Appendix A

Helmet Creek Restoration & Monitoring Work Plan

Adak Petroleum Diesel Spill

April 13, 2013 Final

A. Executive Summary

Diesel fuel spilled into Helmet Creek on Adak Island, Alaska on January 11, 2010 injuring natural resources in the creek and the nearby estuary, intertidal and nearshore marine habitats. Investigations performed by the Responsible Party (RP) and the federal and state natural resource trustees (Trustees) during October 2010 and September 2011 identified restoration opportunities on Helmet Creek. The pictures below identify the stretch of Helmet Creek proposed for restoration (see, Figure 1 and Figure 2).

B. Restoration Description

Restoration will be performed cooperatively with the RP and Trustees. The Trustees will be present during implementation of the restoration and will be consulted if changes are made in the methodology. If changes involve in-water work or could adversely affect fish populations, the appropriate permitting agency clearance will be necessary. Additionally the environment on the island of Adak and in Helmet Creek specifically has been altered significantly and the risk of releasing new contaminants or of encountering unexploded ordinances (UXO) exists. The RP must illustrate that they have followed through on any island specific safety requirements regarding UXO. Soil samples in areas that will be newly exposed to the stream by barrel removal will be analyzed prior to restoration work. Soil samples will be collected using standard methods[1] from within and around the barrels and composited into a single sample at each of the following three work locations:

1) Barrel Location #1;
2) Barrel Location #2; and
3) Barrel Locations #3 and #4 (see Figure 2).

The three composite samples will be analyzed for metals, PAHs and PCBs as outlined in Table 1. If exceedences of thresholds listed are found in the samples, the contaminated area will be re-evaluated for restoration by the Trustees with an option to retain the current plan for the site, modify the current plan at the site, or come up with an alternative action. The Trustees and RP will discuss modifications to the work plan, if necessary, with the understanding that any existing actions that are eliminated will be replaced with an action(s) requiring similar effort in time and expense.

If more than trace amounts of oil are observed during restoration, sorbent booms and pads will be utilized to remediate any further damage. All booms and pads will be collected immediately after the work is completed for appropriate disposal.

[1] A separate document entitled *Adak Petroleum Diesel Spill, Helmet Creek Sediment Sampling Plan* has been prepared to describe the specific methods that will be used at each of the tree sites.

Figure 1: Lower Helmet Creek showing structures

Figure 2: Upper Helmet Creek showing structures

Table 1: Contaminant Thresholds

Symbol	*Contaminant*	*TEL[1] (ppb)*	*LEL[1] (ppb)*
As	Arsenic	5900	
Cd	Cadmium	596	
Cr	Chromium, total	37300	
Cu	Copper	35700	
Pb	Lead	35000	
Hg	Mercury	174	
Ni	Nickel	18000	
	PAHs, total (QM calculated)		4000
	PCBs, total (QM calculated)	34.1	
Zn	Zinc	123000	

[1] TEL – Threshold Effect Level; LEL – Lower Effect Level

1. Debris Cleanup

Roughly 15 to 20 pieces of anthropogenic debris (plywood, scrap metal, etc.) were noted in the creek during the various surveys. There is some risk that this material could adversely influence habitat quality or potentially shift and cause future fish passage blockages. Virtually all of the material can be easily removed by hand in a day. A team of two or more people shall walk the channel from the small boat harbor to the spill origin site -- collecting and hauling away all anthropogenic material located within or immediately adjacent to the creek. On future monitoring trips, this exercise will be repeated to remove any future accumulations. A wood stave pipe and timber are located immediately above Culvert #2 (Figure 3). This wood stave pipe and timber may require mechanical effort to cut away the objects close to both banks.

Figure 3: Wood stave pipe and timber

2. Fish Passage

i. *Trash Rack*

Examination of the two trash racks found that neither were tightly fixed to the adjacent concrete headwalls. Hardware historically holding the racks in place appears to have deteriorated over the years. Also, the trash rack at Culvert #2 has partially pulled away from the headwall. Both structures can likely be removed by hand by one or two people after first using a reciprocating saw or hacksaw to detach any remaining fittings.

Trash racks will be removed on the first day of restoration work. Hand tools may be used to remove the sediment around the trash rack to allow its removal. Once the racks are removed, the channel bed in the immediate area shall be disturbed using hand tools to break up any minor sediment steps that may have formed. The two sites will then be left undisturbed for several hours before decisions are made on final channel reconfiguration. This will allow time for a natural hydrologic regime to form in the affected areas.

Culvert #2: The downstream end of this culvert looks fine, but the upstream end is blocked by the plugged trash rack. The channel will also need some minor handwork to eliminate the vertical drop into the culvert. Currently there is a 12 to 18-inch drop into culvert #2. In order to eliminate the vertical drop after the trash rack is removed, the accumulation of boulders and other sediment will need to be reconfigured to create a relatively stable streambed with no drops exceeding ten (10) vertical inches. The exact process will be determined in the field during the restoration process in coordination with ADFG and NOAA fisheries biologists and is expected to consist of one or more of the following steps:

- Fill in the drop area of the stream and possibly remove some of the stream bed at the top of the drop.
- To ensure that the resulting grade is not too steep, the restoration could include some hand work to rearrange boulders upstream. Reference-reaches upstream can be used to identify the appropriate slope for the stream following trash rack removal.

Culvert #3: The bed of the stream upstream to the next culvert (a distance of approximately 25 feet) may also be modified as necessary to ensure the slope is not a barrier to fish passage. The exact process will be determined in the field in coordination with ADFG and NOAA fisheries biologists and is expected to consist of one or all of the following steps:

- Fill in the drop area of the stream and possibly remove some of the stream bed at the top of the drop (see Figure 4).
- If the channel grade exceeds four percent, create two, or possibly three, equally spaced steps (see Figure 5). The steps should reduce the effective grade for fish passage, help trap sediments, and should not disrupt stream conveyance. All steps will include gaps as necessary to minimize fish jump height.

- Create a step at culvert mouth to help preclude significant head-cutting of the channel upstream.
- Review potential for sluicing of sediment from culvert and take steps to avoid this action as necessary. This may include creating a small step downstream of the culvert equivalent to the existing step downstream of Culvert #4.

Given the existing grade, it is expected that any necessary changes can be made by hand with minimal disturbance.

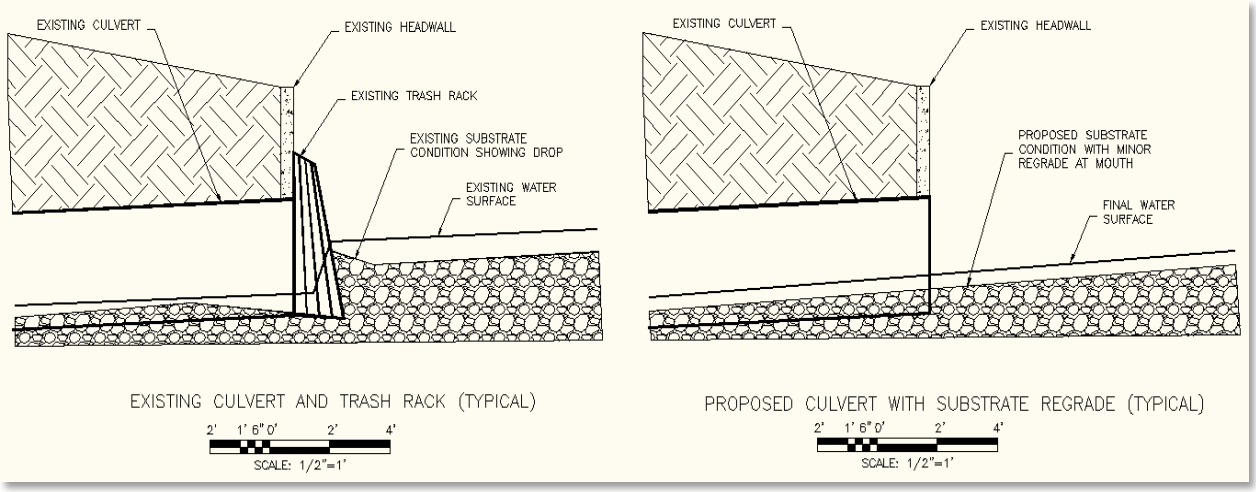

Figure 4: Drawing of proposed channel regrade (Typical)

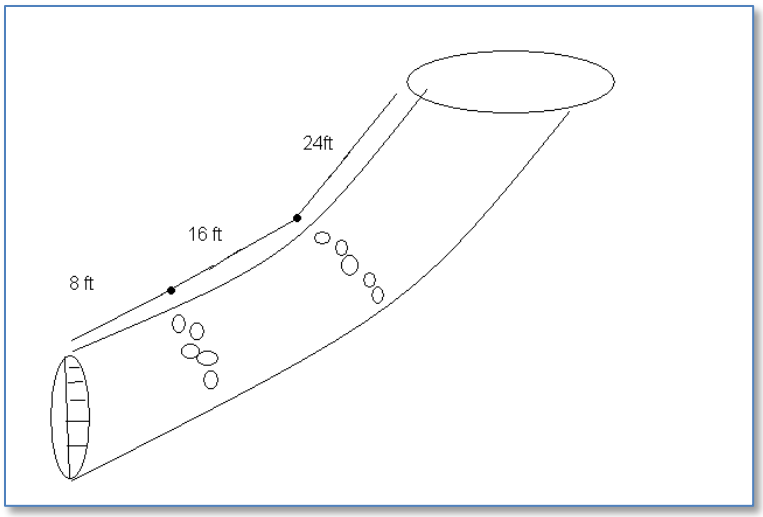

Figure 5: Drawing of potential step pool configuration option

Currently, a step is present before the downstream edge of Culvert #4. The diameter of these rocks ranges from 7 to 18 inches. It is likely that this would also be a suitable diameter for any future steps. Configuration of the rocks in the step will be determined once the trash racks are removed and flows are observed.

ii. Spill Control Structures

Concerns for fish include: (1) the lack of light that the gate lets into the culvert and (2) the possibilities of increases in velocity through the opening during high water in spring. The gates shall be opened to a point where the bottom of the gate is approximately six inches above the water surface at peak flows. The gates are raised and lowered using hand-operated cranks and can be readily moved as the equipment is in good operating condition. The gates may be maintained permanently in that position. During fuel transfer operations the operator may choose to temporarily return the gates to a partially closed position as a safety measure. Partially closing the gates will not interfere with fish passage.

iii. *Streamwide Issues*

General observations of all culverts and possible fish passage barriers should be performed when restoration is occurring and on future monitoring visits. Specifically, observers should record any clogging of culverts, culvert failures, stream bank collapses, diversions of channel, and debris obstructions.

3. Creosote Piling Removal

i. Water Quality

As an issue of water quality, removal of creosote pilings would benefit water quality in Helmet Creek. From initial observation by the Trustees at the site, it seems creosote piles are located near enough to a road that an excavator or heavy truck equipped with a choker can access the site and pull the piles from the streambed. However, the Trustee observer does not have a high level of expertise in this type of removal, so if the piles cannot be removed from the road, a small hole should be excavated with a shovel and the pile cut off below the streambed elevation to remove the piling at streambed level. Any holes left in the streambed shall be filled with clean gravel from a nearby gravel bar.

ii. Piling Between Culverts #4 and #5

A total of three pilings are present between Culverts #4 and #5. One is in Helmet Creek (see Figure 6) and two others are approximately two feet from the bank.

Figure 6: In-stream Piling

iii. Piling After Culvert #5, across from iron floc stream

Three additional pilings exist on the upper bank near the road. Again, due to close proximity of the road, removal can be conducted with machinery that is road-based. The piling are above the high-water mark of Helmet Creek, but drainage into the creek would be affected by the creosote coating on the pilings. Piles that cannot be readily removed from the road will be cut off at ground level and the surface capped with clean soil and native seed or vegetation mat, if available (See Figure 7).

Figure 7: Upper Bank Pilings

4. Floodplain Barrel Removal

The floodplain barrel removal would consist of removing eleven (11) barrels, plus some pieces of barrels located along the shoreline. From the view available through a number of holes in the barrels, they appear to be filled with dirt and rocks. Most of the barrels are located above ordinary high-water and were probably placed as bank protection. These barrels do not seem to be supporting the banks of the stream. In many cases there were hollows behind the barrels and the stream bank. While in some cases the vegetation grows from the bank to the tops of the barrels. If the removal is done carefully, the vegetation mats can be removed and placed in the gap the barrel occupied. All mats at risk of being carried away during peak flow events shall be staked in place using wooden stakes. Many of the barrels are missing and the banks at these locations are stable. In addition, some of the barrels have pulled away from the banks and are tilted towards the river. There is no sign that significant erosion occurred as a result.

A terrace (old building site) immediately adjacent to the barrels on the east side provides a good work staging area. The lower grouping contains three barrels located behind a large boulder on the bank above the creek. Six additional barrels are located in the upper grouping. All six are on the bank above the creek channel. The vegetation plug growing atop each barrel should be removed and set aside. Soil samples should be taken and analyzed prior to restoration from each of the barrels to ensure that new contaminants will not be introduced into the stream. Some of the sediment in the barrel can be emptied at the barrel site to partially fill the hole left by removal of the barrel. A depression should be left into which the vegetation plug is placed such that it is level at the same slope as the adjacent vegetation. Any additional sediment remaining in the barrels after filling the holes should be used to slope the bank behind the barrels. Vegetation mat should be staked in over as much of the exposed area as possible. If the sediment test confirm the fill is clean, sediment will be placed in the depression and covered by vegetation mat. Other scraps of barrels and debris along the creek in this area should be removed. Disturbed areas without vegetation (potentially up to 75 square feet) should be seeded with the *Approved Vegetation Mix*. (See Table 2). The barrels and all other man-made debris should be disposed of offsite.

Table 2: Approved Vegetation Mix

Percent	***Common Name***	***Scientific Name***
60	'Norcoast' Bering Hairgrass	*Deschampsia beringensis*
20	'Boreal'Red Fescue	*Festuca rubra*
15	'Arctared" Red Fescue	*Festuca rubra*
5	Annual Ryegrass	*Lolium multifloum*

5. In-Stream Barrel Removal

A section of the creek actually flows through barrels like a culvert. The barrels seem to be two-deep and, although the stream flows around the barrels as well as through them, the barrels

constrict the stream movement. This would be in-water work and disruptive to the stream during implementation, but the restoration work should provide a net benefit for the long-term, allowing natural stream geomorphology and flow. It also diminishes likelihood of large blowouts in the stream during high water events or spring high flows. For this removal, barrels should be removed from the stream without disturbing the bank. In places where the bank has grown over the barrels, the vegetation mat should be cut and the barrel removed. The area is approximately six (6) barrels long. Another single barrel acting as a culvert is upstream of the tank farm and should also be removed. Removal will require in-water work. The RP or consultant hired to conduct the work will need to obtain a Fish Habitat permit and comply with recommendations from the Alaska Department of Fish and Game (ADF&G) on the correct removal procedure and work window. This site consists of the remains of several rows of barrels historically used as culverts. All barrels are still within the active channel, with many of them completely submerged. Several barrels have a thin veneer of vegetation growing on their sides. A few of the barrels are also supporting some of the soil along the margins of the channel.

Vegetation from atop the two barrels in the middle of the grouping should be cut loose from the bank, lifted off, and set aside for reuse. Where the banks are up against the barrels, bank soils should be removed with shovels leaving a stable 45 degree slope down to the water's edge. Excess soil should be managed according to Fish Habitat permits. All readily accessible barrels and scrap should be removed from the channel by hand. This may require passing a cable through the barrel and lifting or pulling. Minor digging using hand tools is acceptable but no extensive digging in the channel should occur. Barrels or pieces of barrels that cannot be removed by hand or with hand tools should be left in place. It is expected that 95 percent or more of the material in the channel can be removed in this way.

One location has a single, partial barrel embedded in the streambank. Most of the barrel has rusted away, leaving the rim and some of one side to partially support the bank. The remains of the barrel do not block flow, but may cause blockage in the future. The rim and any readily accessible portions of the barrel should be removed by hand while minimizing disturbance to the overlying vegetation. The thick mat of vegetation should be left undisturbed to protect the shoreline. No revegetation should be necessary.

6. Upstream Capping of Barrel Culverts

This barrel location consists of two culvert/barrel complexes in an "L" configuration which diverts a small percentage of the upstream flow. (see Figure 8) The culverts are completely buried, so it is impossible to estimate the exact number of barrels in the ground. Removal of all barrels would require significant disturbance to the landscape and at least one stream crossing by heavy equipment as needed for access to the work area. Because benefits to the environment from barrel removal are minimal, we propose to simply plug the most upstream (inlet) barrel with a 2 x 2 foot vegetation plug, which would in turn cut off flow to the remaining downstream barrels. The barrels shall be left in place under the tundra and allowed to rust away. The vegetation plug shall be collected from an upland area outside of

the creek channel and fitted to the eroded area of the bank at the culvert inlet such that it blocks flow from entering the culvert mouth. Wood stakes shall be driven through the plug and into the underlying soil to hold the plug in place.

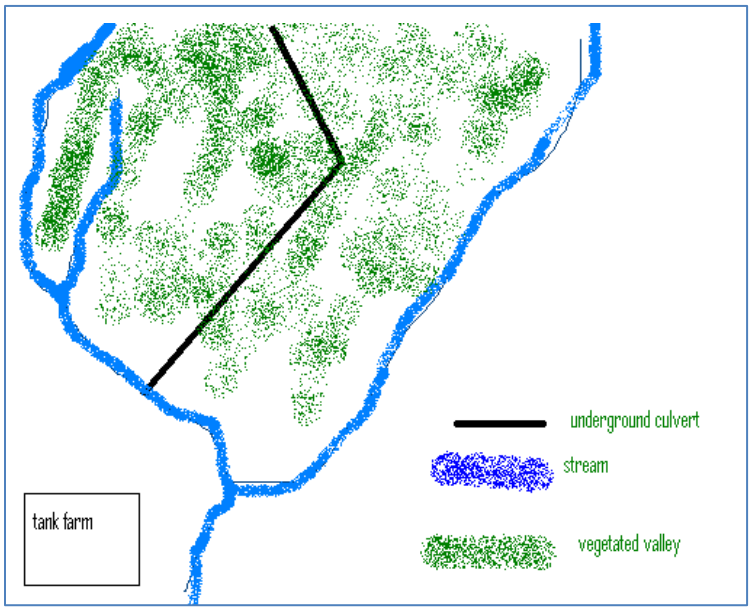

Figure 8: Sketch of Culvert/Barrel System

7. Erosion and Sediment Control

In addition to the revegetation that is directly a part of the restoration for floodplain barrel removal, the following restoration protocols should be used wherever work performed in the creek or near the shores could lead to erosion, sediment release, or denuded vegetation. The primary method for revegetation at each disturbed area shall be to utilize healthy vegetation mats that are removed from the barrels. If no mats are available in the immediate work area, material shall be collected from within 100-feet of where the plug/mat is to be used, as far as possible from any roads, trails, or streams/wetlands, and in a relatively flat location where future erosion is not expected to occur. Any Trustees in attendance during restoration shall be consulted for final approval of the donor vegetation collection locations. If necessary, the ground shall be seeded afterwards with the *Approved Vegetation Mix.* These mats shall be set aside until cleanup work is complete and then laid over disturbed areas as part of the erosion control process. All mats at risk of being carried away during peak flow events shall be staked in place using wooden stakes. Where mats are not available, the *Approved Vegetation Mix* shall be used. (See, Table 2) The *Approved Vegetation Mix* identified for this project was developed by the Alaska Plant Materials Center for use in reclamation at various upland landfill locations on Adak Island (Alaska 2011 in RP report). The grasses are also recommended by ADF&G for

bank protection work near streams (Alaska 2005 in RP report). Seed for the *Approved Vegetation Mix* shall be sourced if possible from local Alaska-grown seed guaranteed to meet State of Alaska Seed requirements per Title 11 AAC 34.010. This will help guarantee purity and quality while keeping the percentage of non-native and invasive species to a minimum. The *Approved Vegetation Mix* is expected to provide temporary site stability during natural re-colonization of native plant species. Revegetation will also occur at the site of the piling removal, as well as any other area where vegetation is negatively affected due to restoration or monitoring activity.

The seed mix will be applied at a rate of 40 lbs/acre (1 lb/1000 sq.ft.) as recommended by the Alaska Plant Materials Center for the type of sandy soils found adjacent to Helmet Creek (Alaska 2008). It is estimated that no more than one to two pounds of seed mix will be needed for this project. No fertilizer shall be applied due to the proximity of the proposed restoration work to the creek channel.

C. Monitoring

If restoration implementation occurs in 2013, monitoring should occur in 2013, 2014 (1-year post-implementation), 2015, and 2017. This monitoring schedule will allow for the following:

- Observations immediately post-implementation to allow for adjustments in stream substrate, step pools, vegetation, or erosion control;
- annual observations of the streambed and slope immediately post-construction and then every monitoring year.
- observation of the stream following two even-year pink salmon classes post-construction;
- observation of stream flow and streambed conditions -- to be observed after four years of normal stream conditions;
- observation of the stream in 2017 -- one year past when ADEC has predicted that the oil would have dissipated naturally.

Compliance Inspection: The objective of compliance inspection shall be to verify that all proposed actions and restoration goals, as described in this plan, have been correctly and fully implemented, and that any changes made in the field are consistent with restoration planning goals. The compliance inspection survey shall evaluate each work location immediately upon completion of the restoration actions (Year 0) and shall serve as a record of the post-restoration baseline condition. Field evaluation tasks shall rely primarily on photographs taken by trained personnel. Trustees and the RP will work cooperatively to ensure that appropriate monitoring is being conducted. Trustees plan on being present all monitoring years. This includes two Trustees for construction monitoring, and one Trustee for each of three subsequent monitoring events (total of five person trips). If during the monitoring, it is determined that an adjustment to the restoration action needs to be taken in order to meet the restoration goals, these actions will be undertaken cooperatively. If the adjustment(s) require a new permit, this must be obtained prior to resuming restoration work.

1. Fish Passage:

i. Trash Racks

Monitoring will occur for the trash rack removal, streambed regrade, and untouched streambed. The monitoring will be performed for the stream section directly below, through, and above the culvert. The reach where monitoring will occur will be calculated at 40x wetted-width, with the center of the reach being the initial restoration activity as encountered travelling upstream from the mouth of Helmet Creek. This will enable monitoring of changes in stream condition resulting for the trash rack removals that occur outside the immediate work zone. Due to the short distance between projects in the lower section of the stream, one reach will overlap with the next restoration location.

Trash Rack Removal Procedures:

Monitor the downstream and upstream impacts of trash rack removal on physical parameters of stream and floodplain. Physical parameters of importance will include anything that could obstruct the upstream movement of adult pink salmon. This would include identification of any new obstructions or blockages to fish movement such as exaggerated width to depth ratios (very shallow reaches), culvert blockages, or new vertical drops greater than 10 inches. Monitoring frequency should be every monitoring year, preferably in the same season each year. The reach should be calculated at 40x wetted-width. Due to the short distance between projects in the lower section of the stream, one reach will overlap with the next restoration location. Conduct photo point and visual assessment of stream bed and stream bank integrity at removal sites.

ii. Streambed Regrading Following Trash Rack Removal

- Normally, a natural reference reach would be used to determine the appropriate slope, but it is doubtful that the stream is located in the historic channel, and therefore a suitable reference has not been identified. Instead, the regrade will aim to eliminate fish passage obstructions -- based on jump heights referenced to the literature on what is acceptable for pink salmon fish passage. These determinations will be presented to the Trustees for approval prior to implementation. Initial monitoring will measure the grade upstream and downstream of the culvert to ensure that the slope does not inhibit fish passage. The monitoring distance upstream or downstream should overlap the undisturbed streambed by a few feet. It is likely that the regrade footprint will be restricted by the presence of the next culvert. For these, the grade will be monitored from culvert to culvert to ensure proper passage. The grade will be monitored every monitoring year to ensure that changes as the stream adapts do not decrease passibility. Monitor physical parameters of stream and floodplain. Monitoring frequency should be every sampling year, preferably in the same season each year.
- Conduct transect measurement of in-stream parameters, such as stream width, depth, and grade. Monitoring frequency for this assessment should be every monitoring year.

- Conduct photo point and visual assessment of stream bed and stream bank integrity looking downstream and upstream over regarded area. Monitoring frequency for this assessment should be every monitoring year.

iii. Spill Control Structures

- Gate positions shall be visually inspected to ensure the bottom of the gate is placed and maintained roughly six inches above the average water-surface elevation. Photo verification should be taken.

2. Creosote Piling Removal

- Conduct photo point and visual assessment at removal location. If piling is in- stream, assessment of stream bank before and after removal will be conducted to evaluate whether any bank erosion or degradation has occurred. Monitoring frequency for this assessment should be every monitoring year.
- Vegetation growth and composition will be assessed at each piling removal site located outside of the stream channel. Monitoring frequency for this assessment should be every monitoring year. Data collection will identify density of plant growth in terms of percent coverage and identification by species. These data will be compared to data collected on control sections of an undisturbed section of stream bank.

3. Floodplain Barrel Removal

- Conduct photo point and visual assessment of stream bed and stream bank integrity looking downstream and upstream over area of removal. Monitoring frequency for this assessment should be every monitoring year. Vegetation monitoring for this area is covered in section 6v.

4. In-Stream Barrel Removal

- Conduct transect measurements of in-stream parameters such as stream width, depth, and grade.
- Monitor physical parameters of stream and floodplain. Monitoring frequency should be all monitoring years, preferably in the same season each year.
- Conduct measurements of water depth and channel width in removal areas and reference reaches.
- Conduct photo point and visual assessment of stream bed and stream bank integrity looking downstream and upstream over area of removal. Monitoring frequency for this assessment should be every monitoring year.

5. Capping of Upstream Culvert Barrel Complex

Conduct photo point and visual assessment of stream bed and stream bank integrity looking downstream and upstream over area of bank plugs. Monitoring frequency for this assessment should be every monitoring year.

6. Erosion /Revegetation

Conduct data collection as previously mentioned in above sections, but data collected needs to also address the following erosion and revegetation monitoring parameters in order to address later stated performance measures.

i. Trash Rack Removal Areas

Conduct visual inspection of the channel for signs of erosion, including a photo point taken every monitoring year.

ii. Streambank Barrel Removal

- Conduct photo-quadrat and visual assessment of stream bed and stream bank integrity -- looking downstream and upstream over area of removal. Monitoring frequency for this assessment should be every monitoring year.
- Assess vegetation growth and composition at removal sites. Monitoring frequency for this assessment should be performed every monitoring visit. Data collection will identify density of plant growth in terms of percent coverage.

iii. In-Stream Barrel Removal

- Assess vegetation growth and density at removal site. Monitoring frequency for this assessment should be performed every monitoring visit.

iv. Piling Removal

- Assess vegetation growth and density at site. Monitoring frequency for this assessment should be performed every monitoring visit.

v. Areas Affected by Restoration or Monitoring Activity

- Assess vegetation growth and density at site. Monitoring frequency for this assessment should be performed every monitoring visit.

D. Reporting

Four reports shall be prepared -- including a compliance inspection report -- after substantial completion of the restoration work in 2013. The compliance inspection report should include the data from any pre-construction monitoring, such as the culvert capping activity. Three additional monitoring reports will be submitted in 2014, 2015, and 2017.

E. Performance Standards

If there is a need to adjust the restoration action in order to meet performance measures, this will be done cooperatively with Trustees and the RP. In these cases, monitoring may be reset to allow for a full three post-work monitoring visits.

1. Fish Passage

Upstream fish migration access shall be considered unblocked if the following conditions are met:

- No accumulation of debris that blocks greater than 10 percent of the opening (upstream or downstream) or interior of any culvert or spill control gate.
- No accumulation of debris at either opening or in the interior of any culvert that creates a vertical drop in-water surface elevation of greater than four inches.
- No changes in streambed configuration between Culverts #3 and #4 or at in-stream barrel removal locations that result in a significant increase in the slope of the stream, or the creation of jump heights in excess of 10-inches which can be barriers for the passage of weak swimming fish species. Jump heights shall be measured as shown in Figure 9. The measured height shall be the minimum jump height that must be overcome by a fish moving upstream as determined by a trained fisheries biologist. The biologist shall identify the likely preferred passage location taking into account such factors as gaps in the step, suitability of launch and landing locations, and any other obstructions that could interfere with passage conditions.
- The spill control gates are maintained in a position no less than six inches above the peak water surface elevation.
- Following removal of the barrels, in-stream hydrology of the creek must still allow for fish passage. Measurements of water depth and channel width should ensure that the stream does not go subsurface, and these measurements should be comparable to reference reaches.

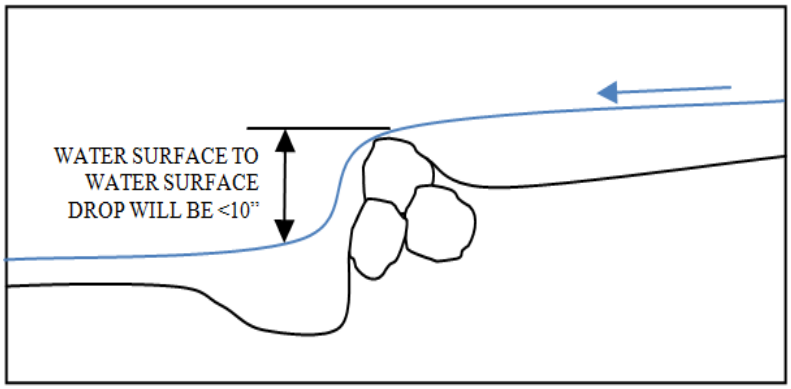

Figure 9. Technique for measuring jump height.

2. *Erosion/ Revegetation*

This Section considers measurements for areas where vegetation was disturbed in the restoration process. Restoration shall be considered stable if the following conditions are met in locations where revegetation is used:

- Year 2014 -- One year following completion of revegetation – There is no more than minor erosion in or directly adjacent to locations where barrels were removed after bank settles. There is no erosion where equipment was located.
- Year 2015 and 2017 – There is no more than minor erosion of areas where equipment was located or directly adjacent to locations where barrels were removed.
- Revegetation will be assessed as percent cover of native vegetation over the disturbed areas for seeded areas, and transplanted vegetation mats. Revegetation and these performance standards will occur in barrel removal areas, piling removal areas, and areas where vegetation has been harmed in the restoration process.
- Percent Cover (seeded areas):
  2014 – greater than 50%
  2015 – greater than 75%
  2017 – greater than 95%
- Percent Cover for Vegetation Mats:
  Year 2013 – minimum of 95% coverage of mat with live vegetation.
  Year 2014, 2015, 2017 – greater than 95% coverage of mat with live vegetation.
- Native species dominance: Disruption of an area can lead to an increase in non-native species. Areas revegetated should be dominated by native species with non-natives not exceeding 5% of the total plot.

3. *Cap of Upstream Barrels*

Observations of the water diversion and investigations of the diverted flow should occur every monitoring year to ensure the capping action did not have unexpected repercussions. The culvert vegetation plugs will be examined for presence, stability, and effectiveness.

F. Maintenance

1. *Fish Access*

- No accumulation of debris that blocks greater than ten percent of the mouth or interior of any culvert or spill control gate. If debris accumulation occurs, it shall be removed by hand and disposed of offsite.
- No accumulation of debris at the opening or in the interior of any culvert that creates a vertical drop in water surface elevation of greater than four inches. If debris accumulation occurs, it shall be removed by hand and disposed of off-site.
- No changes in streambed configuration between Culverts #3 and #4 that result in a change in the slope of the stream or jump heights in excess of 10-inches, which can be barriers for the passage of weak swimming fish species. If streambed configuration changes and becomes a barrier to fish passage, corrective actions must be implemented and approved by a representative Trustee on site.

- The spill control gates should always be situated no less than six-inches above the average water surface elevation, except for periodic and temporary partial/full closure during fuel transfer operations. If the gates are not higher than six inches from the water's surface, except during the aforementioned exception periods, the gates must be adjusted to achieve the performance standard. Measurements must be made on monitoring visits and adjustments implemented as necessary.
- Throughout the stream, fish passage should be adequate for passage of weak swimming fish. If any unforeseen event creates a blockage, action should be taken to restore fish passage in agreement with a Trustee representative.

2. *Erosion/Vegetation*

- Areas in or directly adjacent to locations where barrels were removed that do not meet erosion performance standards shall be further stabilized by covering the affected area with a biodegradable landscaping fabric and reseeding with the approved vegetation mix. (See Table 2) Seeded areas that do not meet percent-coverage standards shall be treated as follows:

  I. After completion of work in 2013 – the area shall be reseeded with the approved mix. The Alaska Plant Materials Center shall be contacted for advice on selecting a more appropriate seed mix.

  II. In years following construction (2014, 2015 and 2017) – photos and measurements shall be collected at the site and for evaluation.

- Areas where mats were used that do not meet percent-cover standards shall be treated as follows:

  After completion of work in 2013 and in all monitoring years:

  I. If the vegetation within the mat covers greater than or equal to 95 percent, a photo of the mat shall be taken and the mat shall be left alone.

  II. If the vegetation within the mat covers less than 95 percent, but more than 50 percent, the approved vegetation seed mix will be applied to the sparsely vegetated areas of the mat.

  III. If the vegetation within the mat covers less than 50 percent, the mat shall be removed and the area shall be seeded with the approved vegetation mix.

  IV. In areas that exceed the 5% tolerance limit for non-native vegetation, the situation will be evaluated to determine the best method of correction. One possible method could be to remove the non-native vegetation by hand and reseed the area with the approved seed mix.

3. *Removal of In-Stream Barrels*

If restoration activities result in a significant change to the creek channel that blocks fish passage, action will be taken to modify the restoration in accordance with the Performance Standards. If in-water work is required, Trustees must approve new restoration actions, and all applicable permits must be secured prior to conducting work.

4. Cap of Up-Stream Barrels

If significant dewatering of the main stem or channel migration is observed, action will be taken to modify the restoration. If in-water work is required, Trustees must approve new restoration actions, and all applicable permits must be secured prior to conducting work.

If culvert vegetation plugs are missing, loose, or damaged (e.g. leaking), action will be taken to modify or replace defective plugs as necessary to meet the goal of preventing stream flow from entering the culverts. This might include replacement of the plugs, addition of sand bags inside the culvert to back up the plugs, or addition of more staking. If future failure looks imminent, the culvert can be crushed in the immediate area, and the disturbed area vegetated with soil plugs or seed as necessary to protect the site from erosion. This decision shall be made in conjunction with NOAA and/or ADFG staff.