DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO
ATTENTION OF

CENPS-RM-BU

14 May 1996

Skagit County check nó. 00000152277 dated 05/08/96 in the amount of **$103,820.00.**

Required Contributed Funds (COEMIS **"FWSGA"**) in the amount of **$103,820.00**, for cost-shared PL84-99 levee repair and restoration, project : **SKA-1-95.**

Check is accepted IAW ER 1165-2-30, paragraph 4G.

COEMIS Project >>>	FWSGA	(related to: DCSGA)
Appropriation Symbol :	96x8862	96x3125
Appropriation Code :	980	910
Category/Class :	310	320
O/H Key(s) :	C-CC	C-CC
CWIS :	030079	030079
55K :	.195	.805

Pertinent tran codes: "DW" to record A/R for Contributed Funds. "GL" to collect A/R for Contributed Funds, and in a subsequent batch, "AD" all done by CENPP-RM-FS, document number **A08963232.**

Original: CENPP-RM-FD

CF: 14 May 1996
CENPS-RM-FA
.....-EN-PL
.....-OP-EM, Spicer
.....-PM-PB, Curtis
.....-RM-BU
CENPP-RM-FS

C. Schmitz-Robinson
Budget Analyst

CLAIMS FUND
WARRANT NO. 00000152277

Skagit County

PAYABLE THROUGH
MOUNT VERNON BRANCH
SEATTLE-FIRST NATIONAL BANK
MOUNT VERNON, WASH.

19-2
1250

DATE 05 0[illegible]

TO THE TREASURER OF SKAGIT COUNTY
MOUNT VERNON, WASHINGTON

***$103,820 DOLLARS AND 00 CENTS ***$103,820.00

NON-NEGOTIABLE

PAY TO
THE ORDER OF:

FAD,USAED,PORTLAND
DEPT OF ARMY CORPS OF ENGINEER
PO BOX 3755
SEATTLE WA 98124-2255

Kathy Hill
AUTHORIZED SIGNATURE

150211

⑈150211⑈ ⑆125000024⑆ 9353 202⑈

CENPS-EN-PL-CP

MEMORANDUM FOR Commander, North Pacific Division, ATTN: CENPD-ET-OE

SUBJECT: Skagit River, Washington, Skagit County, Public Law 84-99,
Levee Restoration, Diking District No. 17, Job No. SKA-1-95

1. LOCATION. The levee section is located on the left bank of the Skagit River in Diking District No. 17 (DD 17), Skagit County, Washington. Enclosure 1 provides a location and vicinity maps, and a typical cross-section and estimated quantities for the proposed repair.

2. OWNER. This non-Federal levee is operated and maintained by Diking District No. 17, Skagit County, Washington.

3. SPONSORS. Skagit County has requested assistance in repairing the damaged levee sections on the Skagit River within Skagit County, see enclosure 2. DD 17 will act as the local sponsor. This includes providing 20 percent cost share of the total construction costs and necessary real estate requirements. Prior to the Government initiating construction work, DD 17 will sign a Project Cooperation Agreement to provide the usual items of local cooperation. Before construction begins, DD 17 will provide to the Government for acceptance all documentation needed to demonstrate it owns all lands, easements and rights-of-way, including suitable borrow sources and dredged or excavated material disposal areas, necessary for construction, operation and maintenance of the levee system.

4. POINT OF CONTACT FOR SPONSOR.

Diking District No. 17
Mr. Arnold Moores, Secretary
2548 River Bend Road
Mt. Vernon, Washington 98273
telephone (360) 424-6411

5. PROJECT CLASSIFICATION. This is a non-Federal levee designed for flood control to provide protection from periodic, recurring floods.

6. DESIGN DATA OF PROJECT. The levee commences at the Burlington Northern Railroad (BNRR) bridge and extends for about 22,000 feet downstream on the left bank of the Skagit River. The levee system is adjacent to the river's edge along much of its length. The levee structure consists of silty sand with occasional spalls and cobbles covered with a class IV to V riprap blanket from the toe to within 8 feet of the top of the levee. Prior to the flood damage, the levee provided approximately 22 year level of protection.

7. PREVIOUS PL 84-99 ASSISTANCE. The last Federal participation in repairs on this levee system was in 1991 at cost of about $1,078, 000. Prior Federal participation under PL84-99 was in 1980 at a cost of about $16,000.

8. MAINTENANCE. This levee section is active in Seattle District's PL 84-99 continuing eligibility inspection inventory. This levee is sufficiently maintained. DD 17 expends approximately $250,000 annually for operation and maintenance of the flood control facilities along the Skagit River.

9. DISASTER INCIDENTS.

a. Job No. SKA-1-95 involves repair of a section of the levee that was damaged during the 9 and 30 November 1995 flood events. November 1995 was the wettest November on record for most of western Washington. Flood damage to DD 17 levee resulted from a combination of two high water events, one at the beginning of November and the other at the end of the month. In early November, a combination of heavy rains and a rise in the freezing level to above 8,000 feet produced high water on the Skagit River for about 4½ days. The magnitude of the peak, occurring the afternoon of 9 November, was 92,030 cubic feet per second (cfs) as measured at the USGS recording gage near Mt. Vernon, Washington. During the second event, heavy rains, a high freezing level and melting snow combined with already high river levels and saturated ground resulting in a peak discharge on the afternoon of 30 November of 136,000 cfs, 9.39 feet above flood stage. High water levels lasted about 9 days and the peak discharge had a recurrence interval of approximately 15-years. Average channel velocities through the river reach covered by this report are estimated to vary between 5 and 6.3 feet per second.

b. Situation Reports No. 1 and 2 for Western Washington were submitted to CENPD-CO-E during the period of 8 to 12 November 1995. Situation Reports No. 1 through 18 for Western Washington were submitted to CENPD-CO-E during the period of 27 November to 13 December.

10. DAMAGE DESCRIPTION. See enclosure 3 for photographs of the damaged levee. Levee failure has occurred as a result of loss of the toe with resultant slip failure of the embankment. Failures range from severe to moderate, however, as water levels subside damage continues with additional embankment loss. The damaged area is a 750-foot long section beginning at about rivermile 17.4, approximately 50 feet downstream of the BNRR bridge. The centerline of the levee varies from 50 to 75 feet from the river's edge with rock slope protection on the riverward levee toe. During the early November high water event, debris stacked up behind the BNRR bridge and jetted the flow against the levee. To prevent levee failure during the flood event, Diking District 17 placed in excess of 4,000 of riprap along a 350 foot section. This rock does not provide adequate protection, is not durable rock and will be partially removed as part of the repair.

11. PROPOSED WORK.

a. Typical repairs to the DD 17 levee will consist of removing unstable side slope and partial removal of temporary repair material, and resloping the bank as necessary to produce a 1.5 foot horizontal (H) on 1 foot vertical (V) side slope. A 1-foot thick gravel filter blanket (above the water line) or blanket of rock spalls (below the water line) will be spread on the graded embankment. Class IV riprap with a 2-foot top width will be placed on the filter blanket at a 2H on IV slope to form a wedge section with a minimum thickness of 14 feet at the toe. At the temporary repair section, no filter blanket will be required because this section varies from 8 to 14 feet thick. DD 17 has designated a disposal site for any unusable material. Material for the filter blanket will be trucked to the site from a local established gravel source approximately20 miles round trip haul distance from the site.. Riprap will be brought to the site from a local quarry, also approximately a 20 mile round trip haul. Access to the project area will be gained through use of existing ramps and along the levee itself.

b. Diking District 17 is located northeast of the downtown Mt. Vernon area, along the left bank of the Skagit River. Development in this area is mixed. The eastern portion of the diking district, along the I-5 corridor, is predominately commercial with a high rate of development over the past 10 years. The western portion, which is more rural contains the Anacortes Water Treatment Plant, several nurseries and agricultural operations, as well as residential housing. Benefits are based on the following:

(1) Protection of approximately 175 residences, two retail shopping malls, several new car dealerships, the Anacortes Water Treatment Plant, two large manufacturing firms, and 20-25 smaller commercial establishments. The majority of the protected area lies within the city limits of Mt. Vernon.

(2) Protection of approximately 800 acres of agricultural land used for growing peas, cut grass, vegetable seed, cauliflower, and wheat. In addition to crops, there are also two nurseries that grow a variety of horticultural products including bulb crops and Christmas trees. Agricultural land values in this area average about $3,900 per acre.

c. The Economic evaluation for the proposed work was based on several sources of information including; the 1993 Skagit Basin Flood Damage Reduction Reconnaissance Report, 1990 Public Law 84-99 Rehabilitation Report and a 1978 GDM Flood Damage Reduction Report, providing a detailed damage frequency relationship. These reports were supplemented by field investigations during each of the flood events as well as a post-flood inspection. As part of the 1993 report, a detailed geotechnical evaluation of the structural adequacy of existing (pre-flood) levees to determine probable failure and non-failure points was completed. A similar type of evaluation

was completed for the flood damaged levee sections following the November 1995 flood events in order to determine the post-flood level of protection. Based on these evaluations, the pre-flood probable non-failure point (PNP) was estimated at a 20 year event which corresponds to a discharge of 138,000 cfs, the probable failure point (PFP) was estimated at a 25 year event which corresponds to a discharge of 146,000 cfs.

d. Based on the 1993 economic evaluation (price updated to 1995 conditions) expected annual damages for the PNP scenario would be $1,065,000. Based on the PFP scenario expected average annual damages are $1,110,000. For simplicity, an average of the two values will be used to establish an economic justification. As such expected average annual damages, if the levee sections are repaired to their pre-flood condition, are $1,089,000. This would correspond to roughly a 22.5 year level of protection. Based on the post-flood geotechnical evaluation, the damaged levee section within the Diking District currently affords a 10 year level of protection. Expected annual damages under this condition (post-flood) are estimated at $1,845,000. The following table summarizes by category the with and without repair expected annual damages.

CATEGORY	POST-FLOOD EXPECTED ANNUAL DAMAGES	WITH REHAB EXPECTED ANNUAL DAMAGES	EXPECTED ANNUAL BENEFITS
RES. STRUC.	$209,970	$131,550	$78,420
RES. CONT.	95,400	58,090	37,350
COM/IND	633,260	397,540	235,720
PUBLIC	225,960	114,440	111,520
EM. AID	578,520	333,810	244,710
AGRICUL.	80,540	42,240	38,330
OTHER	21,720	11,060	10,660
TOTAL	1,845,370	$1,088,730	$756,710

e. With repair, the level of protection would be restored to an approximate 22 year level of protection. In accordance with ER 500-1-1, the economic life was estimated equal to the degree of protection. In this case, for purposes of deriving annual costs a 22 year economic life is utilized. The following economic analysis was based on the current discount rate of 7.63% and an economic life of 22 years.

First Cost (January 1996 prices)	$554,700
Annual Cost:	
Interest and Amortization (22 yrs @ 7.63%)	$ 52,800
Operations and Maintenance	$ 8,500
Total Annual Cost	**$ 61,300**
Total Annual Benefits	**$ 756,670**
Benefit-to-cost Ratio	**12.3 to 1.0**

The following checks were performed:

(1) Total value of property protected:

Agricultural Land (800 acres)	$ 3,120,000
Residences	12,378,000
Commercial, Industrial, & Public	139,250,000
	$154,748,000

(2) Value of Cropland:

Farm Land	Value	8 percent	Benefits/Acre
800 acres	$3900/acre	$312	$48

(3) Net Farm Income:

Income per acre[1/]	Benefits/Acre
$500	$48

(4) Distribution of Project Benefits: There are 659 property owners in the protected area. No individual receives more than 25 percent of the project benefits.

f. Various alternatives for the damaged area have been considered to provide the pre-flood level of protection. The alternative of a set-back levee for the damaged section has been found to be more costly than the selected plan. The no-action alternative was examined but not considered since this alternative would significantly reduce the level of flood protection for the area.

[1/] Skagit County Aq Stats. Washington State University Cooperative Extension, 1990,93.

12. COST ESTIMATE. Estimated Cost (Price Level January 1996)

(1) Construction Cost: (1,425 feet)

Equipment Mob and Demob,	1 job L.S.	$ 3,000
Excavation,	3,300 c.y. at $ 7.00	23,100
Remove Temporary Rock	2,100 c.y. at $ 7.00	14,700
Gravel Filter Blanket,	250 c.y. at $10.00	2,500
Rock Spalls,	350 c.y. at $23.00	8,100
Access Road Gravel,	1,500 c.y. at $12.00	18,000
Riprap,	14,700 c.y. at $25.00	367,500
Subtotal		$436,900
Supervision and Inspection, (8%)		$ 35,000
Contingency, (15%)		$ 70,800
TOTAL CONSTRUCTION COST [1/]		**$542,700**

(2) Engineering and Design (Federal):

Plans and Specifications	$ 12,000
(3) TOTAL PROJECT COST	**$554,700**

[1/] Engineering and Design (E&D) is a 100% Federal cost per ER 500-1-1 paragraph 5-4.e. Total Construction Cost is the amount to be cost shared with the local sponsor and does not include E&D.

(4) COST DISTRIBUTION

TOTAL FEDERAL COST	
(Total Construction Cost) X 80% + E&D	**$446,160**
LOCAL SPONSOR SHARE OF CONSTRUCTION COST	
(Total Construction Cost) X 20%	**$108,540**

13. STATEMENTS. In accordance with ER 200-2-2, Procedures for Implementing NEPA, paragraph 8, Emergency Actions, the environmental effects of the proposed levee rehabilitation have been considered during the planning process. An environmental assessment (EA) will be prepared to evaluate probable impacts of the project on the existing environment. Factors addressed by the evaluation include public safety, water quality, wetlands, threatened and endangered species, noise, economics, fish, and wildlife. An environmental assessment and Finding of No Significant Impact (FONSI) will be completed, coordinated with applicable Federal and State resource agencies and placed in the study file.

a. Water Quality. Turbidity levels and dissolved oxygen levels should not be impacted because the material is relatively clean. Materials for construction will be obtained from an established borrow pit and rock quarry. No contaminants are known or suspected to be present in the construction materials.

b. Fish and Wildlife. Construction will not affect any aquatic or terrestrial fauna. Excavation, transportation, and placement of embankment materials will require the use of heavy construction equipment whose presence and noise may temporarily displace some species at both the borrow pit and construction sites. No adverse impacts from excavation or removal of construction material are expected. Threatened or endangered species such as the bald eagle and American peregrine falcon may transit the project area but are not expected to be affected as a result of the proposed action.

c. Wetlands. The project area does not contain wetlands as defined by the Corps of Engineers.

d. Cultural Resources. No significant cultural resources are anticipated in the project area due to the disturbed nature of the project area (compacted earth levee).

e. Recreation. The particular section of levee that will undergo rehabilitation is not considered a recreational area.

f. The proposed work is being informally coordinated throughout the planning, design and construction phases with the following agencies. Their recommendations will be considered and implemented as appropriate.

(1) U.S. Fish and Wildlife Service
(2) Environmental Protection Agency
(3) Washington State Department of Fisheries
(4) Washington State Department of Ecology
(5) Washington State Department of Wildlife
(6) State Historic Preservation Office

14. PERMITS. The District Commander has determined that the rehabilitation work is exempt in accordance with 33 CFR 323.4, emergency reconstruction of a recently damaged levee.

15. REQUEST FOR AUTHORITY, WORK ALLOWANCE, AND FUNDS. The damaged flood control levees in Diking District No. 17, Skagit County, Washington, qualify for repair under Public Law 84-99. Unless these repairs are made, the next high water event could further damage the levee, possibly resulting in levee failure with resultant wide-spread flooding. Repair of the levees are recommended as described above. Authorization of the repairs and an allotment of $446,160 for this work is requested. Construction will be contingent upon the local sponsor furnishing the necessary items of local cooperation. CWIS number is 30079,

FOR THE COMMANDER:

3 Encls
as

Brian R. Applebury, P.E.
Chief, Operations Division

Scudder/EN-PL-CP

Cardinal/EN-PL-CP

Fischer/EN-GT-GI

Schuldt/EN-DB-CD

Swanson/EN-CE

Komoroske/OP-EM

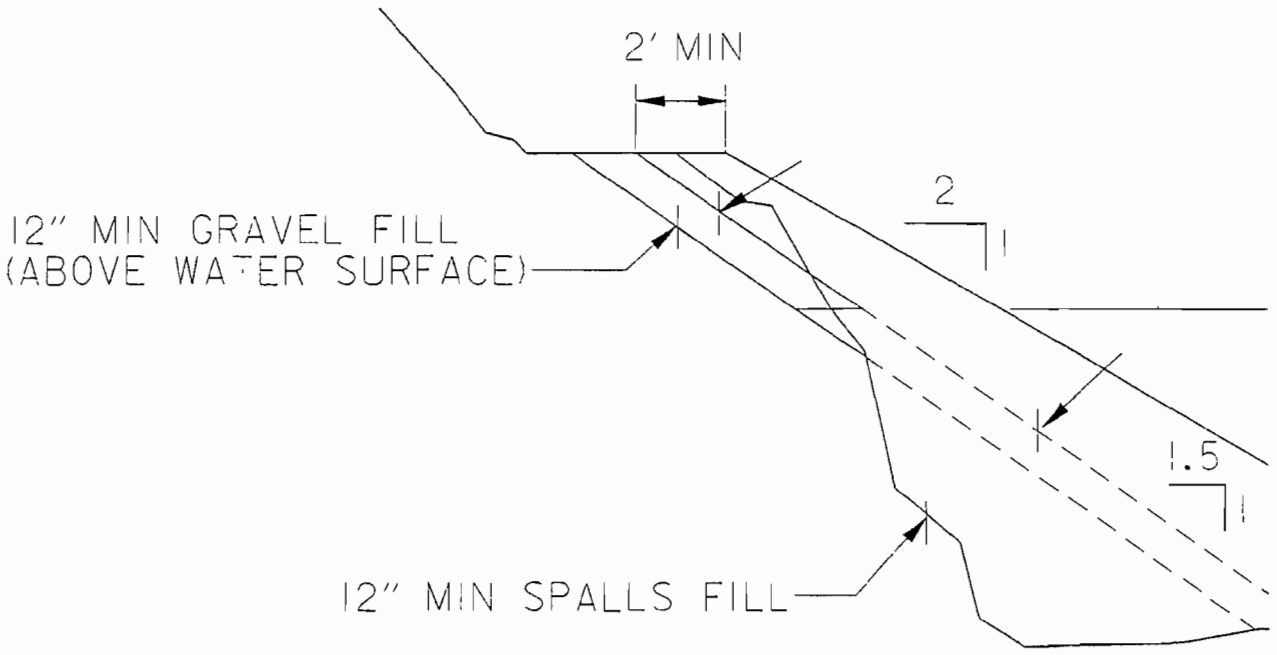
Applebury/OP/s/

EP File

CC:
OP-EM (Weber)
RE-AQ (Gentry)
EN-CE (Pierce)
EN-GT-GI (Kaiser)
EN-PL-CP (Soule)
EN-PL-CP (Cardinal)
EN-PL-CP (Scudder)
EN-PL-ER (M^cNeely)
EN-HH-HG
PAO

MFR: Design based upon 1990 rehabilitation work.
This design has proven effective for 20+ years.
Damage was not due to lack of maintenance.
Following technical offices provided coordination:
ECON, Hydrology, Cost Engineering, OPNS-EM,
Planning Br.

MATERIAL	QUANTITY	HAUL DISTANCE
EXCAVATION	3,300 C.Y.	N/A
REMOVE TEMP ROCK	2,100 C.Y.	N/A
GRAVEL BEDDING	250 C.Y.	20 MILES (R/T)
ROCK SPALLS	350 C.Y.	20 MILES (R/T)
GRAVEL ACCESS	1,500 C.Y.	20 MILES (R/T)
RIPRAP	14,700 C.Y.	20 MILES (R/T)

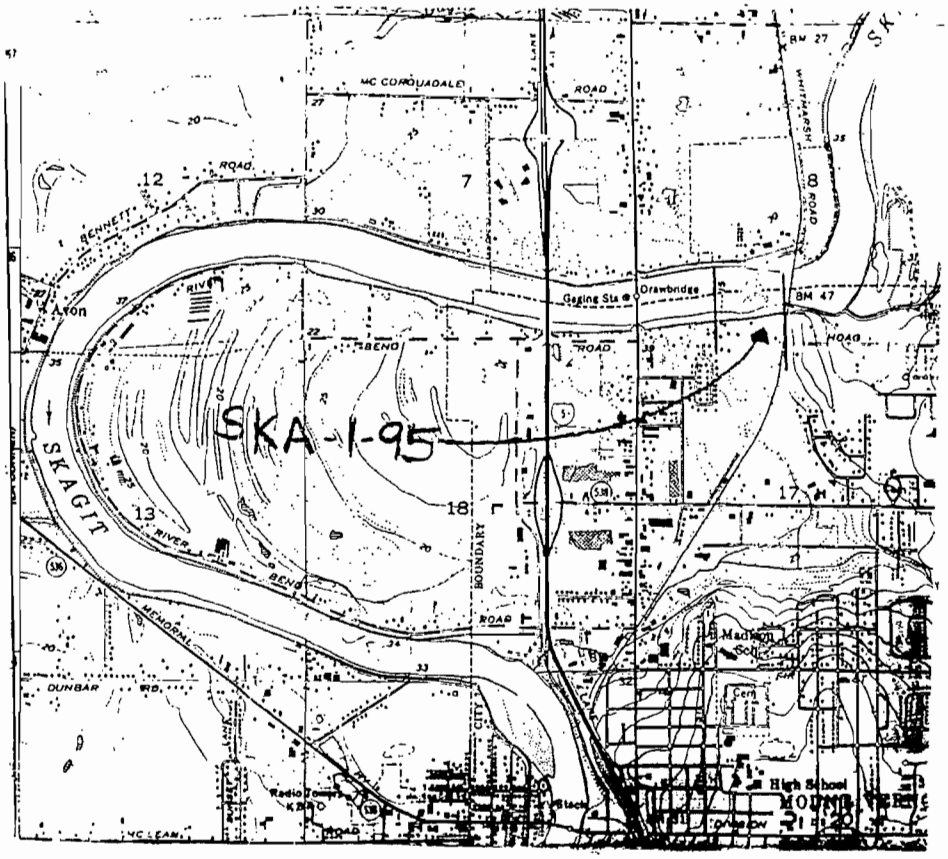


LEVEE TOE REPLACEMENT

TYPICAL SECTION
NOT TO SCALE

NOTE:
1. T.C. = ESTIMATED WATER SURFACE AT TIME OF CONSTRUCTION.

VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

= T.C.

CLASS IV RIPRAP

REDUCED TO 50% OF FULL SIZE

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

1995 FLOOD DAMAGE REPAIR

SKA-1-95
LEVEE REHABILITATION
NEAR MT. VERNON

SKAGIT RIVER WASHINGTON

SIZE	INVITATION NO.	FILE NO.	DATE	PLATE
		E-6-6-379	JAN 96	1
DSGN. SCUDDER		CHK. SCHULOT	SHEET 1 OF 1	

DATE AND TIME PLOTTED: 05-FEB-1996 09:13
DESIGN FILE: i:\designs\misc\civil\pi99_ska1.dgn

Enclosure 1