Appendix A

Alaska Community Erosion Survey Results Summary

Alaska Community Erosion

Survey Results Summary

Introduction

Following is a summary of the Alaska Community Erosion Survey conducted in 2007 and 2008. This survey was in response to the Consolidated Appropriations Act of 2005, PL 108-447, Division C – Energy and Water Development Appropriations Act, 2005 under the heading of Tribal Partnership Program, which reads in part:

> *"The conference finds there is a need for an Alaska baseline study to coordinate and plan the appropriate responses and assistance for Alaska villages in the most need and to provide an overall assessment on the priority of which villages should receive assistance".*

In order to establish the baseline for Alaska erosion issues, the Corps developed a personal interview survey to contact Alaska communities known to experience erosion. Through the study process of the Baseline Erosion Assessment (BEA), 161 communities were identified for the survey effort. The survey was developed by Alaska District and approved by the Office of Management and Budget on 12 June 2007. A copy of the survey instrument follows this summary and includes the OMB number 0710-0001 which expires on September 30, 2009.

Survey Methodology

In conjunction with the Army Corps of Engineers, Alaska District, a package containing an introductory letter along with personal interview questions was mailed by the Corps to 161 Alaskan communities known to have erosion. The intent of the early mailing of the package was to provide communities with the advance opportunity to prepare and gather all necessary information. Mailing of the survey was followed by telephone contact. As of this analysis, 127 communities have completed the survey.

A contractor to the Corps utilized previously published reports, Corps files, survey responses, and documents collected from communities through the interview process in the development of Erosion Information Papers (EIPs) for each of the surveyed communities. The papers were then reviewed by the Corps and made available to the community for review. The individual EIPs were then assessed by the Corps and others to assess how best to address erosion in Alaska.

The Alaska Community Erosion Survey questions are grouped into a few basic sections: general, coastline erosion, river or stream erosion, continuous, or discrete. The following discussion summarizes responses to each question.

Erosion Characteristics

The first question asked communities whether they would characterize their erosion problem as coastline erosion, river or stream erosion, or both coastal and river or stream. A total of 118 communities answered this question, or 93 percent of the survey respondents. A majority of the communities (68 out of 127) indicated that they experienced river or stream erosion. A breakdown of the type of erosion Alaskan communities are experiencing is illustrated in Figure 1.

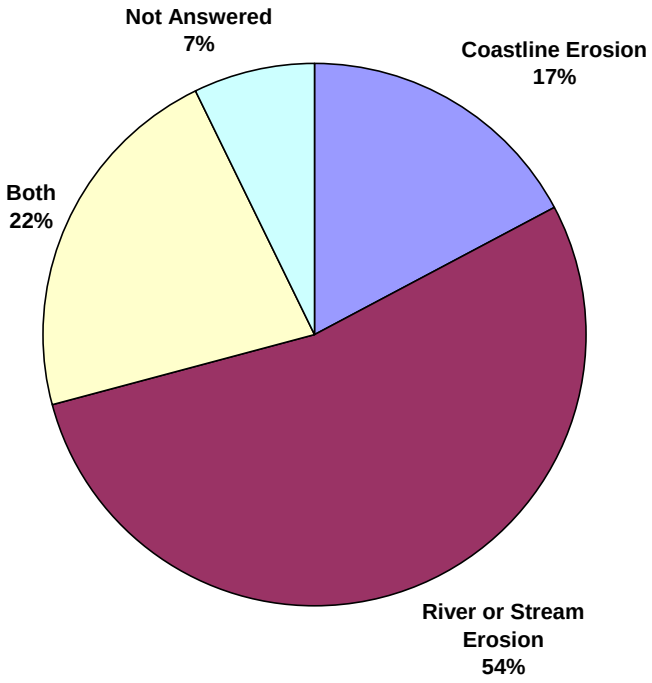

Figure 1. Type of Erosion Experienced by Alaska Communities

If the community indicated that erosion was river or stream related, they were further asked to indicate what conditions cause the erosion or make it more severe. Ninety-five respondents answered this question (out of a total of 96 who indicated they experienced either exclusively river or stream related erosion, or indicated that they experienced both river/stream and coastline erosion), for a response rate of 99 percent. The following table shows the distribution of those aggravating conditions. Most respondents indicated that flooding contributed to their river or stream erosion (75 percent of communities).

Table 1. Causes for River or Stream Erosion (n = 95)

Contributing Factor	# of Responses
Flooding	71
Natural River Flow	59
Ice Jams	55
Spring Breakup	51
Other	35
Melting Permafrost	35
Vehicle/Boat Traffic	22
Beach/Bank Traffic	14

Note: Communities were asked to check all factors that apply.

If the community indicated that erosion was coastline related, or responded that they experienced both coastline and river or stream erosion, they were asked to indicate what conditions cause the erosion or make it more severe. Forty-eight respondents out of fifty answered this question, for a response rate of 96 percent. The following table shows the distribution of those aggravating conditions. Most respondents indicated that storm surges contributed to their coastline erosion (98 percent of communities who responded) followed by wind and waves (90 percent).

Table 2. Causes for Coastline Erosion (n = 48)

Contributing Factor	# of Responses
Storm Surges	47
Wind and Waves	43
High Tides	39
Melting Permafrost	12
Late Forming Coastal Ice	12
Other	8
Vehicle/Boat Traffic	6
Beach/Bank Traffic	6

Note: Communities were asked to check all factors that apply.

The survey then asked communities to answer questions based on whether erosion was caused by discrete major events, or from on-going gradual erosion. The respondents were asked to answer two questions if they believed their erosion was based on discrete major events and a separate single question if they believed their erosion was gradual and on-going. Twenty four respondents answered the questions for discrete events (18.9 percent), and thirty-two respondents answered the question for on-going erosion (25.2 percent). Twenty-one additional communities responded to both (16.5 percent). The following chart shows the distribution of those categories.

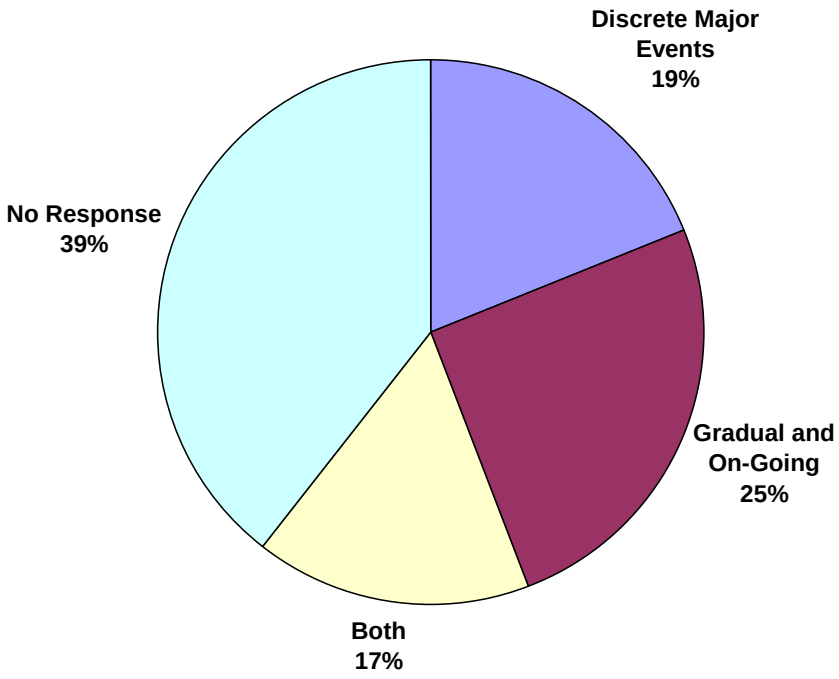

Figure 2. Erosion Event Classification

Discrete, Major Events

When communities responded that they experienced discrete major erosion events (or to both discrete and on-going), the survey asked how many major events had occurred in the last 20 years in their community. Thirty communities responded to this question, with the average number of erosion events being just over three. The minimum number of events was zero, with the maximum of eighteen.

The same communities were then asked to detail how much land eroded in each of these major events and secondly the date when the event(s) occurred. Thirty-three communities responded to one or both parts of this question. Nine communities provided an estimated length inland and estimated distance along coast or shoreline of land lost per major erosion event in feet, while other communities provided only a single measurement. Of those respondents that provided both measures, the average length inland lost per major erosion event was 37.2 feet, with a minimum of 5 feet and a maximum of 100 feet. The average distance lost was 1,600 feet, with a minimum of 350 feet and a maximum of 2,400 feet.

On-Going, Gradual Erosion

When communities responded that they experienced on-going gradual erosion, the survey asked how much land is typically eroded on an annual basis in their community. Fifty-two communities responded to this question. Some communities provided an estimated

length and distance in feet for the erosion, while other communities provided a singular measurement. Of the three communities that provided both an estimated length inland and distance in feet, the average annual land lost due to erosion was 29 feet inland by an average distance of 3,233 feet.

Protective Measures

Communities were asked to indicate what types of protective measures had already been utilized in their community to slow or stop erosion damages, who constructed the countermeasure, and how much the structure cost. Ninety-three communities answered part one of this question, for a response rate of 73 percent.

The table below shows the breakdown of protective measures, as indicated by the community survey respondent. The category of "other" erosion protection measures was the most frequent response, with 47 communities indicating that "other" measures had been utilized. When this option was selected, the community was asked to further describe the measure utilized. Most communities indicated that they utilized some type of fill material. Specifics that were frequently mentioned include: fill, concrete blocks, 55 gallon drums, dikes, and tree branches. A less frequently mentioned measure includes beach nourishment. See Table 3.

Table 3. Previous Erosion Protective Measures Utilized (n = 93)

Type of Protective Measure	# of Responses
Rip Rap	31
Gabions	9
Sandbags	8
Articulated Concrete Mat	6
GeoTubes	1
Other	47

Note: Communities were asked to check all factors that apply.

Figure 3 shows the total number of protective measures utilized by each community, as indicated by the community respondent. The majority of communities who responded to this question indicated that they had implemented one type of erosion protection measure (44 out of the 93 communities). Two communities reported implementing at least five different types of protective measures in an attempt to control erosion.

Additionally, those communities indicating that they had utilized at least one protective measure were further asked to provide an estimated cost for the structure(s). Of the 93 communities that answered the original question, 67 indicated that they had at least one protective measure. Estimated costs for 22 protective measures were provided (including some communities that provided estimated costs for multiple types of protective measures) with an average cost of $428,576 per protective measure.

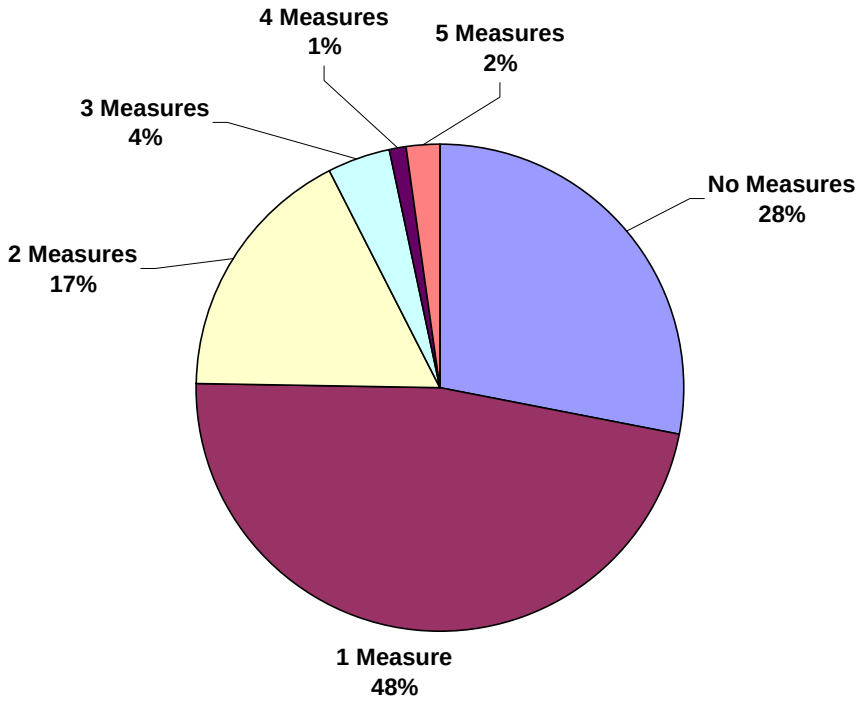

Figure 3. Number of Erosion Protection Measures Used in Each Community

All communities who had utilized protective measures were then asked to provide additional information concerning the ongoing costs of their protective measures. Communities were asked if they had experienced repair or operations and maintenance costs associated with their protective measures, and how much those costs were (including a sum of multiple costs if appropriate). Forty-eight communities answered part one of this question, for a response rate of just below 72 percent (based on the 67 out of 93 communities that indicated they had at least one erosion protection measure). Twenty-nine communities indicated that they had experienced cost of repair, operations, and maintenance of their protective measures, while 19 communities indicated that there had been no secondary costs involved.

Of those twenty-nine communities that experienced secondary costs, twelve were able to provide an estimate for repair or operations and maintenance. Costs ranged from a low of $25,000 to a high of ten million. The average cost incurred was $1,146,408 per community for secondary repairs based on the twelve responses.

Communities were further asked about the effectiveness of their protective measures. This included a question about whether the protective measures had been effective in addressing the erosion problem, and a secondary question asking if there had been a failure of the protective measure. Forty-eight communities answered at least one part of this question, with 44 responding about the effectiveness of the protective measure and

23 responding to whether or not there had been a failure (some communities answered both questions).

Forty-four communities answered the first part of the question, with 84 percent of those indicating that the measure had been effective. Only 16 percent indicated that the measure had been ineffective. Twenty-three communities answered the second part of the question, with all twenty three indicating that there had been a failure.

However, 14 of the communities that responded that the erosion protection measure had been effective also indicated that there had been a failure (almost 38 percent of those who indicated the measure was effective). Notes provided on the surveys indicate that many communities feel the erosion protection was beneficial in slowing the erosion to some extent, but was not fully effective in stopping it. Several additional communities also commented that where the erosion protection measure was implemented had been effective in reducing erosion, however the protective measure covered an area that was too small to provide adequate protection to the community on a larger scale and so they deemed that protection measure a failure. Other communities indicated that the protective measure is in imminent danger of failure due to a lack of repair and/or maintenance. Five of the seven communities responding that the erosion protection measure had not been effective also indicated that it had failed.

Erosion Site or Sites

All communities were asked to describe the physical condition of their erosion site or sites including the length of the site in feet, the height of the eroded bank in feet, and the location of erosion relative to the community. Forty-two communities provided a measurement of the length of the erosion site, while 59 communities provided a height of the erosion bank. Those that provided information about the erosion site relative to the community provided it in varying formats such as: south river on community lots; on top of the west bank; etc.

Of those communities that provided a length of the erosion site, many provided a range with a typical low and high erosion length. The average minimum length was 1,531 feet and the average maximum erosion length was 1,871 feet. The overall minimum erosion length, based on responses, was zero feet and the overall maximum was 10,000 feet.

The responses to the height of the eroded bank in vertical feet were also frequently provided as a range, with the minimum average height of 22 feet and the maximum average height of 32 feet. The overall bank height ranged from a low of zero feet to a high of 300 feet.

Communities were requested to identify what activities the eroding area (stream, riverbank, or shoreline) is used for. Ninety-nine communities responded to this question, a response rate of 78 percent. Most communities indicated fishing (76 percent), boat/snowmachine/ATV ramps (56 percent), and barge access (53 percent) occurred in

their erosion prone areas. The table below shows the distribution of activities in the erosion prone areas in descending order.

Table 4. Activity Conducted in Erosion Prone Area(s) (n = 99)

Type of Activity	# of Responses
Fishing	75
Boat/Snow Machine/ATV Ramps	55
Barge Access	52
Boat Storage	45
Hunting	43
Cultural/social Events	40
Other	39
Driftwood Collection	29
Processing Catch	28
Beachcombing	27

Most communities indicated that there are five activities or less occurring in their erosion prone areas. The most frequently indicated number of activities was 3, with 18 communities reporting that three activities occurred within their erosion prone areas. Four communities reported that at least ten activities occur in their erosion prone areas.

Communities were asked to provide information regarding the distance from erosion to a structure(s) or items(s) of importance. The communities could select from the following categories: less than 100 feet, more than 100 feet but less than 500 feet, or over 500 feet. Some communities indicated, for instance, that structures were located in all three distance categories. It can be assumed that most communities have structures located varying distances from the erosion area even though this was not always indicated, so for this analysis the shortest distance response for each community was used in the tabulation. Eighty-one communities responded to this question, a response rate of just below 64 percent (based on 127 communities surveyed). The distribution is illustrated in the table below.

Table 5. Distance from Erosion Area to Structure(s) or Item(s) of Importance (n = 81)

Distance from Community	# of Responses
Less than 100 ft	72
More than 100 ft, less than 500 ft	8
Over 500 ft	1

Communities were then asked to specify what type of structure(s) or item(s) are threatened by erosion. One hundred and thirteen communities provided this information, a response rate of 89 percent. Communities were able to select multiple structures or items, and 55 communities indicated 5 or more different types of structures were threatened (43.3 percent of the 127 communities surveyed), while 15 communities

indicated 10 or more different types of structures were threatened (11.8 percent of the 127 communities surveyed). This does not indicate the numerical count of how many of any particular structure was threatened (for instance, "house" was an option that could be selected, but the number of threatened homes in the community was not requested). The most commonly threatened structures were roads with 71 responses, homes with 69 responses, and outbuildings/sheds with 46 responses. See the chart below (Figure 4) illustrating the number of times a type of structure was indicated as threatened.

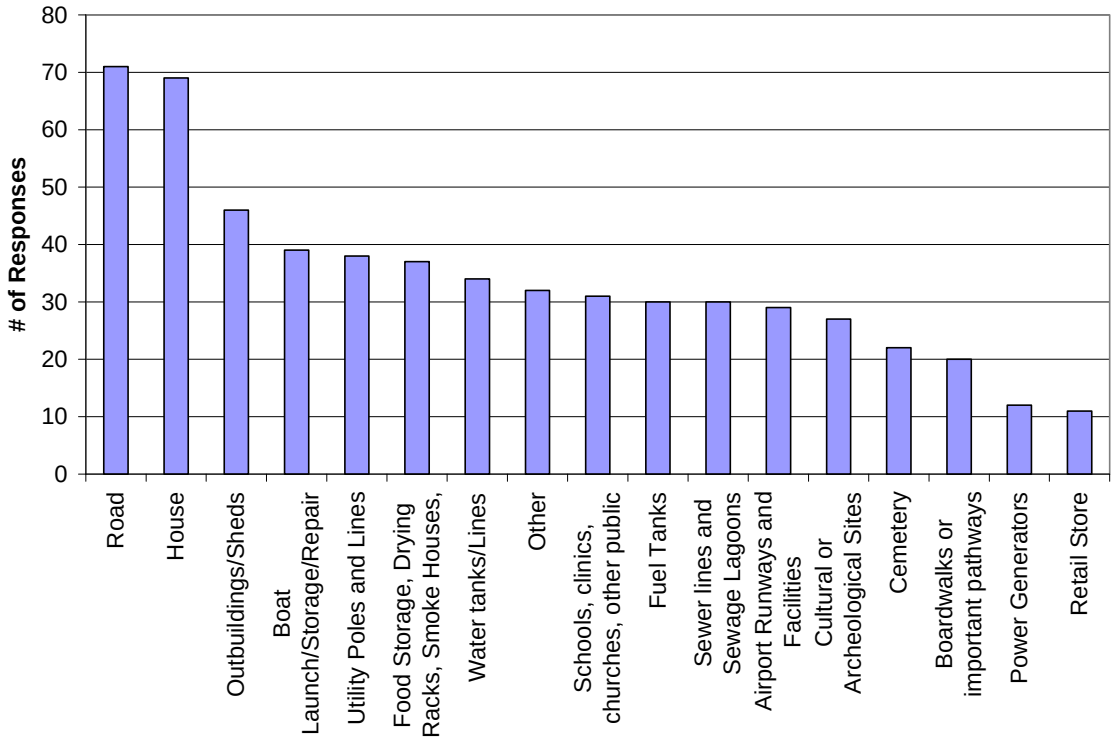

Figure 4. Type of Structure(s) or Item(s) Threatened by Frequency of Response

Damages to Structures, Facilities, or Other Items

Communities were asked to specify previous damages to structures, facilities or other items caused by erosion. This could include costs for repairs, replacement, or relocation. Sixteen communities responded to this question indicating that at least one structure had to be repaired, replaced, or relocated. Five communities provided estimated costs for those damages (with two communities providing estimates for more than one structure, for a total of seven estimated costs). The costs ranged from a low of $3,500 dollars to a high of $450,000 dollars, with an average of just over $105,000 dollars per structure. Many communities indicated that they had experienced damages, but were unable to provide a cost estimate.

A copy of the Alaska Community Erosion Survey follows.

Alaska Community Erosion Survey

Research conducted by the U.S. Army Corps of Engineers
– Alaska District –

The public report burden for this data collection effort is estimated at 60 minutes per survey, including the time for reviewing instructions, gathering needed data, completing and reviewing the information. Respondents should be aware that notwithstanding any other provision of law, an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

OMB number 0710-0001 expires September 30, 2009
Community Name:_____

ALASKA COMMUNITY EROSION SURVEY
Personal Interview Questions

1. Would you characterize the erosion problem in your community as resulting from coastal or riverine process or both??

_____ Coastline erosion **(please proceed to question 4.)**
_____ River or stream erosion **(please proceed to next question.)**
_____ Both coastal and river or stream erosion – please answer all questions.

2. What is the name(s) of the river(s) or stream(s) that is causing the erosion to occur?

_____

3. What conditions cause the erosion or make it more severe? (please check all that apply.)

_____Natural river flow
_____Flooding
_____Ice Jams
_____Spring breakup
_____Melting permafrost
_____Vehicle/boat traffic
_____Beach/bank traffic
_____Other _____

If coastal erosion is not a problem in your community, proceed to question 6.

4. What is the name of the coastal(s) body of water that is causing the erosion to occur?

_____

5. What conditions cause the erosion to be more severe? (please check all that apply.)

_____High tides
_____Storm surges
_____Wind and waves
_____Melting permafrost
_____Late forming coastal ice
_____Vehicle/boat traffic
_____Beach/bank traffic
_____Other _____

6. Please describe the physical conditions of the erosion site or sites.
   _____length in horizontal feet
   _____height of eroded bank in vertical feet
   _____location relative to community (i.e. 500 feet North of the community)

7. What is the stream/riverbank/shoreline used for? (please check all that apply.)
   _____Boat/Snow Machine/ATV ramps
   _____Barge access
   _____Boat storage
   _____Fishing
   _____Hunting
   _____Processing catch
   _____Beachcombing
   _____Cultural/social events
   _____Driftwood collection
   _____Other _____

8. How far is the erosion from a structure(s) or item(s) of importance?
   _____Less than 100 feet
   _____More than 100 feet but less than 500 feet
   _____Over 500 feet

9. What type of structure(s) or item(s) are threatened? (please check all that apply.)
   _____House
   _____Outbuildings/sheds
   _____Water tanks/Lines
   _____Fuel tanks
   _____Cemetery
   _____Food storage, Drying Racks, Smoke Houses etc
   _____Retail store
   _____Road
   _____Boat Launch/Storage/Repair
   _____Utility poles and lines providing power, telephone, cable, etc.
   _____Power generators
   _____Sewer lines and sewage lagoons
   _____Sites of significant cultural or archeological value
   _____Schools, clinics, churches, or other buildings used by the public
   _____Boardwalks or important pathways
   _____Airport runways and facilities
   _____Other _____

Erosion can be classified as resulting from discrete major events or from on-going, gradual erosion.

If the erosion in your community is caused by discrete major events, please answer questions 10 and 11.

If the erosion in your community gradual and on-going, please answer question 12.

10. How many major erosion events have occurred in the last 20 years in your community? _____

11. How much land did the major event(s) erode? (for each of the erosion events included in question 10)

    _____ (month/year)
    _____ (length in feet inland and distance along beach or shoreline)

    _____ (month/year)
    _____ (length in feet inland and distance along beach or shoreline)

    _____ (month/year)
    _____ (length in feet inland and distance along beach or shoreline)

12. For gradual, on-going erosion, how much land is typically eroded each year?
    _____ (length in feet inland and distance along beach or shoreline)

13. What types of protective measures have been utilized to slow or stop the erosion damages, who constructed the structure, and how much did the structure cost? (please check all that apply.)

_____ Rip Rap	$ _____
_____ Gabions	$ _____
_____ Sandbags	$ _____
_____ Articulated Concrete Mat	$ _____
_____ GeoTubes	$ _____
_____ Other _____	$ _____
_____ None	

    Constructed By _____

14. Have there been any repair or operations and maintenance costs associated with the protective measure?

    If yes, what are those costs, (include costs for multiple occasions if appropriate)?
    $ _____

15. Have the protective measures been effective to address the erosion (yes _____) or has there been a failure?

Please describe the nature of the failure: _____

16. If structures, facilities, or other items have been damaged or destroyed by erosion, what were the costs of repairs, replacement, or relocation? (If property was lost, indicate estimated cost to replace.)

Type of Structure	Cost to repair ($):	Cost to replace ($):	Cost to relocate ($):

17. Can you provide any photos of the erosion problem or erosion damage in your community?

If yes, how might we get copies of those from you? _____
_____

18. Is there any other information about your erosion problem you can provide that may be useful for describing your community's erosion problem?

_____
_____

19. Is there anyone else that should be contacted about describing your community's erosion problem?

If yes, who? _____
_____