NATIONAL FLOOD INSURANCE PROGRAM
TRANSITION TO NAVD 88

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BIOGRAPHICAL SKETCH

Elmer C Knoderer received his B. S. in Civil Engineering from Virginia Polytechnic Institute in 1967. After serving two years as an enlisted geodetic surveyor and computer in the U. S. Army, Corps of Engineers, he joined Dewberry & Davis in 1969 as a design engineer. He became a Registered Professional Engineer in Virginia in 1973. Since 1975 he has worked on the firm's continuing project for the Federal Emergency Management Agency, which reviews floodplain studies and provides flood hazard mapping for the National Flood Insurance Program.

ABSTRACT

The National Flood Insurance Program (NFIP) is a Federal program that provides identification of flood hazard areas on a community basis and includes availability of insurance against flood damages. When a community opts to join the NFIP it agrees to adopt minimum Federal floodplain management criteria enforced by local regulations. For severely floodprone communities, the Federal Emergency Management Agency (FEMA) prepares a Flood Insurance Study (FIS) that identifies 100-year (base) flood elevations and flood hazard areas.
Proposed structure elevations are compared to the base flood elevations to ensure that the new construction will be reasonably safe from flooding. Approximately 18,000 communities are currently participating in the NFIP. Nearly all flood maps for these communities are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Conversion to NAVD 88 will impact the majority of those mapped communities and many other aspects of the NFIP. The transition to NAVD 88 will require the education of map users as well as map producers. After the new datum becomes available, new FISs will be based on NAVD 88. Existing studies and maps will be converted when substantive revisions occur to redefine flood hazards (Miller 1985). FEMA will provide technical and informational publications for users, contractors, and community officials as soon as datum details are available. The National Geodetic Survey has provided close cooperation to accomplish this transition.

INTRODUCTION

The National Flood Insurance Program (NFIP) is a Federal Program under the jurisdiction of the Federal Emergency Management Agency (FEMA) that provides floodplain information to local communities, as well as flood insurance for property owners at risk to flooding. The NFIP makes available previously unavailable coverage

for flood losses through a cooperative program based on community adoption and enforcement of minimum Federal floodplain management criteria. The dual mission of the NFIP through the Federal Insurance Administration (FIA) is to reduce future flood losses as well as provide insurance coverage to offset deficit producing disaster assistance payments.

To provide the floodplain management information to the communities, FEMA provides flood hazard mapping of major flooding sources within a community. The delineation of flood hazards usually includes a determination of the base (100-year) flood elevations in areas of intense development, and these elevations on the majority of the maps are referenced to NGVD 29. Therefore, FEMA must revise these maps to reflect the new datum information as it becomes available. But given the 18,000 communities participating in the NFIP, the task must be undertaken in stages. It will also require the education of all FEMA map users, as well as the contractors and other Federal agencies that prepare mapping data for FEMA.

To accomplish this education, FEMA is in the process, with the continued cooperation of the National Geodetic Survey (NGS) in the person of David B. Zilkoski of the Vertical Network Branch, of producing two publications explaining the transition. As soon as the NGS technical publications explaining the conversion are available, FEMA will utilize them to aid in the production of documents aimed at two levels of FEMA map producers and users. The Federal agencies and private architectural and engineering firms are the target of the first bulletin, which will provide guidelines for assuring the new datum is properly used and referenced in any new floodplain studies contracted after the datum is available. A second document will address community officials and floodplain administrators, with a more technical section for surveyors and engineers who may be involved in providing data for homeowners, developers, or communities, that wish to modify the NFIP maps.

As the NFIP is moving from initial identification and mapping to maintenance of existing mapping, greater emphasis will be required for implementing the datum transition for revision of the effective FIRMS. This will be. accomplished by making the shift to NAVD 88 only as the maps require substantive changes of flood hazard delineations or base flood elevations. The private sector will be involved in this process and will need effective instruction in proper use and referencing of the new datum.

FEMA PRODUCTS AFFECTED BY THE NEW DATUM

Flood Insurance Studies

The major product of the NFIP is the Flood Insurance Study (FIS) and accompanying Flood Insurance Rate Map (FIRM). The FIS is provided to the community at the initial detailed study stage. This report provides the technical data required to define the community's floodplains and regulatory floodways, areas in which special planning considerations are required.

It also includes plates of computed flood profiles, upon which the FIRM flood boundary delineations are based. These flood profiles are, for the most part, referenced to NGVD 29, and must ultimately be revised to NAVD 88.

Flood Insurance Rate Maps

The most widely used product of the NFIP is the Flood Insurance Rate Map (FIRM). It serves two purposes: identification of flood-prone structures and actuarial rating of structures for sale of flood insurance policies and community floodplain management. This map is widely distributed; to community and state officials upon first printing, and to lending institutions, realtors, insurance agents, and private citizens upon request. Each year, FEMA distributes from six to eight million copies of map panels. Since the FIRM is a depiction of the flood profiles, the base flood elevations depicted on it are also mainly based on NGVD 29.

In order to assure an "apple to apple" comparison, each FIRM panel contains one or more elevation reference marks (ERMs). These ERMs are developed during the control survey phase of the study by the contractor for the FIS and must be established to third order accuracy (Federal Emergency Management Agency 1985). These ERMs are located in close proximity to the flooding sources on the FIRM. The intent is to provide a nearby benchmark that is known to be based on NGVD 29 for surveyors and engineers who must provide elevation data for flood insurance or floodplain management purposes.

GENERAL NATURE OF THE IMPACTS FROM NAVD 88 CONVERSION

By 1991, about 11,000 communities will have detailed Flood Insurance Studies and Flood Insurance Rate Maps with base flood elevations referenced to NGVD 29. This represents about 100,000 map panels, or an average of about 400,000 ERMs. FEMA policy requires that elevation data be referenced to the most recently adjusted NGS benchmarks, referenced to NGVD 29, soon to be NAVD 88.

The above number estimates supplied by FEMA provide a glimpse of the magnitude of FEMA products and affected people that must be informed of the details of the datum change as it relates to the NFIP. We have been discussing this event with FEMA since the schedule for conversion was established and are working with them to produce the materials needed to accomplish an orderly transition.

Affected Producers and Users

Local Community Officials. Each of the 11,000 communities with detailed FIRMS has at least one official, usually the building permit official, who must understand the change and be able to provide guidance to the general public, other community officials, and local architectural, engineering, and surveying firms. It is their job to assure that all new construction in their community takes place above the established BFEs such that it will be reasonably safe from flooding.

Flood Insurance Agents. There are approximately 165,000 independent insurance agents in the United States, territories, and possessions, who provide outlets for the sale

of flood insurance policies for the NFIP. They rely exclusively on the FIRM to determine parameters for rating the policy premium for each customer. Together with the elevation of the lowest floor of the insurable structure, usually provided by a Certified Land Surveyor or Registered Professional Engineer, the BFE from the FIRM dictates the insured's annual premium.

Policy Holders. About 2.4 million flood insurance policies are in effect during a given year and about 360,000 property owners per year purchase a policy through the NFIP. The flood hazard zone and the difference between their lowest floor elevation and the BFE determines the cost of their policy.

Architects and Engineers. Consultants providing planning and engineering design services for developers and homeowners consult the FIRM, and sometimes the FIS, in order to assure compliance with local floodplain management regulations for proposed projects. Proposed elevations above the BFE are sometimes minimal from economic considerations, so up-to-date and properly referenced elevation data are a must.

FEMA Staff and Contractors. FEMA employees and contractors nationwide will be impacted by the conversion. They will be tasked with assuring that the conversion process within FEMA occurs in a coordinated and well-documented manner. They will also be receiving requests for assistance in explaining the conversion of datums from map users and contractors.

Certified Land Surveyors. This group will bear the immediate impact of the change. They are involved in the planning of new developments and the providing of survey data for title insurance companies, settlement attorneys, and lending institutions. They are often asked to provide an interpretation of the FIRM with respect to a property they have surveyed as part of the service to lenders and attorneys.

Properties Located in Floodplains. There are roughly 22 million people who reside in the nation's floodplains. Correct referencing of those floodplains to the nation's vertical datum must be accomplished as soon as it is administratively and financially possible to do so.

EDUCATION BY FEMA OF MAP USERS AND PRODUCERS

Ensuring that FEMA staff and contractors are knowledgeable about the conversion is paramount. They will be asked to provide assurance that the datum change is correctly reflected in the flood insurance documents for which they are responsible. They will also be informing map users of the effects of the conversion and be asked for a relationship between the old datum and NAVD 88.

FEMA Education Documents

Initially, a total of four publications were envisioned in the conceptual planning by FEMA. However, to contain costs, a logical consolidation from four documents to two was made to reduce some duplication of effort.

Technical Bulletin for Study Contractors. This document will provide guidelines for FEMA contractors that are providing mapping data and products. It will include a brief discussion of the relationship of Mean Sea Level and how it relates to NGVD 29 and NAVD 88. Also discussed will be the impact of NAVD 88 on Flood Insurance Studies and Flood Insurance Rate Maps in riverine and coastal flooding areas. With advice from the NGS, it will also address how to use the products and data to be provided by the NGS to convert previously established elevations to NAVD 88. Advice will also be provided on the use of non-converted benchmark data from the U. S. Geological Survey, the U. S. Army, Corps of Engineers, and other published vertical data. Sources of assistance will be listed that can provide additional guidance on site-specific problems encountered by contractors.

Brochure for Community. Officials, Surveyors, Engineers, and FEMA Staff. This combined document will contain two major parts. The first part will address the questions most likely to be posed by community floodplain administrators and will deal in less technical terms with the conversion process. It will provide a brief background on the need for a change of datums, examples of how to convert from one datum to NAVD 88, how and from where to get additional assistance, and an explanation of the FEMA policy and timetable regarding conversion to the new datum.

The second part will provide the more technical data about the datum change for the engineering and surveying community and FEMA staff. It will also provide a brief background on NGVD 29, preparations by NGS for establishing NAVD 88, and relationships to MSL. Guidance for surveyors and engineers submitting requests for map revisions will be included, which will define FEMA's requirements for datum information. Sources of qualified technical assistance will also be listed.

EFFECTS OF CONVERSION ON PREVIOUSLY DETERMINED FLOOD ELEVATIONS

The redefinition and improvement of the nation's vertical datum may cause spatial differences in the physical data that are part of the determination of flooding characteristics. Over a major drainage basin, these effects could produce differences in rainfall runoff modeling significant enough to alter previous results. Three different situations can be envisioned that will impact FEMA's flood hazard definition and mapping efforts.

Uniform Chancre Over a Given Range. In cases where the datum difference can be expressed as a bias factor for specific geographic areas, little, if any, distortion will occur in the hydrologic and hydraulic parameters that influence the definition of a given floodplain. In these instances, FEMA will be concerned with assuring that the proper conversion of ground and hydraulic elevations takes place. Some experience along these lines already exists with FEMA from dealing with areas undergoing accelerated subsidence. As map revisions occur to reflect physical changes in floodplains, the most current releveling data are included in the flood elevation determinations. Notes to users

are included on the maps to define the date of releveling used in determining the flood elevations and elevation reference marks. Similar notification can be used for NAVD 88.

Non-uniform Chancres Between Benchmarks. In instances where non-uniform elevation differences are indicated, an investigation of the potential effect on hydraulic behavior will be required. Current FEMA criteria for republishing maps requires that the effects of the change be significant in relation to the published flood elevation. Usually, unless the change in flood elevation or depth is greater than 0.5 foot, or in some cases 1.0 foot, no republication of the flood elevations is dictated. Indications of potential changes of 1.0 foot or more will probably place the stream or community on the priority list for a contracted restudy to establish the exact effect of the changes.

Areas of Crustal Motion. FEMA has been informed by the NGS that areas of this nature will be addressed by the NGS at a later date. We will need additional data from the NGS on the nature of each specific area before providing FEMA with suggested alternatives to redefining flood hazards, as appropriate.

The most immediate changes will occur at the map revision level, which are usually confined to a given reach along a given stream. We anticipate that the bias factor data to be provided by the NGS (Zilkoski 1989) will suffice in the majority of situations. Our applications of the data provided by the NGS will be directed by FEMA to assure that their products remain based on the latest vertical control data available.

DEWBERRY & DAVIS' ROLE IN THE CONVERSION

As a technical evaluation contractor to FEMA, we will be closely involved in the coming conversion at FEMA's invitation, assuming our reselection in the 1992 contract recompetition. Through our continued work since 1974 for the NFIP, we have strived to engender within the project the brightest and most enthusiastic people we can find to help achieve its goals and mission.

Within our existing contract with FEMA, we have been requested to prepare drafts of the documents that will provide guidelines for accomplishing the datum conversion. These documents will rely strongly on the products provided by the NGS. Their continued cooperation has made the task an enjoyable challenge.

CONCLUSION

The coming conversion of the country's vertical datum by the NGS will affect many of the products of the Federal government. Chief among those is the National Flood Insurance Program. However, the pre-planning provided by the Vertical Control Branch of the NGS has made the exercise a learning experience and eased the impact on FEMA.

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REFERENCES

Federal Emergency Management Agency September 1985, Flood Insurance Study Guidelines and Specifications for Study Contractors, Washington, D. C.

Miller, M. B. 1985, Impacts of Conversion to the North American Vertical Datum of 1988 on the National Flood Insurance Program: Proceedings, Third International Symposium on the North American Vertical Datum, NAVD Symposium ' 85, Rockville, Maryland.

Zilkoski, D. B. 1989 (Draft), NAVD 88 Datum Definition Study, National Geodetic Survey, NOAA, Rockville, Maryland.