Draft

Conceptual Design Report

WRIA 35 Wetland-Water Storage Project

Asotin County, Washington

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Prepared for:

WRIA 35 Planning Unit

Washington Department of Fish and Wildlife

Washington Department of Ecology

Prepared by:

HDR/EES

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INTRODUCTION

A multi-purpose water storage assessment is being completed to identify a location and method to provide additional water storage for the WRIA 35 watershed. The WRIA 35 Planning Unit, in coordination with the Washington Department of Fish and Wildlife (WDFW) and the Washington State Department of Ecology (Ecology), has selected construction of wetlands as the most feasible alternative to provide enhanced water storage in the watershed. The purpose of water storage in wetlands is primarily to benefit riparian habitat and to provide limited infiltration of water to a shallow aquifer.

Two WDFW-owned parcels located in the upper portion of the Asotin Creek watershed have been identified for locating the wetland-water storage projects. These sites are known as the S. Fork/N. Fork Site (Site 1) and the Lick Creek Site (Site 2). The S. Fork/N. Fork Site is located immediately upstream of the confluence of the South Fork and North Fork of Asotin Creek, between Asotin Creek Road and the downstream left bank of Asotin Creek. The Lick Creek Site is located immediately upstream of the confluence of the Lick Creek channel and Asotin Creek, between Asotin Creek Road and the downstream left bank of Asotin Creek. The sites locations are shown on Figures 1 to 3.

GENERAL DESCRIPTION OF PROJECT

This section of the report provides a general description of the project. Surface water would be diverted from Asotin Creek during high flow periods in the spring and early summer. This water would be diverted either using a gravity diversion, a pump diversion, shallow wells, or infiltration galleries. The preferred method of diversion would be properly screened to avoid entrapment of fish. Shallow wetland ponds would be constructed along the riparian zone. It may be possible to design the upgradient pond to utilize shallow ground water. Ponds in the center and lower portions of the site would be supplied by surface water and would be lined with low-permeability soil or a geotextile liner covered with soil. The lower (downgradient) ponds may include an unlined cell to infiltrate water into the shallow aquifer.

Vegetative planting would involve establishing riparian woody plant species between the new wetland areas and the existing scrub shrub and forested riparian zone. This will maximize riparian function within this portion of Asotin Creek and increase habitat corridor functions. By planting all of the disturbed ground, the project will also help limit weed establishment and help control construction related runoff and sedimentation.

The goal of the project is to increase habitat diversity within the central and upper reaches of the Asotin Creek watershed. Introduction of palustrine wetland habitat into the arid environment of Asotin Creek is expected to provide increased habitat availability, increased use by vertebrate and invertebrate species. These goals are consistent with the intent to improve habitat conditions for terrestrial wildlife, including migratory passerine bird species and small mammals, and furbearers.

FIELD INVESTIGATIONS

Initial Subsurface Investigations

On August 3, 2005, fifteen test pits were excavated with a backhoe to identify the nature and depth of subsurface soils on the two sites. A total of nine test pits were excavated at the N. Fork/S. Fork site and six test pits were excavated at the Lick Creek Site. The locations of the test pits are shown on Figures 2 and 3.

Ground Water and Surface Water Monitoring

Two streamflow gauges were installed on Asotin Creek at each of the project sites upstream and downstream of the proposed wetland area. Three groundwater monitoring wells were also installed on each site. Ground water level, surface water level and surface water flow measurements have been collected during three monitoring events on Oct. 12, 2005, Dec. 15, 2005 and Feb. 2, 2006. Continuous water level recorders have been installed at each of the four surface water gauges and two of the three ground water monitoring wells at each site. The locations of ground water monitoring wells and surface water staff gages are shown on Figures 2 and 3.

Topographic Survey

A topographic survey of both sites was completed to identify the elevation of the ground surface and the location of site features. Locations of the wells and staff gauges installed previously were included in the survey.

Site Visit to Observe Vegetation and Riparian Characteristics

A site visit was conducted by two field biologists with experience in wetland ecology during February 2006. The vegetative characteristics and riparian characteristics of each site were observed during the field reconnaissance.

PHYSICAL SETTING

S. Fork/N. Fork Site (Site 1)

Site Description

Site 1 is an open field within the Asotin Creek floodplain. A site plan is shown on Figure 4 and photographs are shown on Figure 6. The property is owned by WDFW and is used for growing winter wheat for wildlife. A portion of the site is within the Asotin Creek riparian zone. Just upstream of the open field is a riparian wetland with emergent springs and riverine side (overflow) channels.

The site is about 1,600 feet long and 400 feet wide and approximately 12 acres in size. It is located just upstream of the North Fork – South Fork Asotin Creek confluence, southeast of the Asotin Creek Road. The southeastern border of the open field is approximately 100 to 200 feet from the stream in most areas. At Site 1 the surface topographic elevation drops from approximately 1,874 ft. to 1,838 ft (about 36 feet of topographic relief). The stream stage along Asotin Creek drops from approximately 1,868 ft to 1,834 ft over a distance of about 3,800 ft (elevation drop of about 34 ft and a hydraulic gradient of about 0.009).

Geology

At Site 1 topsoil varies in depth between 0 and 2 feet and consists primarily of silt with sand and gravel. Test pit excavations indicate that the geologic deposits on the site were primarily sand, gravel, cobbles and boulders underlain by bedrock. The depth to bedrock is near the surface on the northern portion of the site and deeper than 20 feet in the center of the site and close to the creek. The unconsolidated deposits above bedrock exhibit high permeability.

Hydrology

Ground water and surface water stage elevations measured on the site are presented in Tables 1 to 3 and shown on Figure 8. Asotin Creek flows atop the unconsolidated sand and gravel deposits and there is a strong hydraulic continuity between the creek and ground water. Asotin Creek flow was measured from 22 to 24 cfs during October 2005 and from 24 to 28 cfs during February 2006.

Ground water flow on the site is downgradient and follows the Asotin Creek flow direction. Asotin Creek is losing flow to ground water at the upstream (western) portion of the site. This causes ground water on the western portion of the site to be close to the land surface (ranging from 1 to 7 ft below grade). In the center of the site, ground water levels are about 8 to 10 feet below grade and are below the elevation of the Asotin Creek stage. In the downstream portion of the site (to the east), Asotin Creek starts to gain flow from ground water (ground water flows back into the creek) and the depth to ground water is about 1 to 8 feet below grade.

The hydrographs in Figure 9 show that the surface water and ground water elevations follow the topographic relief across the site. There is little seasonal variation in ground water levels (likely due to the high permeability of the sand-gravel-cobble aquifer).

Lick Creek Site (Site 2)

Site Description
Site 2 is an open field within the Asotin Creek floodplain. A site plan is shown on Figure 5 and photographs are shown on Figure 7. The property is owned by WDFW and is used for growing winter wheat for wildlife. A portion of the site is within the Asotin Creek riparian zone. Just upstream of the open field is a riparian, wetland with emergent springs and riverine side (overflow) channels.

The site area is about 850 feet long and 350 feet wide and approximately 5.5 acres in size. It is located just upstream of the Lick Creek – North Fork Asotin Creek confluence, south of the Asotin Creek Road. The southeastern border of the field is approximately 50 feet from the stream in most areas. At Site 2 the surface topographic elevation drops from approximately 1,963 ft. to 1,936 ft (about 27 feet of topographic relief). The stream stage along Asotin Creek drops from approximately 1,950 ft to 1,932 ft over a distance of about 1,500 ft (about 18 ft of elevation drop- a hydraulic gradient of about 0.01).

Geology
Topsoil varies in depth between 0 and 2 feet and consisted primarily of sandy silt and gravel. Test pit excavations indicate that the geologic deposits on the site were primarily sand, gravel, cobbles and boulders underlain by bedrock. The depth to bedrock is near the surface on the northern portion of the site and deeper than 20 feet in the center of the site and close to the creek. The unconsolidated deposits atop bedrock at this site exhibit very high permeability.

Hydrology
Ground water and surface water stage elevations measured on the site are presented in Tables 1 to 3 and shown on Figure 8. Asotin Creek flows atop the unconsolidated sand and gravel deposits along the site and there is a strong hydraulic continuity between the creek and ground water. Asotin Creek flow was measured at just over 20 cfs during October 2005 and 17 to 20 cfs during December 2005.

Ground water flow on the site is downgradient and follows the Asotin Creek flow direction. On the upstream portion of the site (to the west) Asotin Creek is losing flow to ground water and ground water is near the land surface. The depth to ground water in the western portion of the site (upstream) ranges from 1 to 8 feet below grade. In the center of the site, the Asotin Creek surface water elevation is above the ground water surface elevation and ground water levels are about 10 feet below grade. In the downstream portion of the site (to the east), Asotin Creek starts to gain flow from ground water (ground water flows back into the creek) and the depth to ground water is about 1 to 8 feet below grade

The hydrographs in Figure 10 show that the surface water and ground water elevations at individual gaging stations follow the topographic relief across the site. There is little seasonal variation in ground water levels at the site (likely due to the high permeability of the sand-gravel-cobble aquifer).

WETLAND DESIGN ALTERNATIVES

This section presents a conceptual layout for the wetland-water storage ponds and a description of specific alternatives for various design components.

Wetland Design Function Goals

The overall goals of habitat improvement for this project will be to:

Goal #1 Establish riparian woody plant species between the new wetland areas and the existing scrub shrub and forested riparian zone. This will maximize riparian function and increase habitat value.

Goal #2 Increase habitat diversity within Asotin Creek. Introduction of palustrine wetland habitat into the arid environment of Asotin Creek is expected to provide increased habitat availability, increased vertebrate and invertebrate species use of the sites, and provide an important primary production area for the Asotin Creek riparian area.

These goals are consistent with the intent to improve habitat conditions for terrestrial wildlife, including migratory passerine bird species and small mammals, and furbearers. Raptors and other resident birds may also benefit from increased habitat diversity in these areas. The proposed riparian enhancement and wetland creation will only indirectly affect aquatic species by providing habitat for aquatic invertebrates and amphibians, but these habitat areas will not be directly connected to the Asotin Creek aquatic habitat and will not be accessible to fish.

Design Assumptions

- Two sites next to Asotin Creek and on WDFW property have been chosen to construct wetland ponds. The wetlands will be designed to take advantage of the characteristics of each site.
- The primary benefit for this project will be water storage for wildlife habitat. The sites are underlain by a shallow aquifer in direct hydraulic connection with Asotin Creek. Any water infiltrated into the aquifer will remain for a short duration before flowing back to the creek. There will be very limited benefits to streamflow from water infiltration and aquifer storage at either site.
- The project is designed to be hydraulically separate from Asotin Creek and to keep fish from entering the wetland ponds.

- Regulated wetlands are likely present on the western portion of each site. A well-developed riparian zone is established adjacent to the creek. The project design will seek to avoid or minimize disturbance in these areas.
- Shallow wetland ponds located above the ground water table will require some type of liner (soil or geotextile) to hold water.
- The sites should be designed to operate in the long-term with little maintenance, few operational manpower requirements and at a low-cost. The water supply to the site should be provided through an alternative that is constructible, low-maintenance, durable and preferably requiring limited manpower for operation.
- The site design should conform to generally accepted engineering practices necessary to maintain public safety and to protect the environment..

Conceptual Wetland Pond Design Layout

The conceptual wetland pond design layout is presented on Figure 11. At both sites, a series of shallow ponds would received water diverted from Asotin Creek with spill-over discharges from upgradient to downgradient ponds. The lower-most pond would include an unlined cell to allow infiltration of carry-over water to the aquifer. The depth to ground water at the S. Fork/N. Fork Site (Site 1) may be sufficiently shallow to allow construction of a ground water fed pond. It is envisioned that each pond would include deep-water (2-4 ft) and shallow-water (1-2 ft) areas.

Wetland Pond Design Alternatives

Design alternatives are presented below for specific components of the wetland site layout, including:

- Water diversion methods
- Wetland pond type and design characteristics
- Spillway configuration
- Vegetative planting

Environmental benefit, construction, operation and maintenance requirements, cost and longevity of the project are the primary considerations in evaluating and recommending alternatives. The project alternatives will be presented to the Planning Unit for acceptance. Upon acceptance of an alternative, detailed design will occur. Several key assumptions are stated below, followed by the alternatives, and then the recommended alternatives.

A summary of diversion options are listed below and summarized in the matrix below. Figures 12 to 14 provide sketches of some of the design alternatives.

Water Supply Diversion and Conveyance Alternatives

Gravity Methods
Diversion Structure: This method consists of a concrete structure constructed in the bank of the stream. A sheet screen would be placed at the inlet side of the structure to prevent fish from entering. A slide gate would be placed in the structure allowing the operator to control water diversion. An adjustable weir could also be placed in the structure to only allow flow during higher stream flows and to reduce operational requirements.

Infiltration Gallery: This method consists of one or more perforated pipes installed subsurface near the stream which collect shallow groundwater, then route it to a non-perforated pipe leading to the site. A valve would be placed in the pipeline or a gate at the outlet in order to shut this diversion off.

Pumped Methods
Direct Pump: This method consists of a suction screen being placed into the stream leading to a small centrifugal pump on the bank. This pump would lift water from the stream and deliver it to the pond site.

Diversion Structure to Sump/Pump: This method consists of the installation of a diversion structure as described above, except the delivery would be to a sump where a pump would deliver the water to the ponds.

Infiltration Gallery to Sump/Pump: This method consists of the installation of an infiltration gallery as described above, except the delivery would be to a sump where a pump would deliver the water to the ponds.

Shallow Well/Pump: This method consists of digging or drilling a shallow well to bedrock, then installing a perforated casing or drywell structure. Shallow groundwater would infiltrate into the well where it would be pumped up to the ponds.

Diversion Alternatives		
Method	**Advantages**	**Disadvantages**
Gravity		
Diversion Structure	Medium Maintenance, No Power Cost	Screen Maintenance, Instream Construction, Disturbance of Wetlands, High Construction Cost
Infiltration Gallery	Low Maintenance, No Power Cost, Avoids Instream Construction	Near-shore Construction, Disturbance of Wetlands, Long-term Maintenance, High Construction Cost, Potential Clogging
Pumped		
Direct Pump Diversion	Easy Installation, Avoids Wetlands Disturbance	Screen Maintenance, Pump Maintenance, Power Cost, Some Instream Construction, Near-Shore Construction, High Construction Cost
Diversion Structure to Sump to Pump	Easy Installation, Avoids Wetland Disturbance	Screen Maintenance, Pump Maintenance, Power Cost, Pump Maintenance, Power Costs, Instream and Near-shore Construction, High Construction Cost
Infiltration Gallery to Sump to Pump	Low Maintenance, Avoids Instream Construction, Avoids Wetlands Disturbance	Pump Maintenance, Power Cost, Near-shore Construction, High Construction Cost
Shallow Well to Pump	Avoid Instream & Nearshore & Wetlands Disturbance, Easy Construction, Easy Maintenance, Low Overall Cost	Pump and Well Maintenance, Power Cost

Wetland Pond Type Alternatives

A summary of pond options are listed below.

Lined Pond: This option consists of an excavated pond with a blended earth or synthetic lining. Blended earth consists of a combination of imported fines, onsite materials, and organic matter. This would be placed in the bottom and sides of the pond to significantly reduce seepage. Excavated material would be placed at the edges of the pond to build up a low berm for additional storage capacity. Synthetic liners typically consist of 30-mil PVC material with a soil cover, which virtually prevent infiltration all together.

Unlined Pond: This option consists of an excavated pond with no lining materials. Any water diverted into the pond would immediate infiltrate into the high-permeability soils and the pond would not hold water.

Groundwater Pond: This option consists of an excavated pond that is deep enough to intercept the shallow ground water table. Depending upon how deep the excavation is and the variation in groundwater levels, this pond may hold open water year-round.

Wetland Pond Type Alternatives		
Method	**Advantages**	**Disadvantages**
Lined Pond, Blended Earth	Can be constructed with imported soil, Provides materials for plantings	Requires importing of materials
Lined Pond, Synthetic, With Soil Cover	Virtually no seepage	Expensive Likely to require importing of materials
Unlined Pond	None	Will not meet project objectives
Groundwater Pond	Possible water year-round High probability of planting success	Dependent on depth to groundwater- will only likely work in upgradient areas of site

Wetland Pond Spillway Alternatives

A summary of spillway options are listed below. Engineering practice requires building a spillway on all ponds to allow the water to exit the pond in a controlled manner. These spillways can be designed to visually fit into the site design and can be constructed using the material on-sight. Engineered spillways can be designed with vegetation and will not decrease the habitat benefits. Spillways are designed for an outflow stage elevation to allow outflow to another pond, an open infiltration area, or the stream.

Piped Spillway: A piped spillway consists of an inlet within the pond prism, either horizontal or vertical, that is intended to overflow if water reaches a set elevation. Piped spillways have performance problems (clogging, high maintenance, low durability) and the state agencies generally do not allow piped spillways for these types of applications.

Channel Spillway: This option consists of a low point in the pond berm that typically has some type of rock lining allowing high water to exit the pond. A shallow channel is typically constructed that leads back to another pond, an open infiltration area, or the stream.

Spillway Type Alternatives		
Method	**Advantages**	**Disadvantages**
Piped Spillway	None	Maintenance, Poor Performance, Higher Cost
Channel Spillway	Low Cost, Low Impact	None

Vegetation Planting

Riparian Planting

Riparian planting will incorporate native tree, shrub and grass species known to grow in the vicinity, and other native species that provide important long-term habitat benefits. Plant species proposed for the riparian planting include: Ponderosa pine (*Pinus ponderosa*), Western white pine (*Pinus monticola*), Water birch (*Betula occidentalis*), Columbia hawthorn (*Crataegus columbiana*), Pacific ninebark (*Physocarpus capitatus*), Serviceberry (*Amelanchier alnifolia*), Great basin wildrye (*Elymus cinereus*), and bluebunch wheatgrass (*Elymus spicatus*). Other species could be substituted to meet specific riparian management objectives. The species selected were either observed to be naturally established within the adjacent riparian zone, or appear to have been recently planted as part of ongoing habitat management efforts.

Wetland Planting

The wetlands are expected to be seasonally inundated and perennially saturated. This hydrologic condition generally limits woody plant growth and favors emergent plant species. Emergent wetlands may be dominated by common cattail (*Typha latifolia*), hardstem bulrush (*Scirpus lacustris*), American three-square (*Scirpus americanus*) or sedges, such as beaked sedge (*Carex rostrata*). Some planting of one or more of these species is recommended to limit the establishment of undesirable, weedy species.

Planting in Other Areas

Seeding will be required on all disturbed land to limit weed species establishment. Dry site grasses will be broadcast seeded throughout the project areas.

PERMITTING CONSIDERATIONS

This section describes potential permitting requirements. For local permits a local entity usually retains lead agency status for the State Environmental Protection Act (SEPA) authority. The project is on Washington State land meaning that WDFW could declare substantive authority and retain SEPA jurisdiction and authority. Otherwise, Asotin County would be the default SEPA jurisdiction. The SEPA lead agency is responsible for completion of a SEPA checklist (Chapter 43.21C RCW) to provide a comprehensive review of the proposal. SEPA requires the identification and evaluation of probable impacts to all elements of the built and natural environment. The lead agency is responsible for reviewing all environmental aspects of the proposal, including those under the jurisdiction of other agencies, such as project impacts on recreational uses. The lead agency also identifies potential adverse environmental impacts, and whether the impacts are likely to be significant after identified mitigation is applied.

Asotin County may require a Substantial Development Shorelines Permit, which is often required in streams for development on shorelines. Shorelines are listed in RCW 90.58.030 (definitions), WAC 173-18 (streams), and WAC 173-22 (wetlands). After completion of the local process the permits are sent to Ecology for filing but Ecology does not have authority to approve or deny them. The permit is required for all non-exempt developments and uses exceeding $10,000 for project costs in fresh water as defined in RCW 90.58.030(3) and WAC 173-27-030(8). Asotin County may have other local construction permits, such as grading or building permits if structures are involved.

The project has the potential to affect the bed or flow of a stream that are state waters. This action triggers the requirement for a Hydraulic Project Approval (HPA) (Chapter 77.55 RCW and Chapter 220-110 WAC) that is administered by WDFW. The proposed project will also involve the Washington Department of Ecology (WDOE) for water quality impacts. A 401 Certification requires the project meet water quality standards and effluent limitations for construction and operation.

The project is expected to involve waters of the U. S. and therefore a Section 404 Permit from the Seattle Regulatory US Army Corp of Engineers (COE) may be required if the project disturbs these waters.

Potential Regulatory Processes or Permits and Respective Administrators

1. SEPA checklist - Asotin County or WDFW
2. JARPA – permit application process for HPA, 401, 404, and Shorelines.
3. Shorelines permit - Asotin County
4. Hydraulic Project Approval - WDFW
5. Section 401 Water Quality Certification - WDOE
6. Section 404 Regular Permit – COE (if necessary)
7. Section 106 NHPA (National Historic Preservation Act) compliance or Historical & Cultural Resources Consultation per Governor's Executive Order 05-05.
8. Section 404 permits (if necessary)
9. ESA consultation (if necessary)
10. Water Right Permit – WDOE

RECOMMENDATIONS

To be added after further consultation with project partners.