



Alaska Department of Transportation & Public Facilities and Fish

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Keep Alaska Moving through service and infrastructure

Water and Roads

- Do not MIX!!!!!!!

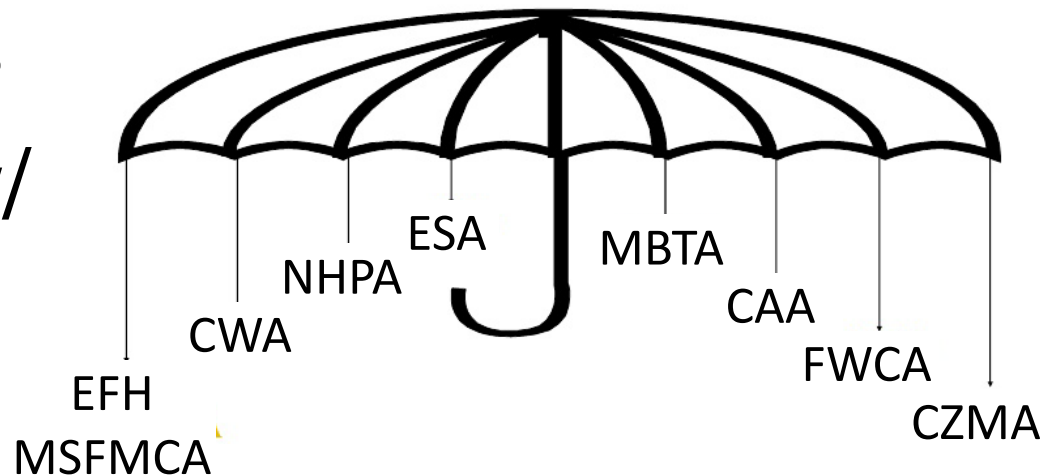


- Design, Construction, and Maintenance

Lets Start at the Very Beginning

NEPA

- Purpose and need
- Alternatives
 - Avoidance, Minimize, and Mitigate impacts
- Considerations
- Coordination w/
Agencies





Environmental Permits

- Permits (pertaining to water)
 - ADF&G
 - COE
 - Flood Hazard
 - ADEC - APDES Construction General Permit & 401 Cert
 - Essential Fish Habitat Permit (part of NEPA, not permit)



Other Criteria

- DOT&PF Criteria
- FHWA Criteria
- Bioengineering cannot be sole means to protect critical infrastructure

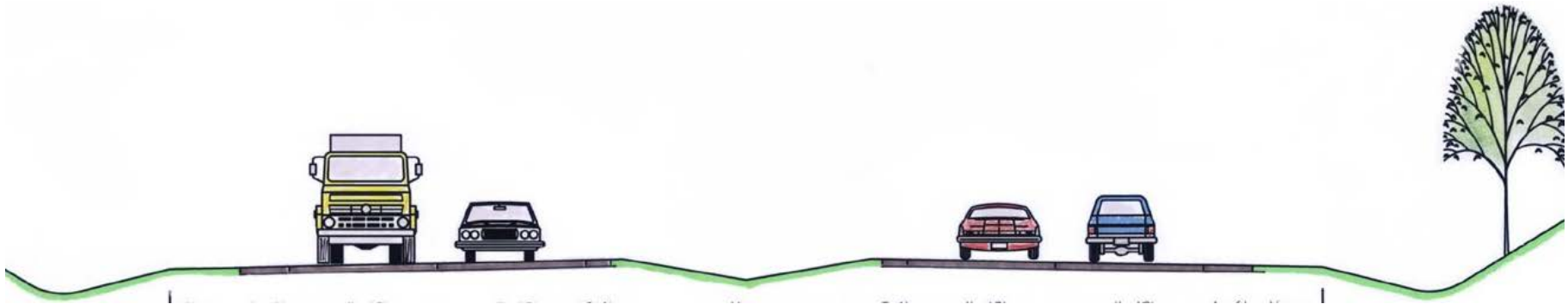
Water and Roads

- Different water challenges
 - Surface – Rain and Snow
 - Subsurface
 - Waterbody crossing/paralleling



Surface Runoff on the Road

- Road General Features
 - Road cross-slope
 - Foreslopes
 - Ditches



Surface Runoff on the Road

- Special Considerations - Bridges
 - Scuppers



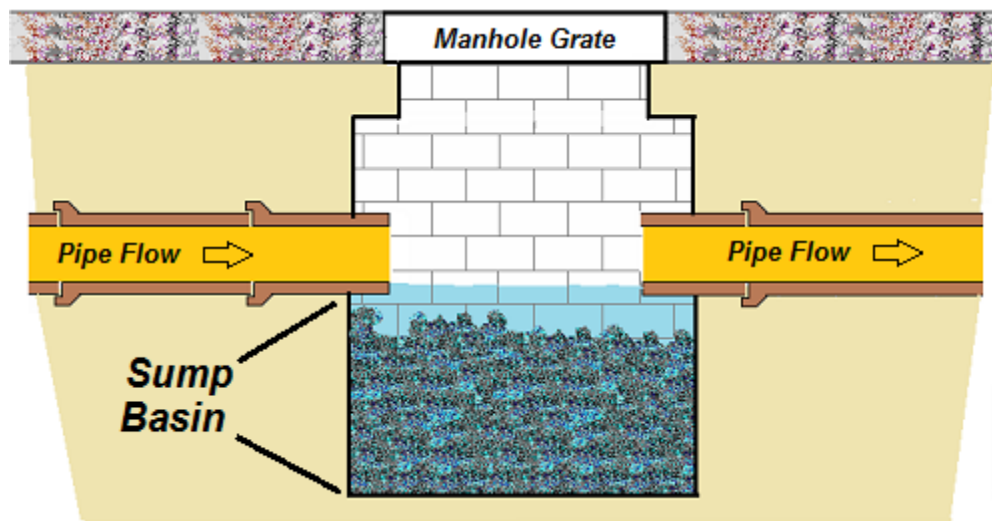
Surface Runoff on the Road

- Special Considerations - Maintenance
 - Plowing
 - Sand
 - MS4



Subsurface

- Groundwater
- Storm Drain systems
 - Oil Grit Separators
 - LID
 - Sumps



Waterbody Crossings





Tier 1 Fish Passage Design

Tier 1 (Stream Simulation)

- Slope $< 0.5\%$: culvert span $> 0.75 \times \text{OHW}$
- $0.5\% \leq \text{Slope} < 6\%$: culvert span $> 0.9 \times \text{OHW}$
- Round: invert burial $\geq 40\%$ of diameter
- Pipe arch: invert burial $\geq 20\%$ of rise.
- Culvert slope $\pm 1\%$ of natural stream slope.
- Add Substrate in culvert to simulate streambed and be stable during larger discharges
- Provide baffles to help retain sediment.

Coal Creek at K Beach Road 18' diameter buried 7.2', After



A collage of five images showing infrastructure workers in various settings: a worker in a yellow hard hat and orange vest, a woman in a green safety vest and sunglasses, a worker in an orange hard hat and safety vest, a worker in a red hard hat and safety vest, and a worker in a blue hard hat and safety vest.

Tier 2 Fish Passage Criteria

- Requires FishXing software created by USFS
 - Fish sustained and burst swimming vs. water velocity
 - Add resting areas as needed
 - Compares water depth to minimum depth for fish

Tier 2 fish passage with baffles Alyeska Highway, Girdwood





Tier 3 Fish Passage Criteria

- Use hydraulic calculations to ensure successful fish passage
- Both ADF&G and DOT&PF agree



Other information

- Collaborate with ADF&G to provide the best culvert designs that meet the criteria and constraints of both agencies
- Erosion protection, as needed

Wasilla Creek at Bogard, 17'-0" x 6'-9"



Coal Creek at K Beach Road 2008, 10' Diameter, Before, Outlet



Coal Creek at K Beach Road 2008, Before, Outlet



Coal Creek at K Beach Road, 2010, looking upstream



Coal Creek at K Beach Road 2015, Tailwater looking downstream



Coal Creek at K Beach Road 2015 looking upstream



Fish Creek at Knik Goose Bay Road Before, 2 – 12' diameter



Fish Creek at Knik Goose Bay Road After, 32' x 12'



Wasilla Creek at Palmer-Fishhook 17'-2"x11'-4", buried 2.3', 2016, Outlet



Wasilla Creek at Palmer-Fishhook 2016 looking upstream

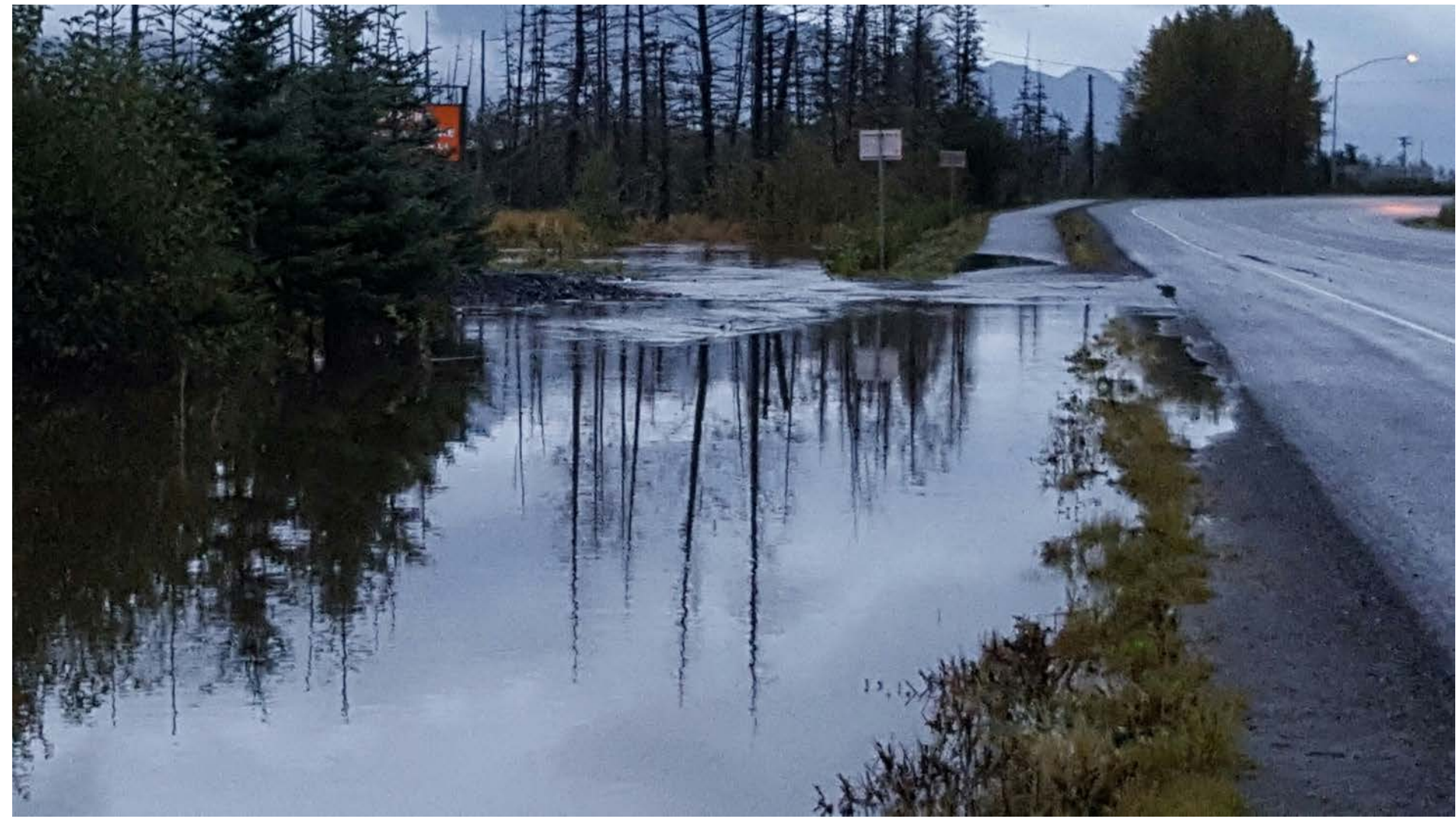




Fish Culverts in the design phase

- North Fork Anchor River at Nikolaevsk Road
- Crooked Creek at Sterling Highway
- Two Moose Creek at Sterling Highway
- Leader Creek near Naknek
- Others on smaller streams

Parallel Flow Embankment Saturation





Parallel Flow, Erosion



Parallel Flow, Road Overtopping



Keep Alaska Moving through service and infrastructure

Parallel Flow, Embankment Stabilization



Parallel Flow, Embankment Stabilization

