





# I-84 Corridor Strategy

A Vision and Design Guidelines for Interstate 84 in the Columbia River Gorge National Scenic Area

November • 2005



## Acknowledgements & Signatures



ODOT - Regions 1 and 4, Technical Services



Columbia River Gorge Commission



USDA Forest Service



Federal Highway Administration

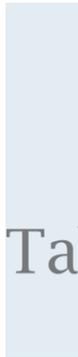
The I-84 Corridor Strategy is the product of input and suggestions from hundreds of agency representatives, interested stakeholders, and citizens. Thanks go to the many representatives from the above agencies, Hood River County, Multnomah County, and Wasco County for their valuable technical input, creative ideas, and painstaking review. Special thanks also go to the members of the consultant team led by Otak, Inc. for directing stakeholder and public involvement and preparing the I-84 Corridor Strategy.



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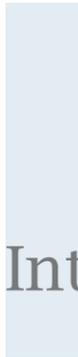
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# Introduction and Background

Purpose of and Need for This Strategy

How This Strategy Was Developed

Defining the Preferred Character of Interstate 84

### Purpose of and Need for This Strategy

The Columbia River Gorge National Scenic Area (CRGNSA) was established by Congress to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge. Approximately 79 miles of Interstate 84 is within the CRGNSA along the southern, Oregon side of the Columbia River. The I-84 Corridor Strategy provides the framework to help the Oregon Department of Transportation (ODOT) manage and improve the Interstate 84 facilities within the CRGNSA in a manner that meets public safety and transportation needs while also meeting the National Scenic Area provisions.

The I-84 Corridor Strategy consists of a long-term vision and design guidelines for the Interstate 84 corridor within the CRGNSA to guide design, construction, and management activities. A clear, cohesive framework for managing and approving design in the corridor expedites the implementation of needed improvements or modifications to Interstate 84 facilities in an efficient manner while establishing continuity of design for corridor features in the CRGNSA.

# How This Strategy Was Developed

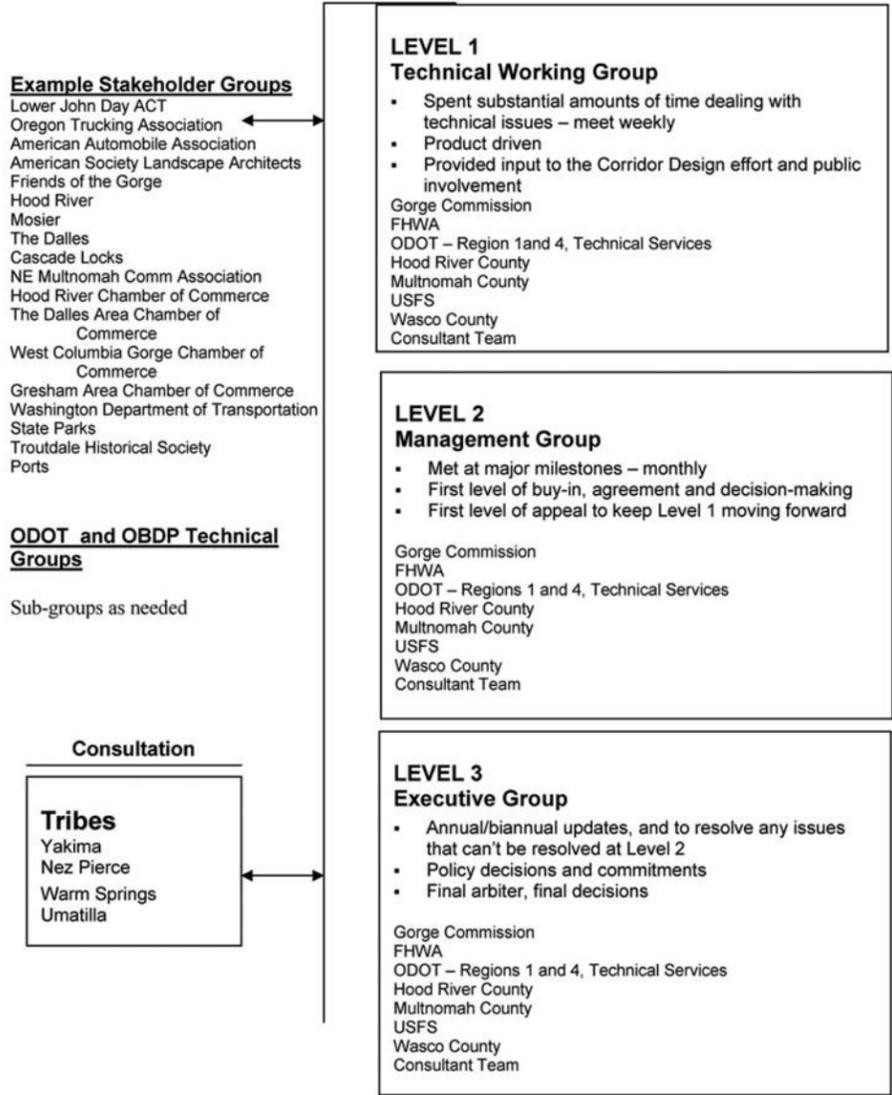
## The Interagency Process

This project has been guided by representatives from the Oregon Department of Transportation, Columbia River Gorge Commission, USDA Forest Service, Federal Highway Administration, and the three counties in the CRGNSA.

The decision making body for the I-84 Corridor Strategy has been patterned after the Transportation Development Committee used by the ODOT Bridge Delivery Unit (BDU) for development of programmatic permits. The structure of the three-tiered Transportation Development Committee is described below and in Figure I. Work products, meeting scheduling, facilitation and public involvement were provided by the consulting staff.

- Level One consists of the technical working group that represents each of the partnering agencies. They worked through ideas, issues, draft documents, processes, and especially technical design issues. The Level One group met regularly, often weekly.
- Level Two consists of managers able to resolve disputes, provide additional interpretation and perspective. The Level Two group met at major project milestones, usually monthly.
- Level Three consists of Executive staff from each of the partnering agencies. They were able to make policy decisions and align priorities. They received updates and met as necessary.

## I-84 Strategy Transportation Development Committee Structure



### Public Involvement and Community Outreach

The vision, goals, objectives, and design guidelines for the Interstate 84 corridor have been developed with ideas and suggestions gathered from a wide range of agencies, stakeholder groups, and the public-at-large. The intent of the outreach has been to involve a broad spectrum of interests and perspectives through all phases of the process to ensure that the I-84 Corridor Strategy will be successfully implemented over the long-term.

The first stage of outreach involved interactive workshop sessions and public meetings that included nearly 400 participants. The workshops were designed specifically to gather input from the public and stakeholder groups throughout the CRGNSA to develop a draft vision and goals to

direct the development of the I-84 Corridor Strategy. Thorough research on design standards and options were reviewed in conjunction with the public input to develop draft design guidelines for each of the highway features.

Draft Vision Statement, Goals, Overall Design Objectives, and a selection of Feature Design Objectives were then presented during the second workshop series to engage the public in discussion about the early design ideas and concepts. Nearly 200 people participated in the second series of workshop sessions, public meetings, a charrette, and open house. There was a high level of conceptual support for the Vision Statement, Goals, and Overall Design Objectives throughout the meetings.

Finally, two public open house series unveiled draft bridge guidelines content and the overall draft I-84 Corridor Strategy, presenting highlights of the draft design guidelines for specific corridor features.

Detailed descriptions of the public meetings and the full input received can be found in the public outreach summary report documents for each of the workshop series.

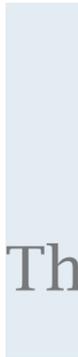
### Project Schedule

	2004			2005												
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
Project Kick-Off	█															
Discovery Stage: Initial Research and Existing Conditions Analysis	█	█	█													
1st Public Meeting Series				◆												
Develop Preliminary Design Ideas and Concepts					█	█	█									
2nd Public Meeting Series								◆								
Develop Draft I-84 Corridor Strategy - Vision and Design Guidelines									█	█	█	█	█			
3rd Public Meeting Series												◆			◆	
Finalize I-84 Corridor Strategy - Vision and Design Guidelines															█	█

### Context Sensitive and Sustainable Solutions (CS<sup>3</sup>)

The I-84 Corridor Strategy has been completed in accordance with ODOT's Context Sensitive and Sustainable Solutions (CS<sup>3</sup>) Program. CS<sup>3</sup> solutions reflect community values and diversity; preserve cultural, aesthetic, and historic resources; maintain safety and mobility; support economic prosperity; achieve responsible stewardship of the natural environment; and ensure cost effective implementation.





# The Vision for Interstate 84

Vision Statement

Goals

Overall Design Objectives

## Vision Statement

Interstate 84 in the Columbia River Gorge National Scenic Area (CRGNSA) is a critically important corridor that serves as a primary regional transportation artery, a key interstate freight route, and a scenic highway. Interstate 84 is envisioned as:

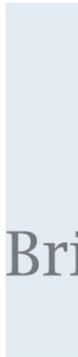
- a corridor where the traveling through is as important as the traveling to;
- providing safe and efficient movement of people and goods while respecting and highlighting the magnificent landscape through which it passes;
- a route with a distinct and cohesive identity that reflects the character and the values of the CRGNSA;
- a vital connector serving social and economic needs by providing access to and between communities, services, recreation areas, and tourism destinations, and
- a model of design and management for interstate highways in scenic rural landscapes.

## Goals

- Goal A: Improve safety along Interstate 84 in a manner that is consistent with the strategy for the corridor.
- Goal B: Maintain the ongoing functionality of Interstate 84 as the most important east-west highway moving people and freight through Oregon.
- Goal C: Establish a distinct visual character for Interstate 84 through design continuity for the common elements of highway features.
- Goal D: Blend the design and management activities of Interstate 84 with the natural landscape setting and historic context consistent with scenic resource provisions of the *Management Plan for the Columbia River Gorge National Scenic Area*.
- Goal E: Protect and enhance scenic, cultural, natural, and recreational resources through careful planning, design, and development of projects and long-term maintenance practices.
- Goal F: Improve access between Interstate 84, local communities, and other destinations to support local and regional economic development.
- Goal G: Ensure that projects are developed through an interagency, interdisciplinary process from initial planning stages through implementation.

## Overall Design Objectives

- Visual continuity should be achieved through the use of a palette of common design elements that extend throughout the CRGNSA corridor.
- The design elements of form, line, color, texture, and scale will be used to meet the *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource provisions.
- The form of features in the Interstate 84 corridor should be integrated with the natural landform.
- The horizontal line of Interstate 84 features should flow with and respond to the line of the river below. The curvilinear line of the existing highway alignment should be retained and emphasized.
- Vertical features should respond to the cliff landscape. The observer's eye should be led to the landscape, rather than to the highway itself.
- The color of features within the Interstate 84 corridor should be selected to harmonize with the natural setting.
- Dark earthtone colors that repeat throughout the CRGNSA landscape should be emphasized.
- The number of colors in the palette should be limited in order to provide unity of design.
- Texture of Interstate 84 features should be rough with an irregular pattern, rather than smooth and reflective for the purpose of minimizing the reflectivity of the various highway features. The textures should blend with the natural setting.
- Textures and colors of concrete and steel structures should derive from the natural color tones of the exposed geology found within the CRGNSA.
- Use common, unifying design elements to create consistency of appearance for Interstate 84 features throughout the CRGNSA.
- The Key Viewing Area of Interstate 84 itself, as well as other Key Viewing Areas from which it is seen, should be considered during project design. In Urban Areas, similar consideration will be made by ODOT in order to maintain unity and continuity of the highway.
- Interstate 84 should be influenced by and honor the presence of the Historic Columbia River Highway (HCRH) and other historic architectural features where appropriate, and in a manner that establishes a physical or visual architectural connection to historic heritage, without mimicry or replication. Interstate 84 features should compliment, not rival or detract from the integrity of the HCRH.
- The Interstate 84 system should facilitate the enjoyment of CRGNSA resources.
- Interstate 84 should be functionally and ecologically integrated into the landscape by accommodating vehicular access to roadside destinations and urban areas, controlling non-motorized access, and accommodating wildlife passage along the corridor.
- Interstate 84 should provide connection between the river and the mountainside where possible.
- Agencies and communities should develop partnerships to leverage funding and resources for cooperative projects where agency and community interests intersect.
- Communities, other agencies, and the private sector should support the development and maintenance of additional rest areas, viewpoints, and recreation sites.
- Encourage connectivity and access by supporting travel through the corridor via various transportation modes – by motor vehicle, bus, train, boat, bicycle, and on foot.



## Bridge Features

Bridge Styles

Mainline Interstate 84 Bridges

Bridges Over Interstate 84

## Introduction

Bridge structures are a central feature of Interstate 84 through the Columbia River Gorge National Scenic Area (CRGNSA).

Bridges supporting the mainline traffic of Interstate 84 allow for the safe movement of people and goods over other roadways, the mainline Union Pacific railway, major and minor drainage channels, and trail accesses. Aesthetically, mainline Interstate 84 bridges provide an opportunity to announce the crossing of significant natural and human-made features.

Bridges over Interstate 84 provide connections across the Interstate for all modes of travel from and between local communities, businesses, and recreation areas. They provide the essential links that prevent Interstate 84 from being a barrier to accessing the Columbia River for residents and visitors alike. Aesthetic guidelines for these structures are very important because of their high degree of visibility. Bridges over Interstate 84 uniformly lie directly in the terminus of all drivers' focal points, unlike railings and other peripheral highway features which are only viewed indirectly.

## Important Considerations

### Safety

The primary purpose of mainline Interstate 84 bridges in the CRGNSA is to provide adequate load-carrying capacity and a safe highway cross-section for the roadway user. Therefore, safety is of paramount concern as a functional requirement for these bridges.

The primary purpose of bridges over Interstate 84 in the CRGNSA is to provide safe vehicular, bicycle, and pedestrian access from one side of the Interstate to the other. All guidelines presented meet or exceed all applicable federal and state safety standards and requirements.

Design guidelines described and shown in this section, in some cases, may require guardrail protection. This treatment is not shown, as it is

the responsibility of the designer to evaluate design speeds and clear zone requirements for all sites and treatments. In some cases, guardrail will be necessary to protect bridge piers.

It is the responsibility of the bridge designers to apply and integrate these guidelines into the entire bridge system while maintaining or improving the safety performance. This system includes all bridge elements and a safe transition of the bridge elements to the adjacent roadway system.

### Overhead Clearances

Freight mobility requirements for Interstate 84 include a 17-foot, 6-inch requirement for overhead clearances from the edge of shoulders. It is not the intent of these guidelines to require significant changes to the vertical profile to create this clearance envelope. Bridge designers should carefully evaluate this clearance requirement on a site by site basis, and choose superstructure options and span arrangements to accomplish safe overhead clearances.

For bridges over waterways, consideration of channel hydraulics, water surface profiles at flood stages, potential for debris, etc. should be accomplished on a site by site basis. Superstructure options and span arrangements to achieve adequate freeboard and debris passage are the responsibility of the bridge designer.

### Future Widening

These design guidelines are developed to provide a consistent approach to bridge design aesthetics for many decades to come. To be responsive to the potential increased future travel demand and provide for a safe user environment, mainline Interstate 84 bridges may require widening either now or in the future. Therefore, the designs for these bridge structures need to be able to accommodate future capacity increases through the design life of the structure. Structures over Interstate 84 should be wide enough to accommodate the expected future capacity of the Interstate 84 mainline through the design life of the structure.

These guidelines have been developed around the use of conventional beam-and-girder superstructures types. The guidelines can be applied to either concrete or steel superstructures. For situations where steel is a consideration, a site analysis should be made to determine if moisture and wind conditions will allow proper oxidation of weathering steel elements.

Reasons to work with conventional superstructure types include: cost-effectiveness, ease of construction, ability to achieve aesthetic goals and objectives, and ease of widening to meet travel demand requirements. These guidelines are appropriate both for widening existing bridges and for future widening of bridges that will be built based upon these guidelines.

### Bridge Repair

These guidelines are intended to be applied as repair designs are developed. Mainline Interstate 84 bridge guidelines that may relate to repair scenarios follow with comments:

- Guidelines related to bridge rail can be applied to bridges that require rail replacement. Bridge designers are cautioned to consider the structural adequacy of the deck if new bridge rail is installed.
- Use natural slope treatments (rocks, boulders, etc.) rather than concrete or other paving materials. (This guideline would apply to reconstruction/repair of slopes adjacent to abutments.)
- Drainage should be continuous along the bridge to avoid erosion at the abutments. (This guideline applies where deck replacement is necessary.)
- Provide standard outside shoulder width to create safe separation between bicycles and lanes of traffic. (This guideline applies where deck replacement is necessary.)

Structural repair of existing foundations, piers, abutments, bridge rails, and other existing bridge elements are not addressed in the mainline Interstate 84 bridge guidelines.

Short term repairs may not meet all of the design objectives. It will be necessary to handle these repairs on a project by project basis.

### Design Objectives

The design objectives for bridges have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow and specifications in Appendix B provide greater detail and specific instruction on meeting bridge feature design objectives.

Mainline Interstate 84 bridges and bridges over Interstate 84 should:

- have common design of features such as railing, structure, abutments, pedestrian and bicycle accommodation, and signage to achieve corridor-wide continuity;
- utilize an architectural character and design elements that blend with the surrounding natural landscape;
- have flexibility to vary according to site specific conditions and opportunities while maintaining continuity;
- have continuity in the structural themes through the retention of arched forms and use of materials from the surrounding area;
- allow for variation in the design of detailing such as screening, color, and texture;
- incorporate characteristic architecture and design elements of regional historic structures to help blend with the setting;
- break up large visible surfaces using color, line, and texture;
- use railing that allows views of the features that the bridge is crossing, and
- safely accommodate bicycles without encroaching on vehicular traffic.

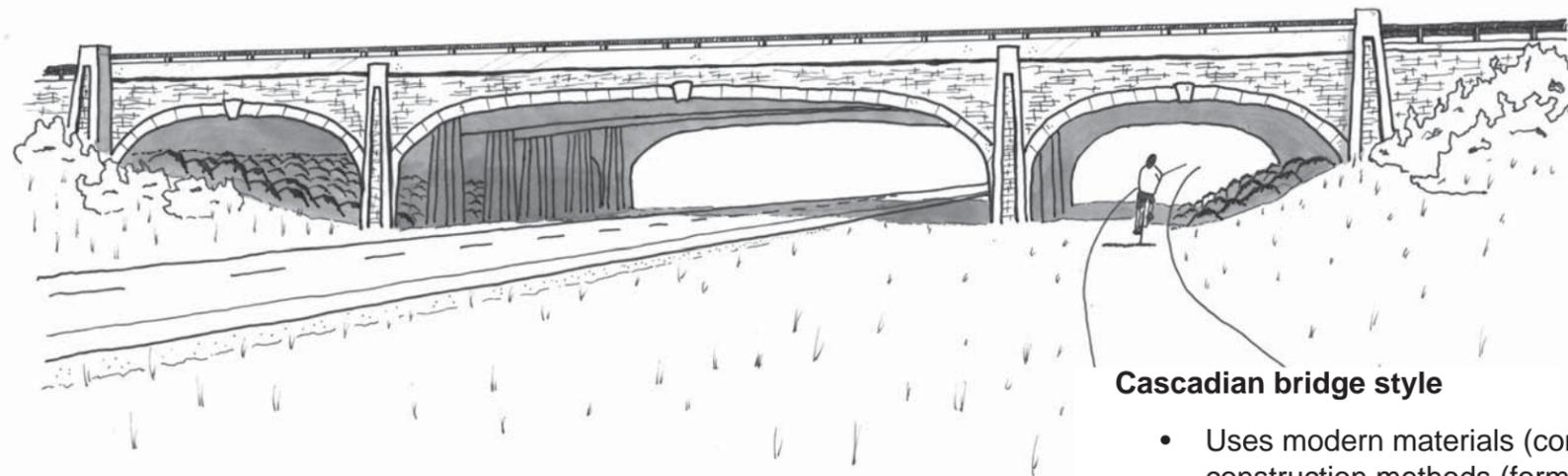
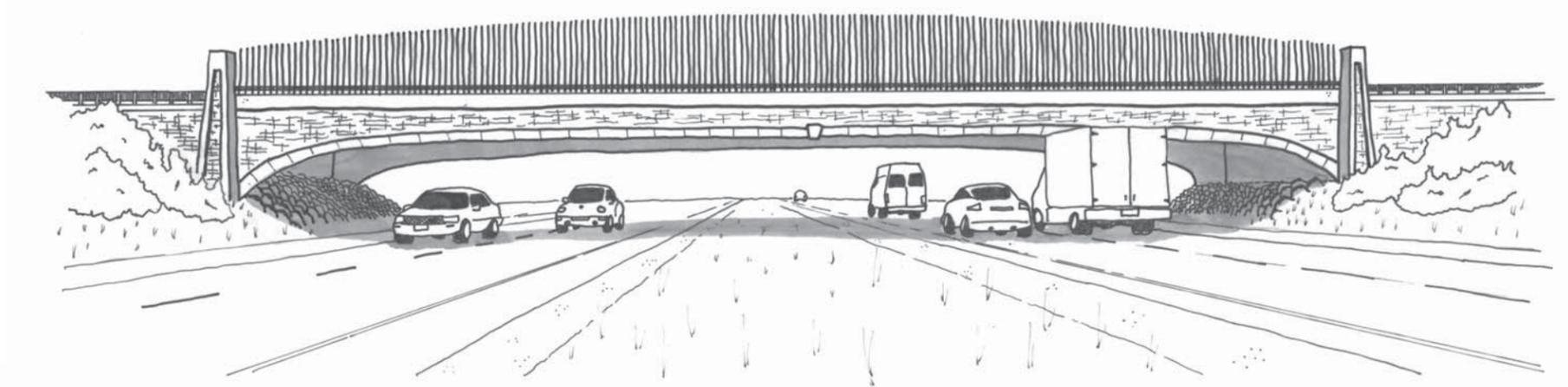
### Design Guidelines: Bridge Styles

Two styles have evolved from the guidelines for bridge features to respond to different levels of bridge visibility. All guidelines apply to single and multiple span bridges as well as to each bridge style. Rendered images in this section represent examples of how these styles may look when applied. Appendix D identifies bridges that are scheduled for replacement and proposes the application of style based on the location details.

#### Cascadian Bridge Style

A Cascadian bridge style was developed for use in low-speed traffic areas, pedestrian routes, and high-speed areas with long approaches that focus the observer toward the bridge structure. This style was developed to respond to regional Cascadian architecture and design elements tending toward a sturdier, more robust structure in appearance. The Cascadian style is intended to provide contextual richness relative to the local, cultural and natural setting when viewed from ¼ mile or less and is intended to blend into the natural landscape setting from further viewing distances. It tends toward an historic highway bridge appearance with detailing that includes features taken from historic bridges in the area. This style makes extensive use of architectural facades and a detailed abutment design that incorporates patterned concrete to give the appearance of natural rock color and texture.

The Cascadian style bridge would not be appropriate to use in locations where the horizontal alignment has significant curvature. Within designated urban areas where the dominant architectural character conflicts with the Cascadian style, flexibility will be considered.

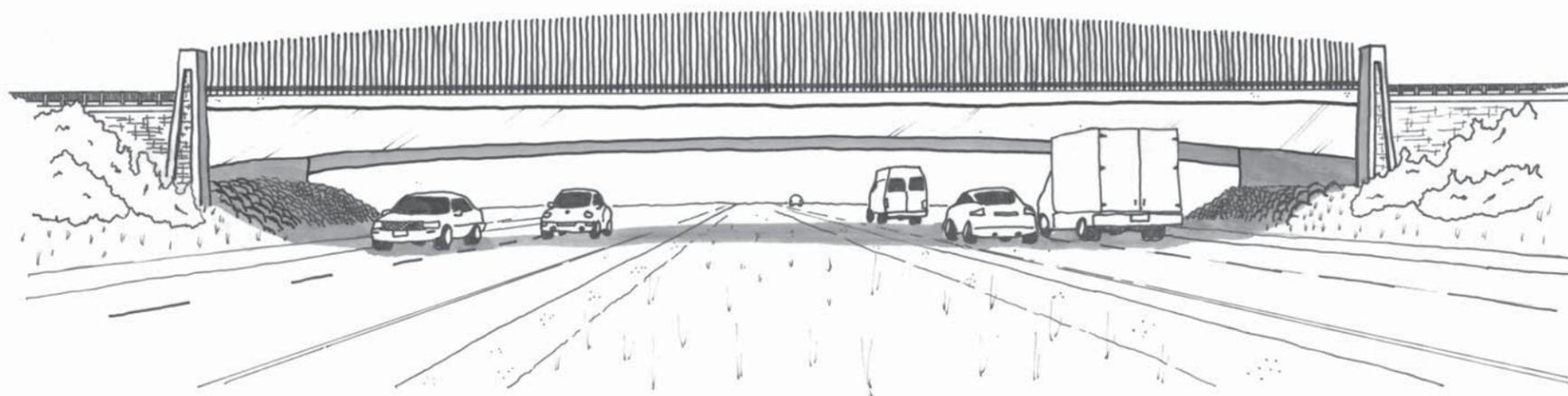
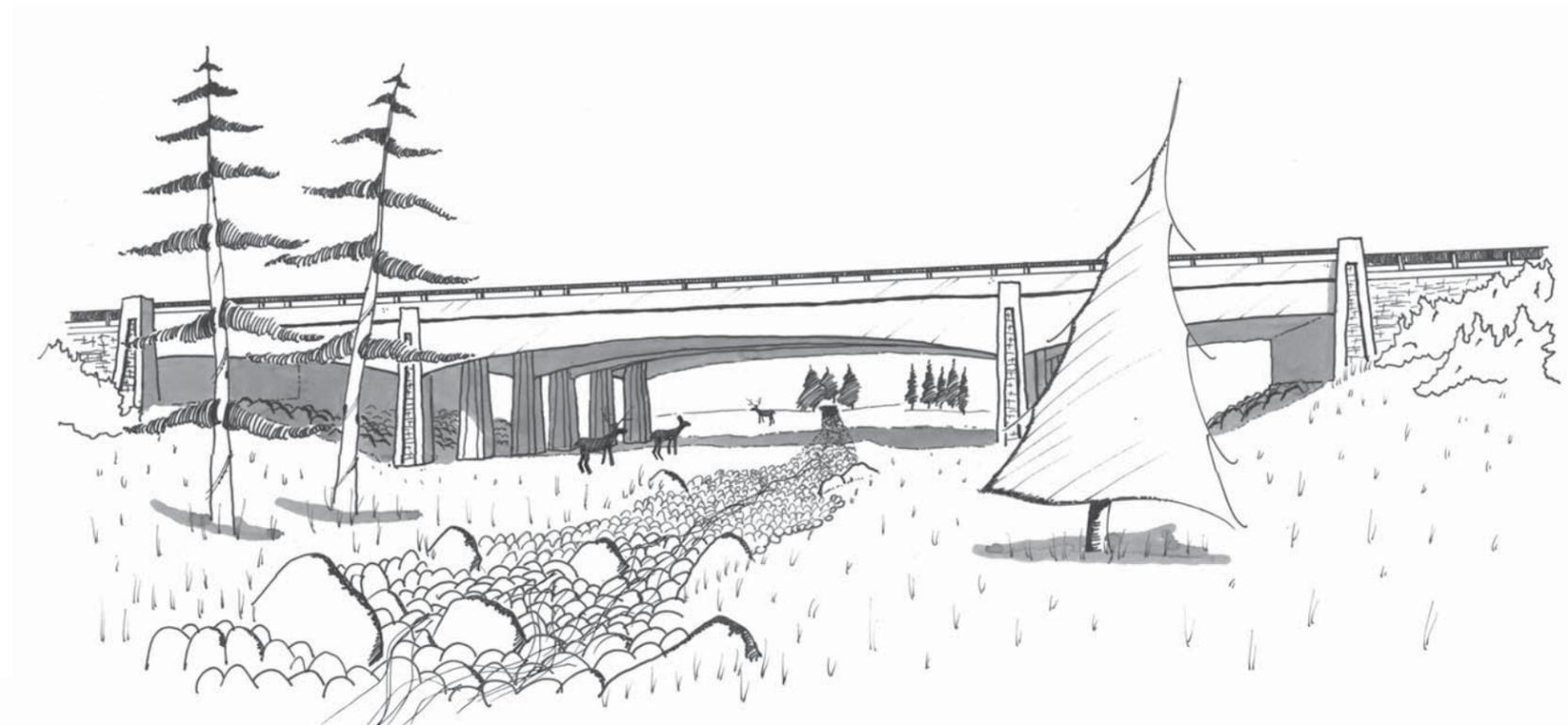


**Cascadian bridge style**

- Uses modern materials (concrete and weathering steel) and construction methods (formliners, etc.)
- Accentuated arch forms on the end spans, using a vertical tangent at the spring line transitioning into an elliptical form
- Haunched girder at mid-span, using an elliptical form
- Textured pier treatment using formliner
- Textured bridge girder treatments using formliner
- Textured abutment treatment using formliner
- Monuments at bridge abutment face
- Open bridge railing

### Contemporary Bridge Style

A Contemporary bridge style is intended for settings that are less visible or for built environments with a more contemporary character. It is important that the bridge architecture fits in context, rather than contrast, with the local setting and cultural character. This style tends toward a modern highway bridge appearance with detailing that includes features taken from historic bridges in the area. These features include a curved bottom girder soffit and a detailed abutment design that incorporates patterned concrete to give the appearance of natural rock color and texture. This style minimizes the use of architectural facades relative to the Cascadian style.



### Contemporary bridge style

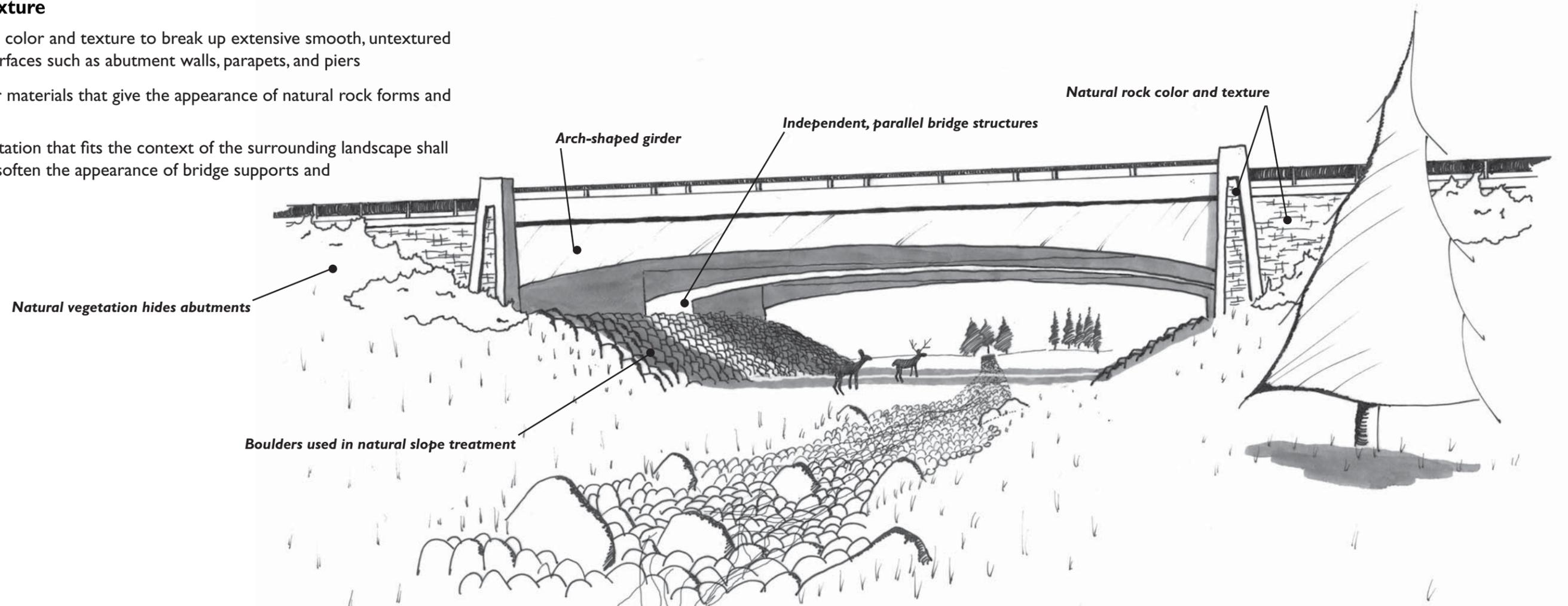
- Uses modern materials (concrete and weathering steel) and construction methods (formliners, etc.)
- Haunched bridge girder with arch-like form for all spans. The haunch shape is based on a standard parabolic form
- Textured pier treatment using formliner
- Smooth bridge girder surface
- Textured abutment treatment using formliner
- Monuments at bridge abutment face
- Open bridge railing

### Design Guidelines: Mainline Interstate 84 Bridges

These guidelines provide detail and specific instruction for how to achieve the design objectives for mainline Interstate 84 bridges. All guidelines apply to single and multiple span bridges as well as each style.

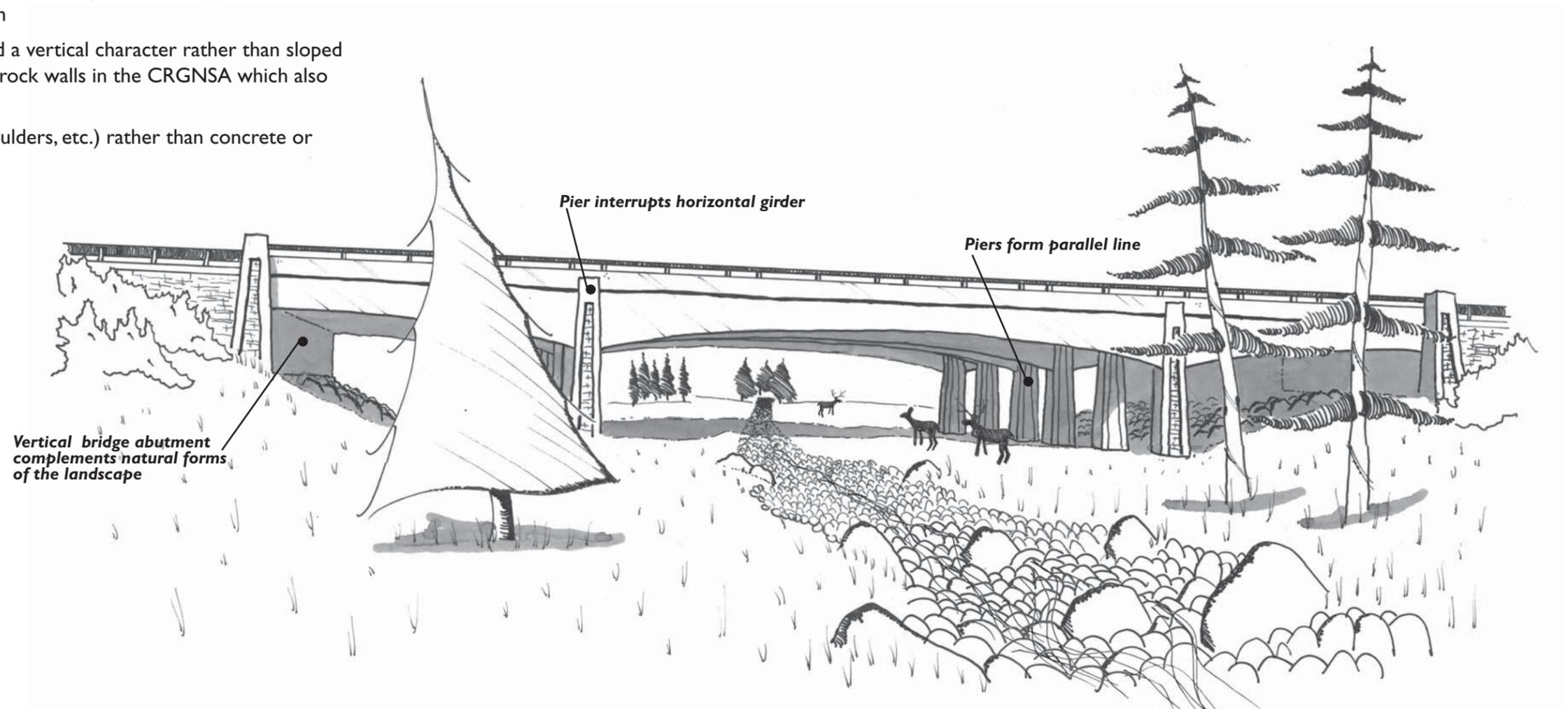
#### Color and Texture

- Incorporate color and texture to break up extensive smooth, untextured concrete surfaces such as abutment walls, parapets, and piers
- Use rock or materials that give the appearance of natural rock forms and textures
- Native vegetation that fits the context of the surrounding landscape shall be used to soften the appearance of bridge supports and abutments



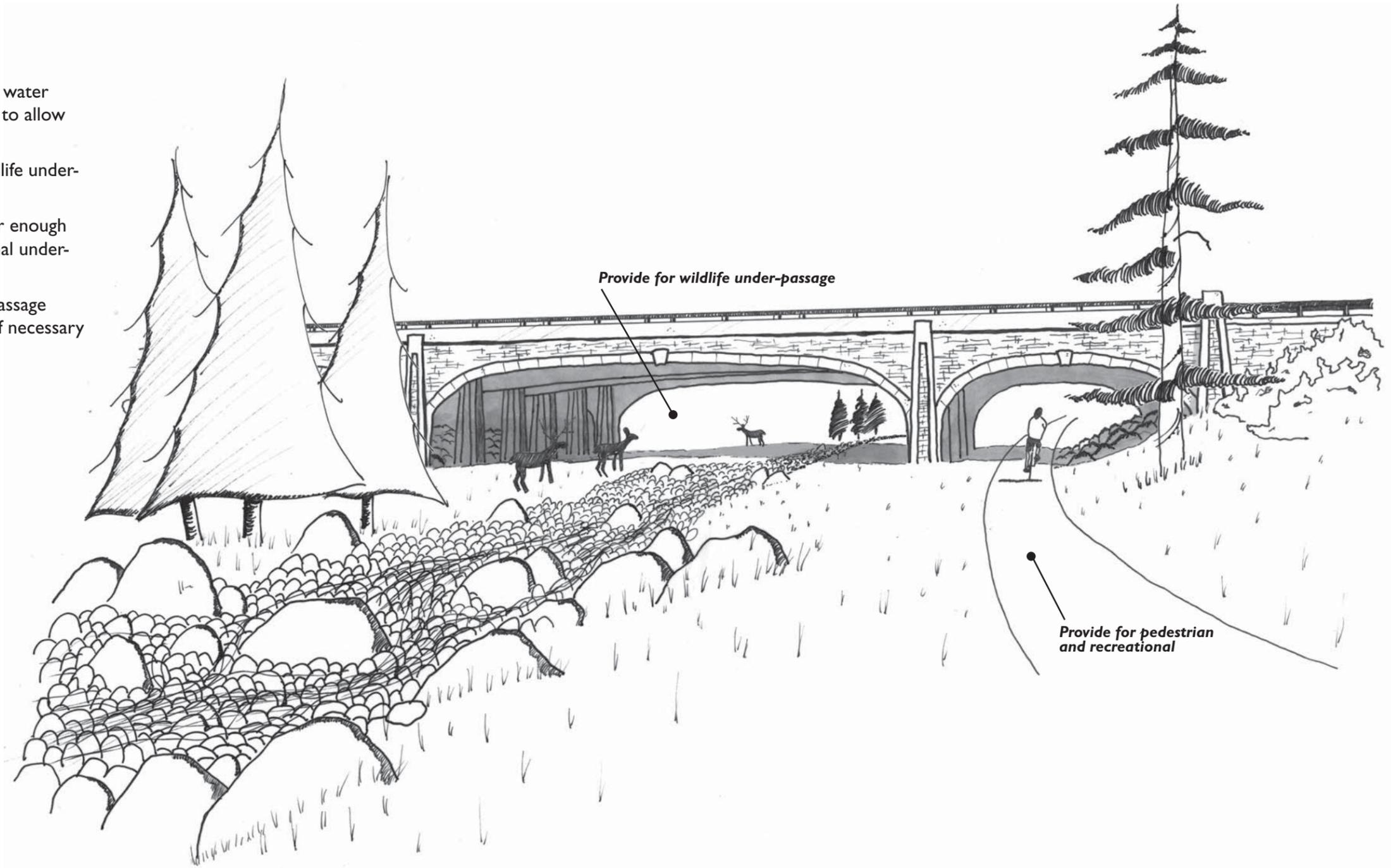
### Form and Line

- Eastbound and westbound lanes on mainline Interstate 84 bridges shall be on independent bridge structures with an obvious separation to allow air and light through where feasible
- Piers of independent, but parallel bridges shall be lined up rather than staggered
- Minimize bridge abutment surface to give the bridge deck the appearance of flowing out of the grade of the landform
- Bridge abutment form shall tend toward a vertical character rather than sloped pavement in character with the natural rock walls in the CRGNSA which also tend to the vertical
- Use natural slope treatments (rocks, boulders, etc.) rather than concrete or other paving materials
- Integrate arch shape into design



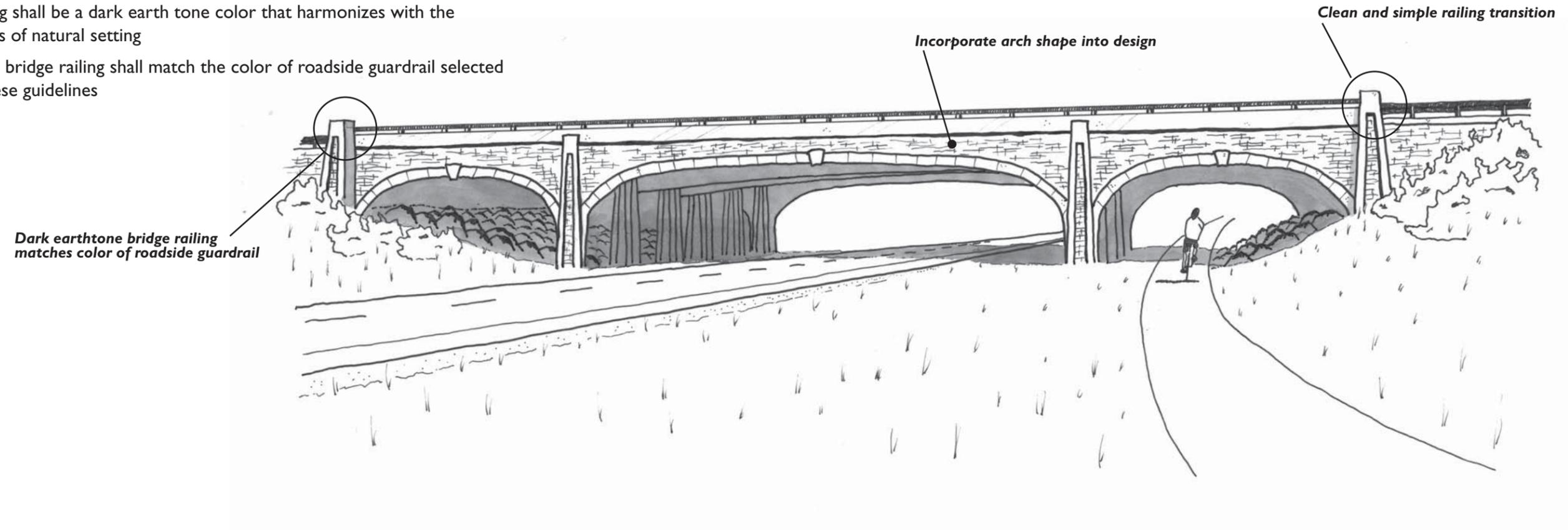
**Functionality**

- Bridges crossing water bodies shall extend beyond the water body to span streamside riparian landscape sufficiently to allow wildlife passage
- Maximize the usable space for recreational and/or wildlife under-passage
- Mainline bridges that cross other roads shall extend far enough to provide for pedestrian, bicycle, and other recreational under-passage and attractive road edge treatments
- Interstate 84 bridges shall accommodate safe bicycle passage with a sufficiently wide shoulder, or a separate facility if necessary



### Bridge Railing

- Incorporate bridge railing that is consistent in form, color and texture with other linear design elements to maintain continuity
- Bridge railing design shall be compatible with clean and simple transition to the selected roadside guardrail
- Railing shall have nighttime reflectivity to delineate road edge and maximize night/inclement weather driving safety
- Railing shall be a dark earth tone color that harmonizes with the colors of natural setting
- Metal bridge railing shall match the color of roadside guardrail selected in these guidelines



## Bridge Features: MAINLINE INTERSTATE 84 BRIDGES

### Guideline Application Examples: Mainline Interstate 84 Bridges

As stated in the design objectives, designs will have the flexibility to vary according to site specific conditions and opportunities, while maintaining continuity. Two different bridge styles emerged through development of the guidelines and images to support the objectives.

The following rendered images represent examples of how these guidelines and bridge styles could be applied to mainline Interstate 84 bridges, and are not intended to represent exact dimensions or designs for specific locations.

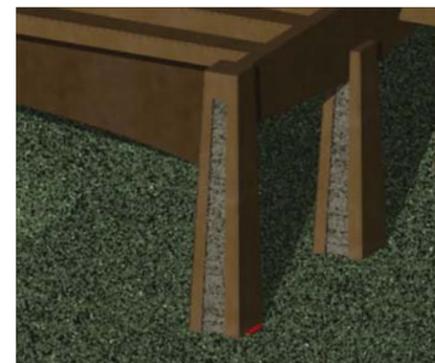
#### Cascadian Bridge Style



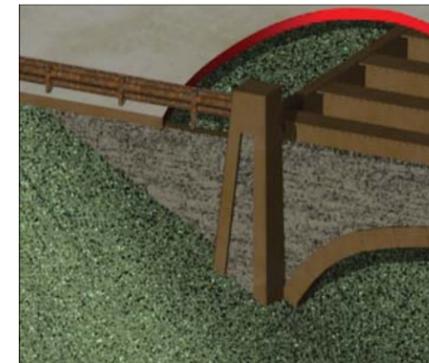
*Cascadian single-span mainline bridge*



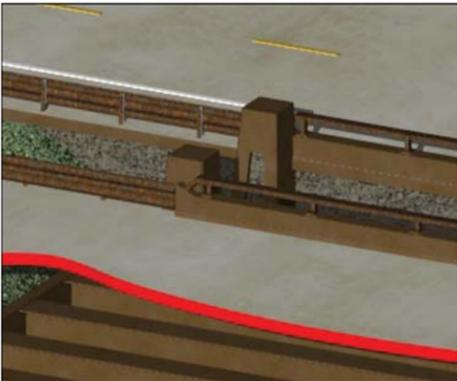
*Cascadian three-span mainline bridge*



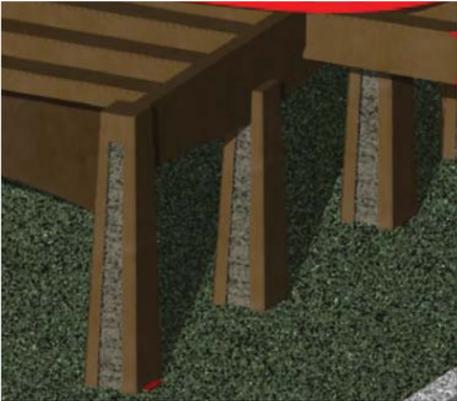
*Mainspan pier detail*



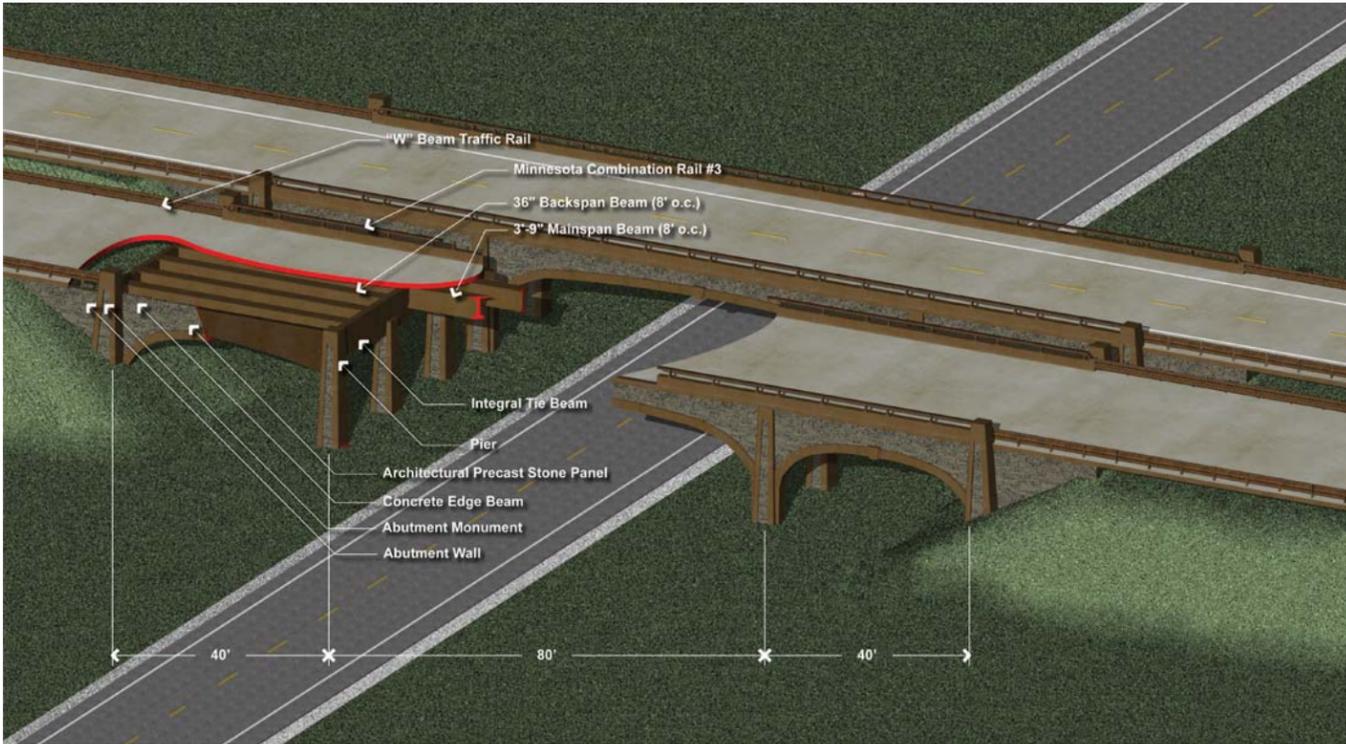
*Abutment wall detail*



Rail transition detail



Integrated tie beam detail



Axonometric cutaway



Pedestrian underpass and abutment wall/slope detail

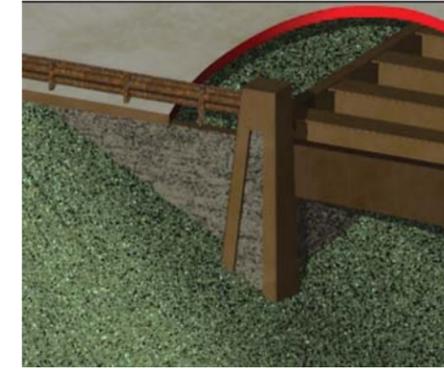
**Contemporary Bridge Style**



*Contemporary single-span mainline bridge*



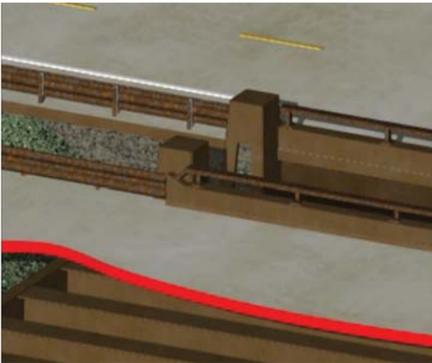
*Integrated tie beam detail*



*Abutment wall detail*



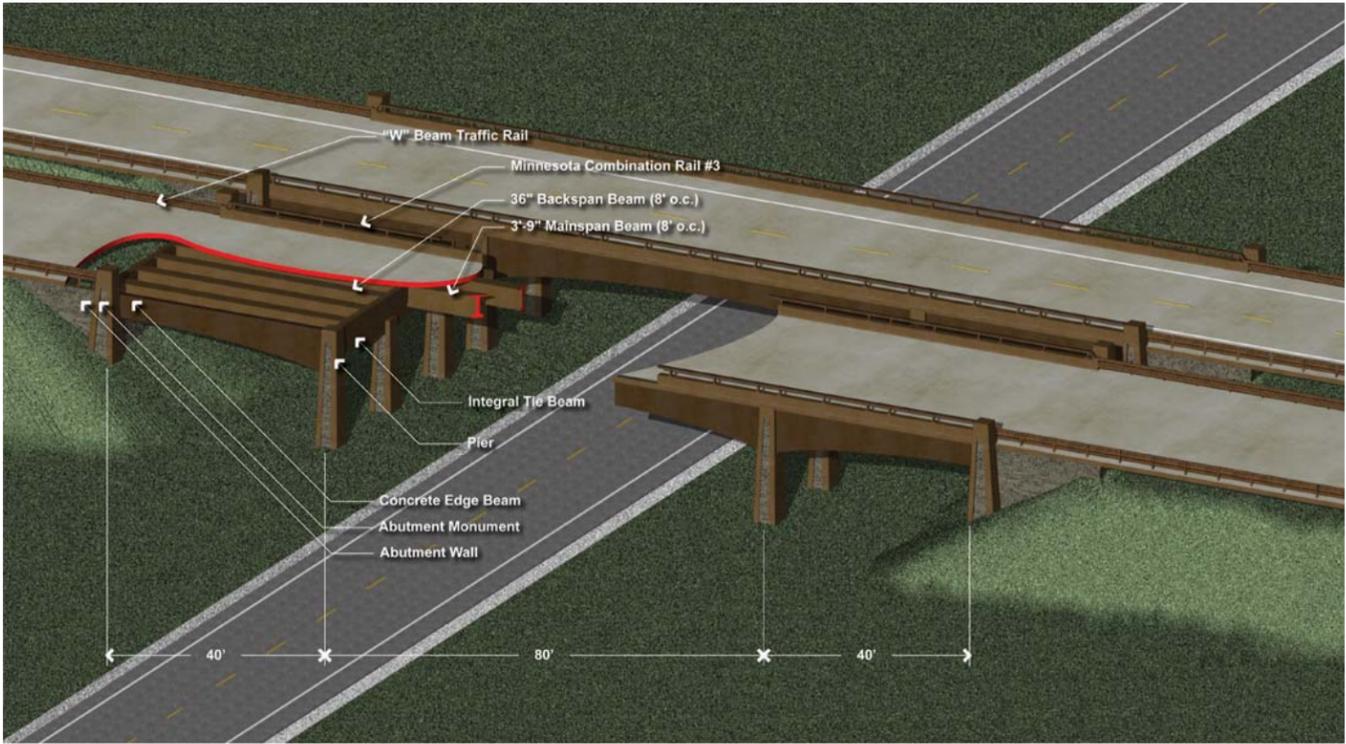
*Contemporary three-span mainline bridge*



Rail transition detail



Mainspan pier detail



Axonometric cutaway



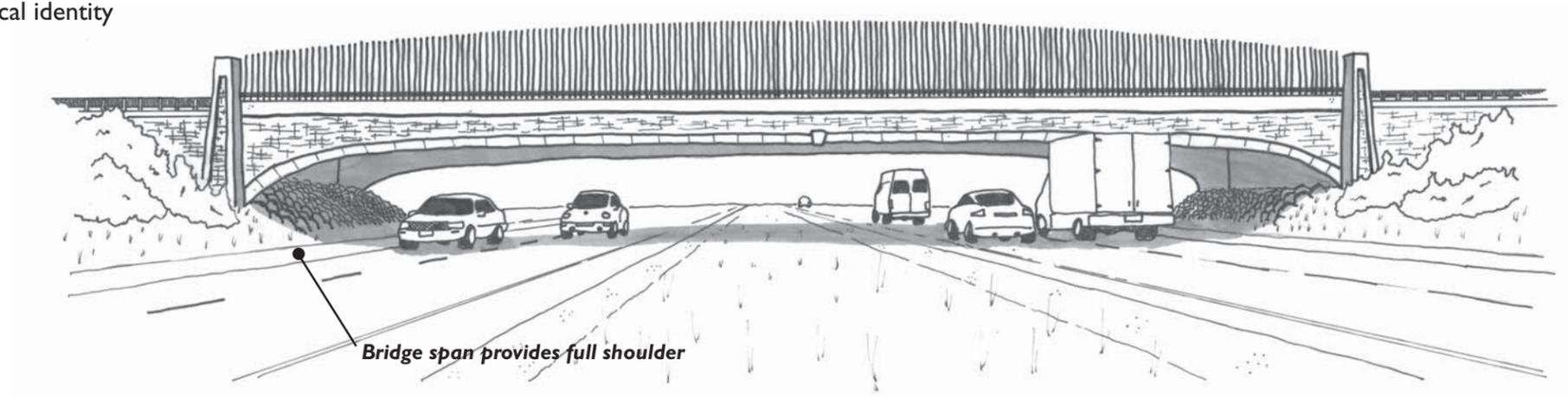
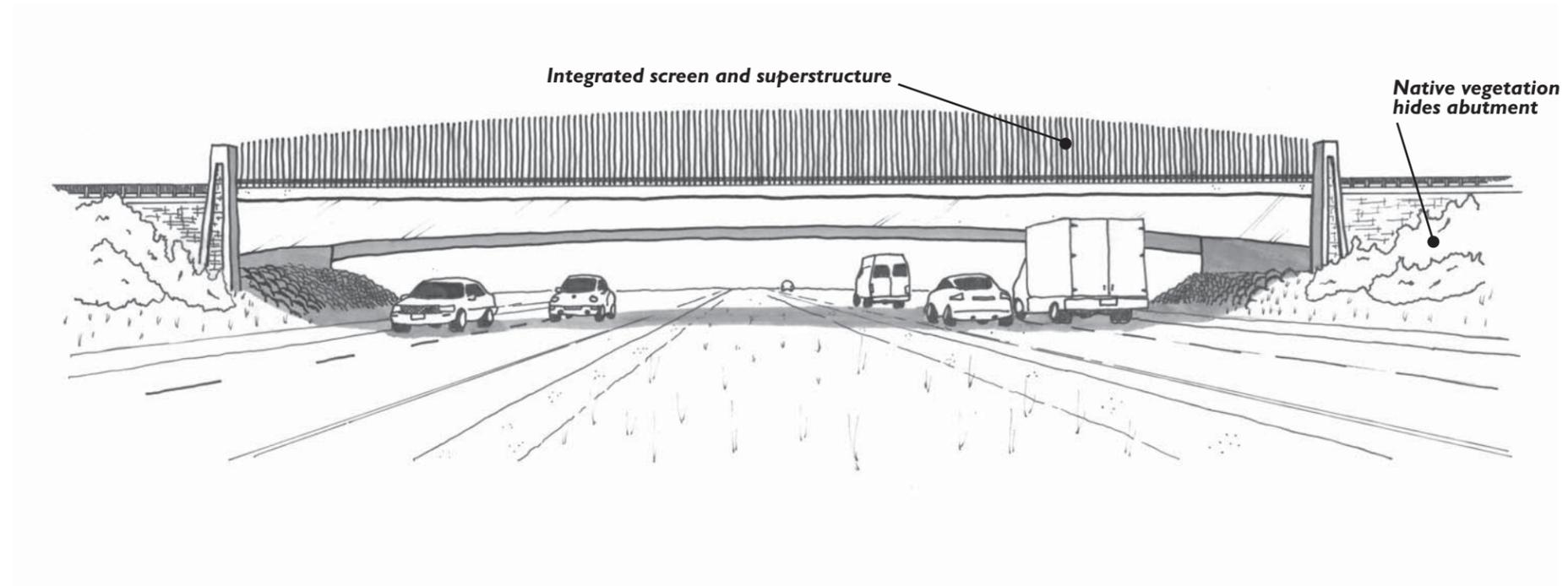
Pedestrian underpass and abutment wall/slope detail

## Bridge Features: BRIDGES OVER INTERSTATE 84

### Design Guidelines: Bridges Over Interstate 84

These guidelines provide detail and specific instruction for how to achieve the design objectives for bridges over Interstate 84. All guidelines apply to single and multiple span bridges, as well as to each style. The guidelines presented for mainline Interstate 84 bridges apply to bridges over Interstate 84, with the following exceptions and/or additions

- Bridges over Interstate 84 shall accommodate safe pedestrian and bicycle passage with a sufficiently wide shoulder, curb/sidewalk configuration for local urban streets, or a separate facility if necessary
- Railing on bridges over Interstate 84 shall meet minimum crash test level while using a transparent and low profile design
- Shall span far enough to provide a full shoulder along the mainline to accommodate bicyclists
- Screens shall be visually integrated into the bridge rail and superstructure design:
  - Arch forms shall be integrated into the screen design to maintain consistency of form and line throughout the CRGNSA
  - Urban areas shall be allowed to vary color and texture to establish a local identity



### Guideline Application Examples: Bridges Over Interstate 84

As stated in the Design Objectives, designs will have the flexibility to vary according to site specific conditions and opportunities, while maintaining continuity. Two different bridge styles emerged through development of the guidelines and images to support the objectives.

The following rendered images represent examples of how these guidelines and bridge styles could be applied to mainline Interstate 84 bridges, and are not intended to represent exact dimensions or designs for specific locations.

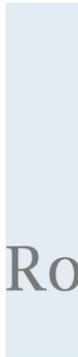
#### Contemporary Bridge Style



#### Cascadian Bridge Style







## Roadway Edge and Alignment Features

Median Barrier

Roadside Guardrail and Barrier

Railing Transitions and Terminals

Interchange Configuration

Pavement Widening

### Introduction

Roadway edge features are essential safety facilities that enclose the driving lanes. These features prevent vehicles from running off the road and provide a positive separation of traffic from fixed objects and opposing lanes in horizontally constrained locations. Roadway edge features are some of the most prominent visual components of Interstate 84 because of their location between vehicles and the surrounding landscape.

Roadway alignment features address how the overall highway layout fits into the landscape. The geometry of new and reconstructed interchanges can be designed to decrease the overall visual impact of Interstate 84 as seen from Key Viewing Areas (KVAs) and increase the safety of merge and intersection areas. In addition, pavement widening to accommodate development of additional roadway width for elements such as auxiliary lanes and shoulders needs to consider the overall visual impact of such activities.

## Median Barrier

### Introduction

Several different median configurations occur on Interstate 84 through the Columbia River Gorge National Scenic Area (CRGNSA). A wide median with adequate clear zone is the most desirable condition. However, due to the limited space constraints on Interstate 84, in many cases a median barrier is necessary to prevent cross-over accidents. The median barrier also serves the function of providing delineation of the left side of the roadway at night and in inclement weather. The median barrier also is a critical visual element. Views from Interstate 84 are defined by the height and configuration of the median barrier. In addition, the median barrier represents a significant contribution to the overall consistent, linear aesthetic treatment of Interstate 84.

### Important Considerations

- Safety - Crash Test Level 4
- ODOT, FHWA and AASHTO design standards
- ODOT Design Exception for 35" cast in place median barrier to be constructed using slipform techniques or static steel forms
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Compatibility with planned end anchors and transition to bridge railing systems

### Design Objectives

The design objectives for median barrier have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for median barrier.

Median barrier should:

- minimize cross-over accident potential;
- allow drainage to avoid pooling and minimize vehicle spray;
- be used only where a natural median is not possible due to inadequate separation;
- preserve views to the river and other features;
- use one design to create consistency of appearance throughout the CRGNSA;
- use dark earth tone-colors, non-reflective textures and other design elements to meet CRGNSA scenic resource standards as seen from KVAs, while maintaining a sufficient level of visibility and safety, and
- be designed to allow views of the Columbia River and surrounding landscape as much as possible, within safety standards.

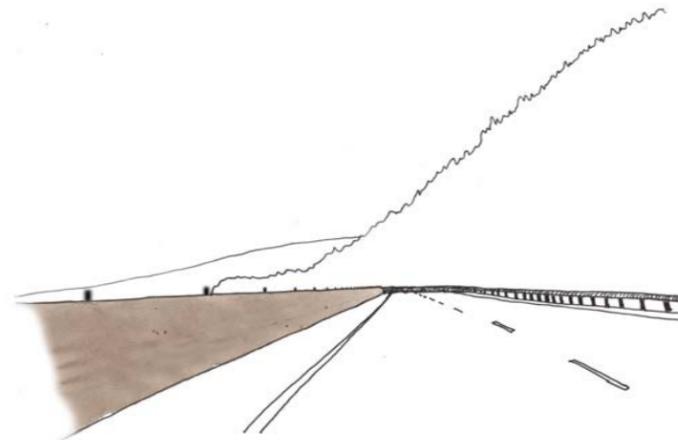
## Roadway Edge and Alignment Features: MEDIAN BARRIER

### Design Guidelines: Median Barrier

#### Function

- Use the 35" F-Shape, cast-in-place concrete Crash Test Level 4 barrier developed in conjunction with ODOT Technical Services (height allows for one future 3-inch pavement overlay, resulting in a final 32-inch barrier height)
- Reflectors shall be added to the barrier top to clearly delineate the roadway during night time and inclement weather driving conditions

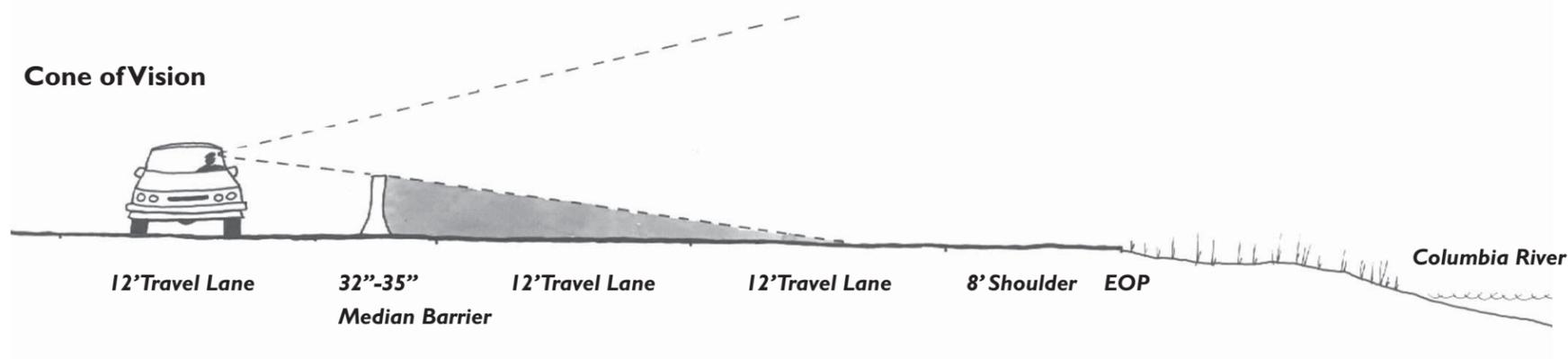
#### Daytime roadway delineation



#### Nighttime roadway delineation

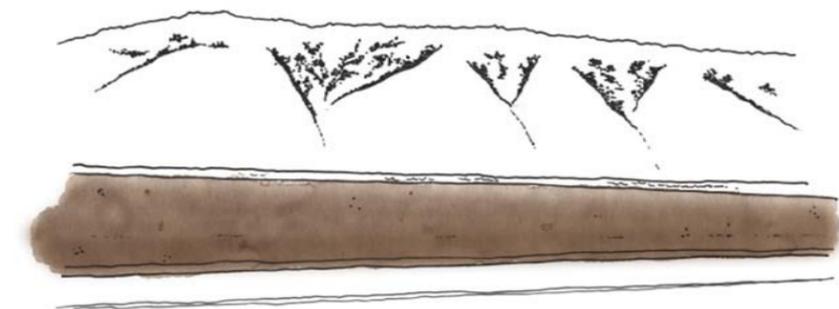


#### Cone of Vision



#### Driver's Perspective

Median barrier does not block views of the river from Interstate 84



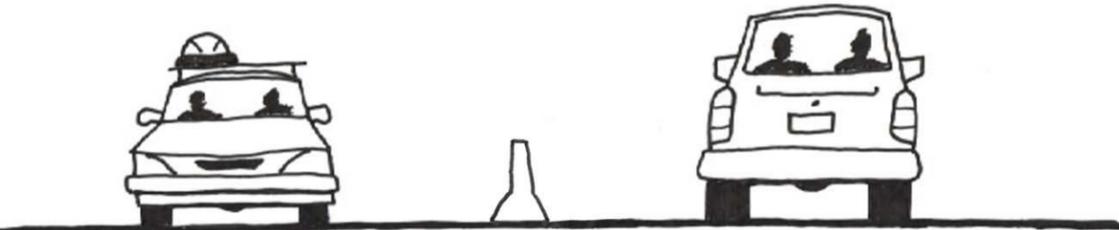
**Alignment**

- Consider future roadway realignment opportunities, the riverside, hillside and other constraints to create adequate clear zone separation, establish a grassy, landscaped median and eliminate the need for a median barrier
- Existing natural median shall be maintained without a solid median barrier where clear zone is sufficient

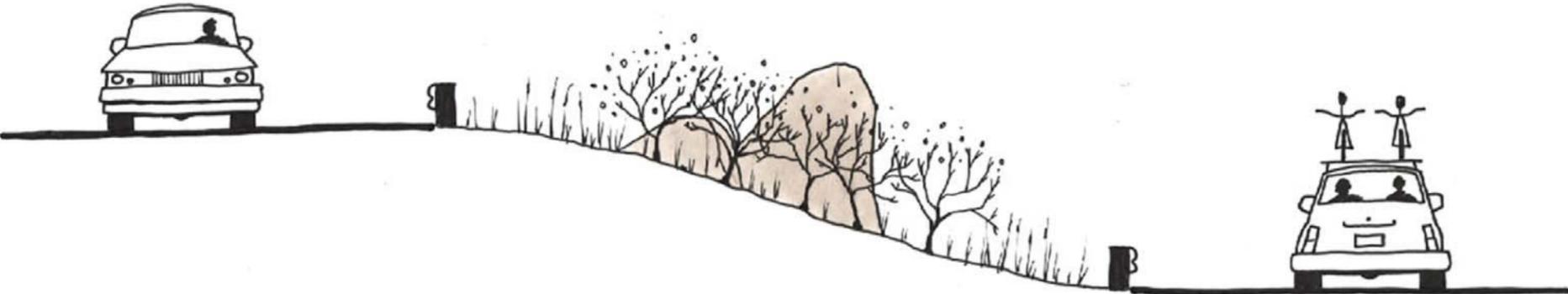
**Visual Elements**

- Surface texture shall be smooth, as created by slipform or static steel forms

**Adjacent lanes require TL-4 barrier**



**Separated lanes with obstruction in the clearzone require TL-3 barrier**



**Sufficient clearzone requires no barrier**



## Roadside Guardrail and Barrier

### Introduction

In areas where clear-zone requirements cannot be met, roadside guardrail is necessary to provide protection from roadside hazards. It also serves to delineate the right-side edge of the roadway at night and during inclement weather conditions. Roadside guardrail is a critical feature defining the views from Interstate 84.

### Important Considerations

- Safety
  - › contain and redirect design vehicle meeting Crash Test Level 3
  - › available barrier deflection distance
- ODOT, FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Compatibility with planned end anchors and transition to bridge railing systems

### Design Objectives

The design objectives for roadside guardrail and barrier have been developed to support the overall vision for the I-84 Corridor Strategy (see *The Vision for Interstate 84*). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for roadside guardrail and barrier.

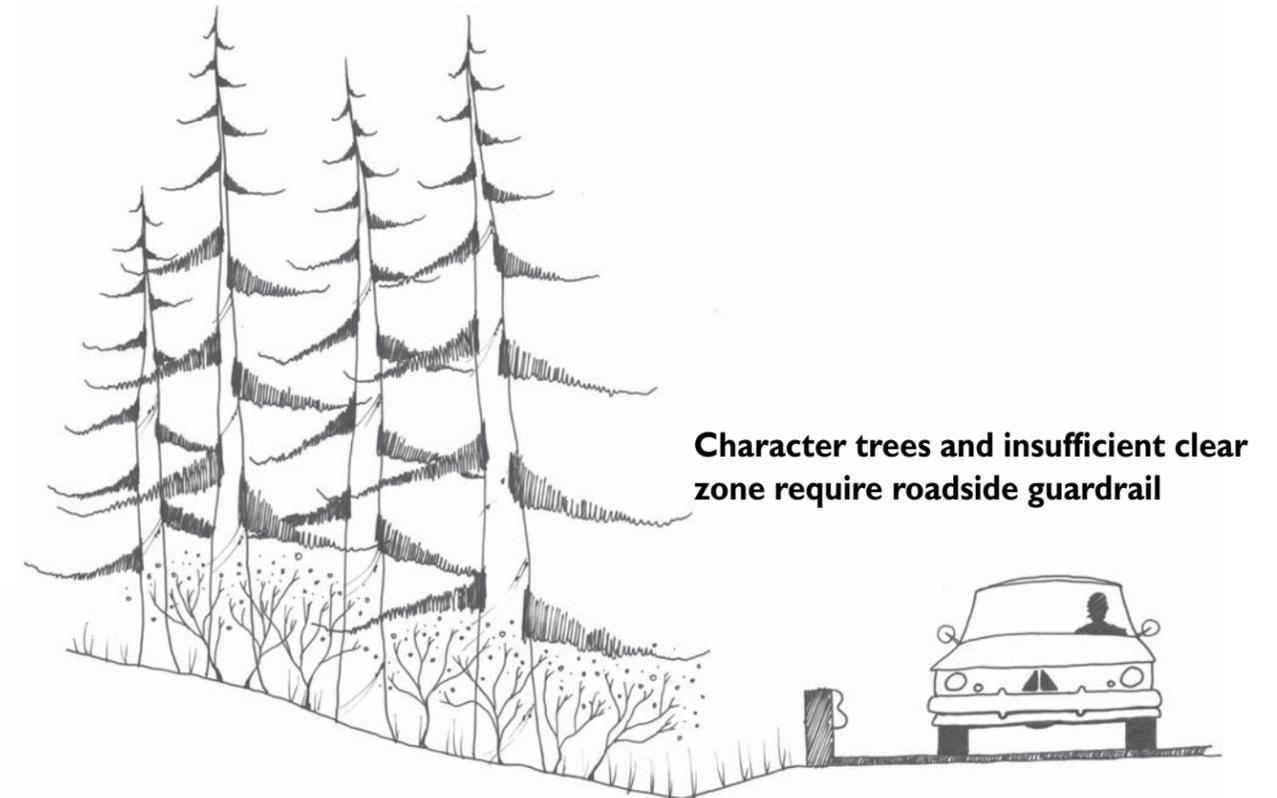
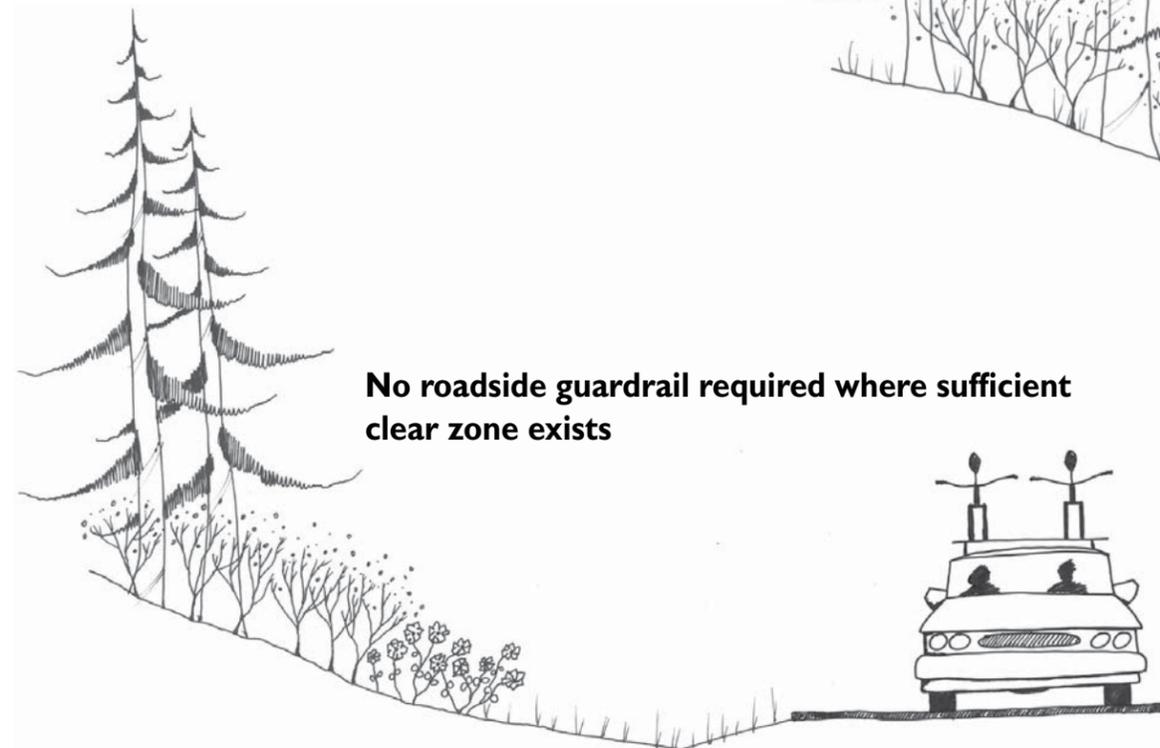
Roadside guardrail should:

- use one design to create consistency of appearance throughout the CRGNSA;
- maximize views of the Columbia River and surrounding landscape from Interstate 84, within safety standards;
- use dark earth tone-colors, non-reflective textures and other design elements to meet CRGNSA scenic resource standards as seen from KVAs, while maintaining a sufficient level of visibility and safety, and
- maintain a visual connection to the line, color, and texture of bridge railing and railing transitions.

### Design Guidelines: Roadside Guardrail and Barrier

#### Function

- No roadside railing or barrier shall be installed where clear zone requirements can be met
- Roadside guardrail shall be used to protect character trees within the clear zone
- Railing shall have nighttime reflectivity to delineate road edge and maximize night/inclement weather driving safety, accomplished with reflectorized tabs mounted to the railing



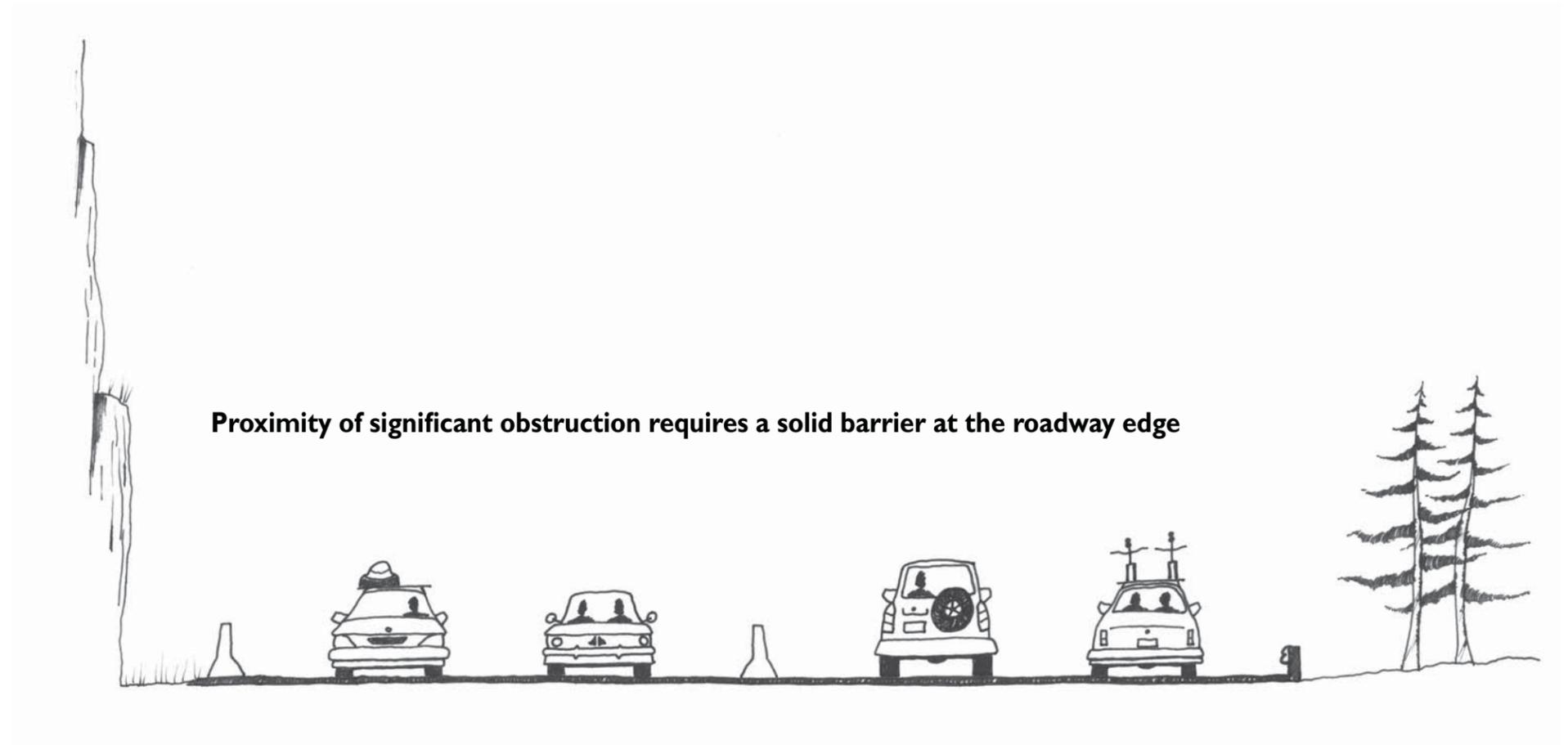
## Roadway Edge and Alignment Features: ROADSIDE GUARDRAIL AND BARRIER

### Alignment

- Roadside guardrail that intercepts hillside slopes shall utilize the same visual character as median barrier and retain the color of the adjoining guardrail sections
- Guardrail at interchange on and off ramps shall visually match the roadside or bridge railing to maintain continuity

### Color

- Use a weathering steel w-beam guardrail with wooden posts



## Railing Transitions and Terminals

### Introduction

Railing transitions and terminals are required to ensure safe transition and termination of bridge rails, median barrier, and roadside guardrail. Beside being an important safety component, railing transitions and terminations provide an opportunity to develop visually pleasing and consistent roadway elements. For example, railing transitions can create smooth transition between different height barriers, and provide a safe and visually clean termination of roadside guardrail and bridge rail runs.

### Important Considerations

- Safety
- ODOT, FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards

### Design Objectives

The design objectives for railing transitions and terminals have been developed to support the overall vision for the I-84 Corridor Strategy (see *The Vision for Interstate 84*). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for railing transitions and terminals.

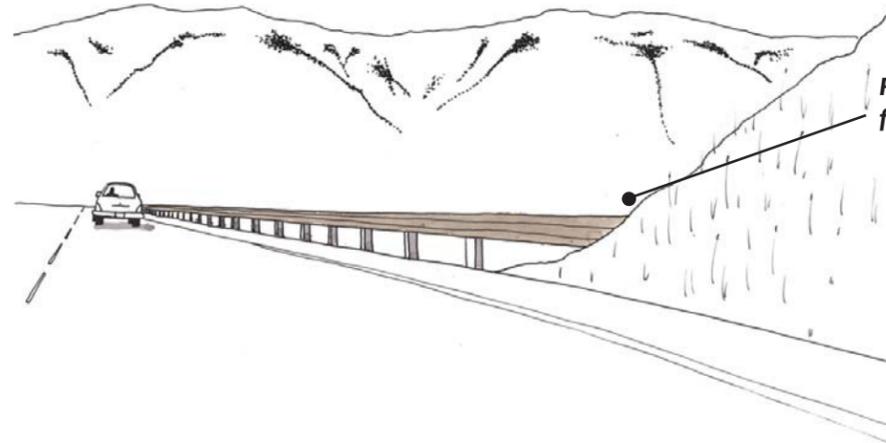
Railing transitions and terminals should:

- maintain consistency in material types, form, line, color, and texture from one railing system to the next, and
- terminate smoothly into the surrounding landscape where clear zone requirements can be met.

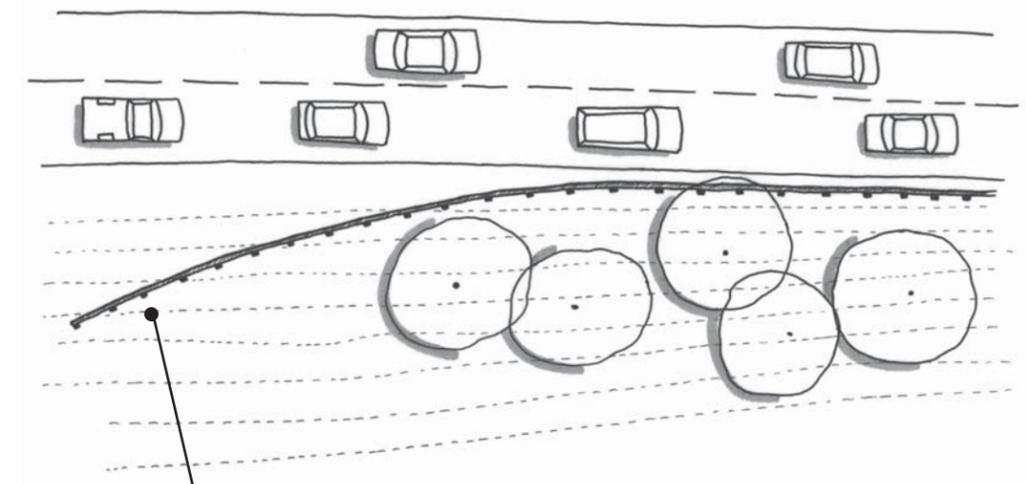
## Roadway Edge and Alignment Features: RAILING TRANSITIONS AND TERMINALS

### Design Guidelines: Railing Transitions and Terminals

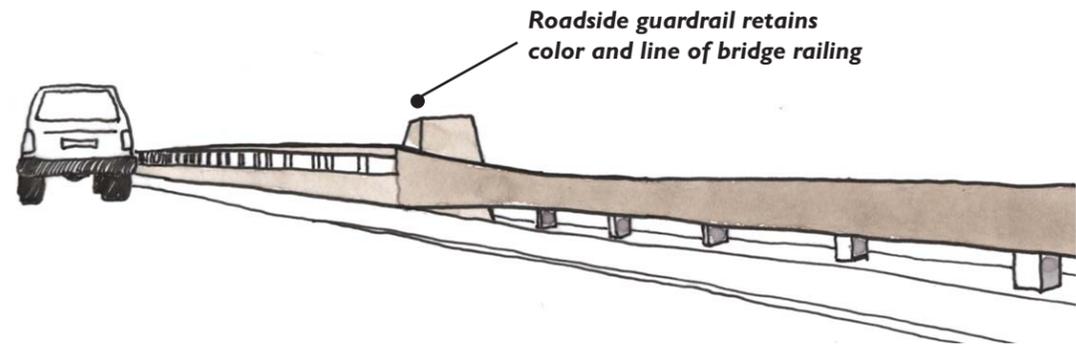
- Create a smooth transition between the top line of the two barrier systems
- When landforms present a logical endpoint, guardrail beginning point and terminus shall not end abruptly, but taper away from the roadway and transition out of or into the landscape
- Terminals shall be buried in 1:1 backslope (or steeper); if flatter there must be reasonable recovery area behind barrier, free of obstruction
- Earth mound end treatments shall not be used



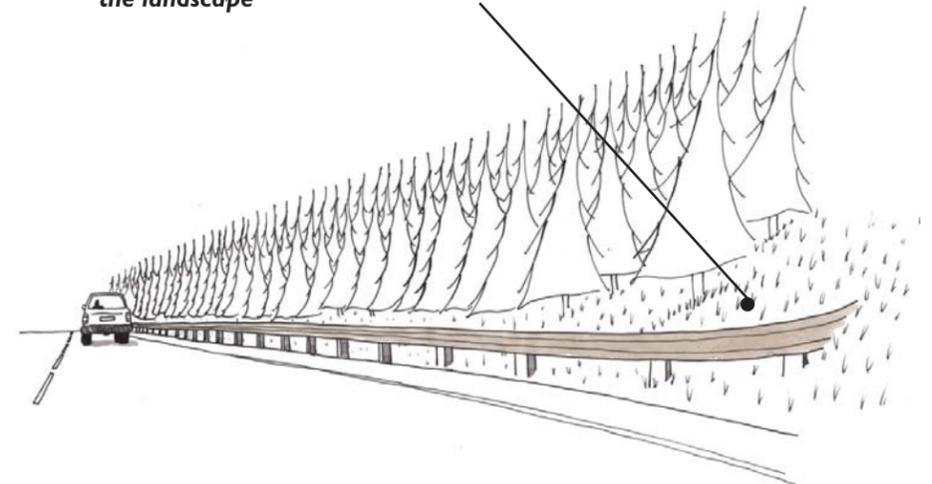
*Roadside guardrail appears to flow into or out of the landscape*



*Guardrail terminus tapers away from roadway and transitions into the landscape*



*Roadside guardrail retains color and line of bridge railing*



## Interchange Configuration

### Introduction

Interchanges are critical highway elements which allow for safe connections between Interstate 84 and local and state highways. Interchanges on Interstate 84 are important aesthetic elements due to their scale and their location within the views from and to Interstate 84.

Many different configurations are possible with modern freeway interchange design. Due to the limited space available for interchange development and reconstruction on Interstate 84, interchange configuration and location can have a significant impact on the visual characteristics of Interstate 84 through the CRGNSA.

Interchange configuration has an important role in the overall safety of the interstate facility. Ramps and merge/exit distances are elements of safe interchange designs. Interchange configuration also influences the design of the intersections where the ramps connect to the local road system.

### Important Considerations

- Safety, adequate visibility, acceleration, and deceleration lanes
- ODOT, FHWA and AASHTO design standards
- ODOT Interchange Area Management Plans
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Capacity required and surrounding land uses

### Design Objectives

The design objectives for interchange configuration have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that provide greater detail and specific instruction on meeting interchange configuration design objectives.

Interchange configuration should:

- improve geometrics where existing sight distances, slopes, curves, and intersections create hazardous conditions;
- blend harmoniously with the natural landform;
- minimize the area required for the interchange footprint unless increased size better achieves resource protection and enhancement (emphasis on fitting within the landscape will dictate the area required);
- not adversely affect the HCRH district, and
- be consistent with and integrate the guidelines established for other features in this document.

## Roadway Edge and Alignment Features: INTERCHANGE CONFIGURATION

### Design Guidelines: Interchange Configuration

- Interchanges shall be right-hand entrances to and exits from Interstate 84
- New and reconstructed interchanges shall be fully directional with eastbound and westbound off and on access

**Existing interchange with left-hand exit at Multnomah Falls**



**Simulation – Eastbound lanes relocated north of parking area**



**Simulation – Right-hand exit created; no lanes relocated**



## Pavement Widening

### Introduction

When other alternatives to increasing the capacity of Interstate 84 are not available, pavement widening may be necessary to provide additional through-lanes (including auxiliary lanes). Pavement widening on shoulders and medians may also be necessary to achieve certain highway safety criteria, such as horizontal safe stopping sight distance (HSSD).

### Important Considerations

- Safety
- ODOT capacity and travel demand projections
- ODOT, FHWA and AASHTO design standards
- *Oregon Highway Plan, 1999*
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Space constrictions

### Design Objectives

The design objectives for pavement widening have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for pavement widening.

Pavement widening should:

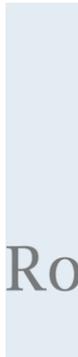
- consider all other alternatives for managing traffic and transportation functions of Interstate 84 before increasing capacity in accordance with the *Oregon Highway Plan*;

- encourage tourists and visitors to travel through the CRGNSA by other modes, such as buses, trains, and watercrafts to accommodate future traffic growth, and
- consider applicable goals of the *Management Plan for the Columbia River Gorge National Scenic Area*
  - › “Designate those portions of the following roads in the Scenic Area as scenic travel corridors and protect and enhance scenic resources within the corridors: Washington State Routes 14, 141, and 142, Interstate 84, the Historic Columbia River Highway (all segments), and Oregon Highway 35.”
  - › “Increase scenic appreciation opportunities throughout the Scenic Area.”
  - › “Designate those portions of the following roads in the Scenic Area as scenic travel corridors and promote uses that improve their functions as recreational and scenic travel routes: Historic Columbia River Highway (all segments); Washington State Routes 14, 141, and 142; Oregon Highway 35; and Interstate 84.”

### Design Guidelines: Pavement Widening

- Where widening occurs, asphalt surfacing shall be full-width to avoid any abrupt edges within the traveled way





## Roadside and ROW Features

Wildlife Crossings

Landscaping and Vegetation Management

Fences

Retaining Walls

Signs and Gateways

Lighting

Culverts

## Introduction

Roadside and ROW features include important safety, informational, aesthetic, access control, and drainage elements that reside off the traveled way, outside the roadside edge and inside the freeway right-of-way. Guidelines for these features include both design considerations and maintenance practices to support corridor aesthetics and a healthy, sustainable ecosystem.

## Wildlife Crossings

### Introduction

Interstate 84 presents a potential barrier between wildlife habitat and the Columbia River. Wildlife crossings need to be identified and considered along the entire Interstate 84 corridor to both improve habitat quality and minimize conflict points between animals and motorists. Addressing wildlife crossings increases the safety of the traveling public as well as presents an example of context sensitive resource management.

### Important Considerations

- *Wildlife Hot Spots along Highways in Northwestern Oregon* (ODOT, 2005) and future research on wildlife and highway interaction
- Coordinate design with bridges, culverts, and fences
- Riparian and habitat clearance requirements

### Design Objectives

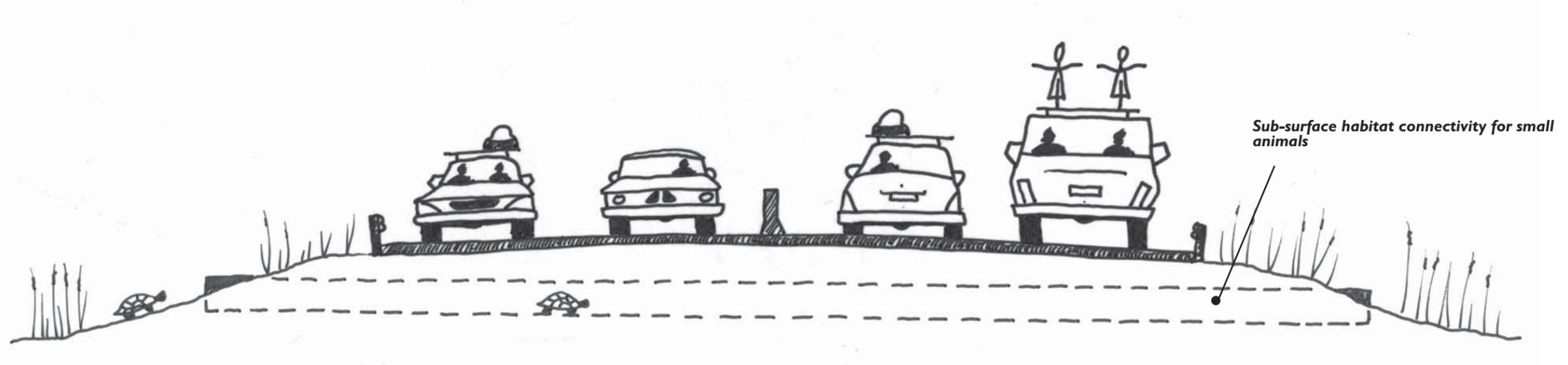
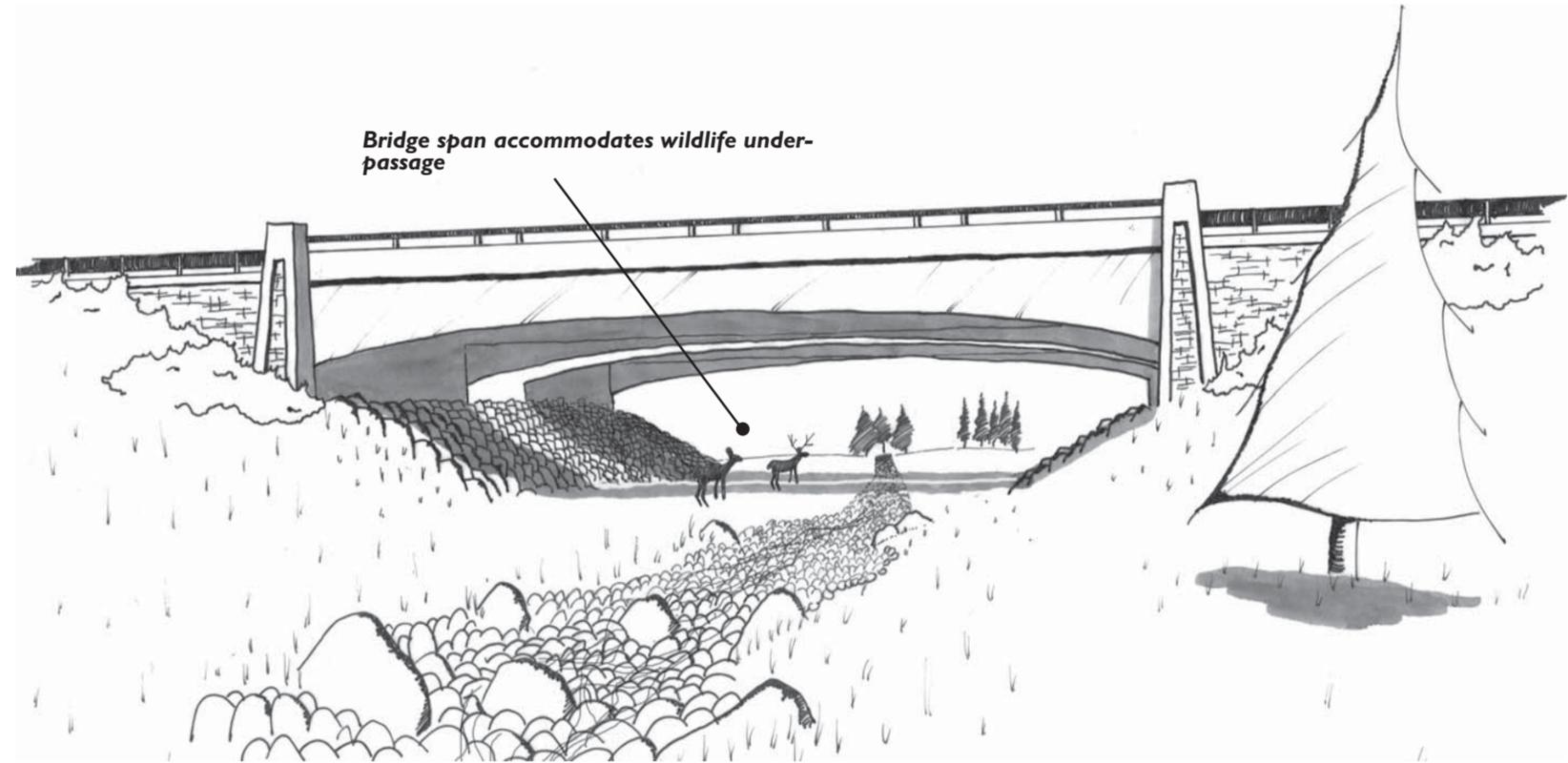
The design objectives for wildlife crossings have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for wildlife crossings.

Wildlife crossings should:

- minimize the conflict between animals and motorists by controlling points of access along the corridor;
- provide access to crossings under and along Interstate 84 wildlife corridors;
- enhance the connectivity and value of terrestrial and aquatic wildlife habitat areas;
- consider the integration of multi-use crossing opportunities, and
- be proactively considered during the scoping of projects.

Design Guidelines: Wildlife Crossings

- Identify critical areas of concentrated wildlife movement and provide for safe passage separated from Interstate 84
- Coordinate the design of bridges, culverts, and fences with provision for wildlife movements
- Guide wildlife to designated crossing points
- Bridges over streams shall have sufficient span to allow for wildlife crossing and 8' vertical clearance on both sides of the stream
- Design fences to prevent animals from being trapped on the highway right-of-way



## Landscaping and Vegetation Management

### Introduction

Management of vegetation along the Interstate 84 corridor needs to consider the full range of resource issues that contribute to a healthy ecosystem. The landscape of the Columbia River Gorge National Scenic Area (CRGNSA) changes to follow the transition between the wet western and dry eastern ends of the area. Sensitivity to this natural landscape transition will determine the native species to be planted and invasive species to be removed from Interstate 84 right of way. Encouragement of native species also reduces required maintenance. In addition to context sensitive resource management, vegetation management can also improve the aesthetics of the CRGNSA. Selective and careful thinning opens views of the diverse natural and cultural scenery of the CRGNSA from Interstate 84.

### Important Considerations

- ODOT clear zone requirements
- Commercially available native plant species
- *Wildlife Hot Spots along Highways in Northwestern Oregon* (ODOT, 2005)
- A long term vegetation management master plan that will be developed for the CRGNSA through a coordinated inter-agency cooperative agreement
- International Society of Arboriculture (ISA), National Arborist Association (NAA), and (AAS) standards

### Design Objectives

The design objectives for landscaping and vegetation management have been developed to support the overall vision for the I-84 Corridor Strategy (see *The Vision for Interstate 84*). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for landscaping and vegetation management.

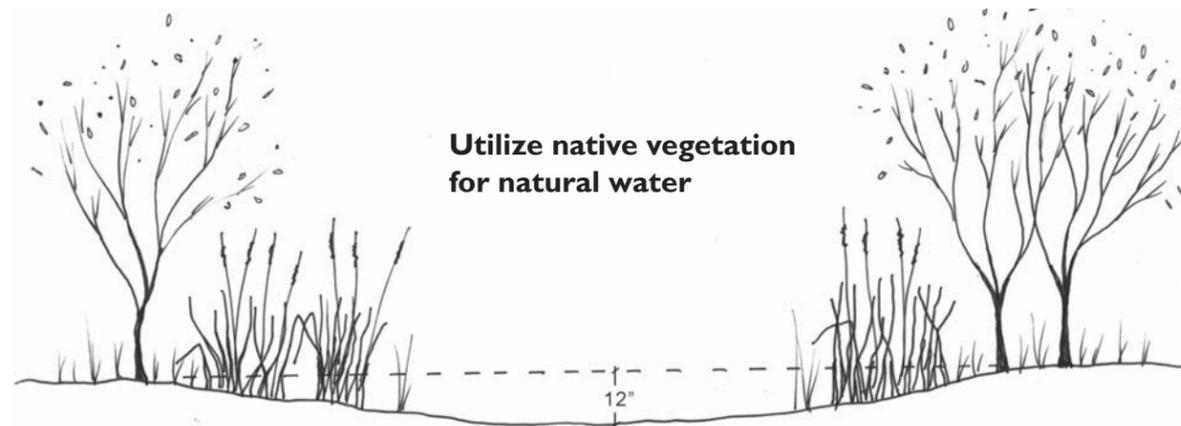
Vegetation management should:

- create new and restore important scenic views to the river and other scenic features where appropriate to the ecological function of the plant community, while maintaining screening;
- consider the visual impacts both from Interstate 84 and from other Key Viewing Areas (KVAs) in the CRGNSA to blend Interstate 84 facilities into the natural setting;
- enhance the scenic quality of the highway and buffer elements that detract from the scenic quality of Interstate 84;
- minimize maintenance required, sustain roadside plant communities, maintain a safe clear zone, and
- consider a range of values and practices inherent to natural resource stewardship such as
  - › promotion of healthy, fire resilient, and dynamic ecosystems
  - › restoration of native species
  - › integrity of riverside terrestrial and aquatic wildlife habitat
  - › filtration and management of surface drainage
  - › avoid impacts to sensitive plant species.

## Design Guidelines: Landscaping and Vegetation Management

### Natural Resources Management

- Plant and maintain native vegetation
- Protect rare and endemic plants
- Control noxious weeds and undesirable non-native species
- Foster a healthy forest by creating/maintaining
  - › structural diversity
  - › multiple canopy layers and age classes
  - › plant species diversity (e.g. a mix of native conifers and hardwoods)
- Encourage the development of large tree character and the maintenance of character trees such as Ponderosa Pine, Douglas Fir and Oregon Oak
- Thin to decrease stand densities in locations where the development of trees is impeded
- Manage, thin and maintain indigenous, unmanaged roadside woodlands to foster a healthy forest stand that enhances wildlife habitat and proactively prevents wildfires
- Strategically design and place water quality best management practices (BMP) landscape treatments to treat water prior to discharging into the Columbia River
- Use integrated vegetation management practices (mechanical, biological, chemical and re-establishment) to comply with ecological and environmental concerns and regulations
- Inventory and avoid adverse effects to rare plants, sensitive wildlife habitat, wetlands, or riparian areas within construction and maintenance project sites to comply with applicable Management Plan policies and guidelines to protect the resources
- Ensure that roadside plantings in known wildlife crossing hot spots do not contain plant species that attract deer or other animals



Depression and vegetation provides natural water filtration before reaching the Columbia River

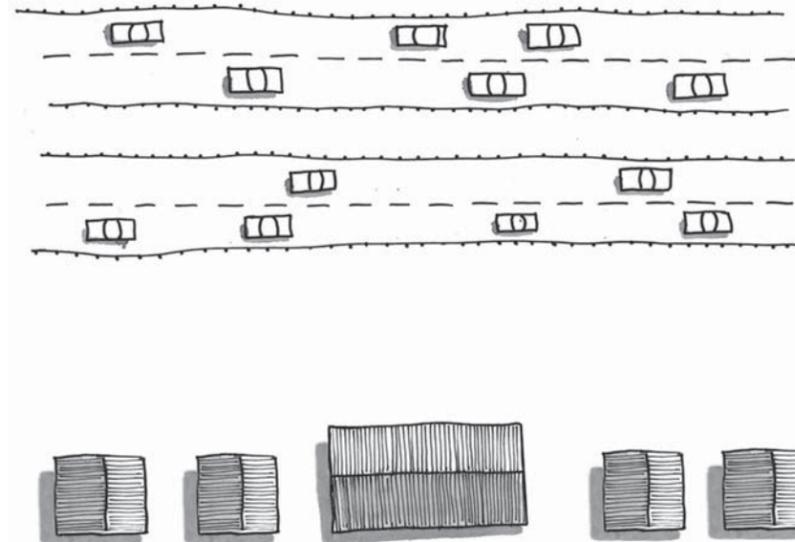


### Visual Elements

- An integrated vegetation management master plan should be developed for the entire CRGNSA to coordinate agency involvement and address broad issues such as ecosystem dynamics, fire resiliency, native and invasive species, and water quality
- Vegetation management projects shall include an evaluation of potential visual impacts of the proposed project as seen from any KVA
- Accentuate scenic views of historic urban areas and natural features as viewed from Interstate 84
- Align vegetation thinning for view enhancement of the river, landforms, and cultural landmarks with the direction of travel and road curvature in order to maximize the viewing quality
- Use vegetation to screen views of roadside maintenance facilities, storage yards, stockpile and staging areas, weigh stations, and parking lots that are visible from the highway
- Re-vegetate areas disturbed by construction and maintenance activities with native species
- Use native vegetation and materials at rest areas, pullouts and roadside viewpoints
- Aesthetically buffer the presence of Interstate 84 from sensitive community areas
- Inside Urban Areas allow communities to develop a custom landscape theme at interchanges to establish an identity
  - › planting layout may have either a variable natural form or a more formal and manicured landscape character while maintaining the use of native species

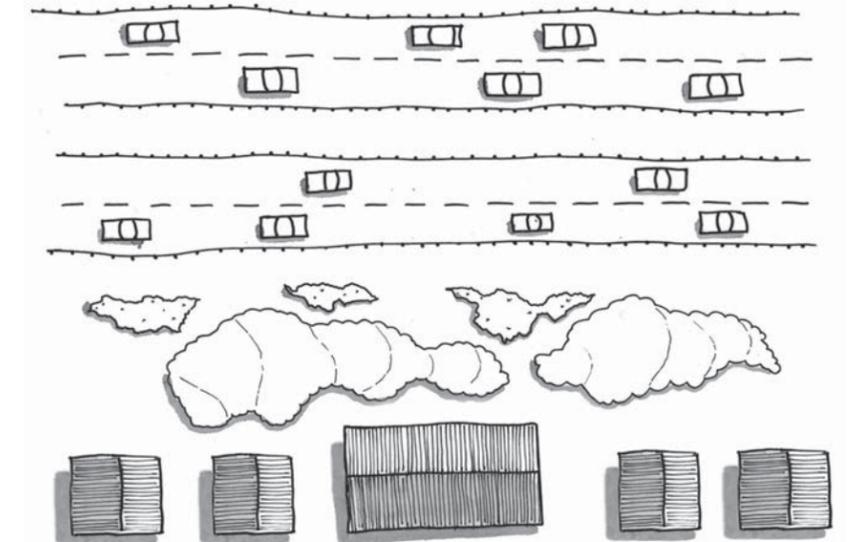
#### Avoid

*Adjacent development is exposed to Interstate 84 traffic*

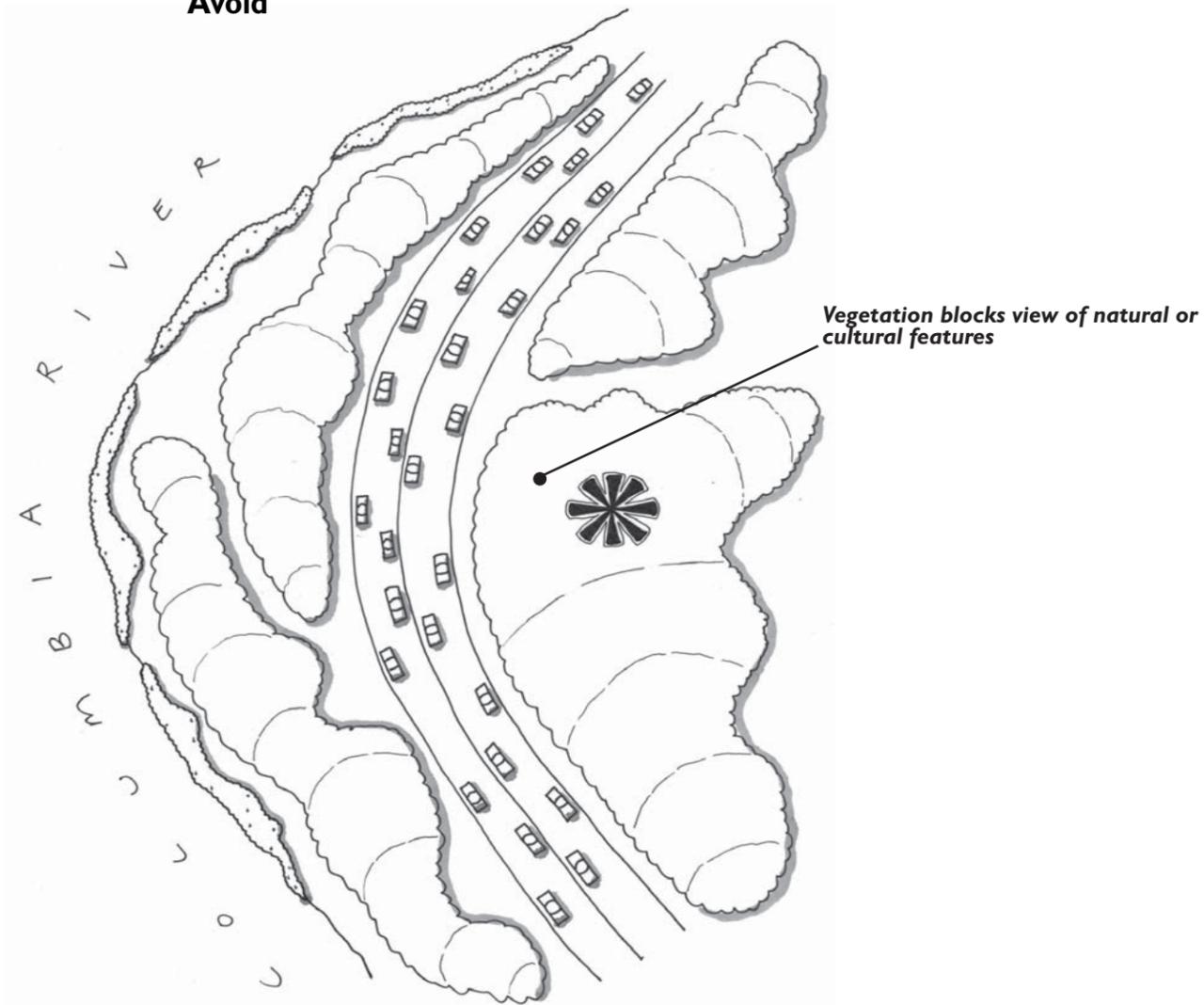


#### Preferred

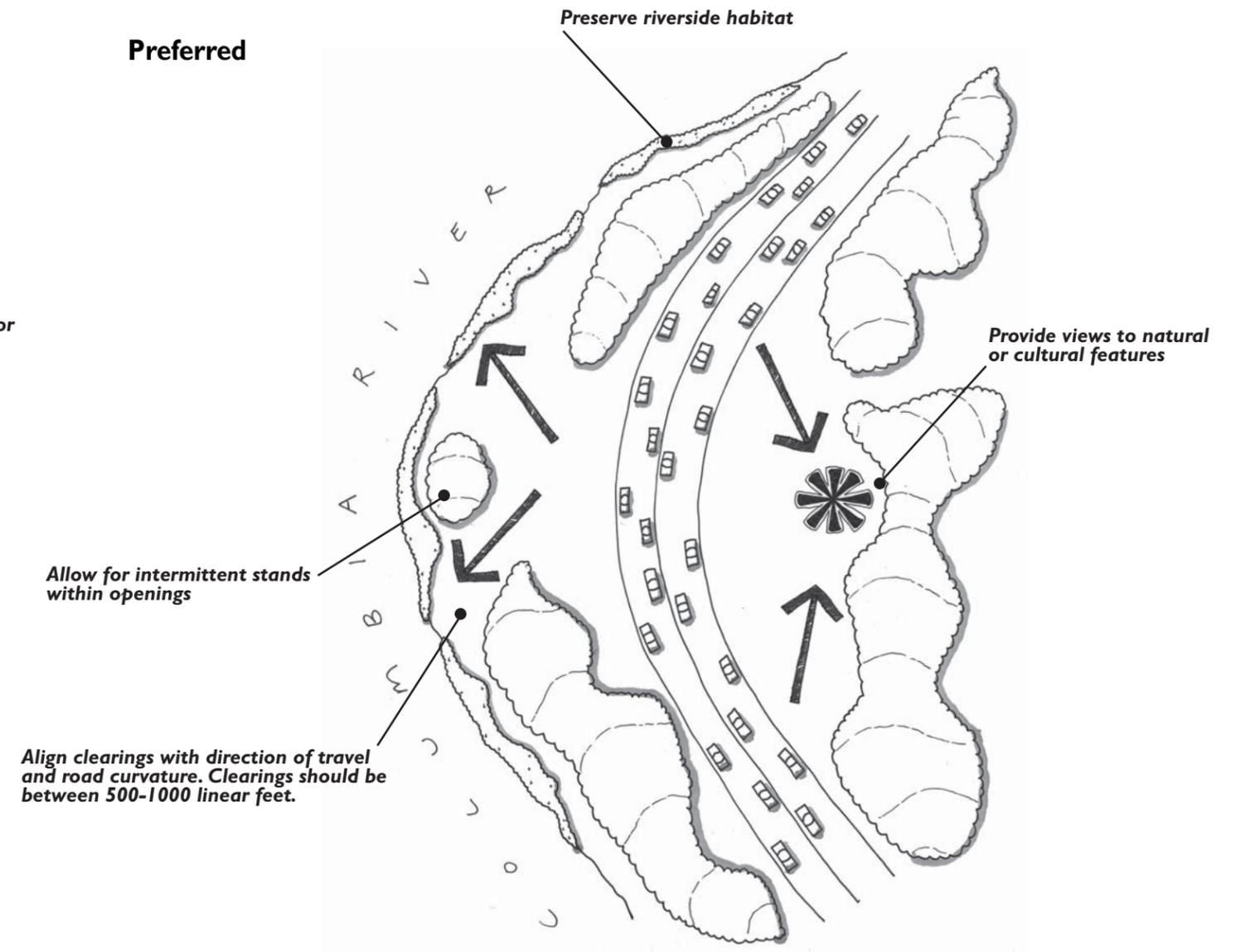
*Adjacent development is screened/buffered from Interstate 84 traffic*



**Avoid**

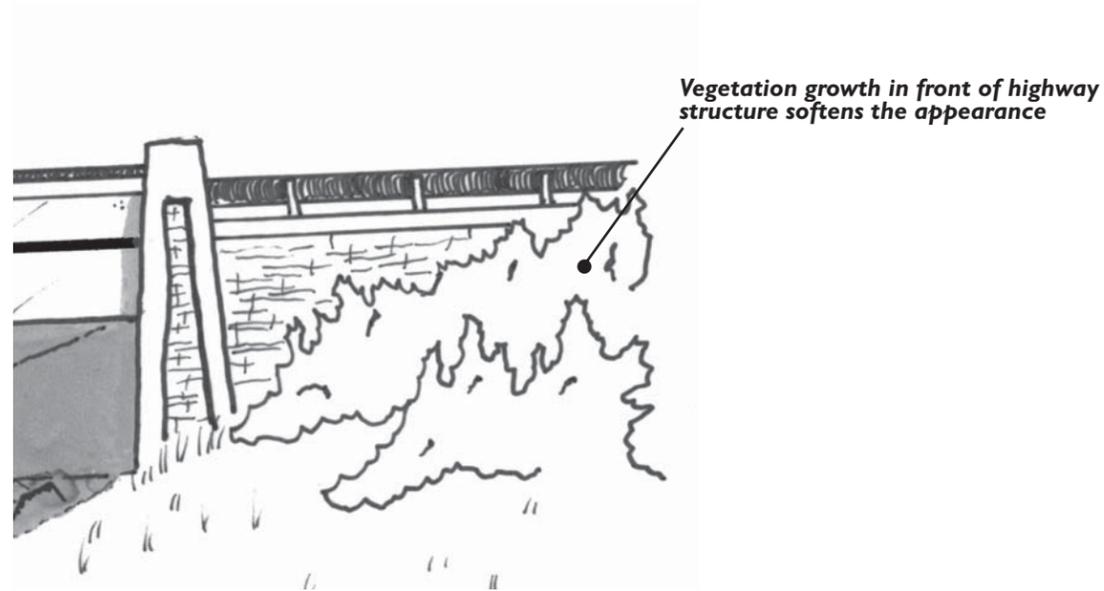


**Preferred**

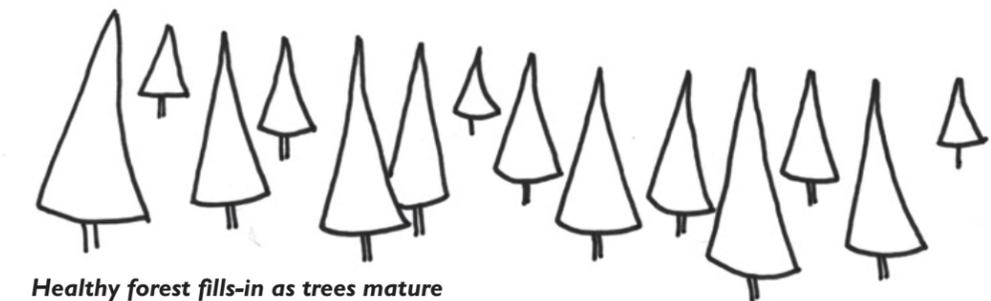
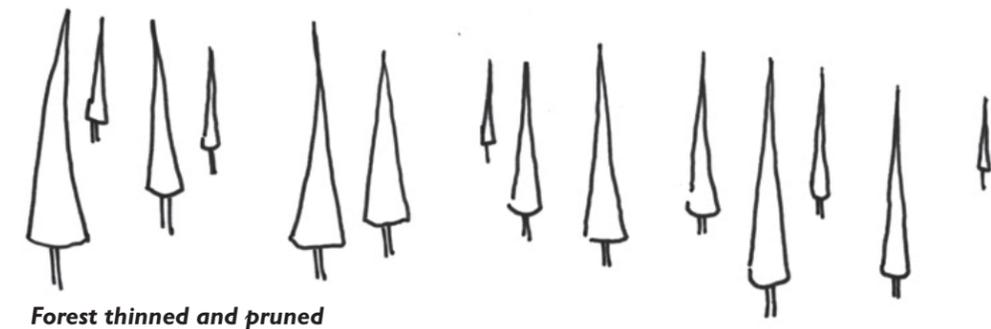
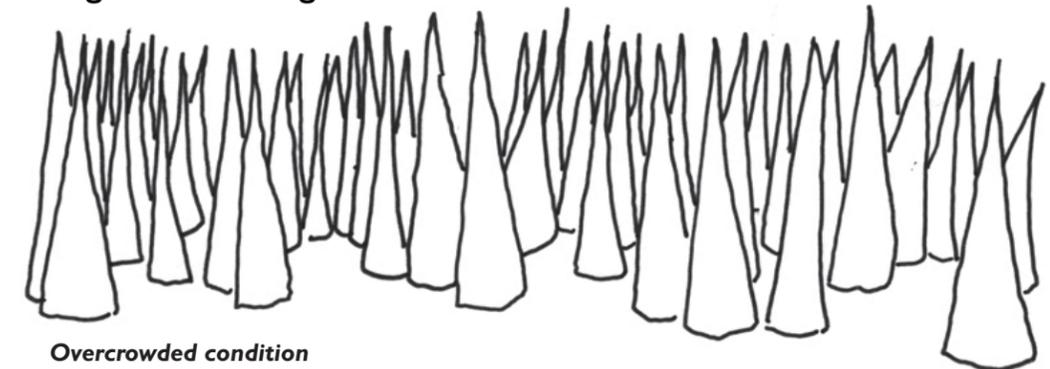


### Roadside Vegetation and Clear Zone

- Permit vegetation to grow in front of highway structures and retaining walls to soften the visual presence of the highway structures as viewed from KVAs
- Tree branches that overhang highway travel lanes and shoulders shall be trimmed in a manner that sustains the natural form, character and health of the tree and provides the required overhead clearance envelope
- Vegetation thinning will be required in areas where vegetation impedes sight distances; any bare ground resulting from thinning will be re-vegetated with native species that are compatible with sustaining safe sight distances



### Vegetation Management for Forest Health



## Fences

### Introduction

Fences are necessary in the CRGNSA to control the access of people and wildlife along the Interstate 84 corridor. Fences can be designed and installed to protect private property, fit the landscape, and protect wildlife while establishing continuity of form, line, and color through the corridor.

### Important Considerations

- Meet the FHWA requirements for access control
- ODOT maintenance processes and expenses
- Maintenance access
  - › agreements will need to be formalized to assure gates are kept secured
- Tribal fishing access and preservation of sites
- *Wildlife Hot Spots along Highways in Northwestern Oregon* (ODOT, 2005) and future research on wildlife and highway interaction

### Design Objectives

The design objectives for fences have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for fences.

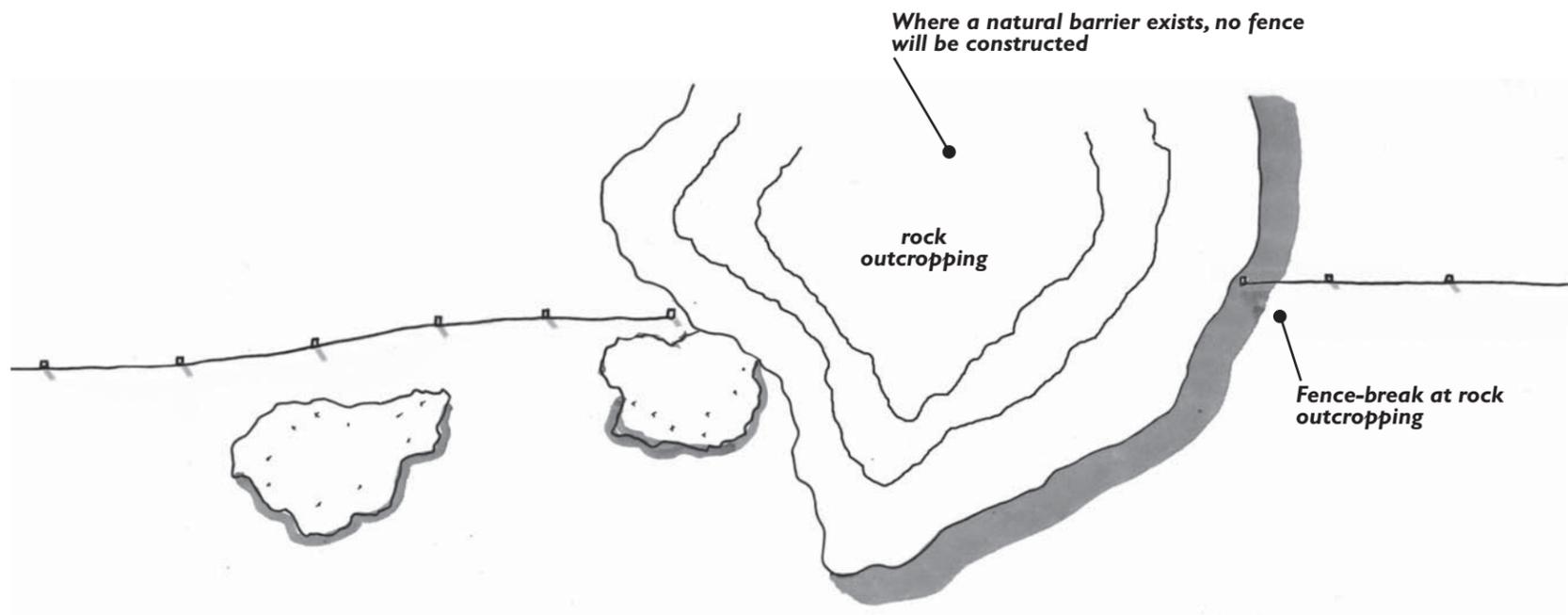
Fences should:

- restrict motorized and non-motorized access;
- select a minimal number of designs to allow
  - › economies of scale through large purchases and
  - › easily obtainable and affordable replacement parts for maintenance operations;
- have a form and style that responds to the location chosen, and
- incorporate form, line, color and texture to achieve visual objectives by
  - › being a reflection of the character of the CRGNSA and the overall design theme of the highway
  - › not detracting from or dominating the scenery along the highway, rather fence design and construction should complement and add interest to the landscape
  - › incorporating design elements of other linear features when it is not possible to blend with the natural landscape.

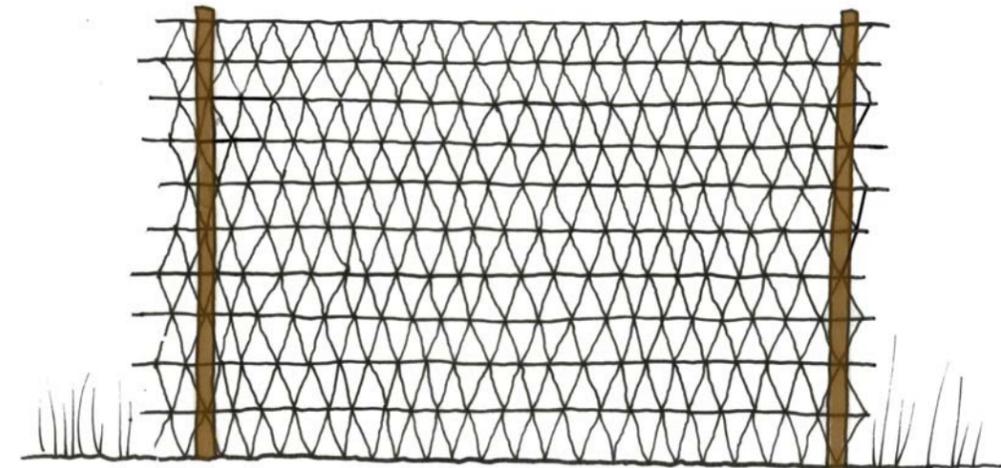
## Design Guidelines: Fences

### Selection of Locations that Require Fences

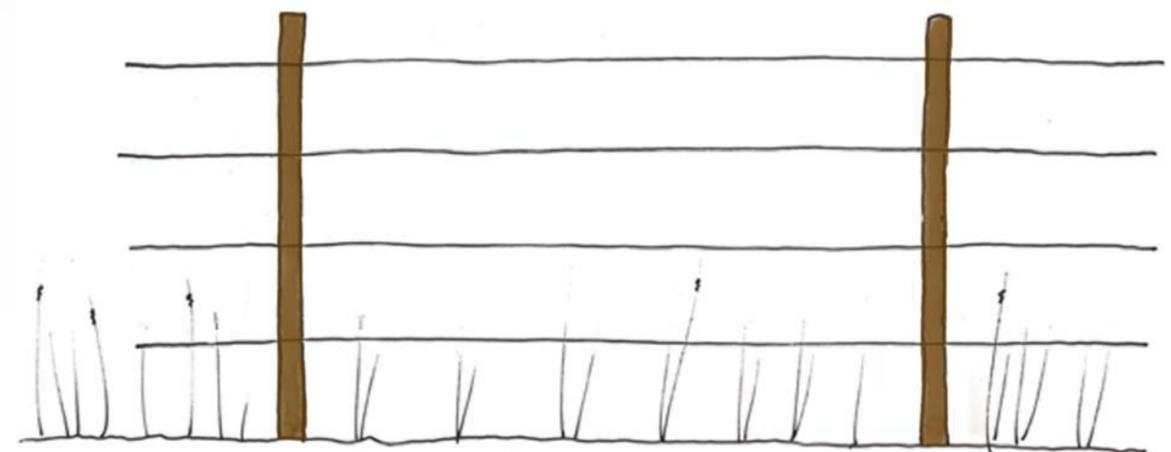
- No fence will be constructed in areas where
  - › natural barriers prohibit uncontrolled motorized and non-motorized access to Interstate 84
  - › existing fencing overgrown with vegetation forms an effective barrier
- V-mesh wire fence shall be used only in parks and urban areas where human access control to the freeway is needed



**V-mesh wire fence**

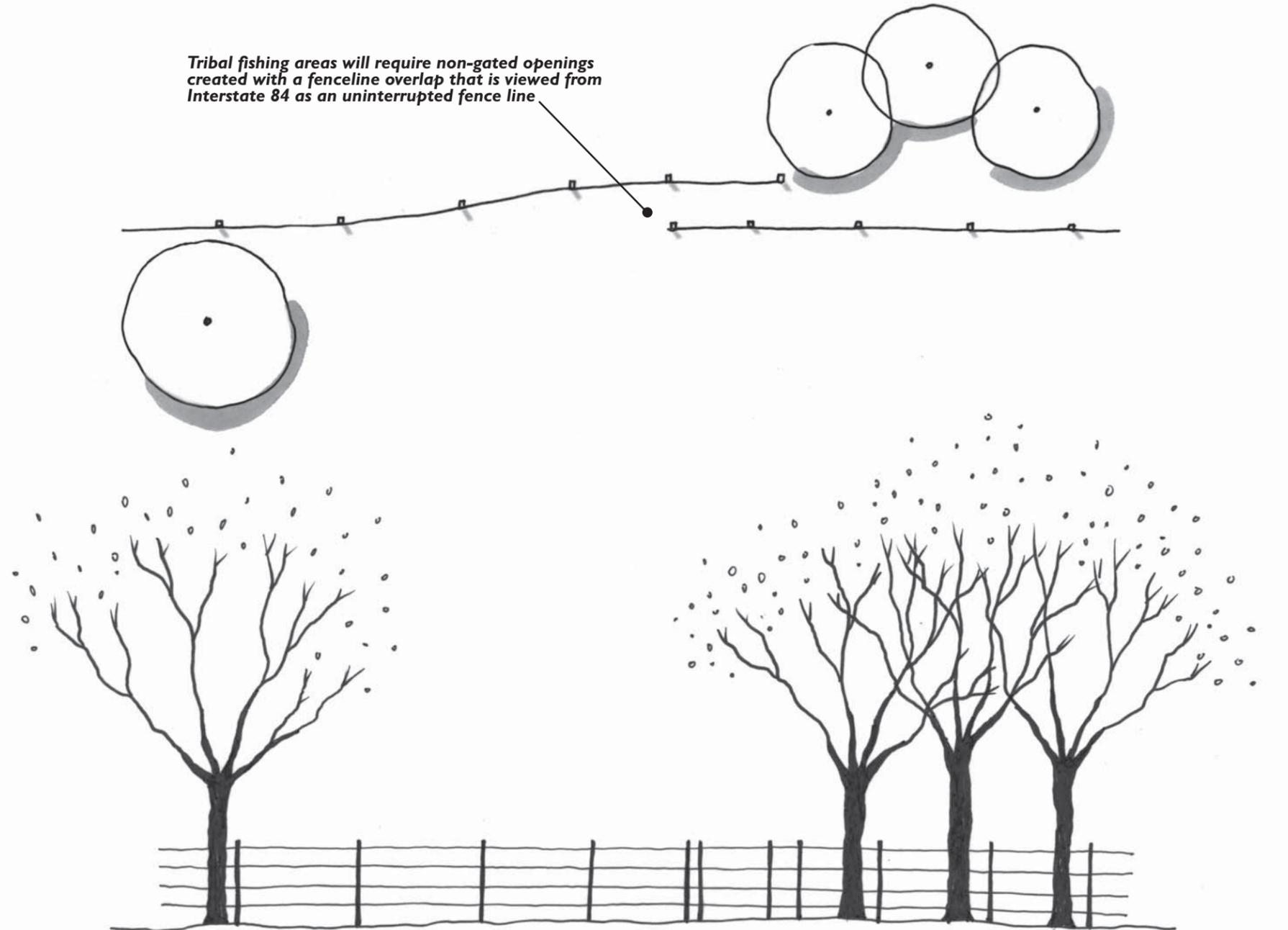


**Four-strand wire fence**



**Visual Elements**

- Fences shall be human in scale and shall not dominate views or points of interest where people will be in close proximity and can see them
- Fencing wire and posts shall be untreated steel to allow natural weathering and achieve a non-reflective dark earth-tone color
- Gates shall be of a uniform design to maintain consistency of appearance throughout the CRGNSA
- Properly designed stone walls are suitable substitutes for fences to delineate highway right-of-way in areas within the CRGNSA where stone materials are commonly used for other purposes within the landscape
- Tribal fishing areas require
  - › non-gated openings with a fence line overlap that is viewed from Interstate 84 as an uninterrupted fence line
  - › metal fence posts to minimize impact on archaeological resources underground



## Retaining Walls

### Introduction

Retaining walls are necessary along Interstate 84 through the CRGNSA due to the small amount of available land between the Columbia River edge and the cliffs and slopes. Retaining walls can be used to decrease the footprint of an interstate highway by replacing natural slopes with vertical structures. These structures provide lateral support to vertical slopes of soil and rock material, creating a flat platform where this material would otherwise collapse into a more natural shape.

Retaining walls are highly visible because of their size, extent, and location within KVAs. Wall materials and finishes, wall layout, and the transition of the wall into the adjacent grading all serve to define the visual impact of the retaining wall structure. The visual impact of retaining walls can be minimized by decreasing the surface area of vertical structures and blending the structures with the surrounding land forms and colors.

### Important Considerations

- Safety
- FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Guidelines pertaining to architectural facade developed for bridges

### Design Objectives

The design objectives for retaining walls have been developed to support the overall vision for the I-84 Corridor Strategy (see *The Vision for Interstate 84*). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow and specifications in Appendix B provide greater detail and specific instruction on meeting design objectives for retaining walls.

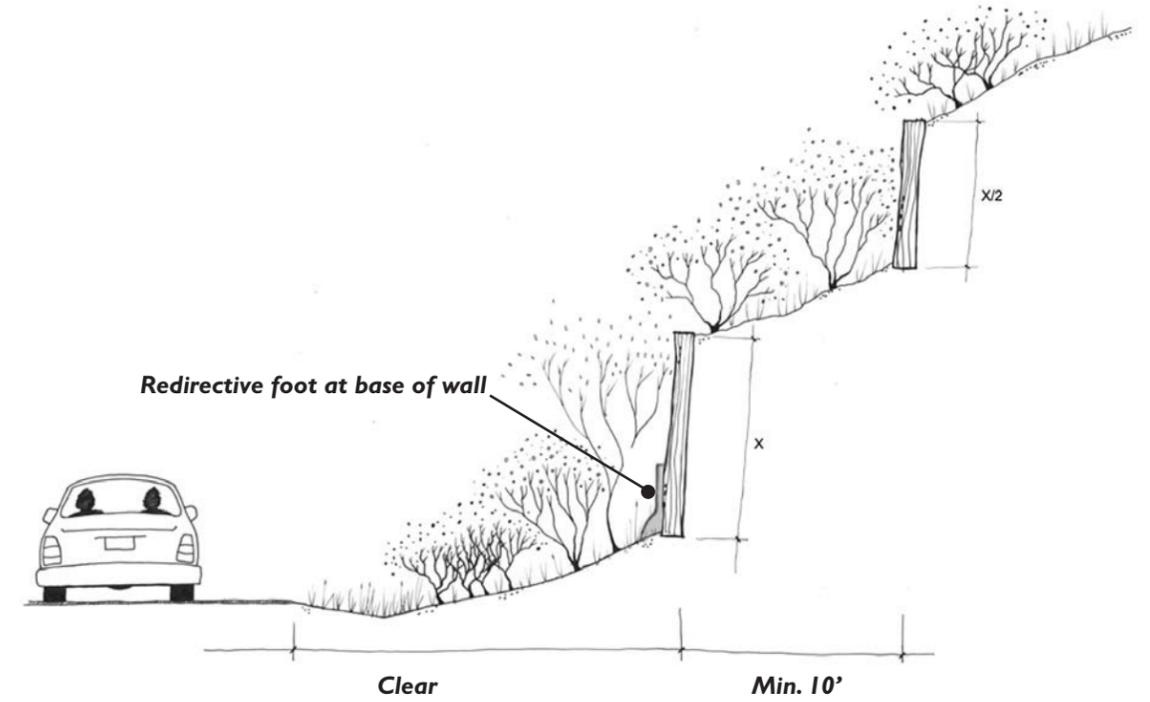
Retaining walls should:

- blend into the CRGNSA landscape;
- emulate the materials and colors of the adjacent geology;
- be visually subordinate to the natural setting, and
- minimize the observed disturbance to natural landforms after the system is constructed.

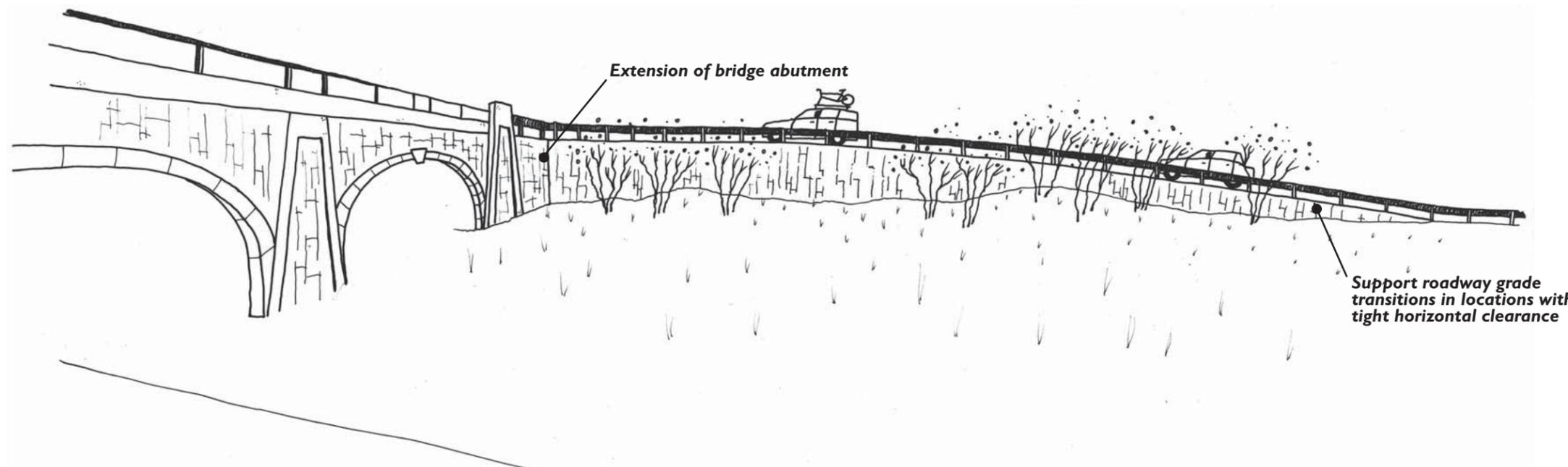
Design Guidelines: Retaining Walls

Placement

- Upslope retaining walls that support natural slopes excavated to establish the highway platform and to support landforms outside of the immediate roadway edge shall
  - › be placed directly adjacent to the roadway pavement edge to preserve landform features when horizontal constraints exist
  - › use a hillside viaduct or tunnel in locations adjacent to unstable or talus slopes where feasible
- Retaining walls that support the roadway prism shall
  - › appear to be extensions of structural elements, such as bridge abutments or road edge supports, and
  - › match grades at interchange ramp transitions to accommodate horizontal site restrictions



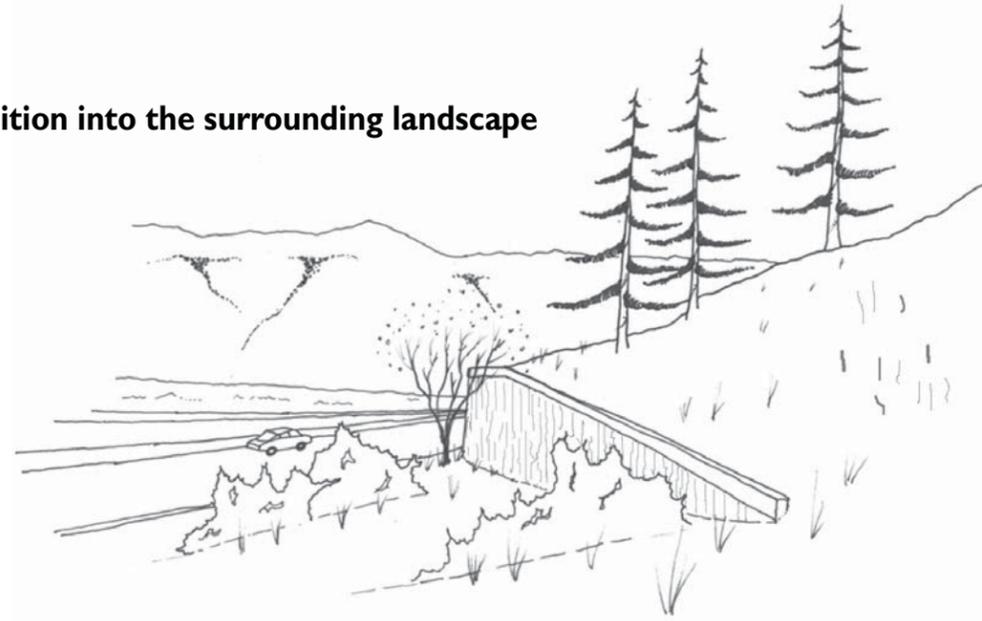
10' minimum planting area should be provided between walls



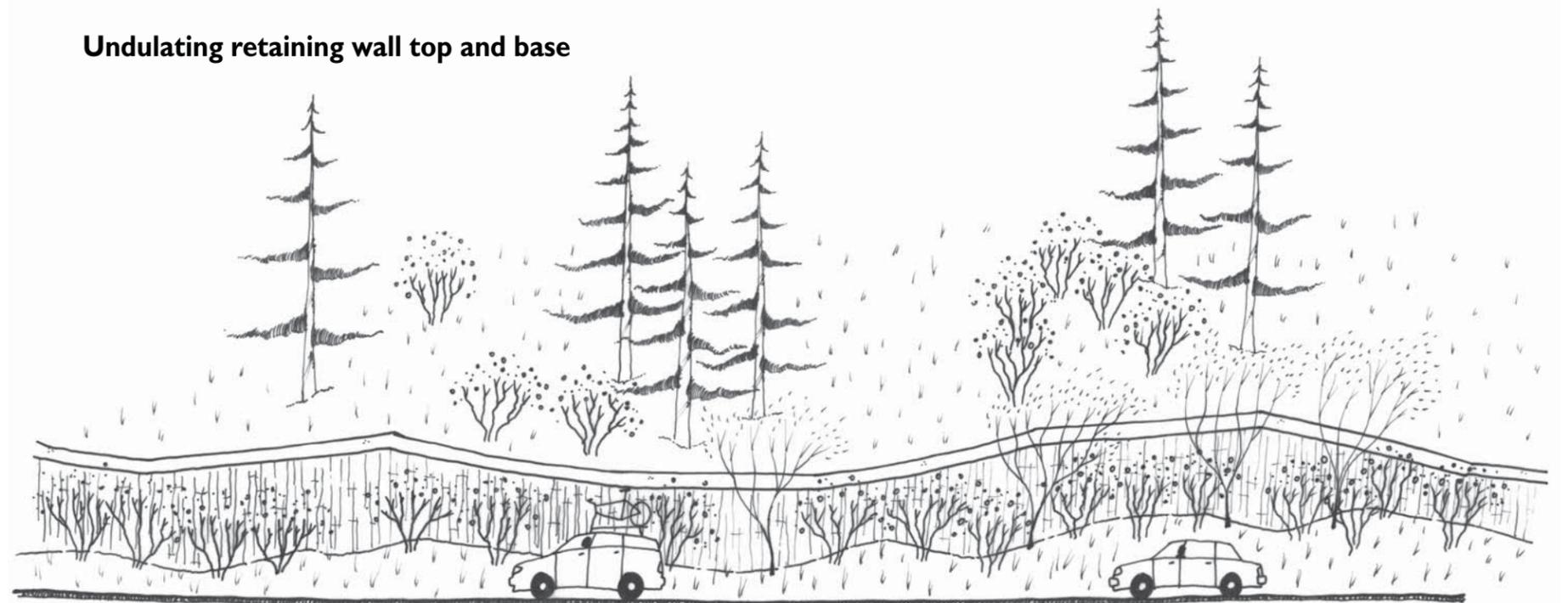
## Design

- Retaining walls that support natural slopes, highway structures, and bridge abutments shall retain a similar architectural character to maintain visual continuity in form, line, color and texture
- Create undulations in the retaining wall top and base to follow general localized slope conditions, but do not follow every undulation of the immediate ground plane
- Natural materials such as boulders shall be used to construct walls that are 4 feet or less in height
- Wall systems taller than 12 feet should be broken into separate shorter terraced walls with integrated landscape
- Retaining walls shall transition smoothly into the surrounding landscape
- The slope of landscape area between the roadway edge and the retaining wall base or between terraced retaining wall sections shall match the adjacent natural landscape topography, but not be steeper than 2:1 (Stabilized slopes shall not be steeper than 1.5:1)
- Re-establish the natural slope angle between the roadway and retaining wall to dictate retaining wall base elevation
- Retaining wall base elevation shall be higher than the roadway grade in an uphill situation

**Smooth transition into the surrounding landscape**

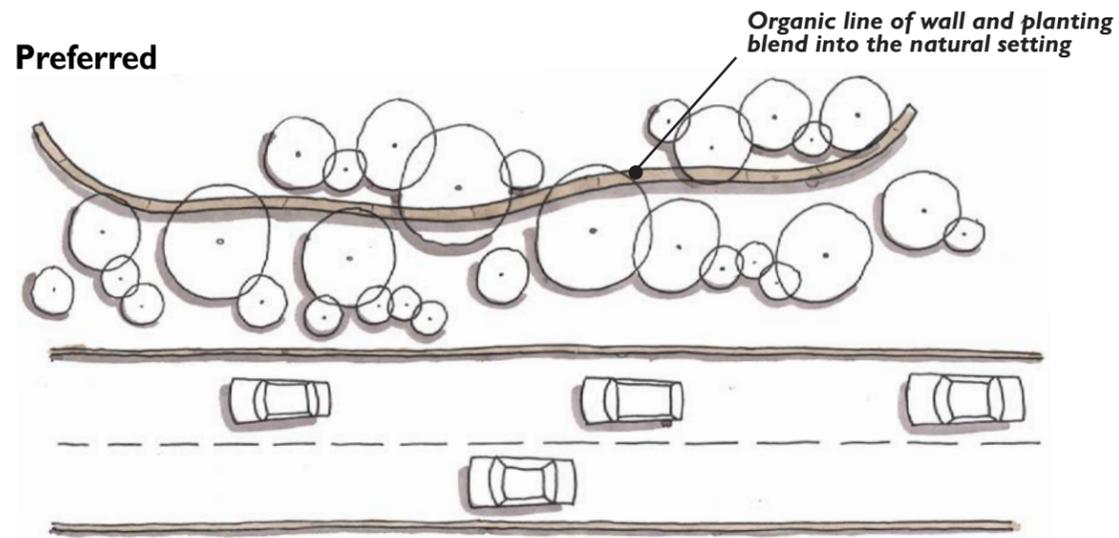


**Undulating retaining wall top and base**

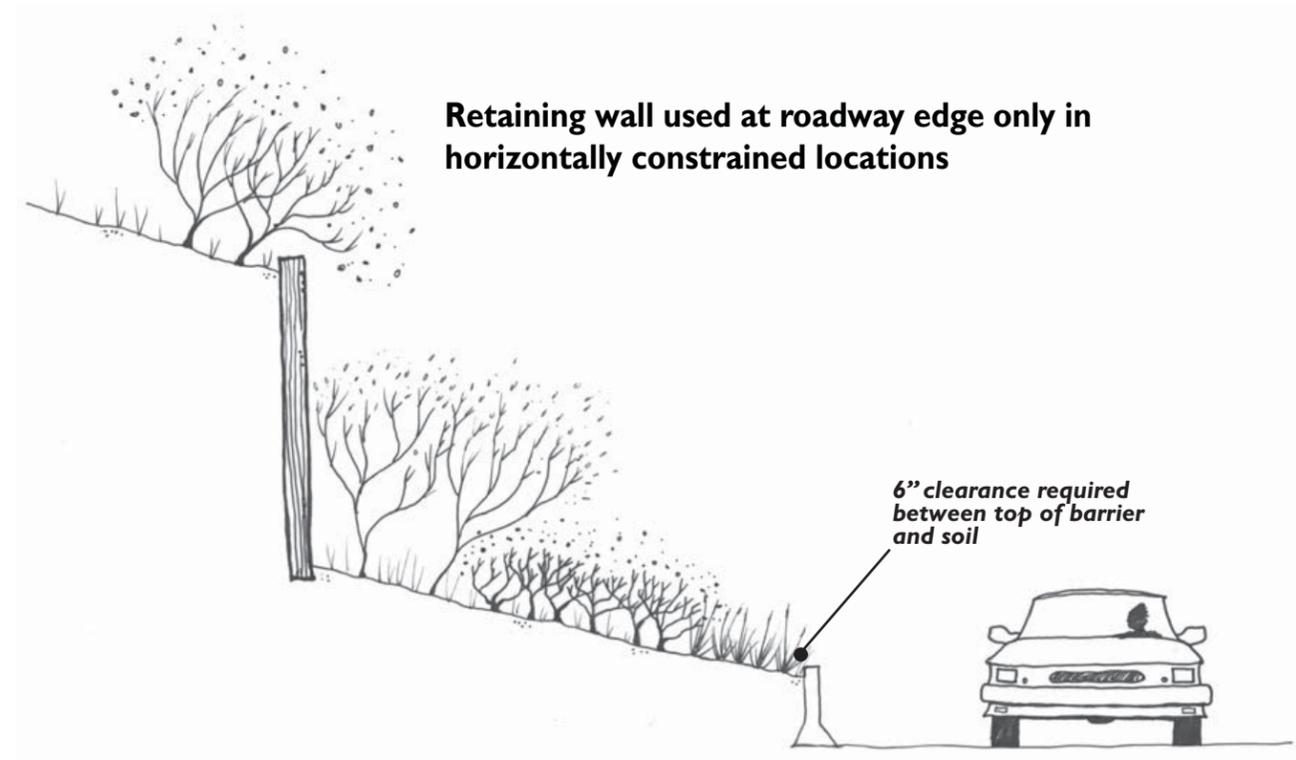
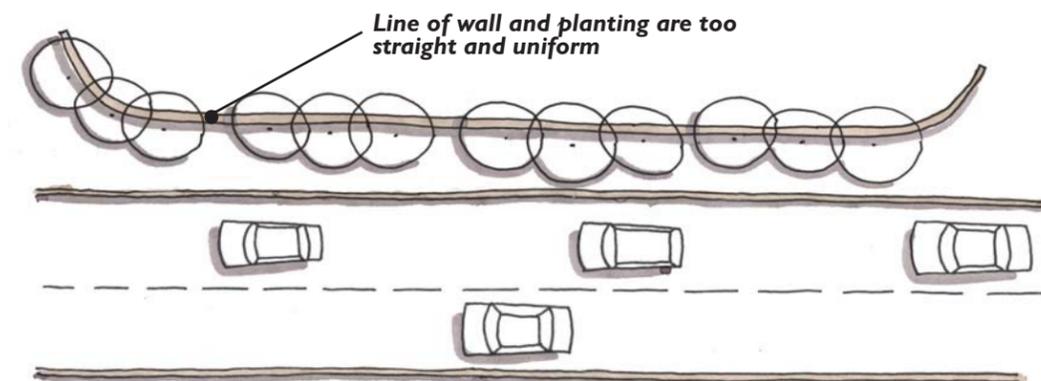


## Roadside and ROW Features: RETAINING WALLS

### Preferred



### Avoid



## Signs and Gateways

### Introduction

Signs are a primary means by which Interstate 84 travelers interact with the highway system. Signs are essential to communicate route finding information as well as identifying cities, natural features, and other manmade amenities as they are passed. Without signs, most of the traveling public would be unaware that the CRGNSA exists.

Signs and gateways also provide a key opportunity to establish a recognizable theme for the CRGNSA. The Sandy River and the Deschutes River form the western and eastern boundaries for the CRGNSA and therefore provide opportunities to introduce the I-84 Corridor Strategy design concepts when travelers first enter the area. The design guidelines for the other highway features speak for themselves through the overall goal of continuity between the features, but NSA boundary gateways and bridge thresholds provide a special opportunity to announce the entrance into a “special place”.

### Important Considerations

- AASHTO, MUTCD, FHWA, and ODOT standards
- *CRGNSA Graphic Signing System*

### Design Objectives

The design objectives for signs and gateways have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for signs and gateways.

Signs and gateways should:

- mark entry into the CRGNSA with gateway signs that are prominent, unique and attractive;
- provide clear signage to allow safe navigation of the corridor, and
- create and follow a consistent appearance and theme throughout the CRGNSA by incorporating elements of the CRGNSA Graphic Signing System while meeting safety standards.

Design Guidelines: Signs and Gateways

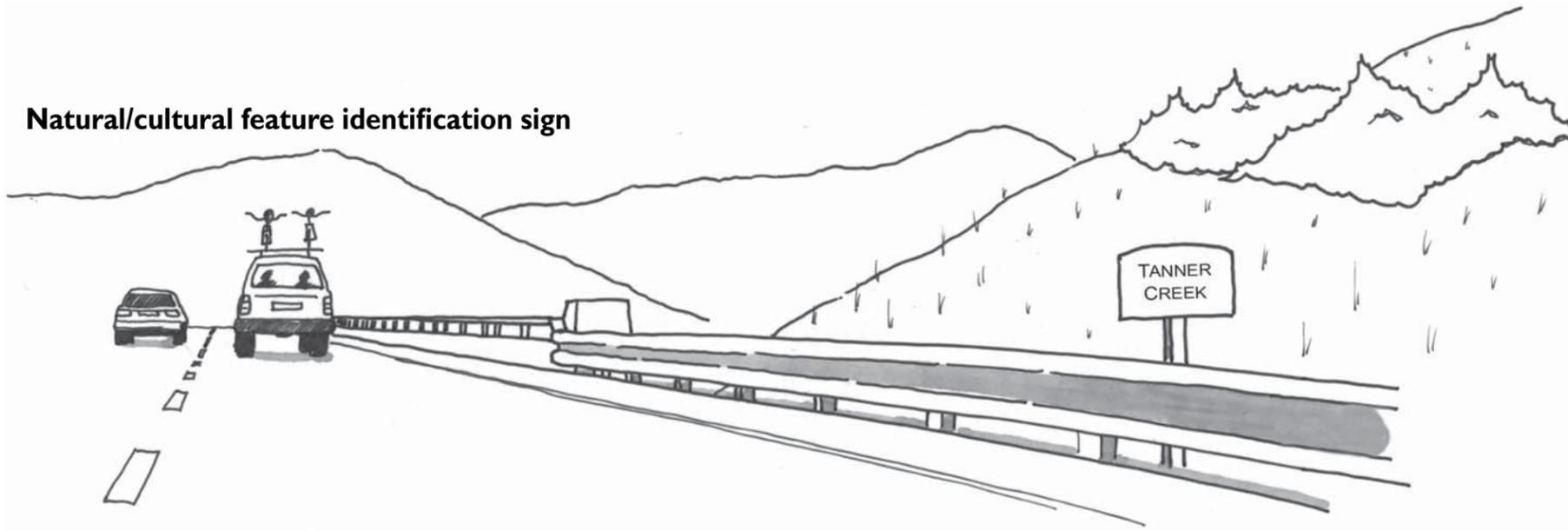
**Location**

- Announce gateways, major stream crossings and other prominent natural/cultural features with identification signing in advance of the feature
- Minimize the number of signs by consolidating information to avoid “sign clutter”
- Remove unnecessary and degraded signs
- Strategically place variable message signs in the CRGNSA when necessary to display weather and road conditions

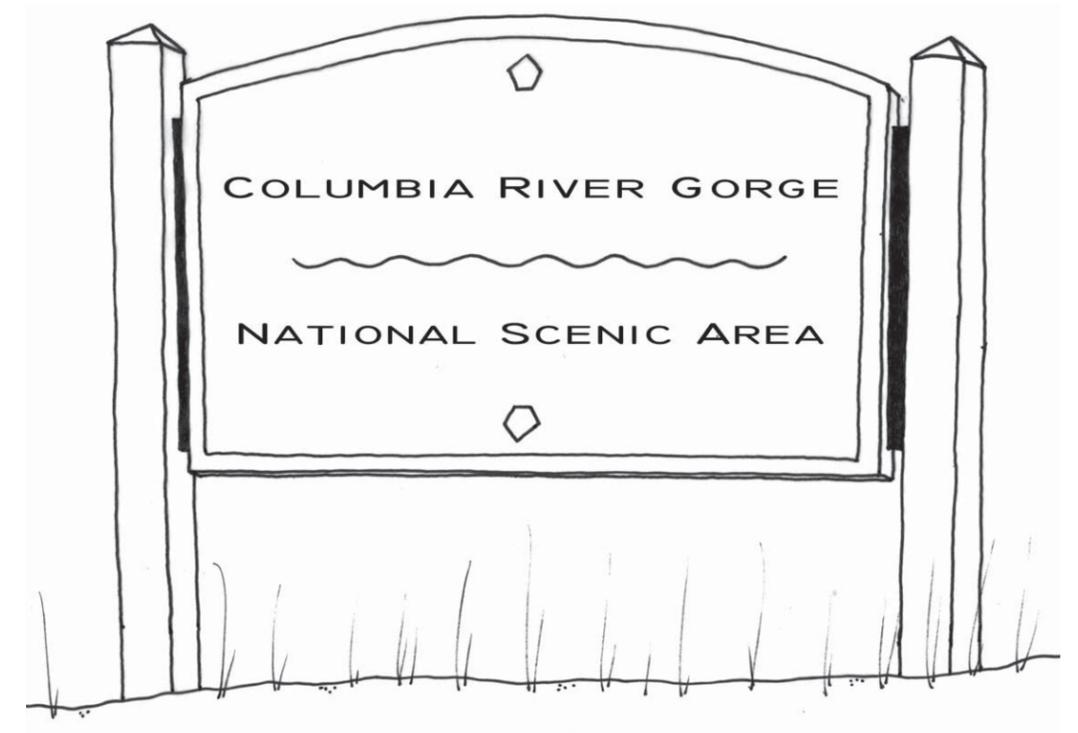
**Visual Elements**

- Signs shall be easily recognizable and readable at highway speeds
- Nighttime reflectivity of signs shall conform to ODOT/AASHTO standards
- Use a non-reflective, dark brown, earth-tone colors for the backs of signs

**Natural/cultural feature identification sign**



**Gateway sign**



## Lighting

### Introduction

Lighting at key locations along Interstate 84 in the CRGNSA provides an essential safety function. Lighting is necessary to assist drivers in night time and inclement weather navigation; define ramps and gore areas to provide for safe merges; and illuminate pullout areas, stopped motorists, parking lots and pedestrian areas. Lighting fixtures and placement can be coordinated to provide adequate lighting without light pollution.

### Important Considerations

- Safety
- FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- ODOT height and brightness standards
- IES and AASHTO standards

### Design Objectives

The design objectives for lighting have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting lighting design objectives.

Lighting should:

- provide sufficient lighting for safe night time access to, from, and on Interstate 84;
- avoid light trespassing and light pollution, and
- be integrated with other visibility enhancements such as striping, reflectors and other safety markings.

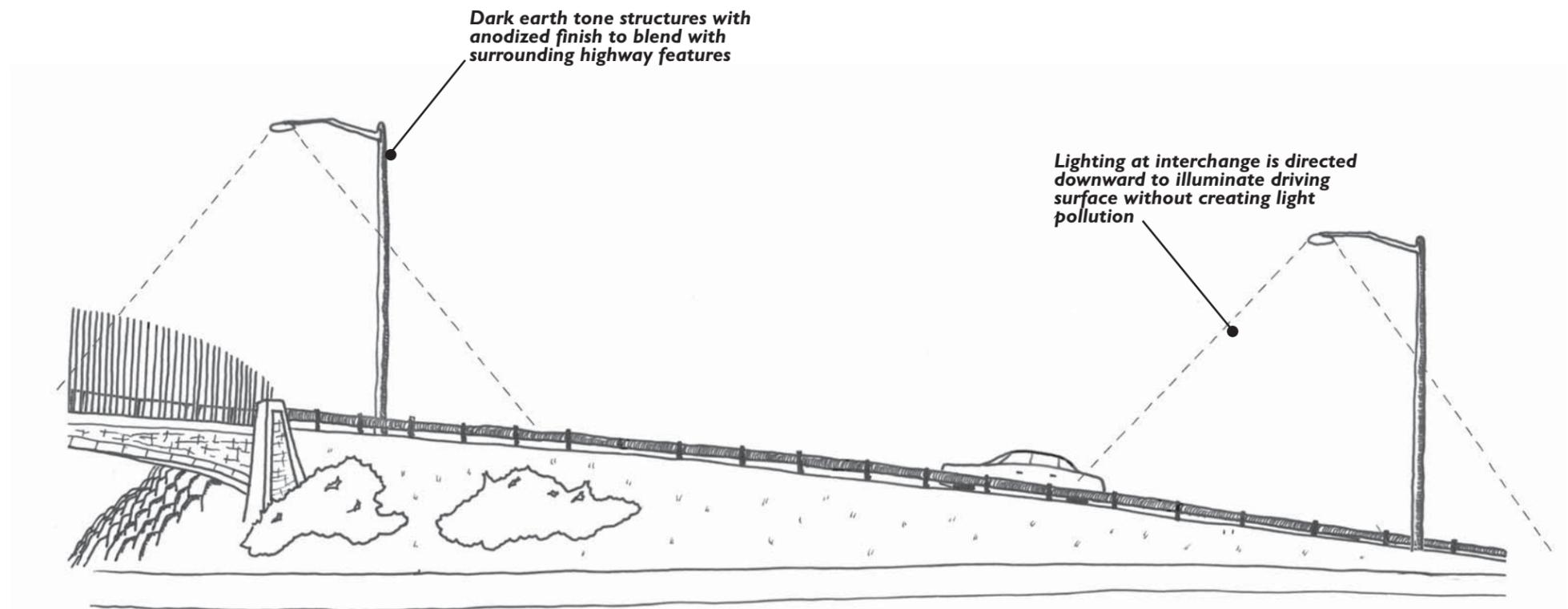
### Design Guidelines: Lighting

#### Placement

- Use only down light fixtures with cut-off optical system to minimize glare and light pollution
- Overhead lighting shall be considered only at key locations listed below
  - › Interchanges
  - › Parking lots
  - › Pedestrian areas
  - › Chain-up areas
  - › Weigh stations
  - › Tunnels
- Use reflectors in place of overhead lighting to decrease light pollution where safety will not be compromised

#### Design

- Use ODOT standard light fixtures, poles and arms with dark earth tone anodized finish to visually blend with the landscape and retain continuity with other elements in the CRGNSA
- Use low-level “bollard” or pipe-mounted fixtures that are fully shielded and down-directed for pedestrian walkways
- Use ODOT standard bulbs



## Culverts

### Introduction

Culverts are essential for drainage, movement of debris, aquatic habitat continuity and wildlife crossings. Environmental standards should be met or exceeded by using best management practices.

Culvert undercrossing maintenance is a critical activity to protect the highway. Careful design consideration should be given to the site access for long-term maintenance of undercrossings.

### Important Considerations

- Safety, ability to pass debris, hydraulic efficiency, and scouring
- ODOT, FHWA and AASHTO design standards
- USFS and Fish and Wildlife standards for fish passage and wildlife crossings
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Hydrologic conditions and flood stages
- *Wildlife Hot Spots along Highways in Northwestern Oregon* (ODOT, 2005) and future research on wildlife and highway interaction

### Design Objectives

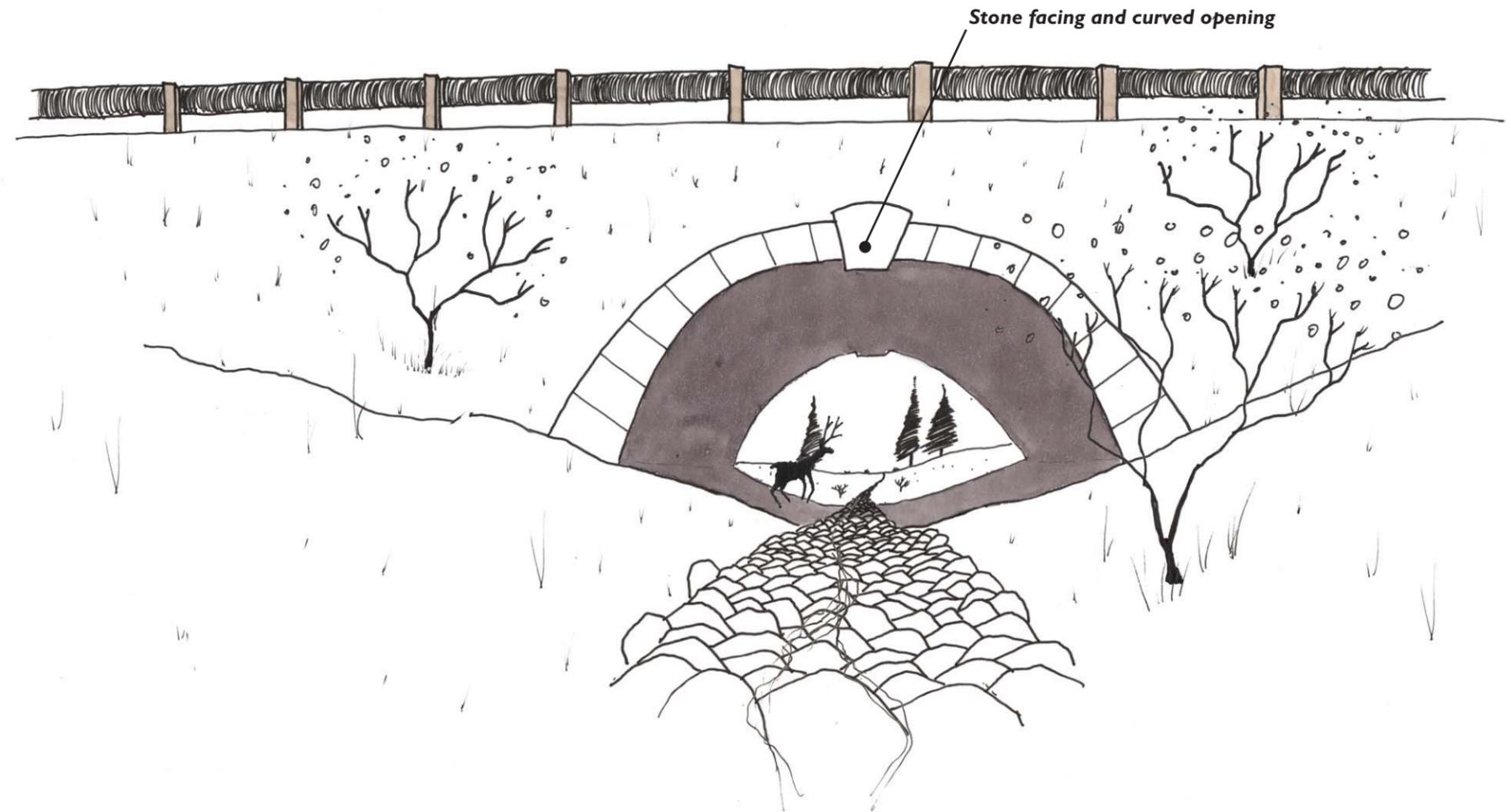
The design objectives for culverts have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for culverts.

Culverts should:

- integrate drainage channels, fish passage, and wildlife crossings where appropriate;
- be consistent with materials and design themes used for other features, and
- protect and enhance riparian/wetland areas through consideration of natural drainage patterns.

### Design Guidelines: Culverts

- Adequately size culverts to comply with most current edition of the ODOT hydraulics manual
- Utilize drainage paths, detention, and landscape treatments to strategically implement water quality treatment prior to discharging into the Columbia River
- For culverts 72' or greater, use headwalls faced with stone where visible in the foreground as seen from KVAs
- Use curved top appearance where possible
- Use natural vegetation to cover the ground surrounding the culvert and assist with natural storm water filtration
- Use larger culverts or bridges at wildlife hot spots to accommodate wildlife crossings





## Operational Features and Support Facilities

- Rock Fall Mitigation
- Viewpoints and Rest Areas
- Embankment Repair
- Permanent De-Icing Systems
- Truck Weighing Stations
- Weigh-in-Motion Facilities

## Introduction

Modern freeway operations require facilities to monitor traffic (truck weights), provide for the comfort and enjoyment of the traveler's experience (rest areas and viewpoints), protect the travelers from environmental conditions (rock fall mitigation and snow and ice control), and protect environmental and scenic resources (rock fall mitigation and embankment repair). Cohesive design approaches and consistent color and finish application visually incorporate these features into the Interstate 84 corridor.

## Rock Fall Mitigation

### Introduction

The scenic, mountainous terrain of the Columbia River Gorge National Scenic Area (CRGNSA) is a source of rock falls for Interstate 84. Loose rock falls from adjacent uphill slopes and cliffs. Loose rocks from uphill slopes and cliffs fall, bounce, roll, and slide onto the traveled way. Mitigation treatments are used to protect the traveling public and interstate facilities from rock falls.

The visual appearance of rock fall mitigation varies greatly based on the scale and location of the treatment measure. Mitigation treatments that occur close to the roadway are highly visible to drivers on Interstate 84, whereas treatments that involve extensive work on uphill slopes can become a visually dominant element from other Key Viewing Areas (KVAs) in the CRGNSA due to the large scale of the activity.

### Important Considerations

- Safety
- FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards

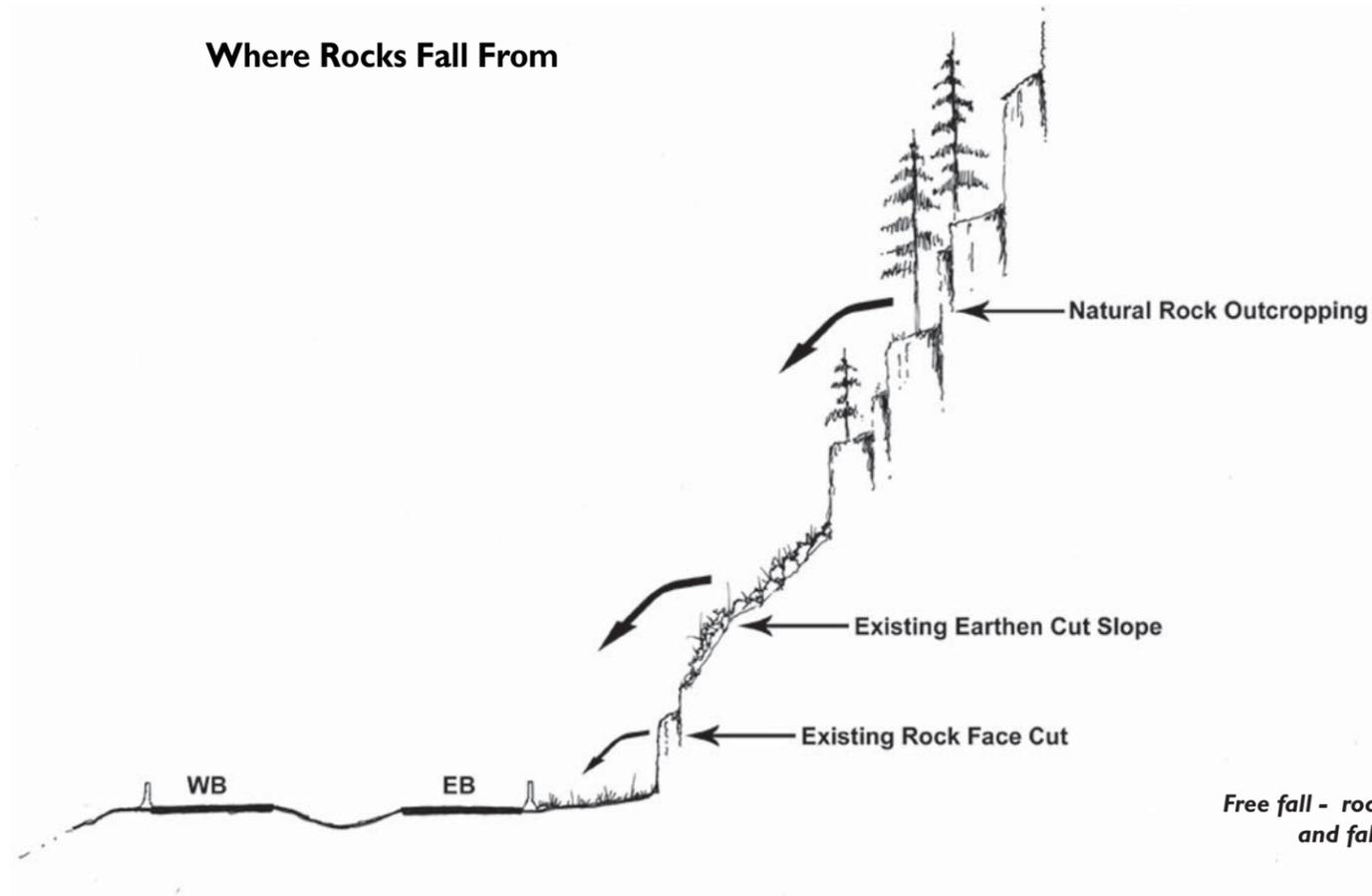
### Design Objectives

The design objectives for rock fall mitigation have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for rock fall mitigation.

Rock fall mitigation should:

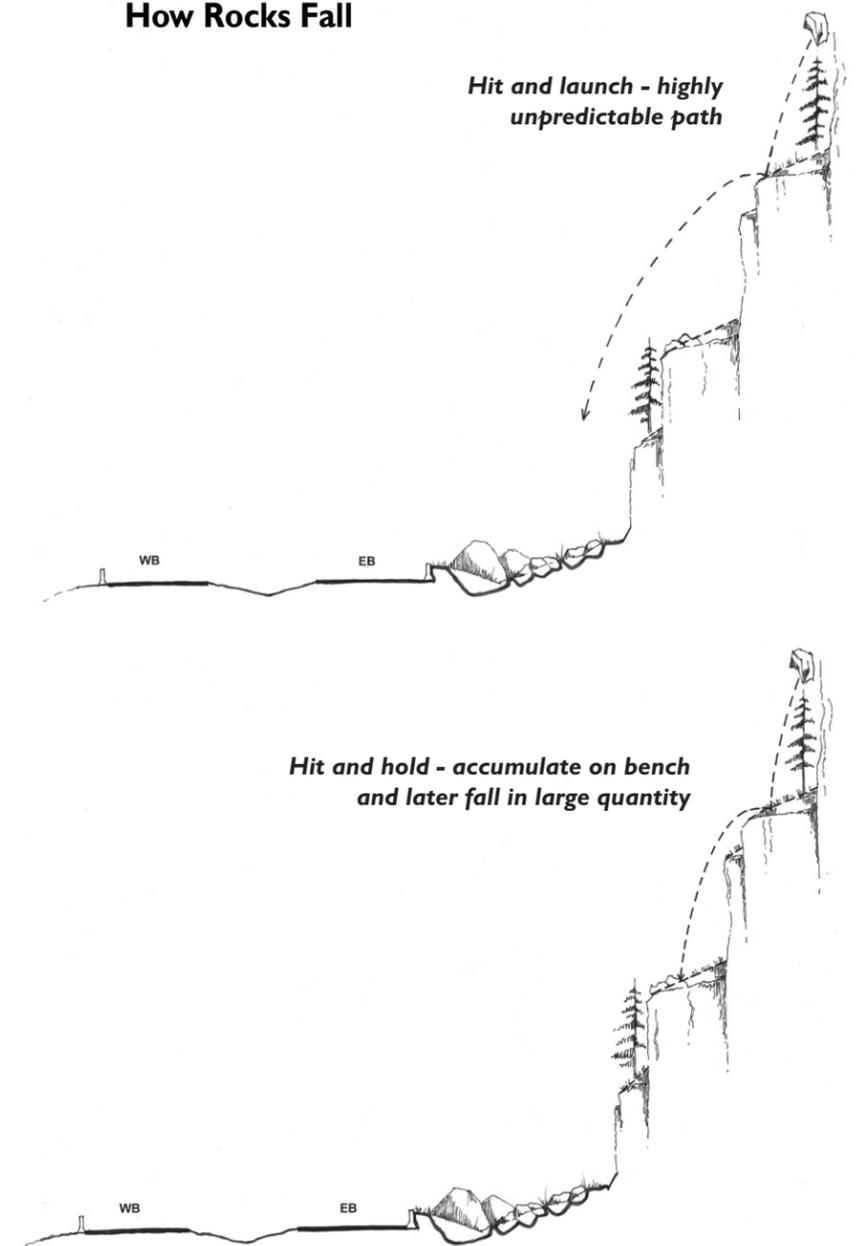
- protect the traveling public;
- choose an alignment that precludes the need for mitigation;
- apply treatment away from the roadway edge where possible to minimize visual impact;
- minimize structural solutions in the immediate foreground;
- minimize alteration of existing slopes, and
- create slopes and structures that visually blend with the natural surrounding terrain.

### Where Rocks Fall From



*Free fall - rocks miss the slope completely and fall directly into the catchment*

### How Rocks Fall



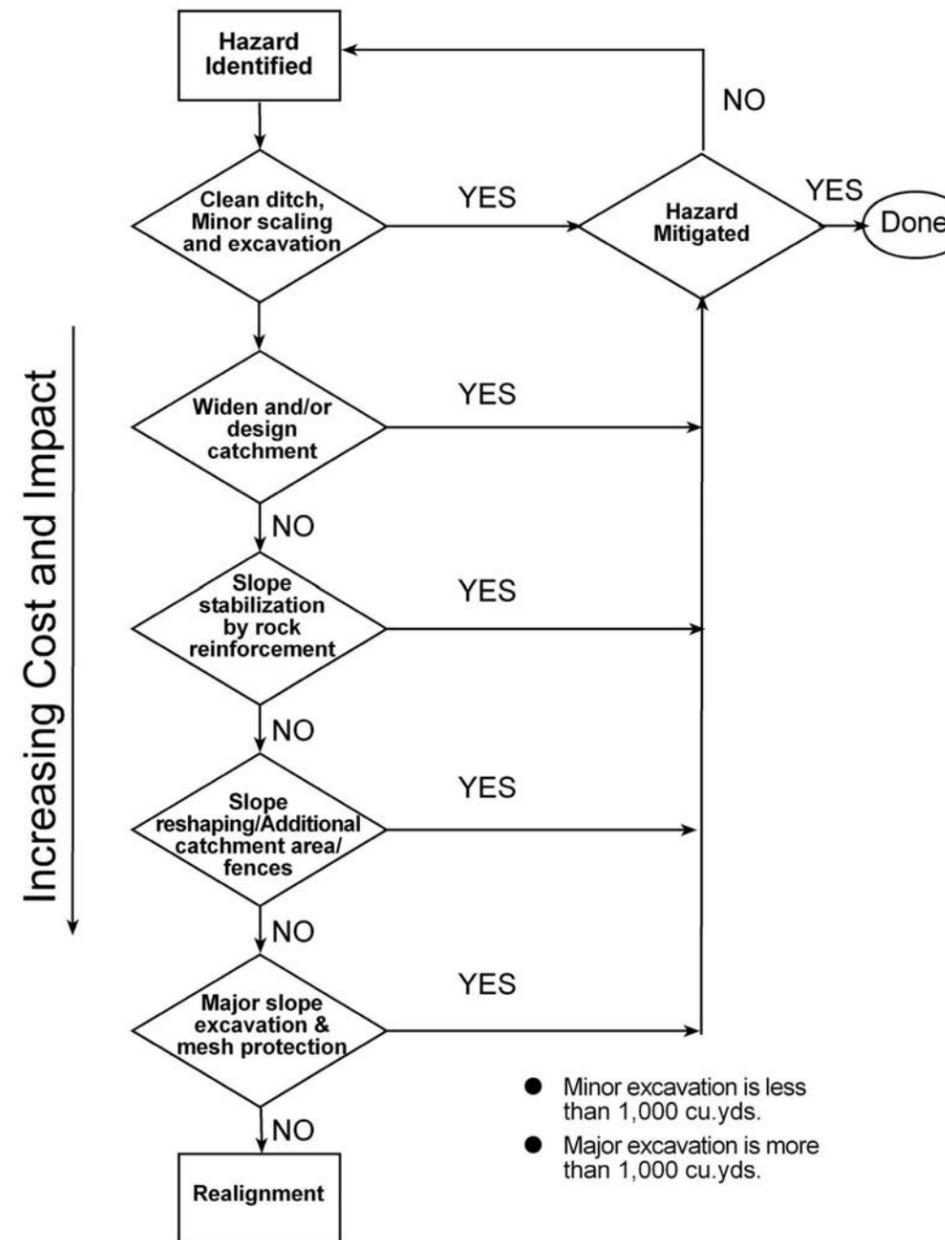
*Hit and launch - highly unpredictable path*

*Hit and hold - accumulate on bench and later fall in large quantity*

### Design Guidelines: Rock Fall Mitigation

- The extent of rock fall mitigation applied shall be determined by following the Decision Tree.
- Effective rock fall mitigation requires a combination of the methods described in these guidelines; consider the cumulative visual impacts of combined treatments when prescribing the mitigation methods
- Explore the possibility of using a viaduct or bridge to cross long sections of unstable rock or talus slopes
- Physically integrate the form and color of rock fall mitigation approaches with both the adjacent Interstate 84 roadway structure and the surrounding natural landforms; sample combined treatments are shown in the following images

### I-84 Design Features Rock Fall Hazard Decision Tree



### Treatment at the Source

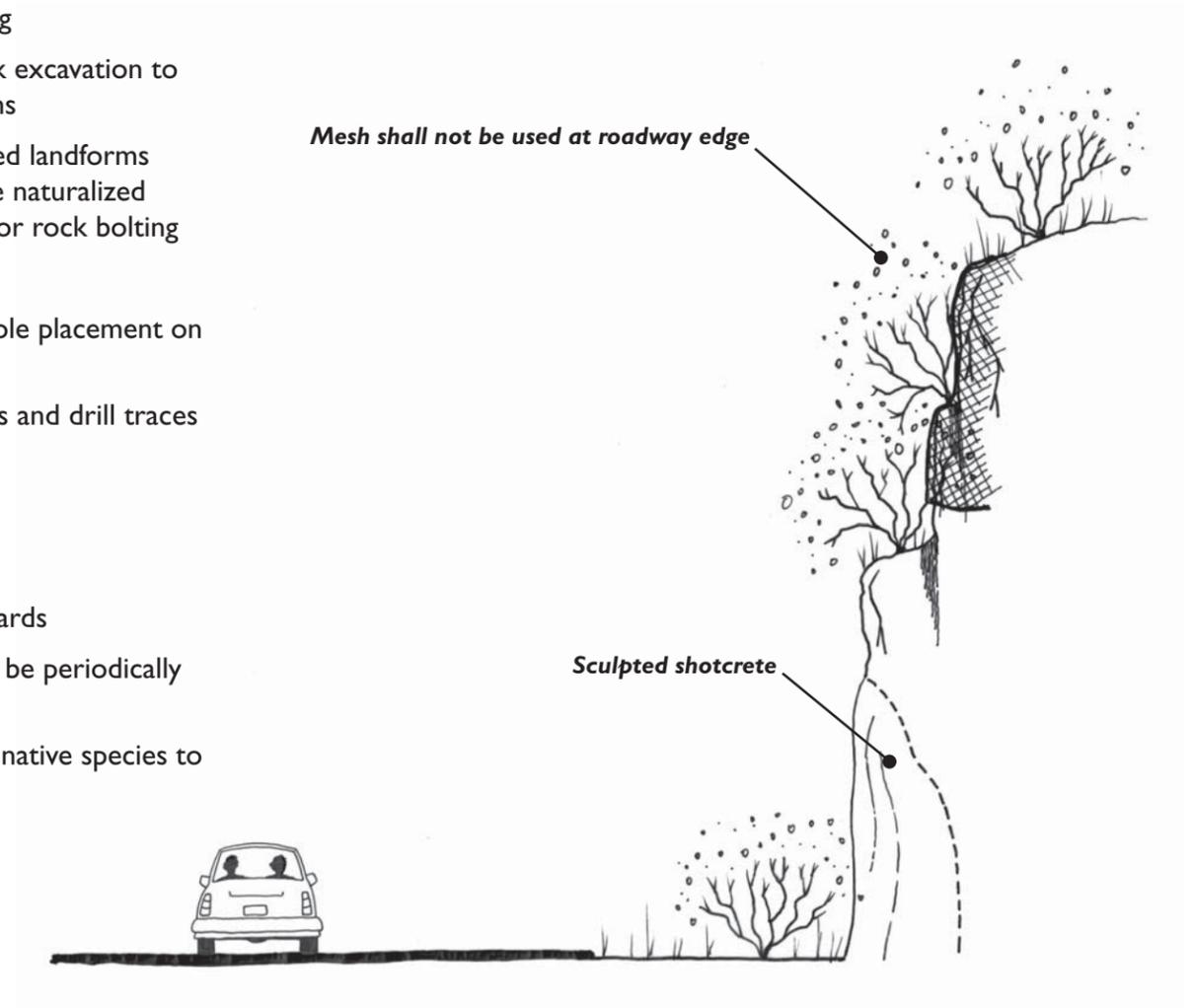
#### Preservation: stabilize the geologic feature while preserving its natural form and character

- Rock bolting
  - › Color treat exposed hardware and finishes to match the natural color of the surrounding rock
  - › Cut the rock bolt tail close to the nut to minimize visual appearance
  - › Place bolts in natural recesses in the rock face to hide them from casual observance
- Mesh and cable net slope protection
  - › Mesh fabric covering a slope is to be used only when there is no practicable alternative
  - › Mesh shall not be visible in the landscape from KVAs and must meet scenic resource provisions of the *Management Plan for the Columbia River Gorge National Scenic Area*
  - › Conform mesh to the landform to avoid draping
  - › Color-treat mesh to match the natural color of the rock feature being stabilized
- Shotcrete
  - › Shotcrete shall be sculpted to match the color and texture of existing rock
  - › Shotcrete is to be used only when there is no practicable alternative

#### Modification: stabilize the geologic feature by modifying its form

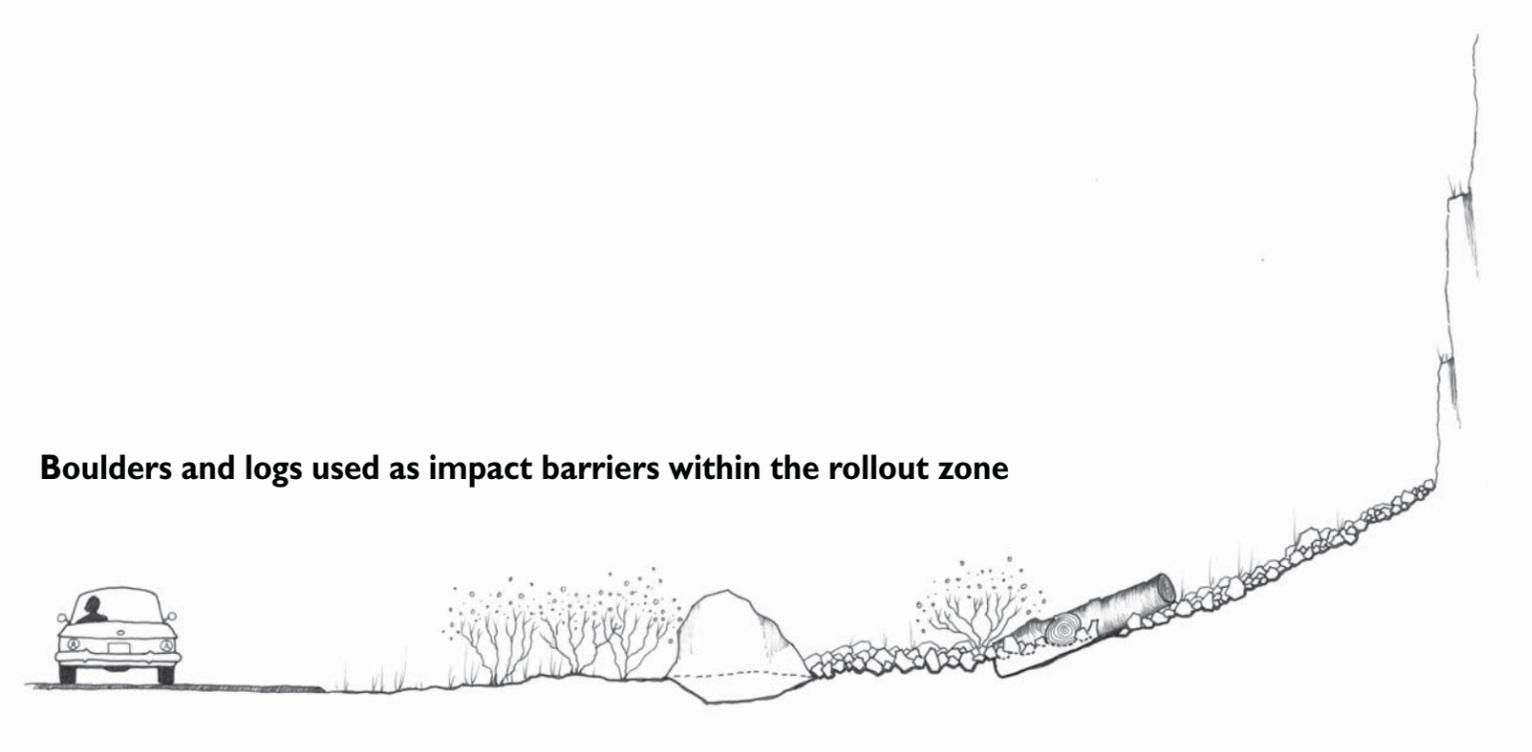
- Rock Scaling
  - › Non-weathered rock faces exposed by rock excavation or scaling procedures shall be color-treated to match the surrounding weathered rock

- Structural re-engineering of the landform
  - › Use horizontal drainage pipes to minimize the impacts of freeze/thaw expansion and contraction
  - › Color-treat engineered structures to match the surrounding natural landform
- Landform re-grading/rock sculpting/controlled blasting
  - › Sculpt modified bedrock formations during rock excavation to visually correspond with stable natural landforms
  - › Unstable portions of the graded or rock sculpted landforms should be stabilized in a manner that retains the naturalized character of the new landform through scaling, or rock bolting
  - › The visual results of blasting can be softened by
    - using irregular wall face planes (vary blast hole placement on the rock face)
    - minimizing the visual impact of presplit holes and drill traces
    - coloration of new rock surfaces
    - minimizing continuous lines of blast holes
- Benches
  - › Design benches to minimize rock-launching hazards
  - › Benches shall only be used in locations that can be periodically cleared of debris
  - › Grade slopes with topsoil and re-vegetate with native species to match the surrounding undisturbed terrain



**Treatment at the Source (continued)**

- Structural rock fall deflection and catchment
  - › Catchment walls
  - › Deflector structures such as custom rock chimes
  - › Rock fall protection fences
  - › Commercially available hi-impact cable nets
- Upslope Landform Modification and Grading
  - › Catchment ditches and rollout zones
    - Excavated catchment ditches are designed and graded to intercept and catch falling rocks, and shall be graded to match the character of the surrounding natural landscape
    - Place and maintain vegetation to blend catchment ditches with the surrounding landscape
    - Catchment ditches that can not blend into the surrounding natural setting shall be hidden from view by landscaping or placed behind an existing natural visual barrier (hillside, forest vegetation, etc.) while allowing maintenance access
  - › Place boulders and logs strategically to serve as rock fall impact barriers within the rollout zone
    - Boulders shall not be placed to receive direct hits or launch falling rocks
    - Boulders shall not be placed in rows, but in a manner that has a natural appearance
    - Use boulders that match the type of rock naturally occurring within the immediate landscape
    - Place logs such that they appear as naturally fallen trees
    - Place logs and boulders to allow maintenance access to catchment area



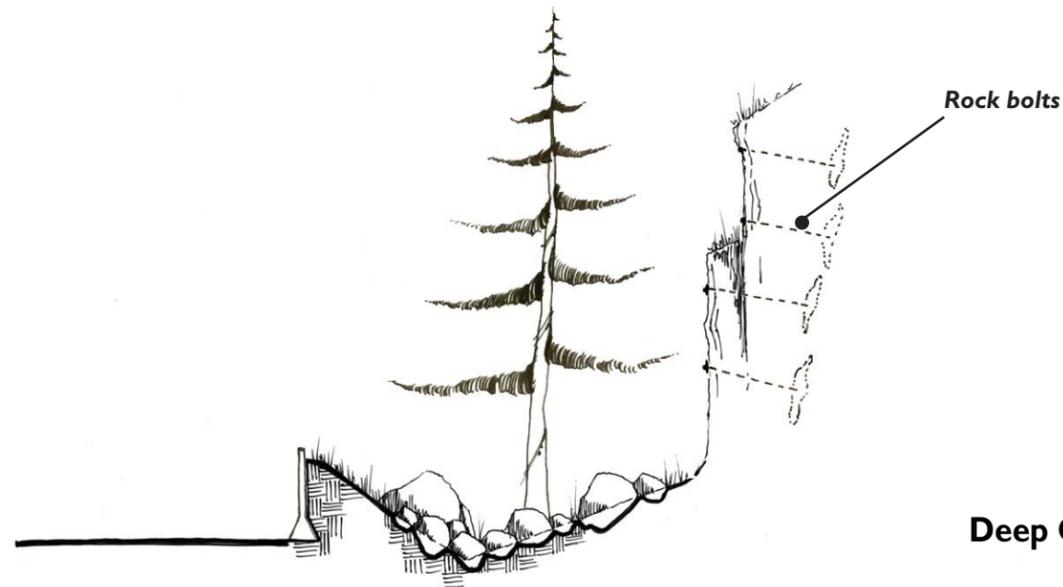
### Treatment at the Roadway Edge

- Berms
  - › Grade berms to match the character of the surrounding natural landscape
  - › New landforms shall be revegetated to blend with the surrounding landscape
  - › Berms that can not blend into the surrounding natural setting shall be hidden from view by landscaping or placed behind an existing natural visual barrier (hillside, forest vegetation, etc.)

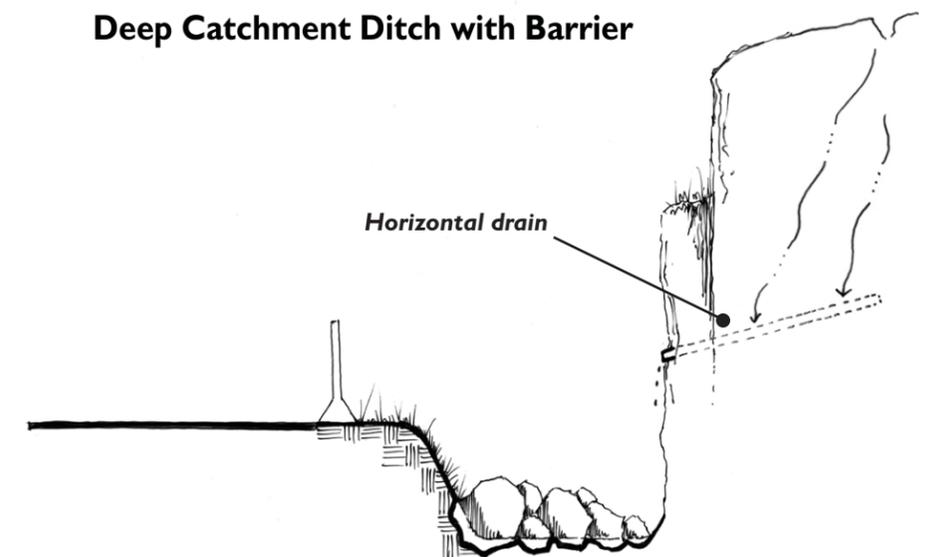
### Catchment ditch and rollout zone at highway edge

- Catchment fence or wall as an extension of roadside barrier as a last resort in horizontally constrained locations
- Reinforced roadside barrier wall with a graded catchment ditch

**Catchment Ditch with Berm and Barrier**



**Deep Catchment Ditch with Barrier**



## Viewpoints and Rest Areas

### Introduction

Viewpoints provide opportunities for travelers to safely stop and experience vantage points of important natural and cultural landscapes within the CRGNSA. Viewpoint facilities can be integrated into existing rest areas and recreational sites, or new viewpoints can be created where space allows.

Rest areas are an important safety feature associated with interstate highway facilities. They are necessary to increase the comfort of travelers and provide opportunities for rest during long distance travel.

Rest areas can be developed to include viewpoints and recreational access. A rest area provides an opportunity to incorporate interpretive displays to educate the public about the natural and cultural diversity of the CRGNSA. Rest areas may include elements to enhance traveler comfort and safety, such as expanded truck parking areas, restroom facilities, security systems, sheltered picnic areas and walking paths. Information such as maps, tourist information, road condition reports and weather updates can be made available.

### Important Considerations

- Safety
  - › egress and ingress from and onto Interstate 84
- FHWA and AASHTO design standards
- *Management Plan for the Columbia River Gorge National Scenic Area* scenic resource standards
- Design manual for interpretive signs, exhibits, and historical markers
- Guidelines for interchange configuration and lighting
- Viewpoints shall be consistent with Recreation Intensity Class guidelines

### Design Objectives

The design objectives for viewpoints and rest areas have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for viewpoints and rest areas.

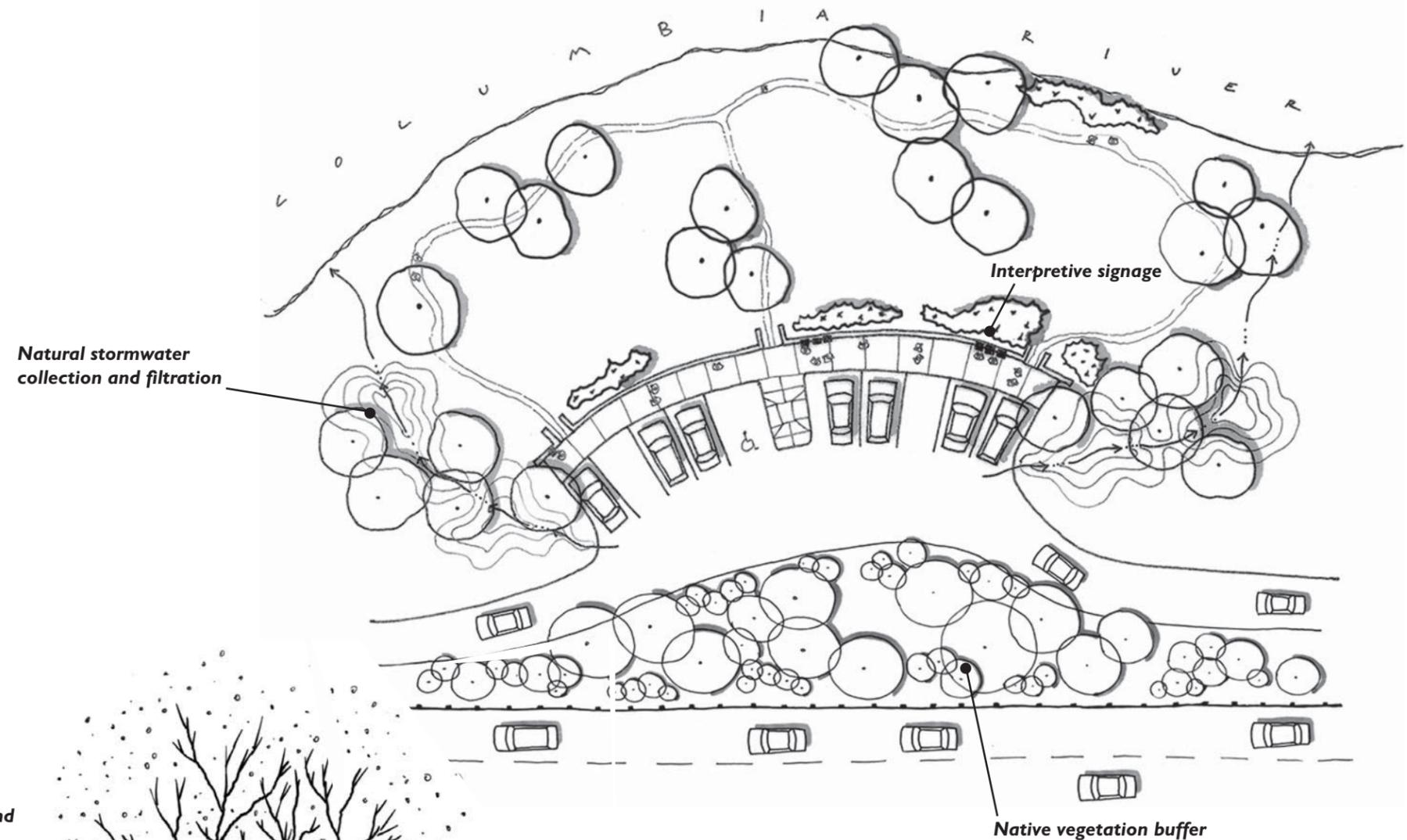
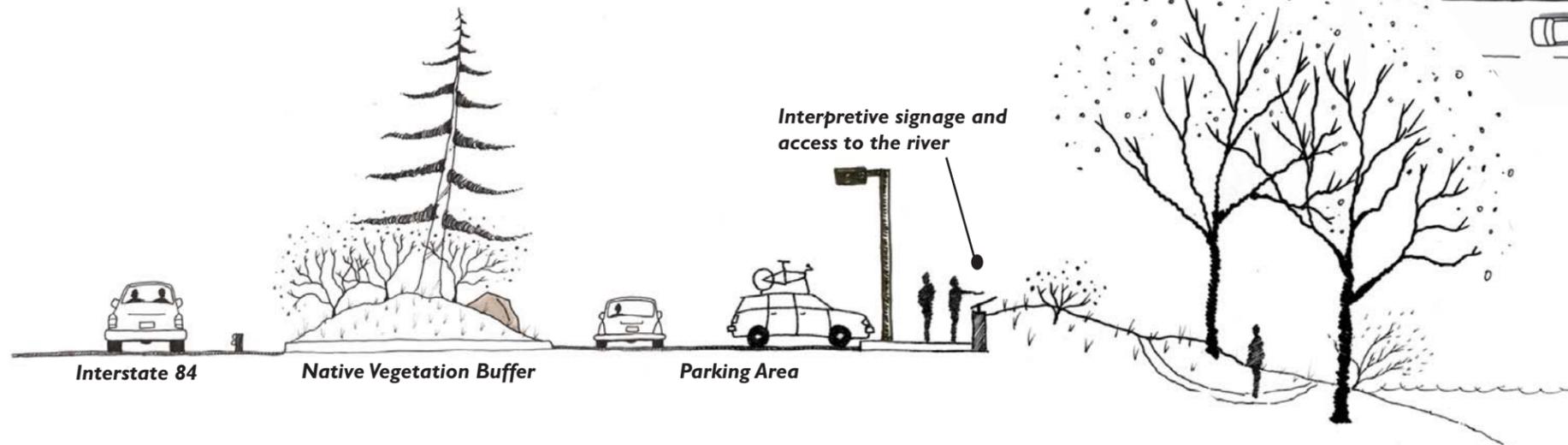
Viewpoints and rest areas should:

- provide opportunities for travelers to stop;
- provide safe egress and ingress from and onto Interstate 84;
- minimize impact to resources;
- preserve and provide access to prime vantage points to view the scenic, natural, and cultural landmarks in the CRGNSA;
- be located and designed in coordination with existing interchanges, State Parks, and recreation accesses, and
- educate, interpret, and increase awareness about the unique historic, cultural, and natural resources of the CRGNSA, including the historic and cultural assets of the local communities.

## Operational Features and Support Facilities: VIEWPOINTS AND REST AREAS

### Design Guidelines: Viewpoints and Rest Areas

- Locate viewpoints away from the lanes of travel to provide maximum safety to sightseers
- Place parking areas and viewpoints in locations that are buffered from the highway by vegetation and/or landforms
- Use native vegetation to reflect the landscape setting in which they are located
- Include landscape islands between parking rows
- Landscape islands that collect, filter and detain stormwater are especially encouraged (these facilities provide an opportunity for public art and interpretive signage)
- Provide pedestrian access to the riverbank where possible
- Equip rest areas with call boxes or similar emergency communication devices
- Use local, natural materials for facilities and structures



## Embankment Repair

### Introduction

The banks of the Columbia River are sometimes disturbed by erosion, required maintenance, and construction activities along the Interstate 84 corridor. These activities need to consider and address protection of habitat, promotion of native plant species, and the visual appearance of needed construction.

### Important Considerations

- Native habitat and vegetation protection and enhancement
- Hydrologic needs of the river channel
- ODOT rip rap standards and specifications
- Fish habitat and ESA compliance

### Design Objectives

The design objectives for embankment repair have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting embankment repair design objectives.

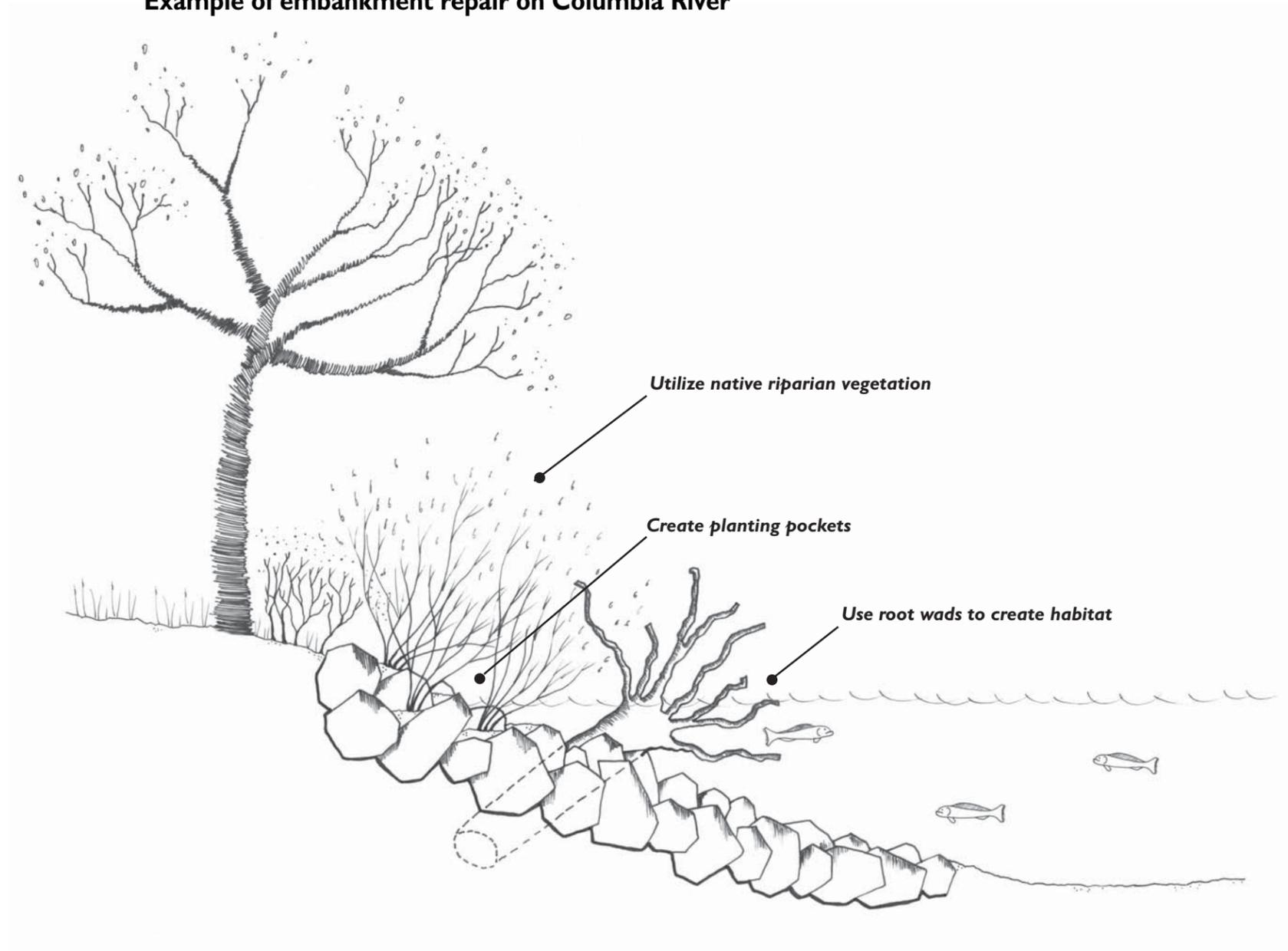
Embankment repair should:

- create an appearance that does not stand out from natural embankments;
- protect the shoreline from erosion;
- be designed to withstand anticipated river flows, and
- protect locations with natural, cultural, or historical significance.

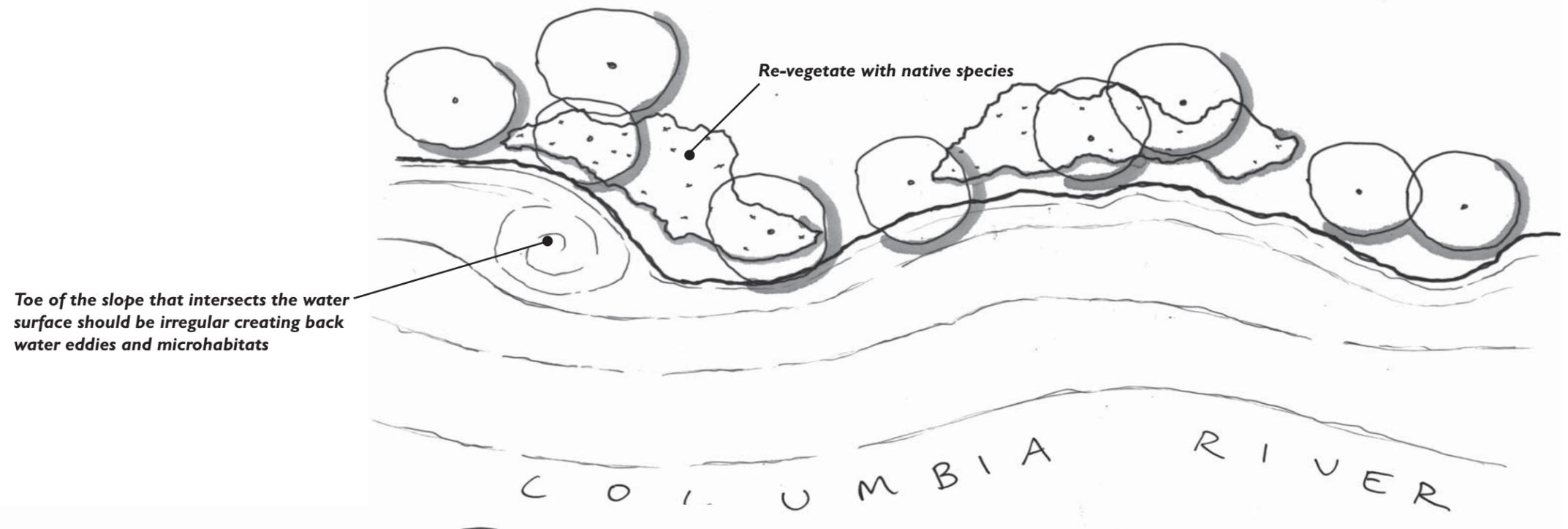
### Design Guidelines: Embankment Repair

- Construct embankment repairs using materials and forms that emulate the surrounding natural conditions
  - › reflect indigenous composition of plant species
  - › place material to create natural appearing contours
- Embankment repair requiring rip rap shall
  - › be placed on the slope in a rough and irregular form
  - › place topsoil in voids between rip rap and plant
  - › create an irregular toe of the slope that intersects the water surface, and place root wads to create back water eddies and microhabitats
- Re-vegetate areas disturbed during embankment repair with native species to prevent erosion and weed invasion
- Embankment repairs shall not impair Native American fishing access

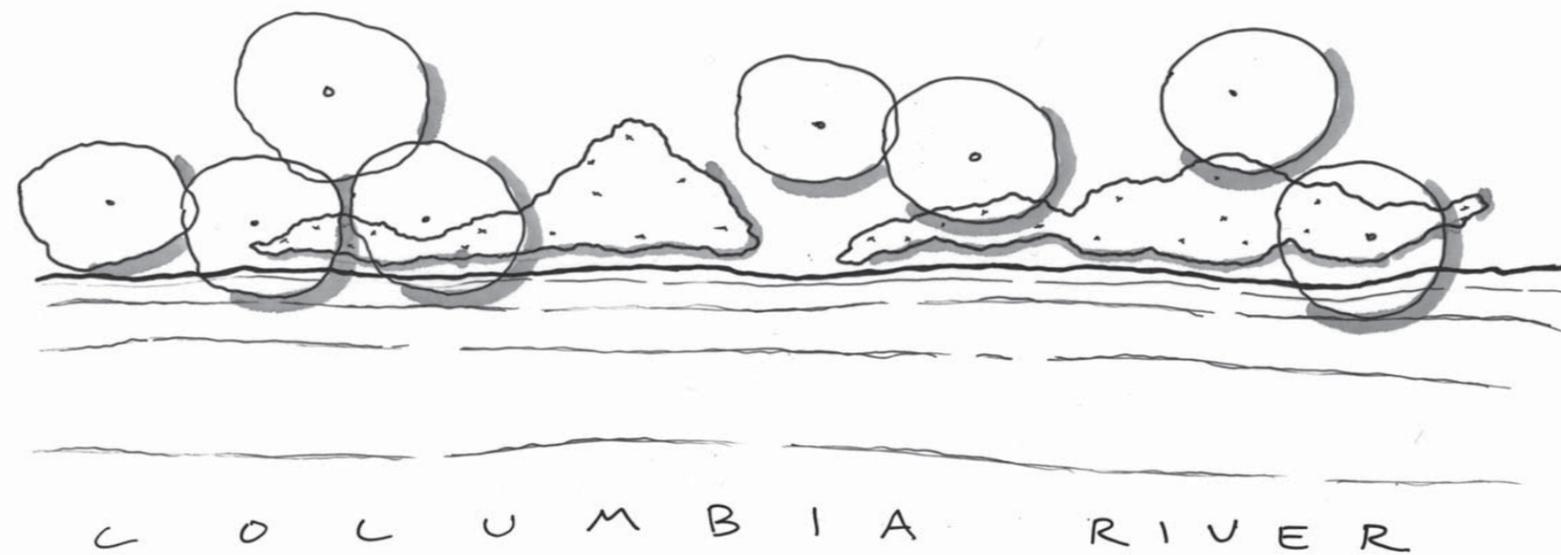
**Example of embankment repair on Columbia River**



Preferred - irregular bank



Avoid - straight bank



## Permanent De-Icing Systems

### Introduction

De-icing systems can greatly enhance the safety of the traveling public through the sometimes treacherous weather conditions along Interstate 84 in the CRGNSA. These facilities can be designed to visually blend with the surrounding scenic landscape while creating a more safe and enjoyable driving experience through the Scenic Area.

### Important Considerations

- ODOT and FHWA design standards

### Design Objectives

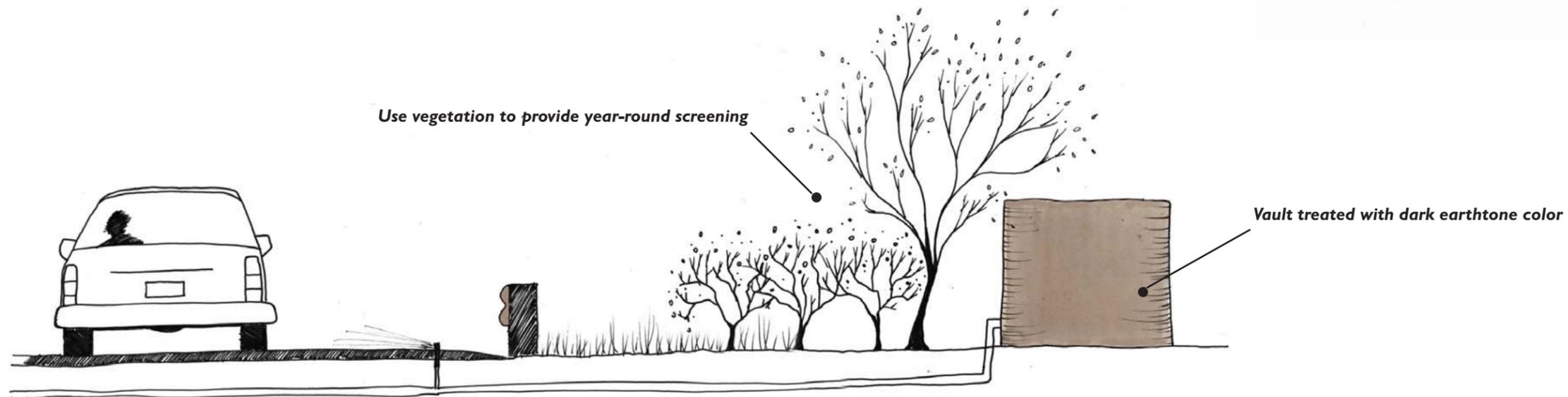
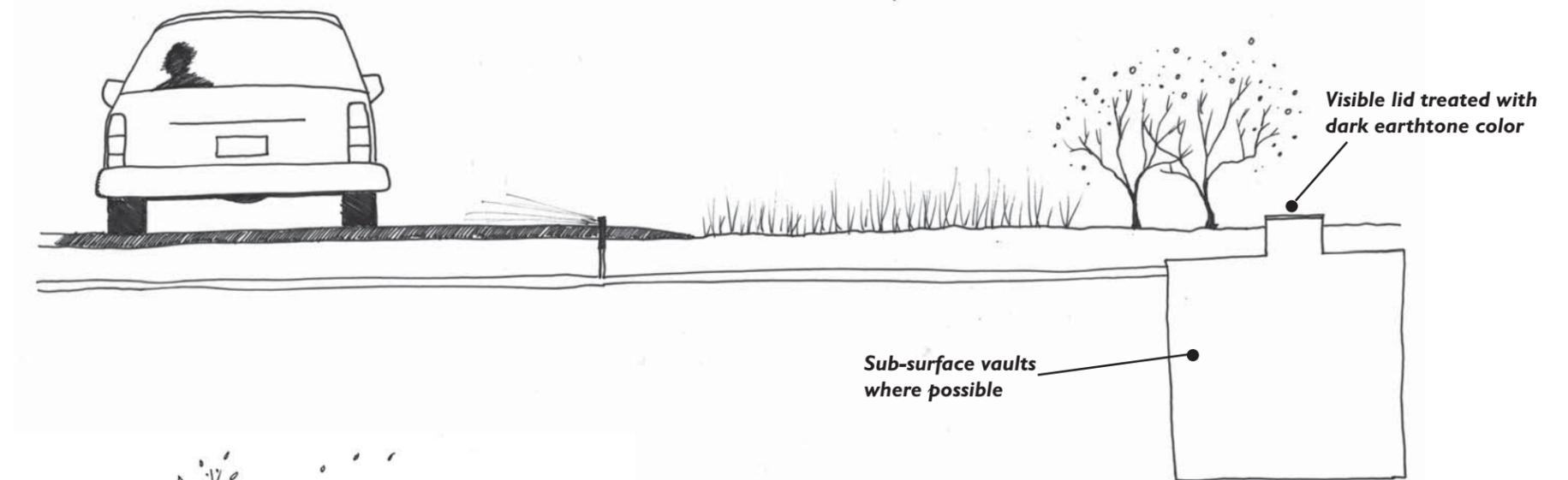
The design objectives for permanent de-icing systems have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for permanent de-icing systems.

Permanent de-icing systems should:

- be located to minimize visual impact;
- be located far enough out from the present edge of roadway to provide for future lane expansion;
- not attract the attention of the casual observer;
- not affect the flow of traffic, and
- adequately deal with extreme weather conditions present in the CRGNSA.

### Design Guidelines: Permanent De-Icing Systems

- De-icing infrastructure should be housed in subsurface vaults with vault lids color treated to match the dark earthtone colors that are predominate within the immediate landscape setting
- If subsurface vaults are not able to be installed due to site constraints, then above ground vaults shall be located far enough from the highway edge to allow for vegetative screening while maintaining a safe clear zone
- Above ground installations shall be color treated to match the dark earthtone colors that are predominate within the immediate landscape setting



## Truck Weighing Stations

### Introduction

Truck weigh stations are essential to protect Interstate 84 from premature deterioration and monitor freight activity along the corridor. These facilities should be designed to minimize or even eliminate their visual impact to passing motorists.

### Important Considerations

- ODOT and FHWA design standards

### Design Objectives

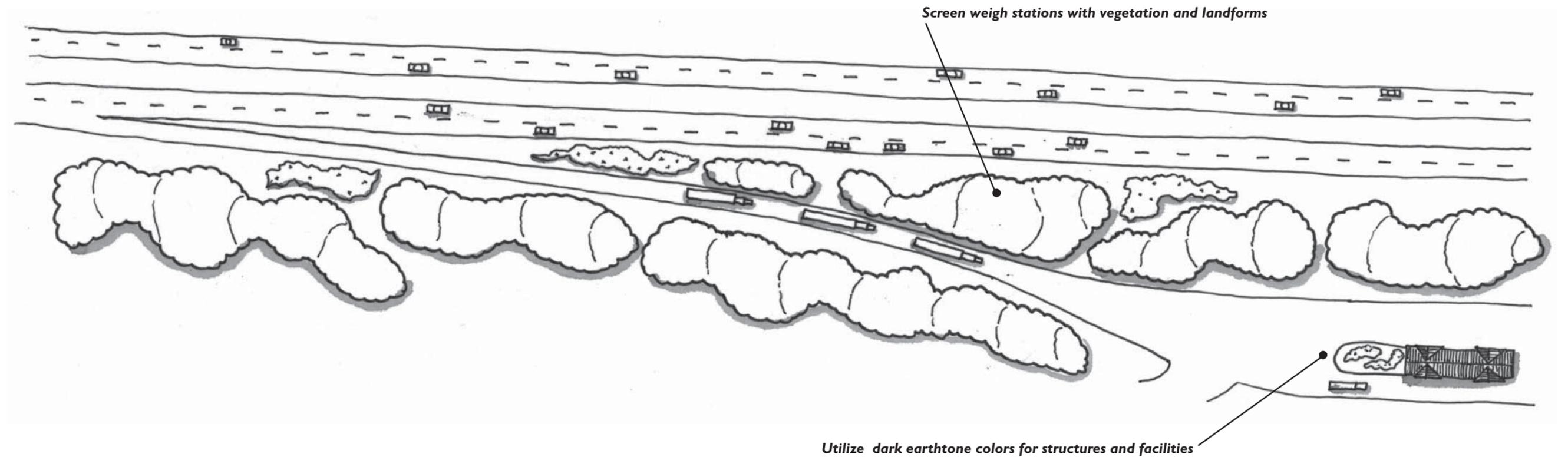
The design objectives for truck weighing stations have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for truck weighing stations.

Truck weighing stations should:

- maintain existing vegetative screening;
- decrease visual impact of structures and standing vehicles;
- provide safe ingress and egress of truck & freight traffic, and
- provide adequate stacking distance so that idling trucks are not blocking the right lane of Interstate 84.

### Design Guidelines: Truck Weighing Stations

- Where possible, new truck weigh stations shall be provide separation of a minimum of 30 feet for visual buffering or 50 to 100 feet for full screening from the roadway using landscaping or structures constructed from natural materials
- Weigh station buildings shall be painted with a dark earthtone color that blends into the landscape setting



## Weigh-In-Motion Facilities

### Introduction

Weigh in motion facilities minimize the infrastructure necessary to monitor freight traffic along the Interstate 84 corridor. Despite their already minimal physical presence, these facilities can be designed to further minimize their visual impact to passing motorists.

### Important Considerations

- Overhead clearance requirements
- ODOT and FHWA design standards

### Design Objectives

The design objectives for weigh-in-motion facilities have been developed to support the overall vision for the I-84 Corridor Strategy (see The Vision for Interstate 84). They define how the Goals and Overall Design Objectives can be achieved with the design of each feature. The more detailed guidelines that follow provide greater detail and specific instruction on meeting design objectives for weigh-in-motion facilities.

Weigh-in-motion facilities should:

- be located and colored to minimize their visual presence along the Interstate 84 corridor.

### Design Guidelines: Weigh-In-Motion Facilities

- Weigh-in-motion facilities shall be color treated to blend with the surrounding natural earthtone colors, consistent with other similar features within the proximity such as lighting fixtures and permanent de-icing systems
- Weigh-in-motion facilities shall be placed in locations that are not visible from KVAs other than Interstate 84

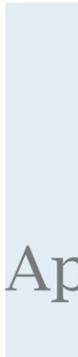


*Existing weigh-in-motion facility on Interstate 84*



*Weigh-in-motion facility treated with proposed dark earthtone color*





## Applying Color to Interstate 84

## Introduction

The following color palette was developed by the USDA Forest Service and Columbia River Gorge Commission to identify specific colors that meet the *Management Plan for the Columbia River Gorge National Scenic Area's* definition of “dark, earthtone” colors. The colors selected for features along the Interstate 84 corridor have been chosen from this approved palette.

The numbers on the palette correspond to the list of features that will receive that corresponding color treatment. The parenthesis after each interstate feature element contains whether the color shall be applied by paint or stain.



**Color 1**

- Steel portion of bridge rail (paint)
- Bridge girders (weathering steel or stain if concrete)
- Steel portion of roadside guardrail (weathering steel)
- Back of signs (paint)
- Eastern stone facade (stain)
- Eastern retaining walls (stain)

**Color 2**

- Western stone facade (stain)
- Western retaining walls (stain)

**Color 3**

- Bridge screen (paint)

**Color 4**

- Fences (weathering steel)
- Weigh-in-motion facilities (paint)
- Lighting (paint)
- Sign posts (paint)
- Permanent de-icing systems (paint)
- Truck weigh station facilities (paint)

**Color 5**

- Median barrier (paint)
- Bridge rail base (stain)
- Abutment wall and pier trim for bridges and culverts (stain)

**Color application for facilities at Exit 64 and to the west**



*Bridges Over the Interstate - Cascadian*

*Mainline Interstate Bridges - Cascadian*



*Mainline Interstate Bridges - Contemporary*

**Color application for facilities to the east of Exit 64**



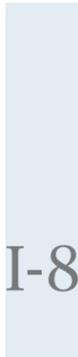
*Bridges Over the Interstate - Cascadian*

**Mainline Interstate Bridges - Cascadian**



*Mainline Interstate Bridges - Contemporary*





## I-84 Corridor Strategy Implementation Plan

I-84 Corridor Strategy Team

STIP Development Steps

STIP Project Steps

Maintenance Project Steps

Emergency Project Steps

I-84 Corridor Strategy Guideline Exception Process

## Introduction

### I-84 Corridor Strategy Team

This section outlines key steps for implementation of the I-84 Corridor Strategy and application of the design guidelines. An I-84 Corridor Strategy Team (I-84 CST), equivalent to the Level I Team formed to develop the I-84 Corridor Strategy, has been established to oversee implementation (see “How This Strategy Was Developed” on page 3 for a description of the Level I team.)

The I-84 CST will meet quarterly to address implementation of this Strategy and issues relevant to specific projects. More frequent meetings will only be scheduled to address urgent issues related to projects. The development of future projects shall be coordinated to align with the quarterly I-84 CST meetings.

A point person (Scenic Area Coordinator within ODOT Region I) is responsible for contacting the I-84 CST as relevant projects arise, coordinating meetings, and documenting interpretations of the guidelines. The following staff shall constitute the agency contacts for the I-84 CST

- Landscape Architect from the USDA Forest Service, Columbia River Gorge National Scenic Area office
- Planning Staff from the Columbia River Gorge Commission
- Operations Engineer from the Federal Highway Administration, Oregon Division
- Planning staff from Multnomah, Hood River, and Wasco Counties

### STIP Development Steps

**Project Identification** – the I-84 CST will work with ODOT Regions I and 4 to develop draft STIP, particularly to identify and select projects within the CRGNSA.

**Develop Scope, Schedule and Budget** – the I-84 CST will work with ODOT Regions I and 4, and be viewed as a regular participant to provide input to project scoping teams.

**Project Selection** – the I-84 CST will participate in public meetings and outreach to hear public opinions of the listed STIP projects that are relevant to the CRGNSA.

### STIP Project Steps

**Determine Environmental Class and Complete Environmental Documentation** – this would not require I-84 CST involvement unless technical assistance is required for the documentation.

**Pre-Application and CRGNSA Federal Review** – contact local permitting authority to discuss NSA permit review process. This may require a formal pre-application meeting. Submit plans to USDA Forest Service for CRGNSA federal review if the project involves a federal decision by FHWA.

**Preliminary Engineering** – the I-84 CST shall participate on the ODOT project team to provide input on the design process only when the project requires specific input to interpret the I-84 Corridor Strategy design guidelines.

**Design Review** – at 30% completion, a Design Guideline report shall be prepared by ODOT identifying the pertinent guideline applications. A set of plans and associated reports should be distributed to the I-84 CST for review and comment. Environmental documentation should be finalized.

**NSA Review by Counties** – submit to the appropriate County along with the development review application. This will require submitting final design and information showing that the project meets scenic, cultural, natural, and recreation resource protection standards. Environmental documents and any conditions placed by the Forest Service CRGNSA office should be included with the submittal.

**Completion of Plans, Specifications and Estimates** – the I-84 CST will participate in the internal ODOT review process to assure continuity of design intents relative to the guidelines.

**Post-Approval Project Changes** – post-approval project changes will require a review by the NSA permitting agency/county to determine if the change necessitates a new NSA application. If re-application is deemed necessary, new construction proposals or design changes shall be reviewed by the I-84 CST prior to re-application to the local planning authority.

### Maintenance Project Steps

These are projects that go beyond the scope of “Repair and Maintenance” as defined by the CRGNSA Management Plan, but do not appear on the STIP.

**Project Identification** – submit an annual list of maintenance projects to the I-84 CST for review and comment.

**Develop Scope, Schedule and Budget** – submit a report on scope and schedule to the I-84 CST to identify each project that relates to the guidelines. A meeting shall be held with the I-84 CST and the District Maintenance Manger to review relevant guidelines that apply to the projects.

**Project Selection** – submit the final list of selected projects to the I-84 CST for review and comment.

**Determine Environmental Class** – this would not require I-84 CST involvement, since maintenance project are mostly categorical exclusions that would not require I-84 CST comment.

**Pre-Application** – contact local permitting authority to discuss the NSA permit review process. This may require a formal pre-application meeting. Submit plans to the local authority and USDA Forest Service for CRGNSA federal review.

**Preliminary Engineering** – submit plans to the I-84 CST along with a report that describes the project’s relationship to the guidelines and how the requirements are met. Hold a meeting with the I-84 CST if the specific project situation requires it (as determined by consultation of the Scenic Area Coordinator with the other I-84 CST agency representatives).

**Completion of Plans, Specifications and Estimates** – maintenance projects that have plans for NSA review and are subject to the I-84 Corridor Strategy design guidelines will include narrative to explain the final action and describe how it meets the requirements of the guidelines before filing for a permit.

**Design Review** – at 30% completion, a Design Guideline report shall be prepared by ODOT identifying the pertinent guideline applications. A set of plans and associated reports shall be distributed to the I-84 CST for review and comment. Environmental documentation should be finalized.

**NSA Review by Counties** – submit to the appropriate County along with the development review application. This requires submitting final design and information showing that the project meets scenic, cultural, natural, and recreational resource protection standards. Environmental documents shall be included with submittal.

**Post-Approval Project Changes** – post-approval project changes will require a review by the NSA permitting agency/county to determine if the change necessitates a new NSA application. If re-application is deemed necessary, new construction proposals or design changes shall be reviewed by the I-84 CST prior to re-application to the local planning authority.

### Emergency Project Steps

Post-emergency design review goes through the STIP or Maintenance Project Steps, modified to meet time restrictions arising from the CRGNSA Management Plan Emergency/Disaster Response Process.

The design and use of materials consistent with the Strategy should be employed where possible. Coordination with the local planning agency during the disaster response and post emergency permitting process shall occur as established in the CRGNSA Management Plan Emergency/ Disaster Response provisions.

### I-84 Corridor Strategy Guideline Exception Process

A process has been established to handle required exceptions to the guidelines. A Guideline Exception is intended only to address a critical safety issue with unique, site-specific solutions that meet the following criteria:

- A documented public safety problem that is not mitigated by the design guidelines.
- All practicable alternatives that are consistent with the guidelines have been explored and exhausted.
- The proposed variation from the guidelines is the minimum necessary to address the safety issue.
- A Guideline Exception must still be consistent with applicable CRGNSA Management Plan guidelines.

Fundamental problems with the I-84 Corridor Strategy and design guidelines arising from changes in ODOT or Federal Design Standards or design innovations require an amendment or update to the document and shall not be addressed with a Guideline Exception.

A Guideline Exception will typically originate during the project development process. Informal coordination with the I-84 CST should begin as soon as the designer realizes the need for a design guideline exception that is critical to the project design. This coordination is necessary to tap into the expertise and institutional knowledge of the

I-84 CST. It is intended as a first screen by responsible parties to ensure that the request is a last resort situation. An indication of whether the Guideline Exception shall proceed is given by the I-84 CST after informal consultation.

The Request for: I-84 Corridor Strategy Guideline Exception form shall be completed by the designer to initiate a Guideline Exception. Requests for Guideline Exceptions must be accompanied by documentation of how the exception meets the four criteria listed above. All four criteria must be satisfied in order for the exception to be approved. The Guidelines Exception package is then forwarded to the I-84 CST for review. It is the responsibility of the ODOT Area Manager (or their delegated representative) to coordinate with the I-84 Corridor Strategy Team and ensure that all questions and concerns are addressed during the Guideline Exception process.

Requests may be handled by meetings, phone conferences, and electronic transmission of information to seek the concurrence of the I-84 CST. If a meeting is necessary to discuss the requested Guideline Exception, it shall include the full I-84 CST. The I-84 CST can elect to include Level 2 members in such a meeting. If concurrence is not attained at this level, the I-84 CST will convene a meeting with Level 3 executive members from each of the stakeholder agencies to discuss the request and seek concurrence. If concurrence is not attained at this level, the process will end and the request is withdrawn.

It is noted that elevation to discussion at Levels 2 and 3 shall be completed for both approval and conflict resolution. Guideline Exception requests that receive full concurrence will be documented with signatures by the I-84 CST agencies on the Request for I-84 Corridor Strategy Guideline Exception form. The completed exception then becomes part of the project design file.

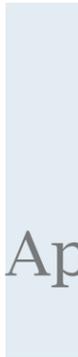
A copy of any documented Guideline Exception shall be included with the project application to the appropriate county for a National Scenic Area permit and is subject to review by that agency to ensure that the exception is consistent with scenic, cultural, natural, and recreational resource protection standards.



## Appendices

Appendix A	Participating Stakeholders and Agency Staff
Appendix B	Specifications
Appendix C	Design Exception Request and Support for CIP Median Barrier
Appendix D	Bridge Replacement Locations
Appendix E	Other Recommended Actions





## Appendix A: Participating Stakeholders and Agency Staff

## Appendix A: PARTICIPATING STAKEHOLDERS AND AGENCY STAFF

### ODOT

#### Technical & Support Staff

Kent Belleque, Interchanges

Nelson Chi, Signals

Bruce Council, Geo/Hydro

Brad Dehart

Sandy Van Bommel, ODOT Project Leader

Sue Dagnese, Traffic engineering

Ed Fischer, Signs and illumination

Dave Greenberg, Illumination

Fred Gullixson, Geo/Hydro

Bob Hadlow, Region I Historian

Bruce Johnson, Bridge Program Manager

Dan McDonald, Barriers, guard rail and clear zone

Ted Miller, Illumination

Curran Mohny, Retaining walls and rock fall mitigation

Pat Moran, Scenic Byways Program Manager and visual resources

Tom Murtagh, ODFW/ODOT coordinator

Bruce Novakovich, Bridge Geo/Hydro

Michael Ronkin, Bike & pedestrian coordinator

Sandra Rosier, Administrative support

Craig Shike, Bridge design

Alvin Shoblom, Senior Hydraulics Engineer

David Smith, Signs

Greg Stellmach, Signs

Morry Stover, Signs

Tony Stratis, Bridge design

Mindy Trask, Environmental section

Don Turner, Retaining walls and rock fall mitigation

Richard Watanabe, Geo/Hydro

Sam Wilkins, Maintenance district manager

Holly Winston, Bridge design and railings

Paul Wirfs, Retaining walls, rock fall mitigation and culverts

#### Level I

Bill Ryan, Environmental Program Manager

Charlie Sciscione

Jeanette Kloos, CRGNSA Coordinator

Steve Lindland

#### Level 2

June Carlson, ODOT Region I Area Manager

Tom Lauer, Roadway Engineering Manager

Ray Mabey, Bridge Delivery Unit – Deputy Program Manager

#### Level 3

Lorna Youngs, Director of ODOT

Matt Garrett, ODOT Region I Manager

Mike Wolfe, ODOT Project Delivery Manager

#### OBDP

Technical & Support Staff

Wayman Bolly, Design Coordinator

Steve Drahota, Bridge Lead

Jim Hagar, Economic Development Coordinator

Lynn Iaquinta, Engineering Manager

Douglas Kirkpatrick, Assistant Design Manager

#### Level I

Michaella Wittmann, CS3 Coordinator & Facilitator

#### Level 2

Jason Neil, Operations Manager & Facilitator

#### USDA Forest Service

##### Technical & Support Staff

Chuti Fiedler, Fish and Wildlife Biologist

Virginia Kelly

**Levels 1 & 2**

Diana Ross

**Level 3**

Dan Harkenrider, CRGNSA Area Manager

Richard Sowa, Region 6 Engineering Director

Columbia River Gorge Commission

**Levels 1 & 2**

Brian Litt, Senior Planner

**Level 3**

Martha Bennett, Executive Director

FHWA

**Level 1**

Jeff Graham, Regions 1 & 3 Liaison Engineer

**Level 2**

Emily Lawton, Oregon Division

Mike Morrow

**Level 3**

David Cox, Division Administrator

ODFW

Susan Barnes

Hood River County

**Level 1**

Eric Walker, Senior Planner

**Level 3**

Mike Benedict, Planning Director

Multnomah County

**Level 1**

Tammy Boren-King

**Level 2**

Derrick Tokos, Lead Planner

**Level 3**

Karen Schilling, Planning Director

Wasco County

**Level 1**

Dawn Baird, Planning Associate

Sam Crummett, Planning Associate

Deborah Gonzalez-Cyparski, Planning Associate

**Level 3**

Todd Cornett, Planning Director

Otak, Inc.

Kay Van Sickle

Mandi Roberts

John McCarty

Lucas Cruse

Louis Wilsher

Erin Tam

Joe Dills

Kate Schwarzler

Jodie Vice

Nora Daley-Peng

In-Tae Lee

Terry Song

Lindsey Utter

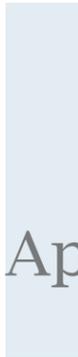
Adam Castor

Ralph Trapani, R2JM

Bradley Touchstone, Parsons Transportation

Roger Pihl, Yeh & Associates





## Appendix B: Specifications

## Specifications

To achieve the desired look, the application of these design guidelines requires careful attention to the final construction specifications. Techniques and construction tolerances not ordinarily associated with heavy construction projects are necessary for exposed concrete work. Sample specifications follow:

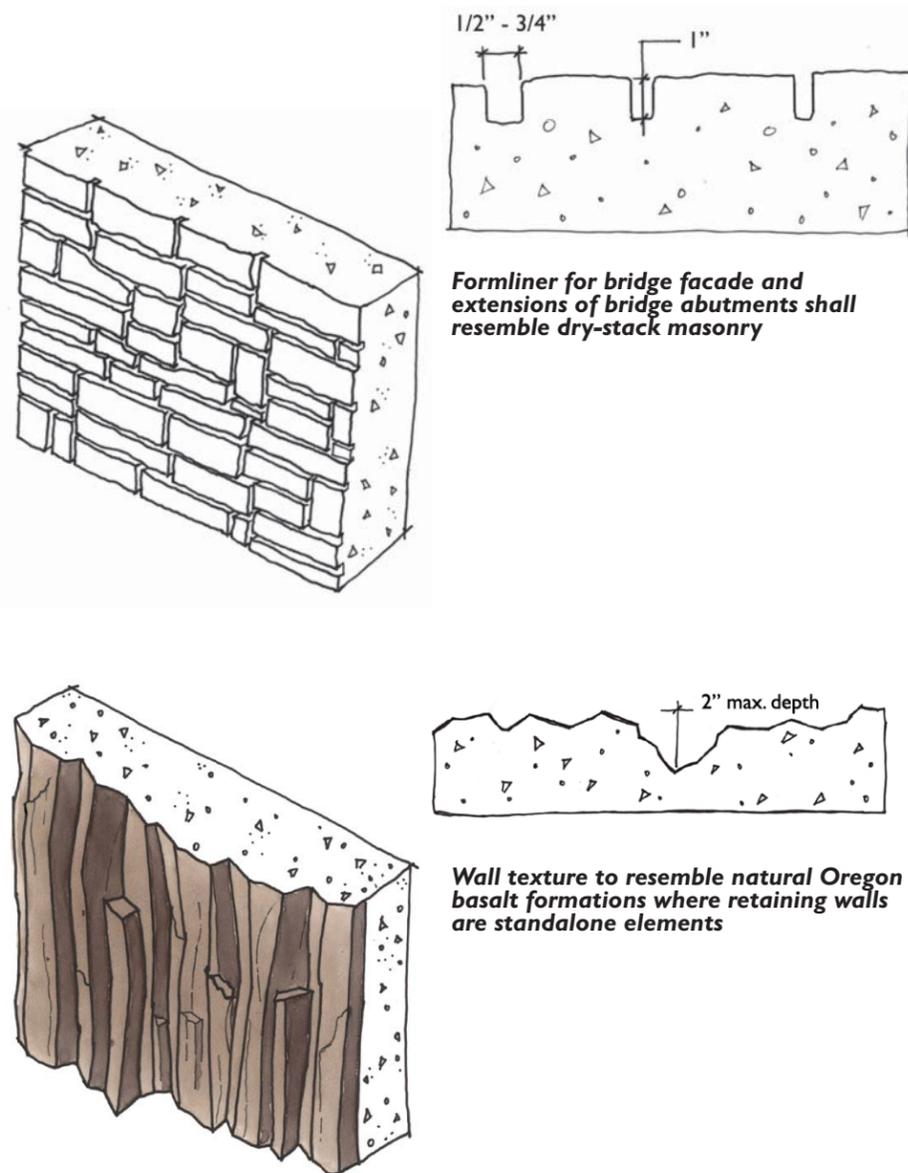
### Concrete Patterns/Textures

A pattern that resembles that of dry-stack masonry, with a roughed surface finish, shall be used on designated portions of bridges (substructure elements such as abutments and piers, superstructure elements such as architectural facade panels, outside girders and concrete portions of bridge railing). An approved formliner shall be used to produce this pattern. Commercially available cultured stone does not meet the durability requirements of an interstate highway. Textures for retaining walls that are standalone elements shall have an Oregon basalt pattern.

The contractor shall furnish samples of formliner measuring 3 feet by 3 feet depicting the proposed surface treatment, including color, for approval. The final sample must receive the Engineer's written approval before the pattern can be incorporated into the work. Also, a construction drawing showing the full panel layout including colors, patterns, and joint locations will be required.

Portions of bridges requiring textured pattern shall be considered both structural and architectural elements. Deviations from specifications in either area will be cause for rejection.

The formliner shall be one continuous piece if possible. If not possible, joints in the formliner shall be located so they are not visible.



### Structural Concrete (cast in place and precast)

- All concrete work shall be designed for a high-quality architectural appearance. It shall be considered both structural and architectural, requiring tolerances not normally associated with heavy/highway construction.
- All form joints shall be stoned or ground until smooth for all exposed surfaces; such as those on parapets, slab overhangs, bridge railing, piers, and abutments.
- Offset joints on chamfered edges shall be ground to create a smooth transition.
- When approved by the Engineer, concrete may be ground to meet the requirements. All exposed concrete shall meet the following tolerances:
  - › The completed concrete element shall be within ¼ inch of the plan location both vertically and horizontally at all points. Deviation from plan location shall not increase or decrease more than 1/8 inch in any 10 feet.
- The overall appearance of the element shall be one of straight lines and smooth curves with no visible angles or breaks in curvature.
- Concrete coating shall not be applied until the concrete surface has been accepted by the Engineer or bridge Architect.
- Concrete may not be added to meet the above requirements. Patching is not allowed.
- All cavities formed by air pockets shall be cleaned and filled with mortar using acceptable repair techniques.

### Bridge Deck

- The ODOT hydraulics manual shall be followed during bridge deck design.

### Painted Bridge Railing

ODOT desires to not use weathering steel for steel bridge railing elements, due to maintenance and safety concerns. To accomplish the necessary coloration and corrosion protection for steel bridge rail elements, the following specifications apply:

- Fabricated bridge rail and hardware shall be galvanized using accepted industry practices.
- Fabricated railing elements shall not be post treated with water quenching or chromate conversion coated.
- After galvanization, zinc high spots such as metal drip line and others that would detract from the paint appearance will be made flush with the surrounding surface by SSPC SP2 or SP3. Care shall be taken that the base galvanized coating is not removed. Repaired areas shall be checked for required coating thickness.
- Galvanized coatings damaged during shipment shall be repaired per ASTM A780 method A3.
- Galvanized coatings damaged in the field shall be repaired per ASTM A780 method A1.
- After removing high spots, the galvanized coating shall be cleaned per SSPC SP-1. The cleaning solution shall be an alkaline solution with a PH ranging from a minimum of 11 to a maximum of 12. This solution can be applied by immersion, spray or soft nylon brush. Follow cleaning with a hot water or hot pressure washer rinse. Individual pieces shall be separated and positioned to facilitate drainage and drying. The pieces shall be completely dry before proceeding.
- After cleaning, the pieces shall be abrasive blasted per SSPC-SP7 Brush-off Blast Cleaning. The blasting operation shall roughen the galvanized surface to an angular surface profile of 0.25 to 0.50 mils. The blasting equipment, technique and abrasive material shall be

selected to provide for the specified surface profile without removal of excessive zinc layers. The final zinc milage shall not be less than 4.0 mils. All abrasive residue shall be removed with clean compressed air or other methods acceptable to the department.

- After obtaining surface profile, shop-apply a two coat paint system consisting of an epoxy intermediate coat and a urethane finish coat. The epoxy intermediate coat shall be a two component chemically cured Advanced Technology Epoxy semigloss coating. The urethane finish coat shall be a high performance, two component chemically cured aliphatic acrylic urethane gloss enamel. The epoxy coating shall be applied within 24 hours of the brush-off blasting. The coatings shall be applied per manufacturer's specifications.
- Field repairs and touch-ups shall be as directed by the Engineer.
- Prior to fabrication a sample bridge railing panel which includes two post, all hardware, incidentals and coating shall be installed on a concrete slab as directed by the Engineer. This sample panel shall be used to judge acceptance of the fabrication, coatings, quality control program and installation procedure. After the review of this sample, the Engineer and Contractor may agree upon any fabrication, coating, quality control or installation changes as a modification to these provisions. The fabrications can proceed anytime after the acceptance of this sample panel.

### Bridge Railing

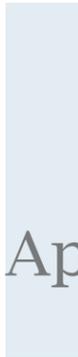
Bridge railing shall be a crash-tested design that meets Crash Test Level 4 for mainline Interstate 84 bridges, and Crash Test Level 3 for bridges over Interstate 84 (bridge deck to be designed using LFRD), unless a warrant dictates a higher standard. Expected deflection of bridge railing should not exceed available deflection distance. Minnesota rail is the preferred style.

Although not required by FHWA or ODOT for bridge railings, reflectors shall be affixed to bridge railings in the CRGNSA to delineate the roadway edge. Reflectors shall be affixed to the vertical post portions of the selected Minnesota TL-4 railing at a spacing commensurate with the spacing of reflectors on adjacent guardrail.



*Minnesota rail – Image from FHWA 2005 Bridge Rail Guide*





## Appendix C: Design Exception Request and Support for the CIP Median Barrier

## Design Exception Request

### OREGON DEPARTMENT OF TRANSPORTATION DESIGN EXCEPTION REQUEST

**Section:** Interstate 84 from about Milepost 18 to 97  
**County:** Multnomah, Hood River, and Wasco Counties  
**Highway:** Interstate 84 through the Columbia River Gorge National Scenic Area (CRGNSA)  
**Key No.**

#### PROJECT DATA

Functional Classification: Interstate	Design Standard: ODOT 3R & 4R
Current ADT (Year): Rowena - 19,900 (2002)	
Troutdale - 28,200 (2002)	Design ADT (Year): 40,400 (2022)
% Trucks: 25-26	Design Speed: mph
Current Estimate:	Posted Speed: 65 mph

**Design Exception Requested for:** 35-inch tall cast-in-place concrete barrier (safety shape) for median barrier (TL-4 crash tested). (See attachment #1 - Schematic drawing of barrier to be completed by ODOT)

**Location of Design Feature:** Interstate 84 through the Columbia River Gorge National Scenic Area (CRGNSA).

**Accident History & Potential:** Lower barrier height may increase potential for tip-over of certain vehicles. However, the crash history data shows much lower overall and truck at-fault accident rates compared to all other Interstate sections in Oregon. (See attachment #2 - I-84 Crash data)

#### Reasons for Not Attaining Standard:

- Federal regulations embodied in the Management Plan for the Columbia River Gorge National Scenic Area mandate the protection and enhancement of scenic views throughout the Interstate 84 corridor. (See attachment #3 - Applicable CRGNSA Management Plan Goals)
- Public dialogue supports a strong desire to sustain and improve views of the river and mountain side natural surrounding landscape as viewed from Interstate 84. (See attachment #4 - Results of January 2005 public workshops)
- The currently-used 42-inch solid barrier cuts these views in most passenger cars (3'9" eye level), which is not consistent with CRGNSA Plan policies and objectives criteria. (See attachment #5 - Visual impact study and simulation examples)
- Cast-in-place concrete barrier will provide a more visually appealing solution in the CRGNSA. (See attachment #4 - Results of January 2005 public workshops)
- The 35-inch cast in place barrier is crash tested at a TL-4 rating, which provides an equivalent level of safety to the current standard 42-inch pre-cast barrier.
- Proposed barrier exceeds current FHWA/AASHTO Standards which require TL-3.
- Lower barrier will improve view of taillights in curves to the left with narrow median shoulders.

**Effect on Other Standards:** Requires integration with transition railing design

**Compatibility with Adjacent Section:** The majority of the existing median barrier along I-84 in the NSA is at 32-inch height. Adjacent sections of I-84 outside the NSA are to use 42-inch tall median barrier as described in November 28, 2000 ODOT Memo to Designers, Subject: Tall F-Shape Precast Concrete Barrier.

**Probable Time before Reconstruction of Section:** N/A

#### Mitigation for Exception Included in Design:

- Regions will monitor and report crash history with particular attention to median crashes (crossovers and excessive barrier deflection receive special note).
- With the use of a 35-inch tall barrier, the design can accommodate one 3-inch thick mainline overlay and still maintain an acceptable height of 32 inches. This compensates for the move ability of pre-cast barrier and extends the useable life of the cast-in-place barrier.

Recommended by: Paul DePina Date: 10-21-05  
 (Region 1 Technical Center Manager)

Recommended by: Chris Lavin Date: 10-20-05  
 (Region 1 Area Manager)

Approved by: Thomas J. Lauer Date: 11/16/05  
 (Roadway Engineering Manager)



## Design Exception Request Attachments

**Attachment #1:** Schematic drawing of 35 inch tall cast-in-place barrier, using the current safety shape to be completed by ODOT

**Attachment #2:** I-84 Crash Data Summary

The total crash rates for Interstate 84 through the CRGNSA have been lower than Interstate 84 east of MP 167, all of Interstate 5, and the total rate for all Interstates in Oregon.

Total Crash Rates Comparison

Year	I-84 (MP 0 to 167)	I-84 (MP 167 east)	I-5	All Oregon Interstates
1999	0.15	0.45	0.30	0.35
2000	0.21	0.45	0.30	0.36
2001	0.25	0.39	0.28	0.37
2002	0.13	0.34	0.33	0.37
2003	0.12	0.34	0.30	0.42

The Truck At-Fault Crash Rate on Interstate 84 in the CRGNSA (MP 16 to 100) has been lower than the rates on Interstate 84 (MP 167 and east) and on all of Interstate 5.

Truck At-Fault Crash Rates Comparison

Year	I-84 in CRGNSA (MP 16 to 100)	I-84 (MP 0 to 167)	I-84 (MP 167 east)	I-5
1999	0.06	0.08	0.29	0.17
2000	0.12	0.11	0.26	0.16
2001	0.10	0.14	0.26	0.15
2002	0.06	0.05	0.22	0.17
2003	0.05	0.05	0.20	0.15

For the five years from 1999 through 2003, there were 77 crashes on all highways in Oregon and 24 on all Interstates in Oregon that involved a vehicle that “crossed, plunged over, or through median barrier”. Of the 77, there were three accidents of this nature on Interstate 84 within the CRGNSA:

- 03/02/2001 – MP 18.90 – in snow conditions with speed as a factor (2 injuries)
- 07/18/2003 – MP 63.63 – in dry conditions (1 injury)
- 11/19/2003 – MP 95.30 – in wet conditions (1 fatality)

**Attachment #3:** Applicable CRGNSA Management Plan Goals

*Page I-33:* “GMA Goal: Designate those portions of the following roads in the Scenic Area as scenic travel corridors and protect and enhance scenic resources within the corridors: Washington State Routes 14, 141, and 142, Interstate 84, the Historic Columbia River Highway (all segments), and Oregon Highway 35.”

*Page I-146:* “SCENIC APPRECIATION AND SCENIC TRAVEL CORRIDORS – GMA Goals:

1. Increase scenic appreciation opportunities throughout the Scenic Area.
2. Designate those portions of the following roads in the Scenic Area as scenic travel corridors and promote uses that improve their functions as recreational and scenic travel routes: Historic Columbia River Highway (all segments); Washington State Routes 14, 141, and 142; Oregon Highway 35; and Interstate 84.”

**Attachment #4:** Results of January 2005 Visioning Public Workshops

Full results from the workshops can be found in the report: “I-84 Corridor Strategy – Public Involvement and Community Outreach Summary Report – March 2005”

The below represents a sampling of the most frequently stated words and phrases from the January public workshops. It lists the phrase’s ranking and the number of times it was mentioned. This ranking clearly demonstrates the importance to the public of the river and views in the CRGNSA. In addition, it demonstrates that barriers are a visible feature in the Gorge and correspondingly deserving of special design treatment.

1. River (188)
3. View/Viewpoint/Viewshed (152)
12. Barrier(s) (67)

The collection of Common Messages and Themes from the first round of public input further demonstrates the importance of viewing the river and minimizing the visual impact of highway structures, particularly barriers:

**Preservation and Design Considerations**

- Provide and enhance views:
  - River, waterfalls, and Bridge of the Gods
  - Consider see-through guardrails and barriers
  - Diminish the visual impact of fences, power lines, and railroad
- The highway and features should blend with the natural landscape
  - Use natural materials (rock)
  - Emphasize the landscape more than structures

**Diverse Perspectives**

- What can be done to provide views and accommodate safety? (Median and side barriers block views, but also shield headlight glare and control vehicles.)

## Appendix C: DESIGN EXCEPTION REQUEST AND SUPPORT FOR THE CIP MEDIAN BARRIER

The Visual Preference “Dot” Exercise also presents an image of median barrier blocking the view towards the river among those receiving the most red (negative impression) dots.

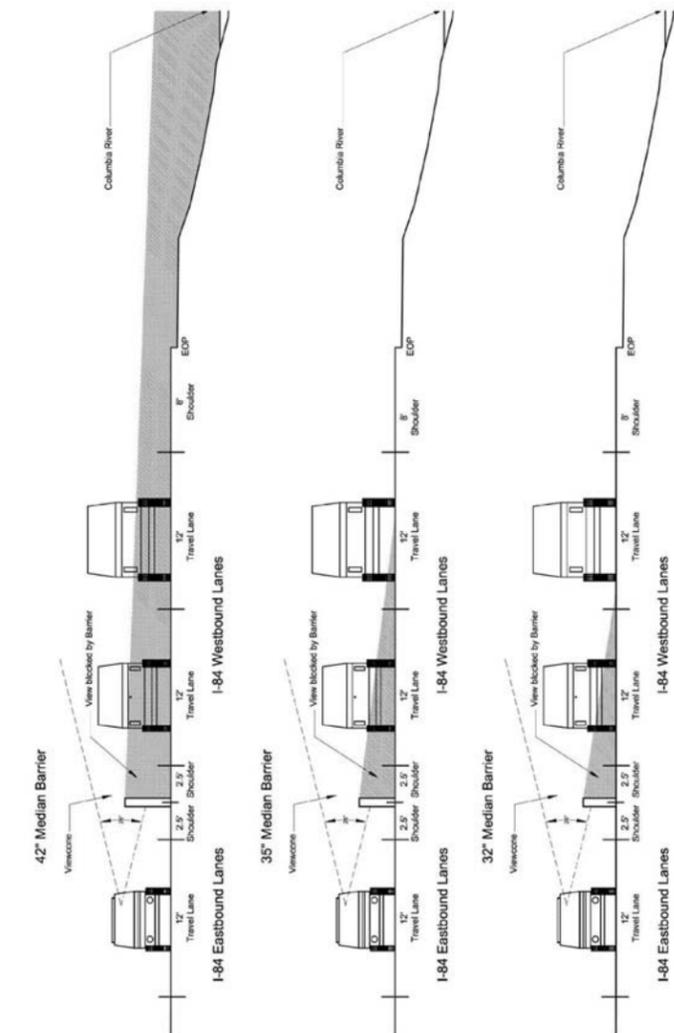
Milepost 59 – 42” Tall Median Barrier



Excerpted individual comments regarding the visual impacts of barriers (full comments can be found in the Summary Report):

- Guardrail that blends – allows travelers to see the river
- Good vegetation management/preserve views to hill/river – more openness
- Views from highway less obstructed
- No median barriers; barriers = separation
- Openness to the river would be nice. Somewhat unobstructed, both from a roadway standpoint (barriers) and vegetation. Open barriers or even no barriers. More clear.
- See the river and cliffs, don't notice the roadway.
- Views from roads are opened up.
- Better views of river from I-84
- Etc.

Attachment #5: Visual Impact Study of different median barrier heights



Visual Impact of Solid Median Barrier: Compact Car  
(Height of Driver's Eye: 3'-9")

Milepost 58 – 32" Median Barrier from inner lane



Milepost 66.5 – 32" Median Barrier from outer lane



Milepost 58 – Simulated 35" Median Barrier from inner lane



Milepost 66.5 – Simulated 35" Median Barrier from outer lane



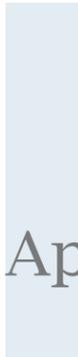
Appendix C: DESIGN EXCEPTION REQUEST AND SUPPORT FOR THE CIP MEDIAN BARRIER

Milepost 58 – Simulated 42” Median Barrier from inner lane



Milepost 66.5 – Simulated 42” Median Barrier from outer lane





## Appendix D: Bridge Replacement Locations

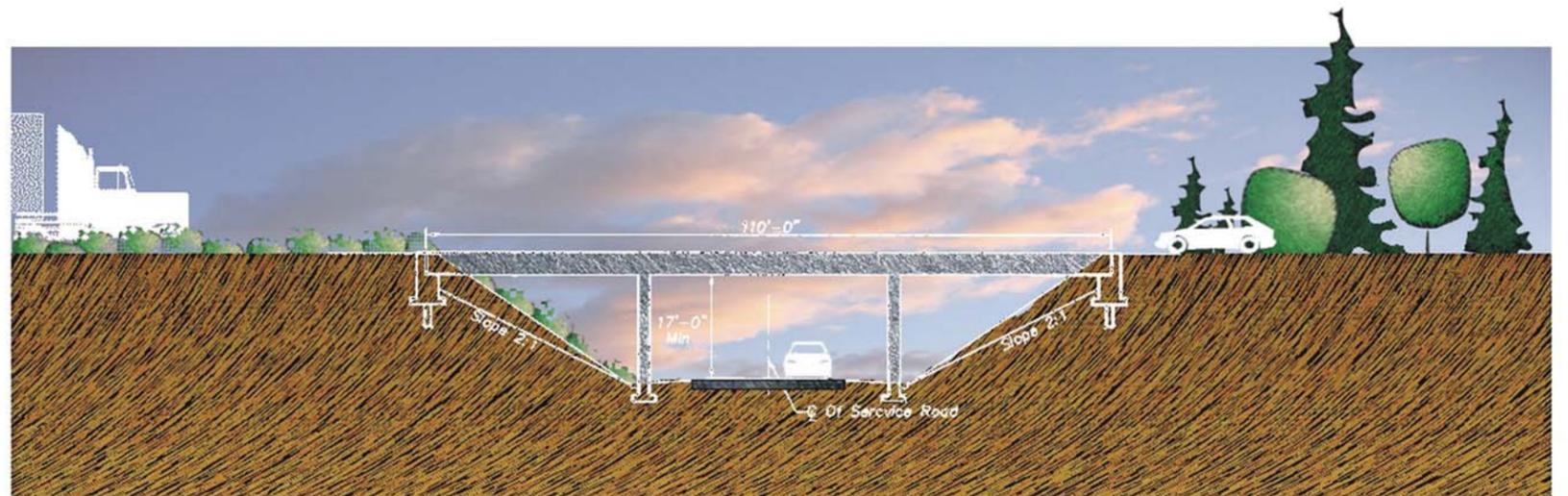
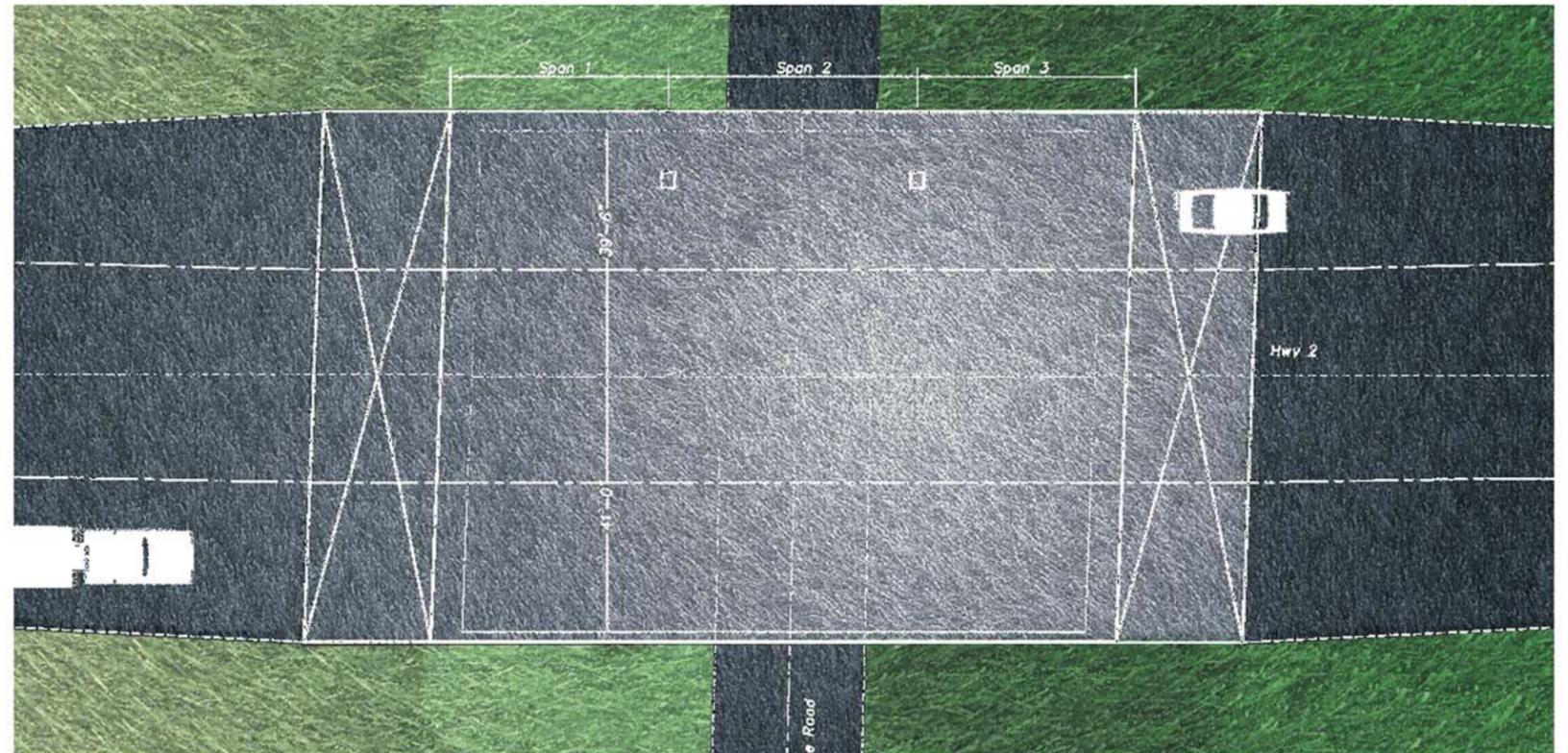
## Appendix D: BRIDGE REPLACEMENT LOCATIONS

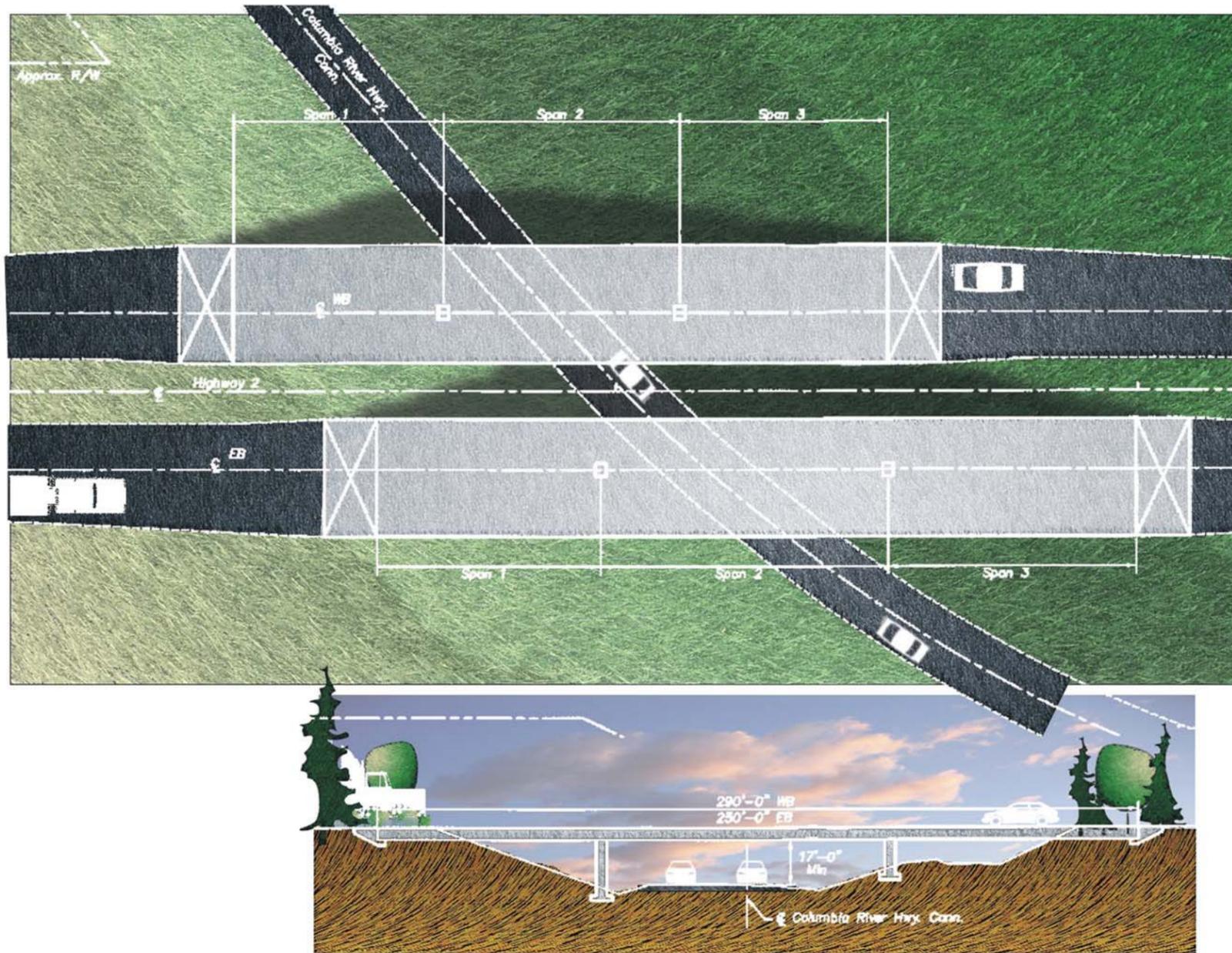
### Introduction

This appendix includes a plan, cross section, and existing condition photo for mainline Interstate 84 bridges in the Columbia River Gorge National Scenic Area (CRGNSA) to be replaced as part of the OTIA III program. Bridges listed are based on data available as of August 1, 2005.

The bridge layouts shown in this appendix are taken from the appropriate Bridge Engineering Baseline Reports, prepared by W&H Pacific, with various report dates. The layouts, structure depths, etc. are subject to change as bridge design proceeds. Each bridge sheet includes a recommendation for bridge style.

### Hood River Exit 64 – Cascadian Style recommended



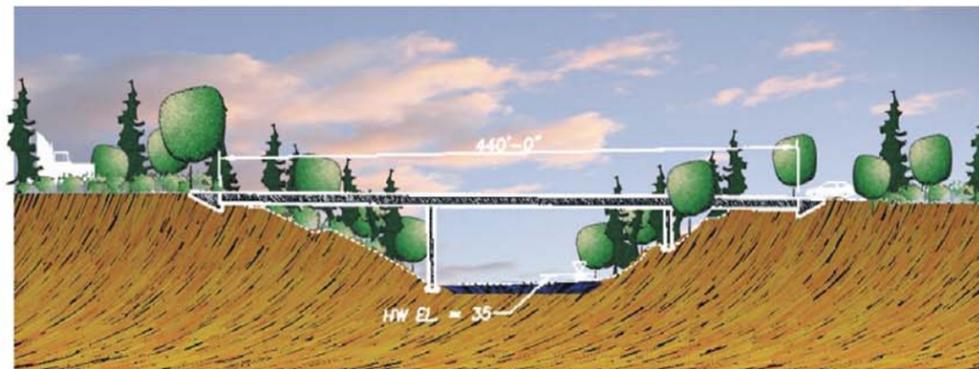
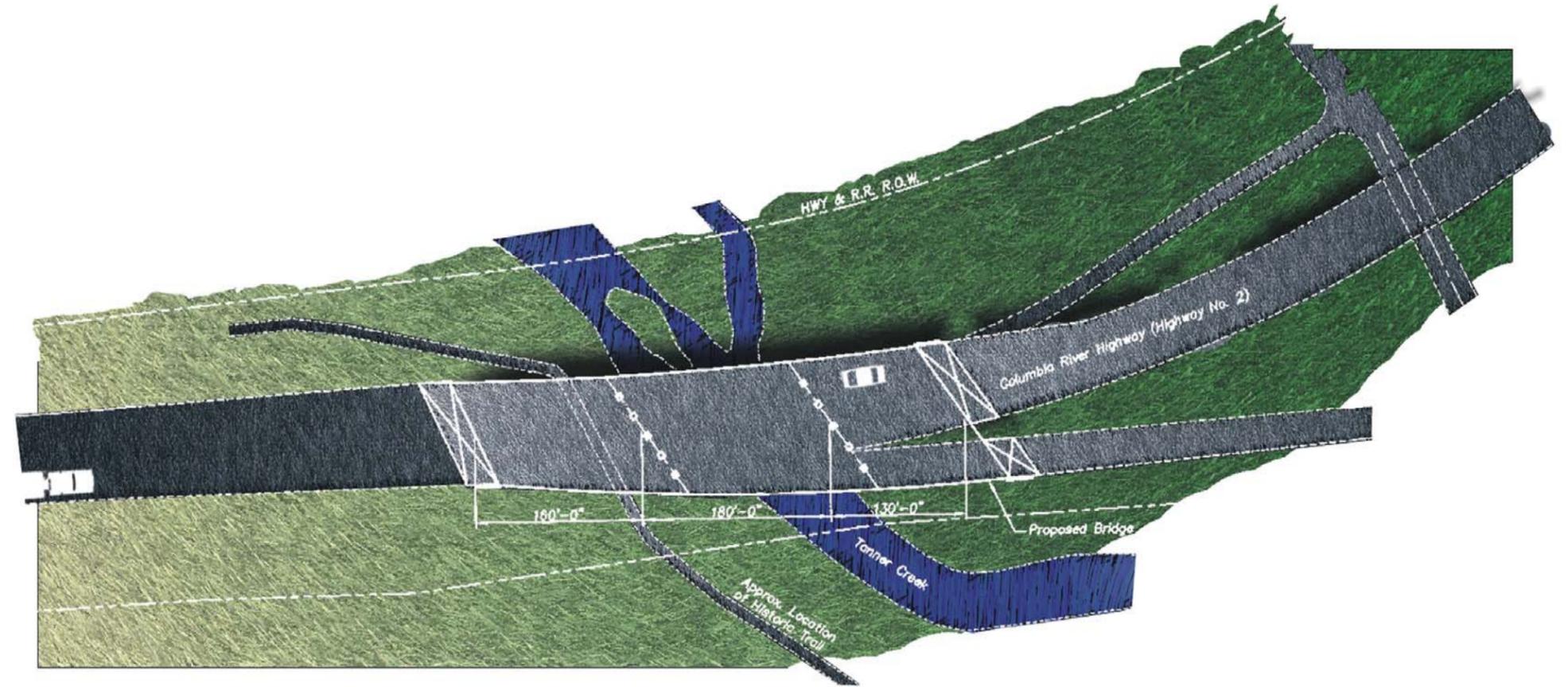


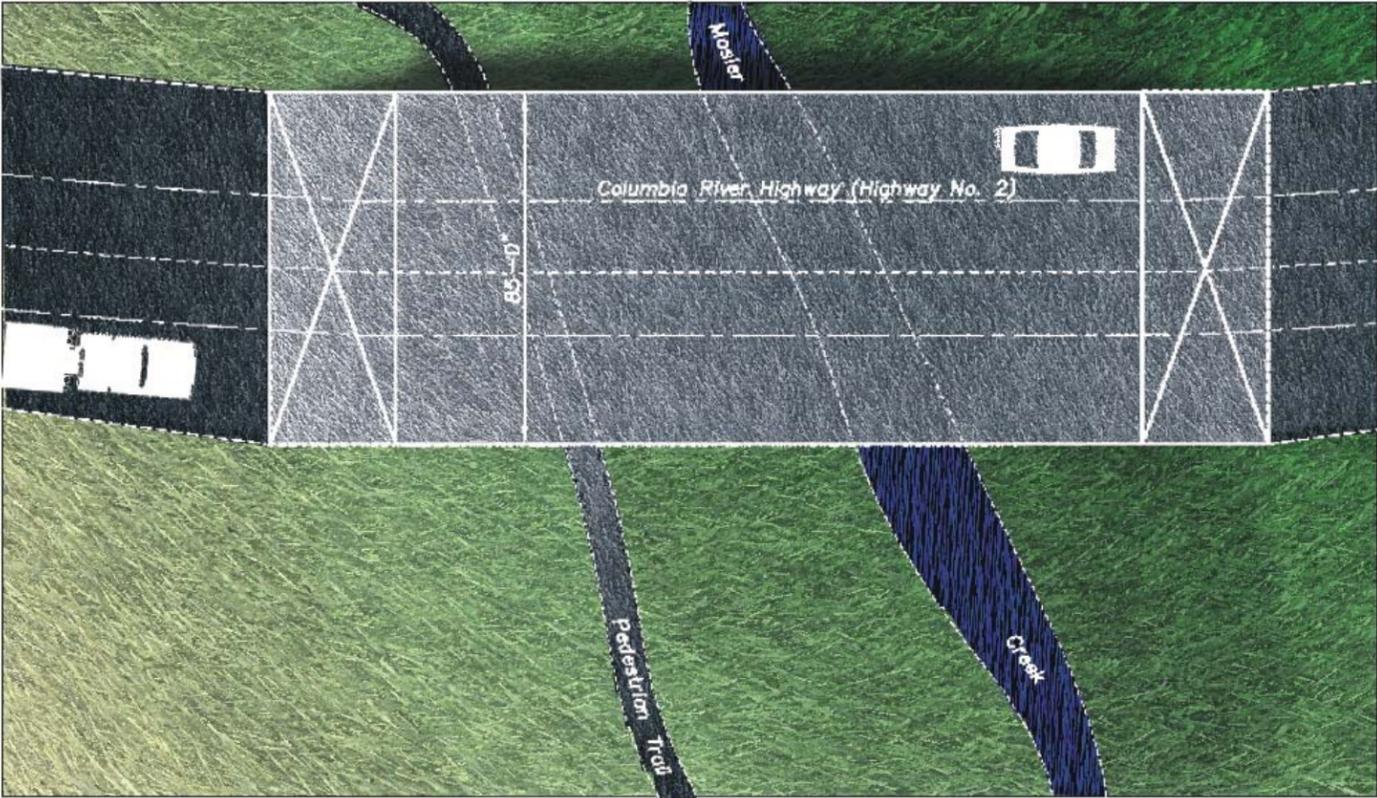
Highway 100 in Cascade Locks – Cascadian Style recommended



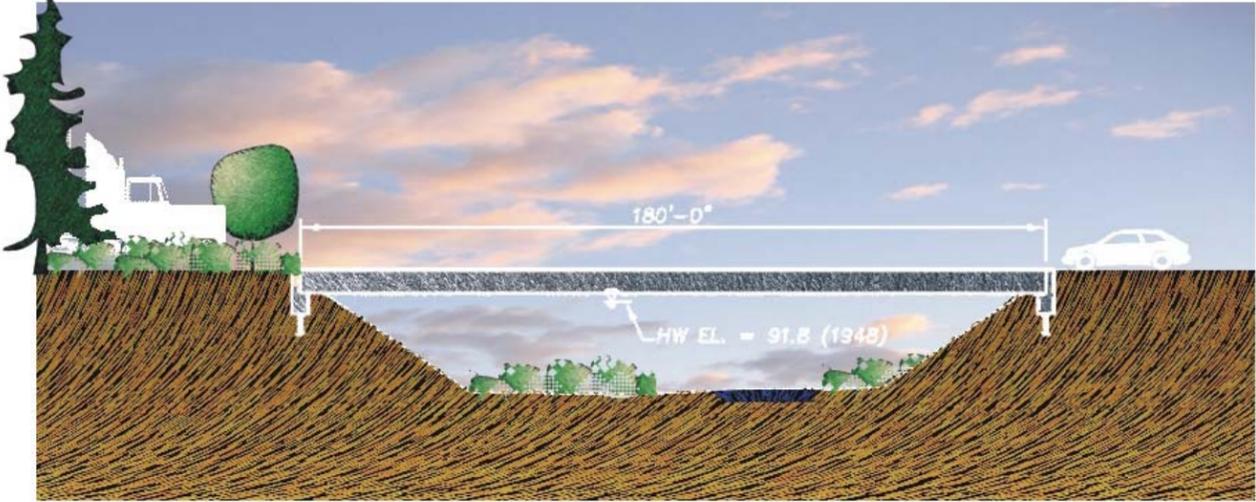
Appendix D: BRIDGE REPLACEMENT LOCATIONS

**Tanner Creek Bridge –  
Cascadian Style recommended**





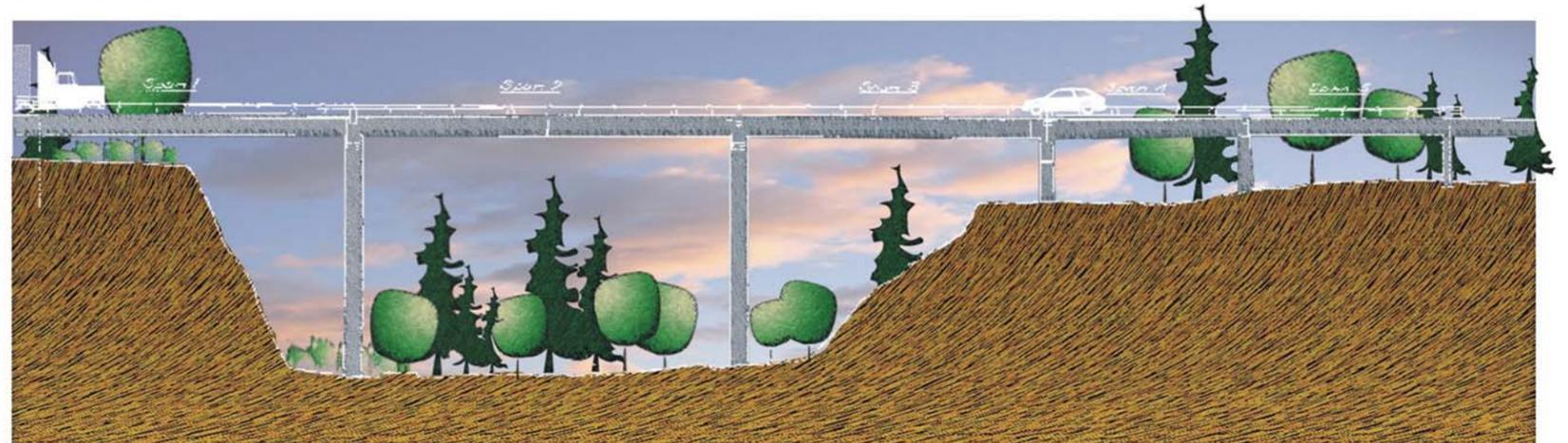
**Mosier Creek Bridge –  
Cascadian Style recommended**

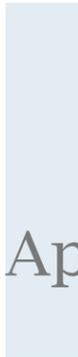


Appendix D: BRIDGE REPLACEMENT LOCATIONS



**15 Mile Creek Bridge –  
Cascadian Style recommended**





## Appendix E: Other Recommended Actions

## Potential Projects to Implement the I-84 Corridor Strategy

The following potential projects have been identified through the process of developing the I-84 Corridor Strategy. The suggestions from stakeholders and members of the public represent possible studies and actions that would implement the vision developed under the I-84 Corridor Strategy. This is not an exhaustive list and the potential projects are not represented in any priority order.

- Evaluate options to reconfigure selected interchanges including:
    - › Jordan Road
    - › Multnomah Falls
  - Create a Vegetation Management Master Plan for the entire CRGNSA
  - Implement suggestions of the I-84 Corridor Strategy with relation to Vegetation Management such as:
    - › Thin trees for forest health, habitat preservation, and opening of views
    - › Remove invasive plants using Integrated Vegetation Management practices
  - Evaluate and implement mitigation measures for wildlife crossings
    - › Locate, design, and construct under-crossings for both small and large animals
    - › Evaluate and implement vegetation management relative to wildlife crossing objectives
  - Identify feasible and preferred locations for viewpoints and/or rest areas
  - Evaluate the possibility of placing a rest area at Wyeth, including viewpoint and recreation north of Union Pacific Railroad (UPRR)
- Signing
    - › Create and install new signs that identify major stream crossings
    - › Create and install gateway signs at each end of the CRGNSA
  - Color-treat weigh-in-motion poles at Cascade Locks
  - Evaluate redesigning and screening the Wyeth weigh station