

# **REQUEST FOR PROPOSAL (RFP)**

## ***Interior Drainage Analysis***

***Sauvie Island Drainage Improvement Company***

***February 2017***

*This project was funded in part with a financial award from the Special Public Works Fund, funded by the Oregon State Lottery and administered by the Oregon Infrastructure Finance Authority*

**TABLE OF CONTENTS**

**I. INTRODUCTION..... 3**  
A. Background ..... 3  
B. Purpose ..... 3  
C. Minimum Consultant Requirements ..... 3  
D. Questions ..... 4  
E. Correspondence..... 4  
F. Proposal Submission Deadline ..... 4

**II. PROPOSALTIMELINE ..... 4**

**III. PROPOSAL CONDITIONS..... 4**  
A. Contingencies ..... 4  
B. Modifications ..... 4  
C. Proposal Submission ..... 4  
D. Incurred Costs..... 4  
E. Negotiations ..... 4  
F. Acceptance or Rejection of Proposals ..... 4  
G. Alternate Proposals ..... 4  
H. Formal Agreement ..... 4  
I. Final Authority..... 4

**IV. PROPOSAL SUBMISSION ..... 5**  
A. General..... 5  
B. Cover Page ..... 5  
C. Introductory Letter..... 5  
D. RFP Format, Style, and Length ..... 5

**V. EVALUATION PROCESS ..... 6**  
A. General..... 6  
B. Evaluation Criteria ..... 6  
C. Final Selection ..... 6

**ATTACHMENTS**  
Attachment A – Cover Page ..... 7  
Attachment B – 44 CFR 65.10 ..... 8  
Attachment C – FEMA Procedural Memorandum 34..... 11  
Attachment D – USACE Design Documentation ..... 13  
Attachment E – SIDIC Canal Cross Sections ..... 14

## **I. Introduction**

### **A. Background**

As part of their Map Modernization Program, FEMA has initiated a countywide Flood Insurance Study (FIS) and Digital Flood Insurance Rate Map (DFIRM) for all incorporated communities within the County. FEMA has implemented a policy to verify the certification status of all levees currently depicted on the effective FIRM as providing protection from the base (1% annual chance) flood. The regulatory requirements for accrediting levees as providing base flood protection on FIRMs is found in Title 44 of the Code of Federal Regulations, Section 65.10 (44 CFR 65.10) (see Attachment B). These criteria include design criteria (e.g. freeboard, closures, embankment protection, embankment and foundation stability, settlement, interior drainage), operation, and maintenance.

### **B. Purpose**

The purpose of this RFP is to solicit qualified firms to coordinate, research, develop and provide required certification information for the Sauvie Island Drainage Improvement Company (SIDIC) in response to the FEMA levee certification program requirements. Subsequent to the selection, an agreement will be entered into between the selected firm and the SIDIC.

The SIDIC is seeking proposals from qualified firms for professional engineering services to evaluate and provide an interior drainage assessment in accordance with FEMA requirements (44 CFR, Section 65.10) and other applicable City, County, State, and Federal regulations. This assessment will include the development of an interior drainage model, determination of model components (topography, precipitation, flow characteristics, pump stations, etc.), calibration of model and sensitivity analysis, with and without levee condition, etc. FEMA requires that an interior drainage assessment be performed by a licensed engineer in order to be considered as providing the necessary protection against the base flood (100 year recurrence interval) as part of FEMA certification.

### **C. Minimum Consultant Requirements**

All Consultants must:

1. Have experience with FEMA FIRM mapping requirements and procedures (e.g., LOMR submittals, etc.).
2. Have experience with standard practices of flood control, hydrologic modeling, hydraulic modeling, and levee construction.
3. Have experience working with FEMA on levee accreditation.
4. Have experience with similar interior drainage analysis projects.
5. Must be currently licensed to do business in the State of Oregon.
6. Submit proposal in the manner as stated in Section IV of this proposal.
7. Have professional Liability Insurance.

### **D. Questions**

Questions regarding the contents of this RFP may be directed to the individual listed in Section I, Paragraph E.

### **E. Correspondence**

All correspondence, including proposals, are to be submitted to:

Tim Couch  
District Manager  
Sauvie Island Drainage Improvement Company  
29264 NW Sauvie Island Rd.  
Portland, OR 97231  
Phone: 503-621-3397

**F. Proposal Submission Deadline**

All proposals must be received at the address listed in Section I, Paragraph E, no later than March 9th, 2017. Postmarks will not be accepted in lieu of actual receipt. Late or incomplete proposals will not be considered.

**II. Proposal Timeline**

Release of RFP	February 15, 2017
Deadline for Proposals	March 10, 2017
Proposal Presentation (top ranked Consultants if necessary)	March 24, 2017
Tentative Date for Consultant Selection	April 10, 2017

**III. Proposal Conditions**

**A. Contingencies**

This RFP does not commit the SIDIC to award a contract. The SIDIC reserve the right to accept or reject any or all proposals, if the SIDIC determine it is in the best interest of the SIDIC to do so. The SIDIC will notify all proposers in writing, if the SIDIC rejects all proposals.

**B. Modifications**

The SIDIC reserve the right to issue addenda or amendments to this RFP if the SIDIC considers that additional clarifications are needed.

**C. Proposal Submission**

To be considered, all proposals must be submitted in the manner set forth in this RFP. It is the Consultant's responsibility to ensure that its proposal arrives on or before the specified time.

**D. Incurred Costs**

The SIDIC is not obligated to pay any costs incurred by Consultants in the preparation of a proposal in response to this RFP. Consultants agree that all costs incurred in developing this proposal are the Consultant's responsibility.

**E. Negotiations**

The SIDIC may require the potential Consultant selected to participate in negotiations. This may include cost, technical, or other clarifications needed to develop a contract.

**F. Acceptance or Rejection of Proposals**

Proposals shall remain open, valid and subject to acceptance anytime within ninety (90) days after the proposal opening. The SIDIC reserve the right to reject any or all proposals. The SIDIC will award contract based on the proposal that best meets the needs of the SIDIC.

**G. Alternate Proposals**

The SIDIC will consider any and all proposals as long as they are submitted individually. This may include alternate solutions, suggestions or procedures that could be followed or methods of enhanced communication.

**H. Formal Agreement**

Consultant will be required to enter into a formal agreement with the SIDIC. This RFP sets forth some of the general provisions which will be included in the final contract. In submitting a response to this RFP, Consultant will be deemed to have agreed to each clause unless the proposal identifies an objection and the SIDIC agrees to a change of language in writing.

**I. Final Authority**

The final authority to award a Contract rests solely with the elected governing Board of the SIDIC.

#### **IV. Proposal Submission**

##### **A. General**

Consultants that submit proposals in response to this RFP must have the capability of providing the products and services specified herein. Consultants selected for this project will be responsible for the completion of all required tasks associated with a defined scope of work to be determined at the project specific level. The SIDIC will select the top-ranked firms from the scored and ranked proposal submittals. Interviews may be scheduled if deemed necessary by the SIDIC.

##### **B. Cover Page**

Attachment A is to be used as the cover page for the proposal. This form must be fully completed and signed by the authorized officer of the consultant.

##### **C. Introductory Letter**

The RFP shall include an introductory letter addressed to:

Tim Couch  
Sauvie Island Drainage Improvement Company  
29264 NW Sauvie Island Rd.  
Portland, OR 97231

The letter shall contain the following items:

1. The Proposer's expression of interest in being selected for the Project;
2. A statement acknowledging receipt of all RFP addenda, if any issued;
3. A statement of the commitment of the key personnel identified in the RFP to the extent required to meet the SIDIC's schedule and quality expectations;
4. A summary of key points regarding the Proposer's qualifications;
5. A statement that the Proposer will comply with all applicable federal, state, and local laws and regulations.

##### **D. RFP Format, Style, and Length**

In order to assure uniformity of the RFP's and to facilitate the evaluation process, all submittals should be organized and labeled following the outline below:

Cover Sheet  
Introductory Letter

1. Project Understanding – Synopsis of the Consultant's understanding of the SIDIC's needs. This should provide a broad summary of the Consultant's proposal.
2. Project Approach – The proposed plan for how the Consultant will conduct the interior drainage analysis. At a minimum, the Consultant will describe the methods proposed to (i) incorporate detailed information for existing channels and structures into the interior drainage analysis; (ii) hydraulically route flows through the drainage network to the pump stations; and (iii) define water surface elevations in areas with depths exceeding one foot.
3. Level of Effort –The proposed level of effort (in hours) to conduct individual tasks as part of the interior drainage analysis.
4. Project Team, Key Personnel and Organization – Include Professional Experience of Project Manager and Project Engineer.

5. Relevant Experience – Familiarity and project experience with the FEMA levee certification requirements and process for interior drainage evaluation.
6. Quality Control Program – Ability to meet project schedule requirements
7. Appendices – Project Team Resumes

Writing style should be concise and straightforward. Lengthy narratives containing extraneous information are discouraged. Total page count for the scored evaluation criteria is limited to 15 pages using 12-point letter font for the main text. Firms not conforming to these criteria may be considered non-responsive. Proposers may use their discretion for the font size of other materials (e.g. graphics, charts). Foldouts, not exceeding 11"x17", are permitted. Project team resumes attached as appendices are not included in the determination of total page count.

## **V. Evaluation Process**

### **A. General**

All proposals will be subject to a standard review process by a Technical Advisory Committee and/or the Board of the SIDIC. Scoring proposals will be based on an ordinal ranking system.

### **B. Evaluation Criteria**

#### **1. Initial Review**

- a. All proposals will be evaluated initially to determine if they meet the minimum technical requirements, including surveying, mapping, hydrology and modeling.
- b. The proposal must be complete, in the required format, and be in compliance with all material requirements of this RFP.

Failure to meet all of these requirements may result in a rejected proposal. No proposal shall be rejected, however, if it contains a minor irregularity, defect, or variation, if the irregularity, defect, or variation is considered by the SIDIC to be immaterial or inconsequential. In such cases, the Consultant will be notified of the deficiency in the proposal and given an opportunity to correct the irregularity, defect, or variation, or the Districts may elect to waive the deficiency and accept the proposal.

#### **2. Proposal Review**

Proposals meeting the above requirements will be evaluated on the basis of the following criteria (not necessarily in order of priority):

- a. Understanding of the work to be done
- b. Experience with similar kinds of work
- c. Quality of staff for work to be done
- d. Familiarity with FEMA mapping procedures and requirements
- e. Level of effort (in hours) to complete the project
- f. Cost of the project.

A contracting agency may direct appoint a consultant if the estimated cost of the project does not exceed \$100,000. ORS 279C.110(8)

#### **3. Oral Presentation and Demonstration**

The top Consultants may be asked to provide an oral presentation of their proposal if necessary to aid the Technical Advisory Committee and/or the SIDIC Board in the selection process.

### **C. Final Selection**

Based on review and ranking process identified herein the SIDIC Board shall select the top consultant to perform the levee certification work on behalf of the SIDIC. The selected consultant will be tasked with developing a scope of work and associated costs specific to an interior drainage analysis. Once final scope and costs are determined the consultant shall develop and enter into a contractual agreement to perform the services for the SIDIC.

**ATTACHMENT A – COVER PAGE**

<b>FIRM'S NAME</b> <i>(name of firm, entity or organization):</i>
<b>FEDERAL EMPLOYER IDENTIFICATION NUMBER:</b>
<b>NAME AND TITLE OF FIRM'S CONTACT PERSON:</b>
<b>MAILING ADDRESS:</b>
Street Address:
City, State, Zip:
<b>TELEPHONE NUMBER:</b>
<b>FAX NUMBER:</b>
<b>EMAIL ADDRESS:</b>
<b>FIRM'S ORGANIZATIONAL STRUCTURE</b>
<input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Proprietorship <input type="checkbox"/> Joint Venture
<input type="checkbox"/> Other (explain):
<b>If Corporation, Date Incorporated: State Incorporated:</b>
<b>States Registered in as foreign corporation:</b>
<b>FIRM'S SERVICES OR BUSINESS ACTIVITIES OTHER THAN WHAT THIS RFP REQUESTS:</b>
<b>FIRM'S AUTHORIZED SIGNATURE:</b>
The undersigned hereby certifies that this proposal is submitted in response to this solicitation.
SIGNED: _____ DATE: _____
<b>PRINT NAME:</b>
<b>TITLE:</b>

## ATTACHMENT B - 44 CFR 65.10

[Code of Federal Regulations]  
[Title 44, Volume 1]  
[Revised as of October 1, 2002]  
From the U.S. Government Printing Office via GPO Access  
[CITE: 44CFR65.10]

[Page 346-348]

### TITLE 44--EMERGENCY MANAGEMENT AND ASSISTANCE CHAPTER I--FEDERAL EMERGENCY MANAGEMENT AGENCY

#### PART 65--IDENTIFICATION AND MAPPING OF SPECIAL HAZARD AREAS--Table of Contents

##### Sec. 65.10 Mapping of areas protected by levee systems.

(a) General. For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive flood plain management criteria established by Sec. 60.3 of this subchapter. Accordingly, this section describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the base flood. This information must be supplied to FEMA by the community or other party seeking recognition of such a levee system at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought based on a levee system, and upon request by the Administrator during the review of previously recognized structures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how a structure or system will perform in a flood event.

(b) Design criteria. For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:

(1) Freeboard. (i) Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.

(ii) Occasionally, exceptions to the minimum riverine freeboard requirement described in paragraph (b)(1)(i) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to an assessment of statistical confidence limits of the 100-year discharge; changes in stage-discharge relationships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.

(iii) For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave run up (whichever is greater) associated with the 100-year stillwater surge elevation at the site.

(iv) Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two

[[Page 347]]

feet above the 100-year stillwater surge elevation be accepted.

(2) Closures. All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

(3) Embankment protection. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include, but are not limited



to: Expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

(4) Embankment and foundation stability. Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

(5) Settlement. Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design--Settlement Analysis" (EM 1100-2-1904) must be submitted.

(6) Interior drainage. An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

(7) Other design criteria. In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

(c) Operation plans and criteria. For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

[[Page 348]]

(1) Closures. Operation plans for closures must include the following:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.

(2) Interior drainage systems. Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) Other operation plans and criteria. Other operating plans and criteria may be required by FEMA to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

(d) Maintenance plans and criteria. For levee systems to be recognized as providing protection from the base flood, the maintenance criteria must be as described herein. Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

(e) Certification requirements. Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at Sec. 65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

[51 FR 30316, Aug. 25, 1986]

## ATTACHMENT C – DRAFT LEVEE CERTIFICATION PROCEDURES AND PLAN

### DRAFT LEVEE CERTIFICATION PROCEDURES AND PLAN

#### - FEMA Procedural Memorandum 34 -

Federal Emergency Management Agency  
Washington, D.C. 20472  
August 22, 2005

**MEMORANDUM FOR:** Regional Directors, Regions I -X

**FROM:** David I. Maurstad, Acting Director  
Mitigation Division

**SUBJECT:** Procedure Memorandum 34 -Interim Guidance for Studies  
Including Levees

**Background:** Throughout the United States, levees protect numerous communities and large expanses of agricultural land from floods. Their importance in mitigating flood hazards and their relevance to the National Flood Insurance Program are indisputable. However, and coastal levees, in the aggregate, stretch for tens of thousands of miles, and information on their location, structural integrity, and certification often is outdated or missing altogether.

**Issue:** To address this challenge, a Levee Coordination Committee-including representatives from other Federal agencies, and States-is examining current levee regulations and assisting in the development of a long-term policy that protects citizens and property, while accommodating the needs of the NFIP. This memorandum helps to clarify the entities responsible for providing information on levees identified during a mapping project.

**Action Taken:** Until the new policy is developed, this memo provides interim guidance to minimize delays in near-term mapping studies. The attached flow chart supplements procedure memorandums 30 and 32. This information is in conformance with Section 65.10 of the NFIP regulations.

#### **Supplement to Procedure Memo 30-FEMA Levee Inventory System.**

Mapping partners – CTPs, IDIQs, OFAs, etc. --should continue providing information about levees located in or adjacent to study areas. Information should be provided via the FEMA Levee Inventory System (FLIS) according to Procedure Memorandum 30 and the instructions available on the FLIS Web site located at <http://flis.pbsjdfirm.com>. The FLIS will be accessed via the MIP after release 3.0.

Levee coordinates should be gathered at a level of detail consistent with GIS accuracy and digital Flood Insurance Rate Map (FIRM) standards. Mapping partners who do not already have access to the FLIS can contact the National Service Provider at (703) 960-8800.

August 22, 2005

Page 2 of 2 -Procedure Memorandum 34

**Supplement to Procedure Memo 32-Levee Review Protocol.**

The protocol for levee reviews, particularly the details provided in Table 1 of Procedure Memorandum 32, is revised according to the attached flow chart.

**Identification of Levees**

It is critical that all levees within the scope of the mapping project be identified early in the mapping project, ideally no later than the scoping meeting. The role of all mapping partners, including coordination with the State and other Federal partners (e.g., U.S. Army Corps of Engineers), related to review of levee certification should be clearly identified as part of the scoping process. When levees are identified at the scoping meeting the community must be informed of the data requirements for FEMA to recognize a levee as providing protection from the 1-percent-annual-chance flood (base flood) on the FIRM. In accordance with 44 CFR Section 65.10(a) it is the responsibility of the community or other party seeking recognition of a levee system at the time of a flood risk study or restudy to provide the data outlined in 44 CFR Section 65.10. FEMA will not be conducting detailed examinations of levees to determine how a structure or system will perform in a flood event. In addition, the community or party seeking recognition should be provided with a deadline for submitting the data and informed that if the data are not submitted by the deadline, the levee cannot be recognized as providing protection the base flood as part of the current mapping effort. However, a revision could be initiated once data are available.

Early identification of levees allows the mapping partner to outline to the community, or party seeking recognition, their responsibilities and expectations to minimize study delays. In order to aid our mapping partners in properly assessing how to handle levee mapping issues, we have generated the below flowchart.

## ATTACHMENT D – USACE Design Documentation

### U.S. Army Corps of Engineers Documents

The U.S. Army Corps of Engineers documents and engineering manuals relevant to levees and floodwalls are summarized in the table below. These documents contain useful guidance in evaluating whether or not a levee meets the criteria of 44 CFR 65.10.

<b>Doc.No.</b>	<b>Title</b>	<b>Date</b>	<b>Relevant Contents</b>
EM 1110-2-1913	Engineering and Design- Design and Construction of Levees	4.30.2000	Basic principles in design and construction of earthen levees. Includes guidance on field investigations and laboratory testing that can be used to assess the current geotechnical condition of an existing levee.
---	Levee Owner's Manual for Non-Federal Flood Control Works	3.2006	Guidance on the operation and maintenance of levees, floodwalls, and other flood control structures, including inspections and flood preparedness.
EM 1110-1-1904	Engineering and Design- Settlement Analysis	9.30.1990	Guidelines for calculations of vertical displacements and settlement of soil under shallow foundations supporting various types of structures.
EM 1110-2-1413	Engineering and Design- Hydrologic Analysis of Interior Drainage Areas	1.15.1987	Guidance and criteria for performing an interior drainage analysis for a levee system
EM 1110-2-2502	Engineering and Design- Retaining and Flood Walls	9.29.1989	Guidance for design and construction of retaining and flood walls subject to hydraulic loading
EM 1110-2-1906	Engineering and Design- Laboratory Soils Testing	11.30.1970 (rev. 8.20.1986)	Recommended testing procedures for making determinations of the soil properties to be used in the design of civil works projects.
EM 1110-2-301	Engineering and Design- Engineering and Design - Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams	1.1.2000	Guidelines for acceptable vegetation and landscape planting at levees and floodwalls
EM 1110-2-2705	Engineering and Design - Structural Design of Closure Structures for Local Flood Protection Projects	3.31.1994	Guidance on the design of closure structures

## **ATTACHMENT E-SIDIC Canal Cross Sections**

A canal survey was completed in October 2009.

The survey includes several canal cross sections:

Three (3) on the A1 Canal

Four (4) on Gilbert River Canal

One (1) on the Marquam Canal

The entire A1 and Gilbert River Canals are covered by the 2009 survey.

The existing cross sections should be used as part of the interior drainage analysis.

Two (2) additional cross section will be needed on the Marquam Canal.