Appendix H:

Threatened, Endangered, and Other Species of Concern List

Appendix H: Threatened, Endangered, and Other Species of Concern Lists

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN WESTERN WASHINGTON AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised October 8, 2004)

SAN JUAN COUNTY

LISTED

Wintering bald eagles (*Haliaeetus leucocephalus*) occur in the county from about October 31 through March 31.

There are two bald eagle communal winter night roosts located in the county.

There are nine bald eagle wintering concentrations located in the county in the following areas: East Lopez Island-South Decatur Island; South Lopez Island-SE San Juan Island; Blakely Island; San Juan Island; Henry Island; Orcas Island-Lummi Island; Orcas Island NW; Orcas-Shaw-Lopez Islands; Waldron Island.

There are 122 bald eagle nesting territories located in the county. Nesting activities occur from about January 1 through August 15.

Bull trout (*Salvelinus confluentus*) may occur in the marine waters adjacent to the county.

Marbled murrelets (*Brachyramphus marmoratus*) may occur in the marine waters adjacent to the county.

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.
3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Arenaria paludicola (marsh sandwort) may occur in the county.

Castilleja levisecta (golden paintbrush) occurs in the county.

Major concerns that should be addressed in a biological assessment of this listed plant species

include:

1. Distribution of taxon in project vicinity.
2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.
3. Changes in hydrology where taxon is found.

DESIGNATED

None

PROPOSED

None

CANDIDATE

Whulge (Edith's) checkerspot (*Euphydryas editha taylori*)

SPECIES OF CONCERN

Island large marble butterfly (*Euchloe ausonides insulanus*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Emys* (= *Clemmys*) *marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Oregon vesper sparrow (*Pooecetes gramineus affinis*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Western toad (*Bufo boreas*)

Washington Natural Heritage Information System
List of Known Occurrences of Rare Plants in Washington
September 2004
San Juan County

A key to status fields appears below. If a scientific name is underlined you may click on it to go to a field guide page (html or pdf format) for that taxon.

Scientific Name	Common Name	State Status	Federal Status	Historic Record
Arenaria paludicola	Swamp Sandwort	X	LE	
Aster borealis	Rush Aster	T		
Aster sibiricus var. meritus	Arctic Aster	S		
Carex pauciflora	Few-flowered Sedge	S		
Castilleja levisecta	Golden Paintbrush	E	LT	
Crassula connata	Erect Pygmy-weed	T		
Isoetes nuttallii	Nuttall's Quillwort	S		
Lepidium oxycarpum	Sharpfruited Peppergrass	T		
Liparis loeselii	Twayblade	E		
Lobelia dortmanna	Water Lobelia	T		
Meconella oregana	White Meconella	T	SC	
Microseris bigelovii	Coast Microseris	X		
Ophioglossum pusillum	Adder's-tongue	T		
Orthocarpus bracteosus	Rosy Owl-clover	E		H
Oxytropis campestris var. gracilis	Slender Crazyweed	S		
Potamogeton obtusifolius	Blunt-leaved Pondweed	S		
Puccinellia nutkaensis	Alaska Alkaligrass	S		H
Ranunculus californicus	California Buttercup	T		
Utricularia minor	Lesser Bladderwort	R1		

Description of Codes

Historic Record:

H indicates most recent sighting in the county is before 1977.

State Status

State Status of plant species is determined by the Washington Natural Heritage Program. Factors considered include abundance, occurrence patterns, vulnerability, threats, existing protection, and taxonomic distinctness.
Values include:
E = Endangered. In danger of becoming extinct or extirpated from Washington.
T = Threatened. Likely to become Endangered in Washington.
S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state.
X = Possibly extinct or Extirpated from Washington.
R1 = Review group 1. Of potential concern but needs more field work to assign another rank.
R2 = Review group 2. Of potential concern but with unresolved taxonomic questions.

Federal Status

Federal Status under the U.S. Endangered Species Act(USESA) as published in the Federal Register:
LE = Listed Endangered. In danger of extinction.
LT = Listed Threatened. Likely to become endangered.
PE = Proposed Endangered.
PT = Proposed Threatened.
C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.
SC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but insufficient information to support listing.
NL = Not Listed. Used when two portions of a taxon have different federal status.

Appendix I:

Assessment of Potential Sources of Toxic Substances

Appendix I: Assessment of Potential Sources of Toxic Substances

Preliminary Assessment of Potential Sources of Toxic Substances in the Deer Harbor Estuary Study Area

Introduction

Pursuant to the scope of Interagency Committee for Outdoor Recreation (IAC) Project No. 02-1577N, a preliminary assessment of potential sources of toxic and hazardous materials that may potentially affect the natural environment of the Deer Harbor Estuary study area was completed. The geographical area covered by this assessment consists of the area within the Deer Harbor watershed lying between Cormorant Bay Road in the north to the Deer Harbor village center in the south. This area is larger than the Deer Harbor Estuary study area identified in the *Environmental Assessment and Feasibility Study Report*, reflecting the potential for toxic materials moving in surface and groundwater to impact down-gradient areas.

The general approach for this assessment was based on the methodology for "Level 1 Environmental Site Assessments" specified in the American Society for Testing and Materials (ASTM) Standard Practice No. E 1527-00. The scope of the assessment included the following tasks:

- A review of historical documentation of the study area, including maps, aerial photos, and historical records;
- A review of federal and state regulatory agency files concerning releases of contaminants or potential sources of contaminants;
- Interviews with regulatory agency officials;
- An opinion regarding potential local sources of toxic contamination provided by a long-term local resident; and
- Site visits by project team members to make visual observations of potential contamination sources in the study area.

The results of the assessment are presented below.

Historical Documentation

Research by the Center for the Study of Coast Salish Environment (2002) identified two industrial facilities that formerly operated in the assessment area. The Great Northern Fisheries Company operated a salmon cannery near the present-day location of the Cayou Quay Marina from the late 1800s to the early 1900s. A sawmill operated from 1943 to the 1960s on the east shore of the inner harbor, just downstream of the lagoon outlet. No information was found regarding potential releases of toxic material from these historical facilities.

Review of Regulatory Agency Files

Selected regulatory agencies files were searched for documentation of potential releases of toxic materials or potential sources of toxic materials within approximately one half mile of the Deer Harbor Estuary study area. The record search included review of the U.S. Environmental Protection Agency's "Comprehensive Environmental Response, Compensation, and Liability Information System" (CERCLIS) database and the Washington Department of Ecology's (WDOE) "Confirmed and Suspected Contamination Sites List" (CSCS List).

As of April 25, 2005, neither US EPA's CERCLIS nor WDOE's CSCS List contained any records of confirmed or suspected releases of hazardous or toxic materials within the assessment area.

Interviews with Regulatory Agency Officials

The project team interviewed Mr. Michael Spencer, an official with WDOE's Toxics Cleanup Program, regarding a site within the assessment area that had formerly been listed on WDOE's CSCS List. Mr. Spencer provided a copy of a technical report that documented WDOE's "Determination of No Further Action" for the site under the Washington Model Toxics Control Act (MTCA) regulations, WAC 173-340-310(5)(d)(i). (WDOE, 2005). The report concluded that although four priority pollutant metals were detected in a soil sample from the site at concentrations exceeding the MTCA Method A Cleanup Levels in 1996, no metals were detected in excess of the MTCA soil standards in a subsequent sampling event in 2004. WDOE concluded that because of the effectiveness of voluntary site cleanup activities and improvements in waste management at the site, the site posed no significant threat to health or the environment.

Opinion of Local Resident Regarding Contamination Sources

A Deer Harbor resident wrote an email to the project team describing potential sources of toxic materials that may impact sediment and water in Deer Harbor and Cayou Valley Lagoon (Anonymous, 2005). The resident gave the opinion that two local marinas were sources of petroleum contamination due to boat fueling and bilge pumping as well as sources of toxic metal contamination due to scrubbing of anti-fowling boat hull paint. The resident also identified stormwater runoff from a construction yard located near the west tributary of Cayou Valley Lagoon as another potential source of toxic contamination. The project team did not attempt to independently investigate the resident's claims. This report makes no opinion regarding the validity of the claims.

Visual Observations by the Project Team

Project team members made visual observations of the study area (i.e. Cayou Valley Lagoon and Inner Harbor) to identify potential sources of toxic materials that may be present. The only noteworthy field observations were the presence of several old creosote-treated timbers that have accumulated above the mean tide level at the north end

of Cayou Valley Lagoon and the presence of creosote-treated pilings in the lagoon outlet at the Channel Road Bridge.

A local environmental advocacy group "Restoring the Ecosystem of Deer Harbor" (REED) has contacted the Washington Department of Natural Resources (WDNR) regarding participating in WDNR and the Northwest Straights Commission's "regional creosote project" to collect and dispose of the timbers at an approved offsite location (WDNR, 2005). To date, the project team knows of no definite plans for removing the timbers or for replacing the creosote-treated bridge pilings.

Conclusions and Limitations

Based on the investigations conducted for this Level 1 assessment, the primary known source of potential toxic contamination in the study area appears to be creosote-treated drift logs and creosote-treated bridge pilings. While the presence of past and present industrial and commercial activities in the vicinity may be associated with the potential for releases of petroleum products and priority pollutant metals into the soil, water, and sediment, no documentation was found to indicate that such releases have significantly impacted the Deer Harbor environment. Likewise, no direct sampling of water, soil, or sediment was conducted in this assessment to test for the presence of toxic substances.

The conclusions in this assessment are based solely on the information described above. The project team does not guarantee the validity of the information or assume responsibility for the identification of sources of toxic contamination that may or may not be present in the assessment area. This assessment is not intended as a legal opinion but as a presentation of the information from the sources described herein.

Appendix J:

Planning Level
Cost Estimates for Restoration Measures

Appendix J: Planning Level Cost Estimates for Restoration Measures

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Removal of Rock Sill and Replacement of Existing Bridge
By: T. Slocum **Date:** 4/11/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Land Acquistion						
Land acquisition	acre	$10,000	2.0	$20,000		Note 1
Transaction costs	lump sum	$10,000	1	$10,000		
Subtotal				$30,000		
2. Construction and Implementation						
Improvements to traffic detour route	l.s.	$20,000	1	$20,000		Note 2
Demolition of existing bridge	l.s.	$20,000	1	$20,000		
Earthwork - removal of riprap	CY	$20	200	$4,000		Note 3
Disposal of rock	CY	$5	200	$1,000		
Bridge	SF	$175	1450	$253,750		Note 4
Landscaping and site restoration	l.s.	$10,000	1.00	$10,000		
Subtotal				$308,750		
Construction mobilization/demobilization		10%		$30,875		
Dewatering and TESC		15%		$46,313		Note 5
Traffic control		15%		$46,313		
Contingency		15%		$46,313		
Subtotal				$169,813		
add sales tax		7.9%		$516,369		
3. Engineering and Management						
Engineering		20%		$103,274		
Construction management		10%		$51,637		
Permitting		5%		$25,818		
Subtotal				$180,729		
Total Estimated Project Cost:				**$727,098**		

Notes

1. Assumes purchase of temporary or permanent 2200' x 40' ROW on Potlatch Dr and Lagoon Rd to allow detoured traffic access during bridge construction.
2. Complete minimum necessary grading and widening of one lane traffic detour along Potlatch Drive, Lagoon Rd.
3. Removal of rip rap to be done by small excavator operating from a barge. Riprap disposed (or re-used) offsite
4. Assume installation of a 50' x 29' clear span concrete bridge. Unit cost based on Snohomish Co. 2002 unit costs.
5. Extensive dewatering and sediment controls to minimize impacts to estuary ecology

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Remove Fill to Restore 80-foot wide Channel and Construct New 90-foot Bridge
By: T. Slocum **Date:** 4/11/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Land Acquistion						
Land acquisition	acre	$10,000	2.0	$20,000		Note 1
Transaction costs	lump sum	$10,000	1	$10,000		
Subtotal				$30,000		
2. Construction and Implementation						
Improvements to traffic detour route	l.s.	$20,000	1	$20,000		Note 2
Demolition of existing bridge	l.s.	$20,000	1	$20,000		
Earthwork - removal of riprap and fill	CY	$20	940	$18,800		Note 3
Disposal of rock and fill	CY	$5	940	$4,700		
Bridge	SF	$175	2610	$456,750		Note 4
Landscaping and site restoration	l.s.	$10,000	1.00	$10,000		
Subtotal				$530,250		
Construction mobilization/demobilization		10%		$53,025		
Dewatering and TESC		15%		$79,538		Note 5
Traffic control		15%		$79,538		
Contingency		15%		$79,538		
Subtotal				$291,638		
add sales tax		7.9%		$886,817		
3. Engineering and Management						
Engineering		20%		$177,363		
Construction management		10%		$88,682		
Permitting		5%		$44,341		
Subtotal				$310,386		

Total Estimated Project Cost: $1,227,202

Notes

1. Assumes purchase of temporary or permanent 2200' x 40' ROW on Potlatch Dr and Lagoon Rd to allow detoured traffic access during bridge construction.
2. Complete minimum necessary grading and widening of one lane traffic detour along Potlatch Drive, Lagoon Rd.
3. Removal of rip rap to be done by small excavator operating from a barge. Riprap and fill disposed / reused offsite
4. Assume installation of a 90' x 29' concrete bridge with one set of center piers. Unit cost based on Snohomish Co. 2002 unit costs.
5. Extensive dewatering and sediment controls to minimize impacts to estuary ecology

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Remove Fill to Restore 120-foot wide Channel and Construct New 120-foot Bridge
By: T. Slocum **Date:** 4/11/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Land Acquistion						
Land acquisition	acre	$10,000	2.0	$20,000		Note 1
Transaction costs	lump sum	$10,000	1	$10,000		
Subtotal				$30,000		
2. Construction and Implementation						
Improvements to traffic detour route	l.s.	$20,000	1	$20,000		Note 2
Demolition of existing bridge	l.s.	$20,000	1	$20,000		
Earthwork - removal of riprap and fill	CY	$20	1300	$26,000		Note 3
Disposal of rock and fill	CY	$5	1300	$6,500		
Bridge	SF	$175	3480	$609,000		Note 4
Landscaping and site restoration	l.s.	$10,000	1.00	$10,000		
Subtotal				$691,500		
Construction mobilization/demobilization		10%		$69,150		
Dewatering and TESC		15%		$103,725		Note 5
Traffic control		10%		$69,150		
Contingency		15%		$103,725		
Subtotal				$345,750		
add sales tax		7.9%		$1,119,193		
3. Engineering and Management						
Engineering		20%		$223,839		
Construction management		10%		$111,919		
Permitting		5%		$55,960		
Subtotal				$391,717		

Total Estimated Project Cost: $1,540,910

Notes

1. Assumes purchase of temporary or permanent 2200' x 40' ROW on Potlatch Dr and Lagoon Rd to allow detoured traffic access during bridge construction.
2. Complete minimum necessary grading and widening of one lane traffic detour along Potlatch Drive, Lagoon Rd.
3. Removal of rip rap to be done by small excavator operating from a barge. Riprap and fill disposed or reused offsite.
4. Assume installation of a 120' x 29' concrete bridge supported by two sets of piers, unit cost based on Snohomish Co. 2002 Unit costs.
5. Extensive dewatering and sediment controls to minimize impacts to estuary ecology and oyster beds

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Dredge Approx. 1800 LF of Distributory Channels in Cayou Valley Lagoon
By: T. Slocum **Date:** 2/2/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Property Interest Acquistion						
Land acquisition	acre	$10,000	0.5	$5,000		Note 1
Transaction costs	lump sum	$6,000	1	$6,000		
Subtotal				$11,000		
2. Construction and Implementation						
Dredging of new channels	CY	$20	2000	$40,000		Note 2
Disposal of dredge spoils	CY	$5	2000	$10,000		
Subtotal				$50,000		
Construction mobilization/demobilization		20%		$10,000		
TESC / Water quality BMPs		20%		$10,000		Note 3
Traffic control		5%		$2,500		Note 4
Contingency		20%		$10,000		
Subtotal				$32,500		
add sales tax		7.9%		$89,018		
3. Engineering and Management						
Engineering		25%		$22,254		
Construction management		10%		$8,902		
Permitting		15%		$13,353		
Subtotal				$44,509		
Total Estimated Project Cost:				**$144,526**		

Notes

1. Assumes land agreement negotiated for offsite disposal of dredge spoils
2. Dredging to be done by a small dragline or excavator operating from a barge
3. Extensive sediment and water quality protection controls to minimize impacts to estuary ecology and oyster beds
4. Minor traffic control during mobilization and demobilization of barge and trucking of dredge spoils offsite

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Construct Grade Controls and Fish Passage at Fish Trap Creek Headcut
By: T. Slocum **Date:** 2/2/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Property Interest Acquistion						
Land acquisition	acre	$10,000	0.0	$0		Note 1
Transaction costs	lump sum	$6,000	0	$0		
Subtotal				$0		
2. Construction and Implementation						
Site clearing / access	acre	$5,000	0.25	$1,250		
Excavation and earthwork	CY	$20	100	$2,000		
Rock and/or LWD grade controls, placed	ea	$1,000	7	$7,000		
Gravel for channel restoration, placed	CY	$20	100	$2,000		
LWD for channel restoration, placed	ea	$300	10	$3,000		
Landscaping and site restoration	acre	$5,000	0.25	$1,250		
Subtotal				$16,500		
Construction mobilization / demob.		15%		$2,475		
TESC / Water quality BMPs		5%		$825		Note 2
Traffic control		0%		$0		
Contingency		20%		$3,300		
Subtotal				$6,600		
add sales tax		7.9%		$24,925		
3. Engineering and Management						
Engineering		25%		$6,231		
Construction management		20%		$4,985		
Permitting		15%		$3,739		
Subtotal				$14,955		
Total Estimated Project Cost:				**$39,880**		

Notes

1. Assumes land owner allows work at no cost
2. Work will be done in the summer while the creek is dry, so TESC/BMPs will be minimal

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Construct Grade Controls / Fish Passage at Fish Trap Creek Headcut and West Creek Dam
By: T. Slocum **Date:** 2/2/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Property Interest Acquistion						
Land acquisition	acre	$10,000	0.0	$0		Note 1
Transaction costs	lump sum	$6,000	0	$0		
Subtotal				$0		
2. Construction and Implementation						
Site clearing / access	acre	$5,000	0.4	$2,000		
Excavation and earthwork	CY	$20	130	$2,600		
Rock and/or LWD grade controls, placed	ea	$1,000	10	$10,000		
Concrete V-notch weir fishway, placed	LF	$400	25	$10,000		
Gravel for channel restoration, placed	CY	$20	110	$2,200		
LWD for channel restoration, placed	ea	$300	12	$3,600		
Landscaping and site restoration	acre	$5,000	0.4	$2,000		
Subtotal				$32,400		
Construction mobilization / demob.		15%		$4,860		
TESC / Water quality BMPs		5%		$1,620		Note 2
Traffic control		0%		$0		
Contingency		20%		$6,480		
Subtotal				$12,960		
add sales tax		7.9%		$48,943		
3. Engineering and Management						
Engineering		25%		$12,236		
Construction management		20%		$9,789		
Permitting		15%		$7,342		
Subtotal				$29,366		
Total Estimated Project Cost:				**$78,310**		

Notes

1. Assumes land owner allows work at no cost
2. Work will be done in the summer while the creek is dry, so TESC/BMPs will be minimal

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Plant Tree and Shrub Buffer along Western Shoreline of the Lagoon
By: T. Slocum **Date:** 2/2/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Property Interest Acquistion						
Land use agreement	acre	$2,000	1.2	$2,400		Note 1
Transaction costs	lump sum	$5,000	1	$5,000		
Subtotal				$7,400		
2. Construction and Implementation						
Site preparation	acre	$2,000	1.1	$2,200		
Native trees and shrubs, planted	acre	$5,000	1.1	$5,500		Note 2
Subtotal				$7,700		
Construction mobilization / demob.		15%		$1,155		
Contingency		15%		$1,155		
Subtotal				$2,310		
add sales tax		7.9%		$10,801		
3. Project Design and Management						
Planting design and management		25%		$2,700		Note 3
Subtotal				$2,700		
4. Maintenance and Monitoring						
Maintenance of plantings for 5 years	acre	$500	1.1	$2,381		Note 4
Monitoring for 5 years	acre	$300	1.1	$1,429		
Subtotal				$3,810		
Total Estimated Project Cost:				**$24,711**		

Notes

1. Assumes one-time rental payment to landowner. Alternatively, assume landowner enrolls in USDA CREP program and all land costs paid for by US government.
2. Assumes 1000 stems per acre @ $5.00 per stem
3. Assumes planning and management work done by local conservation district staff
4. Uses a present worth discount factor for 5 years at 5% of 4.3295

Deer Harbor Estuary Restoration Feasibility Study
Project Cost Estimate Worksheet

Project: Re-grading and Stabilization of Active Erosion Sources
By: T. Slocum **Date:** 2/2/2005

Item	Units	Unit Cost	No.	Cost		Comment
1. Property Interest Acquistion						
Land acquisition	acre	$10,000	0.2	$2,000		Note 1
Transaction costs	lump sum	$6,000	1	$6,000		
Subtotal				$8,000		
2. Construction and Implementation						
Site clearing / access	acre	$5,000	0.4	$2,000		
Earthwork - regrading banks	CY	$20	325	$6,500		Note 2
Trucking and disposal of excavated soil	CY	$5	325	$1,625		
Landscaping and site restoration	acre	$6,000	0.4	$2,400		Note 3
Subtotal				$8,125		
Construction mobilization/demobilization		20%		$1,625		
TESC / Water quality BMPs		30%		$2,438		Note 3
Traffic control		5%		$406		Note 4
Contingency		20%		$1,625		
Subtotal				$6,094		
add sales tax		7.9%		$15,342		
3. Engineering and Management						
Engineering		30%		$4,603		
Construction management		20%		$3,068		
Permitting		30%		$4,603		
Subtotal				$12,274		
Total Estimated Project Cost:				**$35,616**		

Notes

1. Assumes agreement negotiated for work in existing conservation easement and for offsite disposal of excavated soil
2. Cut banks excavated back to 1:3 slopes using excavator operating from the bank. Soils trucked to upland disposal site
3. Extensive sediment and water quality protection controls to minimize impacts to estuary ecology and oyster beds
4. Minor traffic control during trucking of excavated soils offsite

Appendix K:

Preliminary Assessment of Plant Species and Communities

Appendix K: Assessment of Plant Species in the Study Area

PRELIMINARY ASSESSMENT OF PLANT SPECIES AND COMMUNITIES

DEER HARBOR WATERSHED, ORCAS ISLAND

By: Brenda Beckwith and Fran Spencer, 3. December 2004.

1.0 Introduction

This report assesses the status of plant species and plant communities in three major wetland systems of the Deer Harbor watershed on Orcas Island – Cayou Lagoon, Fishtrap Creek, and three ponds, all on separate properties and named henceforth Julie's Pond, Treacy's Pond, and Helsall's Lake. Reference sites for each wetland system were also surveyed (Table 1.0). It should be emphasized that this is a working document, and should be viewed as the results of limited vegetation surveys. These surveys were conducted September 18 – 21, 2003, and May 17 – 19; June 7 – 9, 2004. More botanical research should continue to be conducted. See appendices for scientific names. Planting recommendations for trees and shrubs are located in Appendix K-1.

Table 1.0 General description of wetland systems described in this report.

Wetland System	Specific Location/Local Name	Reference Site
Lagoon	Cayou Lagoon/Connor property	False Bay, San Juan Island
Creek	Lower Fishtrap (between lagoon and Cormorant Bay Road); Upper Fishtrap (between Cormorant Bay Road and Julie's Pond)	Skull Creek (between shoreline and Deer Harbor Road)
Ponds	Julie's Pond, Helsall's Lake	Treacy's Pond

2.0 Cayou Lagoon

2.1 Description of Wetland System

Many small herbaceous plants border Cayou Lagoon in the tidal areas. For the most part, established trees or shrubs only occur in the drier, transitional areas directly behind the tidal zone. However, there are a few older wetland tree species (e.g., black cottonwood, willow) at the head of the lagoon. It is likely that other woody species were cleared for fields in the past.

The fields surrounding the lagoon are being colonized by a variety of tree and shrub species, both native and exotic. Young black cottonwood and willow are establishing in areas surrounding the pond on the northwest side of the lagoon. Two highly invasive species should be given particular attention: Scotch broom is present in a few areas and Himalayan blackberry dominates some sites near the head of the lagoon.

Over time, changes to the Deer Harbor watershed have altered the quantity and quality of stream-flow, sedimentation, and small organic debris (SOD) entering Cayou Lagoon. These changes would have greatly impacted the biological production and structure of the lagoon. Preliminary studies have indicated that polluted runoff is reaching the east side of the lagoon, the source of which has not been clearly determined. Unusual depressions were observed in this area. Moreover, a quantity of large woody debris (LWD) lies in the mouths of the two creeks at the north end of the lagoon. Some of this debris may be from the Deer Harbor watershed, though much of it has probably washed in. It is possible that some of this LWD could be used in the reconstruction of Lower Fishtrap Creek.

2.2 Stewardship Recommendations

The estuary at False Bay, San Juan Island, was surveyed for reference plant communities and species for Cayou Lagoon. The estuarine and adjacent upland communities at this site appeared to be intact and diverse. Table 2.0 highlights some of the species found at False Bay that have not been identified at Cayou Lagoon, but could be considered suitable species for introduction. It should be noted that the shrubs/small trees and herbaceous species listed in this table are present at the False Bay site because of an established forest or woodland canopy. These plant types should not be considered unless there is a firm commitment to the re-establishment of a tree layer. Precise ecological requirements should be researched before planting. A change in bridge design and construction in the future will likely affect tidal flows and shoreline scouring, and as a result, could impact vegetation on these surrounding flat habitats.

Table 2.0 Recommended plants for Cayou Lagoon based on reference site, False Creek, San Juan Island.

Plant Type	**Plant Name**
Trees	Grand fir, Sitka spruce
Shrubs/Small Trees	Red-flowering current, salmonberry, black twinberry
Herbaceous Species	False Solomon's seal, Pacific sanicle, broad-leaved starflower, sweet-cicely
Aquatic (marine)/Nearshore Species	Seacoast bulrush, Pacific hemlock-parsley, orache, American searocket

The cultural values of Cayou Lagoon include both economic interests and high aesthetic significance. The introduced fruit trees (apple and pear) provide a source of income for the Connor's, and hence, the established trees could be maintained as an orchard. However, new fruit tree recruits should be eradicated as soon as they appear, as these new trees will likely continue to become established in the area. There is a wide range of native fruit trees and shrubs, such as western crabapple, blackcap (black raspberry), red elderberry, currants and gooseberries, serviceberry, and soopalallie (soapberry), that could be introduced and become a future source of income and possibly lead to ecotourism ventures. Ethnobotanically-focused plantings, or the maintenance of native plant species that provide a range of valuable ad sustainable plant parts for food, technology, or for medicine, could easily be explored for this site.

Aesthetic landscape values are also an important consideration for planting recommendations for Cayou Lagoon. At present, the area is largely open with excellent views of the lagoon for neighboring residents. For the most part, it is the composition and distribution, and not the abundance or extent, of large woody species surrounding the lagoon that should change. Introduced plant species, including some of the large fruit trees that are not regularly harvested should be removed and replaced with native species. There are many stands of young, highly invasive Douglas-fir trees which could be thinned or removed, and replaced with a more diverse assortment of conifer and broadleaf species. New plantings could be aggregated into clumps, and in some cases, young Douglas-firs, or other species already on site, could be relocated to new locations. Focusing on a clustered pattern during planting would greatly improve habitat value for wildlife in the area, while maintaining the aesthetic significance of the site. If large trees are removed, the trunks should be left as potential wildlife trees (i.e. snags). Native woody plants which are shorter in stature, or clustered small trees, should be introduced to the transitional area between the tidal zone and upland habitats. These plantings would help armor the lagoon banks and increase SOD inputs to the lagoon, thereby enhancing its productivity.

Scotch broom and Himalayan blackberry should be removed and maintained at low levels, if not completely eradicated from the site. Other exotic species that should receive immediate attention are evergreen blackberry, English hawthorn, English holly, and all fruit trees that do not have current economic value. Many introduced herbaceous plant species (i.e. grasses) are ubiquitous across the area. Some species, however, which are more easily identified and less abundant, could receive consistent attention through simple hand removal. These plant species include chicory, oxeye daisy, dandelion, prostrate knotweed, Queen Anne's lace, tansy ragwort, and Canada thistle.

3.0 Fishtrap Creek

3.1 Description of Wetland System

Fishtrap Creek was surveyed in two sections: the section above Cormorant Bay Road to Julie's Pond, with some additional observations between Julie's Pond and Helsall's Lake; and the section below the road to Cayou Lagoon. The upper section of the creek ("upper Fishtrap") is much more intact than the section below the road ("lower Fishtrap"): the upper Fishtrap recorded 71 species of vascular plants, while only 7 species were recorded in lower Fishtrap. It should be mentioned that many of the introduced agronomic graminoids (grass-like plants) and weeds were likely not recorded in the surveys of the lower section, and the site was only visited briefly on one day. Upper Fishtrap is much closer in plant species composition to Skull Creek (74 species), the reference site (Table 3.0). Hence, both Skull Creek and upper Fishtrap could serve, at least in part, as reference sites for lower Fishtrap.

Although comparisons between upper Fishtrap and Skull Creek can provide some important ecological insights, the two creeks differ in two primary ways. The section of Skull Creek surveyed is in second-growth Douglas-fir forest within the first few hundred meters of the shoreline. Skull Creek was surveyed from its mouth at the shoreline to Deer Harbor Road. Skull Creek has a more open canopy and sub-canopy, and hence, maintains a more diverse

complement of native herbaceous plant species, some of which were not found at upper Fishtrap (e.g., large-leaved avens, small-flowered forget-me-not, yerba buena). There were also two aquatic species (skunk cabbage and small-flowered bulrush) recorded at Skull Creek but not at upper Fishtrap. Himalayan blackberry was the only exotic woody plant species found at Skull Creek.

Table 3.0 Species comparison between upper Fishtrap Creek and its reference site, Skull Creek.

Species Type	Upper Fishtrap	Skull Creek
Native		
Trees	6	7
Shrubs/Small trees	15	14
Herbs/grasses/ferns	24	27
Aquatics	4	6
Introduced		
Trees	1	0
Shrubs/Small trees	4	1
Herbs/grasses/ferns	16	19
Total Plant Species	***70***	***74***

Upper Fishtrap is at a higher elevation and predominantly represents a narrow zone of dense riparian vegetation with adjacent ecosystems consisting of mixed forest communities and open areas (i.e. cleared land or rocky outcrop). The influence from the nearby agricultural lands is clearly represented in the herbaceous flora (e.g., barren brome, velvet grass, dovefoot geranium, English plantain, sheep sorrel, and spring vetch). Upper Fishtrap has a large complex of shrubs and small trees including the exotic invasive species evergreen and Himalayan blackberry, English hawthorn, and English holly.

Lower Fishtrap is essentially a shallow ditch with no real stream channel. The creek has clearly been diverted and ditched to accommodate the expansion of the surrounding agricultural land. There is a stand of fairly intact vegetation closer to the mouth of the creek (at Cayou Lagoon, as described in next section), however, this vegetation community ends after about 30 m and the remainder of lower Fishtrap is, for the most part, a tangle of shrubs. Himalayan blackberry and Scotch broom have been recorded; the blackberry is currently much more widespread than the broom. The native shrubs Nootka rose and snowberry have invasive growth patterns and are contributing to the dense thickets present on this section of Fishtrap Creek.

3.2 Stewardship Recommendations

The section of Fishtrap Creek above Cormorant Bay Road, upper Fishtrap, already has a wide diversity of plant species, therefore, the initial stewardship focus for this section should be on the removal on exotic species, especially those species that are highly invasive. Invasive exotic species include Himalayan and evergreen blackberry, English hawthorn, and English holly. Significant native plant species which occur at Skull Creek and could be considered for upper Fishtrap include big-leaf maple, blackcap, and black gooseberry.

Many plant species -- herbaceous, shrub, and tree -- could be reintroduced into the section of Fishtrap Creek between the lagoon and Cormorant Bay Road. As the structure and function of lower Fishtrap will need to be restored, future plantings should be coordinated with these efforts.

4.0 Ponds and Lakes

4.1 Description of Wetland System

Three ponds were surveyed as part of this initial vegetation community report. Julie's Pond is a small pond located midway along upper Fishtrap Creek. Treacy's Pond is a larger, and more undisturbed, pond that is located on the west side of Deep Meadow Lane. Helsall's Lake is a fairly large (5-acre) pond that has been excavated and dammed at the top of the watershed.

Treacy's Pond was used as a reference wetland for both Julie's Pond and Helsall's Lake because of its high diversity and isolation. Julie's Pond has a much lower number of plant species (31) when compared to either Treacy's Pond (109) or Helsall's Lake (116). The smaller size of Julie's Pond no doubt contributes to the lower species richness.

Table 4.0 Species comparison among Julie's Pond, Helsall's Lake, and their reference site, Treacy's Pond.

Species Type	Julie's Pond	Helsall's Lake	Treacy's Pond
Native			
Trees	2	7	8
Shrubs/Small trees	8	18	19
Herbs/grasses/ferns	1	39	31
Aquatics	9	9	14
Introduced			
Trees	3	1	0
Shrubs/Small trees	2	0	3
Herbs/grasses/ferns	4	40	33
Aquatics	2	2	1
Total Plant Species	31	116	109

Julie's Pond is largely impacted by livestock. Much of the pond is exposed to sunlight for a large part of the day, with few shrubs and trees on the shore and only small areas of emergent vegetation. As a result, the water temperature in the pond is considerably higher than the much more shaded inflow stream. It is possible that these higher temperatures have enhanced the algal growth in the pond. The shoreline has some topographical variation, however, because of the consistent trampling and browsing of farm animals, much of the pond's edge is highly disturbed. This can be clearly seen in the reduced number of terrestrial herbaceous plants.

4.2 Stewardship Recommendations

Despite the limited diversity of wetland species (e.g., sedges, rushes, water-parsley, smartweed, white water buttercup, tule, hardhack, willow), much of the vegetated portion of shoreline in Julie's Pond is dominated by exotic invasive species, such as reed canary grass. Reed canary grass is considered the most invasive grass species that occurs in wetlands in the Pacific Northwest. It dominates a large area of the wetland at Julie's pond and should be eradicated if possible or at least controlled. Water milfoil was not identified at this site but has been previously recorded. If water milfoil is present, it too should be eradicated or controlled.

Development of adjacent sites into pastures and paddocks affects pond function. Livestock can cause loss of shoreline plants, trampling and erosion of shoreline, and increased sedimentation into the water. These affects could be minimized with increased plantings and reduced or seasonal use of the adjacent areas by farm animals.

Douglas-fir forest surrounds a large portion of the pond but stops short of the pond edge. In the zone between the forest and the open water of the pond there are large open gaps with little vegetation and areas dominated by reed canary grass. Both conditions make accessing the pond difficult for some wildlife. Plantings of larger woody species would eventually also contribute large woody debris into the pond.

Planting trees and large shrubs on the shoreline of the pond and introducing a native water lily (e.g., yellow pond-lily, *Nuphar luteum*) would help decrease water temperature, algal growth, and evaporation. Additionally, increasing plant density, particularly in the area of the shoreline, will prevent further erosion, enhance wildlife habitat, and be a future source of SOD and LWD. Larger woody species appropriate for this site include bitter cherry, western crabapple, big-leaf maple, red elderberry, mock-orange, oceanspray, salmonberry, serviceberry, and thimbleberry.

Much of the vegetation along the shoreline of Helsall's Lake is in an early successional stage due to the excavation of the lake and subsequent clearing. Fluctuations in water levels will affect plant establishment and development along the shoreline. The east shore of the lake is vegetated with grass and small herbaceous species. The west side of the lake, edged by a road, has little vegetation but is armored with rock.

The vegetation composition of Helsall's Lake compares well to that of Treacy's Pond. This indicates that, despite the excavation of the lake, a rich cohort of species are still present to re-establish if succession is allowed to continue. However, since the original plant list for this site was developed, it was learned that the lake was subsequently dredged and the shoreline cleared. As a result, for example, many of the original aquatic species, such as floating-leaved pondweed and water smartweed, were not found, or were observed in restricted populations, on a subsequent visit. Introduced grasses have been established on the lake shore and dam to diminish erosion and sedimentation. Although these plants serve to stabilize the slopes surrounding the lake, introducing wetland and larger species would increase the functionality and biodiversity of the lake. The natural wetland found just north of the lake could be a good reference site and a possible harvesting site from which to transplant suitable plant species.

In many areas, there is a wide gap between forest and the lake's edge. This open transitional space varies around the lake. Although the species appear to be present, to facilitate successional

processes, trees and shrubs could be planted. As the maintenance of an open, oligotrophic lake appears to be an important management goal for this lake, the plantings could be established in a clustered patches and well upslope from the high water level. Regardless of spatial pattern, increased shoreline vegetation will trap and filter more sediment, slow overland flows, and contribute SOD into the lake, increasing productivity and connectivity. Many of the same species recommended for Julie's Pond would be appropriate for this lake.

The principal exotic threats are all herbaceous species, and include mullein, tansy ragwort, sow-thistle, as well as other thistle species. These species should be eradicated or at least controlled. There is a wide distribution and diversity of agronomic grasses. As with Julie's Pond, the invasive species, reed canary grass and water milfoil, are both present at Helsall's Lake.

Appendix K-1. Planting Recommendations for Trees and Shrubs.

Target site abbreviations: CL = Cayou Lagoon; LF = lower Fishtrap; UF = upper Fishtrap; JP = Julie's Pond; HL = Helsall's Lake. Additional species are species that do not presently occur at the target site, but occur at similar sites in this region.

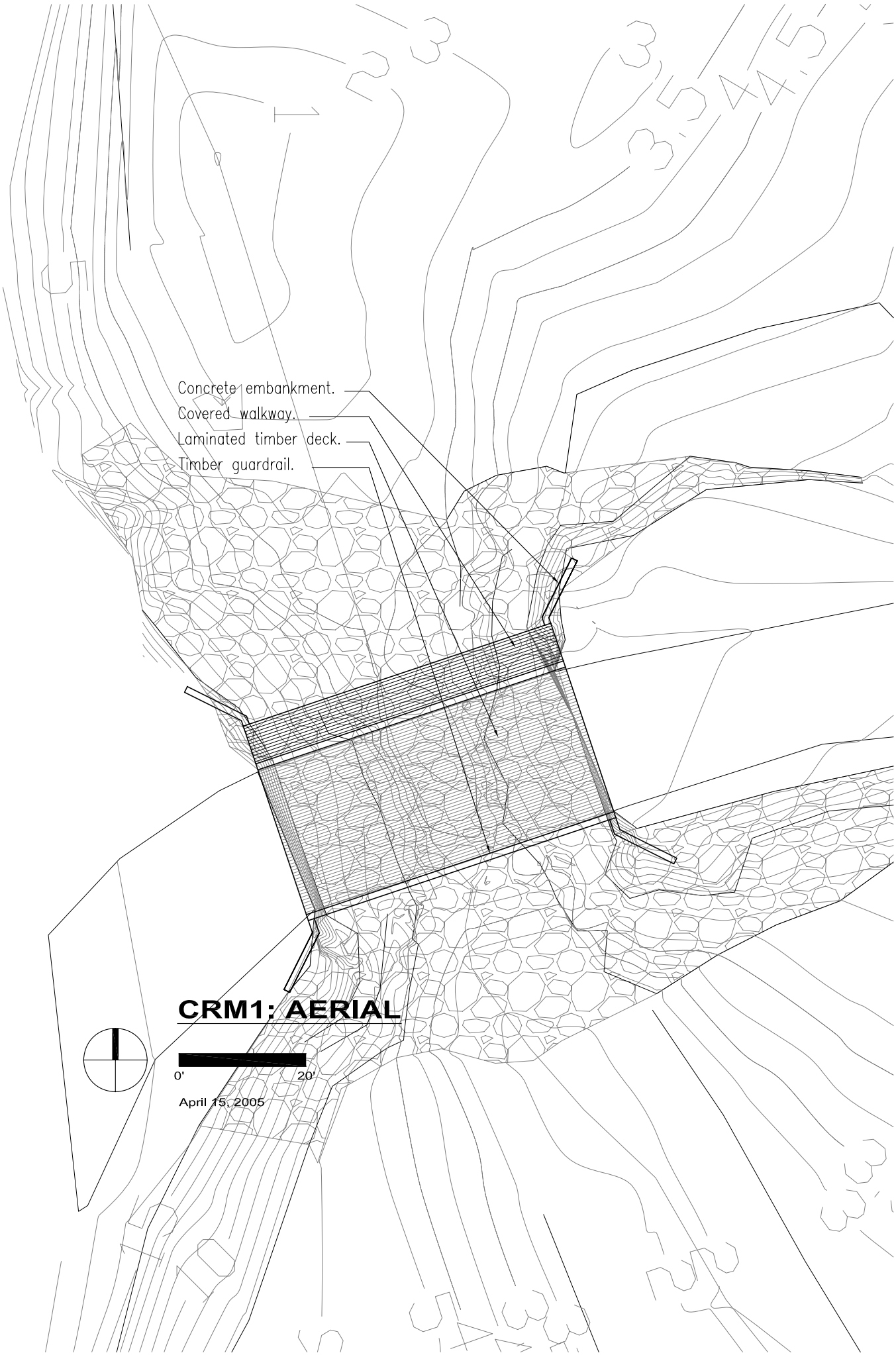
Common Name	**Scientific Name**	**Habitat**	**Target Site**
Trees			
alder (red)	*Alnus rubra*	Moist woods, floodplains, streambanks	CL, LF
cedar (western red)-	*Thuja plicata*	Forest; moist to wet soils	UF
cherry (bitter)	*Prunus emarginata*	Moist forest, streambanks	CL, LF, JP, HL
cottonwood (black)	*Populus trichocarpa*	Moist to wet soils; floodplains	CL, LF, JP, HL
crabapple (western)	*Pyrus (Malus) fusca*	Moist woods, upper beaches, estuaries	CL, LF, JP, HL
Douglas-fir	*Pseudotsuga menziesii*	Multiple sites; usually extremely dry soils	LF
fir (grand)	*Abies grandis*	Dry to moist coniferous forest; river flats	CL, LF
hemlock (western)	*Tsuga heterophylla*	Forest; fairly dry to wet soils	UF, JP
madrone	*Arbutus menziesii*	Dry, often rocky slopes or bluffs	LF, HL
maple (big-leaf)	*Acer macrophyllum*	Forest gaps; dry to moist soils	LF, UF, JP, HL
oak, Garry	*Quercus garryana*	Dry, often rocky slopes or bluffs	LF, HL
shore pine	*Pinus contorta var. contorta*	Multiple sites; usually exposed and dry soils	CL, LF
spruce, Sitka	*Picea sitchensis*	Moist, well-drained soils marine terraces	CL, LF
yew, Pacific	*Taxus brevifolia*	Moist mature forest	UF, JP
Additional Trees:			
dogwood, western flowering	*Cornus nuttallii*	Mixed forest; moist, well-drained soils	LF, UF, JP
Shrubs/Small Trees			
blackberry (trail. wild)	*Rubus ursinus*	Disturbed sites; usually dry and open	LF, HL
blackcap	*Rubus leucodermis*	Disturbed sites; forest gaps	LF, UF, JP, HL

currant, red-flowering	*Ribes sanguineum*	Dry open woods, rocky slopes	CL, LF, UF, JP, HL
elderberry (red)	*Sambucus racemosa*	Open forests, streambanks, moist clearings	CL, LF, UF, JP, HL
gooseberry	*Ribes* sp.	Moist woods, streambanks, shorelines	UF, JP, HL
hawthorn, black	*Crataegus douglasii*	Moist, open sites; shorelines, streambanks	CL, LF, UF, JP, HL
honeysuckle (hairy)	*Lonicera hispidula*	Dry woods, rocky outcrop	LF, HL
honeysuckle (orange)	*Lonicera ciliosa*	Woods and thickets	UF, JP
juniper, Rocky Mtn.	*Juniperus scopularium*	Dry, rocky sites	LF, HL
mock-orange	*Philadelphus lewisii*	Multiple sites; usually forest edges	LF, UF, JP, HL
oceanspray	*Holodiscus discolor*	Multiple sites; usually dry and open	CL, LF, JP, HL
Oregongrape (dull)	*Berberis nervosa*	Multiple sites; dry to wet forest	LF, UF, JP
Oregongrape (tall)	*Berberis aquifolium*	Dry, open sites	LF, HL
rose (baldhip)	*Rosa gymnocarpa*	Multiple sites; dry to moist soils	CL, LF, JP, HL
salmonberry	*Rubus spectablis*	Moist to wet sites; streambanks	CL, LF, UF, JP, HL
serviceberry	*Amelanchier alnifolia*	Rocky shorelines, meadows, open forest	CL, LF, JP, HL
soopolallie	*Sherpherdia canadensis*	Dry to moist open forests	LF, UF, JP, HL
thimbleberry	*Rubus parviflorus*	Open sites; shorelines, forest gaps	CL, LF, JP
twinberry (black)	*Lonicera involucrata*	Moist forest edges, streambanks	UF, JP
willow	*Salix* spp.	Wet sites (choose species based on present distribution)	CL, LF, UF, JP, HL
Additional Shrubs/Small Trees:			
cranberry, highbush	*Viburnum edule*	Moist forest edges, streambanks	LF, UF, JP, HL

Indian plum	*Oemleria cerasiformis*	Dry to moist, open woods	CL, LF, JP, HL
ninebark, Pacific	Physocarpus capitatus	Wet, open sites: moist woods, coastal marshes	CL, LF, JP, HL
dogwood, red-osier	*Cornus stolonifera*	Moist sites; streambanks, open forest	LF, UF, JP, HL
hazelnut, beaked	*Corylus cornuta* var. *californica*	Moist, well-drained sites; open forest	LF, UF, JP

Appendix L:

Conceptual Designs of Bridge Alternatives



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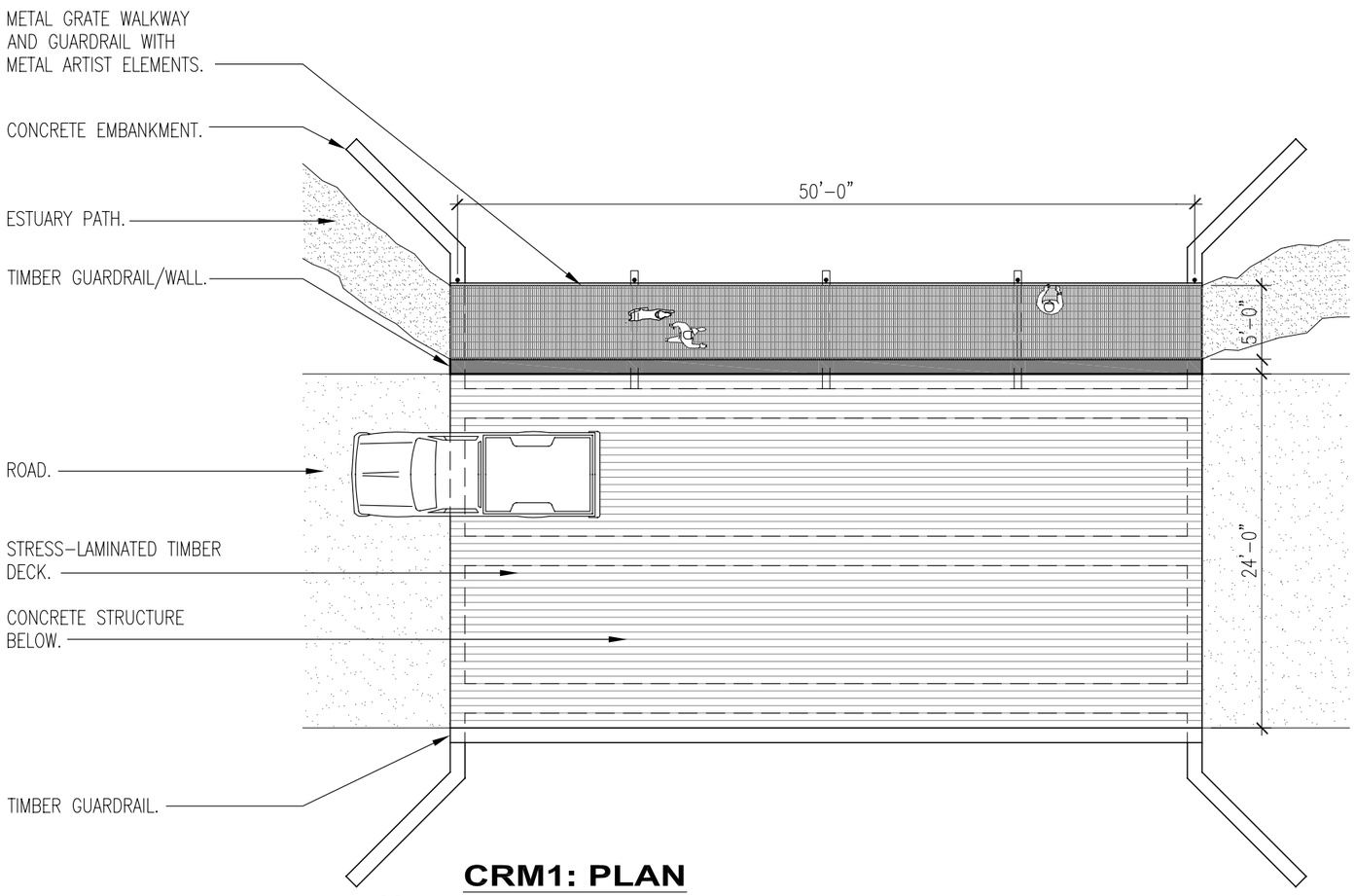

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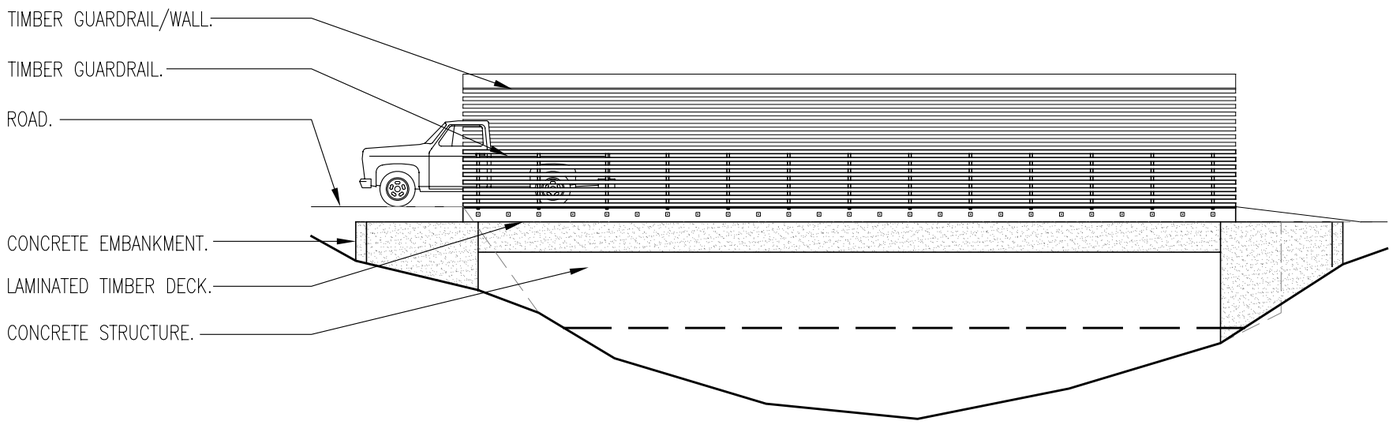
ARCHITECTURE



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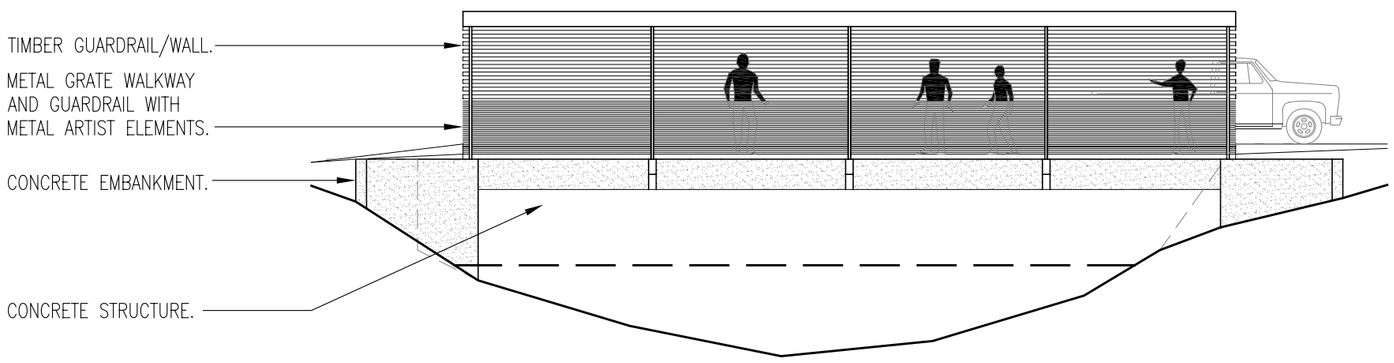

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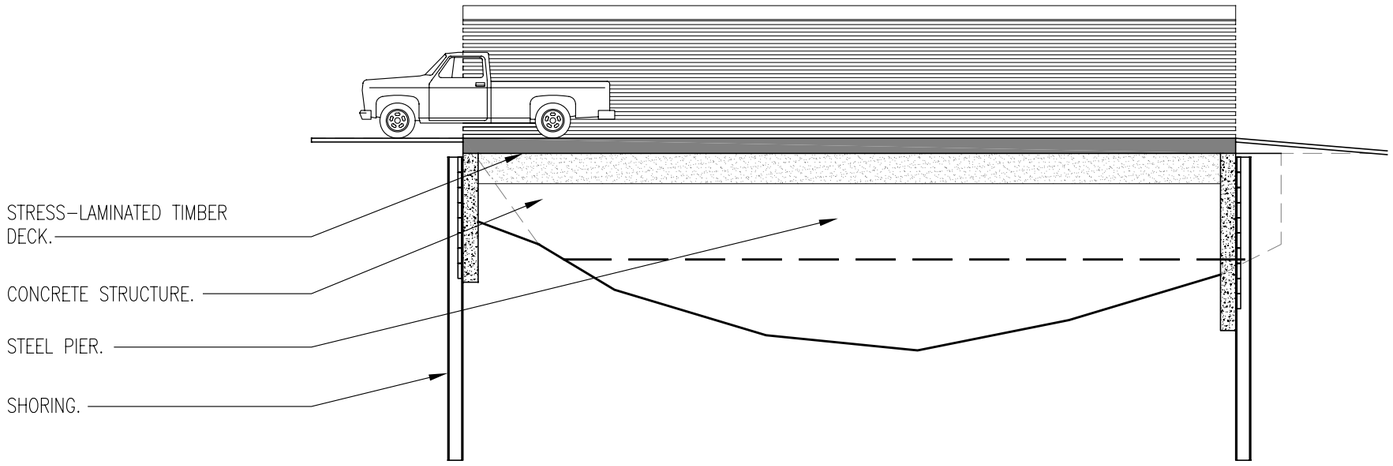

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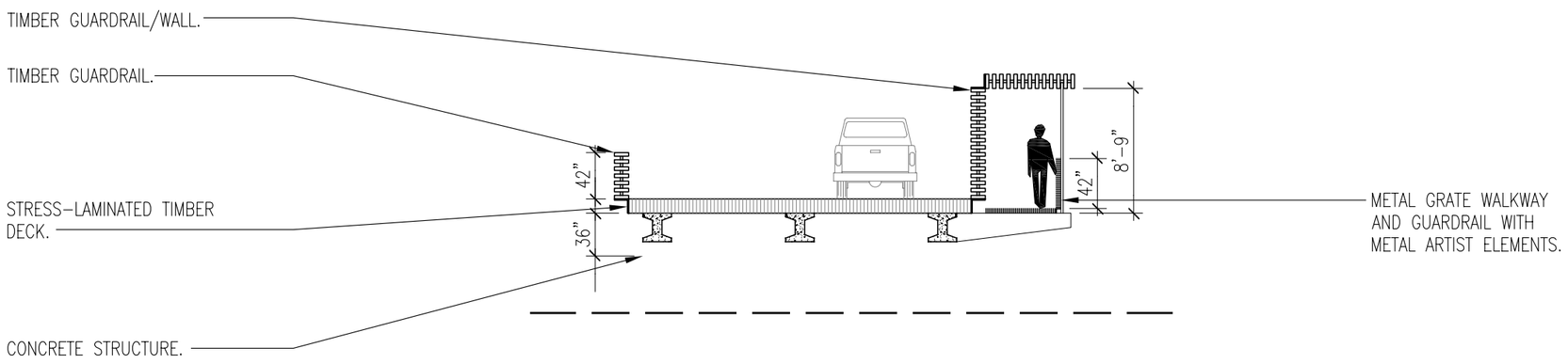

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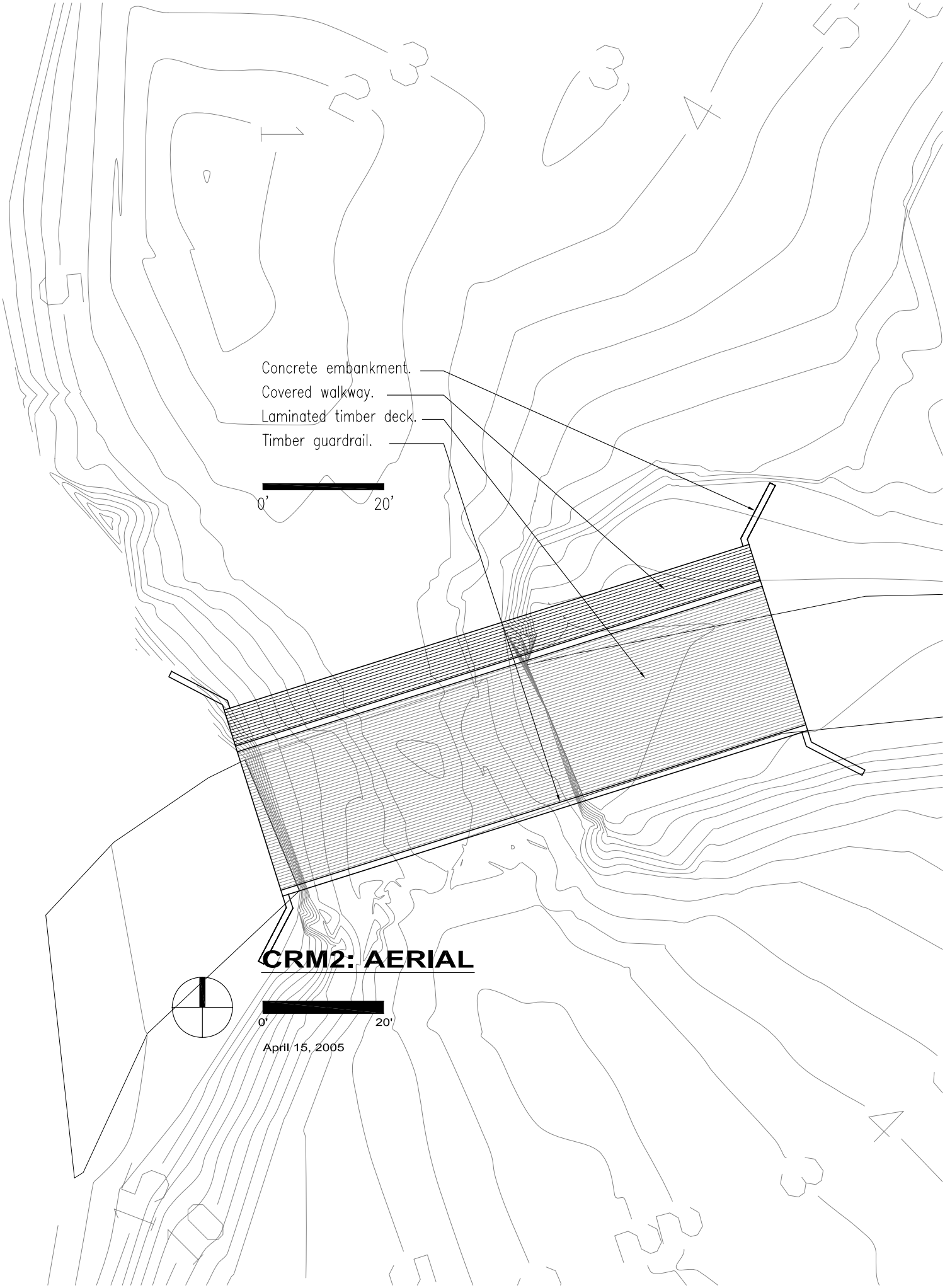

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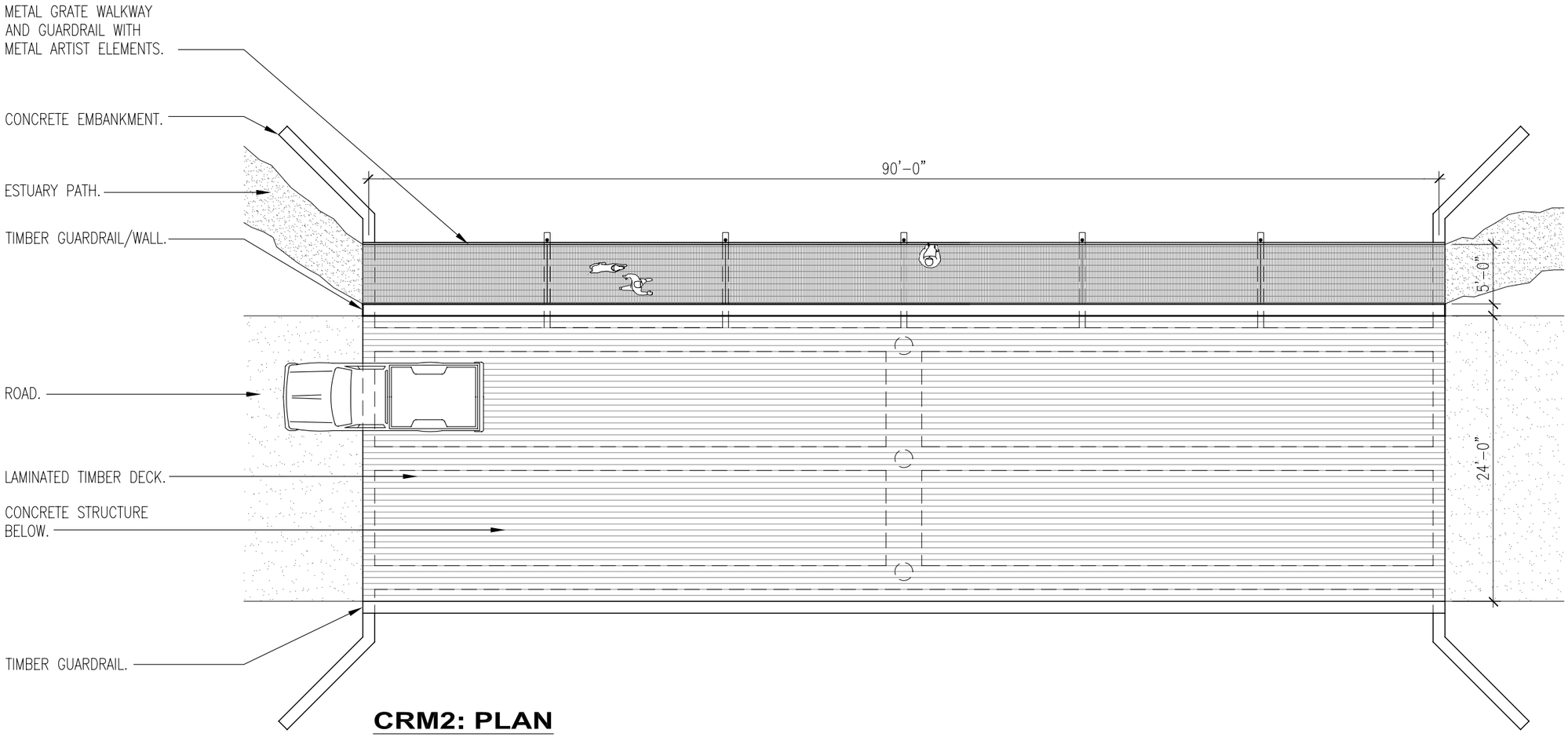

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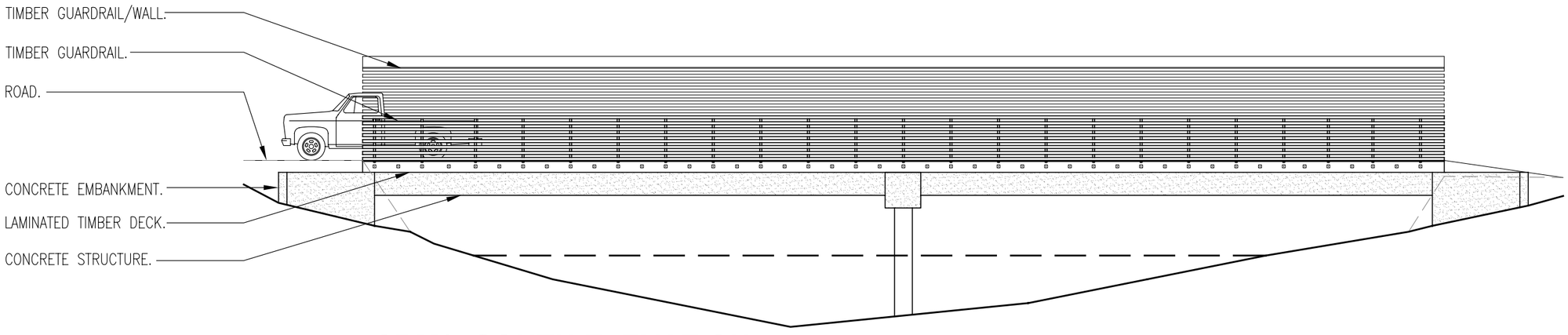

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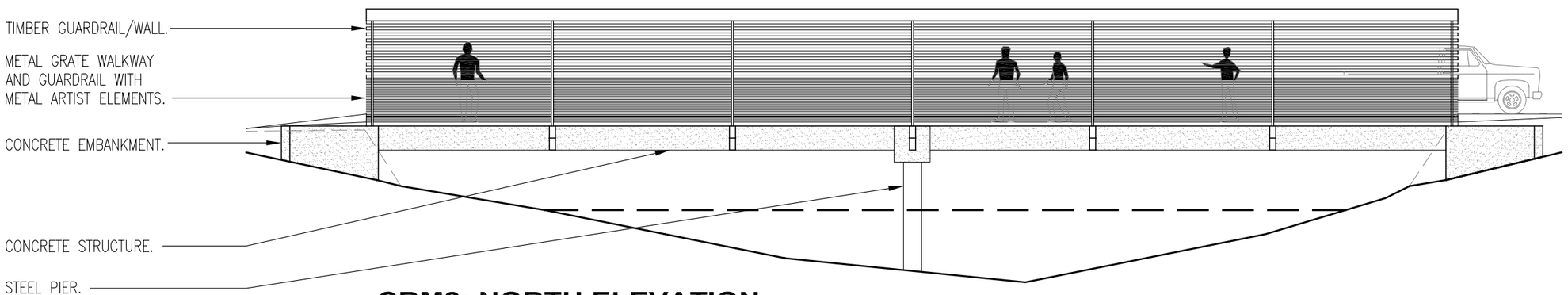

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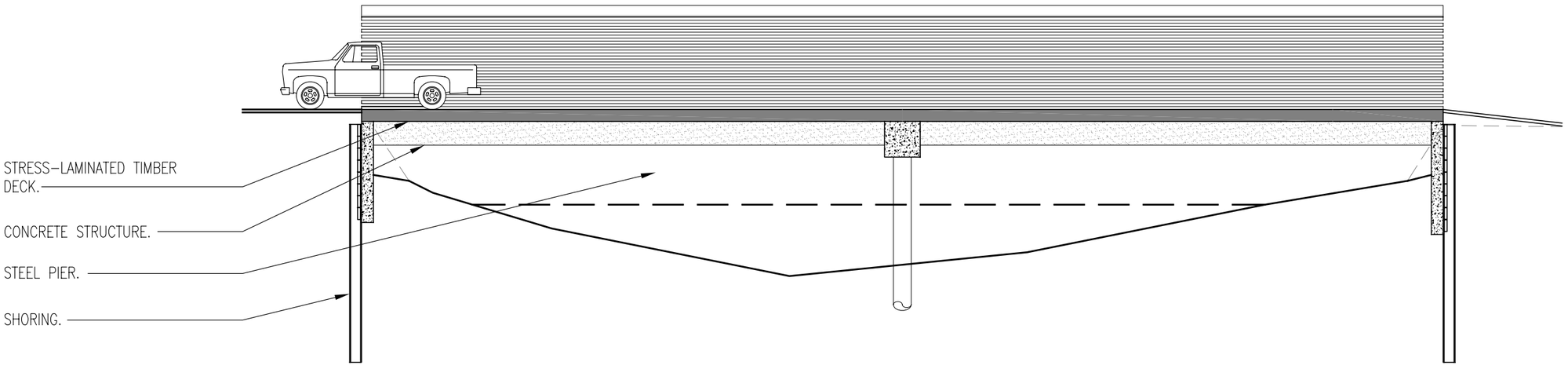

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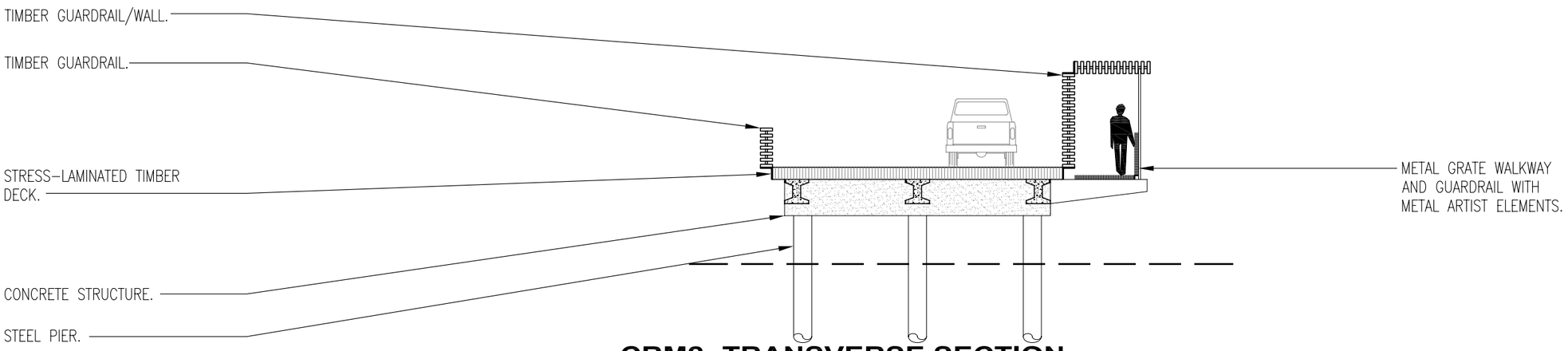

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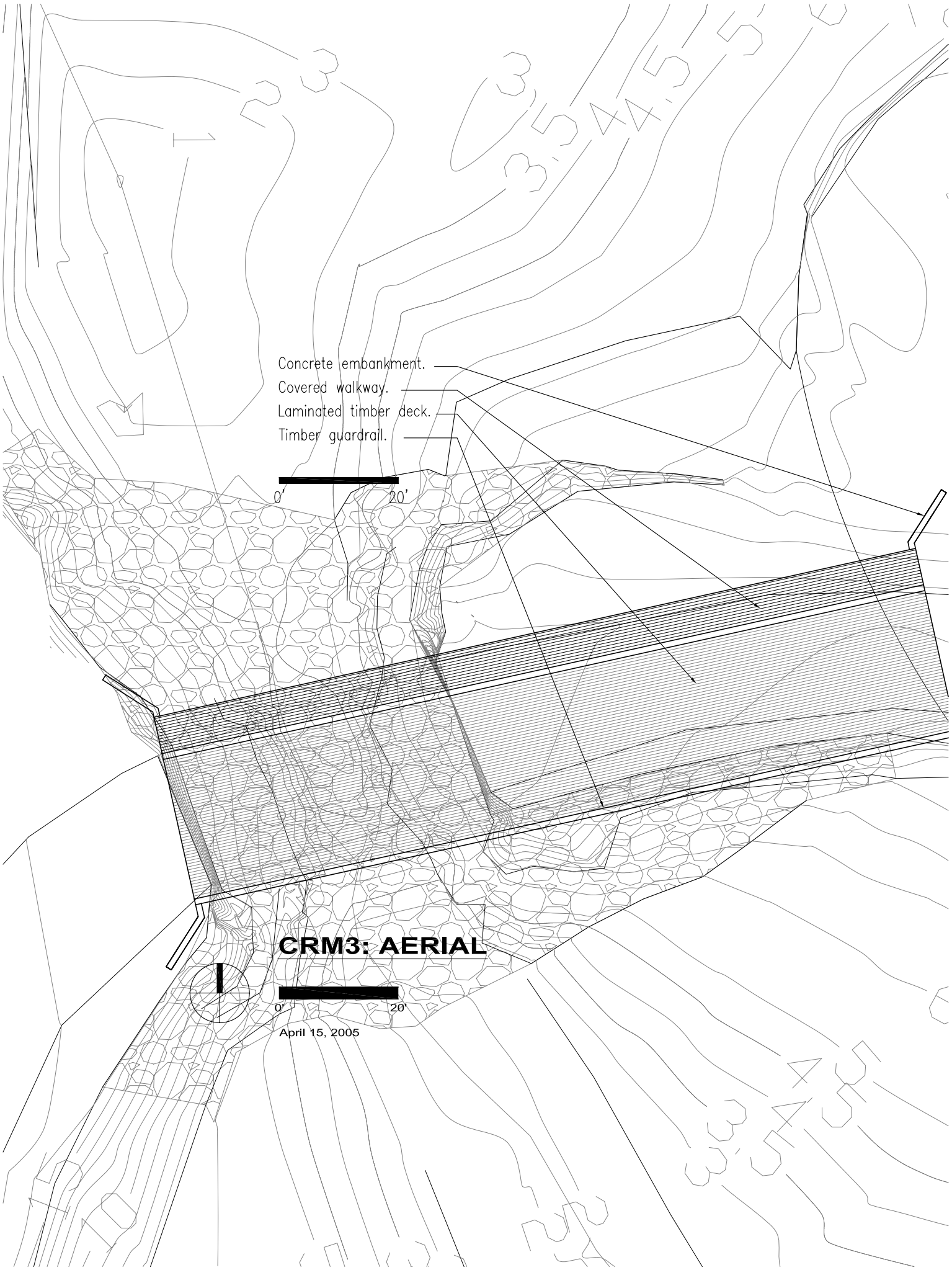

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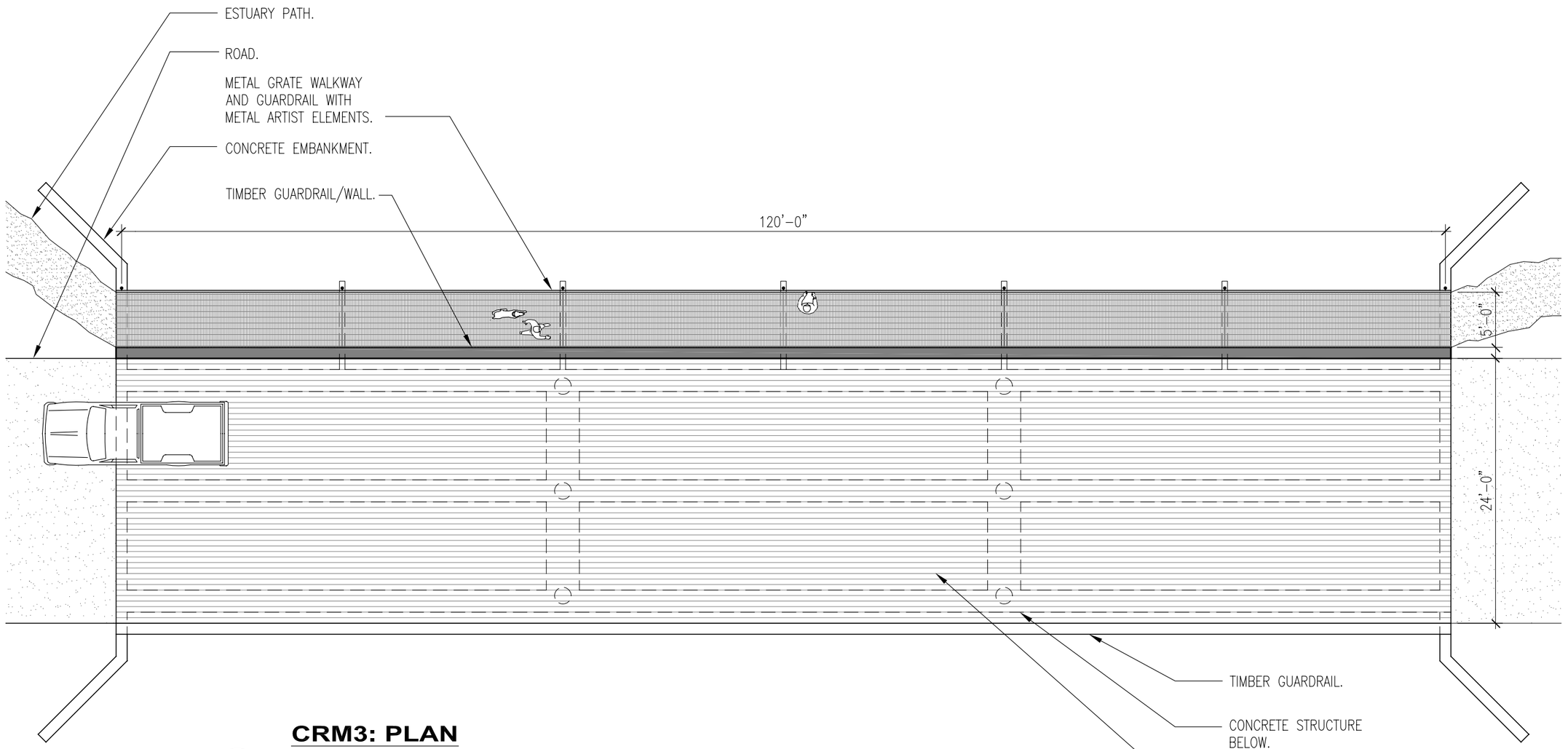

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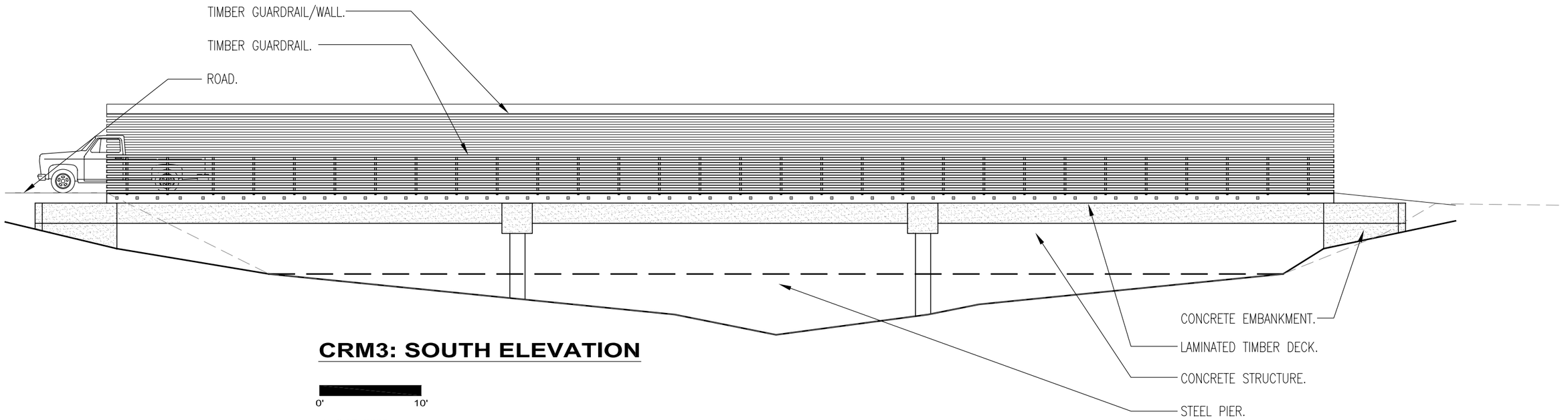

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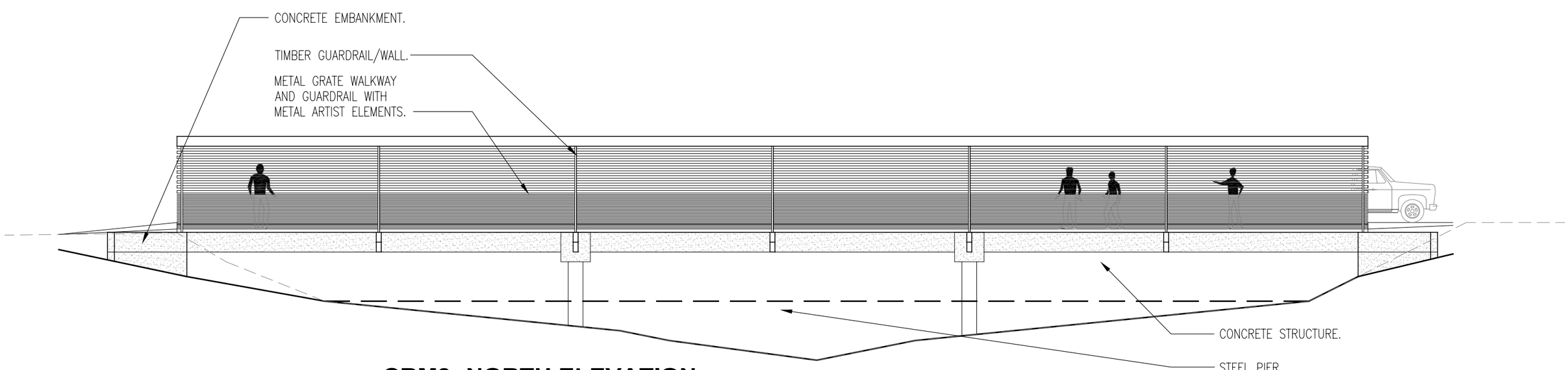

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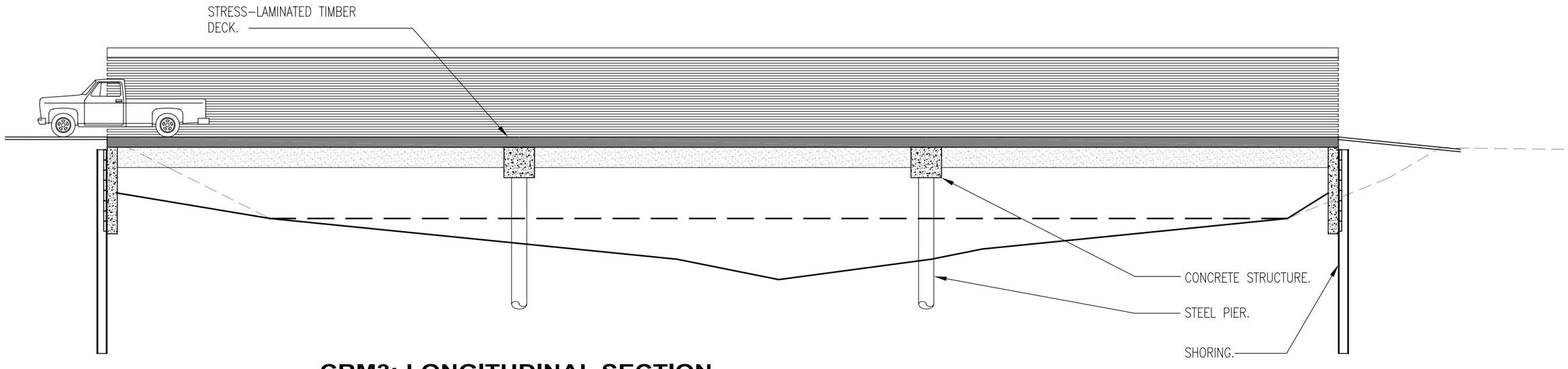

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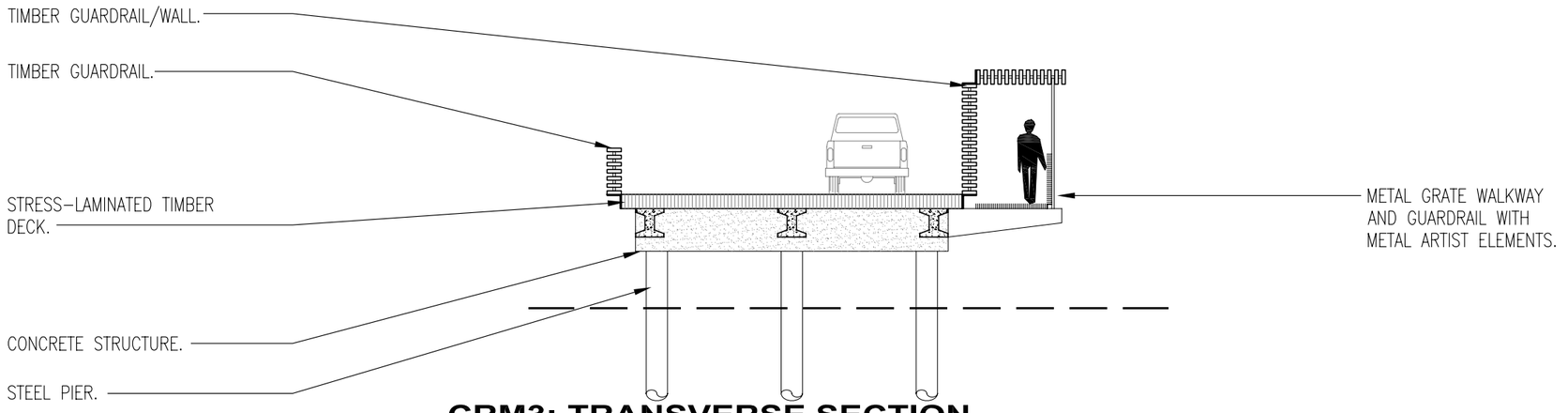

CRM3: TRANSVERSE SECTION

0' 10'

April 15, 2005

HUTCHISON AND MAUL LLC
ARCHITECTURE

Appendix M:

Color Images of Bridge Alternatives


MERCURY
HONDA


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