

# Creating a Workable Standard for Allowing Shoreline Stabilization Structures on Beaches and Bluffs

Prepared for the San Juan Initiative with funding from the Puget Sound Partnership  
By Carol MacIlroy, Consulting

Draft 7.17.09

## 1. Background

The San Juan Initiative, a consortium of government agencies, realtors, construction trade professionals, environmental groups and concerned citizens, worked for the past two years to improve protection of shoreline resources in San Juan County in a way that supports community values and builds capacity for protection. This involved extensive networking between agencies and public engagement as well as analysis of existing shoreline education, regulation and incentive programs in San Juan County. The result was a comprehensive set of recommendations to improve the entire suite of protection tools available. These recommendations were unanimously endorsed by the San Juan County Council in December, 2008. A key recommendation is that any new and replacement shoreline stabilization structures be allowed on beaches and bluffs *only* when existing dwelling structures, roads, driveways and septic systems are threatened by erosion. This new standard is a departure from current practices and will result in better protection of the shoreline.

To prepare for implementation of this new standard, the San Juan Initiative received funding from the Puget Sound Partnership to develop a policy recommendation for San Juan County that would incorporate key technical findings and identify policy issues to resolve. The attached technical addendum is designed to guide the discussions on how best to define and determine threatened homes, roads and other critical human infrastructure. The recommendations presented in this paper are built from the comments and vision of a group of highly experienced shoreline management professionals, including planners, permit staff, policy-makers and engineers from across Puget Sound. Their response to the technical findings is included as an addendum to this report. Participants included staff from the City of Seattle, Thurston County, Bainbridge Island, Pierce County, San Juan County, the San Juan Initiative and Department of Ecology.

The attached technical addendum, *Defining Threatened in Terms of New Bulkhead Installation at Existing Development Relative to San Juan County – Examples and Recommendations*, was completed by Coastal Geological Services. It describes in detail the various technical approaches applied throughout Puget Sound and across the nation. The technical addendum and this paper will assist in determining policy recommendation for San Juan County's new standards.

## **2. Needs/Vision**

In order to effectively meet these new standards, San Juan County needs to do the following:

- Clearly define erosion threat in relationship to the new standard
- Develop a detailed description of the process necessary to make a determination of threatened
- Identify the required level of expertise to ensure consistent and valid determination of threatened.

These three issues are critical to clarify not just in San Juan County but throughout Puget Sound, as many communities are updating their Shoreline Master Programs and addressing these same issues.

In order to successfully implement the new standard of allowing shoreline stabilization only when the main dwelling unit and associated dwelling structures, septic or road are threatened by erosion, San Juan County must develop an administrative process and regulatory language that:

- Defines the type of existing development that may be protected with shoreline stabilization
- Defines when it is threatened and determines the factors causing the threat
- Establishes a process for addressing the threat
- Defines the necessary expertise
- Addresses other considerations

These five factors are discussed in detail in this report.

## **3. Scope of Issue Paper**

This issue paper and technical addendum was developed in late May and early June 2009. It addresses marine (not freshwater) shorelines and focuses on the protection of existing homes, dwelling units, utility corridors and roads from erosion. The scope and timeframe for this paper was limited and as a result it is the starting point for continued dialogue and action.

## **4. The Science**

As the attached technical addendum states: “the County has great biodiversity, and this is a reason for carefully considering construction of new bulkheads and other shoreline modifications which have been shown to have substantial negative impacts on the marine shoreline (MacDonald et al. 1994, Thom et al. 1994, Johannessen and MacLennon 2007, Pentilla 2007, Brennan 2007, Griggs 2005).” It is critical to keep the extraordinary shoreline San Juan County currently has and these negative impacts in mind as decision makers consider the following policy.

In addition to the documented impacts, scientists across the nation are anticipating that sea level rise will increase pressure on shoreline resources. This rise, known among experts as the “coastal squeeze,” will cause a loss of shoreline and marine habitats. The functions of beaches, shorelines and habitat features will be squeezed between existing development on one side and rising waters on the other.

## **5. Recommendations for Developing an Administrative Process and Regulatory Language**

The following section describes in detail the recommended approaches and key policy questions important to address as San Juan County moves forward in updating its Critical Areas Ordinance and ultimately its Shoreline Management Program. Additional important technical information can be found in the technical addendum.

### **5.1. Defining Structure**

The first determination is: What constitutes development or a structure worthy of protection? A clear definition of structure is critical to relieve staff from the burden of parcel-by-parcel determinations and inconsistency in implementation. Terms like “principal structure,” “primary structure,” “valuable primary structure,” or “development” are commonly used. These terms leave room for varying interpretations and the possibility of inconsistency. This paper recommends the Bainbridge Island definition which is clear and more likely to result in consistent interpretation.

Note that because of the ecological importance of limiting shoreline modifications, the recommended definition of what merits protection is tightly restricted. In balancing property rights and ecological importance, the definition of structure is limited to that which is of utmost importance to property owners.

#### **Recommendation**

##### Recommended definition:

“Structures considered for shoreline protection include: primary parcel structure, accessory dwelling units, (includes commercial, industrial or residential), garage, septic system, public road, public infrastructure like pipes or utilities, and private driveways/roads where relocation is not feasible. The following are not generally considered worthy of protection due to non-significance or inherent location in a risk zone: stairs, tram, trail to the beach, bathhouse, deck/patio, fence, stormwater facility, sheds, trees, landscaping, etc.”

##### Policy Implications:

The San Juan Initiative’s Case Study Characterization<sup>1</sup> shows that the majority of properties with shoreline modifications exhibit no apparent coastal erosion threat. It is likely that property owners value and seek to protect assets to their private

---

<sup>1</sup> MacLennan, A, Johannessen, J, 2008. San Juan Initiative Nearshore Case Study Characterization.

property in addition to the main residential structure. Additionally, the San Juan Initiative case study indicates that approximately 1/3 of all shoreline properties with shoreline stabilization structures are vacant or undeveloped. In fourteen public workshops held in late 2008 and early 2009 by the San Juan Initiative, the majority of shoreline property owners showed support for restricting shoreline stabilization only to those places where it is needed to protect a main house.

Key Policy Questions:

Does the definition above balance the property owner's priority to protect their main structure and associated structures with the ecological needs of a healthy shoreline?

## **5.2 Determination of Threatened and Factors Causing Threat**

There are two steps to determining if and how a structure is threatened. The first step is to determine what technical approach to take in evaluating threat and the second is to determine the process to successfully implement the technical approach.

### **5.2.1 Technical Approach**

Four ways to determine risk were described in Coastal Geological Services' research. These are:

- Establish a timeframe during which the structure will likely be damaged or lost based on documented long-term erosion rates.
- Establish a timeframe during which the structure will likely be damaged or lost based on documented storm cycles.
- Make a determination based on a slope stability model.
- Establish a standard setback distance from the erosion scarp which triggers protective measures.

The long-term erosion rate approach incorporates storm cycles and a standard setback distance but provides a longer timeframe and incorporates events like landslides caused by factors other than wave action. The slope stability model, used on Bainbridge Island, was found to be limited by those currently using it because it focuses on deep seated landslides which are not common in the Puget Sound lowlands. This approach is also constrained by a lack of data and standards. The information produced by the slope stability model has not served staff well in making determinations about whether a new, repair or replacement bulkhead is needed.

Recommendation:

Coastal Geological Services explored various technical approaches. Their research and experience with the geology of Puget Sound and the state of science in this region suggests that the most appropriate technical approach is to use

“documented erosion rates over a long enough timeframe to dampen the effect of short-term changes.” They also recommend using an additional hazard assessment process to ensure that the structure is not exposed to landslide hazards potentially not captured in the erosion rate methodology.

Key Policy Implications:

Selecting an erosion rate model necessitates the establishment of clear guidelines and procedures to ensure consistency and ease of use. Costs associated with setting up and implementing this program should be explored in greater detail.

There was broad support for this approach within the work group. They felt that the upfront clarification of procedures discussed in section 5.2.2 would result in significant benefits both to staff and the public once the program was being implemented.

Key Policy Questions:

What additional information is needed to choose this approach?

**5.2.2 Key Components for Implementation**

If documenting erosion rates is the preferred approach, then it becomes critical to determine how this method would be employed. Coastal Geological Services recommends additional hazard assessment to ensure the protection of structures from intermittent larger scale events. Ideally a small team of experts from around Puget Sound would be convened to refine and come to consensus on the components and policy guidance for such an approach. It was felt that this could be accomplished with a few workshops. The following information and recommendations are provided as an initial starting point for discussion.

Recommendation:

**Timeframe** - A timeframe of 30-40 years is recommended for conducting the erosion rate analysis. This is when the earliest aerial photos are available (1965-1969) with a scale of 1:12,000. The scale is important for accurately noting changes in shorelines.

A timeframe of threatened within 3 years is also recommended and is being used by other counties in Puget Sound.

**Report Standards** - Specific and rigorous reporting standards are needed to guide the quality and consistency of submitted reports. Expertise is also critical and will be discussed in 5.3. As noted in the technical addendum, “A geology or geotechnical study for a coastal property needs to account for a variety of factors that effect coastal erosion and slope stability.” Reports should include:

- Quantification of causes of erosion
- Past erosion rates over a minimum of 30 years

- Projection of future rates over the next several decades
- Detailed topography from the structure to the lower beach
- Analysis of slope stability and mechanism for slope failure in the vicinity
- Estimate of when the structure would be undermined (to include an allowance for bank recession equal to the largest documented landslide in the vicinity)
- Detailed analysis of relocating the structure and soft shore protection alternatives if property is found to be threatened within the 3-year timeframe.

Guidelines produced for the California Coastal Commission and known as the Beach Erosion and Response (BEAR) report have the best known examples and are a useful resource for developing reporting standards. Standards and guidance from BEAR are provided in more detail in the technical addendum.

**Process for conducting report** - To reduce the problem of “dueling experts,” it is recommended that the County use a third party to develop the report. It is recommended that San Juan County have a pool of qualified consultants that the County pays from applicant fees. (Desired consultant qualifications are discussed in section 5.4). The report work would be conducted in a manner that is removed from both the County and the applicant. The qualifications of the pool of consultants would be transparent and consistent. In the end, the County and the applicant would have to trust and act on the results produced through the process.

Policy Considerations:

The counties of Puget Sound vary in their standards for determining when a home is threatened by erosion. The lack of specific reporting standards puts tremendous pressure on local planning staff who often are not qualified to evaluate an engineer’s opinion. This, along with the fact that the property owner is directly paying for the expert’s opinion, leads to a highly inconsistent application of protection measures. This lack of consistency results in poor decisions that have negatively affected property owners and their neighbors and resulted in poor environmental outcomes. Conducting the recommended type of analysis reportedly would cost, in most instances, on the order of several thousand dollars.

The reporting standards and a process for conducting the reporting could be hammered out by a small group of professionals from across the region to benefit Puget Sound as a whole. It is recommended that a state agency convene a work group that should include the following professionals: a licensed engineering geologist, a shoreline planner, a shoreline permit coordinator, a geotechnical engineer, an ecologist and a biologist. The work group should also demonstrate training and experience in Puget Sound coastal processes including littoral drift/net shore-drift analyses, beach processes, quantifying beach/bank recession rates, and analyzing the effects of shore development and modifications.

Additionally, the work group would also need experience understanding and navigating the legal constraints and the permitting processes.

It is also important to distinguish between the approaches for assessing risk of an existing structure as opposed to setback regulations for new development. The amount of land needed to protect shoreline health at the outset of development is a much different assessment than determining risk to an existing structure from bank recession.

Key Policy Questions:

What reporting standards shall be required and what is the process for developing these standards given the fact that San Juan County does not have the internal resources to review such reports?

### ***5.3 Establishing a process for addressing the threat***

If a property is found to be *threatened* within 3 years, the process of determining what should be done to protect the structure begins. It is only after a well-documented and site-specific assessment has been conducted to identify specific factors causing the threat that the process for determining a solution should be started. The technical addendum notes that there is a fair degree of consistency across the nation that is already included in several Washington Shoreline Management Programs that describes the primary options and process for proceeding.

Most of the Shoreline Management Programs require consideration of alternatives as part of the permitting process. Region wide, there are few examples of alternatives or demonstration sites, for non-structural solutions. More examples of soft shore alternatives would likely increase their perceived acceptability by the public and by engineers.

Recommendation:

Adopt the following steps to determine appropriate solution. These are taken from the recommendation section of the technical addendum with some slight modifications based on policy feedback.

- Describe the exact factors which are causing the structure to be threatened. Move through the following list to determine which option is least invasive to the function of the nearshore environment while still preventing damage or loss of property.
- Structure relocation is a serious option for consideration, especially as rising sea levels and on-going maintenance and repair are issues.
- All anthropogenic factors should be addressed, such as drainage.
- Softer solutions that could reduce risk, such as dewatering, re-vegetating the slope or placement of beach nourishment and/or large woody debris should be evaluated and integrated into a solution.

- If the above solutions are not adequate or feasible, then the minimal bulkheading could be considered to protect only the threatened structure, not the entire property.
- Mitigate impacts from alterations to functions and processes as they relate to the site and to the landscape (drift cell).

#### Policy Considerations:

The options above are already widely used. The issue is in actually applying them in a manner that results in solutions different from the standard bulkhead approach. Skilled technical staff is necessary to promote non-structural solutions and the state and other regional organizations need to promote examples of alternatives and provide training to excavators, engineers and coastal geologists.

Additionally, it is possible to create an incentive program for relocation or removal of threatened structures. The technical report suggests the best method is to develop an incentive program that is voluntary in nature. The report also states that Michigan has found relocation programs more cost effective than long-term maintenance and repair of erosion control structures.

Lastly, many of the shoreline professionals noted that bulkheads were often sought by new owners after a winter storm event. One management tool is to require that bluff stability and erosion hazards are disclosed on all property listings. Pierce County has a requirement for such a disclosure on all shoreline real estate transactions but did not feel that it had reduced the number of permits sought. It is unclear what is necessary to require this disclosure and whether the data is readily available to carry out the requirement. Another concern is what level of education would be necessary to bring the real estate community up to speed on the implications of various reported hazards.

#### Key Policy Questions:

What refinements to the recommendation above are necessary?

### **5.4 Expertise**

Engineers and Geotechnical Engineers are trained to protect health and human safety from landslides and other risks. However, as our understanding of the marine shoreline ecosystem has improved, it has become clear that an engineering-only perspective neglects the biological/ecological importance of shoreline functions and processes. There is a need for additional skill sets to be added to the evaluation and determination of risk and possible alternatives. A new standard is necessary that includes an ecological and geological understanding of Puget Sound's coastal geography and ecosystems.

In considering the qualifications necessary to conduct a threatened structure report, it is useful to note the various experts that operate in this arena and the

varying level of experience they are required to have. Licensed Geologists, Professional Engineers and Licensed Engineering Geologists all are certified by the State of Washington Department of Licensing and must demonstrate a certain level of expertise and experience. Geologists, geotechnical engineers and engineers are not licensed by the state and can have varying levels of training and experience. Within all of these fields an individual can have a specialty or area of focus. Specialties associated with marine shorelines or coastal environments are important aspects to consider in seeking expertise.

In addition to the level of experience it is also important to consider the type of profession. It is helpful to consider how the State of Washington differentiates between an Engineering Geologist and a Geotechnical Engineer in the following two quotes:

“An engineering geologist is an earth scientist who has specialized in the application of geologic principles to civil works. A geotechnical engineer is a civil engineer who has specialized in the design and construction aspects of earth materials.”

“Engineering geologists typically have greater skills in characterization of geologic conditions and processes and in evaluation of how processes will be affected or will affect a specific development activity. Geotechnical engineers will typically have greater skill in development of site-specific geotechnical design recommendations and criteria.”

Definitions for each of the fields are available and worth noting.

#### Recommendation:

The process for developing and finalizing a standard report should include input from a Licensed Engineering Geologist as well as someone with nearshore ecosystem expertise. This nearshore ecosystem expertise becomes imperative if the structure is deemed threatened and alternatives are being described. The recommended skill set described in section 5.2.2 for developing the reporting standards may also be required to develop various aspects of the report. As the appropriate reporting standards are developed, the type of expertise necessary to produce a quality report should be revisited.

#### Policy Considerations:

Establishing guidelines for the level of expertise necessary could change the current practices and meet with resistance. The engineering and geologic communities are accustomed to a fair degree of latitude in using their best professional judgment. Establishing strong criteria for reporting and for qualifications represents a significant policy shift. San Juan County could potentially benefit from regional support as they seek to make changes to qualification requirements.

The additional cost of this type of process to the landowner or the county should also be further explored.

Key Policy Questions:

What level and type of expertise is necessary to conduct the type of analysis needed to determine if a structure is threatened and to best design feasible, effective and low impact alternatives to the factors threatening the structure?

## **6. Other Considerations**

Two additional issues of significance were unearthed in this process that will be important for San Juan County to explore but are not covered in this paper due to a lack of time and resource. The first is whether or not the County wishes to use a “conditional use” designation for shoreline modifications. The second is the lack of science and specific information about erosion rates in San Juan County and whether or not investments should be made to improve this understanding.

## **7. Regional Coordination and Opportunity**

San Juan County has a unique opportunity to take a leadership role in making long-term improvements to the management of its shorelines. The time is also ripe to seek support from the Puget Sound Partnership as the resolution of these issues is a priority in their recently adopted Action Agenda. Similarly, the Department of Ecology is presently engulfed in trying to move dozens of cities and counties along in their shoreline master program updates. By advancing this kind of work in a quick and timely fashion, San Juan County would contribute leadership throughout Puget Sound. Such leadership, vision and clarity supports the likelihood of gaining the additional resources required to address the complexities of determining threat, a standardized approach, and consistent and effective reporting methods.