

KTC-02-02/FR79-96-1F

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THE PARIS TO LEXINGTON ROAD
RECONSTRUCTION PROJECT



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KTC-02-02/FR79-96-1F

THE PARIS TO LEXINGTON ROAD RECONSTRUCTION PROJECT

by

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In cooperation with the Kentucky Transportation Cabinet

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16. Abstract This report summarizes the efforts to provide the Kentucky Transportation Cabinet with an evaluation of the results obtained for the Paris to Lexington Road Reconstruction Project from 1997 to 2001. A unique pre-qualification process was used for the project to select a fixed pool of contractors to provide input to the design and to bid on the work. The research started in 1996 during the design process and continued following construction until September of 2001. Input was received from the Cabinet personnel working on the project, from the design firms, from the contractors, from the property owners involved, and from the citizen's advisory committee overseeing the project. This was an environmentally sensitive project requiring special design and construction practices to meet the project objectives. An evaluation was done on 15 key project attributes and the project cost. Although more expensive than traditional highway projects, the project was very successful. It is an example of how a highway department can successfully partner with the other stakeholders in a historic and environmentally sensitive project. Several observations and conclusions are included in the report.					
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January 10, 2002

Mr. Jose M. Sepulveda
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Subject: Paris to Lexington Road Reconstruction Project
Federal Aid Research Task No. 79
Report: KTC-02-02/FR79-96-1F

Dear Mr. Sepulveda:

The primary goal of this study was to provide the Kentucky Transportation Cabinet with an evaluation of the results accomplished on the Paris to Lexington Road reconstruction project as compared to traditional highway construction projects. This was accomplished by working closely with the designers and contractors on the project, plus interviews with the landowners and the Citizens Advisory Committee for the project.

The project has been a very successful partnership between the Cabinet, the public, the contractors and all the agencies involved. The report reviews the many activities involved in carrying out this highly sensitive and environmentally challenging project. Several observations and conclusions are made in the report.

Sincerely,

J. M. Yowell, P.E.
State Highway Engineer

JMY/DEH/lw

c: Paul Toussaint
John Carr
Amos Hubbard
Dexter Newman



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1.0 INTRODUCTION

In 1995, the Kentucky Transportation Cabinet (KyTC) set out to develop appropriate evaluation criteria for pre-qualifying highway construction contractors for participation in the Paris-Lexington Road Project, a particularly environmentally sensitive project. After contacting other state highway departments and the Federal Highway Administration Office in Kentucky, pre-qualification evaluation criteria with a weight factor system were developed. The project was approved as an experimental project by the FHWA and the Cabinet was allowed to restrict bidders for the project to those meeting an especially defined criteria for this project.

The Kentucky Department of Highways (DOH) used this evaluation system to pre-qualify and select five Kentucky highway contractors. The DOH invited the five contractors to participate in an advisory capacity on constructibility issues for the Paris-Lexington Road Project. All accepted and were happy to participate.

In 1996, researchers at the Kentucky Transportation Center at the University of Kentucky were asked to follow the Paris-Lexington Road Project and evaluate the final results (environmental, cost, quality, etc.) achieved on this project compared to the typical results achieved for highway construction projects performed under traditional design-bid-build contracting methods. It was anticipated that the innovative approaches used in contracting for this project would yield significant improvements in constructing a project in an environmentally sensitive manner.

Although the Paris-Lexington Road Project has not been totally completed, several interesting observations have been noted and are worthy of mention. This report will address these points and compare the performance results on the project with those on traditional KyTC construction projects.

Historical Perspective

To understand the difficulties that have been experienced on the project an understanding of the historical perspectives and environmental sensitivities is important. The typical highway construction project procedures and methods were deemed inappropriate. Something different was required to move the project forward.

Paris Pike, the term "Pike" is used for "Road" as it has been used from early days in Kentucky, is the twelve-plus-mile portion of US27/58 that connects Paris and Lexington, Kentucky. Paris Pike passes through the Bluegrass Region of Central Kentucky including the prosperous thoroughbred industry situated on picturesque horse farms that dot the countryside. Some horse farms are situated directly on Paris Pike.

Paris Pike is designated as an historic scenic corridor marking an early Kentucky trail that connected Maysville, Kentucky on the Ohio River to Lexington, Kentucky. Native Americans first used this route to follow herds of grazing buffalo. Later this route was used by early settlers of central Kentucky traveling to and from a steady fresh water supply at McConnel Springs that can be attributed to be the focal point for the early settlement of central Kentucky. With the westward expansion, Paris Pike was one of the very first roads built west of the Allegheny Mountains.

In modern times as traffic volumes increased, Paris Pike gained a very unflattering reputation for safety and traffic problems. It was much worse than what was being experienced on other similar type urban highways in the Commonwealth of Kentucky. When measured in 1991, the traffic volumes experienced on Paris Pike exceeded the reasonable service capacity at a rate ten times higher than the state's average. Although the accident rate experienced was approximately the same as other 2-lane rural roadways, the fatality rate experienced in these

accidents was more than twice as high as others. Specific contributing factors for the Paris Pike problems were identified. The specific contributing factors are narrow lane width, lack of paved shoulders, lack of clear zones, steep ditches and slopes, insufficient passing sight distance, fixed roadside objects, and scenic distractions.

It was apparent to the Kentucky Transportation Cabinet (KyTC) that it had to do something to improve the safety and traffic operations of Paris Pike.

2.0 RESEARCH OBJECTIVES

The primary purpose of this research study was to study the results achieved on the Paris Pike project and compare them to results attained on construction projects performed under the traditional design-bid-build contracting method. Of major interest was the special contract experiment of using a prequalified group of contractors for constructibility input to an environmentally sensitive project and to allow only these contractors to bid on the construction work. The following objectives were identified for the research:

1. Collect and analyze performance data for key project attributes on the Paris Pike Project
2. Compare the outcomes of Paris Pike Project with results attained on typical KyTC construction projects

3.0 PROJECT TIMELINE

The KyTC had treated the Paris Pike reconstruction as they would any other project. They quickly found their standard procedures inadequate for this historic and environmentally sensitive project. The historic scenic designation and the extremely influential property owners required the KyTC to develop special project handling. A project timeline sheds light on the difficulty that the KyTC faced.

- In 1966, the KyTC initiated a planning study to see what could be done to improve safety and traffic operations and this resulted in the authorization of the roadway re-construction design project on March 19, 1970.
- In 1973, the KYTC submitted the Environmental Impact Statement and the Project Report to the Federal Highway Administration (FHWA). They both received FHWA approval on June 18, 1973.
- Although the project had received FHWA approval, serious public concerns remained. The KyTC held a public hearing on August 25, 1975.
- These public concerns persisted. The KyTC commissioned a Special Historic Study in December of 1975 and a Design Study in June of 1976 to address these concerns. Both studies were completed and received a KyTC review by the end of 1976. Thinking that all was now well and under control, the KyTC Cabinet reinitiated right-of-way acquisition in February 1977.
- In April of 1978, the well-intentioned public turns to well-connected citizen protest and litigation with the filing of a civil suit in Federal District Court. On September 7, 1977, the Federal District Court ruled and issued an injunction halting progress on the project even before the right-of-way acquisition can be completed.
- Without being able to make progress, the KyTC had to cancel the project on May 12, 1980.
- Not much was accomplished for a period of six years when the KyTC held a public hearing in Paris, Kentucky on March 18, 1986. Public interest in safety improvements seemed to rekindle. In June, the KyTC restated its design study efforts. Between July and November, the KyTC met with as many public representatives as possible. Included: the Land and Nature Trust of the Bluegrass, Citizens for Four-Laning Paris Pike, property owners,

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Bluegrass Area Development District, the Planning Section of Lexington-Fayette County Urban County Government, Board of Directors of the Lexington Country Club, UK Cultural Assessment Team, and the Paris Taskforce.

- By October 1986, the KyTC traffic and accident studies were completed, the Traffic Study Technical Memorandum was prepared, and was submitted in December 1986.
- The KyTC coordinated the project with the U. S. Department of Agriculture (USDA) in January 1987, and the Traffic Study Memorandum received approval on February 3, 1987. The Alternate Corridor Study was completed and received approval on March 24, 1987 and the Environmental Impact Study draft was started in earnest.
- Building consensus, the KyTC spent the next twelve months sharing all of the information they had collected with representatives of the concerned public and special interest groups.
- On August 31, 1988 the KyTC submitted the Supplemental Environmental Impact Statement to the FHWA for approval. With the circulation for review and comment process underway, the FHWA set up an Advisory Taskforce to become part of the approval process.
- In May of 1991, the FHWA executed Section 106 of a Memorandum of Agreement and approved the FSEIS and 4(f) Statement.

After these many years of discussion, study, and consideration, a consensus agreement was finally reached to reconstruct the Paris Pike into four lanes. The rationale for the agreement was the need to improve safety, the critical location of the project, and the concept of sensitivity in design, and the assurances of social and environmental commitments with the proposed reconstruction. The KyTC, the State Historic Preservation Officer, and all other governmental agencies affected signed a Memorandum of Agreement for the preservation and damage mitigation of scenic and historic resources.

- The FHWA endorsed and approved the SEIS and the 4(f) and the MOA in a Record of Decision on October 10, 1991. On September 16, 1993, the fourteen year-old court injunction prohibiting work on the project was lifted, allowing the Paris-Lexington Road Project to proceed under the direction and control of the Paris-Lexington Road Project Advisory Task Force. The Advisory Task Force is composed of citizen community leaders and representatives of the local governmental and political units. The key agreements reached that permitted this to happen were the special considerations to minimize impacts to historical and scenic resources, and commitments for environmental protection.

Table 1. Paris-Lexington Road Advisory Task Force

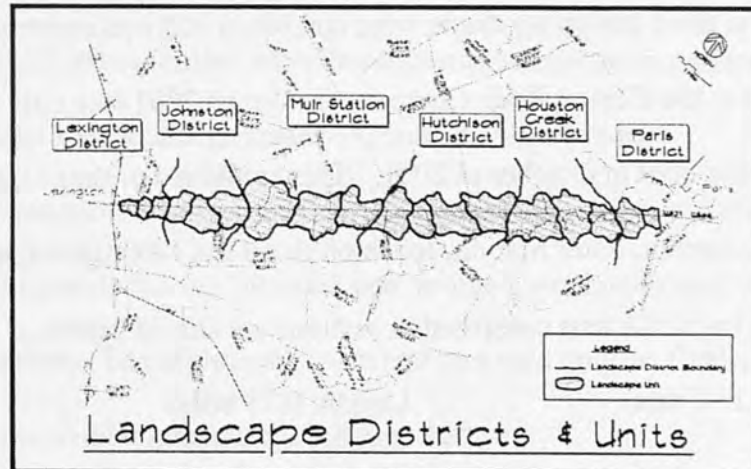
Charles Raymer, Co-Chair	Kentucky Transportation Cabinet
Paul Doss, Co-Chair	Federal Highway Administration
David Morgan, Johnston Road	State Historic Preservation Officer
Harold Tate, Lexington	Lexington-Fayette Urban County Government
Henry Alexander, Johnston Road & Muir Station	Land and Nature Trust of the Bluegrass
Steve Albert, Lexington	The Bluegrass Trust for Historic Preservation
Marie Copeland, Muir Station	Lexington Directions
Jim Alexander, Houston Creek & Hutchinson	Bourbon County Magistrate
Douglas Castle, Paris	Citizen Representative
John L. Carman, Hutchinson	Professional Landscape Architect
David Blythe, Muir Station	Professional Civil Engineer

The challenge of the project design and construction professionals was to live up to the high standards established in the agreement that were so dearly negotiated by the stakeholders: the KyTC, the FHWA, the consultants, the design professionals and the well-intentioned public, as well as, the influential property owners that are directly affected.

The citizen Advisory Task Force also presents special challenges to project management not normally seen on a typical highway construction project. Since the Advisory Task Force has responsibility for project decisions, the KyTC has to rely upon effective presentations, discussions, and persuasion to navigate through the administration of the project and coordination of the designers and contractors.

The project design was organized into a framework of landscape districts (see Figure 1) to ensure a truly exceptional design that is sensitive to the corridor's aesthetic, cultural, and environmental features. The bid letting and contract award process follows this design framework format, with design segments being combined where practical to provide the advantage of economy-to-scale and more efficient construction operations. It also streamlines the pre-construction process.

Figure 1. Paris-Lexington Road Landscape Districts



- In 1995, the KDOH used the unique Pre-Qualification Evaluation Criterion developed by the KyTC and the FHWA (see Table 1) to select prominent Kentucky highway contractors to participate in the constructibility review process for this highly visible road-building project. They were invited to join with the existing stakeholder partners in the project and bring to the

table their construction experience and expertise to help the KyTC and the design team with the project. With regular attendance and participation in the constructibility review meetings, the pre-qualified contractors were then exclusively invited to submit bids for the work as the design packages were completed and let for construction.

- By December of 1996, the first design segment, the Paris Landscape District was complete, the right-of-way obtained, the construction package was prepared for bid/letting, one bid was received and evaluated, and the first construction contract was awarded to Hinkle Contracting Corporation. The next two construction contracts were also awarded to Hinkle Contracting Corporation, again the only bidder. The design segments that were included in these contracts are: the Paris, the Houston Creek, and the Hutchinson Landscape Districts. At present, construction for the Paris and the Houston Creek design segments are completed and construction for the Hutchinson design segment is nearing completion.
- The final three design segments were combined into one construction contract and was awarded to the Central Rock Company in August 2001 (the only bidder) with construction expected to start in October of 2001. This combined package included the original three design segments, Muir Station, Johnston Road and Lexington Landscape districts.
- Summaries of the four construction sections are shown below.

Section 1 – Paris:

Length: 0.75 miles
Letting: 12-13-1996
Work Start: 04-17-1997
Work Complete: 08-03-2000
Contractor: Hinkle Contracting
Amount: \$4,541,554.93

Section 2 – Houston Creek

Length: 3.2 miles
Letting: 12-18-1998
Work Start: 02-18-1999
Work Complete: 05-14-2001
Contractor: Hinkle Contracting

Amount: \$13,988,659.26

Section 3 – Hutchinson

Length: 4.1 miles

Letting: 03-31-2000

Work Start: 05-22-2000

Work Complete: Still under construction

Contractor: Hinkle Contracting

Amount: \$17,495,523.39

Section 4 – Fayette County

Length: 5.6 miles

Letting: Aug, 24, 2001

Work Start: October 1, 2001

Expected Completion: Fall 2003

Contractor: Central Rock

Amount: \$33,899,753.36

Total Cost for Project: \$ 69, 925,490

4.0 PROJECT SENSITIVITIES

The contractors working on this project have been faced with a set of unique design and construction sensitivity issues, unlike any other highway construction project that the Cabinet has built. Some of the special design issues to contend with include:

1. The cut/fill was minimized to match original ground contours and the lay of the land. The original topsoil, *Marnie* silt loam was stripped, stockpiled and returned to the original thickness. The *Marnie* silt loam can be found only on Central Kentucky horse farms and is unavailable to purchase at any cost.
2. The roadway was aligned to miss historical properties and structures. One such type of structure was the historic mortar-less stone walls that line a portion of Paris Pike. If the stone walls could not be saved, they were dismantled and reconstructed. Another challenge was the historic signature entrances to the horse farms. If they could not be missed, new entrances were built to match the original entrances at the KyTC's expense.

3. The project included restoration of the Wright House, a house on the Historic Registry to be the local interpretive center.
4. Steel-backed timber guardrail was used for aesthetics.
5. Stone facade matching indigenous stone outcrops was applied to concrete bridge structures.
6. Extensive landscaping with local indigenous plant species (trees, shrubs, grasses) was included. The roadway alignment was adjusted to miss specific trees. Medians were located to keep the best quality of healthy trees undisturbed. Extensive tree protection was maintained to prevent root zone damage for the mature trees. Utility easement modifications were coordinated to lessen impact on trees. An endangered species, *running buffalo clover*, was transplanted to a fence-protected easement purchased by the KyTC solely for this purpose.
7. Grass shoulders along the roadway to maintain a natural scenic atmosphere and historic aesthetics were required.
8. Water channel changes were combined to minimize and control erosion. A scupper slab erosion control technique was used at the Paris bridge location.
9. Archeological site investigations were performed at *Monteray*, the first free-black community in Kentucky. Guided tours were held for the public at the archeological site and the recovered artifacts were exhibited at public and private schools. Archeological site investigations also were performed at *McConnel Springs*, the first community of Central Kentucky.

5.0 KEY PROJECT ATTRIBUTES RESULTS

The information presented here was obtained from contacts with the project participants having pertinent involvement and/or financial interest in this particular project. Specific input was solicited directly from the key KyTC project personnel, the resident engineers, the project manager and the district engineer, via several interviews at different stages of the project.

The successful contractor was interviewed shortly after the initial construction contract award and on several other occasions. The contractor's field and project office personnel, and company management were interviewed. The field coordination and progress meetings were observed to gain an indication of the degree of cooperation between the KyTC, the contractor, subcontractors, utility companies, and the designer's field representative. In particular, coordination of sub-contractors' work, reporting of progress, identification and resolution of field problems, planning and scheduling of detailed fieldwork activities, coordination with independent utility work, and oversight and coordination with the KyTC was identified as indicators for this cooperation. The pre-qualified contractors that were the unsuccessful bidders were also interviewed to get some idea of their perspective on the bidding process.

The design consultants were observed at the design presentation meetings, bid lettings, meetings with KyTC and the Advisory Taskforce. The property owners and the public at-large were observed at their information meetings that the KyTC held. Specific anecdotal experiences and humorous stories were also freely offered. The Advisory Taskforce was observed at its committee meetings. Also direct contacts were made to get input on specific issues.

The findings expressed here are drawn from the project meetings, after-the-meeting discussions, formal and informal interviews, surveys of the pertinent stakeholders, and other forms of project events and communications that were available during the study. These findings are presented in the

framework of the Key Project Attributes that were delineated in the initial research objectives statement.

Table 2. Paris-Lexington Road Project Key Attributes

Environmental Sensitivity of Construction Processes	Dispute Resolution History
Safety Performance	Specification Adherence
Workmanship	Specification Compliance
Cooperation/Teamwork	Partnering Efforts
Constructibility Impact	Project Quality Achieved
QA/QC Procedures Used	Experience with the Public
Prequalification Success	Bonding Company Evaluation
Change Order History	Attitudes of Landowners

These Key Attributes will give some insight into what the Paris-Lexington Road Project performance results are to date and how these results may differ from other typical highway reconstruction projects of similar size, construction, topography, and difficulty.

5.01 Environmental Sensitivity of Completed Construction

The major emphasis of the project was the environmental sensitivity of the construction processes to be used on the project. It was made very clear from the outset of the project that great care was to be taken to adhere to the strict requirements of the project and that the work was to be done by hand instead of heavy equipment if needed to protect the environment. The contractor and subcontractors on the first three segments of the project have done an excellent job of making this requirement highly visible to their workers and the work to date has been done with great care and success.

5.02 Safety Performance

Safety has been given top priority by management of the KyTC, the contractors and the subcontractors to prevent construction personnel accidents on the Paris-Lexington Road Project. The safety performance on this project has been admirable with zero lost time accidents to date.

- The project partners were strongly committed to safety as was identified in the Project Mission Statement and Charter. Safety was also a major agenda item for project partnering meetings although no action was usually required.
- The general contractor implemented the company's standard safety program that did satisfy the scrutiny of the pre-qualification evaluation process.
- The general contractor used his best and most experienced field personnel on this project.
- The contractor also decided to use his newest and best equipment on this project.

Although, serious traffic accidents, even fatalities, have continued to occur on Paris Pike, only a very few minor traffic mishaps have occurred in the construction-affected zones.

- As they have committed to the safety of their own personnel, the project partners also committed to the safety of the traveling public in the Project Mission Statement and Charter.
- The general contractor was committed to maintaining the traffic control devices and safeguards to assist the traveling public through the construction limits of the project.
- The project partners have been very careful in the planning and implementation for traffic control, diversions, and lane changes. The specifics details of what, how, and when changes are to be done are communicated to the public through static and electronic billboard signage, public service announcements, and through a KyTC web page.

- The majority of the traveling public were local inhabitants, using Paris Pike in their daily commute or their local travel. They are probably more attentive to work progress and the road conditions, which reduced the impact of the construction activities.

5.03 Workmanship

The Paris-Lexington Road project has received statewide and national visibility and acclaim from the political arena, influential public citizens and the highway construction industry.

- The project partners were committed to quality workmanship as was identified in the Project Mission Statement and Charter.
- The general contractor elected to use a more experienced project management team and workforce, along with new, or better equipment that also results in better workmanship.
- The individual workers, having been hand-picked and with more experience, have taken better care to produce high-quality workmanship.
- The project has been very well organized and in tune for the field operations. It has also been kept cleaner than most normal road-building projects, an atmosphere that may encourage the pursuit of better workmanship.

5.04 Cooperation, Teamwork and Partnering

The Paris-Lexington Road Project is a stellar example of partnering resulting in cooperation and teamwork of the project partners. With the difficult history of the project, the KyTC desired a strong partnering relationship to achieve the dedication and commitment needed of all involved to bring this project to fruition. Teambuilding techniques were used in the early design phases of the project. The decision was made to emphasize partnering throughout all phases of the project. Evidence of the success of the cooperation and teamwork can be recognized in that each of the project partners

claimed ownership of the Paris-Lexington Road Project, regardless of how big or little their contribution. The results of the partnering process have been excellent; some of the key elements were:

- The Paris-Lexington Road Project had the requirement of a formal partnering process at the start of every contract with all stakeholders participating: the KyTC, the contractor, the subcontractors, the suppliers, the utilities, the designers, etc.
- All project partners made a commitment to the project and to each other in the Project Mission Statement and Charter. Constant reference to the mission statement has occurred throughout the project phases. As example, use of the lowest possible level which effectively resolves a question or problem, and in a timely manner, has been standard practice.
- The subcontractors and suppliers, not having done this before, were not initially in tune with partnering, but became included in the project partnering culture as the project progressed.
- All project partners were required to attend a formal partnering meeting at the jobsite every two weeks. The agenda follows an established format to cover progress and planning for the entire project. Having the partners attendance provided for a regular set-aside-time for other before-and after-the-meeting interactions to address other detailed project issues.
- The project partners assigned tasks of project team members, referred to as "taskings", to be accomplished, researched, resolved, or other appropriate action, and to be reported back by the project partners at the next meeting
- Partnering contributed to the positive differences in the atmosphere that was evident on this project, and not always present on other similar projects.

5.05 Pre-Qualification Process

The KyTC has always used a prequalification process to control the amount of contract work that contractors working for them can undertake. However, due to the highly sensitive nature of the work on this project, a rigorous unique quality-based prequalification process was developed to secure the involvement of top quality contractors to participate on the project under a FHWA approved special experiment. Five firms responded to the request for proposals and were rated according to the special criteria shown in Table 3, in addition to the regular prequalification criteria used by the Cabinet. All five firms were approved for the project.

The prequalified contractors were to participate in a unique experiment by providing input via constructibility reviews throughout the design phases of the project. All five were invited to participate throughout the project, but had to follow strict rules to stay prequalified. Also, these contractors were allowed exclusively to submit bids for the work phases on the project. The purpose of this special process was to insure that the contractors were constantly apprised of the sensitivity of the project and the extra-ordinary steps expected to comply with the spirit and intent of the work.

Table 3. Pre-Qualification Evaluation Criterion

	Criteria	Weighting
1	Prior experience of prime contractor	30 points
2	Prior experience of other team members	30 points
3	Continuous quality improvement program	10 points
4	Safety program	10 points
5	Experience of team's engineer representative in highway construction	5 points
6	Experience of team's surveyor staking supervisor	5 points
7	Proposed quality control program	5 points

8	Coordination and control of subcontractors and overall organization	5 points
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Contractors were generally in favor of the KyTC using the pre-qualification process for this and other special projects. Two of the original five contractors were disqualified during the course of the project because they did not attend the required project meetings. The two disqualified contractors had other business demands that presented better opportunities. The emphasis on quality performance data for prequalification led to a full research project on quality-based prequalification for all contractors desiring to work on KyTC projects and has resulted in a new process which is currently being implemented.

5.06 Constructibility Impact

Another emphasis of the contracting experiment on Paris Pike was to have the contractors participate in constructibility reviews for each of the design phases. At first the contractors were reluctant to offer constructive input to the KyTC and the designers. After an atmosphere of trust was established, the contractors grasped the concept with vigor, performing detailed evaluation of plans and specifications, indicating construction difficulties, and suggesting pragmatic changes in the design and in the construction process. The "driving force" for the control of the Paris-Lexington Road Project was the design sensitivities delineated in the project documents. The KyTC and the designers were not at liberty to implement any idea that was in conflict with these design sensitivities. A benefit of the constructibility review process was that the contractors were very familiar with most of the details of the project and its extraordinary need for construction sensitivity versus cost, which was of great benefit for preparing bids for the project phases. There was also

great benefit for the Cabinet in managing the preconstruction process in working with a close-knit select group of qualified and interested contractors.

Constructibility reviews have not contributed significantly to this project. Most of the contractors' suggestions were not implemented for reasons related to the strict design restrictions. The review process could have been improved by allowing the contractors more advanced notice of design plans plus more time for review and comments. The fact that the first three phases of the project were awarded to the same contractor, who had an advantage of its home office being close to the project, may also have led to lower enthusiasm for the other contractors taking the process more seriously. The experiment has led to a new research project being funded to do an in-depth review of how to more successfully utilize constructibility reviews for KyTC projects.

5.07 QA/QC Procedures Used

The Quality Control and Quality Assurance procedures used on the Paris-Lexington Road Project were no different than those used for other KyTC highway reconstruction projects. The KyTC inspection process is focused to assure the exact adherence to plans and specification, the same as any highway project. In fact, the KyTC inspectors worked other projects with the same contractor at the same time, with exactly the same procedures being used.

5.08 Project Quality Achieved

By consensus of all the project partners, there is slightly better quality than the typical highway construction project being demonstrated on this project. This is thought to be due to the partnering process. When problems did arise, the KyTC has chosen innovative solutions that improve the quality of the project, at their expense. The contractor has readily cooperated with the KyTC without undue concern for the cost or profit. The contractor has also made a strong commitment to

quality with the assignment of key project management personnel, highly experienced workers, and new equipment on this project. This project is very visible in the community and the highway construction industry, and the contractor claims ownership of the Paris-Lexington Road Project. This attitude for high quality was stressed from the outset by the cabinet and has successfully permeated through all contractors working on the project.

5.09 Change Order History

The Paris-Lexington Road Project is characterized by very few change orders compared to other KyTC projects. There is more cooperation and teamwork used in interpretation of plans and specifications by the project partners. All of the project partners have made the commitment in the Project Mission Statement and Charter to respect the design intent and quickly resolve disputes at the lowest responsible level. Although the change order process is the same as for other projects, the time required to issue an authority to proceed with field changes has been vastly improved. Generally, it is promptly issued within a 24-hour time period. The small changes that do require contract modification are combined together in a single change order to expedite the process.

By focusing on the design intent, and not the cost, the subject of changes is much easier to handle. Keep in mind that the historic and environmental concerns of the Paris-Lexington Road Project override most cost issues, within reason.

5.10 Dispute Resolution History

The Paris-Lexington Road Project is characterized by successful dispute resolution. With the partnering process, there is an atmosphere of trust and confidence that disputes can be resolved quickly and fairly. Disputes are normally resolved in private with only the project parties involved.

At the second and third formal partnering meetings for the second and third design segment contracts there was much anecdotal support of the cooperation experienced by the project parties in resolution of disputes. The general contractor's top senior management has been required to participate in only one issue, while the contractor's second level managers have been required to participate in three issues, including the one issue passed up the ladder.

This is thought to be much better than similar highway construction projects because of the commitments made to the partnering process.

5.11 Attitudes of Paris Pike Advisory Task Force

Part of the Kentucky Transportation Center's research was to evaluate the attitudes of the non-construction project participants. One of those groups that were surveyed was the Advisory Taskforce. Below please find the conclusions drawn from the survey.

- Six of the seven respondents have had experience with the KyTC prior to this project, and all that responded attested that the prior experience considered was positive.
- All respondents felt that there was an adequate and timely flow of information to the advisory taskforce, and 86.7% felt the information was presented in a manner that they could understand.
- All respondents felt the KyTC has been open and honest in their dealings with the Advisory Taskforce.
- 85.7% of the respondents felt that their participation in this project has been personally rewarding.
- 85.7% of the respondents felt they were asked their viewpoint on all pertinent issues, and all felt that they had sufficient time to present in detail their viewpoint. All felt that their viewpoints were well-received and taken into consideration.

- No respondent felt any pressure from the KyTC. One of seven respondents felt pressure from special interests, and two of seven respondents felt that outside influences did affect the taskforce decisions.
- All respondents were satisfied with the quality of work in the planning, design and construction phases.
- All respondents feel that the final version of the project will satisfy the original expectations set out by the advisory taskforce.
- The presentation techniques that were helpful were: the Jones & Jones presentation, group discussion, onsite visits and tours, electronic polling, the use of a facilitator, computer slide show, public meetings at each critical step, and visual aids.

5.12 Specification Adherence/Compliance

There was no apparent difference in adherences or compliance to project work specifications on this project than for other similar projects. However, with the strong commitment to quality and sensitivity required, it is not surprising that the contractors' work methods, procedures and results are so in compliance with the DOH specifications.

5.13 Experience with the Traveling Public

Although there has not been a formal survey of the traveling public, the project partners have received many positive telephone calls, and only a few negative ones, related to the handling of the general public on the project. Great care has been given to all traffic control plans and processes throughout the project.

5.14 Management of Subs/Suppliers

From the contractor's perspective, the partnering process was difficult to get started, but was well worth the effort. Some of the subcontractors and material suppliers had little prior experience with partnering and initially resisted embracing the partnering philosophy. However, observations of several partnering meetings on the project revealed a strong commitment by all the parties involved. This has resulted in a much better working relationship between the general contractor and the subcontractors and suppliers.

5.15 Bonding Company Evaluation

The contractors participating in the Paris-Lexington Road Project all had excellent work performance history and longstanding relationships with their bonding companies. The financial magnitude of this project was not sufficient to have an impact on any participating contractor's bonding capacity. Subcontractors and suppliers were also required to supply their own bonds and warranties on this project.

5.16 Attitudes of Landowners

Although the KyTC personnel, the designers, and the contractor have made a concerted effort to communicate all plans and operations with each and every property owner that is impacted by the project, landowners are suspicious, untrusting, and focused on the financial issues.

In order to get an understanding of the property owners affected by the Paris-Lexington Road Project, a survey was prepared and respondents to the survey equally represented property owners from the Paris & Houston Creek Districts, Hutchinson District, and Muir Station, Johnson and Lexington Districts.

- 25.9% of the respondents had previous dealings with the Department of Highways, of which 57.1% have had a satisfactory experience.
- 92.5% of the respondents felt that the KyTC kept them well informed of the developments of the project, of which 86.0% felt that they understood the information being presented.
- 73.9% of the respondents felt that the KyTC had been fair, open and honest. 77.1% felt that the KyTC did their best to align the road for all concerned. 83.7% of the respondents felt that the KyTC did their best to preserve the history and mitigate the environmental damage of the Paris-Lexington Corridor.
- 84.5% of the respondents felt that all interested parties were represented by the project organization, but only 61.2% felt that it represented their specific interests. Only 76.0% of the respondents had any contact with the Paris-Lexington Road Advisory Taskforce.
- 90.0% of the respondents felt they had been given adequate opportunity to express their position on issues.
- 52.6% of the respondents felt that they have been, or will be, offered fair and adequate compensation for any loss of to their property. 31.4% of the respondents felt that they might need to litigate to receive fair and adequate compensation.
- 75.0% of the respondents were satisfied with the Quality of Planning, Design, and Construction to date.
- 63.0% of the respondents felt the results to date had met their original expectations, but 78.9% felt that eventually their expectation would be met.
- Only 55.6% of the 54 respondents offered specific comments, mostly positive.

6.0 COMPARISON TO OTHER KYTC PROJECTS

The original research objective had been to compare the results obtained on the Paris to Lexington Road Project (Paris Pike Project) to typical KyTC construction projects. The first task was to determine a typical case or condition, in this case a typical highway construction project for the Commonwealth of Kentucky. The second task was to determine the specific characteristics to use as an accurate measure, in this case project effectiveness. Once these tasks were completed, the final task was to conduct an analysis of the comparison of the identified characteristics that would result in an indication of project effectiveness.

This objective turned out to be more difficult than initially anticipated. The key project characteristics identified in the research proposal were related to the innovative aspects of the project and were difficult to measure, thus requiring a subjective evaluation of these key project characteristics. Comparison data to use for this evaluation is not collected by the Kentucky Transportation Cabinet as part of its regular construction database. An evaluation of these innovative project attributes is addressed in Section 5 of this report.

A feasible approach for evaluating project effectiveness is to use the construction data normally collected, compiled and obtainable through KyTC historical sources. This data could then be compared to the same data from the Paris to Lexington Road Project.

The Kentucky Transportation Cabinet routinely collects construction data on all its highway construction projects. This data is stored in the data file, Projects.zip, which includes all highway construction projects conducted for the past ten years.

6.1 Data Collection Methodology

Construction data was first sorted by year and then by project type to obtain a construction data subset of the project type(s) by year. The purpose was to match this data to the

project types experienced on the Paris to Lexington Road Project. At the beginning of the project, it was decided to use five construction/letting packages, selected for their appropriate size and combination of similar work items. This packaging organization allowed for construction work to commence much sooner and prior to the total completion of the design effort. The number of packages was later reduced to four.

The Paris to Lexington Road Project, as a whole, would be classified as a four-lane bituminous surface road reconstruction project of an existing two-lane road with minor adjustment in roadway alignment. The first letting segment consisted of north-bound and south-bound bridges over the Houston Creek, and the associated approach work. The remaining three letting packages can be classified as a "Grade, Drain, and Bituminous Surface" project classification. The data subset could be sorted to yield historical construction data for these two types of project classifications. The project effectiveness of the Paris to Lexington Road projects could then be evaluated by a comparison to similarly classified historical projects.

The historical construction data was sorted by the "Grade, Drain and Bit Surface" project classification and by year. This yielded a construction data subset that was highly variable and not considered to be an accurate measurement tool for project effectiveness for the Paris to Lexington Road Project. The data subset was found to have a large number of the projects of very short paving distances, several less than one mile. This was much different than the three major construction packages of the Paris to Lexington Road Project, which were from three to five miles in length.

The historical construction data was then sorted to eliminate "Grade Drain and Bit Surface" projects less than two-miles in grading and paving length. The resultant data subset appeared more realistic and in line with what could be expected for projects of this nature and

size. The cost per mile was within more reasonable and believable levels. A summary of this construction data subset can be found in Table 4. This data subset includes one hundred ninety six "Grade, Drain and Bit Surface" projects having been completed in the last 19 years, and located throughout the Commonwealth.

These projects, however, were mostly developed for much different conditions than the political sensitivity of the Paris to Lexington Road Project. Thus, there was concern that they were not directly comparable without a thorough understanding of the project circumstances, which could impact the project attributes. A review of the project data in Table 4 exhibits a wide variation in project attributes from project year to project year.

A better method of evaluating project effectiveness would be to compare the Paris to Lexington Road Project construction data to that of similar projects, i.e., of similar lengths, topography, terrain, accessibility, construction methods and techniques, and political environment. Although no exact project matches were identified, six similar projects were selected by a number of experienced highway construction engineers and are listed in Table 5 as "Comparative Projects," along with comparison data for the first three segments of Paris Pike and the 196 Grade, Drain and Bituminous Surface projects.

Table 4. Summary of 196 Grade Drain and Bit Surface Projects of 2.0 miles and greater.

Year	Number of Projects	Average Miles per Project	Average Contract Amount, Mill \$	Average Contract Amount, Today's Mill \$	Mill \$ per Mile	Today's Mill \$ per Mile	Average Change Order Amount, Mill \$	Average Change Order Amount, Today's Mill \$	CO's as % of Contract Amount	Average WD	WD per Mile	WD per Mill \$	WD per Today's Mill \$
2001	9	3.175	7.111	7.111	2.240	2.240	0.348	0.348	4.89%	187.5	64.4	32.2	32.2
2000	24	3.645	11.710	12.120	3.213	3.325	0.220	0.228	1.88%	235.7	71.6	32.0	30.9
1999	11	3.904	11.256	12.058	2.884	3.089	0.968	1.037	8.60%	237.5	60.8	21.1	19.7
1998	12	3.321	10.843	12.022	3.265	3.620	0.907	1.005	8.36%	223.0	69.6	26.7	24.1
1997	8	3.032	10.225	11.734	3.372	3.869	1.457	1.672	14.25%	262.1	87.7	31.6	27.5
1996	13	3.411	6.821	8.101	2.000	2.375	0.441	0.524	6.46%	215.5	59.6	30.2	25.5
1995	15	4.523	7.875	9.680	1.741	2.140	1.686	2.073	21.42%	222.7	76.3	32.9	26.8
1994	16	3.246	4.947	6.294	1.524	1.939	0.566	0.720	11.44%	209.3	71.0	49.4	38.8
1993	12	4.255	6.400	8.428	1.504	1.980	0.648	0.853	10.13%	218.5	63.4	47.0	45.4
1992	4	2.371	5.080	6.924	2.142	2.920	1.073	1.463	21.12%	207.5	87.5	46.1	35.0
1991	23	3.547	6.561	9.256	1.850	2.609	0.546	0.770	8.32%	240.1	75.4	47.1	34.6
1990	9	3.456	8.256	12.053	2.389	3.488	0.186	0.272	2.26%	251.4	72.7	34.1	24.2
1989	8	3.298	3.986	6.023	1.209	1.826	0.386	0.584	9.69%	391.8	127.6	129.9	89.0
1988	4	3.201	7.856	12.287	2.454	3.838	0.728	1.139	9.27%	225.0	67.0	39.2	25.9
1987	7	3.709	6.517	10.549	1.757	2.844	0.472	0.765	7.25%	240.7	72.2	47.0	30.0
1986	11	3.136	6.606	11.068	2.107	3.530	0.219	0.367	3.31%	219.4	144.0	42.0	25.9
1985	6	3.399	13.369	23.182	3.934	6.821	1.498	2.597	11.20%	254.5	89.4	44.1	26.3
1984	2	3.491	5.882	10.557	1.685	3.024	3.093	5.551	52.58%	230.0	65.9	39.1	22.5
1983	2	2.675	5.378	9.990	2.010	3.734	0.218	0.405	4.06%	222.5	83.1	43.9	24.4
1982													
1981													
AVG	10	3.410	7.720	10.497	2.278	3.116	0.824	1.177	11.39%	236.6	79.4	42.9	32.0

Table 5. Comparison of Paris Pike Project Outcomes to Other KYTC Projects

Grade Drain & Bit Surface Comparative Projects	Miles	Contract Cost	Change Order Cost	Total Contract Cost	YR	WD	Million \$ per mile	Today's Mill \$ per mile	CO %	CO Mill \$ per mile	WD per mile	WD per Mill \$	WD per Today's Mill \$
Gr Dr & Bit Sur Projects 10 year Avg (196 Projects)	3.410	\$7,720,095.81	\$824,278.09	\$8,544,373.90		237	\$2.278	\$3.116	11.39%	\$0.824	79.4	42.900	32.000
Comparative Projects													
Camp Nelson - Nicholasville Road, US27	5.087	\$8,888,445.79	\$1,023,655.74	\$9,912,101.53	95	334	\$1.949	2.395	10.3%	\$0.201	65.7	33.696	27.412
Paducah - Wickliffe Road, US60	2.405	\$5,996,722.61	\$398,138.70	\$6,394,861.31	97	180	\$2.659	3.051	6.2%	\$0.166	74.8	28.148	24.529
Paducah - Wickliffe Road, US60	2.374	\$3,898,641.28	\$109,594.50	\$4,008,235.78	97	145	\$1.688	1.937	2.7%	\$0.046	61.1	36.176	31.525
Paducah - Wickliffe Road, US60	1.974	\$3,112,656.56	\$336,598.58	\$3,449,255.14	97	180	\$1.747	2.005	9.8%	\$0.171	91.2	52.185	45.476
Hopkinsville - Russellville Road, US68	5.440	\$7,291,184.14	\$122,226.88	\$7,413,411.02	98	160	\$1.363	1.511	1.6%	\$0.022	29.4	21.583	19.466
Hopkinsville - Russellville Road, US68	1.900	\$6,991,617.36	\$137,500.00	\$7,129,117.36	98	160	\$3.752	4.160	1.9%	\$0.072	84.2	22.443	20.242
Comp GDB Projects Avg (6 Projects)	3.197	\$6,029,877.96	\$354,619.07	\$6,384,497.02		193	\$2.193	2.510	5.4%	\$0.111	60.4	32.372	28.284
Lexington - Paris Road Segment #2	3.200	\$13,988,659.26	\$ 541,379.72	\$14,530,038.98	98	211	\$4.541	5.034	3.7%	\$0.169	65.9	14.522	13.098
Lexington - Paris Road Segment #3	4.100	\$17,495,523.39	\$ 104,620.00	\$17,600,143.39	00	246	\$4.293	4.443	0.6%	\$0.026	60.0	13.977	13.505
Paris Pike Segments #2 & #3 Avg	3.650	\$15,742,091.33	\$ 322,999.86	\$16,065,091.19		229	\$4.401	4.555	2.0%	\$0.088	62.6	14.223	13.742

Bridge Comparative Project

Bluegrass Parkway (Bridge Proj)	0.124	\$ 4,048,848.24	\$ 333,321.14	\$4,382,169.38	98	140	N/A	N/A	7.6%	\$2.688	N/A	31.948	28.815
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Paris Pike Projects

Paris to Lexington Road, US27, Seg #1	0.750	\$ 4,541,554.93	\$ 27,768.90	\$4,569,323.83	97	162	N/A	N/A	0.6%	\$0.037	N/A	35.454	30.896
Lexington - Paris Road, Seg #2	3.200	\$13,988,659.26	\$ 541,379.72	\$14,530,038.98	98	211	\$4.541	5.034	3.7%	\$0.169	65.9	14.522	13.098
Lexington - Paris Road, Seg #3	4.100	\$17,495,523.39	\$ 104,620.00	\$17,600,143.39	00	246	\$4.293	4.443	0.6%	\$0.026	60.0	13.977	13.505

Future Paris Pike Projects

Lexington - Paris Road, Lexington, Johnson Road, Muir Station Road	5.640	\$33,899,753.36											
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6.2 Results of Comparisons

The historical construction data subset of Grade Drain and Bit Surface projects spanning over 19-years was found to have significant variability. This was true even when the data subset was reduced to the 196 projects of 2.0 miles in length or longer. The results for key project attributes are shown in Table 5 and are discussed in the following paragraphs.

From the investigation of 196 projects, 2.0 miles in length and longer, the average cost per mile in today's dollars is \$3.116 million per mile. The contractor was allowed 79.4 works days per mile to complete the 3.410 miles average project length. The work days allowed per today's million dollars is 32.0 work days. The change order's per project averages 11.39% of the total contract amount.

From the investigation of six similar projects (Comparative Projects in Table 4), the average cost per mile in today's dollars is \$2.510 million per mile. The contractor was allowed an average of 60.4 works days per mile to complete the 3.197 miles average project length. The work days allowed per today's million dollars is 28.3 work days. The change order's per project averages 5.4% of the total contract amount

The Grade Drain and Bit Surface parts of the Paris to Lexington Road Project are 3.20 and 4.10 miles in length for construction segments number 2 and 3, with an average length of 3.65 miles. The cost per mile in today's dollars is \$5.034 and \$4.443 million, for an average today's dollars of \$4.555 million per mile. This amounts to 146.2% of the 196 projects average and 181.5% of the six-comparative projects average cost, respectively.

The work days allowed per mile to complete these projects is 65.9 and 60.0 per mile for construction segments 2 and 3, respectively, for an average of 62.6 work days allowed per

mile. This amounts to a 78.8% of the 196 projects average and 103.6% of the six-comparative projects average, respectively.

The work days allowed per today's million dollars is 13.1 and 13.5 work days allowed, for an average of 13.7 work days allowed per million dollars. This amounts to 42.8% of the 196 projects average and 48.4% of the six-comparative projects, respectively.

The change orders per project are 3.7% and 0.6% of the total contract amounts, with an average of 2.0% of the average contract amount. This amounts to 17.5% of the 196 projects average and 37.0% of the six-comparative projects, respectively.

Table 5 Summary Comparisons for Paris Pike to Other KYTC Projects

Summary of Comparisons	19-Year Gr Dr Bit Surface Projects	Six-Comparative Projects	Paris Pike
Average Length, mi	3.410	3.197	3.650
	1.000	0.938	1.070
Today's Million Dollar Cost per Mile, \$	\$3.116	\$2.510	\$4.555
	1.000	0.806	1.462
Work Days Allowed per Mile, days	79.4	60.4	62.6
	1.000	0.761	0.788
Work Days Allowed per Today's Million Dollars, days	32.0	28.3	13.7
	1.000	0.884	0.428
Change Orders as a % of Total Contract, %	11.4%	5.4%	2.0%
	1.000	0.474	0.175

A review of the comparison data shown in Table 5 indicates a significant difference for the Paris to Lexington Road Project versus other KyTC projects. The cost was considerably higher, while the work days allowed were similar to comparative projects, and the change orders were very much lower than previous projects. There are explanations that could be offered for these differences are as follows:

1. The Paris to Lexington Road Projects includes many transportation design enhancements not usually found on a highway road reconstruction project. Some of these were not easy to accommodate in the construction phase. For example, the handling of the unique topsoil required stripping, stockpiling and re-distribution once the final grades were established. This required weed control, as well as the extra handling to meet the intent of the specification. Another example is the construction grass shoulders, which required special separate grading provisions for the shoulders and roadway, while handling the drainage blanket materials multiple times to ensure required installation.
2. There was also a design emphasis to accommodate finished roadway characteristics to enhance tourism of the region. Special provisions were made to improve the existing structures adjacent to the roadway and right of way. For example, many of the stone walls were removed and relocated to be exactly the same way they were when built. Stone masons had to be trained to handle this special construction. Other examples would be the emphasis on stone application to concrete culverts and bridges, and the requirement of special guardrail to fit with the environment.

3. The scope of the work for the Paris to Lexington Road Project was much more sensitive to the protection of existing vegetation, as well as, the installation of new vegetation, and the difficulties caused by the interaction of heavy road building equipment and sensitive vegetation. Many protective measures were required of the contractor.
4. The commitment of the Cabinet, the designer, the contractor, the subcontractors, and the suppliers and vendors to the partnering concept and prompt resolution of differences was outstanding on this project. The partnering meetings were very positive sessions. There was a very strong commitment by the managers and the workers to achieve quality in the work. This relationship was a major contributor to the drastically lower change order percentage of the total contract price.
5. Although not shown in Table 5, the design fees for this project were tremendously more expensive than for more typical projects, estimated to be 3 to 4 times as much.
6. Finally, there was extensive involvement of the public and cooperating agencies on this project, all of which attributed to the high cost of construction and design. Although the landowners were cooperative with the project, they still demanded top price for their land which was purchased for right of way.

7.0 SUMMARY AND CONCLUSIONS

7.1 Summary

The construction to date on the Paris-Lexington Road Project has been very successful with excellent quality and very few conflicts. This can be attributed to the strong commitment and teamwork of the project parties. Unique for this project, active participants include all the stakeholders not normally considered in a highway construction project. Without the cooperation and support of the public, the special interests groups, the historians, the property owners, the environmentalists, the agronomists, the local business owners, the local influential citizens, along with the representatives of the local governments, this project would have bogged down at the expense of the traveling public that need to rely on the Paris Pike as their major transportation route.

The general contractor's success could not have happened without the commitment of his workers, the subcontractors, the suppliers, and his senior management. The contractor also assigned his best available field and office personnel, along with the assignment of his brand-new, or at least, his best operating equipment.

The KyTC has also assigned their more experienced field and management personnel who were aptly suited for the challenges of this project. They also assigned highly qualified design personnel and managers to the project. This has been a truly high-profile project.

Additionally, there has been a consistency in the personnel throughout the entire project. Management personnel changes have been made sparingly, and only after much thought and care to minimize the impact on the project. This has contributed consistently to a strong professional and cooperative management environment for all parties that have contributed greatly to the results achieved for safety, workmanship, quality and teamwork.

There have also been other benefits achieved from lessons learned on the project which have led to new initiatives, such as implementing quality-based prequalification and constructibility reviews, which could benefit all KyTC projects in the future.

The Paris-Lexington Road Project is an excellent example of how a highway department may need to adapt their approaches to highway reconstruction projects when confronted with an historic and environmentally sensitive project. This is particularly true when a well-intentioned public with very different interests and motivation has serious doubts or concerns. To overcome these situations, a DOH must be able to operate with sensitivity to these concerns, and integrate the public's concerns into the project design and construction. However, this is a very expensive process, both monetarily and in human resources, and should not be engaged except for very special projects.

7.2 Conclusions

7.21 The Paris-Lexington Road Project has been a successful and unique venture of public and private partnering to achieve a difficult and sensitive transportation project. However, it is a very time-consuming, expensive and resource-intensive undertaking. Hopefully, the lessons learned here will make such a process more cost effective for other special projects.

7.22 Partnering can be utilized for very effective results on KyTC projects and should continue to be encouraged for most KyTC construction projects.

7.23 Excellent quality can be demanded and achieved on KyTC projects. Quality performance should be evaluated and the results used for dealing with all contractors working for the Cabinet.

7.24 Constructibility reviews can be beneficial for KyTC construction projects. However, much more evaluation is needed to determine how to effectively implement constructibility reviews and lessons learned into the current design/construction/operations processes.

7.25 Contractors must be more involved in the environmental aspects of projects and in dealing with the public. Project success on many of the KyTC projects is highly dependent on such activities.