PROJECT ADMINISTRATION DATA SHEET

Project No. D-48-606 (cont. of D-48-673)  GTRI/GTR
Project Director: John Myers  U.S. School/Lab
Sponsor: National Park Service (DOI)  Atlanta, Ga.

Type Agreement: Contract 5000-2-0755; Supplement No. 4
Award Period: From 8/9/82 To 5/30/83  (Performance) 2-7-84  (Reports)  Funded: $98,000*
Sponsor Amount: Total Estimated: $ 4/14/84
Cost Sharing Amount: $ 2-15-84  Cost Sharing No:

Title: Servicewide Building Inventory Analysis Program

ADMINISTRATIVE DATA
1) Sponsor Technical Contact:
   Bill Smith
   National Park Service
   Southeast Regional Office
   75 Spring St. SW
   Atlanta, GA 30303

2) Sponsor Admin/Contractual Matters:
   Dusty Schultz
   National Park Service
   Southeast Regional Office
   75 Spring St. SW
   Atlanta, GA 30303

Defense Priority Rating: NA
Military Security Classification: NA
(or) Company/Industrial Proprietary: NA

RESTRICITONS
See Attached Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval — Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Gov't; except under $1,000 vests with GIT if prior written approval is obtained.

COMMENTS:
*This project is funded at $98,000 which is a portion of the total contract value of $758,478. The rest of the funds are in Project D-48-673.

COPIES TO:
Research Administrative Network  Research Security Services  Research Communications (2)
Research Property Management  Reports Coordinator (OCA)  Project File
Accounting  GTRI  Other
Procurement/EES Supply Services  Library  Other

John W. Burdette x4820
SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date: 6/6/86

Project No. D-48-606

Includes Subproject No.(s)

Project Director(s) John Myers

Sponsor National Park Service (DOI)

Title Servicewide Building Inventory Analysis Program

Effective Completion Date: 5/30/83

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. D-48-673

Continued by Project No.

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/GTRI Supply Services
Research Security Services
Reports Coordinator (OCA)

Library
GTRC
Research Communications (2)
Project File
Other A. Jones

R. Embry
A MANAGEMENT REPORT ON THE FREQUENCY AND METHODS
OF UPDATING BUILDING INVENTORY-INSPECTION PROGRAM DATA

PREPARED BY THE CENTER FOR ARCHITECTURAL CONSERVATION
COLLEGE OF ARCHITECTURE
GEORGIA INSTITUTE OF TECHNOLOGY
REFERENCE DATA

Reference Data, which contains information on location, climate, services and other logistical items, is unlikely to be affected by any physical changes to the building itself. Much of this data is for groups of buildings and is the result of parkwide policy or operations. The fact that this data is independent of the building is very useful in the planning and organization of data in the Building Inventory-Inspection Program because:

1. This data group is useful in identifying and locating any building in the database. Once all buildings have been inventoried, NPS will have a very precise accounting of the buildings, their size, location, services and building numbers. This is vital information to management and it is least susceptible to change over time. This means that as a management database, the reference data needs minimal updating and revalidation, plus the triggering actions for change will be so substantial that it will be reasonably easy to affect a modification to the data per the "event of change," i.e., only major events such as building removal or contract cancellations may affect the accuracy of the data elements.

2. The stability of the information results in the reference data being a valuable WASO database because a high level of confidence can be maintained that the data is accurate over time. Minimal effort will have to be expended to resurvey the field on a periodic basis. In fact, by placing some kind of trigger mechanism to pick up on the limited types of change, this data might never require an update survey or possibly as rarely as every ten years.

INVENTORY DATA

Inventory Data addresses the type, quantity and condition of the physical materials which comprise the facility. This data also contains information on conditions which occur in Handicapped Accessibility, Public Health and Fire Safety areas. The items in this section are relatively stable, but less so than the reference data since maintenance and repairs can frequently involve a change in material type or system descriptions.

Fortunately, by its very nature, the Building Inventory-Inspection Program flags items in the inventory database which are most susceptible to change. This is accomplished through the identification of conditions, especially poor conditions, and recommendations for repairs or modifications which automatically indicate that related elements are likely to change as the corrective actions are implemented. The result is that any pending list of work recommendations is also a
checklist for monitoring or resurveying the Inventory data to detect and incorporate changes as the work is accomplished.

Changes to the data elements in this section can occur based on factors such as:

1. Performance of routine or preventive maintenance (PM)
2. Implementation of the work recommendations made in the Building Report
3. Emergency intervention based on systems failure, disaster, vandalism or accident
4. The implementation of new programs or planned improvement to park facilities
5. Aging of the buildings, wear on the equipment and systems.

In general, the five processes which are mentioned are known best and first by the park staff, especially the maintenance staff responsible for the building. The detailed nature of the inventory data is also such that it is the park staff which has the greatest use for this data on a continuing basis. The result of this is that any detailed inventory database is most useful and best maintained at the field or park level, when the park is given an adequate capability to manage the data.

When the baseline inventory data has been established by the inspection program and a park has the computer capability to use and upgrade the data, then the detailed inventory database can become available on demand, when needed by Regional Offices or WASO in planning and budgeting activities. Until the park maintenance programs have automated capability for managing the data (input, edit, report, transmit), the maintenance of the database will depend on traditional, manual survey and reporting techniques.

DEFICIENCY DATA

Deficiency Data and work recommendations which comprise output of the Inspection component of the program are the most volatile elements, most subject to change and most extensively affected by building maintenance actions. The sections in this database are affected by the same five factors cited above for the inventory; however, the nature of the changes is much more substantial or drastic than for the inventory data; For example, when a job action is implemented to correct a deficiency, the entire entry will be deleted from the file. While only the "condition" rating in an inventory data element may change from "poor" to "good," the deficiency, proposed solution, inherent quantities and costs will totally disappear from the current file. "Back-up" files can be used to retain a historical record
The deficiency data is the most sensitive section of the report. It should be the most visible indicator of changes in the status of the buildings. As with the inventory data, it is the park staff which has the greatest need to know all pending deficiencies and necessary work. The park maintenance staff will always be the point of most current knowledge about work to the buildings. The same factors with respect to Regional and WASO availability will apply. (Please see last paragraph under section, "INVENTORY DATA" on page 3 for a discussion of automation. The same comments apply to "DEFICIENCY DATA.")

MAINTENANCE AND UPDATES

Maintenance and Update. The interim, non-automated maintenance of the database of inventory and inspection data will depend upon traditional, manual resurvey and reporting techniques; upon a new system to continuously monitor ongoing construction and maintenance activities in the parks; or a combination of the two.

1. Manual surveys have long been used by the various divisions of the Park Service to collect information from the parks and regions. This is a labor intensive manual task which consumes time, impacts park operations and is fraught with validity problems, due to time and manpower limitations. Comments received from parks visited generally indicate that such surveys are a source of frustration because they often come from several uncoordinated sources.

2. Continuous monitoring is a process which has not been as evident in NPS operations, however, it sometimes occurs in operational areas such as the maintenance and submission of monthly reports on certain program areas. If a monthly report summary of maintenance and repairs performed to buildings could be forwarded to a "building information center," a central data collection, review and entry process could maintain current and up-to-date electronic building files. The short-term feasibility of this will vary from park to park based on the current operating procedures for documenting work tasks, giving written work orders to staff and monitoring jobs. Parks which use 10-577's or the equivalent to assign and track work should be able to send copies of the monthly work statements to such an information center with minimal effort. This process would seem to be much more efficient than sending in a semi-annual questionnaire regarding work to each building, or the return of a new report each six to twelve months for redlining and return. The difficulty with implementation of continuous
monitoring will occur with park operations which do not have an established system of written job assignments and accountability. These parks may have no existing mechanism by which to report maintenance and construction activities on a regular basis.

Parks which do not have a mechanism for monitoring or reporting on their maintenance activities should be given priority for some management review and assistance, since the lack of a tracking system for work assignments and work completed should be considered a major program management deficiency. (It may be more efficient, for BIP, to require that such parks implement a maintenance tracking system which could support a BIP update. Otherwise, it will be very difficult to assure a valid update of BIP data in parks without a system of monitoring and reporting current maintenance activities.

3. A combination of (1) and (2) could work effectively if a continuous monitoring program is used to correct and upgrade building files; and then a new building report was sent to parks annually or semi-annually until such time as the park acquired a system to keep the data online electronically.

This process would require the cyclic shipping of potentially larger amounts of paper to parks but would only be considered temporary. On a twelve-month cycle this would be a manageable process (possibly tied to the annual budgeting process).

This approach is the recommended one for NPS at the current stage of the project. There is a two-part form recommended:

1) Transmittal form requesting park assistance in the review of Item 2, and
2) Quick print of building deficiencies for mark-up by park.

Items "1" and "2" are attached as Figure 1 and Figure 2.

The evaluation of the program at Mammoth Cave National Park revealed that 10-577's were used for documenting problems, solutions and projected costs. These forms were used for assigning work and preparing management/budget and summary reports, such as R07's and 8's and 10-238's. A 10-577 is attached as Figure 3 for reference to illustrate that the data included is virtually identical to the BIP deficiency data sheets (also attached). The key point is that these forms are so similar that 1) BIP output can directly create 10-577's (thereby reducing park work), and 2) 10-577's created manually by the park in their current operation can directly support BIP.
update. We would recommend that a testing phase be used to 1) adapt and test all of the forms and procedures involved and 2) work with park staff to develop a model program of integration of BILP with current operating procedures. By allowing BILP to generate basic forms, the manual workload of the staff would be reduced and the BILP output can then be used to 1) assign work to personnel, 2) prepare the annual maintenance budget, and 3) update BILP. Such a process would be very efficient because it would substitute fast, efficient microcomputer techniques for labor intensive manual tasks without modifying operating procedures, forms or other familiar processes. If this approach can be demonstrated successfully, it will be a major incentive for parks to actively utilize BILP.

The use of a centralized staff to manage BILP data is recommended as a short-term approach to assure maximum utilization of data by staff experienced with the program. This would occur while regions and parks are being introduced to the program objectives and procedures (it is likely to take a couple of years at a minimum to integrate procedures and have regional personnel actively managing BILP). As parks and regional maintenance programs become more automated, alternatives for managing and reporting the data will emerge. The short-term approach of maintaining the data will allow the manipulation and summarization of the data by specialists familiar with the system until a variety of user-friendly outputs are developed.

AUTOMATED CONTROL of the entire Building Inventory and Inspection data at the park level is the most desirable long-term alternative to assure: (1) effective management of the data, (2) usefulness to the park and (3) systemwide availability of current data. The demonstration micro-computer network (RAIN) now allows for user-friendly, menu-driven programs to enter and edit the data, and also allows direct communications capability. The operation of the Building Inventory-Inspection Program will be enhanced by the installation of a capability equivalent to a "RAIN" station in each park maintenance office (see the System User's Guide for a discussion of system configuration).

The implementation of such a move to automate the management and reporting of NPS maintenance operations would involve the following considerations:

1. The establishment of a standardized work station configuration for performance of the required functions in the Facilities Management program. The system hardware and software requirements have been established as a result of Phases I through III of the Building Inventory-Inspection Program and are stated in the "System User's Guide." Specifications on the BILP system requirements may be provided in advance to parks which are contemplating equipment purchases.
2. Establishment of software and edit routines to promote and allow the use of the system, data input, edit, reporting and communications by park support and maintenance staff in an efficient, user-friendly manner. This has been accomplished as a part of this phase of the Building Inventory-Inspection Program. The documentation of all edit routines to permit the fast, efficient and user-friendly updating of the data is described in this operations manual on pages ( ) under the "System User's Guide."

3. The coordination and justification of the installation of systems, to operate BLIP, in the maintenance offices of parks. This will involve addressing the following points:

a) Compatibility with or duplication of equipment. During our investigation of park building information needs we have observed that while some parks have computer capability (whether it is Data point or micro-computers) this equipment has not been under the control of, or for the express use of, the maintenance and facilities management operations. The scale of facilities management in all except the smallest sites would be such that a micro-computer of the type and configuration of the existing "RAIN" station could be used full time. It could also be used as a "dumb" terminal to communicate with WASO or regional computer equipment on other management matters.

b) Cost effectiveness of the system. During the first three phases of the Building Inventory, a research program was implemented to design and test a micro-computer system to manage the data, serve additional park management functions, support a modest level of graphics, have full communications capability and be reasonably priced so as to be financially feasible for acquisition by parks.

We have achieved those goals and demonstrated the results with the existing "RAIN" micro-computers in WASO, SERO, MACA, the Center and the MRL. Additionally, the untapped potential of the network for providing technical support for the parks is as important as the demonstrated management role in the Building Inventory. One area of financial and operational impact which needs to be explored further, is that of computer system maintenance and repair in the parks. The Southeast Region has recently been negotiating an agreement with IBM to provide service in National Parks which could be appropriate for "RAIN" stations which are IBM PC's.
Technical support and training for users. The effective use of micro-computers and associated software will depend upon providing appropriate software for field needs, and providing technical support and training to the maintenance staff. It should be understood that hardware and software will not be used effectively and possibly at all, unless support is provided to:

1) Demonstrate the capability of hardware and software package to perform valuable program functions

2) Describe hardware and software functions in clear, uncomplicated terms

3) Provide continuing support to users as they undertake the learning tasks and go through the normal learning curve associated with new equipment and procedures. (This support will also stimulate the development of applications by park staff which may have widespread applications within the Service.)

During the research on the Building Inventory-Inspection Program, procedures were developed and followed to accomplish the preceding three objectives as the "RAIN" station was placed in the test park in MACA. Some of the results and demonstrations can be used in a larger scale installation of maintenance work stations, however, the training approach will have to be modified for multiple park applications. In general, the following procedure was followed in the placement of a "RAIN" system in MACA:

1. Park maintenance operations and computer applications were observed by a technical specialist on site.

2. Suggestions for potential management applications were solicited from park staff, and support data was collected for the preparation of demonstration and training examples prior to installation.

3. A primary park staff user was identified and brought into the Center for two days of orientation to the "RAIN" station hardware, and a range of potentially useful software including the Building Inventory-Inspection Program.

4. The "RAIN" station was delivered and a training specialist familiar to the staff through the preceding steps spent two days in the park, going over set-up and operations.
5. Technical assistance is available to the park at all
times via phone, and follow-up visits are scheduled to
implement and test the Building Inventory-Inspection
Program in the field.

These procedures have been successful in the test project, but
more importantly, it should be realized that this level of
support must be provided anytime a new program or system is
introduced. There may be methods of making technical support
more accessible and efficient on a large scale, and those
methods are programmed for investigation and development in the
training phase of BIP. The techniques of training may include
the use of the computer itself as the training vehicle, via
tutorial disks for each application.

EXECUTIVE SUMMARY

Data collected as a part of the Building Inventory-Inspection
Program (BIP) must be updated periodically if it is to remain
current. In the absence of an automated program in the parks,
manual techniques are the most feasible short-term update
approach.

A plan is recommended which will seek to avoid layering
additional work on park staff. It will also allow more time to
both manage the manual process and work toward planned
automation. This plan would consist of:

1) Maximizing the compatibility of BIP deficiency data to
existing park manual systems such as 10-577's, RO-7's
and RO-8's, so that it becomes an easily useable
program and can possibly be integrated into the annual
budget cycle.

2) Annual submission of deficiency reports to be compared
to existing park records, marked up with comments and
returned for updating the electronic file.

A transmittal form and deficiency print example is attached to
this report. Edit routines have been developed and included in
the System User's Guide.

Additional work on the park staff is minimized by tying the key
data to be updated (deficiency data) to existing procedures and
reports they are already preparing as part of their operations.
Input from park staff can be obtained via the marked up
deficiency reports. Regions should be copied on all output, and
special program interests, such as Concessions, Historic
Architecture and others, should have access to current reports
as they conduct their own operations. Comments and
modifications may be obtained from any of these sources as they
respond to the data in the reports.
As the short-term plan is implemented, the long term approval of increasing the micro-computer capability of the parks to perform facilities management and other functions will be proceeding. Short-term tasks can be phased out as park capabilities are enhanced. Both the short- and long-term options are multi-year tasks and actual time frames will be based upon NPS implementation decisions.

PLAN
ADM. #7
MEMORANDUM

TO: Park Maintenance Chief
FROM: Building Inventory Program Manager
SUBJECT: ANNUAL UPDATE OF BUILDING STATUS

Enclosed are the itemized listings of all deficiencies and pending work items on all buildings in _________ Park, which are currently on file in the National Building Inventory.

Please compare this list with your file copy of the building report, and indicate any deletions or additions to the list by marking up the enclosed copy. The corrected lists should be returned to the Building Inventory Program Manager. An updated comprehensive report will be returned to you to replace the current file copy.

The following building numbers are attached:

Building #_______
Building #_______
Building #_______

Sincerely,

--------------------------------------------------

FIGURE 1
<table>
<thead>
<tr>
<th>#</th>
<th>ELEMENT</th>
<th>JUSTIFICATION</th>
<th>STATEMENT OF WORK PROPOSED</th>
<th>UNIT OF MEASURE</th>
<th>MAN</th>
<th>LABOR TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>SI LANDSCAPING GRADE</td>
<td>Grade too close to bldg sill on N and W elevations</td>
<td>Rework grade at N and W sides of bldg to pull earth away from sill, but allow drainage</td>
<td>35 CY</td>
<td>539 2</td>
<td>1268</td>
</tr>
<tr>
<td>13</td>
<td>EE FOUNDATION OPENINGS</td>
<td>Cellar access on S side of bldg has no permanent cover allowing rain to doors to cover opening and curb</td>
<td>Provide steel cover w/ 2-hinged no permanent cover allowing rain to doors to cover opening and curb</td>
<td>1 EA</td>
<td>257 2</td>
<td>586</td>
</tr>
<tr>
<td>36</td>
<td>IE FLOOR DECKING</td>
<td>Decking rotted in bathroom locations due to water damage</td>
<td>Replace decking and structure if necessary w/ scabs</td>
<td>192 SF</td>
<td>206 2</td>
<td>772</td>
</tr>
<tr>
<td>37</td>
<td>IE FLOOR FLOORING</td>
<td>Floorin rotted over deck in 3 bathrooms</td>
<td>Replace flooring after deck has been replaced in bathroom areas</td>
<td>192 SF</td>
<td>309 2</td>
<td>1297</td>
</tr>
<tr>
<td>38</td>
<td>IE FLOOR COVERINGS</td>
<td>Vals deteriorated and soft in 3 bathrooms due to water damage</td>
<td>Replace Vals in 3 bathrooms over new flooring</td>
<td>192 SF</td>
<td>139 2</td>
<td>398</td>
</tr>
<tr>
<td>50</td>
<td>FS DETECTION FIRE DETECTION SYSTEM</td>
<td>Smoke detectors are not hardwired and need continual maintenance</td>
<td>Hardwire smoke detectors into existing fire detection system</td>
<td>8 EA</td>
<td>576 a</td>
<td>1617</td>
</tr>
<tr>
<td>78</td>
<td>HE WATER TREATMENT DOMESTIC</td>
<td>Water is not filtered or chlorinated</td>
<td>Provide new sand filter/chlorine contact system or interface w/ Salt Pond Motel system</td>
<td>1 EA</td>
<td>2500 2</td>
<td>4200</td>
</tr>
<tr>
<td>79</td>
<td>HE WATER TREATMENT WASTEWATER</td>
<td>Waste is not treated in septic system/Cesspool must be pumped regularly</td>
<td>Provide new septic system w/ tank/dist box/ and drain tile or interface w/ Salt Pond Mtl</td>
<td>1000 EA</td>
<td>1125 2</td>
<td>1825</td>
</tr>
<tr>
<td>89</td>
<td>HV HEATING PIPING</td>
<td>HW supply piping for 3 units is uninsulated/ System must run to keep pipes from freezing</td>
<td>Insulate HW piping w/cellular foam as far as practicable</td>
<td>200 LF</td>
<td>104 2</td>
<td>753</td>
</tr>
<tr>
<td>91</td>
<td>HV HEATING VALVES/TRAPS</td>
<td>Gate valve leaking on one circuit</td>
<td>Repair gate valve for leaks on one HW heating circuit</td>
<td>1 EA</td>
<td>15 2</td>
<td>38</td>
</tr>
<tr>
<td>106</td>
<td>HV TEMPERATURE CONTROL THERMOSTATS</td>
<td>Not a thermostat for each heating zone and an independent thermostat for boiler actuation</td>
<td>Install additional thermostats for each heating zone and for boiler itself</td>
<td>2 EA</td>
<td>154 2</td>
<td>493</td>
</tr>
<tr>
<td>112</td>
<td>PL WATER PIPING</td>
<td>HW piping not insulated</td>
<td>Insulate HW supply piping to eliminate freeze up and loss of heat</td>
<td>200 LF</td>
<td>67 2</td>
<td>395</td>
</tr>
</tbody>
</table>

FIGURE 2.
## JOB ORDER REQUEST

(See Instructions on Reverse)

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<thead>
<tr>
<th>JOB ORDER NO</th>
<th>FY</th>
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<th>DUPTION</th>
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<tr>
<th>ED START DATE</th>
<th>TARGET COMP. DATE</th>
<th>NO. OF UNITS</th>
<th>UNIT OF MEASURE</th>
<th>EST. COST PER UNIT</th>
<th>ACT. COST PER UNIT</th>
</tr>
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<th>HOLE AND LEVEL PROPOSED</th>
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<th>ENT OF WORK PROPOSED</th>
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</table>

<table>
<thead>
<tr>
<th>POSITION, TITLE, GRADE AND SURNAME</th>
<th>EST. MTDAYS</th>
<th>DAILY RATE</th>
<th>EST. COSTS</th>
<th>ACT. MTDAYS</th>
<th>ACTUAL COSTS</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>TYPE OF EQUIPMENT</th>
<th>EST. HRS/MIS</th>
<th>RATE</th>
<th>EST. COSTS</th>
<th>ACT. HRS/MIS</th>
<th>ACTUAL COSTS</th>
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<table>
<thead>
<tr>
<th>ITEM</th>
<th>EST. COSTS</th>
<th>ACTUAL COSTS</th>
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<table>
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<tr>
<th>COST ACCOUNT</th>
<th>PERSONAL SERVICES</th>
<th>EQUIPMENT RENTAL</th>
<th>SUPPLIES AND MATERIALS</th>
<th>OTHER</th>
<th>TOTAL</th>
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</table>

REQUESTED BY (Title & Signature)  
CONCURRED BY (Title & Signature)  
APPROVED BY (Title & Signature)  
MPLTETED BY

<table>
<thead>
<tr>
<th>DATE COMP.</th>
<th>INSPECTED BY</th>
<th>DATE INSPECTED</th>
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FIGURE 3.