has done, to join the bandwagon early, helping to shape direction. Better to lead than to be lead.

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Appendix A: Figures

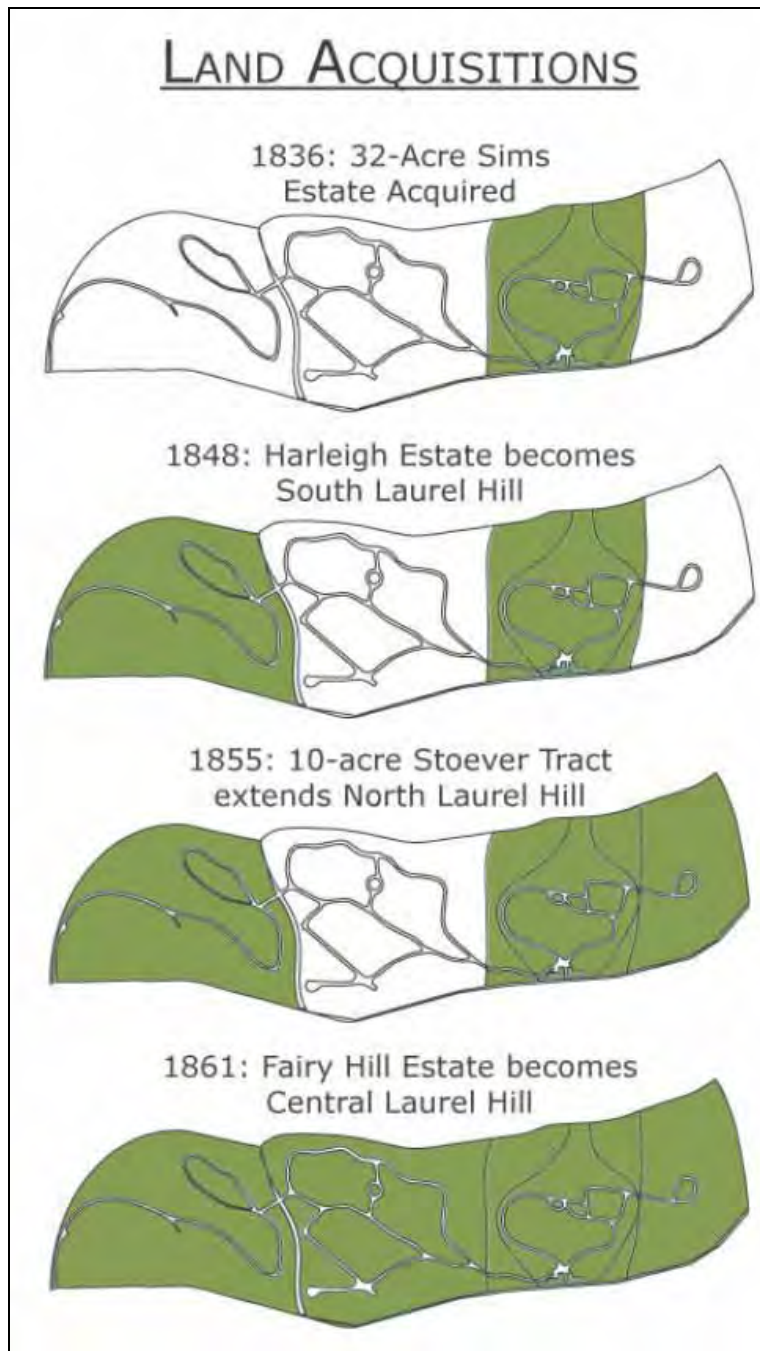


Figure 1 - Evolution of Laurel Hill Cemetery (Source: T. Aphale, 2007)



Figure 2 - Laurel Hill Cemetery's main gatehouse as it appears today (Source: C. Rossetti, Fall 2007)

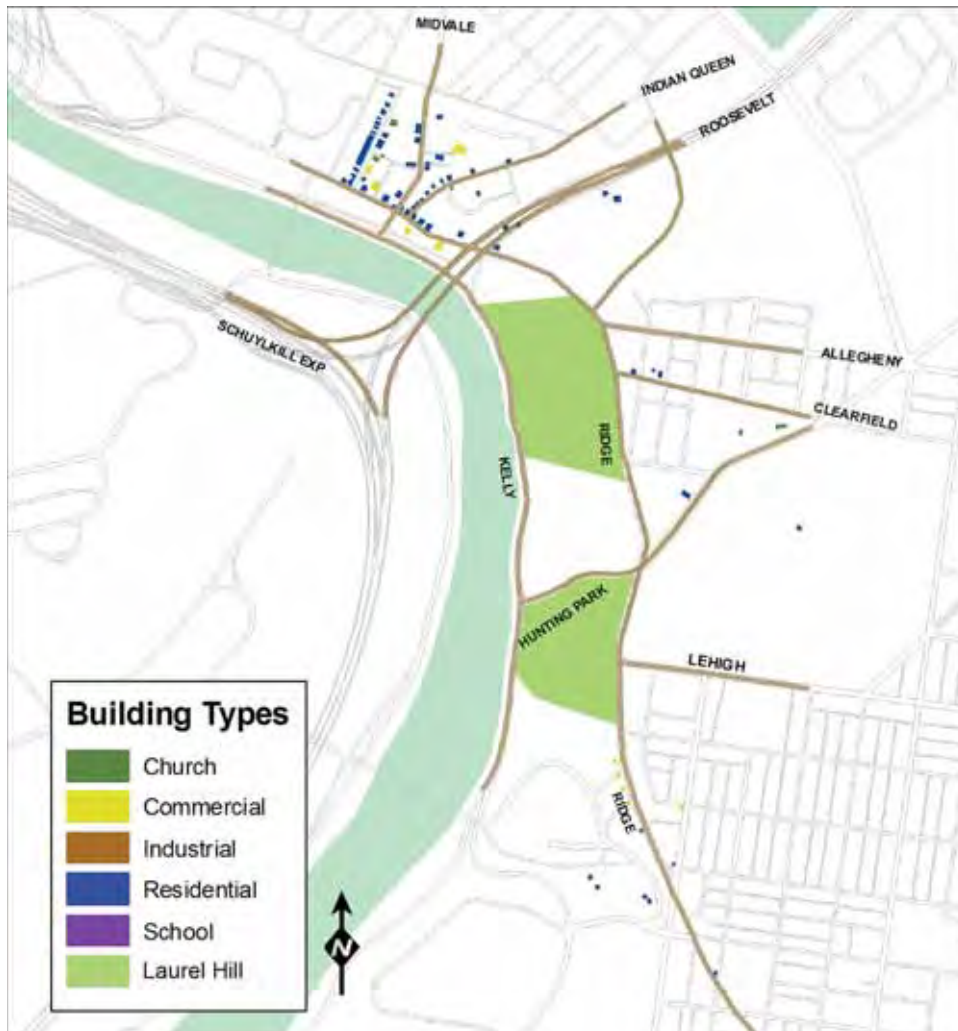


Figure 3 - The Laurel Hill neighborhood circa 1860 (Source: C. Rossetti, Fall 2007)

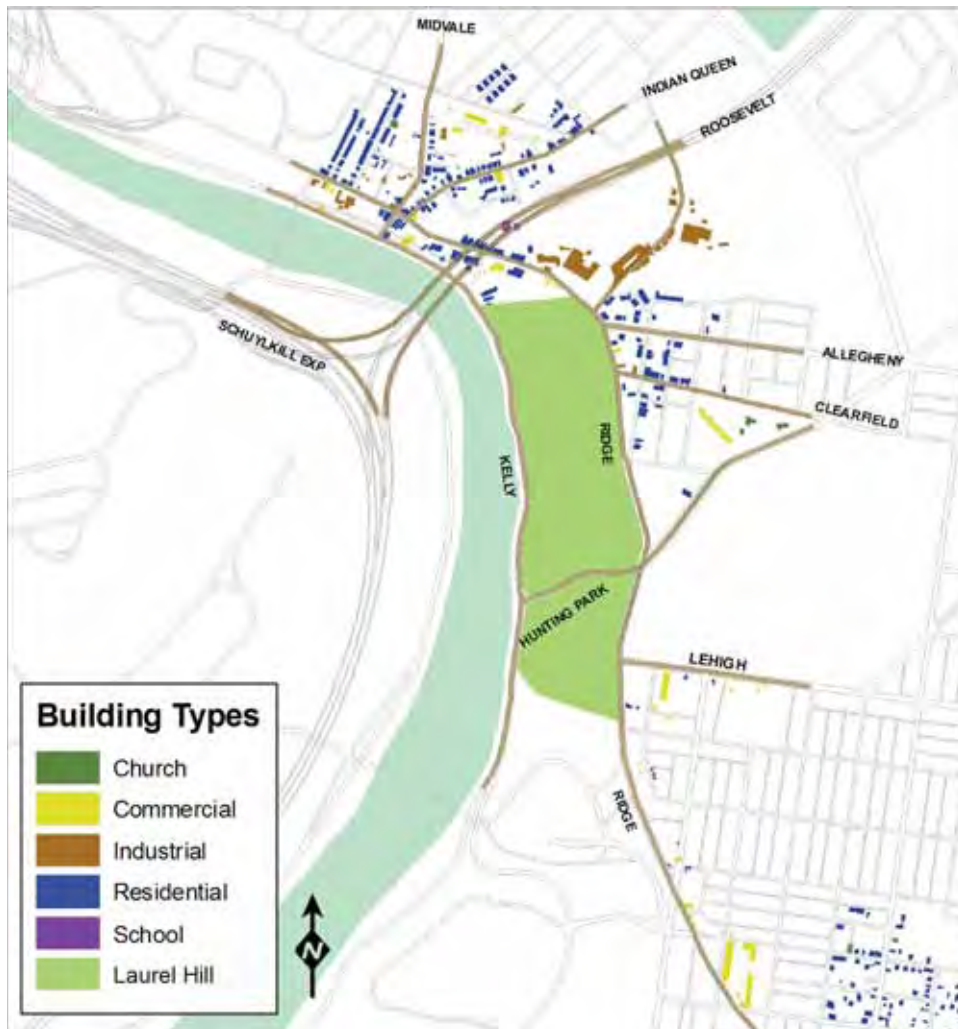


Figure 4 - The Laurel Hill neighborhood circa 1875 (Source: C. Rossetti, Fall 2007)

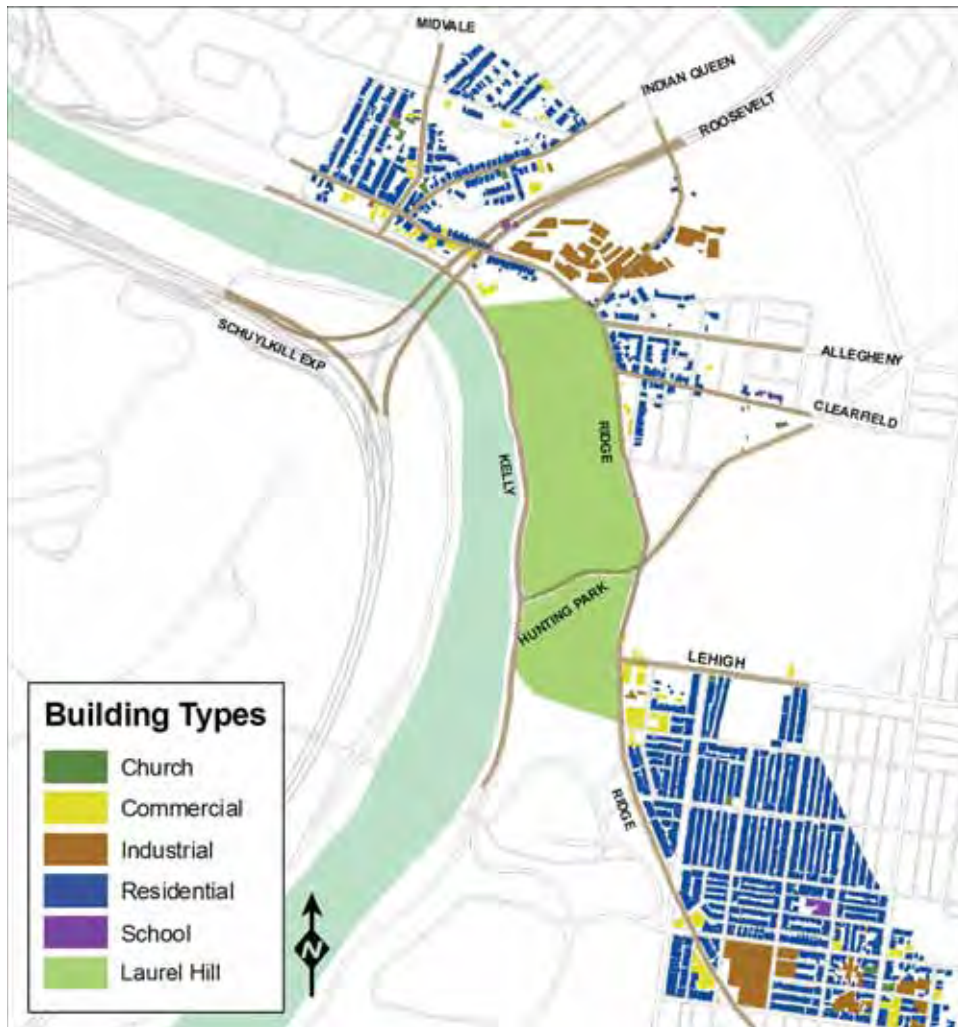


Figure 5 - The Laurel Hill neighborhood circa 1923 (Source: C. Rossetti, Fall 2007)

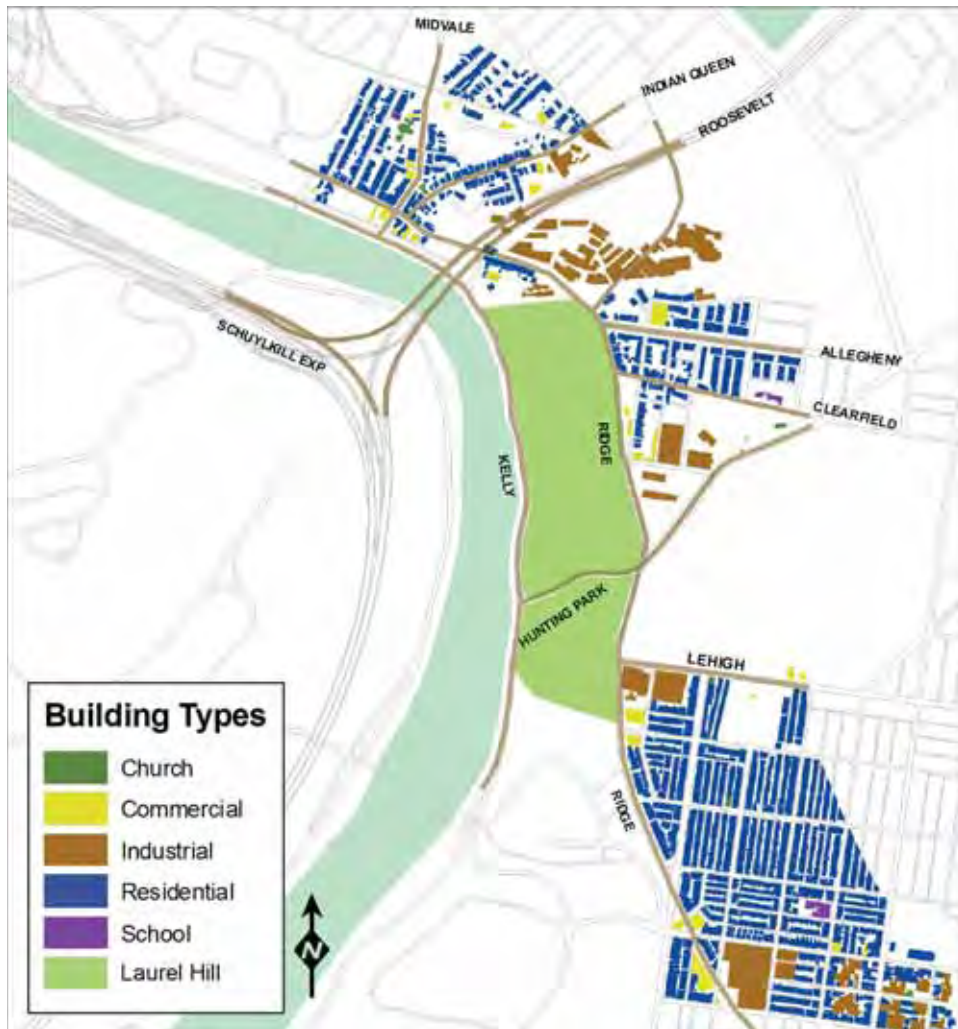


Figure 6 - The Laurel Hill neighborhood circa 1951 (Source: C. Rossetti, Fall 2007)

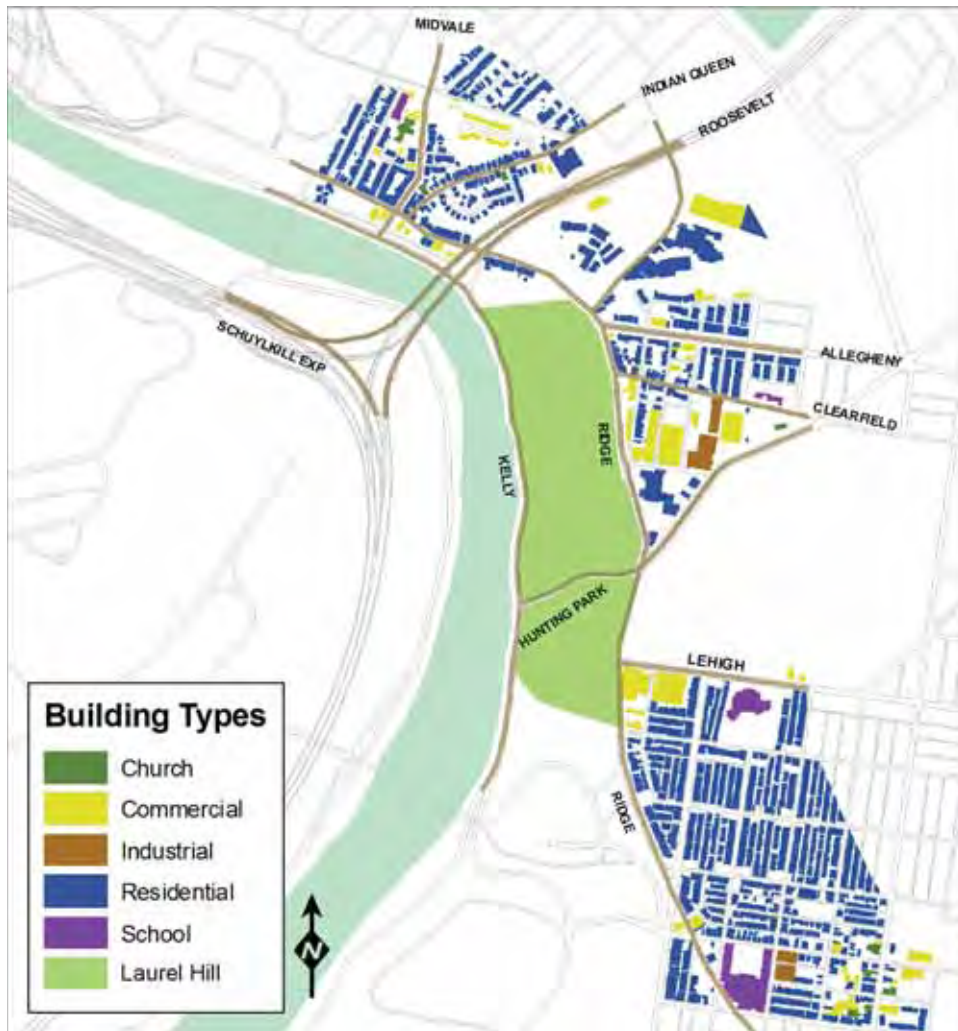


Figure 7 - The Laurel Hill neighborhood circa 2005 (Source: C. Rossetti, Fall 2007)



Figure 8 - The Laurel Hill Cemetery (Source: C. Rossetti, Fall 2007)



Figure 9 - New residential development in the East Falls neighborhood (Source: C. Rossetti, Fall 2007)



**Figure 10 - View across Kelly Drive of Laurel Hill Cemetery from Fairmount Park
(Source: M. Goeke, Fall 2007)**



Figure 11 - View south along Ridge Avenue. The chain link fence to the right of the image further cuts Laurel Hill Cemetery off from its neighbors. (Source: C. Rossetti, Fall 2007)



Figure 12 - View west of the Hunting Park Avenue division between Central and South Laurel Hill. (Source: C. Rossetti, Fall 2007)



Figure 13 - Advertisement for Sherman Mills, an adaptive reuse community in East Falls
(Source: C. Rossetti, Fall 2007)

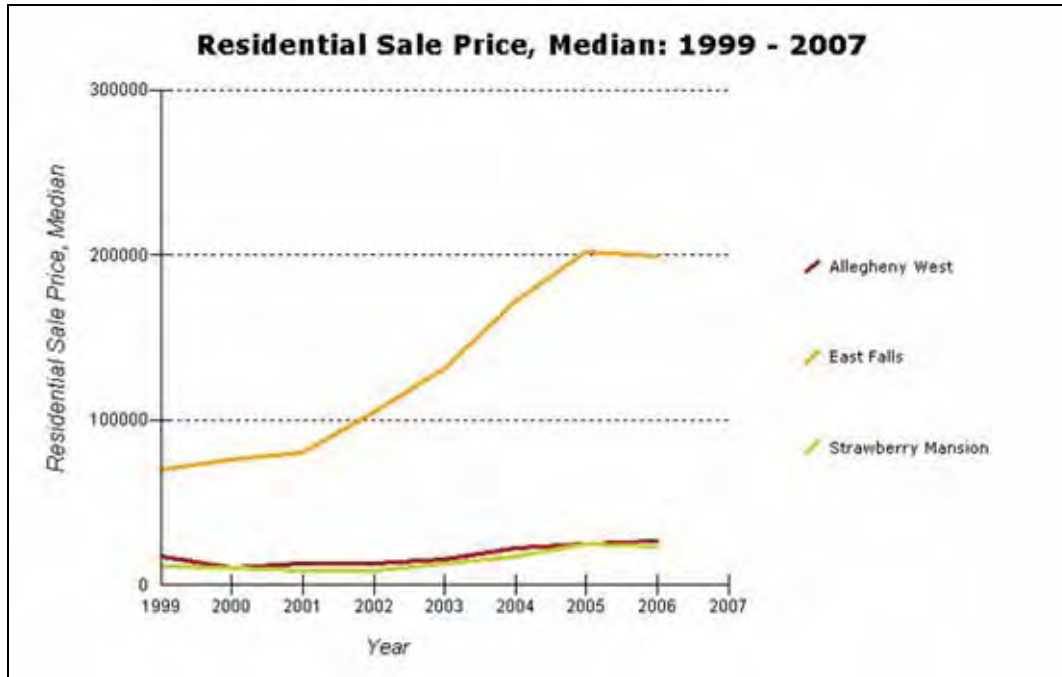


Figure 14 - Median home prices in the neighborhoods adjacent to Laurel Hill Cemetery
(Source: Philadelphia neighborhoodBase: cml.upenn.edu/nbase/)

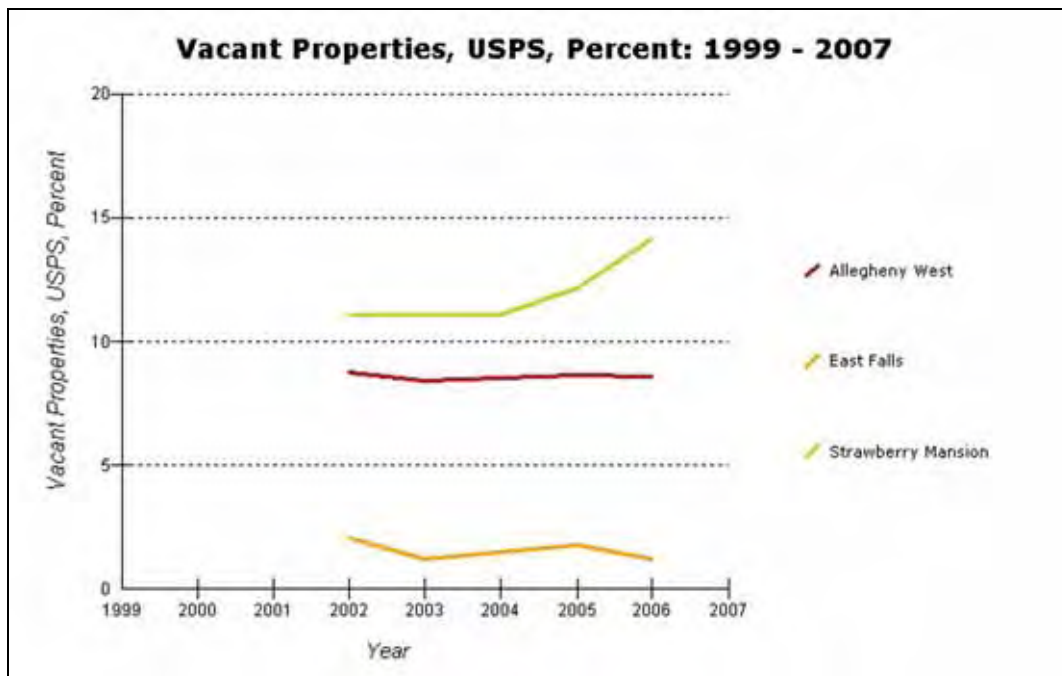


Figure 15 - Rate of property vacancies in the neighborhoods adjacent to Laurel Hill Cemetery
(Source: Philadelphia neighborhoodBase: cml.upenn.edu/nbase/)

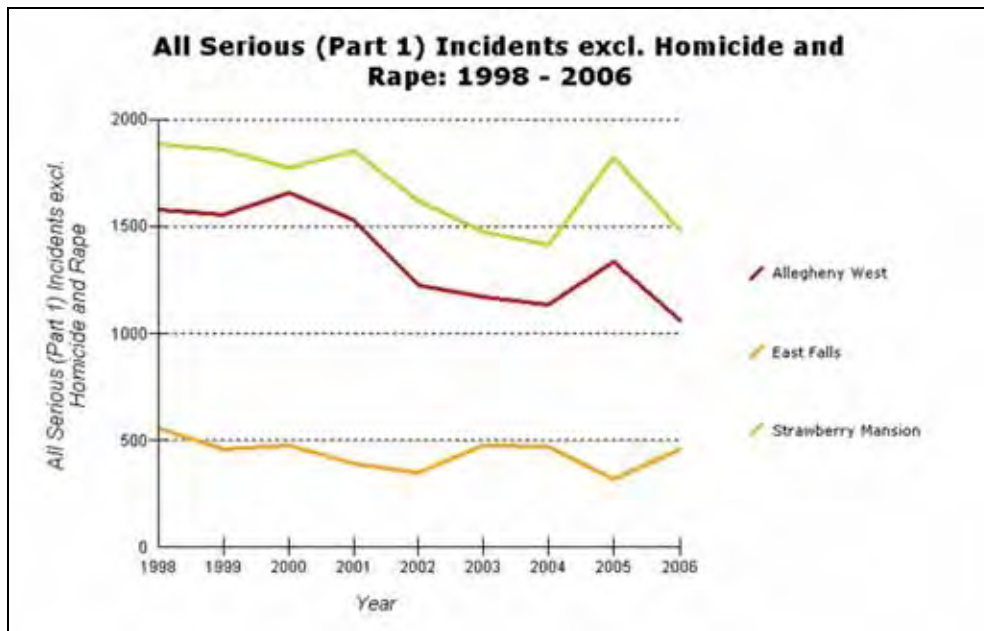


Figure 16 - Rates of serious crime in the neighborhoods adjacent to Laurel Hill Cemetery (Source: Philadelphia crimeBase: cml.upenn.edu/crimebase/)



Figure 17 - Central Laurel Hill (Source: M. Goeke, Fall 2007)



Figure 18 - Laurel Hill Cemetery landscape (Source: T. Aphale, 2007)



Figure 19 - Shape WALKS Contemporary Architecture Tour Page (Source: Shape East website: www.shape-east.org.uk)

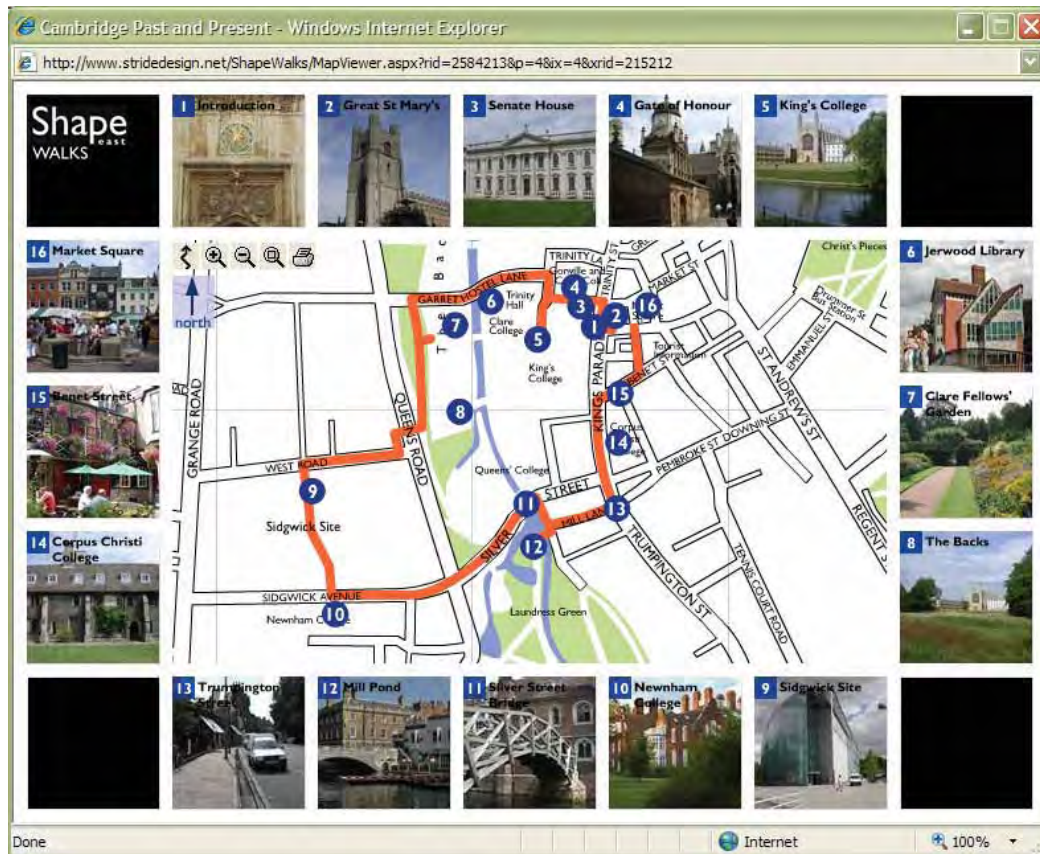


Figure 21 – Shape WALKS Change in the City Tour Map Page (Source: Shape East website: www.shape-east.org.uk)

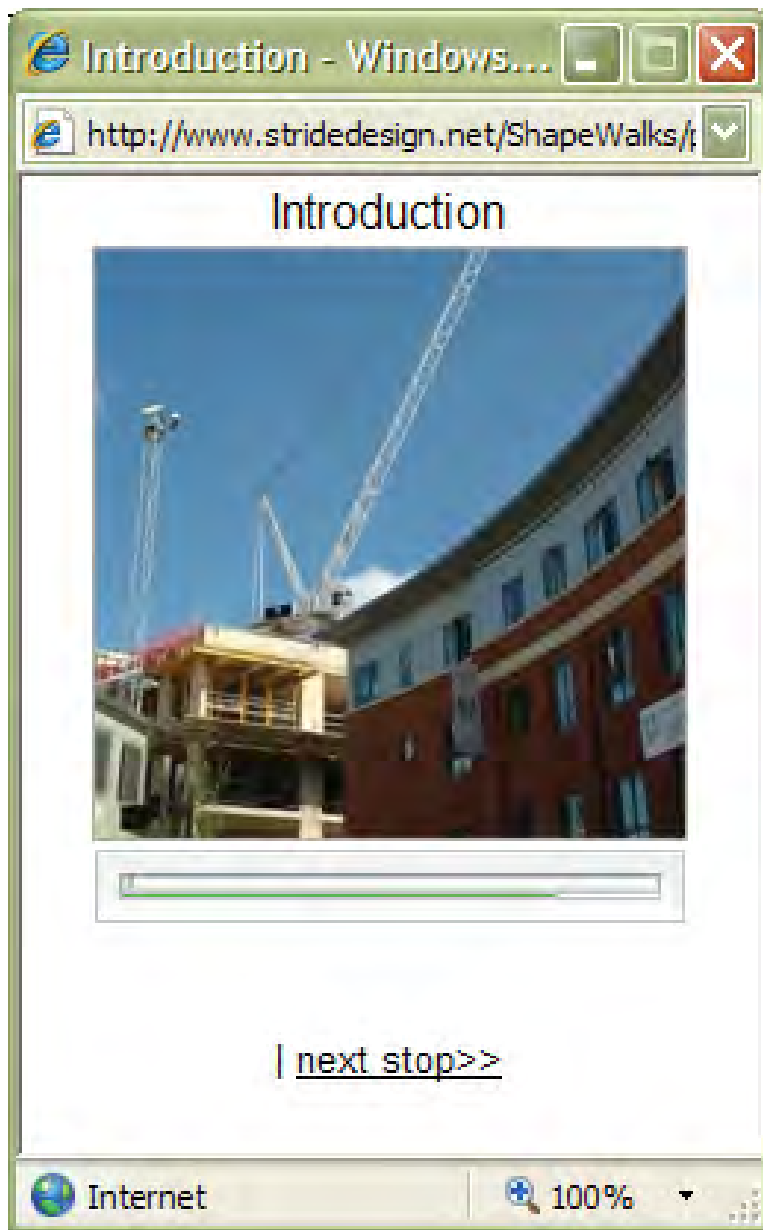


Figure 22 – Shape WALKS Sample Audio Streaming Page (Source: Shape East website: www.shape-east.org.uk)



Figure 23 - Stourhead Gardens - View across the bridge to the Pantheon. (Source: C. Rossetti, June 2007)



Figure 24 - Stourhead Gardens - View across the lake to the Temple of Apollo. (Source: C. Rossetti, June 2007)



Figure 25 - Stourhead Gardens - View of the colorful foliage. (Source: C. Rossetti, June 2007)



Figure 26 - Node Explorer website showing the handheld unit with graphic GPS-guided map. (Source: Node website: www.nodeexplore.com)



Figure 27 - Sample advertisement from LHC's Spring 08 marketing campaign. These simulated outlets are to be placed in public spaces across central Philadelphia. (Source: Laurel Hill Cemetery)



Figure 28 - Sample advertisement from LHC's Spring 08 marketing campaign. Toasters are to be placed in public fountains across central Philadelphia. (Source: Laurel Hill Cemetery)



Figure 29 - Existing web page for Laurel Hill Cemetery's self-guided tours. (Source: Laurel Hill Cemetery website: <http://www.thelaurelhillcemetery.org>)



Figure 30 - Suggested web page design for accessing tour information. Selecting a tour from the list changes the stops indicated on the map above. Stops are color coded by tour type (e.g., civil war, politics, etc). In the overview tour selected above, many types are represented.

115

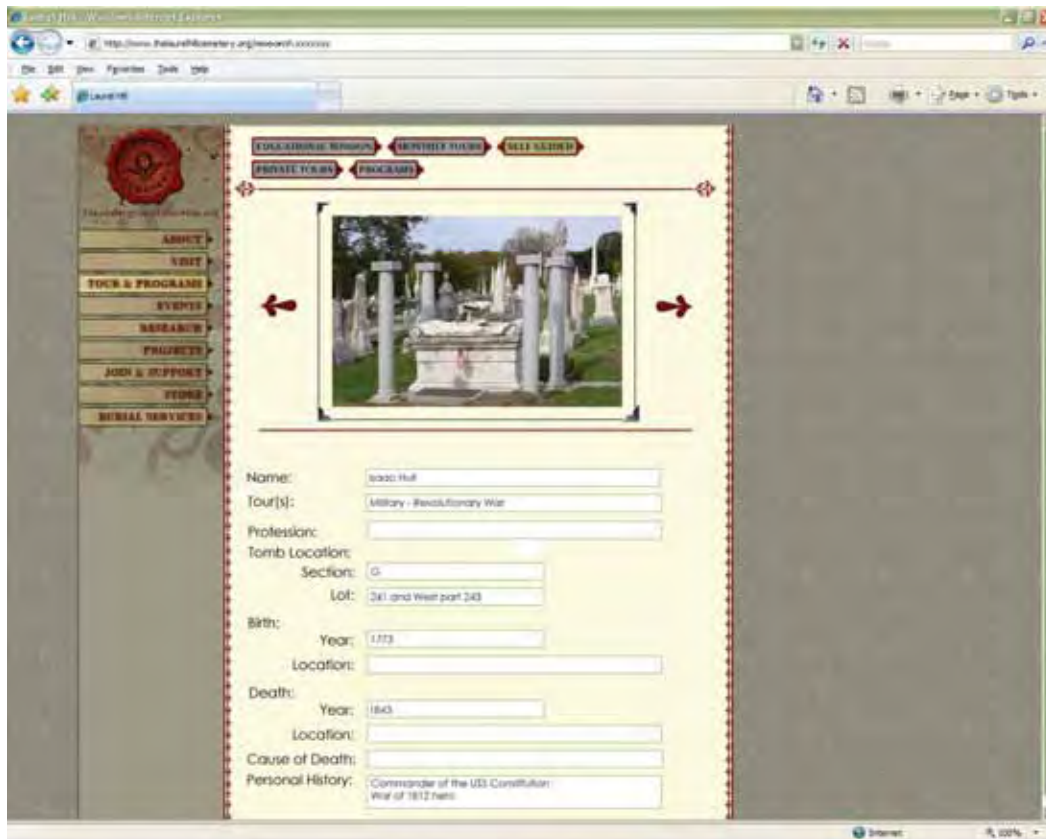


Figure 32 - Suggested web page design for details on a particular tour stop. Following current LHC web site behavior, user would scroll down to see additional information.



Figure 33 - Existing web page for Laurel Hill Cemetery's Research topic. This blank slate is the proposed entry point for access to Laurel Hill's electronic archive. (Source: Laurel Hill Cemetery website: <http://www.thelaurelhillemetery.org>)

The screenshot shows a web browser window with the address bar displaying "http://www.laurelhillcemetery.org/research.cocoon". The page title is "Laurel Hill Cemetery Record Search". On the left side, there is a vertical navigation menu with the following items: ABOUT, VISIT, TOURS & PROGRAMS, EVENTS, RESEARCH, FUNERALS, DONATION & SUPPORT, and BURIAL SERVICES. The main content area has a header with "COLLECTION" and "SEARCH" tabs. Below the header is a photograph of a cemetery path. The search form includes the following fields: Name, Tour(s), Profession, Tomb Location (with a dropdown for Section and a dropdown for Lot), Birth (with a dropdown for Year and a text field for Location), Death (with a dropdown for Year and a text field for Location), and Tomb Type. A "Search" button is located above the form fields.

Figure 34 - Suggested web page design for the main search function. Completing the form with search criteria and clicking search provides any associated results from the database.



Figure 35 - Suggested web page design for a search resulting in multiple records. This page appears when multiple results are returned for a search. In this case, the search was for occupants in the database located in Section G. Selecting a specific result, such as Isaac Hull above brings the user to the information page specific to that record.

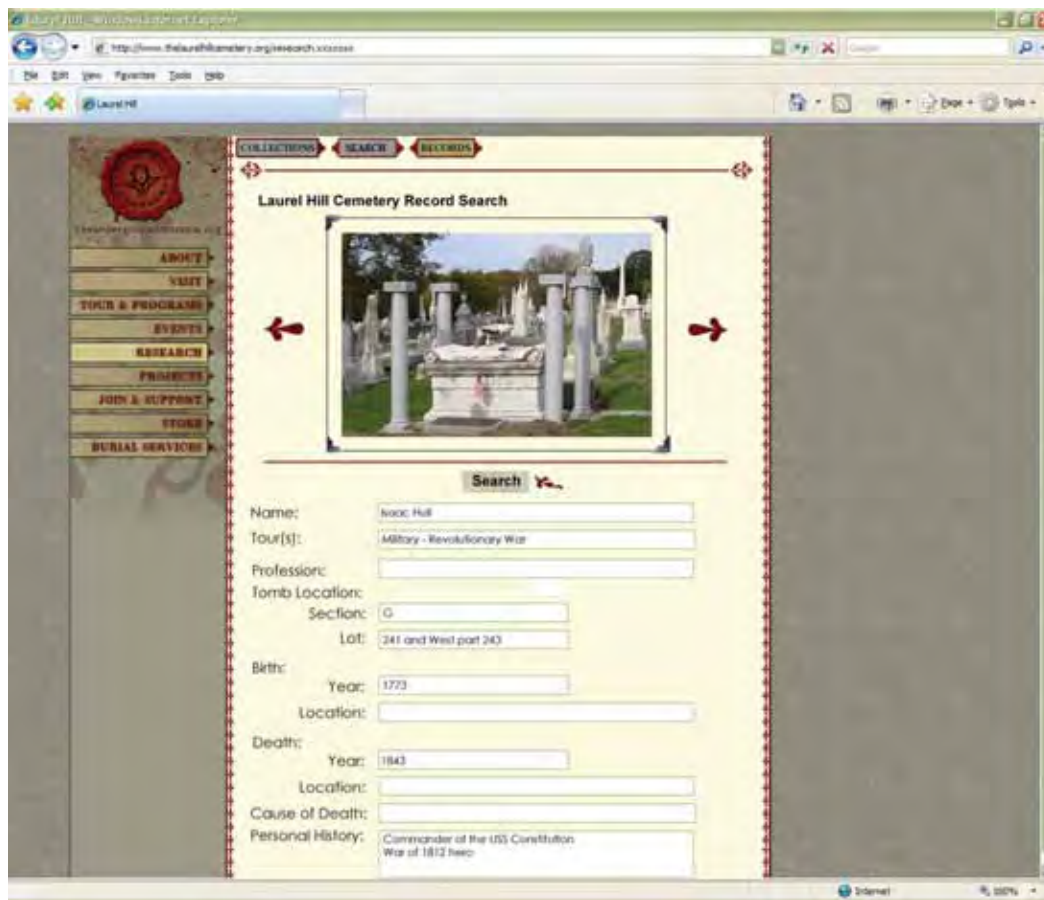


Figure 36 – Suggested web page design for a search resulting in a single record. Following current LHC web site behavior, user would scroll down to see additional information.

Appendix B: Interpretive Goals v. Technological Approach Matrix

In the matrix below, positive and negative aspects of each technology are identified as they relate to the key interpretive goals identified by Laurel Hill. Positive elements are indicated first in each category. For most, challenges or negative aspects follow. For each goal category, a single technology has been identified as the preferred technology to achieve that goal for Laurel Hill based on what is known of that goal and of the other considerations and constraints under which LHC operates.

	Web	Podcast	Cell Phone	Multi-Media
Audience		Best balance of interpretive experience, audience appeal, and financial considerations		
	<input checked="" type="checkbox"/> Requires no special technology on site <input checked="" type="checkbox"/> Can reach a new audience, drawing visitors to the site <input checked="" type="checkbox"/> Graphic map, high quality images, descriptive text of tour stops provides the feel of the site. Facilitates	<input checked="" type="checkbox"/> Ubiquitous technology with a greater appeal than simple map or cell phone <input checked="" type="checkbox"/> Can reach a new audience, drawing visitors to the site <input checked="" type="checkbox"/> Potentially a smaller audience than cell phone	<input checked="" type="checkbox"/> Ubiquitous technology <input checked="" type="checkbox"/> Arguably popular among a wider audience than podcast <input checked="" type="checkbox"/> Provides opportunity for greater interpretive depth than a printed map / narration <input checked="" type="checkbox"/> Similar auditory place-making opportunity to	<input checked="" type="checkbox"/> ‘Wow factor’ - Availability of moving images, graphics, sound effects and context-sensitivity are impressive <input checked="" type="checkbox"/> Conveys a greater sense of the place than other mechanisms <input checked="" type="checkbox"/> Tertiary business

	Web	Podcast	Cell Phone	Multi-Media
	<p>choice of the preferred tour(s)</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Allows users to print out free, customized tour packets prior to arrival <input checked="" type="checkbox"/> For those unaware of the site or unable to print the materials in advance, a kiosk or standalone web-enabled PC / printer might be made available on site <input checked="" type="checkbox"/> Lacks the glitz of multi-media 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Strong following among the young demographic likely attracted to an offbeat destination <input checked="" type="checkbox"/> Graphic map, high quality images, streaming audio provides the feel of the site. Facilitates choice of the preferred tour(s) <input checked="" type="checkbox"/> Allows users to print out free, customized tour map prior to arrival <input checked="" type="checkbox"/> Provides opportunity for greater interpretive depth than a printed map / narration <input checked="" type="checkbox"/> Similar auditory place-making opportunity to the cell phone <input checked="" type="checkbox"/> Lacks the glitz of multi-media 	<p>the podcast</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Technology's appeal is less than for the iPod or other MP3 player <input checked="" type="checkbox"/> Lacks the glitz of multi-media 	<p>paradigm – can be used across multiple historic sites</p>
	Least labor intensive			
Message Ensuring Consistency	<input checked="" type="checkbox"/> Well suited to ensure consistency	<input checked="" type="checkbox"/> Same as for Web	<input checked="" type="checkbox"/> Same as for Web	<input checked="" type="checkbox"/> Same as for Web

APPENDIX B: INTERPRETIVE GOALS V. TECHNOLOGICAL APPROACH MATRIX

	Web	Podcast	Cell Phone	Multi-Media
Key Themes	<input checked="" type="checkbox"/> Obviates the need for volunteer guides to be available at all times <input checked="" type="checkbox"/> Content can be vetted for accuracy in advance of release <input checked="" type="checkbox"/> Reusable components – i.e., narrative for one tour is reusable for other tours making the same stop			
	<input checked="" type="checkbox"/> Content can be carefully drafted after primary research <input checked="" type="checkbox"/> Search for appropriate audio is not required <input checked="" type="checkbox"/> Photos can be taken on site or pulled from archive	<input checked="" type="checkbox"/> Content can be carefully drafted after primary research <input checked="" type="checkbox"/> Photos can be taken on site or pulled from archive <input checked="" type="checkbox"/> Search for appropriate sounds is resource intensive	<input checked="" type="checkbox"/> Content can be carefully drafted after primary research <input checked="" type="checkbox"/> Photos / images are not required <input checked="" type="checkbox"/> Search for appropriate sounds is resource intensive	<input checked="" type="checkbox"/> Content can be carefully drafted after primary research <input checked="" type="checkbox"/> Photos can be taken on site or pulled from archive <input checked="" type="checkbox"/> Search for appropriate sounds is resource intensive. Video / image search is an added burden
	Simplest / least costly to get off the ground & maintain			
	<input checked="" type="checkbox"/> Reusable components <input checked="" type="checkbox"/> Access limited only by	<input checked="" type="checkbox"/> Reusable components <input checked="" type="checkbox"/> Access limited only by	<input checked="" type="checkbox"/> Reusable components <input checked="" type="checkbox"/> Audio files can be used	<input checked="" type="checkbox"/> Reusable components
Resource Constraints				
Scalability				

APPENDIX B: INTERPRETIVE GOALS V. TECHNOLOGICAL APPROACH MATRIX

	Web	Podcast	Cell Phone	Multi-Media
Maintenance	server capacity	server capacity	for Podcasting at a later date	<input checked="" type="checkbox"/> Increased hardware and fees for increased demand
	<input checked="" type="checkbox"/> Moderate complexity process to add new stops / tours once a web template is defined <input checked="" type="checkbox"/> Requires content preparation, photography, mapmaking and web posting <input checked="" type="checkbox"/> Can be progressed without purchase of technical equipment, assuming the site already has a website available. <input checked="" type="checkbox"/> For an historic site already maintaining a website, ongoing costs may be minimized <input checked="" type="checkbox"/> Less costly and less time-consuming to	<input checked="" type="checkbox"/> Requires content preparation, consistency of narrator, re-recording the narration, mixing the audio, preparing the downloadable files, mapmaking, and web posting <input checked="" type="checkbox"/> Can be progressed without purchase of technical equipment, assuming the site already has a website available. <input checked="" type="checkbox"/> For an historic site already maintaining a website, ongoing costs may be minimized	<input checked="" type="checkbox"/> Increased fees for increased demand <input checked="" type="checkbox"/> Moderate complexity process to add new stops / tours <input checked="" type="checkbox"/> Requires content preparation, consistency of narrator, re-recording the narration, mapmaking and preparing / posting the audio files <input checked="" type="checkbox"/> Can be progressed without purchase of technical equipment <input checked="" type="checkbox"/> Comparatively simple for site staff to update	<input checked="" type="checkbox"/> Requires content preparation, photography, mapmaking, specifying new GPS coordinates, consistency of narrator, audio / video recording, mixing the audio, multi-media production, distribution to the handheld devices <input checked="" type="checkbox"/> High complexity process to add new stops / tours <input checked="" type="checkbox"/> Requires purchase of technical equipment <input checked="" type="checkbox"/> Lengthy, resource-intensive process likely to be beyond the reach of a non-profit organization <input checked="" type="checkbox"/> Professional assistance required to create /
		<input checked="" type="checkbox"/> Moderate-High complexity process to add new stops		

APPENDIX B: INTERPRETIVE GOALS V. TECHNOLOGICAL APPROACH MATRIX

	Web	Podcast	Cell Phone	Multi-Media
Navigation	<p>produce than podcast</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Development software required, if maintaining in-house <input checked="" type="checkbox"/> Annual costs incurred in hosting and maintaining a web site <input checked="" type="checkbox"/> Costs have proved beyond the reach of non-profit organizations to date <input checked="" type="checkbox"/> Knowledgeable staff or professional assistance required to update 	<p>/ tours once a web template is defined</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Annual costs incurred in hosting and maintaining the web site <input checked="" type="checkbox"/> Costs have proved beyond the reach of non-profit organizations to date <input checked="" type="checkbox"/> Cost of Podcasts as delivered in Cambridge / Ware examples is double the web-based tour, taking nearly a third longer to produce <input checked="" type="checkbox"/> Professional assistance required to update 		updated content
		Best use of maps, images, and audio to aid way finding, given financial considerations		
	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Detailed printable maps with photos allow visitors to vary their path to accommodate interests and amount of time on site <input checked="" type="checkbox"/> Not location aware 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Detailed printable maps with photos allow visitors to vary their path to accommodate interests and amount of time on site <input checked="" type="checkbox"/> Moving about while 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Lacks integrated map, though map could be provided on entry to the site <input checked="" type="checkbox"/> Detailed printable maps would allow visitors to vary their path to accommodate interests and amount of time on 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> GPS-based device instantly triggers media when in range of each tour stop.

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	Web	Podcast	Cell Phone	Multi-Media
Availability and Usability		wearing headphones can be dangerous <input checked="" type="checkbox"/> Not location aware - Requires user to trigger audio	site <input checked="" type="checkbox"/> Not location aware - Requires user to trigger audio	
		Best combination of availability and user-friendliness		
	<input checked="" type="checkbox"/> Can be user-friendly <input checked="" type="checkbox"/> Provides a rich interactive experience <input checked="" type="checkbox"/> Allows for high-resolution graphic maps / images <input checked="" type="checkbox"/> Available outside the site's normal operating hours <input checked="" type="checkbox"/> Assumes some element of preplanning – Visitors must plan their visit in advance	<input checked="" type="checkbox"/> User-friendly <input checked="" type="checkbox"/> Available outside the site's normal operating hours <input checked="" type="checkbox"/> Difficult to share <input checked="" type="checkbox"/> Assumes some element of preplanning on the part of the visitor – Visitors must plan their visit in advance	<input checked="" type="checkbox"/> Usability not as seamless as podcast - Need to redial at each location <input checked="" type="checkbox"/> Unavailable outside the site's normal operating hours unless the phone numbers are published	<input checked="" type="checkbox"/> User-friendly <input checked="" type="checkbox"/> Difficult to share <input checked="" type="checkbox"/> Unavailable outside the site's normal operating hours
Suitability Summary				
	<input checked="" type="checkbox"/> Appropriate entry-level technology where	<input checked="" type="checkbox"/> Appropriate when funding is only a	<input checked="" type="checkbox"/> Appropriate entry-level technology where cost	<input checked="" type="checkbox"/> Best applied to venues where the message is

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	Web	Podcast	Cell Phone	Multi-Media
	availability is important, cost is a factor and skilled resources are available for maintenance	moderate concern and when availability and technology of delivery is important	is a factor	solid and the commitment to upkeep, distribution, marketing is strong

Index

A

Abowd, Gregory · 15
Albertini, Adriano · 19, 21
Allegheny West · 7, 8
Angliss, Sarah · 22
ArcGIS · 74, 76
ARCHEOGUIDE · 28
Asheim, David · 40, 44
Aslan, Ilhan · 16

B

Backseat Playground · 26
Bamberger, Yael · 24, 25
Bellotti, Francesco · 23, 26
Brammar, Tom · 48, 50

C

Cell phone tours · 42
Cheverst, Keith · 20, 22
ChiKho EU project · 26
Chou, Li-Der · 23
CRUMPET · 17
Curran, Kevin · 17

D

Davies, Nigel · 16, 20, 21
Deep Map · 28
Dunstall, Simon · 17

E

East Falls · 7, 8, 9, 95, 99
Education and Outreach Committee · 42, 52, 53, 82
Edutainment · 11, 26
Edwards, Simon · 18, 22
Explorer · 46, 47, 48, 49, 56, 111

F

Fairmount Park · 56, 96
Fleck, Margaret · 16, 22

Fopp, Michael · 14, 15
Fujii, Satori · 16

G

GEIST · 28
GIS · 1, 27, 29, 36, 77
Google Maps · 76
GPS · 22, 26, 27, 29, 46, 47, 63, 64, 79, 111, 125, 126
GUIDE · 20, 21, 28
Guide By Cell, Inc. · 40, 44
Gustafsson, Anton · 26

H

Hadžic, Olga · 14
Harleigh · 5
Hermann, Fabian · 17, 22
Hinton, Morna · 25

I

Ieong, Ao · 22
iJADE FreeWalker · 18
IMAGE project · 18
Interpretive clusters · 43, 53, 54, 58

J

Johnston, David · 24

K

Kesner, Ladislav · 12
Kim, Jong-Woo · 22
Kotohiragu Navigator · 27
Kretschmer, Ursula · 28

L

Lam, Toby · 18
Laurel Hill
 Central · 6, 8, 98, 102
 North · 5, 6
 South · 5, 6, 8, 98

Lee, Raymond · 18
Location-based media · 46, 48, 49, 50
Lord, Beth · 11

M

Malaka, Rainer · 28
Manes, Gianfranco · 20
Martin, David · 15
McPherson, Gayle · 13
Musex · 27

N

Nash, Christopher · 12, 13
Neff, James · 6
Node · 46, 47, 48, 49, 50, 51, 56, 111
Notman, John · 5, 6

O

Open source · 74, 75
Opperman, Reinhard · 17
Oracle · 74

P

PDA · 22, 23, 27, 30, 46
Pepper Estate · 6
Podcast tours · 37
Poslad, Stefan · 17, 18, 26, 29
PostGIS · 75
PostgreSQL · 74, 75, 76, 80
Proctor, Nancy · 13, 22

R

Rawle, William · 5
Rennie, Leonie · 24
Ruffle, Simon · 34, 35, 40
Rural Cemetery Movement · 1, 4, 5

S

Schmidt-Belz, Barbara · 17, 22
Shape WALKS · 19, 31, 32, 34, 38, 105, 106, 107
Sidney, James · 6
Sims, Joseph · 4
Smith, John Jay · 5, 6
Smith, Keith · 17
Specht, Marcus · 17
SQL Server · 74, 75
Stoever Tract · 6
Stourhead · 46, 48, 108, 109, 110
Strawberry Mansion · 7, 9
Stride Design · 34, 35, 37, 40, 51, 61, 64

T

Tarumi, Hiroyuki · 27
The National Trust · 46
Thomson, Charles · 5
Tilden, Freeman · 17, 24, 25

U

Umlauft, Martina · 23

V

Virtual Earth · 74, 76
Vlahakis, Vassilios · 28

W

Ware Audiowalks · 38
Web-based tours · 31

Y

Yatani, Koji · 27

Z

Zipf, Alexander · 28