



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

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December 19, 2012

Susan Adams, Executive Director  
Washington Water Trust  
1530 Westlake Avenue N., Suite 400  
Seattle, WA 98109

Dear Ms. Adams:

Thank you for submitting the proposed **Dungeness Water Exchange Mitigation Plan**, dated **December 3, 2012** for Ecology's review and approval. We have reviewed the plan and have determined it meets the requirements of WAC 173-518-075. The Mitigation Plan is hereby approved.

**YOUR RIGHT TO APPEAL**

You have a right to appeal this decision to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this decision. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do all of the following within 30 days of the date of receipt of this decision:

- File your appeal and a copy of this decision with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this decision on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

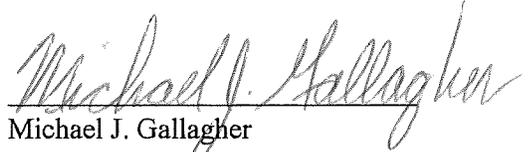
**ADDRESS AND LOCATION INFORMATION**

Street Addresses	Mailing Addresses
<b>Department of Ecology</b> Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	<b>Department of Ecology</b> Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
<b>Pollution Control Hearings Board</b> 1111 Israel RD SW STE 301 Tumwater, WA 98501	<b>Pollution Control Hearings Board</b> PO Box 40903 Olympia, WA 98504-0903



*For additional information visit the Environmental hearings Office Website: <http://www.eho.wa.gov> .  
To find laws and agency rules visit the Washington State Legislature Website:  
<http://www1.leg.wa.gov/CodeReviser>*

**SIGNATURE**

A handwritten signature in cursive script that reads "Michael J. Gallagher". The signature is written in dark ink and is positioned above a horizontal line.

Michael J. Gallagher  
Southwest Regional Section Manager  
Water Resources Program

# Dungeness Water Exchange Mitigation Plan

December 3, 2012



**Prepared by**  
Washington Water Trust  
1530 Westlake Avenue N, Suite 400  
Seattle, WA 98109



## **Introduction**

This mitigation plan was prepared by Washington Water Trust (WWT) and our contractor, Ecosystem Economics, for the Dungeness Water Exchange to fulfill the requirement of a mitigation plan under WAC 173-518-075, the specific section of the Dungeness Water Management Rule governing mitigation plans. The Exchange will not be authorized to accept payment for mitigation credits or hold, sell, and assign mitigation credits prior to approval of the mitigation plan by Ecology.

The Dungeness Water Exchange (Exchange) is a program of Washington Water Trust (WWT). WWT has agreed to initially manage the Exchange. At some future, time a local entity may take over operation of the Exchange. In that event, this mitigation plan and its continuing obligations would need to be transferred or assigned by WWT and Ecology to the local entity. The Exchange has a dual mission of restoring flows on the mainstem Dungeness River and providing mitigation for new permit-exempt well users as well as new groundwater right permits as mitigation credits are available. A more detailed discussion of the Exchange's activities can be found in the Mitigation Strategy Document (Draft November 2011).

This plan begins with a description of the purpose of the mitigation program and the mitigation activities to be implemented by the Exchange, followed by sections that address the specific mitigation plan requirements of the Dungeness Rule.

## **Purpose**

The primary purpose of the mitigation program is to fund projects that generate mitigation credits to be sold to prospective water users required by WAC 173-518 to mitigate for their impacts to small streams and the Dungeness River.

WAC 173-518 limits the cumulative flow reduction resulting from new water uses in each stream approximately equivalent to the loss of 1% of the aquatic habitat during the critical period. It is called the maximum depletion amount and it cannot be exceeded. The critical period is defined in the rule as the 30-day period of lowest flow (WAC 173-518-020). Based on current conditions, Washington Department of Fish and Wildlife and Ecology have generally identified the critical low flow period as August 15 to September 15 for the Dungeness River and September 1 – September 30 for the small streams. The mitigation program will be managed to ensure that the maximum depletion amounts are not exceeded and, if and where possible, mitigation actions will also improve other aquatic habitat metrics.

## **Mitigation Activities**

The Dungeness Mitigation Strategy (WWT/EE 2011) presents all of the potential water-for-water project types that could be used to generate mitigation credits. The mitigation strategy analyzed the suitability, effectiveness, and relative cost of candidate projects that conserve or restore stream flows. The following project list is the result of the Multi-Criteria Analysis and Cost Benefit Analysis presented in the mitigation strategy. The projects are listed below by category or project: water right leases and purchases, aquifer recharge, source changes and storage and other approaches.

The Exchange will draw on a variety of different types of mitigation projects to create mitigation credits, however as discussed in Attachment A, shallow aquifer recharge will be the primary strategy for generating mitigation. To the extent feasible the Exchange will select projects based on their ability to create mitigation credits within all of the subbasins listed in WAC 173-518.

### **Water Right Purchases/Leases**

- Purchase of year round or permanent late season water rights from DWUA (Dungeness Water Users Association) members, Dungeness River rights from August 15 (or earlier) to September 15
- Lease surface water (SW) from individual water right holders; including Dungeness River rights, but also rights in other small streams
- Partial season lease agreements for SW rights
- Lease ground water (GW) rights from individuals
- Purchase SW rights from individuals
- Purchase GW rights from individuals

### **Aquifer recharge**

- Shallow aquifer recharge (SAR) with Dungeness River Water using irrigation ditches
- SAR with reclaimed water

### **Source Changes**

- Switching irrigation from SW to GW in the late season
- Switching stockwater use from SW to GW
- Switching irrigation from reclaimed water to GW
- Switching GW use from a high-impact shallow GW well to a lower-impact deeper GW well

### **Storage and Other Approaches**

- Build a large storage reservoir (Atterberry or another location) for DWUA
- Build multiple small storage reservoirs (ideally less than 10 AF in volume or less than 6 feet in height) throughout the DWUA system

The following sections of the Dungeness Water Exchange Mitigation Plan respond directly to the required elements of a mitigation plan as outlined in the rule. Additional detail on the proposed mitigation projects to be completed under this Mitigation Plan is provided in Attachment A.

### **Effectiveness of Mitigation**

The majority of mitigation projects will be permanent or very long-term contracts. In the case of water right acquisition, the contract between the seller and the Exchange will obligate the seller to cease water use (usually irrigation). Payment for the project will depend on compliance with the contract. In the case of a permanent purchase, the water right will be transferred to the Washington State Trust Water Right Program and be protected as an instream flow water right in perpetuity which will ensure effectiveness. With more active types of mitigation projects such as source substitutions or aquifer recharge projects, contracts will be in place with the entities managing the project to ensure compliance and long term effectiveness. An advantage of the Exchange approach to mitigation is that it will engage in a suite of mitigation and restoration transactions at any one time. In the unlikely event that a mitigation project proves ineffective, other projects can be relied upon to meet the need for mitigation credits. As the operator of the Exchange, Washington Water Trust has considerable experience implementing mitigation projects that comply with Ecology standards for mitigation and will propose only projects that have a strong likelihood of long-term effectiveness as mitigation credit generators.

### **Prevent losses beyond Maximum Depletion Amounts**

This mitigation plan will operate, by carefully scheduling and distributing credit generating projects across the East WRIA 18 area, and by careful tracking of debits against the credits, the maximum depletion amount (and for domestic uses the reserves), and thus prevent negative flow impacts in excess of the maximum depletion amounts. Ecology, the Dungeness Water Exchange, and the County will share pertinent information with sufficient frequency to support an accounting system that tracks the reservations, mitigation credits created by mitigation projects, mitigation credits assigned or pledged to mitigate for new uses subject to the rule, maximum depletion amounts for each stream, and maximum allocation amounts for the Dungeness mainstem.

## **Measures to prevent water from being appropriated by others**

Several measures will ensure that water allocated for mitigation credits will not be allocated by another person or entity for another purpose. When the Exchange engages in water right acquisitions the water right will be placed into the State Trust Water Right Program. The water right can then be managed as an instream flow water right. If it's desired, the same trust water right could be partially or fully used to supply one or more infiltration basins managed for aquifer preservation purposes. In either case, the instream flow or aquifer preservation trust water right can be enforced against junior users if necessary. Other types of water management projects will be proposed for mitigation if it can be demonstrated that downstream water users can be prevented from appropriating the water.

## **Monitoring and Reporting Plan**

There are two types of monitoring that the Exchange will engage in as discussed below.

### *Monitoring of Mitigation Generating Projects*

All mitigation contracts will specifically address monitoring and compliance. Monitoring activities may include: diversion monitoring, on field monitoring, monitoring of the point of recharge, and stream flow monitoring.

### *Monitoring of Mitigation Recipients*

Providing mitigation credits in amounts less than the full ground water permit exemption (RCW 90.44.050) means that mitigation buyers voluntarily agree to limit their water use to an amount that is reasonable to offset the actual use. In return, water users are able to reduce the cost of their mitigation obligation. As a consequence, to be equitable to all the mitigation credit purchasers and to existing water right holders, the Exchange will periodically assess compliance of individuals' use with the chosen package. To make this assessment, the Exchange may conduct the following types of baseline and monitoring activities:

- review parcel map, aerial photos and, as necessary, conduct a site visit in order to record any existing outdoor uses on the site and establish a baseline of area irrigated from other sources on the property
- ensure that the water use restriction is recorded on the deed to provide notice to subsequent purchasers of the property
- conduct annual monitoring via site visit, aerial photography, remote sensing, meter readings or other appropriate methods in order to verify that the acreage irrigated under the exempt well is equal to or less than that specified in the chosen mitigation package
- report egregious failures to use water in amounts and purposes consistent with their mitigation certificate to Ecology for technical assistance or enforcement action

## **Avoiding Impairment of Existing Water Rights, Including Instream Flow Rights**

The general principles of the Exchange along ensure that impairment of existing water rights including instream flow water rights will be avoided. The generally accepted principles of the Exchange for water transactions include:

- Respecting DWUA, irrigation district and ditch company rules and regulations
- Acquiring water rights only from willing sellers
- Operating the Exchange within the maximum depletion amounts identified for each stream in WAC 173-518 and leasing and transferring only water that was previously diverted or withdrawn and used (“wet” water)
- Addressing and where necessary mitigating for any additional and significant third party impacts

Impairment will be explicitly addressed for Exchange transactions, by consideration of other water rights that may be impacted by the proposed project(s) and by compliance with WAC 173-518.

## **Protection of the Public Interest**

Just as the Exchange is dedicated to avoiding impairment of other senior water rights, the Exchange will strive to only complete transactions that are in the public interest. The Exchange was created to serve the public interest to realize flow restoration in the Dungeness as well as provide new water for economic development through mitigation Administration of the Exchange by the Washington Water Trust, a 501(c)3 nonprofit with input from the Exchange’s local Advisory Council will ensure that the Exchange works solely to meet its mutual objectives to fulfill small amounts of groundwater mitigation and restore stream flows on the mainstem Dungeness River. The activities proposed in this mitigation plan all attempt to manage and balance water use in the Dungeness Valley with the interest of the community in mind. Furthermore the accounting process discussed below ensure that the maximum depletion amounts and reservations will be tracked carefully thus contributing to the protection of the public interest as well.

## **Financial Assurances**

Contracts will be established between the Washington Water Trust and the water right seller or participating entity or entities for all mitigation projects. Contracts specify the price, the funder, and the terms of the deal including whether the water right will be transferred to the State Trust Water Right Program. Water rights involved in mitigation transactions will be transferred to Ecology and managed within the State Trust Water Right Program whenever possible. However, in some instances the Trust Water Right Program may not be a good fit for the particular mitigation transaction such as when an aquifer recharge or storage project is used to generate mitigation. In this case, the contracts will be structured to provide adequate assurances of the long-term financial viability of a project.

Financing for the Exchange’s activities and acquisition will come from start-up grants provided by the Department of Ecology, mitigation fees charged to new groundwater users for mitigation credits, and public and private funding sources sought by the Exchange, and partner organizations in the basin. Given the dual nature of the Exchange, it may enter into single water right transactions where a portion of the acquired water may go to mitigation purposes and a portion to restoration purposes. However, every effort will be made within the Exchange to finance, track, and account for transactions according to the two purposes (mitigation and restoration) in order to ensure that mitigation activities are not subsidized by public funds acquired for the purposes of flow restoration.

## **ATTACHMENT A**

### **Detailed Description of Proposed Mitigation Plan**

This attachment offers a more detailed explanation of the proposed mitigation credit transactions that form the basis for the Mitigation Plan of the Dungeness Water Exchange at inception. This plan is based on the availability of a \$450,000 grant from the Department of Ecology for use during FY2013-2014. As documented in the Plan below, this start-up funding combined with revenue from the sale of mitigation credits should be sufficient to provide mitigation for 950-2,350 wells, enough mitigation for 5 to 50 years depending on the amount and type of mitigation packages sold and the depth and location of new wells.

This Mitigation Plan is submitted by the Dungeness Water Exchange to the Department of Ecology to provide it and the fisheries co-managers, Washington Department of Fish and Wildlife and the Jamestown S’Klallam Tribe, with a clear illustration of a plan that provides all the required mitigation in in-kind form, including that to be provided to small streams. Based on our assessment, Washington Water Trust has found that mitigation credits based on shallow aquifer recharge, is the most feasible way to immediately implement a plan that meets small stream mitigation needs and provides the necessary financial assurances required in the rule. To supplement recharge WWT will also acquire water rights from members of the Dungeness Water User’s Association that will be transferred into the State Trust Water Rights program to meet mitigation needs on the Dungeness River.

Depending on the pace and pattern of demand, and to the extent that further research or other developments results in the identification of other feasible, reliable and more cost-effective approaches to provide mitigation, WWT will continue to explore complementary approaches including:

- Surface storage for release to meet small stream mitigation needs.
- Dedication of a portion the funds generated from mitigation to support out-of-kind habitat restoration projects.

WWT would propose amendments, or to revise and resubmit this Mitigation Plan, based on learning and experience with mitigation demand and mitigation projects. Annual reporting on progress under the plan will be used to make minor amendments to the plan and to seek Ecology approval for any changes.

### **Modeling Approach**

This Mitigation Plan is based on a hydro-economic scenario modeling tool (developed by Ecosystem Economics) that incorporates demand and supply for mitigation water, as well as the projected costs of mitigation projects. The model is used to allow WWT to explore scenarios for supply, demand and credit pricing to size the credit projects and verify that the Exchange’s financial commitments are sustainable over time.

The demand for mitigation is characterized as mitigation “obligations.” These mitigation obligations are met (or cancelled) by a corresponding amount of mitigation credits. Obligations and credits are differentiated into critical and noncritical period mitigation, in accordance with WAC 173-518. Further mitigation is accounted for by the subbasins identified in WAC 173-518 including:

- Bagley Creek
- Bell Creek
- Casselary Creek
- Dungeness River and Matriotti Creek
- Gierin Creek

- McDonald Creek
- Meadowbrook creek
- Siebert Creek

In the scenario modeling tool a demand scenario is developed for a set of assumptions regarding the number of wells expected over a fixed period. The supply of credits from two shallow aquifer recharge projects and purchase of water from the DWUA for the Dungeness River are then specified in order to establish that all credit needs are met for each scenario's new wells. A fund for habitat restoration projects in the Meadowbrook drainage, for reasons described below, is also used to meet remaining Non-Critical Period credit needs in that drainage. The capital and recurrent costs of the recharge projects are compiled and used to price the mitigation credit packages and provide a cash flow for the Exchange. First the demand and then the supply scenarios are explained below, including critical assumptions and parameters, followed by the financial plan.

## **Mitigation Demand**

The demand scenario employed for the Mitigation Plan builds on the previous demand analyses prepared by Ecosystem Economics and the Washington Water Trust for the Mitigation Strategy. On the demand side the following information is used to turn estimates of well numbers into credit obligations:

1. Water use and consumption data, divided by indoor and outdoor use, for the three mitigation "packages" that the Exchange will offer for sale (Indoor Only, Basic Outdoor and Extended Outdoor)
2. A set of water use scenarios, reflecting the variability in choices of mitigation packages by Exchange customers
3. A set of impact scenarios, reflecting the variability in the choice of aquifers (shallow, middle or deep) by Exchange customers
4. Historic information from Clallam County on the drilling of wells by subbasin, as well as information from the County on available lots, is used to assign wells to subbasins (note these subbasins include those mentioned above as well as 3 "Straits" basins that do not drain into a small stream)
5. Impacts on streams from consumptive use is then estimated by selecting five parcels from each subbasin and averaging the impacts from drilling in each subbasin on nine streams based on the groundwater model (impacts on Matriotti are developed and then added to those for the Dungeness River)
6. The impacts on streams of the scenario are then broken back into two portions that related to indoor and to outdoor use respectively

These impacts on streams are then categorized as Critical Period and Non-Critical Period mitigation credit obligations as follows:

7. Indoor use occurs year-round with only minor variation. To ensure that the impacts of indoor use on the Critical Period (a 30-day period) are fully mitigated, two months per year of indoor use is defined as the Critical Period mitigation obligation.
8. Irrigation use by households is assumed to occur over the same five-month window as that carried out by irrigation water right holders (i.e., from April 15 to September 15). The impact of this irrigation on the groundwater system and subsequently on streams can be expected to attenuate somewhat; that is the impacts will tend to distribute across a longer period. For wells that are distant from surface waters, and are completed in the deeper aquifers, the attenuated impact could distribute across the full year. For wells completed in the shallow aquifer located near small streams or the Dungeness River, the attenuation may be a week or less. For the

purposes of this mitigation plan analysis, the impacts felt by streams during any 30-day Critical Period window are assumed to be equal to the cumulative consumptive use from June 15 to August 1, which is equal to just less than 40% of the annual consumptive water use, with the remainder being Non-Critical Period mitigation.

For any scenario the projected number of wells yields a set of critical and non-critical period mitigation obligations for the seven small streams and the Dungeness River (and Matriotti Creek). The Water Budget Neutral Amount is simply the sum of these figures.

Four demand scenarios were developed to match budget projections:

1. High impact and high-water use scenario
2. High impact and mid-range water use scenario
3. Mid-range impact and mid-range water use scenario
4. Low impact and low-water use scenario

The percentage allocations for impact and water use scenarios are shown in the tables below.

**Table 1. Percentage allocations for impact and water use scenarios**

<b>Aquifers</b>	<b>Shallow</b>	<b>Middle</b>	<b>Deep</b>	<b>Totals</b>
<b>Scenarios</b>				
Low impact	0%	0%	100%	100%
Mid impact	50%	24%	25%	100%
High impact	100%	0%	0%	100%

The water use packages are described in the table below

**Table 2. Mitigation Packages**

<b>Package</b>		<b>Indoor Only</b>	<b>Basic Outdoor</b>	<b>Extended Outdoor</b>
<b>Indoor Use</b>				
Pumping Volume in:	gpd	150	150	150
	g/yr	54,750	54,750	54,750
	AF/yr	0.17	0.17	0.17
Consumptive Use in:	g/yr	5,475	5,475	5,475
	AF/yr	0.017	0.017	0.017
<b>Outdoor Use</b>				
Irrigated Lawn Area in:	sq length in ft	-	50	75
	Sq.ft	-	2,500	5,625
	acres	-	0.06	0.13
Total Irrigation Requirement	inches/yr	-	20.80	20.80
Pumping Volume in:	Af/yr	-	0.099	0.224

	g/yr	-	32,416	72,935
	gpd	-	89	200
Consumptive Use Rate	inches/yr	-	18.72	18.72
Consumptive Use	AF/yr	-	0.090	0.201
<b>Totals</b>				
Total Pumping Volume in:	gpd	150	239	350
	AF/yr	0.17	0.27	0.39
Total Consumptive Use	AF/yr	0.017	0.106	0.218
Average Shallow Aquifer Impact	AF/yr	0.01	0.07	0.14
Average Medium Aquifer Impact	AF/yr	0.01	0.05	0.10
Average Deep Aquifer Impact	AF/yr	0.01	0.04	0.07

### Mitigation Supply Project Descriptions

*Shallow Aquifer Recharge Projects.* To obtain in-kind mitigation credits for the small independent streams to the East and west of the Dungeness River one shallow aquifer recharge project on each side of the River will be developed. To conduct aquifer recharge the Exchange will acquire water rights from the Dungeness Water Users Association for the purpose of diversion and use at the recharge sites. Site preparation and construction activities will depend on the site, but may vary from a simple spreading basin to more sophisticated recharge designs that increase infiltration rates. WWT will also enter into contracts with Dungeness irrigation districts and companies to deliver water to the sites using their irrigation ditch infrastructure. Long-term contracts or easements with landowners will be used to guarantee access to the sites. The shallow aquifer will receive the water temporarily, but it will discharge to area streams, the lower Dungeness River, as well as to the Strait and deeper aquifers. The rise in the water table will not exceed 10 feet.

The Dungeness groundwater model provides estimates of the impacts of the recharge projects on small streams and the Dungeness River. East and west side projects that provide the approximate distribution of benefits such as those shown below in Table 3 will be sought. These figures from prospective sites were used in the scenario model to calculate the response of recharge projects.

**Table 3. Optimal surface water effects at recharge sites**

	Bagley	Bell	Cassalery	Dungeness	Gierin	Matriotti	McDonald	Meadow-brook	Siebert	Total
East	0%	4%	13%	54%	13%	2%	1%	1%	0%	91%
West	18%	0%	0%	11%	0%	1%	23%	0%	23%	77%

Timing of the recharge projects is designed to occur when water is in plentiful supply and at a time which it will assist in delivering the water to the streams during the Critical Period. The likely period for recharge selected in consultation with the Department of Ecology is for a 30-day period, between May 15 and July 15. One-half of the water recharged is expected to accrue during the Critical Period.

*Late Season Purchase of Irrigation Water.* In addition to purchasing water rights that will service the recharge projects, WWT will acquire additional water rights from the DWUA to meet Dungeness River Mitigation needs. This water will be placed into the Trust Water Right Program and will be available to

serve as mitigation for impacts to the Dungeness River mainstem. The scenario runs indicate that the proportion of Dungeness River credits required during the Critical Period is relatively low. Thus, the water rights that will be acquired from the Dungeness mainstem may be Critical or non-Critical Period credits.

The water rights acquired will be part of the DWUA water rights held in the Trust Water Program on a temporary basis. While this amount of water is not tied to specific acreage within the District, the DWUA have an agreement with Ecology to manage the trust water right at their points of diversion. Should the WWT acquire Critical Period water, that water is subject to both the 50-50 rule and the 60 cfs diversion limit in the 2012 MOA signed by Ecology and DWUA. The season of use for this water would be the last 30 days of the irrigation season (August 15-September 15). The 2012 MOA specifies that “the quantity of water from the DWUA Temporary Trust Water Right transferred to permanent trust and used for mitigation for out of stream purposes shall be considered a diversion of water by the DWUA subject to the 50% agreement and the 60 cfs agreement” This means that any water rights purchase by WWT will be added to the actual diversion by DWUA members for determining whether they are in compliance with the 50% agreement, and will be added to the 60 cfs minimum to limit diversions under the DWUA’s Superceding Water Right Certificates

*Complimentary Habitat Mitigation for Non-Critical Period Flows.* While the primary focus of this mitigation plan is to provide in-kind, water for water mitigation some of the revenue generated by the purchase of mitigation credit will be set aside in a fund to be used for habitat projects to benefit small streams. The in-kind mitigation will be used to offset impacts during the critical period for new withdrawals. However, during the non-critical period, mitigation will be achieved partially through out-of-kind habitat mitigation in the small streams. Based on the scenario runs, it is Meadowbrook Creek that will receive this funding as its mitigation needs are relatively hard to meet from the likely East and West side recharge projects (see further discussion in the financial plan below). Meadowbrook needs could be met from the East side project, but it will be costly ,therefore a fund to offset Non-Critical Period mitigation obligations in Meadowbrook Creek with habitat mitigation will be instituted

## **Scenario Runs and the Financial Plan**

The Exchange’s Mitigation Plan is intended to forward finance, construct and operate the projects listed above with a budget constraint of \$450,000 for capital costs of recharge and water rights acquisition. The scenarios bring all of the information, parameters and methods together to examine how supply and demand can be equilibrated under a range of circumstances. The bookends to the scenarios were a high impact and high-water use scenario and a low impact and low-water use scenario. The latter scenario, in which all customers choose the indoor only package and drill wells in the deep aquifer is unlikely. Further, the scenario suggests that the budget would not be expended before capacity was installed for literally tens of thousands of wells, far more than is really possible in the watershed. For this reason this scenario is excluded from the table below. Instead high impact, mid-range water use scenario and mid impact, mid-range water use scenarios are used to explore likely lower bounds to demand (in contrast to the high impact, high-water use scenario).

The results suggest that mitigation projects to meet the mitigation needs from 950 to 2,350 wells can be set in motion with the budget available. The actual cost of providing this mitigation in perpetuity is far more than \$450,000; however the physical capacity can be installed and the sufficient water rights can be acquired from DWUA with these funds. Future operations would then be funded and endowed through sales of mitigation credits to Exchange customers.

The scale of recharge projects needed will be in the 0.5 to 2cfs range, one on the East side of the Dungeness River and one on the west side. Water rights acquisitions for direct credit generation in the Dungeness River would be about 45 AF, and varies only slightly among the scenarios.

Finally, the table shows the amount of Meadowbrook impacts that would not be mitigated in-kind by the first two types of projects (in the first column of each scenario). The amounts are small, so small that it would not be effective to develop an entire recharge project in the Meadowbrook subbasin. Instead funds will be collected for out-of-kind habitat mitigation. Funds are set aside for this purpose from the capital budget at a rate equivalent to the average cost per credit for the other two types of mitigation. Due to the small amounts of mitigation needed the amount of funds that might be deployed is also relatively low, on the order of \$3,000 to \$5,000.

**Table 4. Scenario Summaries**

Scenario Indicators	Hi Impact / High-Water Use	Mid Impact / Mid-water Use	High Impact/ Mid-water Use
Number of Wells	950	2,350	1,850
Recharge Projects (cfs)			
Eastside	1.75	1.85	1.70
Westside	0.75	0.55	0.75
Capital Costs (\$)	459,000	444,000	456,000
Dungeness CP Credits (AF)	43	44	45
Shortage of Meadow-brook Non-CP Credits (AF)	0.32	0.14	0.36
Total Credit Sales (\$m)	2.8	4.0	3.6
Average cost per Well (\$)	2,290	919	1,174

Finally, the model ties the capital and operating costs of the projects into the generation of pricing schemes. The table above also summarizes the likely expected cumulative revenues of selling mitigation for the expected number of wells under each scenario, as well as the average cost per well. The difference between scenarios is very dependent on the number of wells and the need to assure that the fixed costs of running the recharge projects and the Exchange are met in perpetuity.

Once started, the Exchange should be self sustaining by relying entirely on the proceeds from the sale of mitigation certificates. Even with the current low interest rates, a large \$450,000 endowment will ensure funding to pay fixed costs and begin building a capital fund for future water acquisitions and projects. Fixed costs of operating the Exchange once the initial capital investment is made include: operating recharge sites, servicing exchange customers, carrying out outreach, administration, coordination and monitoring activities.

Again, these sales would be realized over the long term. As the operating costs of the recharge projects and the Exchange administration costs continue on in perpetuity, it is important to realize that the proceeds from the sale of mitigation certificates also need to create an endowment for the Exchange to support future mitigation projects. If future project cost for operations, maintenance, and new acquisitions change, it is expected that the cost of mitigation certificates would also change. Project costs and mitigation certificate pricing will be reviewed periodically to ensure that both objectives are met.

Initial mitigation package pricing is listed in the last table. The pricing is based on the high impact and high-water use scenario. As can be seen \$1,000 is the base cost for indoor only packages, with prices rising for the other packages to a maximum of \$3,000 for the extended outdoor package.

**Table 5. Mitigation Package Pricing**

(\$/well)	Indoor Only	1.1.1 Basic Outdoor	1.1.2 Extended Outdoor
Mitigation Payment	\$1,000	\$2,000	\$3,000