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Don't muddy the waters: construction BMPs for bridge rehabilitation



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Agenda



The why



Common construction activities & pollutants



How to prevent or capture pollutants



Main take-aways

Why do we care?



Our bridges are reaching the end of their useful life



Kaipapau Stream Bridge Replacement
Hau'ula, Oahu

Circa 1937



Makaha Bridge Replacement,
No. 3 & 3A
Makaha, Oahu

Circa 1937

Waiaka Bridge Replacement
South Kohala, Hawaii

Circa 1932



Why do we care about construction BMPs?



Nature Conservatory

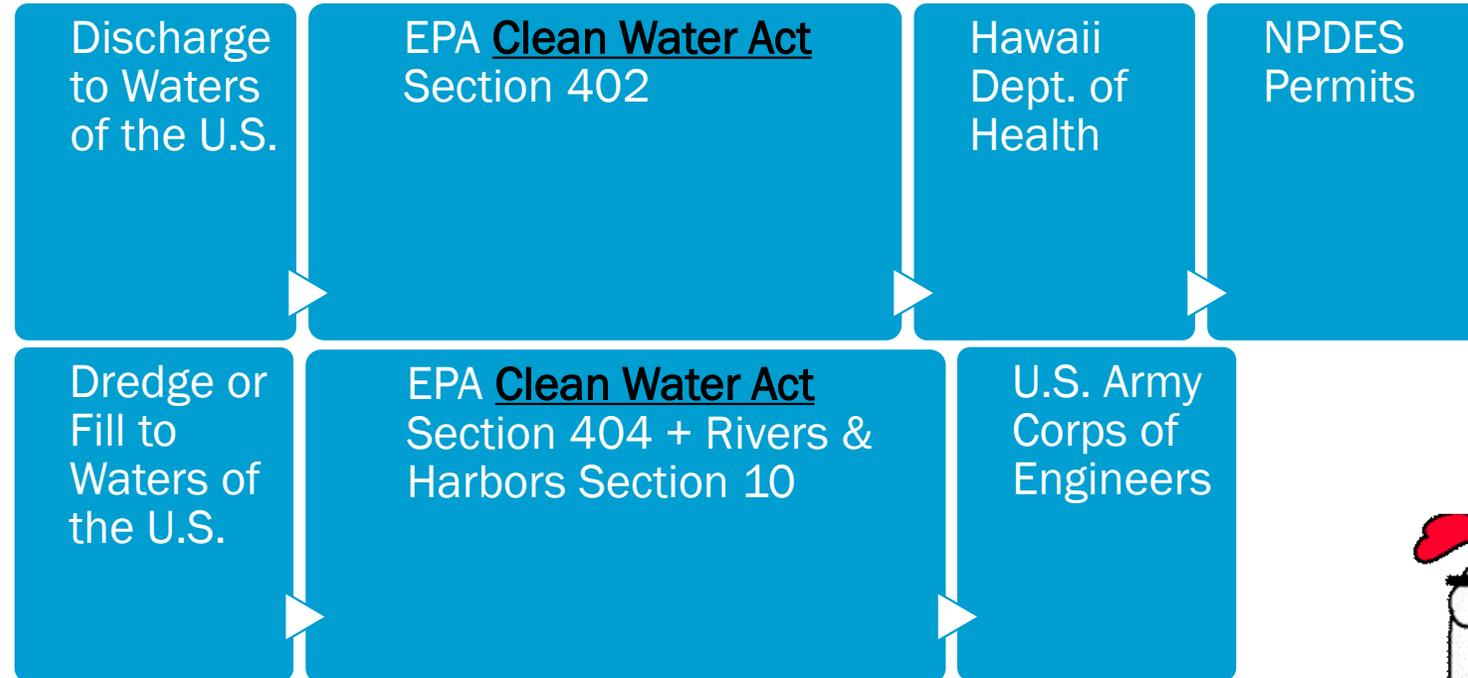


808photo.me



NOAA

Why do we care about construction BMPs?



Water quality is regulated by federal law -
violations will result in fines!!



Common construction activities and pollutants

Common types construction activities and pollutants

- Demolition:
 - Material waste such as metals, concrete, plastics, epoxy, coatings, lead paint
 - Dust
- Paving:
 - Dust
 - Aggregate waste
 - Petroleum products
- Deck Work:
 - Installation of steel and concrete
 - Removal and installation of coatings
 - Hotwork



<https://www.cnn.com/2019/06/28/europe/genoa-bridge-demolition-scli-intl/index.html>

Common types construction activities and pollutants

- Concrete work:
 - Dust
 - Concrete waste and washout
- Painting:
 - Blasting abrasives
 - Paint chips
 - Hazardous materials
- Abutment or pier alterations:
 - Sediment erosion
 - Grout entering the stream



HDOT

Common types construction activities and pollutants

- Heavy equipment:
 - Oil, grease, chemical fluids
 - Vehicle tracking of sediment
- Staging and stockpiling:
 - Sediment and material washout into streams
 - Fuel and chemical storage leaks
- External utilities:
 - Potential for spills from wastewater



<https://www.fisheries.noaa.gov/story-map/reopening-rivers-migratory-fish-northeast>

How to prevent or capture pollutants:

1. Administrative and work controls
2. Over-water BMPs
3. In-water BMPs

First step: Administrative controls

Administrative controls

- Prevention through planning and design
- Engineering controls
 - Design requirements
 - HDOT Section 209 – Temporary Water Pollution, Dust, and Erosion Control
 - Site-specific best management practices
 - Storm Water Pollution Prevention Plan (SWPPP)

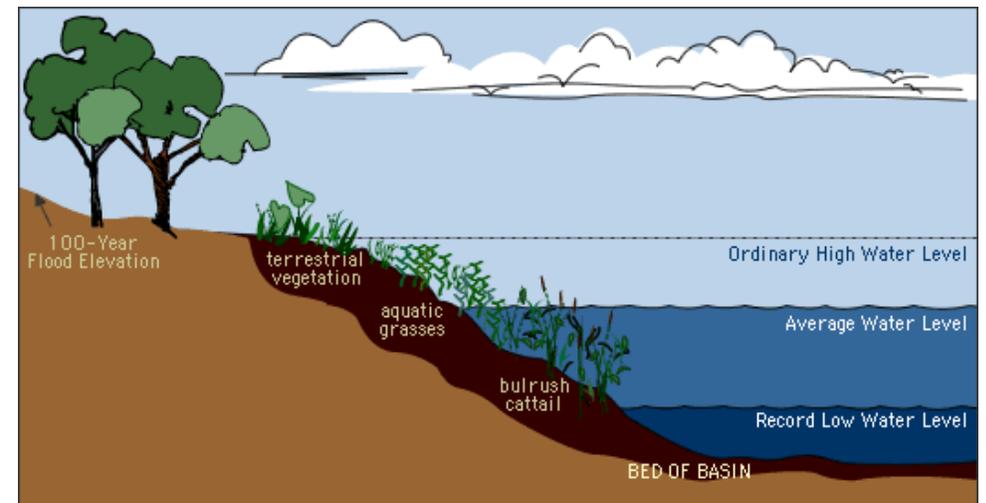


Administrative controls

- Schedule considerations
 - Low stream flow → dry weather
 - Avoid fish migration season
- Staging considerations:
 - Material and vehicle storage away from waterbodies



www.stormwaterhawaii.com/construction-bmps/construction-bmp-tip-staging-areas/



<https://www.shorelandmanagement.org/quick/ll.html>14

Work Controls

- Required as part of the BMP plan
- Certification
- Training
- Inspection
- Maintenance



Second step: Over-water options

Over-water capture devices

- Tarps, platforms, and barges
 - Platforms and scaffolding need to be designed by licensed engineer
 - In-water platforms and floating barges may need a permit
 - Covers, platforms, and barges should extend outward from bridge dripline



Photos Courtesy of HDOT

Other considerations

- Means and methods
 - Attachments on construction equipment to catch small debris
 - Vacuums
 - Negative pressure dust collectors
- Scupper, down drain, and storm drain protection



Third step: In-water options

In-water options

- General considerations
- Streambank stabilization
- Sediment capture
- Stream isolation and diversion



Photo Courtesy of HDOT

General considerations

- BMPs are *first* and *last*
- Materials should be inert, non-toxic, non-hazardous, and close to neutral pH
- Weather and tide events
- Double perimeter requirements
- Aquatic life and vegetation



Photo Courtesy of HDOF

Streambank stabilization

- Temporary stabilization is installed prior to in-stream BMP installation and maintained throughout life of project
- Permanent streambank stabilization must be installed and established after removal of temporary stabilization

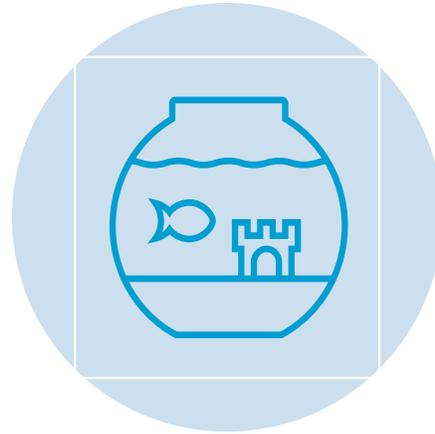


Photo Courtesy of HDOT

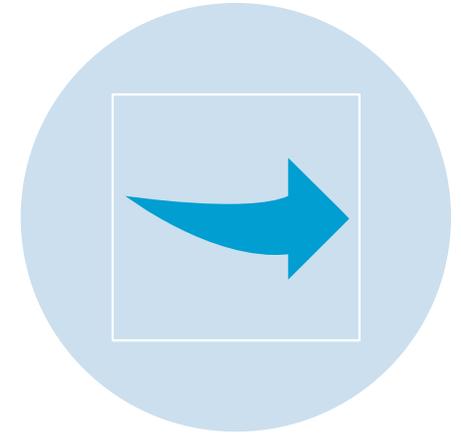
In-Water Work



SEDIMENT CAPTURE



STREAM ISOLATION



STREAM DIVERSION

Sediment capture – Filter fabric

- Used on streambanks or in calmer water
- Needs to be anchored with stakes, sandbags, or berms
- Inexpensive

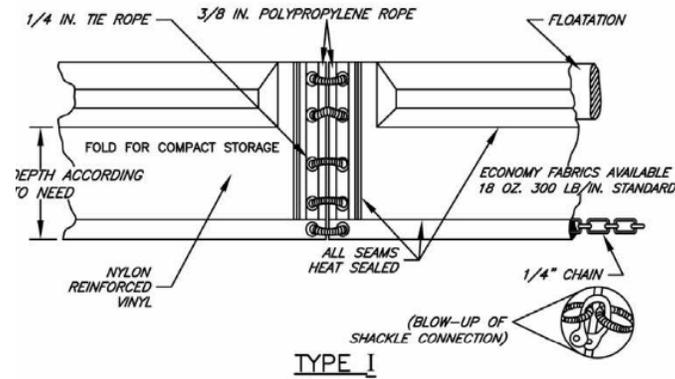
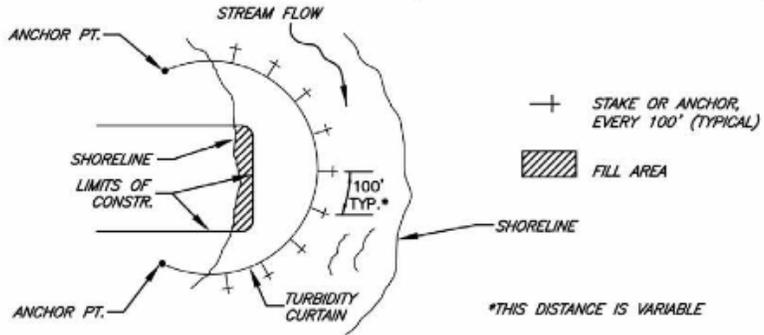


Photo Courtesy of HDOT

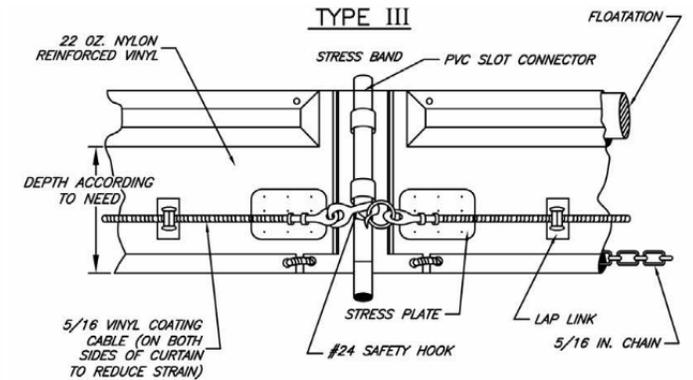
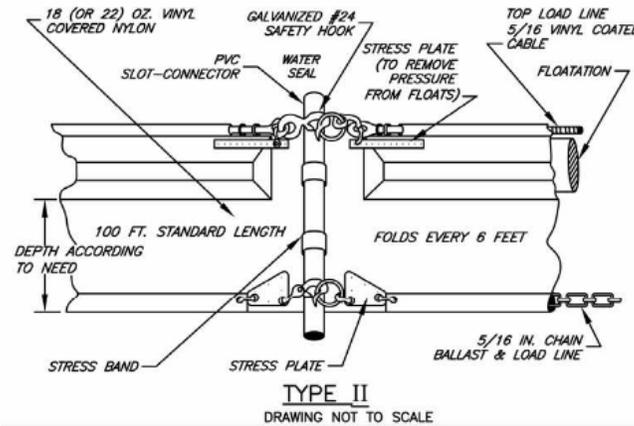
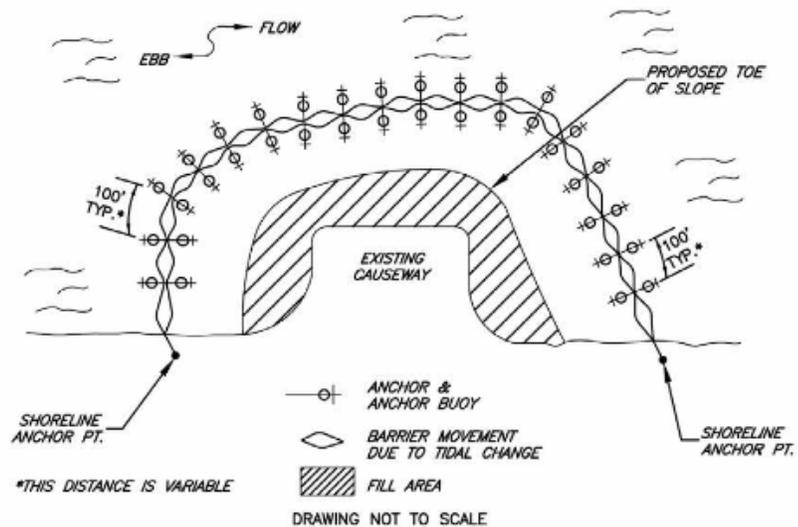
Sediment capture – Turbidity curtains

TURBIDITY CURTAIN

TYPICAL LAYOUTS:
STREAMS, PONDS & LAKES (PROTECTED & NON-TIDAL)



TIDAL WATERS AND/OR HEAVY WIND & WAVE ACTION



Section 5.7, page 131, Draft Practitioner's Guide, HDOT & FHWSA 2016

Sediment capture – Turbidity curtains



Photos Courtesy of HDOT

Sediment capture – Sediment traps

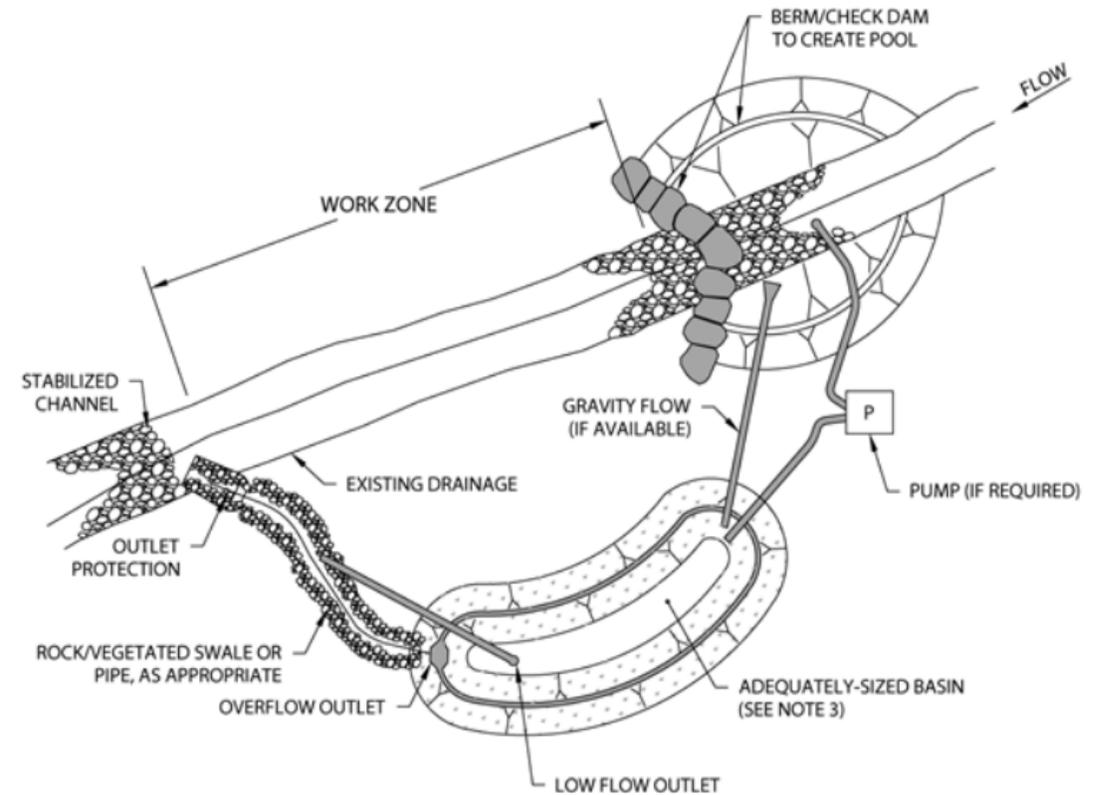
- Detention ponds
- Sediment bags
- Sediment collection mats
- Portable treatment units
- Sand filters



https://stormwater.pca.state.mn.us/index.php?title=Sediment_control_practices_-_Sediment_traps_and_basins

Stream diversion

- Pumped Diversions:
 - Dewatering flat terrain
 - Short duration
 - Low base flows
- Pipe/Flume Diversions:
 - Moderate slopes
 - Short duration
 - Low base flows
- Dam-Type or Excavated Diversions:
 - Temporary dams above and below work site
 - Any stream size
 - Needs open area adjacent to stream



Section 5.13, page 149, Draft Practitioner's Guide, HDOT & FHWSA 2016

Stream isolation - Temporary berms, dikes, and cofferdams

- Watertight structures built to block off or hold back an area that normally has water
- Common options:
 - Sand or gravel bags
 - Earth or rock berms
 - Concrete barriers
 - Membranes
 - Wood barriers
 - Steel barriers
 - Combination of any of the above



<https://civilwale.com/>

Stream isolation - Gravel or sand bags

- Low flow and velocity
- Low cost
- Easy to find
- Labor intensive
- Leaks between the bags can make dewatering difficult



Photo Courtesy of Idaho Transportation Department BMPs

Stream isolation – Jersey rails

- Partial dewatering
- Higher water velocities
- Lower cost
- Easy to find
- Needs heavier equipment to set into place



<https://udfcd.org/wp-content/uploads/2014/07/SM-08-Temporary-Diversion-Methods.pdf>

Stream isolation– Membrane dams

- Larger streams or waterbodies
- Partial to full dewatering
- More costly
- Not as common to find



<https://onsite.co.uk/capability/portadam/>

Stream isolation – Water membranes

- Small streams to large rivers or water bodies
- Partial dewatering
- Lightweight, reusable, easy to install
- More costly
- Not as common



<https://www.aquadam.net/>

Stream isolation – Sheet pile enclosures

- All waterbodies
- Full dewatering
- Lightweight, reusable, long-lasting
- Expensive
- Requires heavy machinery



<https://www.jfbrennan.com/environmental/isolation-barriers>

Take-away points

Take-away points

- Prevent pollutants from entering waters
- Pollution prevention is regulated by federal laws and administered by state and federal agencies
- First consider administrative and engineering work controls
- Employ best practices on land or above water
- Ensure proper design of in-water BMPs and diversion
- Trained team to document and perform regular checks and maintenance as determined by site-specific plan
- Draft guidance document by HDOT and FHWA for in-water bridge work

**An Integrated Storm Water Management
Approach and a Summary of Clear Water
Diversion and Isolation Best Management
Practices for Use in the
State of Hawaii, by the
Federal Highway Administration and
Hawaii Department of Transportation**

Practitioners Guide

Prepared By:



U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
Lakewood, Colorado

April 2016

Version 1: Draft



Thank you.
Questions?