

**HURRICANE FRAN
CEMETERY DAMAGE ASSESSMENT
& RECOMMENDATIONS**

FOR THE

**RALEIGH HISTORIC DISTRICTS
COMMISSION**

PREPARED BY:

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February 27, 1997



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February 27, 1997

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ATTRIBUTIONS
FOR
HURRICANE FRAN CEMETERY DAMAGE ASSESSMENT
AND RECOMMENDATIONS REPORT

Raleigh Historic Districts Commission, Inc.
Dan Becker, Executive Director, RHDC
David S. Maurer, Chair

Funding Support:

City of Raleigh, Parks & Recreation Department
National Trust for Historic Preservation
Oakwood Restoration Project Committee
Raleigh Cemetery Association
Raleigh Historic Districts Commission, Inc.

Acknowledgements:

Charles Gooch
Mark Senior
Betsy Shaw
Thomas M. Smith, Jr.
John C. Williams

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01. INTRODUCTION AND BACKGROUND

In the wake of Hurricane Fran, Kurt Eichenberger/architect was contacted by the Historic Districts Commission of the City of Raleigh to secure our services in carrying out an assessment of storm damages to the city's historic cemeteries, together with recommendations for repairing that damage. We were also asked by the city staff to make recommendations for reducing the potential for destruction in future storms, as well as suggesting what steps the city might take to enhance the condition of the cemeteries for which it has responsibility. Principally concerned were Mt. Hope and City Cemeteries, the two of the three city-owned burying places, although our report also contains recommendations which concern Oakwood Cemetery.

The Historic Districts Commission was fortunate in securing a Preservation Services Fund grant from the National Trust For Historic Preservation to help pay for this analysis. Matching funds for the grant came from the City of Raleigh, the Raleigh Historic Districts Commission, the Raleigh Cemetery Association, and the Oakwood Restoration Committee.

City Cemetery is the oldest of Raleigh's cemeteries, having been established by the North Carolina General Assembly in 1798 when it became clear that there was a need for burial space in the new state capital. The General Assembly made provision for the City Commissioners to lay off up to 4 acres of state-owned land adjacent to the city for a "public burying ground," and a plot was selected just east of East Street, then the city line. Additional land was added in the 1840's to increase the size of the cemetery to its current seven acres. City Cemetery was originally divided into four sections: two for residents, one for visitors, and a fourth for blacks, mainly slaves.

By the early 1870's, African-American residents of the city were complaining that the black section of City Cemetery was filled, and that provisions needed to be made for future burials. A. L. Lougee, Norfleet Dunston, and Joseph Prairie were named as commissioners to acquire a site. They picked a piece of property south of the (then) Governor's Mansion at the end of Fayetteville Street for Mount Hope, the new African-American cemetery. A cornerstone for a cemetery monument (no longer in existence) was laid on July 4, 1874. Additional land was later added to the original plot.

The two cemeteries, together with Oakwood Cemetery (founded in 1869) contain the resting places of many of the city's most prominent early residents. City Cemetery contains, for example, the graves of John Rex, who donated land to the city for its first hospital; William Peace, the benefactor of Peace College;

William White, N. C. Secretary of State (1798-1811); African-American educator Anna J. Cooper, and various Scottish stone masons who helped build the old State Capitol.

By the 1880's there were complaints that City Cemetery had fallen into disrepair. In the late 1890's an effort was made to upgrade the condition of the cemetery by, among other things, laying out the existing cobblestone and concrete carriage ways, and by enclosing its grounds with a handsome cast iron fence relocated from the State Capitol grounds.

In the 1930's, a fire at City Hall destroyed records for both City Cemetery and Mount Hope Cemetery. This put an end to sales of burial plots in the original sections of the burying grounds, although burials continue to be made when families can demonstrate their ownership of burial plots.

The improvement of City Cemetery in the 1890's was the first of periodic attempts at refurbishing the city's cemeteries, usually following a decade or two of neglect. In 1966, for example, a City Cemetery Commission was formed under the Raleigh Historic Sites Commission, with its goal as carrying out a program to preserve, beautify and restore the burying ground. A public dedication ceremony was held several months later to celebrate their efforts. Never-the-less, in 1973 the Wake County Historical Society was again complaining about the poor condition and poor maintenance of the cemetery. A cemetery advisory committee was appointed to work with the Parks and Recreation Department, historical research was carried out and a pamphlet produced for City Cemetery, and additional planting was done. A clean-up effort was launched in Mt. Hope Cemetery. By the early 1980's there were again complaints about the condition of burials in City Cemetery.

The Raleigh Parks and Recreation Department, which administers the City's cemeteries, provides maintenance for the cemetery grounds and for the landscape aspects of the burial plots. However, the City does not acknowledge any responsibility for maintaining gravestones, monuments or burial plot enclosures. The City asserts that these elements are legally the responsibility of the owners of the burial plots. Unfortunately, with the destruction of ownership records, and given the age of the burials, it is difficult to determine or contact any responsible person for most of the plots. The havoc wreaked by the hurricane was thus overlaid on the existing poor condition of burial markers at the city-owned cemeteries. It should be noted that the City is apparently not precluded by law from carrying out repairs to gravestones, since several other North Carolina communities have done so.

The high winds and heavy rain of Hurricane Fran caused substantial damage to Oakwood, City and Mt. Hope Cemeteries primarily through the medium of overturned trees and falling branches. In all three cemeteries, large oaks and maples (and some smaller cedar and pear trees) were toppled from the roots. Damage to grave markers was caused both by the impact of falling trunks and branches, and by the uplifting of stones and plot borders by the root balls of the trees. In some cases, the root balls that were upturned included elements from burials that had been overgrown. Some erosion damage occurred at Oakwood, where a stream flows through the cemetery, and along paved drives at Mt. Hope. The following sections evaluate and quantify damage caused to burials, monuments and landscape features. They also include suggestions for methods to repair the damage, to prevent further destruction, and to upgrade the condition of the cemeteries.

We recommend that the following process be followed:

1. General cleanup in cemeteries, removing branches, trunks and root balls in non-sensitive areas (see "Landscape Damage Assessment and Recommendations for Stabilization-Mt. Hope Cemetery," "Landscape Damage Assessment and Recommendations for Stabilization-City Cemetery," "Fallen Tree and Branch Removal Procedures," "Marker Damage Assessment-City Cemetery," "Marker Damage Assessment-Mt. Hope Cemetery," and "Identification of Disturbed Burial Sites").
2. Carry out archeological investigation of disturbed burial sites (see "Identification of Disturbed Burial Sites," and "Estimates for Repairing Storm Damage to Burials").
3. Remove the remaining tree trunks and root balls in coordination with the gravestone conservation contractor (see "Marker Damage Assessment-City Cemetery," "Marker Damage Assessment-Mt. Hope Cemetery," and "Documentation and Storage Procedures").
4. Carry out conservation procedures on grave markers (see "Marker Damage Assessment-City Cemetery," "Marker Damage Assessment-Mt. Hope Cemetery," and "Specifications for Marker Repair and Cleaning").
5. Co-incident with items 1.-4., begin the master planning process for each of the historic cemeteries (see "Master Plan Recommendations").

HARGETT STREET

SEC. J

SITE 10 (1)

SEC. H

SITE 11 (10)

SITE 12 (6)

SITE 13 (8)

SITE 14 (12)

SITE 15 (17)

SITE 16 (18)

SITE 17 (18)

SITE 18 (18)

SEC. G

SEC. F

SEC. E

SEC. D

SEC. C-2

SEC. C-1

SEC. B

SEC. A

MAIN DRIVE

MORGAN DRIVE

NEW BERN AVENUE

FAST STREET

— TOTAL ACRES 7.3

— ORIGINAL ACRES 4.0

FIRE STATION

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(Tree Numbers)

02. MARKER DAMAGE ASSESSMENT CITY CEMETERY

Site No. 1

Large oak tree fallen to the south, raising approximately 10 foot diameter root ball. Large hole below root ball into which (1) small white marble tablet has fallen. Two granite pier corners of Poole Family enclosure dislodged by rising root ball, including metal pipe railings which join them. Granite curbing also upturned by root ball. (1) large granite stone overturned to the east of the trunk. (1) large granite stone knocked off base to the west of the trunk.

Tasks:

1. Retrieve marble tablet from hole and store tablet. Re-set tablet after hole is filled in and compacted as per cemetery standards.
2. Re-set corner posts of Poole Family enclosure. Set pipe railings back into corner posts.
3. Re-set granite curbs.
4. Re-mount granite gravestone to west.
5. Re-mount granite gravestone to east.

Site No. 2

Heavy oak limb fallen across large (approx. 2 ft. x 4 ft. x 2 in thick) white marble tablet gravestone, snapping stone in half cleanly below grade level. One "ear" of tablet sheared off diagonally through gravestone shaft.

Tasks:

1. Retrieve base of tablet from ground. Clean both pieces of marble and drill, pin and epoxy together two halves of tablet. Re-set tablet in pea gravel in ground.
2. Re-adhere "ear" with epoxy adhesive.

Site No. 3

Large oak tree fallen to the southwest with approximately 12 foot diameter root ball exposed. (2) large, granite grave markers have fallen into root hole. Granite corner posts of adjacent burial plots have been dislodged. Corner post and sections of

granite curbing are suspended on root ball. Pipe railing pulled from corner post. Limbs down or suspended over stones, creating potential for further damage.

Tasks:

1. Retrieve curbing and corner posts from root ball. Re-set corner posts, curbing and rail after hole filled in and compacted as per cemetery standards.
2. Retrieve (2) granite stones from hole. Re-set after hole filled in.

Site No. 4

One foot diameter maple tree down. Root ball has lifted and broken concrete curbs of two adjoining plots.

Tasks:

1. Retrieve curbs from root ball. When root ball hole has been filled in and compacted, re-set concrete curbs in original positions.

Site No. 5

Two foot diameter maple tree fallen to west. Root ball has lifted multiple stones. (2) white marble grave markers incorporated in root ball. (1) white marble cross on white marble shaft, marble base and granite foundation stones, all overturned by root ball. New chips missing around edge of cross.

Tasks:

1. Retrieve grave markers from root ball. After root hole is filled in and compacted, re-set small white marble markers in original location.
2. After root hole is filled in and compacted, re-set granite base stones below grade in original location. Clean elements of marble cross marker. Put marble base back in place and re-install marble shaft and cross using new nylon pins and epoxy adhesive. Re-adhere large chips to cross with epoxy adhesive.

Site No. 6

Approximately 18 inch oak fallen to south. Small white marble grave marker fallen in hole. Gray marble shaft adjacent to tree shifted on base.

Tasks:

1. Retrieve white marble grave marker from hole. When root hole is filled in and compacted, re-set marker in original location.
2. Re-set gray marble shaft on base. Provide new nylon pin and epoxy adhesive between pieces.

Site No. 7

Root ball of large fallen maple has lifted section of granite curbing, also adjacent concrete curbs. Shaft of granite corner marker broken in two cleanly. Trunk of fallen tree on top of several white marble markers near root ball, but with no apparent new damage to markers.

Tasks:

1. Retrieve marble markers from beneath and immediately-adjacent to the tree trunk. After trunk is removed, re-set markers in ground in their original positions.
1. Re-combine pieces of granite corner post with nylon pin and epoxy adhesive.
2. When root hole is filled in and compacted, re-set granite and concrete curbs.

Site No. 8

Cedar tree fallen to the west, pulling up loose brick from corner of family plot enclosure.

Tasks:

1. Collect brick from root hole and re-lay them along top edge of vault using Type N mortar mix composed of 1 part white portland cement, 1 part hydrated lime and six parts sand.

Site No. 9

Large maple tree split in half, with trunk sections falling to north and south. (1) 4 inch thick granite tablet knocked off base stones, chip broken from side. (1) white marble tablet knocked out of plumb.

Tasks:

1. Remove white marble stone from ground and re-set plumb.
2. Place granite base stones back in their original locations, providing compacted pea gravel beds. Secure tablet to base stones with epoxy adhesive and one nylon pin per bearing point.

Site No. 10

14 inch diameter cedar tree fallen to south. Sections of concrete curbing broken and depressed by tree trunk.

1. When tree is removed, re-set curb sections, providing compacted earth or pea gravel as supporting bed below the curb sections.

Site No. 11

(2) small, white marble tablets knocked over by large branch.
(1) white marble tablet and base overturned. (1) white marble tablet knocked askew on base.

Tasks:

1. Straighten white marble tablet on base, using epoxy adhesive to join the two sections.

2. Look for bases of two small white marble tablets. If bases can be found, reattach tablets to bases with pins and epoxy adhesive.

3. Set white marble tablet and base upright in original location. Secure tablet to base with pins and epoxy adhesive.

Site No. 12

Root ball of large tree fallen to west has overturned (1) granite marker and raised (2) others from their beds.

1. When root ball is removed and hole filled and compacted, re-align the two raised stones.

2. Set overturned granite marker upright in original location.

Fig. 1
City Cemetery
Site 1.



Fig. 2
City Cemetery
Site 1.

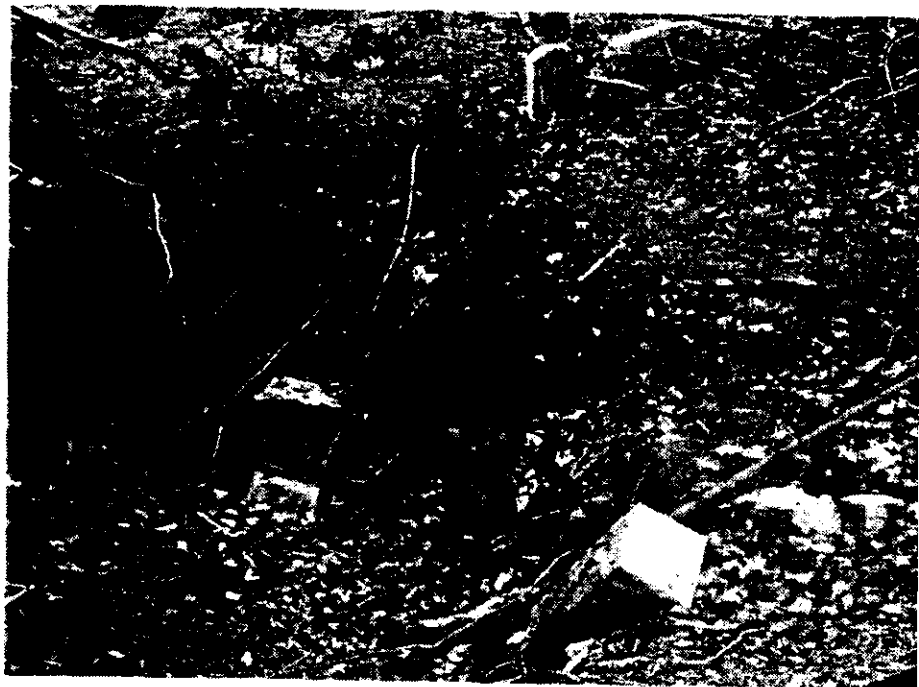


Fig. 3
City Cemetery
Site 1.



Fig. 4
City Cemetery
Site 1.



Fig. 5
City Cemetery
Site 2.



Fig. 6
City Cemetery
Site 3.



Fig. 7
City Cemetery
Site 3.



Fig. 8
City Cemetery
Site 3.



Fig. 9
City Cemetary
Site 4.



Fig. 10
City Cemetary
Site 4.



Fig. 11
City Cemetary
Site 5.



Fig. 12
City Cemetery
Site 5.

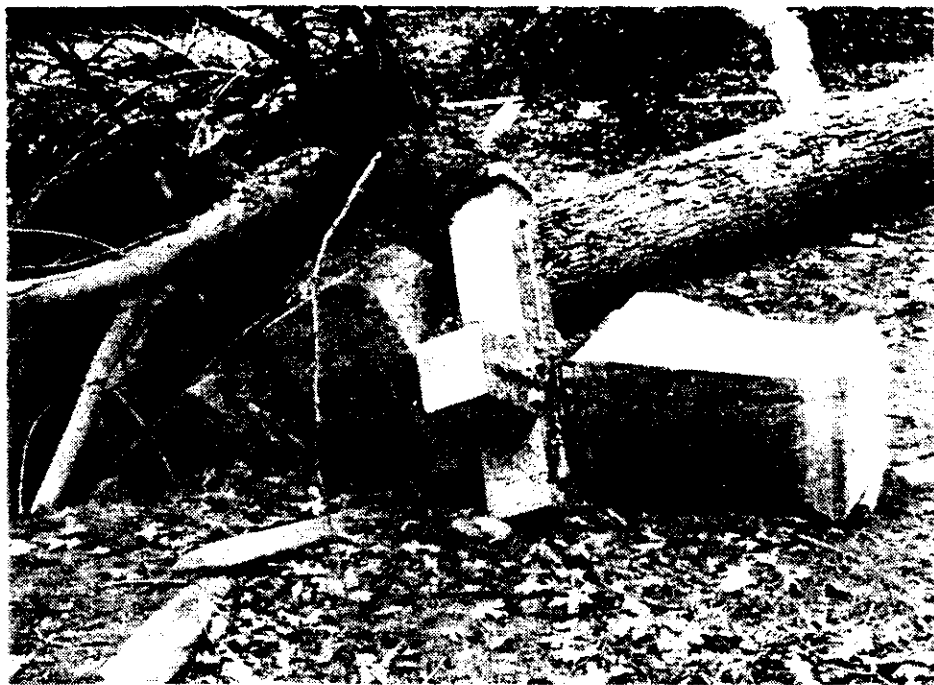


Fig. 13
City Cemetery
Site 6.

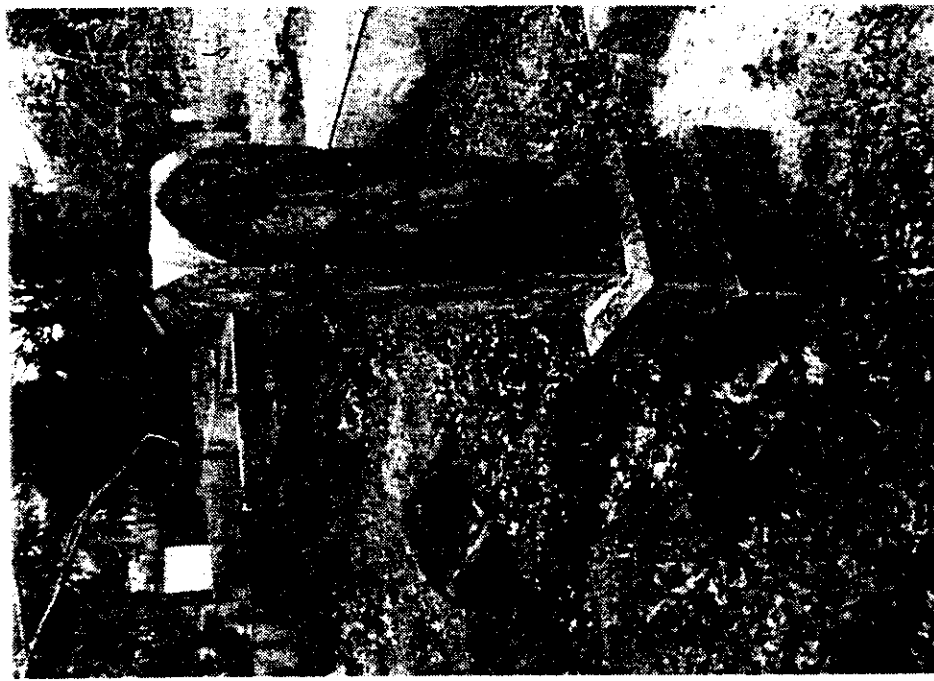


Fig. 14
City Cemetery
Site 6.



Fig. 15
City Cemetery
Site 6.



Fig. 16
City Cemetery
Site 7.



Fig. 17
City Cemetery
Site 7.



Fig. 18
City Cemetery
Site 7.



Fig. 19
City Cemetery
Site 8.

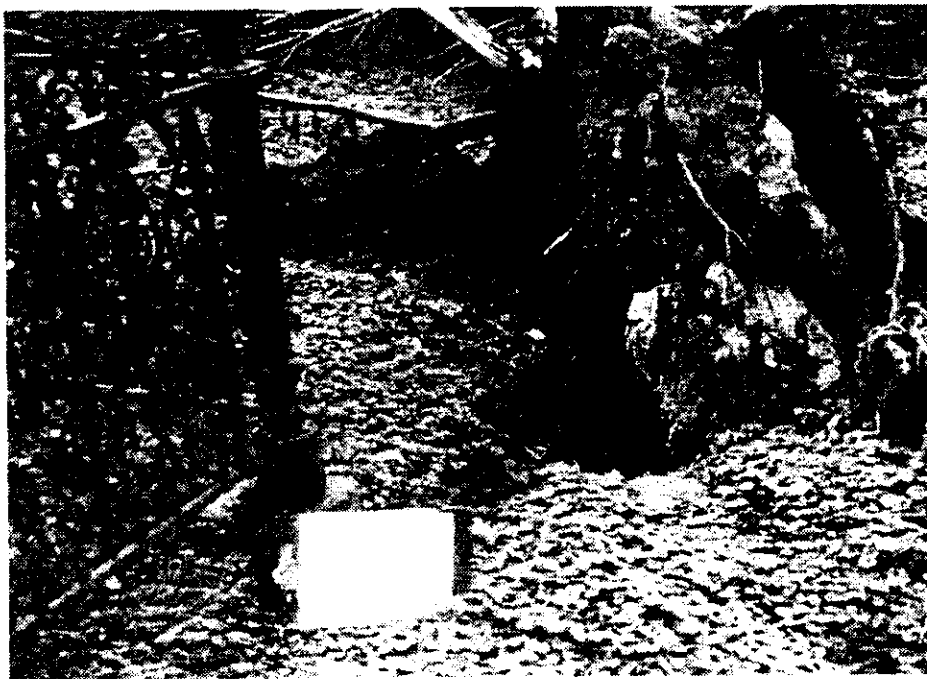


Fig. 20
City Cemetery
Site 9.



Fig. 21
City Cemetery
Site 9.



Fig. 22
City Cemetery
Site 9.



Fig. 23
City Cemetery
Site 10.



Fig. 24
City Cemetery
Site 11.



Fig. 25
City Cemetery
Site 11.

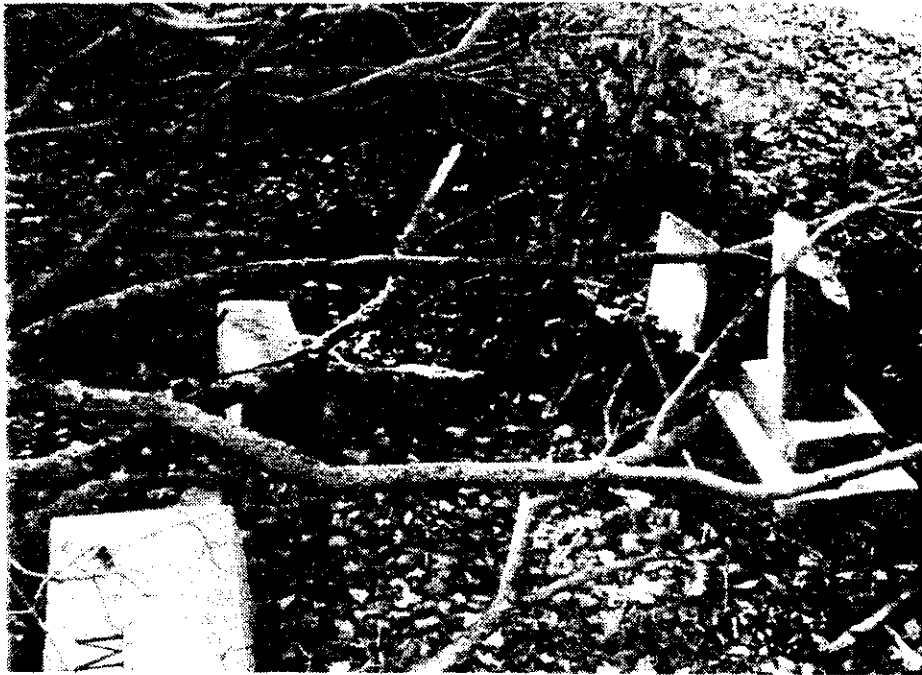


Fig. 26
City Cemetery
Site 12.



Fig. 27
City Cemetery
Site 12.



03. MARKER DAMAGE ASSESSMENT MOUNT HOPE CEMETERY

Site No. 1

Approx. 2 ft. diameter maple fallen to the south, raising approx. 6 ft. diameter root ball. Section of granite curbing broken into two major and several minor pieces. Two sections of curbing and one granite corner post lodged in root ball. Additional section of granite curbing dislodged along top of slope. Several small, white marble gravestone pieces scattered beneath and adjacent to tree trunk, in danger of further damage. Approximately 1 ft. diameter cedar fallen adjacent to maple tree, raising section of concrete curbing.

Tasks:

1. Mark location of loose marble gravestone pieces and remove from area until tree trunks are cleared away. Reset stones in burial plot.
2. Retrieve curbing and corner post from root ball. When root ball is removed and hole refilled and compacted as per cemetery standards, re-set corner post and undamaged curbing.
3. Re-adhere granite chips to curbing section.

Site No. 2

Magnolia limbs fallen across grave marker, knocking (1) gray marble tablet off its base. Tablet originally secured with two steel pins and mortar.

Tasks:

1. Re-set marble tablet on base, replacing iron pins with stainless steel pins, and using epoxy adhesive.

Site No. 3

Tree fallen to southwest, knocking heavy gray granite tablet askew on base.

Tasks:

1. Re-set granite tablet on base.

Site No. 4

Approximately 1 foot diameter pine tree fallen to south. (1) granite cross knocked from base, causing chipping along edges of cross. Segment of white marble curbing around burial dislodged by tree crown. (1) gray marble tablet knocked from base.

Tasks:

1. Re-set granite cross on base with new nylon pin and epoxy adhesive. Re-adhere larger chips to cross with epoxy adhesive.
2. Re-set marble curbing.
3. Re-set gray marble tablet on base.

Site No. 5

Approximately 8 inch diameter cedar fallen to west. Raised root ball has toppled substantial gray granite tablet, uplifted tablet's base and several sections of concrete curbing.

Tasks:

1. After root ball is removed, and hole filled and compacted, put granite base back in place and lift granite tablet onto base (no mortar required).
2. Re-set concrete curbing.

Site No. 6

Cedar with 8 inch trunk down to northeast. Corner segment of concrete curbing lifted by root ball.

Tasks:

1. After root ball is removed and hole filled and compacted, put concrete curbing back in place.

Site No. 7

Oak with approximately 18 inch trunk fallen to southwest across unpaved drive. (1) 8 inch thick North Carolina granite tablet knocked off high base. (1) 4 inch thick gray granite tablet toppled (no apparent base, no break) by limbs. (1) narrow cast stone shaft snapped in half cleanly. Corner of cast stone shaft broken off and missing.

Tasks:

1. Re-set granite tablet on base, using two new nylon pins and epoxy adhesive.
2. Set 4 inch granite tablet upright, providing new pea gravel setting bed, if necessary.
3. Repair break in cast stone shaft with 1 nylon pin and epoxy adhesive. Re-adhere corner segment with epoxy adhesive, if segment can be located.

Site No. 8

Heavy oak limb has clipped gray marble tablet, knocking it from its base and breaking large chips from the bottom of the tablet.

Tasks:

1. Re-adhere chips to tablet with epoxy adhesive. Re-set tablet on base with epoxy adhesive, first cleaning existing metal pins.

Site No. 9

Very large oak (approx. 4 foot diameter) fallen to south, adjacent to drive. No new damage to stones, but trunk of tree suspended over marble tablets.

Tasks:

1. Provide cribbing to protect marble tablets from damage during removal of tree.

Site No. 10

Small cedar tree partially-uprooted, trapping white marble headstone against concrete curbing.

1. If tree is to be removed, take weight of tree from stone and carefully remove stone. After hole is filled in and compacted, replace marker in original position.

Site No. 11

Approximately 18 inch diameter cedar tree fallen against adjacent tree. Multiple stones located under trunk.

1. Provide cribbing around stones to protect them while tree is removed.

Site No. 12

Two-foot diameter pecan tree split in half. Grave markers and concrete curbing trapped in root ball. (1) concrete tablet broken in two.

Tasks:

1. Carefully remove markers and curbing from root ball while tree trunk is being cleared away. After root hole is filled and compacted, replace markers to as near their original location as is possible.
2. Repair break in concrete headstone with two pins and epoxy adhesive.

Site No. 13

One-foot diameter pear tree fallen to south. Segments of concrete curbing caught in root ball, lifted out of place.

Tasks:

1. Retrieve curbing from root ball. After root hole is filled in and compacted, re-set curbing sections in original position.

Site No. 14

One-foot diameter maple fallen to south. Concrete curbing broken and uplifted by root ball of tree.

Tasks:

1. When root ball is cleared away and hole filled and compacted, re-set curbing in its original location.

Site No. 15

Approximately three foot diameter pecan tree has uprooted and broken sections of granite curbing. Trunk is suspended over multiple granite headstones.

1. Provide cribbing to protect headstones while trunk is being removed.
2. After trunk is removed and root hole filled and compacted, re-set curbing in its original location.

Site No. 16

Fall of large maple has broken and dislodged sections of concrete curbing.

Tasks:

1. Re-set concrete curbing after tree is removed.

Fig. 1
Mt. Hope Cemetery
Site 1.



Fig. 2
Mt. Hope Cemetery
Site 1.



Fig. 3
Mt. Hope Cemetery
Site 1.



Fig. 4
Mt. Hope Cemetery
Site 2.



Fig. 5
Mt. Hope Cemetery
Site 2.

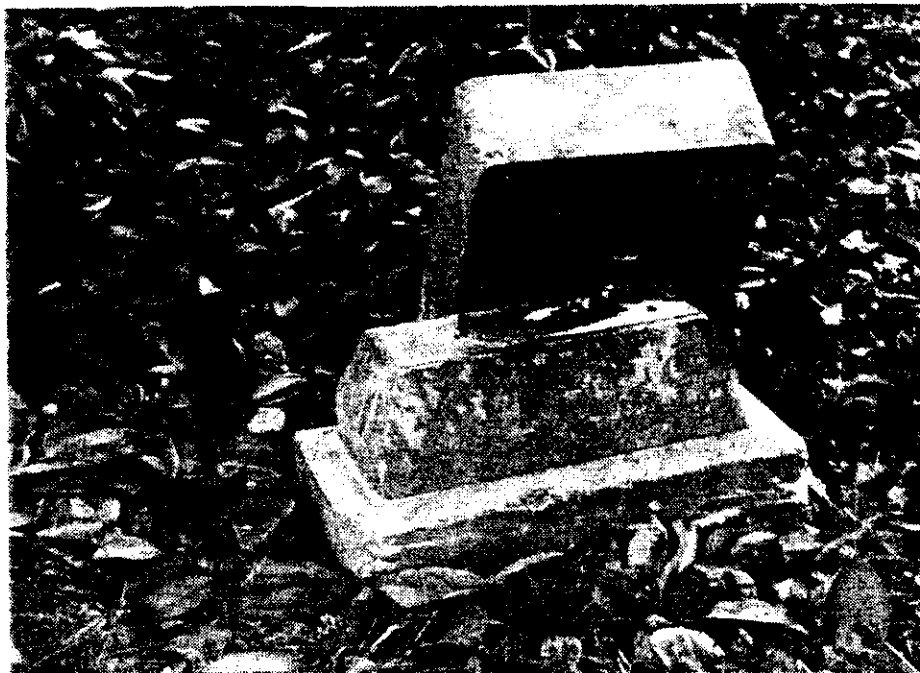


Fig. 6
Mt. Hope Cemetery
Site 3.



Fig. 7
Mt. Hope Cemetery
Site 4.



Fig. 8
Mt. Hope Cemetery
Site 4.



Fig. 9
Mt. Hope Cemetery
Site 5.



Fig. 10
Mt. Hope Cemetery
Site 6.

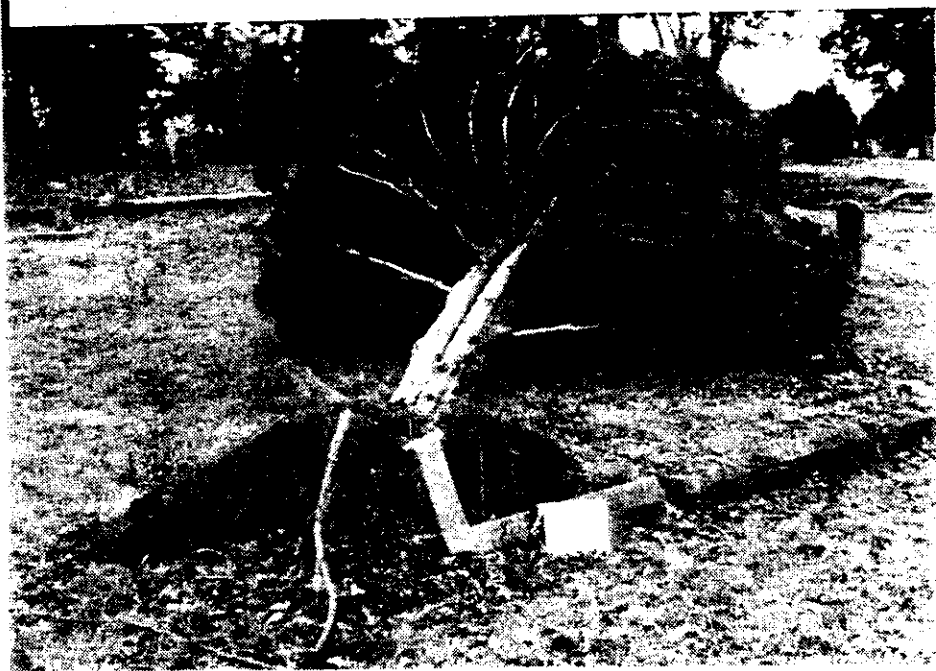


Fig. 11
Mt. Hope Cemetery
Site 7.



Fig. 12
Mt. Hope Cemetery
Site 7.



Fig. 13
Mt. Hope Cemetery
Site 7.

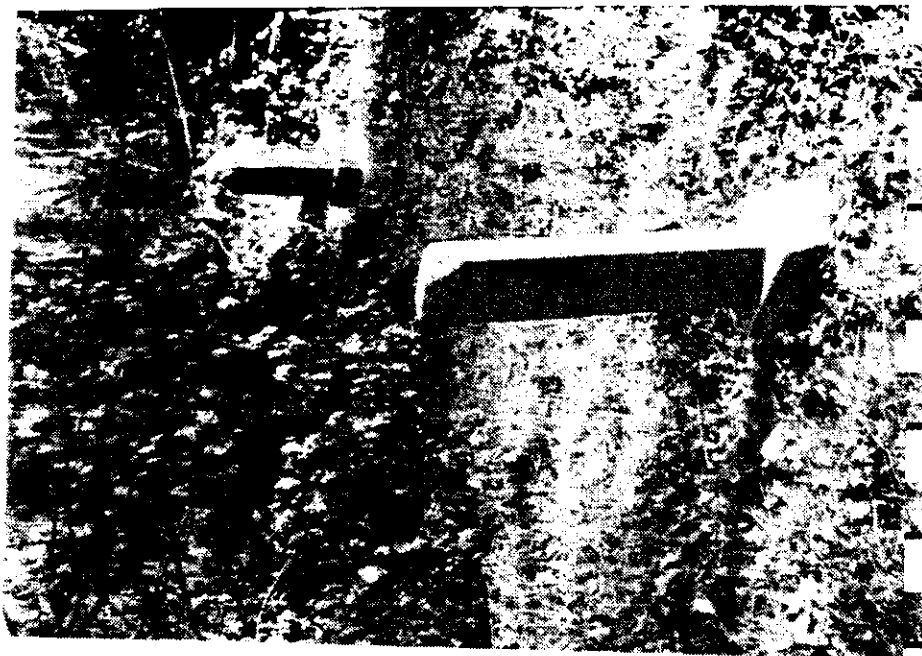


Fig. 14
Mt. Hope Cemetery
Site 8.



Fig. 15
Mt. Hope Cemetery
Site 9.



Fig. 16
Mt. Hope Cemetery
Site 10.



Fig. 17
Mt. Hope Cemetery
Site 11.



Fig. 18
Mt. Hope Cemetery
Site 12.



Fig. 19
Mt. Hope Cemetery
Site 13.



Fig. 20
Mt. Hope Cemetery
Site 14.

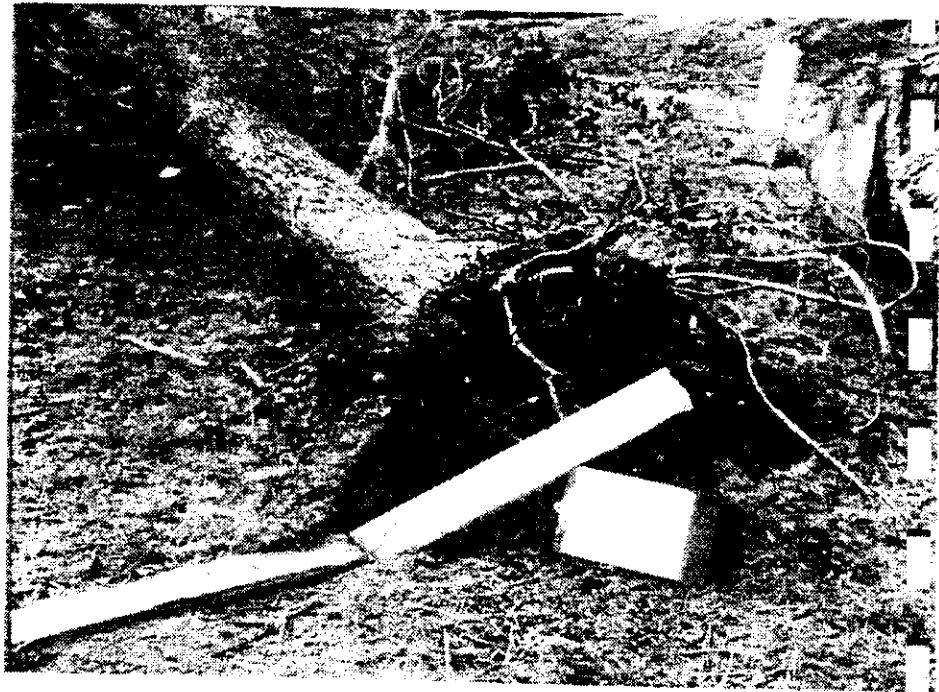


Fig. 21
Mt. Hope Cemetery
Site 15.



Fig. 22
Mt. Hope Cemetery
Site 13.

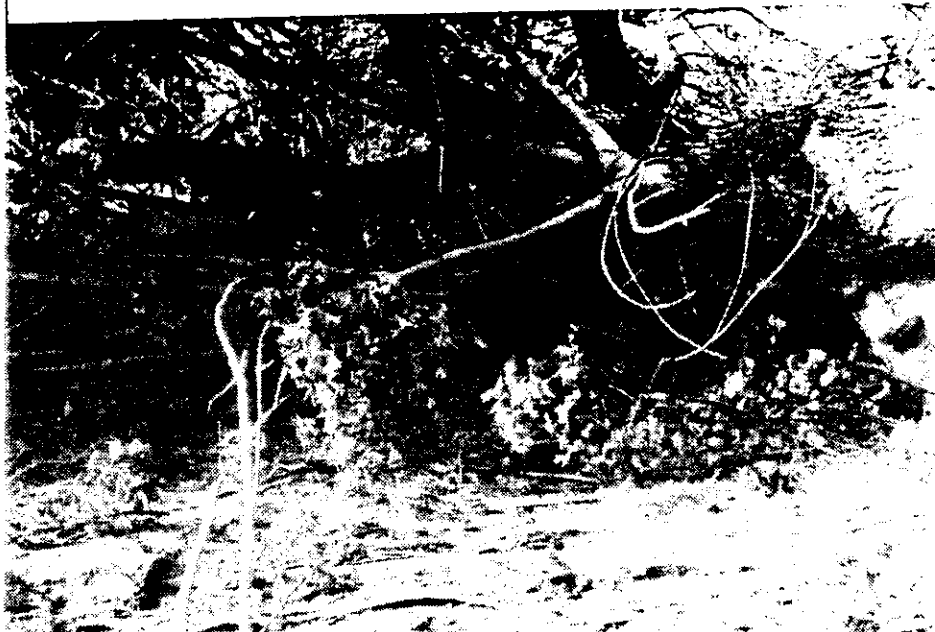


Fig. 23
Mt. Hope Cemetery
Site 13.



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04. MATERIAL QUANTITIES AND COST ESTIMATES FOR MARKER REPAIR

The following statements of probable repair costs are for the work tasks described in the damage assessments in items 02. and 03. The cost figures for epoxy repair of individual markers are based on information provided by Dean Reudrich, a general contractor with substantial experience in this type of repair.

CITY CEMETERY

Site No.	Tasks	Est. Cost	Total
1	Re-set (1) marble tablet Re-set granite curbing and pipe railings Re-mount (2) granite headstones	1 @ \$100.00 \$500.00 2 @ \$150.00	\$100.00 \$500.00 \$300.00
2	(1) clean and pin (2 pins) white marble marker (1) re-adhere "ear" with epoxy adhesive	1 @ \$450.00 1 @ 50.00	\$500.00
3	Re-set granite curbing and pipe railings (2) retrieve and re-set granite headstones	\$500.00 2 @ \$150.00	\$500.00 \$300.00
4	Re-set concrete curbs	\$300.00	\$300.00
5	Re-set (2) marble markers Provide new foundation, repair and re-pin 3 part marble cross marker	2 @ \$100.00 \$700.00	\$200.00 \$700.00
6	Re-set (1) marble marker Re-set gray marble shaft on base with new pin and epoxy adhesive	\$100.00	\$300.00
7	Re-set granite and concrete curbs Repair granite corner post with pin and epoxy adhesive Re-set (3) marble markers	\$300.00 \$200.00 3 @ \$100.00	\$300.00 \$200.00 \$300.00
8	Masonry repair to brick vault	\$300.00	\$300.00
9	Repair and re-set granite marker with 2 pins and epoxy adhesive on new foundation Re-set (1) marble marker	\$500.00 \$150.00	\$500.00 \$150.00
10	Re-set curb sections on new foundation	\$300.00	\$300.00
11	Re-set (4) marble tablets with pin and adhesive	4 @ \$150.00	\$600.00
12	Re-set (3) granite markers	3 @ \$200.00	\$600.00
	Contingency @ 10%		\$695.00
	Contractor's overhead and profit @ 30%		\$2293.50
	Archeological Costs		\$1050.00
	Total Cost		\$10988.50

MOUNT HOPE CEMETERY

Site No.	Tasks	Est. Cost	Total
1	Re-set concrete curbing Repair and re-set granite curbing Re-set (3) marble headstones	\$100.00 \$500.00 3 @ \$100.00	\$100.00 \$500.00 \$300.00
2	Re-set marble tablet on base with new stainless steel pins and epoxy adhesive	\$300.00	\$300.00
3	Reposition granite marker on base	\$200.00	\$200.00
4	Re-set granite cross on base with new pin and epoxy adhesive Re-adhere chips to cross with epoxy adhesive	\$300.00 \$100.00	\$300.00 \$100.00
5	Re-set granite monument and base Re-set concrete curbing	\$300.00 \$100.00	\$300.00 \$100.00
6	Re-set concrete curbing	\$100.00	\$100.00
7	Re-set (1) granite tablet on base with 2 pins and epoxy adhesive Re-set granite tablet Repair (1) cast stone shaft with nylon pin and epoxy adhesive	\$300.00 \$200.00 \$300.00	\$300.00 \$200.00 \$300.00
8	Re-set (1) marble tablet on base with existing pins and epoxy adhesive Re-adhere chips to marble tablet with epoxy adhesive	\$300.00 \$100.00	\$300.00 \$100.00
9	Provide cribbing for protection of headstones	\$500.00	\$500.00
10	Protection and re-setting of marble headstone	\$200.00	\$200.00
11	Provide cribbing for protection of headstones	\$500.00	\$500.00
12	Re-set markers and curbing Repair (1) concrete headstone with pins and epoxy adhesive	\$200.00 \$300.00	\$200.00 \$300.00
13	Re-set concrete curbing	\$200.00	\$200.00
14	Re-set concrete curbing	\$200.00	\$200.00
15	Provide cribbing to protect stones Repair and re-set granite curbing	\$300.00 \$300.00	\$300.00 \$300.00
16	Re-set concrete curbing	\$200.00	\$200.00
	Contingency @ 10%		\$640.00
	Contractor's overhead and profit @ 30%		\$2112.00
	Archeological Costs		\$1050.00
	Total		\$10202.00

NOTE: Tree and root ball removal costs will be much greater than ordinary tree removal costs. We estimate that costs will vary from \$500.00 to \$1,500.00 per tree depending upon the amount of hand work required to remove artifacts from root ball, and amount of hand work required to remove large trees from around graves without damaging them.

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05. CONSERVATION PROCEDURES FOR MARKER REPAIR

Most of the gravestone damage in City Cemetery and Mt. Hope Cemetery affects white or grey marble markers, or gray granite markers. Also involved are concrete or gray granite plot borders, a brick enclosure, and at least two cast-stone markers. The repair techniques described in the appended specifications are appropriate for repairing marble, granite and cast stone markers. We would like to acknowledge the assistance of gravestone repair contractor Dean Reudrich, Stephens and Francis, Architects, architectural conservator Peter B. Sandbeck, and staff of the North Carolina State Historic Preservation Office in providing information used to compile these specifications.

Storm damage to burial plots and gravestones generally takes three different forms:

1. Uprooted boundary stones, footstones and gravestone bases, and modern granite gravestones detached from their bases without being broken. This type of damage may be repaired by monument workers using standard setting techniques and equipment.

2. Headstones broken cleanly into two or more large pieces. This type of damage requires the skills of an artisan or conservator familiar with plastic stone repair and the use of epoxies.

3. Gravestones missing small chips or broken into pieces smaller than 6 inches square. This is the most difficult category of repairs to complete satisfactorily, from an esthetic and practical point of view, and any repairs may have a limited lifetime. Such work should only be carried out by an artisan or conservator with considerable experience in plastic stone repair and the use of epoxies.

Some other complicating factors are the size of the elements involved and the type of stone that is to be repaired. Very large stones are difficult to handle and may require either special lifting equipment of the type used by monument works or portable scaffolding with a chain hoist and straps. The techniques described in this report should not be used on sandstone (brownstone), slate, or on stones which are fragile or which have numerous interior fractures. Fortunately, there are few of these stones in Raleigh's city cemeteries.

The techniques used for repair of gravestones have evolved over the last twenty years on two parallel tracks. The building stone industry now uses a mix of structural adhesives to repair and join pieces of stone. Where two pieces of granite are being joined, as in the construction of burial vaults, epoxies are the

favored material. Epoxies are also used to join marble elements, supplemented by polyester adhesives where the element will not be exposed to weathering.

Architectural and material conservators have also been experimenting with a variety of repair methods for building stones and gravestones. Current practices call for joining stones with nylon or stainless steel threaded rods secured with a high-strength structural epoxy. While epoxy was at one time used to make a bond across the entire fracture, and to fill gaps in the stone, concerns about trapping moisture in the stone and the limited resistance of epoxies to ultraviolet radiation have reduced epoxy use to serving as an anchoring medium and spot adhesive. In general, where gap-filling is desirable for aesthetic reasons, the gap-filling role has been turned over to cementitious mortars specially formulated for stone patching, such as the Jahn System.

No one, either the building stone industry or conservators, appears to have a reliable, long-term answer to the question of repairing small chip damage to stones. Neither cyanoacrylate (recommended by the North Carolina Granite Company) or epoxy is likely to be a permanent solution, but epoxy and cementitious repairs probably represent the best options now available.

In general, gravestones should not be cleaned unless conservation work is being undertaken and there is a need to match the underlying stone color or to remove soil which could interfere with the bonding of adhesives. Almost any cleaning method will result in some erosion of, or damage to the material being cleaned, so cleaning for cosmetic reasons should be limited. Most stones in our area which would require cleaning are of white or grey marble, and with these soft and porous stones there is a high potential for damage with most cleaning methods.

The least damaging technique is to use water at low pressure to flood the surface of the stone for at least six hours and for up to twenty-four hours. A simple system of mist nozzles (available from major garden supply houses) on stands can be set up which provide a constant one to two-gallons per minute. The gentle pressure and solvent action of the misting water will loosen and sometimes remove dirt. Obviously, this and other cleaning or repair techniques which involve water should not be carried out in freezing weather or when sub-freezing temperatures are expected within the next 48 hours. It is also essential to have a water supply that has a low content of iron and other dissolved minerals which might stain the stone. For this reason, well water should be avoided.

If dirt or other deposits are still present after the stone has been misted for a substantial period, scrubbing the stone gently

with a soft, non-metallic bristle brush may be sufficient to remove the soil. Usually, a combination of gentle brushing and continued rinsing is very effective, but any form of scrubbing may abrade the surface of the stone, so it is important to monitor the process closely and to stop immediately if any erosion is detected.

If the extended soaking method is not practical for a given situation, a simplified method involves saturating the stone thoroughly with a wide-angle spray nozzle and garden hose, then using a soft bristle brush to gently scrub the surface while continuing to use the spray to float soil away. The purpose of water in this method is to soften soil and carry it away. Do not use pressures greater than 60 psi as this will likely result in damage to the stone's surface.

In some situations, additional cleaning may be required after water methods have been tried. Detergent cleaning with a gentle non-ionic detergent such as Amway's LOC, Triton-X by Rohm and Haas, Igepal, or Photo-Flo by Kodak (available at photo supply stores) should be safe and effective for most stones. More stubborn staining may require the use of an ammonia solution. Very heavy soiling of marbles and limestones may need a proprietary limestone cleaning system.

With these and any other cleaning methods, a test should be made first on a small area of the stone, preferably on the rear.

For further information on gravestone repair and cleaning see:

Strangstad, Lynette. A Graveyard Preservation Primer. (American Association for State and Local History, 1988)

Sandbeck, Peter. The Conservation and Cleaning of Historic Gravestones. North Carolina Historic Preservation Office Newsletter, Fall 1994.

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06. FALLEN TREE AND BRANCH REMOVAL PROCEDURES

Note: The procedures described below are inherently dangerous and should be performed only by tree removal contractors familiar with the shifting dynamics of fallen trees. These procedures are in no way meant to supplant or interfere with standard safety practices for this type of work.

1. If the trunk of the fallen tree is supported by its branches and there are gravestones beneath or near the trunk and root ball, provide timber cribbing adequate to support the trunk before removing any branches. Do not brace cribbing against headstones, curbing, graves or other cemetery elements.
2. If broken stones or pieces of stones are beneath the fallen tree's branches, document their location (see Documentation and Storage Procedures) and remove them.
3. Taking care to avoid further damage to adjacent monuments, saw-cut branches into short lengths, working from the branch tips to the trunk of the tree. Keep trucks and trailers on paved roads and off of road shoulders, paths or lawns while loading branches for removal.
4. If the site has not been marked for special archeological procedures (see "Estimates for Repairing Storm Damage to Burials"), remove as much soil as possible from the root ball using hand implements or high-pressure, low-volume water spray. Note that soils in the cemetery may be contaminated with arsenic or disease pathogens (see "Additional Archeological Concerns Related to Storm Damage").
5. When the soil has been removed from the root ball, saw-cut the root ball into sections small enough to remove by hand, wheelbarrow or hand truck. Stump grinders may be used only with the prior approval of the Project Manager. If portions of the root ball are supporting the trunk, leave them in place until the trunk has been safely removed. Brace the root ball with timber cribbing adequate to support the root ball's weight. Do not brace cribbing against headstones, curbing, graves or other cemetery elements.
6. Saw-cut the trunk of the tree into short lengths, working from the top to the bottom of the trunk. Split the trunk sections into segments small enough to remove by hand, wheelbarrow or hand truck. Do not use backhoes, bobcats or other mechanized equipment without prior clearance.

7. Remove all cribbing and bracing and fill in any remaining depressions with clean soil compacted as per cemetery custom or standards.

8. Rake the lawn and graves around and under the fallen tree and collect debris. Examine raked-up debris for fragments of gravestones.

07. DOCUMENTATION AND STORAGE PROCEDURES

1. Make a hand-drawn plan sketch of each site showing the location of the major features of the site (headstones, stone borders, trees, etc.).
2. Make a careful examination of the ground around and under the fallen tree.
3. Collect chips and small pieces (less than 2 inches square) and place them in ziplock bags, one per area where the chips are located. On the outside of the bag, with an indelible magic marker, write the cemetery name, site number, and a letter (A, B, C etc.) for each area where pieces are collected. If the chips or pieces are located next to a gravestone, also mark the bag with the name shown on the stone. On the site sketch, mark the each bag's letter at the approximate location where it was found.
4. Collect pieces larger than 2 inches square, but small enough for one person to handle easily, and wrap them in several layers of plastic garbage bags. Secure each package with duct tape and write on the duct tape the cemetery name, a site number, and a letter (not one assigned previously). If the pieces are located next to a gravestone, also mark the bag with the name shown on the stone. On the site sketch, mark each bag's letter at the approximate location where it was found.
5. Place the wrapped and identified pieces in a sturdy cardboard box with lid. Pad the bags or wrapped pieces with foam peanuts or newspaper so that they will not knock against each other. On the lid of the cardboard box mark the cemetery name, site number and area letters for materials which are contained in the box.
6. If gravestones must be moved from their original sites, or if they have been pulled from the ground, mark the original site with a surveyor's stake on which is inscribed the site number and the name on the stone. If the name on the stone cannot be read, mark the stake with a letter. On the site sketch mark the original location of the stone as well as the direction in which it originally faced. Wrap the stone securely with surveyor's tape on which is marked the site number and letter. Stones should be moved from the cemetery only if there is a danger of further damage or if repair work cannot be completed on-site. If stones are moved from the site, they should first be wrapped in cloth padding and secured in a wooden framework custom fabricated to provide proper support and cushioning for that stone.

7. All of the materials removed from the cemeteries should be stored in a single location that is secure, dry and sheltered from the weather.

08. LANDSCAPE DAMAGE ASSESSMENT AND RECOMMENDATIONS FOR STABILIZATION-MT. HOPE CEMETERY

The first view of historic Mt. Hope cemetery along Fayetteville Street is of toppled trees and broken gates. Passing through the stone entrance, the loss of cedars along the traditional 'Cedar Lane' weakens the enclosed feeling of the entrance drive. The downed trees have also displaced loose stones along the drive which serve as low retaining walls.

Hurricane Fran toppled approximately 41 trees. Downed trees have affected gravesites at least sixteen locations, and a procedure for the removal of those trees, while protecting the gravesites, is contained in this report. Other tree limbs and debris have been stacked by the drive and are awaiting pickup. The downed trees include some venerable old trees likely planted as part of the original cemetery plan. Many of these are trees native to Wake County woods and frequently found in old cemeteries. These include Tulip Poplar, Sweet Gum, White Oak, Red Maple, Red Cedar, Loblolly Pine and others. Compared with new plantings today, the older trees were planted with generous spacing, resulting in mature trees with exceptional canopies that provide an open, lacy silhouette against the sky.

Along the eastern edge, bordering Fayetteville Street, a planting of contemporary Bradford Pear trees was downed. These were probably from 10 to 15 years old. On the southern buffer between the old and new sections of the cemetery, several Red Cedar trees fell. Damage along the northern edge includes large trees along Rocky Branch that fell into the cemetery.

Other damage to the Mt. Hope landscape includes minor damage to the old asphalt pavement at points throughout the cemetery caused by the downed trees and storm water runoff. The steep slope at the northwest corner of the cemetery has extensive erosion and is in pressing need of stabilization. Several grave sites are quite near the edge. This has been a growing need and was not entirely caused by Hurricane Fran.

In addition to the downed trees, some remaining trees suffered damage to the crowns and to the trunks. Some of these appear to be potential safety concerns and should be scheduled for pruning as soon as possible.

Recommendations for stabilization include the following:

- Remove the debris already piled by the drive.
- Remove the Bradford Pear trees and any other remaining trees unaffected by proximity to grave sites.

- As trees are removed, map the tree location, type and size.
- Remove the large stump immediately to the right after the entrance gate, fill the hole, compact, and stabilize with seeding.
- Prepare a pruning schedule and prune the trees, with safety concerns first. The trees of tradition should be a priority as resources allow. An example is the old Osage Orange just inside the gate. These are frequently found in old cemeteries and church yards as a single tree or one of a few. It is considered an untidy tree for most urban spaces, but its presence in the cemetery provides one more visible link to the past.
- Remove the fallen trees near the grave sites according to the procedures outlined in this report.
- On completion of a site, restore grass to stabilize the damaged area.
- Patch asphalt where it represents a hazard.
- It is recommended that a Master Plan be developed prior to planting replacement trees or additional new trees, or the undertaking of other site improvements. Decisions about new plantings should be informed by other issues of graveyard preservation.

09. LANDSCAPE DAMAGE ASSESSMENT AND RECOMMENDATIONS FOR STABILIZATION-CITY CEMETERY

The extensive damage to the more compact landscape of City Cemetery is visible from New Bern Avenue, with branches leaning across the previously-damaged iron fence surrounding the cemetery. Of the 17 trees lost here, the largest are magnificent White Oaks. Downed trees have affected multiple graves at 12 locations. Other downed trees are Red Maples, Cedar, and a large Cherry. Three sections of chain link fencing on the southern boundary were damaged.

Removal of trees has been partially completed on the periphery of the cemetery. Clearance of the sidewalk is complete. Access to accomplish the tree removal in City Cemetery is greatly-limited by proximity to the drive.

Recommendations for stabilization include:

- Begin removal of accessible trees not affecting grave sites. An example is the large White Oak at the southeast corner adjacent to Hargett Street in Section C-1. Completing the removals in Sections A, B, C-1 and C-2 would make a major impact on the overall appearance of the cemetery. The pruning of remaining trees which constitute a potential hazard should be carried out concurrent with the removal of downed trees in an area.
- The clean-up of Section D, with the exception of grave site 1, and the eastern half of Section E might follow.
- Clean-up of the northernmost one-third of Sections H and J, including major pruning of several standing trees just behind the fence on New Bern Avenue, could follow. With this approach, the clean-up of the periphery surrounding City Cemetery would be complete.

With these items carried out, the interior area, comprising about 25% of the total land area remaining, could be done according to the procedure outlined in this report.

No damage to the cemetery drives is visible, however there are sunken areas in the cobblestone paving which need to be addressed

in future work. The iron fence around the cemetery, relocated from the State Capitol grounds, has substantial damage previous to Fran, the repair of which should be addressed in a Master Plan.

Also, as at Mt. Hope, replacement and new tree plantings should be delayed until a Master Plan is developed for City Cemetery. Plantings will necessarily need to be closely-coordinated with the preservation plan.

11. ADDITIONAL ARCHEOLOGICAL CONCERNS RELATED TO STORM DAMAGE

The exposure of graves raises some concerns about health and safety, particularly for field crews involved in working with human remains and soil from burials. For instance, tuberculosis spirochaetes can remain viable in human bone for the better part of a century and can be a health hazard for anyone working closely with the remains, or inhaling dust from such remains. Soil from burials dating between about 1880 and 1910 can also contain significant amounts of arsenic, which was a widely-used component in embalming fluid until it was banned in the early part of this century. Arsenic in the soil could cause serious illness if accidentally ingested, inhaled as dust, or allowed to settle on the skin or eyes. Workers involved with burial restoration should wear protective clothing, including gloves, face masks and goggles. The potential for health hazards from exposed burials, especially if the exposed soil is allowed to dry out and become airborne as dust, is another incentive for dealing with the reinterments as soon as possible.

Another problem with the exposures is the potential for theft and vandalism. The longer the disturbed areas remain open, the more likely it will be that the cemeteries will become the targets of treasure-hunters, curiosity-seekers, and vandals.

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12. ARCHEOLOGICAL PROCEDURES AND ESTIMATES FOR REPAIRING STORM DAMAGE TO BURIALS

Human remains (chiefly bone) exposed to the local acid soils and disturbed by root action (before and after the hurricane) are likely to be in very fragile condition. To recover such remains from the root balls for reburial, we recommend first outlining the specific sections of the root balls containing evidence of burials, as indicated by metal detector scans and visual inspections. Two archeologists should then use trowels and other small hand tools to recover remains from the root ball. This excavated soil should be screened through 1/4 inch hardware cloth. The recovered remains should be placed into an appropriate container for reburial in the exposed grave site (or as close to it as possible). Each of the boxes should also contain a small ceramic marker with the date of the hurricane and of the reburial, with a brief explanation of the disturbance and restoration.

The larger disturbances (City Cemetery sites #1 and #3) will each require one day of attention from a two-archeologist crew. The smaller disturbances (City Cemetery sites #5, #6, and #7, and Mount Hope Site #12) will each require one-half day of work by the archeological crew. We estimate that the labor cost of the archeological work (not counting the labor involved in removing the stumps and refilling the craters) is approximately \$1,800.00. The cost of the boxes and ceramic markers will be about \$300.00.

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13. MASTERPLAN RECOMMENDATIONS

The city's three historic cemeteries, and particularly the two city-owned cemeteries, are badly in need of master preservation plans. After, in the case of City Cemetery, near 200 years of sporadic and inadequate attention, the cemeteries have very substantial accumulated damage. An important historical and aesthetic resource, the grave markers and enclosures, and have been allowed to deteriorate severely, and in many cases disappear completely. The nineteenth century landscaping of the cemeteries, the product of a time in which graveyards were carefully designed as areas for contemplation and in which to experience the presence of God, has been allowed both to deteriorate and be altered by haphazard new planting. The potential for public enjoyment of some of the largest landscaped public spaces in the city has been neglected.

Oakwood Cemetery, founded in 1869, and Mount Hope Cemetery, founded in 1874, are beautiful examples of Raleigh's important links with the American "garden" cemetery or rural cemetery movement. This movement began in the United States in 1831 with the opening of Mount Auburn Cemetery in Cambridge, Massachusetts. A planned oasis on the outskirts of the city, Mount Auburn defined a new romantic cemetery landscape. With winding paths and woods it represented a reaction to densely developed church and urban graveyards, considered by some to be a menace to public health. Mount Auburn's immediate success gave rise to garden cemeteries in beautiful settings across the country. Spring Grove in Cincinnati and Greenwood in Brooklyn are two examples of this movement. It is understood that these pastoral pleasure grounds were the precursors of public parks. The pleasurable experiences of visiting these settings influenced interest in park-like scenery, places where visitors could escape the bustle of urban life for the serenity of a garden.

The movement was inspired by the writings of the American Andrew Jackson Downing, who inspired by the heroes of the English landscape style William Kent, Lancelot "Capability" Brown, and Humphrey Repton. They had changed the direction of the English landscape from the formal geometric style, which had long dominated thinking, and raised landscape gardening to the rank of a fine art. From Downing's 1841 first edition of *Landscape Gardening* through his multiple revisions he eloquently described the pleasures to be derived from a "taste of rural improvements". In his Preface to The Fourth Edition he eloquently describes man's desire to return to nature.

And as the first man was shut off from the garden, in the cultivation of which no alloy was mixed with his happiness, the desire to return to it seems to be implanted by nature, more or less strongly, in every heart.

These landscapes set aside for burials were visited by families of the deceased and people in need of recreation. Popular as quiet places for strolling, for solitude, and for family picnics they were places to enjoy the fresh air and view the wide varieties of trees and shrubs planted for enjoyment. Extensive and beautifully laid out, they feature dignified entrances, winding roads which circumscribe the rolling topography and open views of streams edged with plantings of clumps of trees. Ancient and venerable trees frame walkways and provide magnificent focal points. Paths provide artful arrangements and long vistas of nature's scenery which stir the emotions.

Oakwood and Mount Hope both feature these characteristics of pastoral settings. From the entrance at Oakwood, which announces a different place dedicated to the departed, to the dignified drive up to the crest of Mount Hope, and visitor experiences Raleigh's link with the City's history and with the history of the garden cemetery movement in America. These were planned landscapes no less historic than important build structures. They are deserving of thorough research and preservation. Careful planning and informed management are of the utmost importance in the protection of these valuable windows in Raleigh's history.

Masterplanning Process:

A masterplanning process should be begun which, over a period of years, leads to the restoration and continued appropriate maintenance of these historic resources. The process should, as much as possible, involve the general public in fund-raising, research, and documentation efforts. In the 1970's there existed a Raleigh Cemetery Commission. This commission should be revived under the auspices of the historic districts commission as a planning body for the work.

A master plan for an historic cemetery might address the following areas (as well as other topics unique to the particular cemetery):

1. Place Each Cemetery in its Cultural and Historical Context

Additional historical research is needed to document the development of the cemeteries over time and to establish a clear context for them as historic sites. Historical research should also produce valuable information needed for the accurate restoration of each cemetery.

First, a search should be made for city records relating to the establishment and maintenance of the cemeteries. Some of these records may exist only in secondary sources, since, for example, the original records for City Cemetery and Mount Hope Cemetery were apparently destroyed in a 1930's fire. All available maps which might show the cemeteries should be gathered, along with historic aerial photographs and property surveys.

A search of archival newspaper records, particularly the Raleigh News and Observer and Raleigh Times, would undoubtedly uncover a treasure trove of information; a cursory examination of the newspaper vertical files at the Cameron Village Library revealed dozens of newspaper articles charting work at the cemeteries in the past thirty years. Other resources which should be examined include documentary records in the State Archives, family records, cemetery inventories, and published and unpublished histories.

Perhaps most useful in the restoration of the properties would be drawn, painted or photographic records of the cemeteries at various periods. The public should be involved in a search for historic photographs of the cemeteries, including photos of graves and of funerals which might contain additional valuable information in the background.

2. Mapping and Inventory of Features

A set of base maps should be created which show the existing roads, utilities, walks and topographic features in the individual cemetery. Some of this work has already been undertaken by the City's Engineering Department. These base maps could then be overlaid with layers of additional information as it becomes available.

Maps of the cemeteries should be detailed enough to include the locations of individual graves, cross-referenced with records on each monument. Records should be compiled which include photographs of each marker, transcriptions of inscriptions, and notes on damage. Techniques and standards of recording should follow those recommended by the Association for Gravestone Studies. Again, the public in the form of plot holders or families with relatives buried in the cemetery should be solicited to provide information about plot ownership and unmarked burials. Volunteers or students could be used to record individual markers or burials.

The recording and mapping of the cemeteries should also include non-invasive remote sensing surveys which would allow the discovery of unmarked graves and other subsurface remains with no surface traces (former walkways, some types of landscape features, foundations, etc). The advantage of remote sensing

techniques in this situation lies in their non-intrusive character, since no digging is involved. Three remote sensing survey techniques--magnetometer, resistivity, and ground-penetrating radar--could be used in the cemeteries.

A planting inventory should also be compiled for each cemetery, with recording done in the spring and summer. This information can also be overlaid on the base maps.

3. Conditions Assessments

Following mapping of the cemetery's features, an experienced architectural conservator, historical architect or materials conservator should be retained to do a thorough area by area examination of gravestones, box vaults and other built features (including roads, retaining walls, fences, etc.) to identify elements which are in need of repair and conservation. This assessment should result in an itemized list that sets priorities.

4. Approaches to Preserving Landscape Features

The city's historic cemeteries are nineteenth century landscape entities in which natural materials in carefully-planned relationships are key elements. A thorough survey of existing natural materials and their locations, together with documentary materials, can provide the basis for a landscape plan that restores and reinforces the historic appearance through new plantings of appropriate trees, shrubs and flowers.

Landscape preservation also includes a close look at maintenance of the existing plant materials. Attention to large trees now will help avoid future storm damage.

Long-term solutions need to be found to erosion problems at Mount Hope, where the loss of soil on steep road embankments could eventually threaten several graves.

5. Identify Management Considerations for Visitor Traffic and Safety, Lighting, and Security

A careful study should be made of how visitor traffic can best be accommodated to provide safety and accessibility for visitors while at the same time insuring protection of burial sites and gravestones. While not currently much of a concern, pedestrian wear and tear and erosion from gravestone rubbing can cause cumulative damage to cemeteries.

Most importantly, vandalism has been a serious problem in both City Cemetery and Mount Hope Cemetery for literally decades. Ways to light the cemeteries at night and to physically

discourage intruders without destroying the character of the places need to be examined, along with increased police patrolling. A greater sense of security on the part of visitors can lead to more public use, reducing the opportunities for vandalism.

6. Recommending Conservation Treatments

A set of conservation treatments should be developed to guide the work identified in the conditions assessments. We have provided specifications for the patching and cleaning of marble and granite gravestones, but these should be supplemented with specifications for additional categories of repair, as required, and updated periodically as techniques evolve.

7. Developing a Maintenance Schedule

Key to the long-term survival of the cemeteries as historical entities is the development of a maintenance schedule and a set of maintenance policies which support the preservation of the grounds and monuments. Improper maintenance procedures can actually destroy the character of the cemetery over time. Sensitive regular maintenance and seasonally-appropriate work can make a significant positive impact on the image of the cemetery. Correspondingly, with increased care and activity there is likely to be a reduction in vandalism and the mistreatment of the resources.

8. Funding

Private sources of funding should be explored, as well as private/public partnerships. The City of Boston, Massachusetts has established a Historic Burying Grounds Initiative, a public/private venture which has been able to pursue corporate partnerships and grants for the preservation of the city's historic burying grounds.

While the City of Raleigh has traditionally taken the position that it is not responsible for repairs to monuments on privately-owned plots, this does not mean that the City is precluded from repairing grave markers. The Town of Chapel Hill, for example, has recently repaired markers in the old Chapel Hill City Cemetery, and the City of New Bern has a continuing process for restoring Cedar Grove Cemetery. Both use a mix of public money and grants to carry out the work. The process of research and documentation for the cemeteries should provide enough information to prepare a nomination to the National Register of Historic Places. Once listed on the Register, the cemeteries would be eligible for some limited Federal funding.

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**APPENDIX A: NORTH CAROLINA LAWS ON BURIAL
PROTECTION**

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North Carolina Laws on Burial Protection

North Carolina's General Statutes extend protection to graves threatened with defacement, desecration, or other forms of deliberate destruction (G.S. 14-148 and G.S. 14-149). State laws also regulate the disinterment and transportation of human remains (G.S. 65-13) and the discovery and protection of unmarked human burials (G.S. 70-29 through G.S. 70-33). None of the state statutes deal specifically with actions for restoring marked burials following natural disasters. Assuming that the City of Raleigh wishes to undo the hurricane damage by returning the burial fragments to their original grave sites, then the laws penalizing deliberate grave destruction and disinterment of remains would not seem to apply. Since all of the burials with evidence of disturbances are marked, the laws dealing with the discovery of unmarked remains do not seem to apply. G.S. 65-13 requires notification of next-of-kin before moving burials, a requirement that may be relevant in this situation. The City's attorney might wish to review the relevant statutes (copies are appended to this report) to determine the applicability of the laws).

§ 14-148. Defacing or desecrating grave sites.

(a) It is unlawful to willfully:

- (1) Throw, place or put any refuse, garbage or trash in or on any cemetery;
- (2) Take away, disturb, vandalize, destroy or change the location of any stone, brick, iron or other material or fence enclosing a cemetery without authorization of law or consent of the surviving spouse or next of kin of the deceased thereby causing damage of less than one thousand dollars (\$1,000); or
- (3) Take away, disturb, vandalize, destroy, tamper with or deface any tombstone, headstone, monument, grave marker, grave ornamentation, grave artifacts, shrubbery, flowers, plants or other articles within any cemetery erected or placed to designate where a body is interred or to preserve and perpetuate the memory and name of any person, without authorization of law or the consent of the surviving spouse or next of kin, thereby causing damage of less than one thousand dollars (\$1,000).

(b) The provisions of this section shall not apply to a professional archaeologist as defined in G.S. 70-28(4) acting pursuant to the provisions of Article 3 of Chapter 70 of the General Statutes.

(c) (Effective until January 1, 1995) Violation of this section is a misdemeanor punishable by a fine of not more than five hundred dollars (\$500.00), imprisonment for not less than 60 days nor more than one year, or both, in the discretion of the court. In passing sentence, the court shall consider the appropriateness of restitution or reparation as a condition of probation under G.S. 15A-1343(b)(6) as an alternative to actual imposition of a fine, jail term, or both.

(c) (Effective January 1, 1995) Violation of this section is a Class 1 misdemeanor. In passing sentence, the court shall consider the appropriateness of restitution or reparation as a condition of probation under G.S. 15A-1343(b)(6) as an alternative to actual imposition of a fine, jail term, or both. (1840, c. 6; R.C., c. 34, s. 102; Code, s. 1088; Rev., s. 3680; C.S., s. 4320; 1969, c. 987; 1981, c. 752, s. 1; c. 853, s. 4; 1993, c. 539, s. 87.)

Subsection (c) Set Out Twice. — The first version of subsection (c) set out above is effective until January 1, 1995. The second version of subsection (c) set out above is effective January 1, 1995.

Editor's Note. — Session Laws 1993, c. 539, which amended this section, in s. 1359 provides: "Prosecutions for offenses

committed before the effective date of this act are not abated or affected by this act, and the statutes that would be applicable but for this act remain applicable to those prosecutions." Section 1359 of Chapter 539 provides that the act becomes effective January 1, 1995.

Effect of Amendments. — The 1993

§ 14-148(c) is set out twice. See subsection headings for effective dates.

amendment, effective January 1, 1995, and applicable to offenses occurring on or after that date, in subsection (c) substituted "Class 1 misdemeanor" for "misdemeanor punishable by a fine of not

more than five hundred dollars (\$500.00), imprisonment for not less than 60 days nor more than one year, or both, in the discretion of the court".

CASE NOTES

This section creates a misdemeanor not defined as larceny. *State v. Jackson*, 218 N.C. 373, 11 S.E.2d 149 (1940).

Right of Landowner to Remove Bodies or Monuments. — Where the owner of land consents, either expressly or by implication, to the interment of dead bodies on his land, he has no right to afterwards remove the bodies or to deface or pull down the gravestones and monuments erected to perpetuate their

memory. *State v. Wilson*, 94 N.C. 1015 (1886).

Indictment. — It is not necessary to charge in the indictment that the monument removed was intended to designate the spot where the dead body of a particular named person, or a person unknown, was interred. *State v. Wilson*, 94 N.C. 1015 (1886).

Applied in *State v. Schultz*, 294 N.C. 281, 240 S.E.2d 451 (1978).

Cited in *Mills v. Carolina Cem. Park Corp.*, 242 N.C. 20, 86 S.E.2d 893 (1955).

§ 14-149. Desecrating, plowing over or covering up graves.

(a) It is a Class I felony, without authorization of law or the consent of the surviving spouse or next of kin of the deceased, to knowingly and willfully:

- (1) Open, disturb, destroy, remove, vandalize or desecrate any casket, human remains or any portion thereof or the repository of any such remains, by any means including plowing under, tearing up, covering over or otherwise obliterating or removing any grave;
- (2) Take away, vandalize or destroy any stone, brick, iron or other material or fence enclosing a cemetery, causing damage of more than one thousand dollars (\$1,000); or
- (3) Take away, vandalize, destroy or deface any tombstone, headstone, monument, grave marker, grave ornamentation, grave artifacts, shrubbery, flowers, plants or other articles within any cemetery erected or placed to designate the place where any dead body is interred or to preserve and perpetuate the memory and the name of any person, causing damage of more than one thousand dollars (\$1,000).

(b) The provisions of this section shall not apply to a professional archaeologist as defined in G.S. 70-28(4) acting pursuant to the provisions of Article 3 of Chapter 70 of the General Statutes. (1889, c. 130; Rev., s. 3681; 1919, c. 218; C.S., s. 4321; 1981, c. 752, s. 2; c. 853, s. 5.)

Cross References. — For statute providing the maximum punishment for felonies, see § 14-1.1, effective until

January 1, 1995. For structured sentencing provisions effective January 1, 1995, see § 15A-1340.10 et seq.

ARTICLE 5.

*Removal of Graves.***§ 65-13. Removal of graves; who may disinter, move and reinter; notice; certificate filed; reinterment expenses, due care required.**

(a) The State of North Carolina and any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, any church, electric power or lighting company, or any person, firm, or corporation may effect the disinterment, removal, and reinterment of graves as follows:

- (1) By the State of North Carolina and any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, when it shall determine and certify to the board of county commissioners in the county from which the bodies are to be disinterred that such removal is reasonably necessary to perform its governmental functions and the duties delegated to it by law.
- (2) By any church authority in order to erect a new church, parish house, parsonage, or any other facility owned and operated exclusively by such church; in order to expand or enlarge an existing church facility; or better to care for and maintain graves not located in a regular cemetery or burying ground for which such church has assumed responsibility of care and custody.
- (3) By an electric power or lighting company when it owns land that is to be used as a reservoir on which graves are located.
- (4) By any person, firm or corporation, which owns land on which abandoned cemeteries or burying grounds are located after first securing the consent of the governing body of the town, city or county in which such abandoned cemeteries or burying grounds are situated.

(b) The party effecting the disinterment, removal and reinterment of a grave containing a decedent's remains under the provisions of this Chapter shall, before disinterment, give 30 days written notice of such intention to the next of kin of the decedent, if known or subject to being ascertained by reasonable search and inquiry, and shall cause notice of such disinterment, removal and reinterment to be published at least once per week for four successive weeks in a newspaper of general circulation in the county where such grave is situated and the first publication shall be not less than 30 days before disinterment. Any remains disinterred and removed hereunder shall be reinterred in a suitable cemetery or burial ground.

(c) The party removing or causing the removal of all such graves shall, within 30 days after completion of the removal and reinterment, file with the register of deeds of the county from which the graves were removed and with the register of deeds of the county in which reinterment is made, a written certificate of the removal facts. Such certificate shall contain the full name, if known or reasonably ascertainable, of each decedent whose grave is moved, a

precise description of the site from which such grave was removed, a precise description of the site and specific location where the decedent's remains have been reinterred, the full and correct name of the party effecting the removal, and a brief description of the statutory basis or bases upon which such removal or reinterment was effected. If the full name of any decedent cannot reasonably be ascertained, the removing party shall set forth all additional reasonably ascertainable facts about the decedent including birth date, death date, and family name.

A fee of one dollar (\$1.00) for each page or portion of page of such certificate of removal facts shall be paid to the register of deeds of each county in which such certificate is filed for registration.

(d) All expenses of disinterment, removal, and acquisition of the new burial site and reinterment shall be borne by the party effecting such disinterment, removal, and reinterment, including the actual reasonable expense of one of the next of kin incurred in attending the same, not to exceed the sum of two hundred dollars (\$200.00).

(e) The office of vital statistics of North Carolina shall promulgate regulations effecting the registration and indexing of the written certificate of the removal facts, including the form of that certificate.

(f) The party effecting the disinterment, removal, and reinterment of a decedent's remains under the provisions of this Chapter shall ensure that the site in which reinterment is accomplished shall be of such suitable dimensions to accommodate the remains of that decedent only and that such site shall be reasonably accessible to all relatives of that decedent, provided that the remains may be reinterred in a common grave where written consent is obtained from the next of kin. If under the authority of this Chapter disinterment, removal, and reinterment is effected by the State of North Carolina or any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, any electric power or lighting company, then such disinterment, removal, and reinterment shall be performed by a funeral director duly licensed as a "funeral director" or a "funeral service licensee" under the provisions of Article 13A of Chapter 90 of the North Carolina General Statutes.

(g) All disinterment, removal and reinterment under the provisions of this Chapter shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county where the disinterment, removal and reinterment take place. If reinterment is effected in a county different from the county of disinterment with the consent of the next of kin of the deceased whose remains are disinterred, then the disinterment and removal shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county of the disinterment, and the reinterment shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county of reinterment.

Due care shall be taken to do said work in a proper and decent manner, and, if necessary, to furnish suitable coffins or boxes for reintering such remains. Due care shall also be taken to remove,

protect and replace all tombstones or other markers, so as to leave such tombstones or other markers in as good condition as that prior to disinterment. Provided that in cases where the remains are to be moved to a perpetual care cemetery or other cemetery where upright tombstones are not permitted, a suitable replacement marker shall be provided.

(h) Nothing contained in this Article shall be construed to grant or confer the power or authority of eminent domain, or to impair the right of the next of kin of a decedent to remove or cause the removal, at his or their expense, of the remains or grave of such decedent. (1919, c. 245; C.S., ss. 5030, 5030(a); Ex. Sess. 1920, c. 46; 1927, c. 23, s. 1; c. 175, s. 1; 1937, c. 3; 1947, cc. 168, 576; 1961, c. 457; 1963, c. 915, s. 1; 1965, c. 71; 1971, c. 797, s. 1; 1977, c. 311, s. 1.)

Local Modification. — Orange: 1963, c. 915, s. 1½.

Cross References. — As to interference with graveyards, see §§ 14-144,

14-149. As to removal of or interference with monuments and tombstones, see § 14-148.

CASE NOTES

This section is much broader than the older C.S. 5030, and reflects a recognition of the need for broad authority by church authority to meet the needs of a growing membership in relocating graves which would restrict that growth. *Singletary v. McCormick*, 36 N.C. App. 597, 244 S.E.2d 731 (1978).

The phrase "in order to" in subdivision (a)(2) of this section is synonymous with the phrase "as the means to." *Singletary v. McCormick*, 36 N.C. App. 597, 244 S.E.2d 731 (1978).

Relocation of Street to Enlarge Church Facility. — Though graves proposed to be relocated were within the area of a relocated street, the street was to be relocated "as the means to" expand or enlarge an existing church facility, and therefore relocation of the graves was permissible. *Singletary v. McCormick*, 36 N.C. App. 597, 244 S.E.2d 731 (1978).

Section Not Exclusive Grounds for Disinterment. — This statute does not provide the exclusive grounds for the

disinterment of a body. The statute speaks to the situation where a body had been properly interred, but for some reason justified by the public interest or by some compelling private interests it is necessary to effect a disinterment, removal, and reinterment. This statute nowhere provides for the situation where there has been an improper interment. *Strickland v. Tant*, 41 N.C. App. 534, 255 S.E.2d 325, cert. denied, 298 N.C. 304, 259 S.E.2d 917 (1979).

Action for Removal of Grave in Violation of Former Provision. — See *King v. Smith*, 236 N.C. 170, 72 S.E.2d 425 (1952).

The building of a new vestry room of a church to be used with the one as presently located in relation to the use of the choir, etc., comes within the purview of the statute permitting the removal of the bodies buried in the churchyard by the proper authorities of the church, when necessary or expedient to do so, in carrying out the arrangement. *Mayo v. Bragaw*, 191 N.C. 427, 132 S.E. 1 (1926).

§§ 65-14, 65-15: Repealed by Session Laws 1971, c. 797, s. 2.

ARTICLE 3.

*Unmarked Human Burial and Human Skeletal
Remains Protection Act.***§ 70-26. Short title.**

This Article shall be known as "The Unmarked Human Burial and Human Skeletal Remains Protection Act." (1981, c. 853, s. 2.)

Legal Periodicals. — For survey of 1981 property law, see 60 N.C.L. Rev. 1420 (1982).

§ 70-27. Findings and purpose.

(a) The General Assembly finds that:

- (1) Unmarked human burials and human skeletal remains are subject to vandalism and inadvertent destruction at an ever-increasing rate;
- (2) Existing State laws do not provide adequate protection to prevent damage to and destruction of these remains;
- (3) There is a great deal of scientific information to be gained from the proper excavation, study and analysis of human skeletal remains recovered from such burials; and
- (4) There has been no procedure for descendants or other interested individuals to make known their concerns regarding disposition of these remains.

(b) The purpose of this Article is (i) to provide adequate protection from vandalism for unmarked human burials and human skeletal remains, (ii) to provide adequate protection for unmarked human burials and human skeletal remains not within the jurisdiction of the medical examiner pursuant to G.S. 130-198 that are encountered during archaeological excavation, construction, or other ground disturbing activities, found anywhere within the State except on federal land, and (iii) to provide for adequate skeletal analysis of remains removed or excavated from unmarked human burials if the analysis would result in valuable scientific information. (1981, c. 853, s. 2.)

Editor's Note. — Section 130-198, repealed. For present similar provision, referred to in subsection (b), has been re-see § 130A-383.

§ 70-28. Definitions.

As used in this Article:

- (1) "Chief Archaeologist" means the Chief Archaeologist, Archaeology Branch, Archaeology and Historic Preservation Section, Division of Archives and History, Department of Cultural Resources.
- (2) "Executive Director" means the Executive Director of the North Carolina Commission of Indian Affairs.
- (3) "Human skeletal remains" or "remains" means any part of the body of a deceased human being in any stage of decomposition.

- (4) "Professional archaeologist" means a person having (i) a postgraduate degree in archaeology, anthropology, history, or another related field with a specialization in archaeology, (ii) a minimum of one year's experience in conducting basic archaeological field research, including the excavation and removal of human skeletal remains, and (iii) designed and executed an archaeological study and presented the written results and interpretations of such study.
- (5) "Skeletal analyst" means any person having (i) a postgraduate degree in a field involving the study of the human skeleton such as skeletal biology, forensic osteology or other relevant aspects of physical anthropology or medicine, (ii) a minimum of one year's experience in conducting laboratory reconstruction and analysis of skeletal remains, including the differentiation of the physical characteristics denoting cultural or biological affinity, and (iii) designed and executed a skeletal analysis, and presented the written results and interpretations of such analysis.
- (6) "Unmarked human burial" means any interment of human skeletal remains for which there exists no grave marker or any other historical documentation providing information as to the identity of the deceased. (1981, c. 853, s. 2.)

§ 70-29. Discovery of remains and notification of authorities.

(a) Any person knowing or having reasonable grounds to believe that unmarked human burials or human skeletal remains are being disturbed, destroyed, defaced, mutilated, removed, or exposed, shall notify immediately the medical examiner of the county in which the remains are encountered.

(b) If the unmarked human burials or human skeletal remains are encountered as a result of construction or agricultural activities, disturbance of the remains shall cease immediately and shall not resume without authorization from either the county medical examiner or the Chief Archaeologist, under the provisions of G.S. 70-30(c) or 70-30(d).

(c)(1) If the unmarked human burials or human skeletal remains are encountered by a professional archaeologist, as a result of survey or test excavations, the remains may be excavated and other activities may resume after notification, by telephone or registered letter, is provided to the Chief Archaeologist. The treatment, analysis and disposition of the remains shall come under the provisions of G.S. 70-34 and 70-35.

(2) If a professional archaeologist directing long-term (research designed to continue for one or more field seasons of four or more weeks' duration) systematic archaeological research sponsored by any accredited college or university in North Carolina, as a part of his research, recovers Native American skeletal remains, he may be exempted from the provisions of G.S. 70-30, 70-31, 70-32, 70-33, 70-34 and 70-35(c) of this Article so long as he:

- a. Notifies the Executive Director within five working days of the initial discovery of Native American skeletal remains;

- b. Reports to the Executive Director, at agreed upon intervals, the status of the project;
- c. Curates the skeletal remains prior to ultimate disposition; and
- d. Conducts no destructive skeletal analysis without the express permission of the Executive Director.

Upon completion of the project fieldwork, the professional archaeologist, in consultation with the skeletal analyst and the Executive Director, shall determine the schedule for the completion of the skeletal analysis. In the event of a disagreement, the time for completion of the skeletal analysis shall not exceed four years. The Executive Director shall have authority concerning the ultimate disposition of the Native American skeletal remains after analysis is completed in accordance with G.S. 70-35(a) and 70-36(b) and (c).

(d) The Chief Archaeologist shall notify the Chief, Medical Examiner Section, Division of Health Services, Department of Human Resources, of any reported human skeletal remains discovered by a professional archaeologist. (1981, c. 853, s. 2.)

§ 70-30. Jurisdiction over remains.

(a) Subsequent to notification of the discovery of an unmarked human burial or human skeletal remains, the medical examiner of the county in which the remains were encountered shall determine as soon as possible whether the remains are subject to the provisions of G.S. 130-198.

(b) If the county medical examiner determines that the remains are subject to the provisions of G.S. 130-198, he will immediately proceed with his investigation.

(c) If the county medical examiner determines that the remains are not subject to the provisions of G.S. 130-198, he shall so notify the Chief Medical Examiner. The Chief Medical Examiner shall notify the Chief Archaeologist of the discovery of the human skeletal remains and the findings of the county medical examiner. The Chief Archaeologist shall immediately take charge of the remains.

(d) Subsequent to taking charge of the human skeletal remains, the Chief Archaeologist shall have 48 hours to make arrangements with the landowner for the protection or removal of the unmarked human burial or human skeletal remains. The Chief Archaeologist shall have no authority over the remains at the end of the 48-hour period and may not prohibit the resumption of the construction or agricultural activities without the permission of the landowner. (1981, c. 853, s. 2.)

Editor's Note. — Section 130-198, referred to in subsections (a), (b), and (c) of this section, has been repealed. For present similar provision, see § 130A-383.

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**APPENDIX B: SCHEDULE OF EXISTING CEMETERY
PLANTINGS AND RECOMMENDATIONS FOR
ADDITIONAL HISTORIC PLANTING MATERIALS**

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MT. HOPE CEMETERY: EXISTING TREES

LARGE DECIDUOUS TREES

White Oak	<i>Quercus alba</i>
Red Oak	<i>Quercus rubra</i>
Water Oak	<i>Quercus nigra</i>
Sycamore	<i>Platanus occidentalis</i>
Red Maple	<i>Acer rubrum</i>
Tulip Poplar	<i>Liriodendron tulipifera</i>
American Elm	<i>Ulmus americana</i>
Sweet Gum	<i>Liquidambar styraciflua</i>
Osage Orange	<i>Maclura pumila</i>
Paulownia	<i>Paulownia tomentosa</i>
Chinaberry	<i>Melia azedarach</i>

LARGE EVERGREEN TREES

Red Cedar	<i>Juniperus virginiana</i>
Southern Magnolia	<i>Magnolia grandiflora</i>
Loblolly Pine	<i>Pinus taeda</i>

UNDERSTORY FLOWERING TREES

Dogwood	<i>Cornus florida</i>
Crape Myrtle	<i>Lagerstroemia</i>

SMALL EVERGREEN TREES AND LARGE SHRUBS

American Holly	<i>Ilex americana</i>
Arborvitae	<i>Thuja occidentalis</i>
Sasanqua	<i>Camellia sasanqua</i>
Osmanthus	<i>Osmanthus heterophyllus</i>
Boxwood	<i>Buxus</i>

FLOWERING SHRUBS

Spiraea	<i>Spiraea</i>
Old Roses	<i>Rosa sp.</i>

GROUND COVER

Vinca, Cemetery vine	<i>Vinca minor</i>
Violets	<i>Viola sp.</i>

CONTEMPORARY ADDITIONS

Zelkova	<i>Zelkova serrata</i>
Sawtooth Oak	<i>Quercus acutissima</i>
Maple cultivars	<i>Acer sp.</i>
Bradford Pear	<i>Pyrus calleryana 'Bradford'</i>
Spruce	<i>Picea</i>
Foster Holly	<i>Ilex x attenuata 'Fosteri'</i>
Photinia	<i>Photinia fraseri</i>
Centipede turf	<i>Eremochloa ophioides</i>

CITY CEMETERY: EXISTING TREES

LARGE DECIDUOUS TREES

White Oak	<i>Quercus alba</i>
Red Oak	<i>Quercus rubra</i>
Sycamore	<i>Platanus occidentalis</i>
Red Maple	<i>Acer rubrum</i>
Tulip Poplar	<i>Liriodendron tulipifera</i>
American Elm	<i>Ulmus americana</i>

LARGE EVERGREEN TREES

Red Cedar	<i>Juniperus virginiana</i>
Southern Magnolia	<i>Magnolia grandiflora</i>
Loblolly Pine	<i>Pinus taeda</i>
Cedar of Lebanon	<i>Cedrus libani</i>
White Pine	<i>Pinus strobus</i>

SMALL FLOWERING TREES

Dogwood	<i>Cornus florida</i>
Crape Myrtle	<i>Lagerstroemia</i>
Cherry	<i>Prunus sp.</i>

SMALL EVERGREEN TREES AND LARGE SHRUBS

American Holly	<i>Ilex americana</i>
Sasanqua	<i>Camellia sasanqua</i>
Osmanthus	<i>Osmanthus heterophyllus</i>

Boxwood	<i>Buxus</i>
Common Privet	<i>Ligustrum sinense</i>
Ligustrum	<i>Ligustrum japonicum</i>

FLOWERING SHRUBS

Hydrangea	<i>Hydrangea sp.</i>
Spiraea	<i>Spiraea</i>
Old Roses	<i>Rosa sp.</i>

GROUND COVER

Vinca, Cemetery vine	<i>Vinca minor</i>
Violets	<i>Viola sp.</i>

PERENNIALS

Iris	<i>Iris sp.</i>
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CONTEMPORARY ADDITIONS

Japanese Maple	<i>Acer palmatum</i>
Chinese Rotunda Holly	<i>Ilex cornuta 'Rotunda'</i>
Photinia	<i>Photinia fraseri</i>
Centipede turf	<i>Eremochloa ophioides</i>
Mondo Grass	<i>Ophiopogon japonicus</i>

OLD GARDEN PLANTS: POTENTIAL ADDITIONS TO CITY CEMETERY AND/OR MT. HOPE

These are among the plants that might have been found in our early cemeteries. The list is full of symbolism and plant lore. Many of the plants were handed down through the generations and provide comfort and memory to the cemetery visitor. They also provide a calendar of bloom throughout the year. Master plan research will provide historical annotations necessary for informed decisions on inclusion in future cemetery plantings.

TREES

Beech	<i>Fagus grandiflora</i>
Yellowwood	<i>Cladrastis lutea</i>
Crabapple	<i>Malus sp.</i>
Serviceberry	<i>Amelanchier</i>
Sassafras	<i>Sassafras albidum</i>

SHRUBS

Quince	<i>Chaenomeles speciosa</i>
Sweet Breath of Spring	<i>Lonicera fragrantissima</i>
Old Roses	<i>Rosa sp.</i>
Wintersweet	<i>Chimonanthus praecox</i>
Cape Jasmine	<i>Gardenia jasminoides</i>
Sweet Shrub	<i>Calycanthus floridus</i>
Old Man's Beard	<i>Chionanthus virginicus</i>
Abelia	<i>Abelia grandiflora</i>
Forsythia	<i>Forsythia</i>
Winter Jasmine	<i>Jasminum nudiflorum</i>
Sweet Pepperbush	<i>Clethra alnifolia</i>
Wild Azalea	<i>Rhododendron nudiflorum</i>
Hearts a'Bustin	<i>Euonymus americanus</i>
Butterfly Bush	<i>Buddleia</i>
Hydrangeas	<i>Hydrangea sp.</i>
Virginia Sweets Pine	<i>Itea virginica</i>

BULBS AND GROUNDCOVERS

Snowdrops	<i>Galanthus</i>
Crocus	<i>Crocus sp.</i>
Spanish Bluebells	<i>Scilla</i>
Atamasco Lilies	<i>Zephyranthes atamasco</i>
Dwarf crested iris	<i>Iris cristata</i>
Lily of the Valley	<i>Convallaria</i>
Christmas Ferns	<i>Polystichum acrostichoides</i>
Partridgeberry	<i>Mitchella repens</i>
Green-and-Gold	<i>Chrysogonum virginianum</i>

PERENNIALS

Peonies	<i>Paeonia sp.</i>
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**APPENDIX C-OAKWOOD CEMETERY: STREAM BANK
STABILIZATION RECOMMENDATIONS**

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OAKWOOD CEMETERY: STREAM BANK STABILIZATION RECOMMENDATIONS

The view after entering the monumental gate of Oakwood Cemetery and curving right is uphill to the east with Grassy Creek meandering in the foreground. The creek is an important part of the pastoral setting of this planned Victorian cemetery which had its roots in the English landscape tradition of the nineteenth century. The presence of a beautiful and winding stream or lake with clumps of large trees provide a visual reminder of man's connection to the natural world.

Today Grassy Creek suffers from extensive bank erosion. The stabilization of the stream banks in as natural a form as possible, given today's drainage demands, is important to the long term preservation of the original intended image. Currently, a survey and study for a stabilization plan are underway by the City in cooperation with the Raleigh Cemetery Association which cares for Oakwood. It is recommended that consideration be given to the following concepts.

Grassy Creek enters the cemetery from the south through a large culvert under Oakwood Avenue. At the pipe's outlet, a large scour hole has developed with vertical walls which continue to erode and eat their way back into the cemetery. A stilling basin for the end of the pipe, similar to the one at the outlet spillway of Shelley Lake, should be designed and constructed with washed stone, fabric, and rip rap under water. The sides should be sloped back and stabilized with plants and the area screened from view. Large trees nearby should be considered in the grading design and protected during construction. Large and natural stones available in the creek bed may be reused at the outlet of the stilling basin and above the pool level.

As the creek exists the stilling basin and the channel leads north through the cemetery, the treatment will depend on stormwater velocities and depths which are currently being calculated by the City's Engineering Department. When the critical depths and velocities have been determined, probably in the range of the two to ten year storm events, the channel banks should be regarded and stabilized. At locations where grave plots are close to the creek, full bank retaining structured may be required.

Stabilization of the toe of the stream bank where it meets the stream's channel is critical. Heavy stone armor in this highly erodible zone, keyed into the stream bed, is the conventual method of stabilization. Care in the selection of the type and color of stone and its placement will be necessary to maintain the aesthetic quality of the creek. Above the toe stabilization, plantings of trees, shrubs, and groundcovers should be used to protect the channel (see Sketch 1). When the plantings have

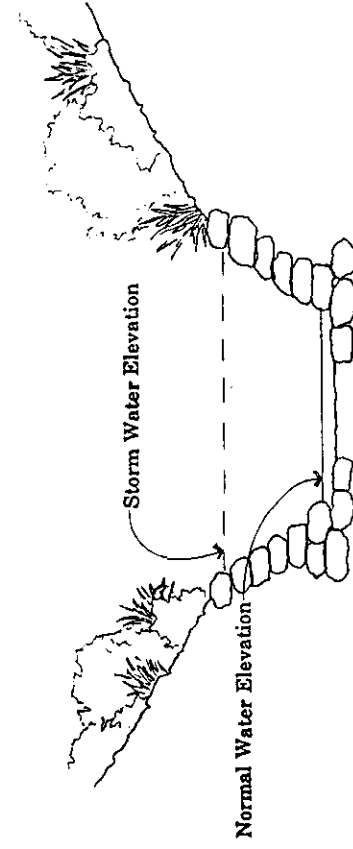
established adequate root systems to protect the stream banks, it is recommended that weirs can be constructed in the channel at intervals depending on stream bed gradient and calculated velocities. The weirs will serve several purposes. First, they will back up water, which will cover and help soften the toe stabilization treatment. Second, they will aid in reducing velocities during the lower frequency storms. Third, they will aid in reducing velocities during the lower frequency storms. Third, they can be designed and installed in a way to add to the visual quality of the stream (see Sketch 2 and Stream Profile).

At the northern end of the cemetery between the small waterfall and the drainage structure under Brookside Drive a small dam and pond should be constructed. This should address redirecting the stream flow into the culvert under the road. Review of current topographic information indicated the dam would need to be only six to eight feet high and 40 to 50 feet long (see Stream Profile and Sketch 4).

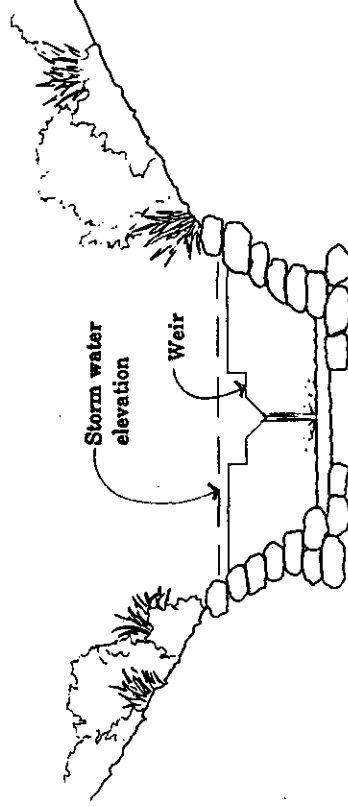
The pond would extend southward from the dam to be toe of the small water fall. Creation of the dam and pond would replace an area along the creek which is currently in disrepair, an eyesore, and difficult to maintain. It could also provide some storage for stormwater runoff and be used as a water supply for irrigation if needed.

The area between the dam and the culvert under Brookside Drive including the pond's emergency spillway should be stabilized with rip rap. The roadway's retaining wall, the dam, and plantings would obscure this area from view while the pond would add another element to the visual quality of the creek.

The current practice of maintaining lawn to the edge of the stream contributes to the problem of erosion. The planting of low shrubs and groundcovers appropriate to the period along the stream banks is recommended. In addition selective plantings of groups of Beeches and other trees which establish their roots to help hold the banks is suggested. This could be done in conjunction with the phased project discussed above.



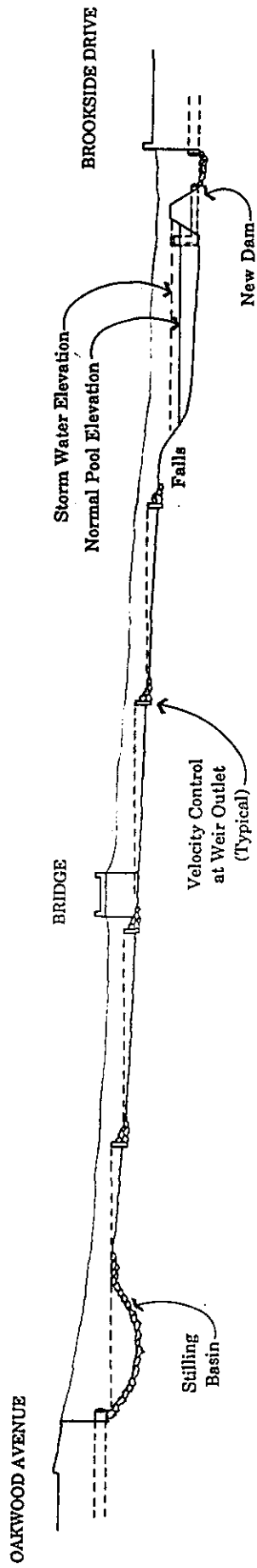
Sketch 1



Sketch 2

Grassy Creek Stream Concepts
Oakwood Cemetery

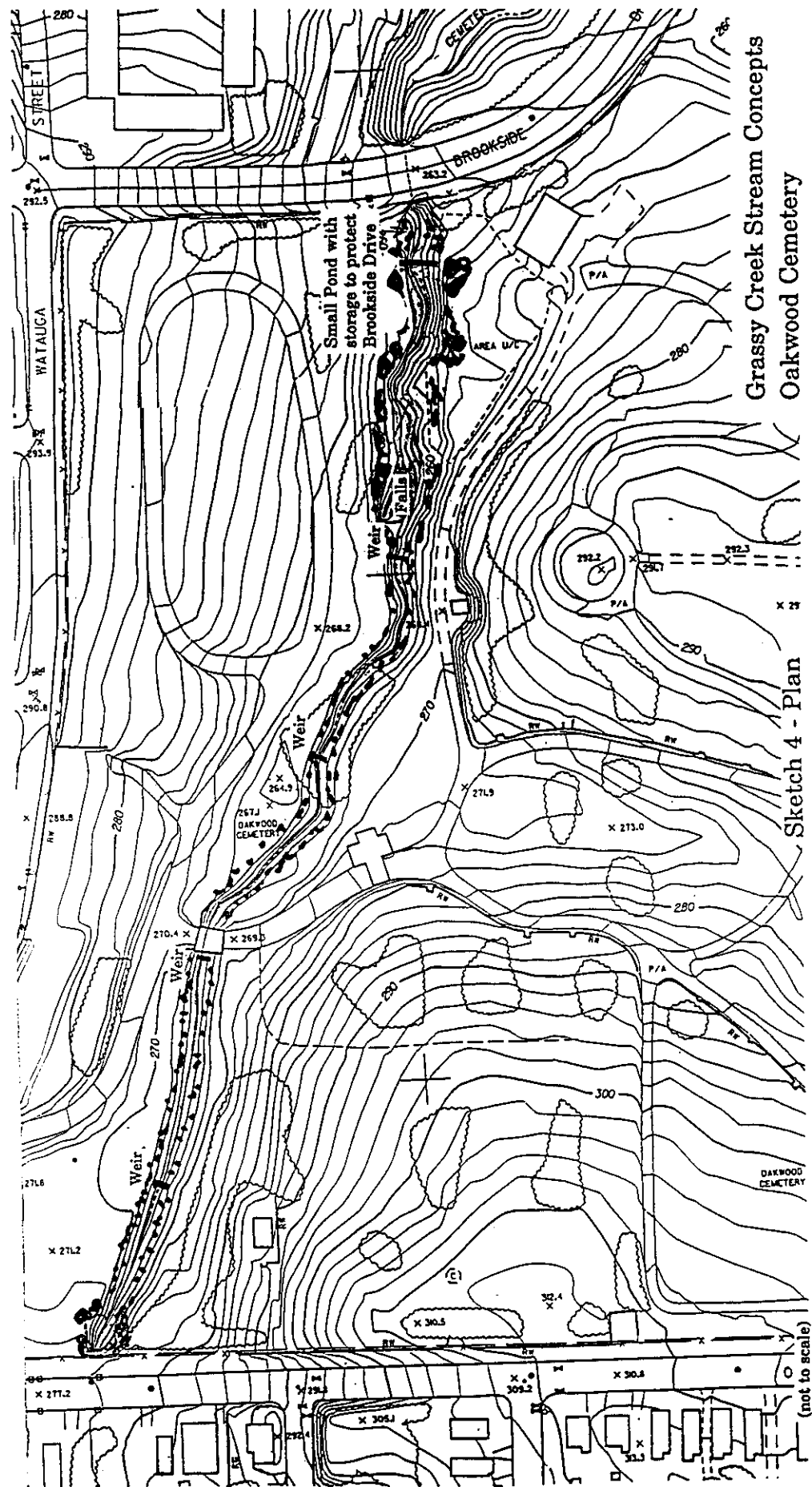
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Sketch 3 - Stream Profile concept

(not to scale)

Grassy Creek Stream Concepts
Oakwood Cemetery



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**APPENDIX D: SPECIFICATIONS FOR MARKER
REPAIR AND CLEANING**

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SECTION 04510 - STONE GRAVE MARKER REPAIR

PART 1 - GENERAL

The stone repair contractor shall be responsible for exercising extreme care at all times in handling grave markers.

Stones removed for conservation at another site shall be replaced by a temporary wooden or metal marker in the exact location as the stone, and noted on a map of the cemetery provided by the Owner. Transport stones in padded wooden containers or on padded pallets to prevent breakage.

01. Related Documents

Maps, Drawings and Schedules of Repair, general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.

02. Scope of Work

Contractor shall furnish all labor, materials and equipment necessary to carry out stone grave marker repair as shown on the Schedules of Repair. Work includes the pinning together of broken gravestones, adhesive re-attachment of chips, plastic repair of broken or missing elements of grave markers, grouting of delaminated areas of markers, and re-setting of gravestones and curbs.

03. Related Sections

SECTION 04520 STONE CLEANING

04. Unit Prices

The following unit prices shall be included on the bid form for the purpose of modifying the contract price should additional work be required:

1. Repairing one break with two dowels: \$ _____
2. Repairing one break with three dowels: \$ _____
3. Patching with repair mortar, per sq. ft.: \$ _____

05. Submittals

Product Data: Submit manufacturers' technical data for

each product indicated, including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

06. Samples

Submit samples of the following to the Owner and Architect for prior approval:

1. Nylon Dowels
2. Stainless Steel Dowels
3. Stone patching mortar
4. Qualifications data for person(s) performing stone repair work, including a list of completed projects with names, addresses and telephone numbers of Owners.

07. Quality Assurance

Restoration Specialist: Work must be performed by a firm having not less than 5 years of successful experience in comparable grave marker restoration projects and employing personnel skilled in the restoration processes and operations indicated.

Field Supervision: The grave marker restoration contractor shall maintain a full-time supervisor on the job site during the times that stone repair is in process.

Field-Constructed Mock-ups: At the beginning of stone repair, prepare sample examples of repairs to each type of stone, and for each type of repair, on gravestones to be selected by the Architect. Samples must be prepared with the same materials and methods proposed for the work, and under the same weather and temperature conditions. These samples shall serve as standards for judging the completed Work.

08. Project Conditions

Repair stone only when air temperature is between 40 degrees Fahrenheit and 80 degrees Fahrenheit and will remain so for at least 48 hours after completion of work.

PART 2 - PRODUCTS

01. Stone Repair Materials

Nylon dowels, threaded	Nylon 6/6, pre-threaded, in diameters from 7/16" to 3/4": E. I. Dupont de Nemours & Co., Inc., Wilmington, DE. (available from Fastenal Co., Raleigh)
Adhesives	<u>Epoxy</u> : Sikadur Hi-Mod Gel: Sika Corp., Des Plaines, IL (800) 323-5926 (available from Guaranteed Supply Co. in Raleigh. West System #105 Epoxy with #209 Hardener and #403 Microfiller: Available from Gougeon Brothers, Inc., PO Box 908, Bay City, MI. (517) 684-7286. AKEPOX Transparent Knife Grade Epoxy: Akemi, Inc. PO Box 40, Eaton Rapids, MI (517) 663-8191.
Patching Mortar	Jahn Restoration Mortar M70, M120 and M160: Cathedral Stone Products, Inc. 8332 Bristol Court #107, Jessup, Maryland (800) 684-0901.
Grout	Jahn M40 Crack Injection Grout: Cathedral Stone Products, Inc. 8332 Bristol Court #107, Jessup, Maryland (800) 684-0901.
Stainless Steel Pins	AISI Type 302/304 stainless steel.

02. Delivery, Storage and Handling:

Deliver materials to project site in manufacturer's original and unopened containers and packaging, bearing labels as to type and name of products and manufacturers, and store as directed by the manufacturer.

PART 3 - EXECUTION

01. Stone Repair

Rejoining Broken Stones with Dowels

General:

For clean breaks, re-assemble pieces of gravestones as indicated, using Nylon dowels set in specified epoxy adhesive. Carry out work on a flat surface, either in the field or in a shop setting. If the stone is too large to move, perform the work in place, taking care to hold the pieces in perfect alignment. Obtain Architect's advance written approval to perform repairs in place.

If the break is not clean, or will have large gaps when repaired, supplement the pinning procedure with the specified patching mortar compound to avoid creating large voids which could admit water into the stone. Follow the manufacturer's specifications for mixing and use. Match color of stone to be patched. Fill any voids or missing areas as specified to provide a complete repair which matches the original stone as closely as possible.

Repair stone only when air temperature is between 40 degrees Fahrenheit and 80 degrees Fahrenheit, and when temperatures will remain in this range for at least 48 hours following completion of work.

Pinning Procedure:

1. Remove broken base section from the ground, if necessary, and gather any other pieces relating to the subject stone. Move to a large, flat, stable work surface.
2. Clean soiled stone surfaces as directed in Section 04520. Allow stones to dry thoroughly; at least 72 hours after cleaning.
3. Inspect surfaces of edges to be re-joined and test fit to insure proper alignment. Clean and prepare surfaces to be joined. Remove any old pins from previous repairs, if not adhered tightly. If pins cannot be removed easily, leave in place and work around them when reassembling the stone fragments. If the old pins prevent making a successful new repair, cut them off or shorten them with a metal saw, taking care to avoid damaging the stone while sawing.
4. Verify the dimensions of the stone and select the proper dowel sizes and numbers:

Dowel Sizing Rules:

Diameter: 1/4 (25%) of the thickness of the stone. For example, a 2" thick stone requires 1/2" diameter dowels.

Drilled Holes: 1/8" larger than the dowel diameter. For example, a 1/2" dowel requires a 5/8" hole.

Dowel Length: 8 times the width of the drilled hole. For example, a 2" thick stone requires dowels of a total length of 5".

Drilled Hole Depth: Dowel length plus a 1/4" allowance in each piece of stone. For example, the hole depth for a 5" dowel would be 2-1/2", plus a 1/4" allowance, for each stone.

Dowel Size Chart:

<u>Stone thickness</u>	<u>Dowel diameter</u>	<u>Hole diameter</u>	<u>Dowel length</u>
1-3/4"	7/16"	9/16"	4-1/2"
2"	1/2"	5/8"	5"
2-1/4"	9/16"	11/16"	5-1/2"
2-1/2"	5/8"	3/4"	6"
2-3/4"	11/16"	13/16"	6-1/2"
3"	3/4"	7/8"	7"

Dowel Locations and Numbers: For stones 16" or less in width, use two dowels. For stones between 16" and 30" use three dowels. Stones greater than 30" shall receive one dowel for each 1' of width. Locate dowel holes at least 2" from the outside edge of the stone. All holes shall be centered in the width of the stone.

5. Assemble stones in perfect alignment on a level, stable working surface. For irregular stones or large slabs which have warped, use mason's shims to provide complete support. Use chalk to mark locations of holes. Use a masonry drill bit to drill holes in one piece to the specified depth. After drilling, insert chalk into each hole, centering it with packing, then line up the two halves so that the chalk marks the location of the holes in the undrilled piece. Drill the second piece.

6. Check the fit of all pieces by assembling the stone with dowels, dry, to verify hole depth and alignment. Blow stone dust from holes with compressed air, then swab with

solvents, first with denatured alcohol, then with acetone. Allow to dry.

7. With stone held upright, carefully fill one set of holes with epoxy adhesive and insert nylon rods, using care to not overfill holes or allow epoxy to contact any exposed face of stone. Any spillage onto exposed surfaces shall be cleaned immediately with acetone. Follow manufacturer's instructions for complete curing. Repeat process with other stone piece. Do not spread epoxy across entire break. Hold epoxy back at least 1/4" to 1/2" from face of stone. Align pieces carefully and secure with braces and clamps until epoxy cure is complete. NO MIS-ALIGNMENT WILL BE ACCEPTED.

Rejoining Unbroken Components Having Iron or Bronze Dowels:

General:

Many marble monuments consist of several separate pieces of marble, joined together by iron or bronze pins. In some cases, the iron pins used to join components have rusted, and the expansion caused by the rust results in damage to the stone. Bronze pins are less likely to corrode and cause failure and bronze pins will not be removed unless by direction of the Architect or Owner.

Pinning Procedure for Components Having Iron or Bronze Dowels:

1. Prior to commencing any work, locate all loose pieces for each monument to be re-assembled. The Owner or Architect must verify all components before work begins.
- 2 Carefully extract or pull out any existing iron pins, taking care not to damage stone. If pins cannot be removed without using excessive force, remove pins by drilling as specified below.
3. Using a hole saw, select a bit that fits over the diameter of the iron pin. Carefully drill a hole around the iron pin to a depth no greater than the depth of the iron pin. Attempt to remove the iron pin after drilling part of the full depth. Drill only to the depth needed to successfully remove the pins.
4. Clean debris from hole using compressed air. If lead jacket is in good condition, leave in place. If it is damaged, remove lead by extraction, or if needed, by drilling as outlined in 3. above.

5. Cut new pins from stainless steel dowel stock of the correct diameter and length as the original pin. Use only AISI Type 302/304 stainless steel. Set new dowels in the lower piece, using lead packing shoved around pin and packed tight. Install new lead packing in the upper piece, forming a tapered receptacle for the pin with a spare piece of steel pin. Create a slightly larger diameter at mouth of the hole, tapering to the bottom of the hole, to insure a tight fit of the pins.

6. Use a bedding mortar when joining the pieces, made either from patching mortar or the following mix: 3 parts hydrated lime mixed dry with 1 part white Portland cement. Combine this mixture with extra-fine screened sand in a ratio of one part fine sand to one part dry lime/cement mix.

7. Apply a 1/4" thick layer of the bedding mortar to dampened stone, covering the bedding/jointing surfaces only. Rejoin stone components, taking care to align stainless steel dowels and to bed pieces firmly in bedding mortar. Immediately clean any excess bedding mortar from the stone.

Stone Patching and Infill

Patch voids, large chips and rough-edged breaks with patching mortar as directed by the Owner or Architect. Follow the detailed manufacturer's instructions carefully, as outlined below:

1. Provide color samples for the stone being patched, before commencing work.
2. Cut out deteriorated stone and any adjacent stone which has begun to deteriorate. Remove additional stone, if necessary, so that patch will not have feathered edges and will be at least 1/4" thick. Tool edges to be square or slightly undercut to provide additional keying action.
3. Using compressed air and a soft bristle brush, remove loose particles, soil, or other contaminants from existing stone units at all locations.
4. Dampen the stone prior to the application of the patching mortar. Do not overwet.
5. Mix mortar as directed by manufacturer; approximately 6-1/2 parts mortar mix to 1 part water, mixing no more than can be used in 30 minutes.
6. Brush-coat stone surfaces to be patched with a slurry coat of patching mortar complying with manufacturer's

directions.

7. Build up patch in layers of at least 1/4" to 1/2" at a time until reaching the desired thickness. All patches must be a minimum of 1/4" thick, when completed.

8. Keep each layer damp for 72 hours or until mortar has set fully. All fresh patches must be cured by repeated water spraying after application is complete. The first spraying should not be too soon or the mortar may dissolve and run. On hot days, the waiting period may be between 30 and 60 minutes; on damp, cloudy days it may be several hours before dampening is required. Finished patches must be dampened several times a day, for 72 hours after the patch is made. Do not work in the full sun. In hot weather, stop all patching after 1 PM. If patches are finished late in the day or on a Friday afternoon, they must be covered with plastic taped in place, then sprayed with water the first thing on the next working day.

9. Do not trowel or "float" the patch; excessive troweling can cause a lighter color.

10. Clean areas around patch immediately after finishing patching. Use a damp sponge to wipe away any patching mortar on the surface of the stone. Repeat several times, taking care not to disturb the fresh patch. Rinse the sponge and use clean water each time, making sure the sponge is clean. Failure to clean as directed can result in a "halo" or mortar stain around the patch. Such stains will not be accepted.

11. After the patch has thoroughly cured, tool or work surface to provide a texture that matches the surrounding stone. Use rubbing stones and/or different grades of sandpaper (grits #60, 80, or #120) to produce a matching surface texture.

12. Unacceptable patches are defined as those with hairline cracks or that show separation from the stone at the edges of the patch, and those that do not match the adjoining stone in color or texture. Remove unacceptable patches and re-fill according to all specifications in order to provide patches free of defects.

Grouting

General: Grouting is an effective way to fill voids or to re-attach or re-integrate layers of stone which are delaminating or which are otherwise becoming detached in non-structural situations. Grouting will consist of the

injection of the specified grout at low pressure into voids and hollow areas of selected gravestones, as directed by the Owner or Architect. Follow the following procedures and manufacturer's directions for the use of the specified grout:

1. Clean cavities to be grouted, where possible, with compressed air, then flush with clean water.
2. Seal all cracks and holes with non-staining potter's clay (not modeling clay) to create temporary dams to hold the grout inside the stone.
3. Mix grout as directed by manufacturer.
4. Inject grout into tops of holes and cavities by gravity or low pressure injection using 60 mm syringes like those used by veterinarians. Fill as completely as possible; repeat applications if necessary. If no holes or voids are present, drill small holes (approx. 3/16") at the tops of voids to permit the injection of the grout.
5. Clean any spilled grout or runs with damp sponges and clear water as soon as possible after completion of grouting, before it sets.
6. Cover entire stone with wet burlap, then wrap with plastic to obtain a slow curing rate and to promote good adhesion.
7. Patch remaining holes and surface voids with patching mortar to prevent or deter water entry and to restore the original visual appearance of the stone. Mortar patches must match stone in color and surface texture; apply and cure as specified in the "stone patching" section of these specifications.

End of Section 04510

SECTION 04520 - GRAVESTONE CLEANING

PART 1 - GENERAL

Certain marble and granite stones, as identified in consultation with the Owner or Architect, will require cleaning prior to undertaking any stone repair work. This cleaning work should only be undertaken by a skilled restoration craftsman or conservator. Four types of cleaning are specified.

Detergent Cleaning will be sufficient for most stones which are in good condition and not heavily soiled. Ammonia Cleaning may be used on stones which are in good condition and more heavily-soiled. Proprietary Cleaning uses an alkaline proprietary cleaning system, which should only be used on limestone or marble stones in good condition and which have soiling which cannot be removed by the other methods. The fourth method, Water Cleaning, supplemented by gentle scrubbing, should be the initial method used for fragile or heavily-eroded stones, or for stones which have thick soiling and lichen deposits which must be softened before proceeding with other cleaning methods.

01. Related Documents

Maps, Drawings and Schedules of Repair, general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.

02. Scope of Work

Contractor shall furnish all labor, materials and equipment necessary to carry out cleaning of gravestones as required during the stone repair process, or as directed by the Owner or Architect.

03. Related Sections

SECTION 04510 - STONE GRAVE MARKER REPAIR

05. Submittals

Product Data: Submit manufacturers' technical data for each product indicated, including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

06. Samples

Submit samples of the following to the Owner and Architect for prior approval:

1. Qualifications data for person(s) performing stone cleaning, including a list of completed projects with names, addresses and telephone numbers of Owners.

07. Quality Assurance

Restoration Specialist: Work must be performed by a firm having not less than 5 years of successful experience in comparable grave marker restoration projects and employing personnel skilled in the restoration processes and operations indicated.

Field Supervision: The grave marker restoration contractor shall maintain a full-time supervisor on the job site during the times that stone repair is in process.

08. Project Conditions

Clean stone only when air temperature is between 40 degrees Fahrenheit and 80 degrees Fahrenheit and will remain so for at least 48 hours after completion of work.

PART 2 - PRODUCTS

01. Stone Cleaning Materials

Detergent	Triton-X non-ionic detergent by Rohm and Haas, Inc., LOC detergent by Amway, or Photo-Flo by Kodak.
Ammonia	Plain household ammonia, unscented and without detergent additive.
Limestone Cleaner	Sure Klean Limestone Prewash and Limestone Afterwash by ProSoCo, Inc. 1601 Rock Mountain Blvd., Stone Mountain, GA (404) 939-9890. 707 Limestone Cleaner Pre-Rinse and 707N Limestone Neutralizer by Deidrich Technologies, Inc., 7373 South 6th Street, Oak Creek, WI (414) 764-0058.

PART 3 - EXECUTION

01. Stone Cleaning

General: The specific techniques and methods for each stone will be determined in consultation with the Owner or Architect, as specified below:

Water Cleaning Method: Soak stone surfaces by applying clean, potable water continuously and uniformly to the entire stone face (front only, or front and back) for a minimum of 6 hours and a maximum of 24 hours, depending upon the extent of the soiling. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Perform initial spray/soak for 6 hours, then inspect for performance of cleaning. If desired level of cleanliness has not been achieved in 6 hours, proceed to soak stone for an additional 12 hours, then inspect again. If stone is still not clean, continue soaking for an additional 6 hours, until a maximum of 24 hours is reached. The objective of the soaking is to loosen and dislodge accumulated dirt and vegetation without using abrasive cleaning techniques.

Gentle Scrubbing Method: If at the end of 24 hours using the soaking method the desired level of cleanliness has not been reached, perform a gentle scrubbing cleaning. With water continuing to flood the stone as directed above, hand-scrub the surface of the stone with a soft bristle brush, allowing the soaking spray to float off dirt released by the scrubbing. Rinse afterward with clean water for a minimum of 15 minutes.

Detergent Cleaning: Soak the stone thoroughly with cold water, for a minimum of 6 hours as outlined above. Apply a detergent solution consisting of one ounce of detergent per gallon of clean, potable water (or solution ratio as recommended by manufacturer). Apply only to stone that has been soaked thoroughly for a minimum of 30 minutes. Scrub masonry with detergent solution using a soft bristle brush and gentle action, until soil is dislodged and can be removed by rinsing. Use small brushes, as required, to remove soil from inscriptions and crevices. Dip brush often in detergent solution to insure that fresh solution is always used and that stone surface remains wet at all times. Rinse loosened material from stone at frequent intervals. At end of cleaning, rinse thoroughly with clean water using a low-pressure spray with a maximum of 80 psi. Rinsing should be performed at least 15 minutes per side of stone.

Ammonia Cleaning: One part plain household ammonia (not scented or mixed with detergent) should be mixed with four parts of clean, potable water. Apply only to stone that has been soaked as thoroughly as possible, for a minimum of 30 minutes. Hand-scrub gently with soft bristle brush, then rinse thoroughly with clear water. Dip brush often in detergent solution to insure that fresh solution is always used and that stone surface remains wet at all times. Use small brushes or small wood paddles to remove soil from inscriptions and crevices. Rinse loosened material from stone at frequent intervals. At end of cleaning, rinse thoroughly with clean water using a low-pressure spray with a maximum of 80 p.s.i. Rinsing should be performed at least 15 minutes per side of stone.

Limestone Cleaner: Use a two-part limestone cleaner consisting of an alkaline prewash and an acid neutralizer afterwash. Apply cleaner as directed by the manufacturer, working from the bottom to the top on the face of the stone. First, soak stone with cold water for 15 minutes with low-pressure (less than 80 p.s.i. at 2 gallons per minute) spray. Apply prewash alkaline cleaner to stone by brush or deep-nap roller. Let cleaner remain on surface for period recommended by cleaner manufacturer. Rinse stone with clear, cold water for 15 minutes. Apply acid neutralizer afterwash to stone while stone is still wet, using low-pressure (less than 80 p.s.i) and low volume spray, soft-fiber brush, or deep-nap roller. Let neutralizer remain on surface for period specified by manufacturer, unless otherwise indicated. Rinse stone with clear, cold water for a minimum of 15 minutes.

End of Section 04520

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