INTRODUCTION

The United States Federal Emergency Management Agency (FEMA) is assessing technical methodologies for developing coastal erosion data that will provide the basis for administering Section 544 of the Housing and Community Development Act of 1987 (commonly known as the Upton-Jones Amendment), as well as other potential programs of land use management that deal directly with shoreline recession and erosion. The methodology contemplated for use in shore erosion studies is one in which Average Annual Erosion Rates (AAER's) are calculated from a computer database consisting of shoreline positions digitized from historic maps (National Ocean Service T-sheets) and recent air photos. This fundamental approach to analyzing and predicting shoreline location has been utilized for some time by several states to support setback programs (NATIONAL RESEARCH COUNCIL, 1990), and it may be adopted to establish a national program of coastal erosion management if the NFIP is legislatively amended.

In order to assess the resources that would be required in conducting erosion rate studies, FEMA has concentrated efforts on two principal objectives: (1) conduct a number of pilot erosion rate studies designed to test the technical and
administrative feasibility of the methodology, and (2) produce a comprehensive set of guidelines and specifications for erosion studies. The purpose of the FEMA guidelines is to standardize data collection techniques and erosion analysis methodologies and to insure that consistent, accurate, and reliable shoreline recession data for our nation's oceanic and Great Lakes shorelines are compiled.

The principal methodological approach recommended in the draft FEMA guidelines is to digitize historical and current shorelines from maps and air photos so that transects, plotted perpendicular to the shorelines, can be created for the purpose of measuring and computing rates of shoreline change. Obviously, it is of the utmost importance that the raw data used in a study of this nature be as accurate and reliable as possible. The rates of shoreline change can only be as accurate as the source material from which they are derived. Maps and air photos used in these studies must be examined carefully so that data containing significant errors or distortion can either be corrected or, if uncorrectable, discarded.

Presently, the utilization of computerized mapping techniques greatly increases the ability to identify incorrect data. Fortunately, many, if not most, of the suspect data can be updated or computer corrected so that maps based on the computer rectified source data will meet or exceed National Map Accuracy Standards (ELLIS, 1978).

The problem of recognizing and correcting inaccurate source data has been discussed in a number of articles and publications. SHALOWITZ (1964) provided a detailed discussion on the history, interpretation, and accuracy of National Ocean Service (NOS) Topographic "T"-sheets. He also described the technique for manually updating obsolete geographic coordinates as well as instructions for measuring T-sheet distortion due to uneven map shrinkage. STAFFORD (1971) and DOLAN et al. (1980) addressed the problem of air photo distortion, while MORTON (1974) was concerned with inaccuracies in T-sheets and optical aberrations inherent in aerial photography. LEATHERMAN (1983) compared the various manual cartographic and computerized mapping techniques used to compile historical shoreline change data. Later, CLOW and LEATHERMAN (1984) discussed the application of the "space resection" subroutine of the Metric Mapping package. This subroutine rectifies and significantly reduces air photo distortion. More recently, ANDERS and BYRNES (1991) provide a review of potential errors associated with mapping shoreline positions from cartographic and air photo data.

**SHORELINE INDICATOR**

A number of potential shoreline datums or geomorphic features can be used to monitor historical shoreline changes. However, in most situations, the high water line (HWL) has been demonstrated to be the best indicator of the land-water interface for historical shoreline comparison studies; it is easily recognizable in the field (it was the boundary line mapped by early NOS topographers) and it can usually be approximated from air photos (STAFFORD, 1971). For high bluffs and cliffed shorelines, however, the clifftop edge may be a better shoreline indicator.

It should be noted that the terms “High Water Line” and “Mean High Water Line” are often confused in the literature, and it is appropriate to briefly discuss the two terms and their relationship to the line actually mapped by the early NOS topographers. The high water line (HWL) delineates the landward extent of the last high tide. This line is visible to the surveyor in the field and is characterized by a change in sand color caused by repeated and periodic inundation of the beach by the high tides (Figure 1). On aerial photographs this line is usually depicted by a change in color or gray tone (Figure 2). Technically, the mean high water line (MHWL) is determined by running spirit levels along the coast and measuring the average height of the high water line over a period of nineteen years (SHALOWITZ, 1964). Although the datum printed on NOST-sheets is listed as “Mean High Water,” it was not determined by these exacting methods. According to SHALOWITZ, the intent of the NOS topographers was “to delineate, as near as it was possible to determine without recourse to leveling, the line of mean high water.” Thus, the NOS surveyors approximated the line of mean high water by familiarizing themselves with the tide in the area and noting the position of the high water line, drift line, and other physical characteristics of the beach.

Coastal photogrammetrists usually rely on
the HWL or MHWL as the reference datum to monitor shoreline change due to its ease in identification on air photos. Fortunately, the difference in position of the MHWL and a “typical” HWL is minimal (assuming moderate weather conditions). McBETH (1956) concluded that for mapping purposes, the differences in positions of the two shoreline datums were insignificant. SHALOWITZ (1964) suggests that the error involved in the field identification of the MHWL may approximate 3 to 4 meters in the worst possible case. DOLAN et al. (1980) determined that the average movement of the HWL over a tidal cycle on medium-size sand beaches with slopes in the 3°–6° range averaged 1 to 2 meters for mid-Atlantic beaches. Because of the near equivalency of the HWL and MHWL (as mapped by the early NOS topographers), direct comparisons between historical NOS T-sheets and current aerial photography are possible. Thus, the available record from which to determine long-term rates of shoreline change usually exceeds 100 years for most of the United States coast.

Beach width naturally fluctuates on a seasonal basis along most U.S. coasts. Stormy winter and hurricane waves generally cause erosion, whereas summer swell (long period) waves promote beach accretion. In determination of long-term trends, these short-term changes must be filtered out of the record. The best approach is to utilize only imagery from the same season (e.g., preferably summertime conditions) and avoid post-storm photography so as to minimize these problems.

**HISTORICAL MAPS (NOS T-SHEETS)**

In order to compare mapped shorelines with other mapped or air photo derived shorelines, a uniform coordinate grid system must be chosen so that all maps and air photos can be properly aligned, thereby ensuring the most accurate determination of past shoreline movement. To align maps to a specific coordinate system, one must identify a number of permanent and stable points or features on the map for which accurate and current geographic coordinates
Uneven Map Shrinkage

T-sheets and other maps that were originally printed on paper have been subjected to varying degrees of shrinkage. This generally is not a problem if the amount of shrinkage is equivalent in all directions because many computer mapping programs have the ability to modify (uniformly increase or decrease) map scale. Unfortunately, shrinkage can be problematic in that paper tends to shrink more along the grain than across the grain so that scale change introduced by shrinkage is not the same in both directions. Uneven shrinkage can be determined by calculating distortion factors, either manually or by computer, so that overly distorted maps can be identified, then rectified or discarded.1

1Listings of triangulation stations with updated coordinates can be obtained at the National Geodetic Survey in Rockville, Maryland.

2Only Mylar copies of T-sheets should be used in historical shoreline change studies. Mylar resists further shrinkage and does not pucker or crease as easily as paper or bromide prints.

A variety of manual, computerized, and hybrid manual-computerized techniques are available to update maps containing obsolete geographic datums. The best procedure to use when digitizing maps with an obsolete datum is to search for, and locate, four or more widely spaced triangulation stations with updated coordinates.2 Triangulation stations are survey stations used by field cartographers as geographic reference points. They are represented on a map as a point or dot bounded by a triangle. If at least four recoverable triangulation stations exist, they can be used as primary control points for map alignment purposes. If a map contains less than four triangulation stations, additional datum points in the form of latitude-longitude tick marks can be manually generated by consulting polyconic tables [procedure explained in detail in SHALOWITZ (1964), pp. 151–154]. Accuracy (i.e., map distortion and/or cartographic error) of T-sheets can be assessed by entering the geographic coordinates of the primary control points (either triangulation stations, latitude-longitude tick marks, or both) into the computer. Then the control points, as actually plotted on the map, are digitized. Next, the computer calculates and the terminal displays the linear deviation between the digitized and true locations of the control points. This procedure is discussed in more detail later in this article.

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Map Defects (Tears, Folds and Creases)

Many older historical T-sheets are plagued with major and minor tears, folds, and creases. Fortunately, these defects are usually easy to observe on the mylar contact prints of T-sheets that are obtained from the NOS archives. The magnitude of distortion caused by defects can be determined by digitizing at least four control points spanning both sides of the defect. If the distortion is excessive, then each segment of the defect-divided map must be digitized separately. Accuracy assessments must again be conducted within the individual defect-bound segments.

AERIAL PHOTOGRAPHY

Since 1927, aerial photography and photogrammetric methods have been increasingly used to provide topographic information along the coast, thereby creating a good data base for the compilation of historical shoreline change maps. Air photos, however, are not map projec-
tions, hence distortion corrections must be made prior to and/or concurrent with the compilation process so that shoreline positions compiled from air photos can be compared to those compiled from planimetric maps.

The methodology used for computerized air photo digitization is more involved than that used for maps because air photos do not contain defined control points such as latitude-longitude tick marks or triangulation stations. However, a type of control point, called a secondary control point, usually may be obtained by matching features on air photos (e.g., corners of buildings, ends of jetties, and road intersections) with their mapped counterparts. Advanced computerized photogrammetric programs (such as the space resection subroutine of the Metric Mapping Program of Leatherman, 1983) make use of the secondary control points to transform air photos to a map projection. As explained below, various types of distortion inherent in aerial photography can be decreased, and quantified, by using space resection programs.

Tilt (Scale Differences Within Photo)

Aerial photographs taken where the optical axis of the camera is approximately perpendicular to the ground surface are called vertical photographs. However, virtually all vertical air photos are slightly tilted with a 1° tilt being common and up to a 3° tilt not unusual (Lillesand and Keifer, 1979). Unfortunately, the scale across tilted air photos is non-orthogonal. This can result in gross displacements of features depending upon the degree of tilt (Figure 4). For example, on 1:20,000 scale air photos, a 1° tilt can result in about 20 meters of displacement between a point on an air photo and its actual ground location; a 3° tilt may yield a horizontal displacement that exceeds 60 meters (Leatherman, 1983).

Air photo tilt must be corrected prior to or concurrent with air photo digitization. Tilt correction can be made manually by using a Zoom Transfer Scope, or analytically by using stereoplotters or computerized space resection programs.

Scale Differences Between Photos

Another problem with aerial photography arises from the inability of an airplane to fly at a constant altitude. Changes in altitude cause the scale to vary from one photograph to the next. A Zoom Transfer Scope is very efficient in removing scale differences between photos. However, because of the likelihood of inherent tilt distortion, the use of space resection programs or analytical stereoplotters may provide better results (Leatherman, 1983; Clow and Leatherman, 1984).

Relief Displacement

Differences in elevation or relief of land surfaces introduce a type of distortion called relief displacement, where surfaces rising above the average land elevation are displaced outward from the photo isocenter. Distortion due to relief displacement can easily be seen when viewing air photos taken above towns or cities with tall buildings. In the center of the photos, tall structures appear to point straight up. Relative displacement of the top of the structure relative to the structure foundation is minimal. However, as one moves farther away from the photo isocenter, summits of buildings become progressively displaced (Figure 5). In this example when the telephone pole and ground surface are projected onto a photograph, the top of the telephone pole is radially displaced outward from the center (Stafford, 1971).

Fortunately, most U.S. coastal areas, particularly the Atlantic and Gulf barrier islands, are relatively flat, so that distortion due to relief displacement is usually negligible. However, when digitizing high relief areas, such as the cliffed shorelines of the Pacific Coast, the Great Lakes, and outer Cape Cod, one should be careful to select primary control points that are at about the same elevation as the feature being digitized (Stafford, 1971). Otherwise, such distortion on air photos must be removed mechanically by stereoplotters or analytically as part of the space resection subroutine. Note that distortion due to relief displacement can be minimized if only the center portion of the air photo is digitized.

Radial Lens Distortion

A problem which may be a factor in older air photos is that of radial lens distortion. Lens distortion varies as a function of radial distance from the photo isocenter. Thus the center of the
In historical shoreline change studies it is important to recognize distorted source maps and air photos and, if possible, to correct or minimize the distortion through the use of computerized and manual techniques prior to and concurrent with digitization. Nonetheless, regardless of how thoroughly the data have been scrutinized and corrected, some degree of error will remain. Basically the remaining error can be categorized into two types: (1) errors due to inaccuracies in identification and

DISCUSSION

In historical shoreline change studies it is important to recognize distorted source maps and air photos and, if possible, to correct or minimize the distortion through the use of computerized and manual techniques prior to and concurrent with digitization. Nonetheless, regardless of how thoroughly the data have been scrutinized and corrected, some degree of error will remain. Basically the remaining error can be categorized into two types: (1) errors due to inaccuracies in identification and
determination of the high water line position, and (2) quantifiable error, where distortions have actually been measured and quantified.

**Inaccurate Determination of HWL**

Two types of potential error are associated with determining the location of the HWL, and each error must be considered separately for maps and air photos. The first type of error concerns the identification or interpretation of the HWL. With regard to pre-1930's T-sheets (i.e., T-sheets mapped prior to the development and use of photogrammetric techniques), this concerns the accuracy in which topographers identified the HWL. For aerial photography, the accuracy to which the photogrammetrist interprets the HWL from photos is involved.

The second type of error concerns mapping or annotating the line interpreted (correctly or incorrectly) as the HWL. For maps, this involves the accuracy of surveying techniques used by the topographers. With regard to aerial photography, this involves the degree of air photo distortion present and/or the reliability of the secondary control points. In order to address this issue, it is necessary to provide some background on the techniques used by topographers and photogrammetrists to identify and map the HWL.

NOS surveyors field-approximated the MHWL by familiarizing themselves with the tidal cycle and noting the position of the high water line, drift line, and other physical characteristics of the beach (SHALOWITZ, 1964). Importantly, the same attributes used by the

![Diagram of Positive Photographic Enlargement](image)
topographer in the field to identify the MHWL are also used by modern photogrammetrists to approximate the HWL from air photos. Obviously, the topographer has a decided advantage when approximating the MHWL (or HWL) because he is situated on the ground where the physical evidence needed to identify this line can easily be observed and interpreted at close range. In contrast, photogrammetrists must observe and interpret the same physical beach characteristics from aerial photography. Fortunately, the HWL is usually evidenced on black and white air photos by a change in gray tone. When this is the case, the MHWL can be located to within 0.5 mm at map scale or to within 5 meters on the ground for a map scale of 1:10,000 (USC&GS, 1944). Occasionally, however, the tonal change is not clearly discernible and may, at times, appear as a transitional zone; sometimes the bound is not visible at all due to poor photographic contrast. Furthermore, the bound may be confused with other identifiable demarcation lines located parallel to the beach. These include the rack line where the flotsam is deposited at the upper limit of swash, the change in color at the contact between newly-deposited sediments and the old storm beach, tire tracks, and erosional scarp. Thus, it is clear that the interpretation of the HWL may be more subjective and less accurate when interpreted from air photos (particularly historic air photos) than when analyzed in the field. (It should be pointed out that the photogrammetric interpretation of the HWL from recent air photos can be improved considerably by using modern infrared tide-coordinated aerial photography; Fromm, G., pers. comm., 1990).

While the topographer interprets the HWL in the field and then plots the interpreted line onto a medium (i.e., the draft map), the photogrammetrist interprets the HWL after the topographic data has been photographically “plotted.” The advantage in using aerial photography is that features used as secondary control points (such as structures) are accurately recorded (photographed) on the image. Assuming relatively distortion-free or rectified air photos with reliable control, the demarcation line photogrammetrically interpreted (correctly or incorrectly) as the HWL, can be referenced directly to the accurately located secondary control points. The pre-1930’s topographers, however, had to rely on the laborious planetable, alidade, and rod to survey and plot the field-interpreted HWL, and importantly, to provide control.

Shalowitz (1964) describes the process by which the early surveyors delineated and plotted the approximated MHWL:

In mapping the shoreline, the topographer set up his instrument at some commanding point where he could see the beach for 400 and 500 yards. The rodman walked along the beach setting up his rod at short intervals and particularly wherever there was a change in direction. The topographer determined the direction and distance of the rod from his instrument, plotted the point on the sheet, and drew the shoreline through the series of points located, sketching in the shoreline between the rodded points.

In assessing the accuracy of the line plotted by the early surveyors, Shalowitz notes that:

1. “it was possible to measure distances [from the planetable to the rodded points] with an accuracy of 1 meter”
2. “the position of the planetable could be determined within 2 or 3 meters of its true position”
3. “the error due to the identification of the actual mean high water line on the ground . . . may approximate 3 to 4 meters”
4. “errors resulting from sketching between [the mapped position of rodded points] may, in some cases, amount to as much as ten meters, particularly where small indentations are not visible to the topographer at the plane table.”

In order to make assumptions concerning the accuracy of the early T-sheets, all of the above potential surveying errors must be considered. It should be noted, however, that the most important coastal areas mapped in historical shoreline change studies are the open-coast, sandy beaches. These areas are usually characterized by fairly straight and smooth shorelines, hence, inaccuracies resulting from (4) “sketching between points” may be of minimal importance. Indeed, when the shore was more irregular (e.g., shoreline meanders present),
additional points were surveyed to delineate shoreline position and orientation.

In summary, it is reasonable to assume that: (1) the field-interpreted HWL, as determined by the NOS topographers, was probably more accurate and less subjective than the HWL as interpreted photogrammetrically, and (2) the position of the line interpreted as the HWL (either as plotted on the draft map by the topographer, or as annotated on the air photo by the photogrammetrist) is probably more accurate on rectified aerial photographs than on T-sheets.

Quantifiable Error

Errors due to media distortion and/or inaccurately plotted or misidentified control points can be measured and quantified during the process of source data compilation where raw data are digitized and converted to a uniform coordinate grid system. For mapped data this procedure works as follows. At least four primary control points (triangulation stations or latitude-longitude tick marks) with known geographic coordinates are located on the map. The geographic coordinates of primary control points are entered into the computer. Then the points as actually plotted on the map are digitized. Next the computer calculates, and the terminal displays, the linear deviation (x-axis, y-axis and geometric sum) between the digitized and true locations of the control points. Thus the deviations represent the magnitude of relative control point displacement. This, in turn, represents the degree of map error caused by distortion and/or inaccurately plotted control points (as well as additional, but minor, errors due to the unsteadiness of the operator’s hand).

To our knowledge, a thorough quantitative analysis of T-sheet accuracy as based on control point accuracy has not been attempted. However, two of us (Crowell and Leatherman) have performed a number of historical shoreline change studies for a number of states, including: Massachusetts, New York (South Shore of Long Island), New Jersey, Delaware, and Calvert County, Maryland. In these studies, more than 400 T-sheets were digitized and tested for error.

The most extensive T-sheet error analysis was performed for the state of Massachusetts Historical Shoreline Mapping Project. In this study, 232 T-sheets were digitized and tested for error. More than 95% of the T-sheets are at a scale of 1:10,000; less than 5% are at a scale of 1:20,000. The T-sheets were divided into two sets: the first consisted of 141 T-sheets dating from 1844 to 1930 and were mapped by the NOS topographers without the use of aerial photography. The second consisted of 91 T-sheets dating from 1930 to 1978 and were compiled using both field and photogrammetric techniques. Six maps from the 1844–1930 set were found to be severely damaged or illegible. In addition, nine maps did not have recoverable triangulation stations or other control points. Control points (usually triangulation stations) from the remaining 1844-1930 set were digitized and tested for error. Six out of the remaining 126 T-sheets (4.8%) were found to have control points with an average error greater than six meters.

None of the 91 T-sheets from the 1934–1978 set were found to be severely damaged or illegible, and all of the maps contained at least four control points in the form of NAD 1927 Latitude-Longitude tick marks and/or Massachusetts State Plane Coordinates. Most of the control points were found to have error less than 2.5 meters for maps produced between 1948 and 1954, and less than 1.5 meters for maps produced between 1962 and 1978. It should be noted that maps produced from 1934 to 1938 were found to be of variable quality. Most exhibited control point error of less than 4 meters; however, a series of six contiguous maps from the Cape Cod area showed error values ranging from 6 to 11.6 meters. These maps were not used in the Massachusetts Shoreline Change Project.

Our experience with the above studies has enabled us to make the following generalizations concerning T-sheet accuracy as based on the analysis of control points; they are:

(1) The location of control points on 1:10,000 scale NOS T-sheets produced from 1844 to 1880 are usually in error by about 2.5 to 5.0 meters.

(2) The location of control points on maps of 1880 to 1930 vintage usually are in error ranging from 1.5 to 4 meters.

These excessive errors may have been due to the unreliability of the newly developed photogrammetric techniques used during the 1930’s. Alternatively, this could be a site-specific problem for the Cape Cod maps caused by inexperienced field surveyors.
Historical Shoreline Change

The location of control points on maps produced from 1934 to 1938 are highly variable and could range anywhere from 1.5 to 11.6 meters.

The location of control points on maps produced from 1943 to 1954 are in error by less than 2.5 meters.

The location of control points on maps produced from 1962 to 1978 are usually in error by less than 1.5 meters.

Everts et al. (1983) assessed the accuracy of recent NOS maps that were compiled from aerial photography. In this study, randomly selected, well defined points, such as road intersections and marsh features, were scaled from the map and then field surveyed. The selected points were found to have a maximum displacement error of 3 meters.

Errors and inaccuracies due to photographic distortion and planimetric conversion can also be quantified (again, based on the distorted location of control points). However, the procedure used to compile photographic data is more complex in that primary control points from a base map and secondary control points from both base maps and air photos are used in the conversion process. Thus, in order to quantify distortion, one must consider distortion error from both base map and air photo. Analysis of more than 2,000 air photos for the Massachusetts, New York (South Shore of Long Island), New Jersey, Delaware, and Calvert County, Maryland historical shoreline mapping projects has shown that control point error from 1:10,000 scale photos (using the center 60% portion) is usually less than one meter, given four or more “hard” structural control points. When geomorphic features were used as control points, the error was usually found to be less than 2 meters (Delaware Bay, Delaware and Calvert County, Maryland projects). If post-1962 T-sheets (1:10,000 scale) are used as base maps to rectify the air photos, then map distortion error of up to 1.5 meters must also be considered. Assuming that the air photo and base map distortions are independent, a simple root-mean-square approach can be used to compute conservative error estimations. Thus, air photo distortion as based on the relative misplacement of control points is generally less than 1.8 meters, utilizing hard structural control; less than 2.5 meters with geomorphic control points.

Conservative estimations of error can be computed for digitized historical and recent T-sheets as well as air photos by totalling worst-case estimates for the various stages of data compilation (Table 1). The worst-case estimates are compiled from data assembled from the above studies. Again, errors in each stage are assumed to be independent, thus the root-mean-square approach was used in this analysis. It should be kept in mind that these are conservative error estimates. The results of numerous post-compilation accuracy assessments (see below) of the Massachusetts, New Jersey, and Delaware historical shoreline change maps have shown that the magnitude of error is usually much less than the estimates as presented in Table 1.

Compilation Quality Control

As described above, all raw data sources must be tested for accuracy before they are used in accurate historical shoreline mapping studies. Other accuracy tests can be utilized after the data have been digitized to verify the accuracy and integrity of the final map product. One such test involves examining draft copies of the shoreline change maps and comparing the location of permanent (or semi-permanent) features common to two or more data sources. These features include (in descending order of importance): (1) man-made structures, (2) configuration of erosion-resistant crystalline headlands, and (3) configuration of tidal marshes. In this manner, data misalignment can be measured relative to recent NOS T-sheets and recorded. If the misalignment exceeds a specified amount or fails to meet National Map Accuracy Standards, then the inaccurate data can be purged from the files. Another test involves research of historical engineering and survey records of coastal structures. Occasionally, these historical records will contain field surveys which include measured distances between the HWL and structures such as lighthouses. Lighthouses are almost always depicted on historical NOS T-sheets, hence distances can be measured from T-sheets and compared directly with contemporaneous surveys.

CONCLUSIONS

The impact of photographic and mapping errors on the determination of mean annual
erosion rates will vary throughout the full range of conditions that can be expected along the nation’s coasts. In areas where the change in shoreline location is large, the error will be small in comparison to this change, and erosion rates will be highly reliable. Conversely, the error will be more significant in areas where the change in shoreline location is small, and erosion rates will be less reliable. This is fortuitous because high erosion rates will subject greater amounts of land to regulation, and are thereby more likely to be challenged on a technical basis.

Past shoreline mapping studies (e.g., Massachusetts, New York, New Jersey, Delaware, and Calvert County, Maryland) have shown
that if care is taken to screen and correct various source data for error and distortion, and if the raw data are computer corrected, then an accurate and reliable map product and erosion rate analysis can be obtained. Indeed, accuracy assessments of these historical shoreline-change maps have demonstrated that the maps meet, but usually far exceed National Map Accuracy Standards (Galgano, 1989).

ACKNOWLEDGEMENTS

The authors would like to thank Dr. Brian Mrazik, former Assistant Administrator for the Federal Emergency Management Agency-Federal Insurance Administration, and Dr. Mark Byrnes of the Louisiana Geological Survey for technical reviews of this manuscript.

LITERATURE CITED


