

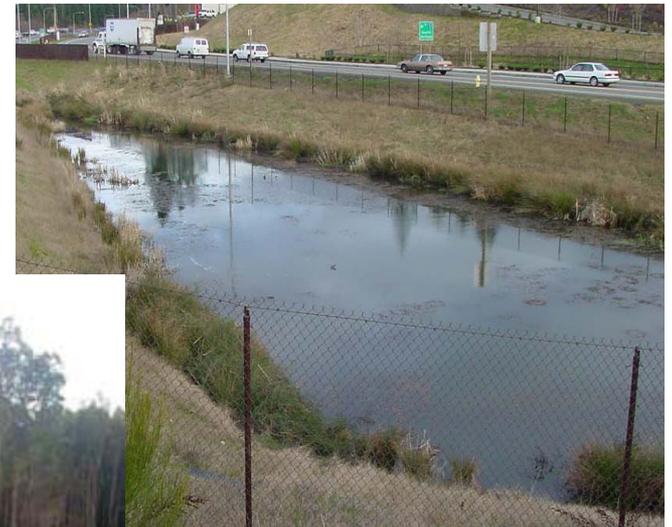
# Methodology

## TEMPORARY MITIGATION

Construction activities can create situations with potential environmental impacts such as exposed soils during excavation. In order to provide protection during construction WSDOT implements many types of preventive measures or temporary mitigation. Examples include temporary ponds for water quality treatment and installing products to stabilize loose soil for erosion control. Other measures are less obvious such as restricting the hours of work to reduce noise impacts. All together these types of measures are implemented in order to construct our projects while preventing impacts to the environment. The following lists some typical items associated with temporary mitigation cost calculations.

### Calculation of temporary mitigation costs typically includes, but is not limited to, the following items:

- Temporary excavation and embankment
- Silt Fence/Wattles/Dikes/Straw/Compost Berms
- Water quality monitoring
- Seeding/rockery/filters
- Pipes and inlets
- Vaults, ponds and bioswales
- Stream by-pass system
- Air quality (dust prevention)
- Erosion control and planting
- High visibility fencing
- Additional fencing
- Tire/Wheel wash



# Methodology

## STORMWATER MITIGATION

Stormwater runoff can be problematic for streams, water bodies and wetlands. To address these issues WSDOT implements Best Management Practices in order to prevent or reduce potential runoff damage. With recent changes in stormwater management requirements, projects are now incorporating more infiltration and dispersion measures. A few examples include natural and engineered dispersion, compost amended vegetated filter strips (CAVFS), and media filter drains (formerly known as ecology embankments). Existing highway sections that have no stormwater treatment, or where existing stormwater treatment is substandard are often times improved in conjunction with new highway improvements. Highway stormwater management systems include: providing runoff treatment to meet water quality standards; recharging groundwater; preventing flow erosion; and controlling the rate and duration of storm flows from state right of way. The following lists some typical items associated with stormwater management cost calculations.

**Calculation of stormwater mitigation costs typically includes, but is not limited to, the following items:**

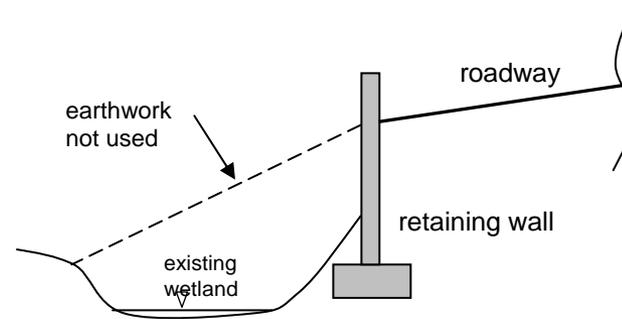
- Excavation and embankment
- All bid items associated with stormwater once it leaves the roadway (beyond the edge of pavement)
- All bid items associated with conveyance of stormwater to the treatment facility (beyond edge of pavement)
- Pipes, inlets, catch basins, and manholes
- Flow spreaders and flow control structures
- Maintenance access roads to facility
- Compost and topsoil
- Seeding and erosion control planting
- Quarry spalls for energy dissipation and outfall protection
- Additional fencing
- Right of way purchase costs associated with stormwater management



# Methodology

## WETLAND MITIGATION

When transportation projects create unavoidable wetland impacts, wetlands are enhanced, restored, created, or preserved. Wetland mitigation costs vary based on the type of impact, cost of real estate, and the required replacement ratio. Other contributing factors are special conditions or more stringent mitigation ratios required by the local jurisdiction in which the project resides.



Retaining Wall Used to Avoid Wetland

Retaining walls can be used to avoid a wetland or to minimize impacts. The avoidance cost is reported as in-place cost of wall minus the cost of earthwork that would have been used had the wetland not been there.

### Wetland Avoidance, Minimization & Compensatory Mitigation Costs typically include, but are not limited to:

Any alterations to the roadway design needed to avoid or minimize wetland impacts:

- Retaining walls
- Altered roadway alignment
- Steeper side slopes
- Guard rail
- Bridges
- Culvert installation

Any items required to compensate for unavoidable impacts:

- Property acquisition
- Costs constructing wetlands: excavation, grading, soil amendments, plant installation, wildlife habitat structures, etc.
- Site monitoring & management

Any items required as a condition of a wetland permit:

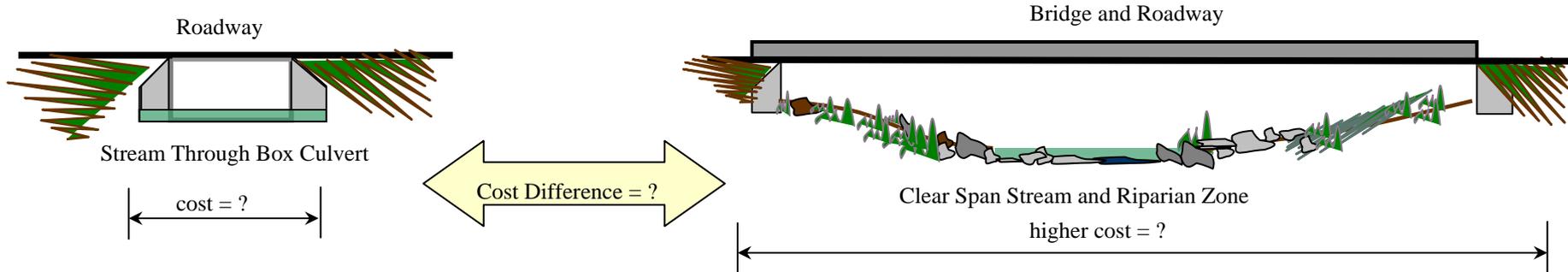
- Removing invasive plants
- Silt fencing or high visibility fencing

# Methodology

## STREAM MITIGATION



Protection of rivers and streams is critical and can influence the design and construction elements of roadways and bridges. There are multiple types of stream protection actions including enhancements to the riparian, or a bridge span over a stream that is wider than the actual width of the stream. For example, if a stream is 10 feet wide and a box culvert of that dimension would sufficiently meet state and federal design standards for carrying stream flow beneath the roadway, but permit conditions require a clear span bridge 50 feet long to protect the other stream habitat functions (such as floodplain connectivity, riparian buffers, bedload and woody debris transport, or channel migration) then a mitigation cost difference can be realized and reported.



These drawings illustrate various types of designs of structures over streams. Box culverts are typically less expensive than bridges that span a stream. However, there are situations where the additional cost for a clear span is necessary and warranted to provide for fish passage.

Often times impacts to a stream/sensitive area parallel to the roadway are avoided or minimized by installing a retaining wall instead of constructing the fill slope that would be necessary for supporting the road.

# Methodology

## NOISE MITIGATION

Federal law and state policy require that every project that builds a new road, adds through-lanes, or significantly realigns a roadway must receive a noise evaluation. Where outdoor noise is expected to reach a lower limit of 66 decibels at “noise sensitive” locations like homes, schools, churches, day care centers, and hospitals are expected, noise mitigation (e.g., walls, earth berms) is evaluated to determine whether it will be meaningful and cost-effective. Noise barriers can reduce traffic noise at residences by as much as one-half and the cost of noise barriers can vary based on the availability of right of way and the materials used.

Since 1963, WSDOT has built over 83 miles of noise barriers throughout the state and we expect that more barriers will be needed in the future as we continue to build projects in our state’s growing urban areas.

### **Noise abatement costs include, but are not be limited to:**

- Cost of barriers in place
- Excavation and embankment
- Right of way costs associated with noise barrier
- Concrete foundations and walls
- Clearing and grubbing
- Wall fascia treatments



# Methodology

## CONTEXT SENSITIVE SOLUTIONS

National Environmental Policy Act, Intermodal Surface Transportation Efficiency Act and the National Highway System Designation Act of 1995 provides the legislative background for Context Sensitive Solutions. The intent is to provide flexibility in design, stress the importance of preserving historic and scenic resources, provide transportation enhancement projects that reduce the intrusion of the landscape, be compatible with the existing built and natural environment and add lasting value to the community.

Achieving Context Sensitive designs involves a collaborative, interdisciplinary approach requiring stakeholder and public involvement.

**Context Sensitive Solution costs include, but are not limited to:**

- Providing community gateways
- Providing community connectivity
- Concrete stamping and coloring
- Unique guardrail or railing
- Special landscaping
- Shared-use paths

