DEPARTMENT OF
ECOLOGY
State of Washington

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Amended
REPORT OF EXAMINATION
Change of: Points of Withdrawal
WRTS File No. CG4-34904P

PRIORITY DATE	APPLICATION NO.	PERMIT NO.	CERTIFICATE NO.
May 21, 2003	G4-34904	G4-34904P	

NAME

Crown Resources Corporation

ADDRESS/STREET	CITY/STATE	ZIP CODE
363 Fish Hatchery Road	Republic, WA	98166

PUBLIC WATERS TO BE APPROPRIATED

SOURCE

Groundwater

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	100	12.6

QUANTITY, TYPE OF USE, PERIOD OF USE

100 gallons per minute (gpm), 12.6 acre-feet per year, for mining and industrial use (Years 0 through 7)*.
100 gallons per minute (gpm), 3.34 acre-feet per year, for streamflow augmentation from July 1 through September 30 (Years 8 through 16)*.

***As it relates to mining at the Buckhorn site, Year 0 = 2007.**

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL

Well D-1 - 2,300 feet south and 1,700 feet east from the northwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-2 - 2,500 feet south and 1,700 feet east from the northwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-3 - 2,500 feet north and 1,700 feet east from the southwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-4 - 2,500 feet north and 1,900 feet east from the southwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-5 - 1,900 feet north and 500 feet east from the southwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-6 - 600 feet north and 1,700 feet east from the southwest corner of Section 24, T. 40 N., R. 30 E.W.M.

Well D-8 - 300 feet north and 50 feet west from the southeast corner of Section 23, T. 40 N., R. 30 E.W.M.

Well D-9 - 600 feet north and 100 feet west from the southeast corner of Section 23, T. 40 N., R. 30 E.W.M.

Additional 2 Wells if within both the NPDES described capture zone AND NE¼SW¼ of Section 24, T. 40 N., R. 30 E.W.M.

Underground Sumps - SE¼NW¼, NE¼SW¼, and NW¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

FILE COPY

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP	RANGE	WRIA	COUNTY
Well D-1 – SE¼NW¼	24	40 N.	30 E.W.M.	60	Okanogan
Well D-2 – SE¼NW¼	24				
Well D-3 – NE¼SW¼	24				
Well D-4 – NE¼SW¼	24				
Well D-5 – NW¼SW¼	24				
Well D-6 – SE¼SW¼	24				
Well D-8 – SE¼SE¼	23				
Well D-9 – SE¼SE¼	23				
Two wells NE¼SW¼	24				
Sumps – SE¼NW¼, NE¼SW¼, and NW¼SW¼	24				

PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED
[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal.]

S½NW¼ and SW¼, Section 24; and the NE¼SE¼ and SE¼SE¼, Section 23; all in T. 40 N., R. 30 E.W.M.

DESCRIPTION OF PROPOSED WORKS

The dewatering works consist of eight dewatering wells with total depths ranging from 540 to 1,022 feet. These wells were drilled and constructed between 2007 and 2009. Water will also be collected in underground sumps distributed throughout the mine workings. Collected water will be pumped to the surface and stored in a surge pond prior to use in the mine or prior to water quality treatment and discharge. A portion of the water will be beneficially used for underground mining operations, and the remainder will be treated at the water treatment facility. The treated water will be pumped to the headwaters of Marias Creek and the Roosevelt Adit, or to other authorized discharge locations.

Several other water right applications are associated with the project as discussed in the body of this report. National Pollutant Discharge Elimination System (NPDES) Permit No. WA-005243-4 was issued to the applicant for the water treatment facility and associated discharge of treated water to surface water and groundwater.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE	COMPLETE PROJECT BY THIS DATE	WATER PUT TO FULL USE BY THIS DATE
Started	December 31, 2013	Term permit, expires December 31, 2023

PROVISIONS

General

1. The amount of water granted is a maximum limit that shall not be exceeded and the water user shall be entitled only to that amount of water within the specified limit that is beneficially used and required.

2. At no time shall the combined use of water under this Permit and Surface Water Permit No. S4-34999P exceed 12.6 acre-ft/yr.

Measurements, Monitoring, Metering, and Reporting

3. An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

4. Water use data shall be recorded weekly. The maximum rate of diversion/withdrawal and the annual total volume shall be submitted to Ecology by January 31st of each calendar year. The following information shall be included with each submittal of water use data: (1) owner; (2) contact name if different; (3) mailing address; (4) daytime phone number; (5) WRIA; (6) Permit/Certificate No.; (7) source name; (8) annual quantity used including units of measurement; (9) maximum rate of diversion, including units of measurement, (10) weekly meter readings including units of measurement, (11) peak monthly flow including units of measurement, (12) purpose of use, and (13) well tag numbers. In the future, Ecology may require additional parameters to be reported or to be reported on a more frequent

YOUR RIGHT TO APPEAL

You have a right to appeal this Decision to the Pollution Control Hearings 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
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia WA 98504-7608
Pollution Control Hearings Board 1111 Israel Road SW, Suite 301 Tumwater WA 98501	**Pollution Control Hearings Board** 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://www.leg.wa.gov/CodeReviser.

Signed at Yakima, Washington, this 6 day of September, 2013.

Mark Kemner, WR Section Mgr by

Mark Kemner, LHG, Section Manager
Water Resources Program/CRO

If you need this document in an alternate format, please call the Water Resources Program at 509-575-2490. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

basis. Ecology prefers web based data entry, but does accept hard copies. Ecology will provide forms and electronic data entry information.

5. Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modification to some of the requirements. Installation, operation, and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".

6. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

7. Installation and maintenance of an access port as described in Chapter 173-160 WAC is required. An airline and gauge may be installed in addition to the access port.

8. Streamflow in Myers Creek shall be monitored through year 16 of the project (7 years of mining and the subsequent 9 years of mine reclamation and flooding of part of the mine workings). Streamflow shall be monitored weekly from April 1 to November 1 at the historic location of USGS gauging station No. 12400900 north of Chesaw, Washington, at the international border.

Flow Augmentation and Mitigation

9. Augmentation of surface water flows at Marias Creek and Roosevelt Adit (Nicholson Creek) shall continue after mining and reclamation until groundwater elevation monitoring indicates that the Gold Bowl workings of the mine have refilled with groundwater, subject to any additional mitigation requirements developed pursuant to the *Adaptive Management Plan*. Kinross shall provide written notice to Ecology's Water Resources Program at least six months prior to the first summer season during which streamflow augmentation at Marias Creek and Roosevelt Adit will cease, and receive written concurrence from Ecology before ceasing flow augmentation.

10. If it can be shown that the requested appropriation has a detrimental effect on existing rights, it shall be the responsibility of the water right holder to mitigate for this impact and/or alter or cease withdrawal of water.

11. At the end of mining or in eight years from the commencement of the mining operations, whichever occurs first, the Permit holder, or its successors and assigns, shall cease irrigating ten (10) acres of land at the Lost Creek Ranch, under the authority of Water Right No. G4-22893C, and place 13 acre-ft/yr into the Washington Trust Water Right Program. The Lost Creek Ranch is located north of the town of Chesaw, adjacent to Myers Creek. The 10 acres shall be land that is currently irrigated and has been tentatively determined by Ecology to represent a valid water right. To meet the terms of this condition, the Permit holder shall, within 60 days of mining operations being permanently ceased, file with Ecology all documents necessary to amend Certificate No. G4-22893C for 13 acre-ft/yr and 10 acres less irrigation than currently valid and to place that portion of Certificate No. G4-22893C into the Washington Trust Water Program, Chapter 90.42 RCW, to protect the water right for instream flows.

12. Ecology may at its discretion, request application be made through a process other than the trust program if at that time Ecology determines that the law provides a better process than the Trust program for protecting the water rights for instream flow purposes.

13. Continued use of water under this permit is conditioned upon compliance with monitoring, reporting, and adaptive management of water resources described in the *Aquatic Resources Mitigation Plan*, *Hydrologic Monitoring Plan*, *Adaptive Management Plan*, and requirements of the *Metals Mining, and Milling Operations Environmental Protection and Performance Security Bond* under Chapter 78.56 RCW. Monitoring and reporting schedules specified in these plans are incorporated by reference.

14. Construction of additional dewatering wells under this authorization shall be approved by Ecology in writing in advance of drilling in order to ensure consistency with environmental review under SEPA and compliance with the monitoring, reporting, and adaptive management of water resources described in the *Aquatic Resources Mitigation Plan*, *Hydrologic Monitoring Plan*, and *Adaptive Management Plan*.

FINDINGS OF FACT AND ORDER

Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated. Furthermore, I find the change of water right as recommended will not be detrimental to existing rights or public interest.

Therefore, I ORDER the requested change of points of withdrawal under Groundwater Change Application No. CG4-34904P, subject to existing rights and the provisions specified above.

BACKGROUND

Description and Purpose of Proposed Change

On May 21, 2003, Crown Resources Corporation (Crown Resources) filed an application (No. G4-34904) with the Washington State Department of Ecology (Ecology) for a water right permit to appropriate public groundwater. The applicant requested authorization for an instantaneous withdrawal (Qi) of 100 gallons per minute (gpm) from one well and underground sumps for mining, industrial use, and flow augmentation. The total annual quantity (Qa) requested was 80 acre-feet per year (acre-ft/yr). In April 2005, the applicant provided a revised dewatering system design that included five dewatering wells and also included collection of groundwater seepage from underground sumps in the mine workings. The revised application was approved by Ecology on November 21, 2007, and Water Right Permit No. G4-34904P was issued authorizing beneficial use of up to 100 gpm and 12.6 acre-ft/yr during active mining and 100 gpm and 3.34 acre-ft/yr following the end of mining.

On October 29, 2009 Crown Resources filed a change application with Ecology requesting to add points of withdrawal to Water Right Permit No. G4-34904P. The purpose of the requested additional points of withdrawal is to support dewatering and water management activities at the mine site. Discharge of treated mine dewatering water and collected stormwater to surface water outfalls and a groundwater infiltration system is authorized under NPDES Permit No. WA-005243-4. Provisions of the NPDES permit require that the dewatering system maintain a groundwater capture zone to include underground mine workings, a surge pond, and all surface stockpiles of ore and development rock, such that groundwater in these areas is withdrawn and treated. The originally authorized dewatering well and sump points of withdrawal were not adequately capturing groundwater, requiring installation and operation of the requested additional dewatering wells. No change in the Qi, Qa, place of use, or purpose of use was requested.

Ecology issued Temporary Change Authorization No. G4-34904 on October 29, 2009 authorizing use of three additional points of withdrawal (wells D-6, D-7, and D-8) pending processing of the subject change application. During the investigation of Change Application No. CG4-34904, the applicant requested to add two additional points of withdrawal (wells MW-2R and MW-14), and to replace well D-7, which had been impacted by grout, with well D-9.

The project site is located in Okanogan County within the Kettle River watershed, Water Resource Inventory Area (WRIA) 60. Notice of the proposed appropriation was published in the *Omak-Okanogan County Chronicle* of Omak, Washington, on December 19 and 26, 2012. Three letters of protest were received within the 30 day public comment period.

The application was reviewed relative to the provisions of the State Environmental Policy Act (SEPA) of 1971, chapter 43.21C RCW and the SEPA rules, chapter 197-11 WAC. A *Final Supplemental Environmental Impact Statement* (SEIS) was completed by Ecology on September 15, 2006. The SEIS supplements the Crown Jewel Mine Final EIS issued by Ecology and the U.S. Forest Service in 1997, which evaluated a previous open-pit mine proposed for Buckhorn Mountain.

Other Water Rights Associated with the Project

This is one of nine water right applications filed with Ecology to support the Buckhorn Mountain Project, an underground gold mine at Buckhorn Mountain in Okanogan County, Washington. Mine construction started in 2007 and mine operations began in late 2008. The mine is owned and operated by Crown Resources, a wholly owned subsidiary of Kinross Gold Corporation (Kinross). The project proponents filed nine water right applications with Ecology to obtain permits for proposed consumptive and non-consumptive uses for mining operations, dust control along truck haul routes, multiple domestic use for employees, and mitigation for mining-related water use. These applications were approved by Ecology between September 2006 and November 2007.

The nine water right applications associated with the project are:

- **CG4-34904P (Mine Dewatering)**
  This change application is the subject of this Report of Examination. Water Right Permit No. G4-34904P, approved by Ecology on November 21, 2007, authorizes a groundwater withdrawal for mining and industrial use from five wells and a network of underground sumps. Use for streamflow augmentation is also authorized at the end of mining and associated mine dewatering. The Qi and Qa authorized for beneficial use are 100 gpm and 12.6 ace-ft/yr during mining, and 100 gpm and 3.34 acre-ft/yr following the end of mining. The current change application seeks to add additional points of withdrawals (wells) to support mine dewatering and water management activities, including maintaining a groundwater capture zone encompassing all underground mine working as required under NPDES Permit No. WA-005243-4.

- **G4-34905 (Domestic)**
  This application, approved by Ecology on October 25, 2007, authorizes a groundwater withdrawal for dust control and domestic use for site employees from a single well. The authorized Qi is 5 gpm. The authorized Qa is 5.2 acre-ft/yr, of which 2.8 acre-ft/yr is for domestic use and 2.4 acre-ft/yr is for dust control.

- **S4-34999 (Stormwater)**
  This application, approved by Ecology on October 24, 2007, authorizes a surface water diversion for industrial and mining use, to augment mine operational needs not met by the quantities authorized under Water Right Permit No. G4-34904. Authorized Qi and Qa are 50 gpm (0.111 cfs) and 12.6 acre-ft/yr. The Qa is non-additive to the Qa authorized under Water Right Permit No. G4-34904. This water will come from collection of stormwater drainage from ore and development rock stockpiles and be stored temporarily in the surge pond reservoir under Reservoir Permit No. R4-35093P.

- **R4-35093 (Reservoir)**
  This application, approved by Ecology on October 24, 2007, authorizes a storage facility (surge pond) for water derived from mine dewatering and stormwater under Water Right Permit Nos. G4-34904 and S4-34999. A maximum of 3.0 acre-feet of water for beneficial use would be stored by the facility at any given point in time.

- **CG4-CCV1-4P200 (Dust Control and Instream Flow Mitigation)**
  This change application (Newman) approved by Ecology on September 26, 2006, changes the purpose, place, and time of use of a certificated seasonal irrigation water right for two groundwater wells to use in year-round dust control and seasonal mitigation of mining impacts on streamflows. The total certificated quantities for this right are a Qi of 300 gpm and a Qa of 200 acre-ft/yr.

- **G4-35084 (Instream Flow Mitigation)**
  This application (Lost Creek Ranch), approved by Ecology on November 21, 2007, authorizes a groundwater withdrawal for streamflow augmentation in Myers Creek, as needed during the irrigation season of April 1 through September 30. Authorized Qi and Qa are 125 gpm and 44.19 acre-ft/yr respectively. These quantities are non-additive to the appropriation authorized under Water Right Certificate No. G4-22893C.

- **CS4-ADJ47P45 (Instream Flow Mitigation)**
  This change application (Leslie Trust), approved by Ecology on October 19, 2007, temporarily changes the purpose of use of an existing water right from agricultural irrigation use to instream flow mitigation use. Use of up to 0.078 cfs and 23.52 acre-ft/yr were approved for mitigation during mining and during recovery of water levels associated with cessation of mine dewatering. Use would revert back to agricultural at the end of mitigation.

- **CS4-ADJ47P36 (Instream Flow Mitigation)**
  This change application (Thorp Trust), approved by Ecology on October 19, 2007, permanently changes the use from stock watering from Myers Creek to instream flow mitigation. Under the change, 0.0071 cfs and 4.03 acre-ft/yr of water used for stock watering from Myers Creek between September 1 and June 15 is permanently dedicated to trust for instream flow mitigation. Approved mitigation quantities at the international border are 0.0064 cfs (4,150 gpd) and 3.67 acre-ft/yr over the period of September 1 through June 15.

- **CG3-29653P (Mining)**
  This change application, approved by Ecology on September 28, 2006, changes the place of use from the K2 Mine to the proposed backfill borrow site in Ferry County. The total permitted quantities for this water right permit are 50 gpm and 80 acre-ft/yr for mining purposes.

Attributes of the Permit and Proposed Change

Attributes of Permit No. G4-34904P

Name of Applicant:	Crown Resources Corporation
Priority Date:	May 21, 2003
Instantaneous Quantity:	100 gpm
Annual Quantities:	12.6 acre-feet per year (Years 0 through 7)*; 3.34 acre-feet per year (Years 8 through 16)*.
Points of Withdrawal:	Well D-1 – SE¼NW¼, Section 24; Well D-2 – SE¼NW¼, Section 24; Well D-3 – NE¼SW¼, Section 24; Well D-4 – NE¼SW¼, Section 24; Well D-5 – NW¼SW¼, Section 24; Sumps – SE¼NW¼ , NE¼SW¼, and NW¼SW¼, Section 24; all in T. 40 N., R. 30 E.W.M.

Purpose and Period of Use:	Year-round mining and industrial use (Years 0 through 7)*; Streamflow augmentation, July 1 through September 30 (Years 8 through 16)*.
Period of Use:	Year round for dust control; April 1 to October 31 each year for irrigation
Place of Use:	S½NW¼ and SW¼, Section 24; and the NE¼SE¼ and SE¼SE¼, Section 23; all in T. 40 N., R. 30 E.W.M.

*As it relates to mining at the Buckhorn site, Year 0 = 2007.

Proposed Change

Name of Applicant:	Crown Resources Corporation
Date of Application for Change:	October 29, 2009
Points of Withdrawal:	Well D-1 – SE¼NW¼, Section 24; Well D-2 – SE¼NW¼, Section 24; Well D-3 – NE¼SW¼, Section 24; Well D-4 – NE¼SW¼, Section 24; Well D-5 – NW¼SW¼, Section 24; Sumps – SE¼NW¼ , NE¼SW¼, and NW¼SW¼, Section 24; Well D-6 – SE¼SW¼, Section 24; Well D-8 – SE¼SE¼, Section 23; Well D-9 – SE¼SE¼, Section 23; Well MW2R – SE¼SE¼, Section 24; Well MW14 – SE¼SE¼, Section 24; Undrilled Well(s) – SW¼NE¼, Section 24; all in T. 40 N., R. 30 E.W.M.

All other attributes of G4-34904P will not change.

Legal Requirements for Proposed Change

Based on the provisions of RCW 43.21A.690 and RCW 90.03.265 Aspect Consulting, LLC of Seattle, Washington, has assisted with the investigation and preparation of this Report of Examination under a contract with the Department of Ecology. In considering this application, the investigation included, but was not limited to, research and/or review of:

- The State Water Code.
- SEPA, including the 1997 Crown Jewel EIS and the 2006 Final SEIS prepared for the Buckhorn Mountain project.
- Records of other water rights in the vicinity.
- Topographic and local area maps and aerial photographs.
- The *Aquatic Resources Mitigation Plan* (ARMP) prepared by Golder Associates, Inc., July 31, 2007.
- The *Adaptive Management Plan* prepared by Golder Associates, Inc., June 25, 2007.
- The *Ecological and Aquatic Resources Monitoring Plan* prepared by Golder Associates, Inc., August 29, 2006.
- The *Hydrologic Monitoring Plan* prepared by Golder Associates, Inc., July 30, 2007.
- Ecology Water Resources guidance documents.

State Water Code

Chapters 90.03 and 90.44 RCW authorize the appropriation of public water for beneficial use and describe the process for obtaining water rights including the process to amend or change existing rights. Laws specifically governing the water right permitting process are RCW 90.03.250 through 90.03.340 and RCW 90.44.060. Changes or amendments to these rights are covered primarily under RCW 90.03.380 and RCW 90.44.100.

State Environmental Policy Act (SEPA)

The requested water right is a component of the Buckhorn Mountain Mine project, which has been the subject of a SEIS prepared by Ecology. The Final SEIS was issued on September 15, 2006. Impacts, including those associated with dewatering activities, identified in the Final SEIS (FSEIS) relevant to Kinross' water rights applications were considered and incorporated into this report.

Crown Resources has requested additional points of withdrawal under the subject application. Specifically, Crown Resources wishes to add dewatering wells and convert 2 monitoring wells (MW-2R and MW-14) into dewatering wells. The use of additional dewatering wells to establish and maintain a capture zone is consistent with plans found in the FSEIS. However, Ecology believes converting the 2 monitoring wells would constitute a new activity which was not considered with respect to environmental impacts under the current FSEIS.

As such, under SEPA rules, additional analysis of the activity and associated environmental impacts as well as updates to the FSEIS would be necessary prior to permitting action for such a request.

The FSEIS relied upon a three-dimensional, steady-state groundwater model (the model) to analyze and estimate impacts due to mine activities, including mine dewatering. The model was used to aid in the understanding of site conditions, predict impacts to groundwater resources, and to serve as input to other site studies (e.g. development of monitoring and mitigation plans and assessment of cumulative impacts). The model evaluated the use of dewatering wells inside the footprint of the mine workings to establish a cone of depression or capture zone.

Monitoring wells MW-2R and MW-14 and the entire area within the SW¼NW¼ of Section 24 are outside the identified mine foot print and capture zone described in the FSEIS. The environmental impacts associated with the use of dewatering wells outside the mine workings and capture zone were not characterized or considered under the scope of the 2006 FSEIS. Therefore, if Crown Resources wishes to enlarge the capture zone, appropriate environmental analysis and review, as well as updates to the FSEIS would be necessary consistent with all applicable SEPA Rules.

INVESTIGATION

Hydrologic/Hydrogeologic Evaluation

Hydrogeology

Groundwater in the vicinity of the Buckhorn Mountain project occurs within bedrock and unconsolidated alluvial and glacial deposits. Groundwater elevations near the mine generally reflect ground surface topography, with groundwater flowing from higher elevation areas to lower elevation areas. A groundwater divide occurs beneath Buckhorn Mountain, separating groundwater that flows east to the Toroda Creek drainage from groundwater that flows west to the Myers Creek drainage.

Groundwater at the mine site is primarily encountered in the bedrock. Groundwater recharge at Buckhorn Mountain occurs via infiltration of precipitation and snowmelt. Groundwater ultimately flows east or west from higher elevations, discharging to springs and creeks in the Toroda and Myers creek drainages. Groundwater also discharges to the Roosevelt Adit, a former underground mine site, at an estimated annual average rate of about 40 gpm. Water discharging from the Adit flows to the headwaters of South Fork Nicholson Creek.

Groundwater is encountered in saturated glacial and alluvial deposits at lower elevations. The glacial and alluvial deposits are recharged by precipitation, stream flow losses, and discharge from the bedrock aquifer. These deposits also discharge water to the streams, contributing to baseflows.

A detailed discussion of the hydrogeology of the area is presented in the 1997 Crown Jewel Mine Final EIS, the 2006 SEIS, as well as supporting technical documents.

Hydrology

Buckhorn Mountain is located within the Kettle River watershed, Water Resource Inventory Area (WRIA) 60. The Kettle River originates in British Columbia, Canada, first entering the United States approximately 10 miles northeast of Buckhorn Mountain in an area referred to as Ferry. Approximately 25 miles downstream from Ferry, the Kettle River reenters Canada near Danville, Washington. The river enters Washington again near Laurier and flows into Lake Roosevelt near Kettle Falls.

Major tributaries of the Kettle River in Washington are Myers, Toroda, Boulder, Deadman, and Curlew creeks. Buckhorn Mountain forms the surface water divide between the Myers Creek and Toroda Creek drainage basins.

The west side of the ridge forming Buckhorn Mountain is drained by Ethel, Bolster, and Gold creeks, all of which are tributaries to Myers Creek. MaryAnn Creek flows in to Myers Creek from the west, entering between Ethel and Bolster creeks. Myers Creek flows northward across the border into Canada, where it joins the Kettle River. The east side of the mountain is drained by Marias and Nicholson creeks, which are tributaries to Toroda Creek, and Gold Bowl Creek, which is a tributary to South Fork Nicholson Creek. Toroda Creek flows north and east, joining the Kettle River approximately 4 miles downstream from where the river first enters the United States from Canada.

The USGS operated a stream gage on Myers Creek immediately upstream of the Canadian border (USGS Station 12400900 Myers Creek near Chesaw, WA). For the period of record of 1996 to 2001, average monthly flows ranged from 8.0 cfs in January to 57 cfs in May. During the irrigation season, the lowest average monthly flow occurred in September, with a flow rate of 9.4 cfs. The minimum recorded daily flow was 2.0 cfs on August 15, 2001. The British Columbia Environment Water Management Program operated a seasonal (typically May through September) stream gage at the Canadian Border from 1923 to 1950 and from 1968

to 1977 (Station 08NN010 Myers Creek at International Boundary). The lowest average monthly flows during the irrigation season at this gage occurred in August and September, with flow rates of about 3.8 cfs. Recorded daily flows dropped below 1.0 cfs for one or more days throughout the 1920s and 1930s, and in 1968, 1970, 1973, and 1977. Stream gauging data for the periods of 1978 through 1994 and 2002 to present are not available.

There are no long-term gauging stations on Toroda Creek, although several temporary stations were installed in support of a previously proposed open-pit mine project at Buckhorn Mountain. Measured flows from these temporary stations were highest in May (80 cfs in 1994) and lowest in October. In October 1994 flows ranged from 2.0 to 4.0 cfs. No winter measurements were taken.

Dewatering Well Construction

The eight dewatering wells were drilled and constructed (one well deepened) between 2007 and 2012. Relevant construction details for these wells are summarized in Table 1.

Table 1 – Dewatering Well Construction

Owner's Well No.	Ecology Well Tag ID	Construction Dates	Well Location	Total Depth	Borehole Diameter	Casing Diameter	Perforated Interval	Static Depth to Water
D-1	APB368	4/17/2007 to 5/8/2007	SE¼NW¼, Section 24, T. 40 N., R. 30 E.W.M.	590 feet	10 inches	6 inches	30 to 590 feet	35 feet on 5/8/2007
D-2	APB367	4/9/2007 to 5/9/2007	SE¼NW¼, Section 24, T. 40 N., R. 30 E.W.M.	580 feet	10 inches	6 inches	40 to 540 feet	65 feet on 5/8/2007
D-3	APB365	2/20/2007 to 3/8/2007 and 12/8/11 to 1/7/2012	NE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.	600 feet on 3/8/2007 1022 feet on 1/7/2012	10 inches	6 inches	40 to 600 feet	100 feet on 3/8/2007 388 feet on 12/7/11
D-4	APQ129	3/12/2007 to 3/26/2007	NE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.	600 feet	10 inches	6 inches	40 to 600 feet	80 feet on 3/26/2007
D-5	APB366	3/9/2007 to 3/21/2007	NW¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.	600 feet	10 inches	6 inches	40 to 600 feet	540 feet on 3/21/2007
D-6	BAE955	8/20/2009 to 9/15/2009	SE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.	750 feet	10 inches	6 inches	690 to 750 feet	510 feet on 9/29/2009
D-8	BBL497	9/22/2009 to 10/10/2009	SE¼SE¼, Section 23, T. 40 N., R. 30 E.W.M.	650 feet	10 inches	6 inches	550 to 650 feet	240 feet 10/8/2009
D-9	BAE961	11/5/2009 to 11/14/2009	SE¼SE¼, Section 23, T. 40 N., R. 30 E.W.M.	550 feet	10 inches	6 inches	450 to 550 feet	400 feet on 11/14/2009

The well logs generally describe granite with one or more relatively narrow (between 2 and 20 feet thick) water-bearing fractured bedrock zones encountered while drilling each well.

Mine Dewatering and Water Use

Initially five wells, with four located in the vicinity of the Lower Portal (D-1 through D-4) and one near the Upper Portal (D-5), and a set of underground sumps within the mine workings were installed to provide water for mining purposes and to dewater the mine workings during construction and mining. Under provisions of the NPDES Permit No. WA-005243-4 the dewatering system is required to maintain a groundwater capture zone beneath the mine workings, surge pond, and all surface stockpiles of ore and development rock, such that groundwater in these areas is withdrawn and treated. Following mine startup it became apparent that additional dewatering wells were required to maintain the capture zone. Additional points of withdrawal are planned to improve groundwater capture. These include three wells near the southern extent of the mine workings (D-6, D-8, and D-9).

As summarized in the ARMP, construction and mining, and associated beneficial use of water for these purposes, are expected to last from Years 0 through 7 of the project (Phase 1 - Mining). At the end of mining, mine dewatering would cease, as would beneficial use of water for mining purposes. Reclamation of the underground mine and surface facilities is expected to occur during Years 8 through 10 of the project (Phase 1 - Reclamation), during which the mine workings would begin to refill with groundwater. Refilling of the Gold Bowl portion of the mine workings, with associated monitoring of groundwater elevations and mine water quality, would start during mine reclamation and continue during Years 11 through 16 (Phase 2 - Gold Bowl Refilling).

During reclamation and mine refilling, water seeping into the Gold Bowl mine pool would be collected, treated to improve water quality, and reintroduced to the mine workings. These activities are expected to continue until Year 18. The non-consumptive collection, treatment, and return of water to the mine would be authorized under the NPDES permit and is not part of the requested water right permit.

One of the mine dewatering wells would be used on a seasonal basis during reclamation and refilling of the Gold Bowl to provide water to augment flows at the Roosevelt Adit (tributary to Nicholson Creek) and Marias Creek as mitigation for mining-related impacts to surface water flows in these drainages. Flow augmentation is proposed to occur in years 8 through 16. The withdrawal and use of water for flow augmentation purposes after the end of mining is considered a beneficial use and is included as part of the requested water right permit.

Estimated mine dewatering rates, proposed water management, and estimated beneficial use of water during mining and during reclamation and refilling of the Gold Bowl are presented in the following sections.

Phase 1 – Mining (Years 0 through 7)

During mining water from mine dewatering wells and sumps would be conveyed to the surge pond on a continuous basis, with some variability in discharge rates, as discussed below. Water would be stored in the surge pond for beneficial use under Reservoir Permit No. R4-35093. A portion of water conveyed to the surge pond would be recycled for beneficial use in underground mining operations. This water would be diverted from the surge pond reservoir at a maximum rate of 100 gpm, as requested in the application associated with this permit (G4-34904). Authorization for an additional 50 gpm instantaneous diversion from the surge pond of collected stormwater has been requested under water right application S4-34999. Planned beneficial uses during mining include drilling, cement backfill and shotcrete production, and dust control. Estimated water use for these purposes is presented in the *Buckhorn Mt. Project Engineering Report* and range from approximately 3.3 to 7.8 gpm on an average annual basis. These average rates correspond to an annual use of 5.3 to 12.6 ac-ft/yr, rather than the 80 ac-ft/yr requested in the water right application. Additional consumptive loss of water would occur through entrainment in development rock and ore, mine ventilation, and evaporation from the surge pond. These additional consumptive loses are estimated to range from 7.7 to 19.3 gpm, or 12.4 to 31.1 ac-ft/yr. These additional losses are not considered beneficial uses and are not included in any water right permit issued for this project; however, they are included in the analysis of potential impacts of the project on surface water and groundwater resources.

Excess water conveyed to the surge pond would be treated and discharged to one of four outfalls, depending on operational conditions and mitigation needs. Management of excess dewatering water in this manner does not require a water right and is not included in the quantities requested under this water right permit. Management and discharge of excess water is covered under the NPDES permit associated with the project, which refers to the following outfall designations and descriptions:

- Outfall 001 - A groundwater infiltration system near the headwaters of Nicholson Creek.
- Outfall 002 - Lower portal stormwater detention ponds, with overflow to Gold Bowl Creek.
- Outfall 003 - The headwaters of South Fork Nicholson Creek at the Roosevelt Adit.
- Outfall 004 - The headwaters of Marias Creek.

A numerical groundwater flow model was developed for and presented in the SEIS that estimated groundwater dewatering rates throughout the life of the mine. Modeled dewatering rates under average precipitation and recharge conditions for each year of mining are summarized in Table 2. Average annual dewatering rates range from about 35 gpm to about 100 gpm, with instantaneous rates ranging from about 10 gpm to about 160 gpm. Applying the average annual dewatering rates over the course of a year results in estimated total annual dewatering withdrawals ranging from a low of 52 acre-feet in Year 0 of mining to a high of 166 acre-feet in Year 6. As discussed above, only 5.3 to 12.6 ac-ft/yr of the total withdrawal would be used beneficially, while the remainder would be lost through evaporation, entrainment in development rock and ore, or treated and discharged to the outfalls. The variability in discharge rates is associated with different phases of mining and is dependent on a number of factors, including the depth and exposed areas of active mine workings. Seasonal variability in mine dewatering rates is also expected, with the highest dewatering rates occurring during spring snowmelt and the lowest dewatering rates occurring during the winter when groundwater recharge is at a minimum. Seasonal variability was estimated to be about 40 percent of the average annual dewatering rates. Similarly, model results indicate that during a wet year with 30 inches of precipitation, dewatering rates would be approximately 75 percent higher than during an average year.

Table 2 – Predicted Mine Dewatering Rates and Total Annual Quantities

Mining Year	Average Annual Dewatering Rates (gpm)	Minimum Dewatering Rates (gpm)	Maximum Dewatering Rates (gpm)	Average Total Annual Quantity (ac-ft/yr)
0	32	0	47	52
1	82	44	156	132
2	68	59	85	110
3	54	50	65	88
4	53	51	55	85
5	69	55	106	111
6	103	87	128	166
7	84	78	91	136

Phase 1 - Reclamation (Years 8 through 10) and Phase 2 - Gold Bowl Refilling (Years 11 through 16)

During reclamation and Gold Bowl refilling, water seeping into the mine would be collected in sumps, conveyed to the surge pond, treated to standards specified in the NPDES permit, and reintroduced to the mine workings. The purpose of collecting and treating mine seepage is to improve groundwater quality in the mine workings and is not expected to affect the rate at which the mine refills. Also during this period, one of the dewatering wells would be used on a seasonal basis to augment surface water flows at the Roosevelt Adit and the headwaters of Marias Creek. Water from this well would also be conveyed to the surge pond, treated to applicable water quality standards, and discharged to Roosevelt Adit and Marias Creek. Because water would be withdrawn for the specific purpose of streamflow augmentation and mitigation, this withdrawal and use requires a water right permit and is included as one of the uses considered in this ROE.

Augmentation of flows at the Roosevelt Adit and Marias Creek would occur during July, August, and September to offset impacts to flows during the growing season, when maintaining sufficient flows are most important for wetland and riparian productivity. The proposed augmentation flows presented in the ARMP at the Roosevelt Adit range from 3.7 to 6.3 gpm (0.008 to 0.014 cfs), depending on the year during which augmentation occurs. The proposed augmentation flows for Marias Creek are 0.1 gpm (0.0002 cfs). The maximum combined augmentation rate of 6.4 gpm corresponds to a total withdrawal over the 91 day augmentation period of 2.57 acre-feet.

The proposed augmentation rates may be increased, depending on results of monitoring and data evaluation specified in the *Hydrologic Monitoring Plan* and the *Adaptive Management Plan*. Groundwater model sensitivity analyses presented in the SEIS indicate that uncertainty in impacts to stream baseflows is less than about 30 percent. Applying a 30 percent contingency to the maximum expected combined augmentation rate of 6.4 gpm gives an upper bound on the expected augmentation rate of 8.3 gpm and 3.34 ac-ft/yr.

Groundwater is expected to refill the mine workings relatively quickly once mine dewatering ceases. Model results presented in the SEIS indicate that the Gold Bowl portion of the mine workings will refill within about 9 years of the end of mining (the end of Year 16), after which groundwater elevations would continue to rise slowly and approach long-term steady-state conditions. Rates at which groundwater would refill the mine workings over the period of proposed flow augmentation at Roosevelt Adit and Marias Creek are expected to be similar to the mine dewatering rates, which are modeled to average approximately 110 ac-ft/yr over the 8 years of active mining. The 3.34 ac-ft/yr maximum combined augmentation rate (including a 30 percent contingency) represents approximately 3 percent of the expected groundwater inflow rate to the mine. Using this quantity of water for streamflow augmentation is not expected to significantly increase the time required for the Gold Bowl workings to refill.

Other Water Rights in the Vicinity

A review of information in Ecology's Water Rights Tracking System (WRTS) database indicates there are 105 certificated water rights in the Myers Creek drainage basin and 81 certificated water rights in the Toroda Creek drainage basin. These listed rights do not include exempt wells, unperfected water right permits, or water right claims that have not been subject to adjudication.

Myers Creek has a documented history of water shortages starting in 1930. The validity of surface water claims in the Myers Creek drainage basin was determined by adjudication in 1932 (Decree No. 7723, Okanogan County Superior Court). The adjudication included water right holders along Myers Creek in Canada. Of the 105 certificated water rights in Myers Creek, 74 are from the 1932 adjudication. Five of the adjudicated rights are held in Canada with a cumulative permitted Qi of 1.861 cfs. The Canadian water users were issued Washington State Certificates of Water Rights in addition to the Final Licenses issued by British Columbia.

Under the prior appropriation doctrine, a fundamental aspect of western water law that is adopted in the Washington Water Code, senior water right holders have priority. The most senior irrigation water right in the basin (Myers Creek Adjudicated Certificate No. 42) is located in Canada. This right (referred to in this ROE as

the Harpur right) authorizes diversion of 0.617 cfs from Myers Creek. The Decree mandates a flow at the Canadian border equal to this amount, plus stream transportation losses between the border and the place of use. A flow of one cfs at the border has historically been sufficient to satisfy this right. Since the adjudication, there have been numerous documented occasions when insufficient water was available for this right. Ecology or its predecessor agencies have been asked to regulate junior water users in the basin in favor of this right in the years 1930, 1931, 1939, 1957, 1967, 1968, 1970, 1977, 1979, 1988, 2002, and 2003. In other years (1935, 1937, 1939, and 1973) it is documented that flows estimated at less than one cfs were crossing the Canadian border, although there is no record of whether Washington water users were regulated. Regulation has typically occurred beginning during the later part of July and continuing into August and September.

Calls for regulation of junior water rights have not historically occurred in the Toroda Creek drainage basin, although some reaches of Toroda Creek tend to go dry during summer low flow periods, in part as a response to irrigation diversions and groundwater pumping. Of the rights in the Toroda Creek basin, one is for a diversion from Marias Creek (Certificate No. 4234), four are for diversions from Toroda Creek downstream of the confluence with Marias Creek and/or Nicholson Creek (Certificate Nos. 61, 499, 2464, and S4-28140C) and one is from a well located in the Toroda Creek valley bottom that is expected to be in direct hydraulic connection with the creek (G4-28503).

During the 2005 site visit a wooden diversion structure was observed in Marias Creek at the approximate location of the point of diversion listed for Certificate No. 4234. This location is on property acquired by Echo Bay Minerals, a subsidiary of Kinross, in December 2005. The previous property owner had filed an application for a new water right (S4-32629, filed on January 26, 1998) for irrigation and wildlife propagation use at the property. This application was withdrawn following the sale of the property. During the initial investigation of Water Right Application No. S4-32629 the previous property owner indicated that the diversion structure had not been used since at least 1998. At the time of the 2005 site visit, the diversion structure was in disrepair and did not appear capable of detaining any flow. No pump was observed at the diversion. A partially buried, 4-inch-diameter steel pipe with periodic stickups for sprinkler head attachments was also found leading away from the diversion structure northward, up a ridge and across a flat area at the top of the ridge. Land adjacent to Marias Creek and along the ridge top did not appear to have been recently irrigated. The validity and extent of this certificate was not fully evaluated; however, it appears that this certificate is appurtenant to land currently owned by the applicant. In addition, it has not been in use for at least nine years.

One property with a permit-exempt domestic well was also identified within the area of predicted maximum groundwater drawdown following mine closure. The well and property, owned by James and Joan Stumpf, is located south of the proposed mine site, on Cow Camp Road in the SW¼SW¼ of Section 25, T. 40 N., R. 30 E.W.M. Model results from the SEIS indicate approximately two feet of drawdown in groundwater elevations from pre-mining conditions could occur in the bedrock aquifer near the Stumpf well. Total depth of the well is unknown; however, it is constructed of concrete rings and is likely on the order of 10 to 20 feet below ground surface (bgs). Depth to water in the bedrock aquifer in this area is expected to be on the order of 200 feet bgs. Based on the well completion depth and the expected depth to water in the bedrock aquifer, the Stumpf well likely taps a local perched aquifer rather than the deeper bedrock aquifer. Groundwater elevations in the perched aquifer are expected to be controlled primarily by local recharge from precipitation and snowmelt and consequently would show little or no response to groundwater elevation drawdown in the bedrock aquifer from mine dewatering and withdrawals for domestic and dust control uses.

Water Rights Proposed for Mitigation Use

The applicant filed six water right applications for mitigation of impacts to streamflows resulting from the requested mining (G4-34904), domestic (G4-34905), and surface water diversion (S4-34999) permits. Pending and approved water right applications proposed for mitigation use include:

G4-34904 (Mine Dewatering)
This change application is the subject of this Report of Examination. Water Right Permit No. G4-34904P, approved by Ecology on November 21, 2007, authorizes a groundwater withdrawal for mining and industrial use (Years 0 through 7) from five wells and a network of underground sumps. Use for streamflow augmentation is also authorized at the end of mining and associated mine dewatering (Years 8 through 16). The Qi and Qa authorized for beneficial use are 100 gpm and 12.6 ace-ft/yr during mining, and 100 gpm and 3.34 acre-ft/yr following the end of mining. Mitigation use is for instream flow augmentation of Nicholson Creek at the Roosevelt Adit and at the headwaters of Marias Creek until the Gold Bowl portion of the mine workings refill with groundwater (estimated as Year 16 after the start of mining). The current change application seeks to add additional points of withdrawals (wells) to support mine dewatering and water management activities.

CG4-CCV1-4P200 (Newman Ranch Dust Control and Instream Flow Mitigation)
This change application, approved by Ecology on September 26, 2006, changes the purpose, place, and time of use of a certificated seasonal irrigation water right for two groundwater wells to use in year-round dust control and seasonal mitigation of mining impacts on streamflows. Under the approved change, 82.4 ac-ft/yr of water currently used for irrigation is dedicated for instream flow mitigation in Toroda Creek during active mining and the 3 year mine reclamation period (Years 0 through 10). Following reclamation until 16 years after end of

mining (Years 11 through 23), 25.1 ac-ft/yr of water currently used for irrigation would be dedicated for instream flow mitigation. After Year 23, use would revert to 125.4 ac-ft/yr for irrigation of 50 acres authorized on the original water right certificate.

CS4-ADJ47P45 (Leslie Ranch Instream Flow Mitigation)
This application, approved by Ecology on October 19, 2007, changes an existing water right from agricultural use to temporary instream flow mitigation use. Under the approved change, 29.91 ac-ft/yr of water currently diverted from Myers Creek for irrigation of 12 acres is dedicated for instream flow mitigation in Myers Creek during active mining and the 3 year mine reclamation period (Years 0 through 10). Following reclamation until 15 years after mine closure (Years 11 through 25), 12.46 ac-ft/yr of water currently used for irrigation of 5.0 acres would be dedicated for instream flow mitigation, and 17.45 ac-ft/yr would be available for irrigation of 7.0 acres. After Year 25, use would revert to 29.91 ac-ft/yr for irrigation of 12 acres authorized on the original water right certificate.

CS4-ADJ47P36 (Thorp Trust Flow Mitigation)
This change application, approved by Ecology on October 19, 2007, permanently changes the use from stock watering from Myers Creek to instream flow mitigation. Under the change, 0.0071 cfs and 4.03 acre-ft/yr of water used for stock watering from Myers Creek between September 1 and June 15 is permanently dedicated to trust for instream flow mitigation. Approved mitigation quantities at the international border are 0.0064 cfs (4,150 gpd) and 3.67 acre-ft/yr over the period of September 1 through June 15.

G4-35084 (Lost Creek Ranch Instream Flow Mitigation)
This application, approved by Ecology on November 21, 2007, authorizes a new water right from one well in the Myers Creek watershed for instream flow augmentation. The purpose use is to augment streamflows in Myers Creek as mitigation for the effects of mine related-water use during the irrigation season. The purpose of flow augmentation would be to avoid potential impairment of the most senior irrigation water right in the basin (Certificate No. 42) and avoid potential curtailment of junior water users. Certificate No. 42 is located in Canada. Water would be drawn from an existing agricultural irrigation well and discharged directly to Myers Creek, temporarily increasing instream flows. Agricultural use of water from this well is authorized under Water Right Certificate No. G4-22893C, which is owned by the applicant.

Flow augmentation would occur when flows at the international border drop below 1.0 cfs, the flow rate that has historically triggered regulation of junior water rights in the Myers Creek drainage. The withdrawal for surface water flow augmentation is non-additive to G4-22893C, and the total combined instantaneous and annual withdrawal for irrigation and flow augmentation will not exceed the 265 gpm and 156 ac-ft/yr considered to be valid quantities under G4-22893C, based on historical beneficial use, as confirmed in PCHB No. 97-146. The flow augmentation use would be limited to the irrigation season of April 1 to October 1. Under the approved application, up to 125 gpm and 44.19 ac-ft/yr is available for flow augmentation, and the remainder will continue to be available for irrigation. The instream flow augmentation program is proposed to continue from Year 0 through Year 16.

G4-22893C (Lost Creek Ranch Irrigation)
A change application has not been filed for this water right certificate; however, the applicant proposes to dedicate a portion of this irrigation certificate to the Trust Water Right Program for mitigation of impacts to instream flows. The existing certificate authorizes a withdrawal of 400 gpm and 156 ac-ft/yr from one well in the Myers Creek drainage for irrigation of 120 acres during the irrigation season of April 1 to October 1, but based on historical use, the instantaneous quantity that has been beneficially used is limited to 156 acre-feet and 265 gpm, as discussed above. The applicant has proposed permanently transferring 13 ac-ft/yr of water used to irrigate 10 acres to the trust water right program for mitigation of instream flows. The purpose of this change would be to address long-term impacts to surface water flows in Myers Creek following the end of mining. The proposed transfer would not occur until the end of mining or Year 8 after the start of mining, whichever occurs first.

Additional details on approved mitigation Water Right Application Nos. CG4-CCV1-4P200, CS4-ADJ47P45, CS4-ADJ47P36, and G4-35084 are provided in the respective ROEs. A full examination of the proposed transfer to trust of G4-22893C will not be completed until an application is filed.

Proposed Mitigation and Net Effects

This section compares the mitigation offered by the applicant to the estimated impacts to water resources and habitat from water right related mining activities. This change application is one of nine applications for new water rights, water right changes, or transfers to trust of existing water rights filed for the Buckhorn Mountain Project. Eight of these applications pertain to mine site operations, and one (CG3-29653P) pertains to operations at the proposed backfill borrow area. The application associated with the backfill borrow area would not affect water resources near the mine site and is not considered further in this evaluation of mitigation and net effects.

The potential impacts of the eight water rights requested for the mine project are described in the SEIS. The evaluation of impacts to water resources presented in the SEIS, including groundwater elevations and surface water flows, are based primarily on results of a numerical groundwater flow model. The evaluation of effects to wetlands in the SEIS is based on comparison of the numerical flow model results for changes in groundwater

elevation and streamflows to the location of mapped wetlands. Predicted impacts to surface water flows used in evaluating impacts in this ROE are from the Average Recharge (AR) groundwater flow model presented in the SEIS, and are based on average annual impacts during an average precipitation year. Sensitivity analyses presented in the SEIS indicate that predicted impacts during dry years or dry seasons are lower than those predicted during average or wet years or seasons. The critical periods for evaluating impacts to water resources are during dry seasons (i.e., summer and fall) and dry years, when groundwater elevations and surface water flows are lowest. Using the average annual predicted impacts for an average precipitation year provides a margin of error when evaluating the effects of impacts during dry season conditions.

The *Aquatic Resources Mitigation Plan* (ARMP), the *Adaptive Management Plan*, the *Hydrologic Monitoring Plan*, and the *Ecological and Aquatic Resources Monitoring Plan* discuss proposed mitigation to offset effects associated with the proposed water rights with respect to potential impairment of existing water rights, and impacts to wetlands, streamflows, and aquatic habitat. The monitoring and adaptive management programs proposed by the applicant include, among other components, monitoring of:

- Groundwater and surface water elevations.
- Groundwater and surface water quality.
- Surface water discharge in seeps, springs, and streams.
- Water use by the applicant.
- Wetland areas, vegetation types, and fauna in both wetlands potentially impacted by the project and wetlands where restoration, enhancement, and preservation activities are proposed as part of mitigation.

Each of the monitoring and management plans includes specific schedules for monitoring and reporting. Results of the monitoring would be used to assess whether impacts from the mine project are greater than predicted and to evaluate the effectiveness of mitigation measures. If mitigation fails to compensate for impacts, modified or additional mitigation measures would be developed per requirements in the Adaptive Management Plan.

The effects of the mine dewatering application are identified in the ARMP. The ARMP analysis considered the combined effects of other proposed water right applications coupled with the proposed mitigation.

The following sections discuss expected impacts and proposed mitigation for the Nicholson Creek, Marias Creek, Toroda Creek, and Myers Creek drainages, as well as the effects on wetlands throughout the project area.

Nicholson Creek

Impacts to Nicholson Creek associated with project water rights applications and mine dewatering include reduced surface water flows from the headwaters to the confluence with Toroda Creek as a result of reduced groundwater discharge to Nicholson Creek. The proposed management of mine dewatering water will offset the impacts to flows in the mainstem of Nicholson Creek during most of the construction and active mining period. Specifically:

- Infiltration of treated mine dewatering water at the infiltration system (Outfall 001) would result in increased groundwater recharge and, in turn, increased groundwater discharge near the headwaters of Nicholson Creek.
- Routing of water in excess of infiltration system capacity to the Lower Portal stormwater ponds (Outfall 002), with overflow to Gold Bowl Creek would result in increased flows in Gold Bowl Creek and Nicholson Creek, to which it is a tributary.

Both of these water management activities were considered in the SEIS in evaluating impacts to surface water flows in Nicholson Creek. Table 3 summarizes the net effect of mine dewatering and the above water management activities based on the SEIS groundwater flow modeling results. Based on these results, flow in Nicholson Creek would be reduced by approximately 0.018 cfs during the first year of construction and mining (Year 0). Net flows in Nicholson Creek would then increase by between 0.020 and 0.094 cfs, depending on the year of mining, as excess treated dewatering water is infiltrated near the headwaters of Nicholson Creek and discharged to Outfall 002. During reclamation, mine dewatering would cease, and excess water would no longer be infiltrated or discharged to Outfall 002; however, impacts of mine dewatering on groundwater discharge to Nicholson Creek would continue as the mine working refilled with water. Net flow reductions in Nicholson Creek would be up to 0.045 cfs during the first four years of reclamation and mine refilling. These flow reductions would decrease over time, reaching a no-impact condition about 12 years after the end of mining (Year 19). As new equilibrium groundwater elevations are established, surface water flows in Nicholson Creek would increase by about 0.011 cfs over pre-mining conditions, because of a permanent shift westward in the Toroda/Myers Creek groundwater divide associated with mine development, and a corresponding increase in the groundwater catchment area for the Toroda Creek drainage.

Table 3 - Net Change in Flow in Nicholson Creek

Mining Year	Change in Flow (cfs)	Mining Year	Change in Flow (cfs)	Mining Year	Change in Flow (cfs)
0	-0.018	10	-0.045	20	0.004
1	0.052	11	-0.045	21	0.005
2	0.080	12	-0.044	22	0.006
3	0.037	13	-0.043	23	0.007
4	0.020	14	-0.039	24	0.008
5	0.046	15	-0.026	28	0.009
6	0.094	16	-0.014	33	0.010
7	0.022	17	-0.006	38	0.010
8	-0.042	18	-0.002	43	0.011
9	-0.044	19	0.001		

Negative value indicates reduction in streamflow.

Reduced groundwater discharge in the drainage will also affect seeps, springs, and wetlands and will reduce groundwater discharge from Roosevelt Adit. Groundwater discharging at Roosevelt Adit flows through the area known as Nine-Acre Wetland and forms the headwaters of south fork Nicholson Creek. Based on the SEIS groundwater flow modeling, groundwater discharge at Roosevelt Adit would decrease during mining and reclamation, with a maximum predicted decrease in flow of 6.3 gpm (0.014 cfs). Predicted reductions in flow are presented in Table 4. Flows in headwater springs, seeps, and wetlands in the Nicholson Creek drainage are also predicted to decrease, resulting in some loss of wetland area and function. Mitigation of impacts to wetlands other than the Nine-Acre Wetland is discussed below in the Wetland section.

Table 4 - Change in Discharge from Roosevelt Adit

Mining Year	Change in Flow (cfs)	Mining Year	Change in Flow (cfs)	Mining Year	Change in Flow (cfs)
0	0.000	10	-0.014	20	-0.005
1	-0.0002	11	-0.014	21	-0.005
2	-0.001	12	-0.013	22	-0.005
3	-0.003	13	-0.012	23	-0.004
4	-0.005	14	-0.011	24	-0.004
5	-0.007	15	-0.009	28	-0.004
6	-0.009	16	-0.008	33	-0.004
7	-0.010	17	-0.007	38	-0.004
8	-0.012	18	-0.006	43	-0.004
9	-0.014	19	-0.006		

Negative value indicates reduction in streamflow.

Proposed mitigation in the Nicholson Creek drainage incorporates seasonal mitigation during mining and reclamation to address reductions in flows in the Nine-Acre Wetland and culvert improvements to enhance riparian habitat. Reclamation of one of the stormwater ponds following mining is also proposed to offset impacts to wetlands, seeps, and springs. This mitigation is discussed below in the Wetlands section. Proposed mitigation specific to Nicholson Creek includes:

- Flow augmentation at Roosevelt Adit.
- Replacement of two culverts with an aquatic life passable culvert and an armored stream crossing.

Flow augmentation would involve discharging treated stormwater and mine dewatering water inside Roosevelt Adit upstream of the Nine-Acre Wetland. Flow augmentation starts in Year 1 of mining, when impacts to flows from Roosevelt Adit are first predicted to occur, and would continue through Year 16, nine years after the end of mining when flooding of the Gold Bowl is predicted to be complete. Water for flow augmentation at the Roosevelt Adit during mining (Years 1 through 7) would come from groundwater removed during mine dewatering and from stormwater and snowmelt runoff collected from the ore and development rock stockpiles. This water would be treated to standards specified in the NPDES permit. Management and discharge of water from these sources in excess of that required for mining uses is not considered a beneficial use and consequently does not require a water right. The subject application would authorize beneficial use of water for mining purposes during mining. Management and discharge of excess water would be authorized under the NPDES permit. During mine reclamation (Years 8 through 10) and the continued refilling of the Gold Bowl (Years 11 through 16), collection and management of stormwater and snowmelt runoff would still be required until surface facility reclamation is completed and runoff water quality meets applicable standards, but mine dewatering would no longer be necessary. During this period, any groundwater used for flow augmentation at the Roosevelt Adit would come from one of the mine dewatering wells, as authorized under this permit.

Quantities of augmentation water are shown on Table 5 and were selected to match predicted decreases to flow from the Roosevelt Adit. Augmentation is proposed for July, August, and September to offset impacts to flows during the growing season, when maintaining sufficient flows are most important for wetland and riparian productivity.

Table 5 - Augmentation Discharge at Roosevelt Adit During Mining, Reclamation, & Flooding of the Gold Bowl

Mining Year	Augmentation Discharge (cfs)	Augmentation Discharge (gpm)	Mining Year	Augmentation Discharge (cfs)	Augmentation Discharge (gpm)
0	0	0	9	0.014	6.1
1	0.0004	0.2	10	0.014	6.3
2	0.001	0.5	11	0.014	6.2
3	0.003	1.3	12	0.013	5.9
4	0.005	2.1	13	0.012	5.4
5	0.007	3.2	14	0.011	4.8
6	0.009	3.9	15	0.009	4.2
7	0.010	4.7	16	0.008	3.7
8	0.012	5.6			

Additional mitigation through culvert replacement is also proposed to offset impacts to habitat resulting from reductions in flows not addressed by flow augmentation. The applicant proposes to replace one culvert and improve or replace a second culvert to allow passage of fish and aquatic life. A fish-blocking culvert at river mile (RM) 0.47 will be replaced with a culvert designed to allow fish and aquatic life passage. A second culvert upstream of the intersection of Forest Road 100 with Forest Road 3375 will either be improved to allow fish passage or replaced with a hardened crossing.

In summary, during most of the active mining period, flows in Nicholson Creek will be greater than pre-mining conditions. At the end of mining, flow in Nicholson Creek would decrease to below pre-mining conditions for a period of approximately 11 years. Flows would then increase again to slightly higher than pre-mining conditions. Flows from Roosevelt Adit would be reduced during and after mining. Associated impacts to the Nine-Acre Wetland during the growing season would be mitigated through streamflow augmentation over the 16 years of mining, reclamation, and refilling of the Gold Bowl (Years 1 through 16, inclusive). Long-term impacts to surface water flows and loss of habitat would be addressed through culvert replacement and improvement mitigation measures. These measures would provide long-term improvements to aquatic habitat by improving fish passage over approximately three to five miles of Nicholson Creek.

Marias Creek

Impacts to Marias Creek associated with mine dewatering and project water rights applications include reduced surface water flows from the headwaters to the confluence with Toroda Creek as a result of reduced groundwater discharge to Marias Creek. Based on the groundwater flow modeling in the SEIS, flow reductions in Marias Creek are predicted to be approximately 0.0002 cfs less than baseline conditions, beginning in the third year of mining. This 0.0002 cfs reduction in flow will continue after the end of mining through reclamation and then gradually increase through the post-reclamation period, reaching a steady-state flow reduction of about 0.0007 cfs in perpetuity.

Lowered groundwater elevations and reduced groundwater discharge in the drainage will also affect seeps, springs, and wetlands. Based on groundwater flow modeling in the SEIS, flow in headwater springs, seeps, and wetlands in the Marias Creek drainage are predicted to decrease, resulting in some loss of wetland area and function. Mitigation of these impacts is discussed below in the Wetland section.

Proposed mitigation in the Marias Creek drainage includes seasonal mitigation during mining and reclamation to address reductions in flows, and stream channel and culvert improvements to enhance riparian habitat. Proposed mitigation includes:

- Flow augmentation at the headwaters of Marias Creek.
- Replacement or improvement of four culverts with aquatic life passable culverts.
- Riparian enhancement in lower Marias Creek.

Flow augmentation would involve discharging at least 0.1 gpm (0.0002 cfs) of treated stormwater and mine dewatering water to a wetland at the headwaters of Marias Creek. Prior to discharge, water would be treated to standards specified in the NPDES permit. Augmentation water would be discharged to a stock tank above the wetlands to encourage cattle to drink at the tank rather than the wetlands. An overflow from the tank would lead downslope to the wetlands. Flow augmentation would start in Year 3 of mining, when impacts to flows in Marias Creek are first predicted to occur, and would continue through Year 16, nine years after the end of mining when flooding of the Gold Bowl is predicted to be complete. Augmentation is proposed for July,

August, and September to offset impacts to flows during the growing season, when maintaining sufficient flows are important for wetland and riparian productivity.

Water for flow augmentation at Marias Creek during mining (Years 3 through 7) would come from treated groundwater removed during mine dewatering and from stormwater and snowmelt runoff collected from the ore and development rock stockpiles. During mine reclamation (Years 8 through 10) and the continued refilling of the Gold Bowl portion of the mine (Years 11 through 16), collection and management of stormwater and snowmelt runoff would still be required until surface facility reclamation is completed and runoff water quality meets applicable standards, but mine dewatering would no longer be necessary. During this period, any use of groundwater extracted from the mine for flow augmentation in Marias Creek would be authorized under this permit.

Additional mitigation measures through culvert replacement and riparian enhancement are also proposed. These mitigation efforts are proposed to offset long-term impacts to habitat through reductions in flows, as well as potential increased erosion and sedimentation impacts associated with mine haul route development. The erosion and sedimentation impacts are not part of the water right permitting process and are not a factor in evaluating this application.

The applicant proposes to replace three culverts and improve a fourth culvert to allow passage of fish and aquatic life. A partially fish-blocking culvert at Toroda Creek Road and a fish-blocking culvert upstream at RM 0.59 will be replaced with culverts designed to allow fish and aquatic life passage. A third culvert at RM 4.38 is not fish blocking, but would be replaced with an aquatic life passable culvert. A hanging culvert at RM 3.78 would be improved to allow fish passage.

Riparian enhancement is proposed on property owned by Kinross immediately upstream from Toroda Creek Road. Marias Creek on this property shows impaired wetland and riparian conditions. The applicant proposes to complete riparian and wetland stream edge planting along a ¼-mile length of Marias Creek to improve habitat function. The property would also be fenced to exclude livestock, and a noxious weed and invasive species control program would be implemented.

In summary, over the first 17 years of mining and reclamation (Years 0 through 16, inclusive), impacts to surface water flows in Marias Creek during the growing season would be mitigated through streamflow augmentation. Long-term impacts to surface water flows and loss of habitat would be addressed through the riparian enhancement and culvert replacement/improvement mitigation measures. These measures would provide long-term improvements to aquatic habitat by improving fish passage over approximately four miles of Marias Creek and by improving riparian ecological function in the lower ¼-mile of Marias Creek.

Toroda Creek

Impacts to surface water flows in Toroda Creek associated with mine dewatering and project water rights applications would occur due to reduced groundwater discharge to Marias Creek, Nicholson Creek, and the Roosevelt Adit. Additional changes in flows in Toroda Creek would occur due to diversion of stormwater runoff to Nicholson Creek associated with Application No. S4-34999 and out-of-season dust control use associated with Water Right Change No. CG4-CCV1-4P200 (Newman Ranch). Specific impacts and mitigation for Nicholson Creek and Marias Creek are discussed above. The proposed mitigation for Toroda Creek involves reduced use during the irrigation season under Water Right Change Authorization No. CG4-CCV1-4P200, which was approved by Ecology on September 26, 2006.

The change application approved by Ecology authorizes a change in use from seasonal irrigation of 50 acres to year-round dust control along the Marias Creek haul route road and at the mine site, and a change to provide water for mitigation of streamflows in Toroda Creek. During the first ten years of mine construction and reclamation, use would be limited to 43 ac-ft/yr for dust control and 82.4 ac-ft/yr for instream flow mitigation. During the subsequent six years, use would be limited to 100.3 ac-ft/yr for irrigation of 40 acres and 25.1 ac-ft/yr for instream flow mitigation. Sixteen years after mining ceases (estimated as Year 23 after the start of mining), use under Water Right Change Authorization No. CG4-CCV1-4P200 would revert back to irrigation of 50 acres using 125.4 ac-ft/yr.

The net effects of the proposed mine dewatering and the approved change in use of Water Right Change Authorization No. CG4-CCV1-4P200 is identified in the ARMP for the following three reaches of Toroda Creek:

- Between Newman Ranch and Marias Creek, where changes in flow in Toroda Creek are due entirely to the change to Certificate of Change No. G4-CCV1-4P200.
- Between Marias Creek and Nicholson Creek, where net effects are due to the change to Certificate of Change No. G4-CCV1-4P200 and effects from actions at the mine site on flows in Marias Creek.

- Downstream from Nicholson Creek, where net effects are due to the change to Certificate of Change No. G4-CCV1-4P200, effects from actions at the mine site on flows in Marias Creek, and effects from actions at the mine site on flows in Nicholson Creek.

In the ARMP, effects on surface water flows in Toroda Creek are evaluated for four time periods:

- During mining and mine dewatering when Change No. CG4-CCV1-4P200 is used only for dust control and mitigation of streamflows (Phase 1 – Mining, Years 0 through 7).
- During the three years of mine reclamation and mine flooding when Change No. CG4-CCV1-4P200 is used only for dust control and mitigation of streamflows (Phase 1 – Reclamation, Years 8 through 10).
- During the subsequent 13 years of mine flooding, when Change No. CG4-CCV1-4P200 is limited to use for irrigation of 40 acres with the remainder used for mitigation of streamflows (Phase 2 – Mine Refilling, Years 11 through 23).
- Long term, after equilibration of groundwater elevations in the mine, when use of Change No. CG4-CCV1-4P200 reverts to the current use for irrigation of 50 acres (Phase 3 – Long Term Re-Equilibration, After Year 23).

Effects on surface water flows in Toroda Creek described for each of these time periods were selected as the maximum estimated impact during various phases of mining, reclamation, and re-equilibration. Results are presented in the ARMP on both an annual and monthly basis. The consumptive use quantities for the current use of the irrigation water right calculated in the ARMP are smaller than those that would be calculated by following *Water Resources Program Guidance 1210*, because of differences in methods for estimating evaporative losses during irrigation. Quantities described below in this evaluation of the net impacts on flows in Toroda Creek are based on calculations following Guidance 1210 (75 percent irrigation efficiency and evaporation loss calculated as 10 percent of total irrigation requirements), and do not necessarily match those presented in the ARMP. Because of the different methods used, the ARMP underestimates the consumptive use for the current irrigation right, and in turn underestimates the increases in flows in Toroda Creek that would be expected from using a portion of this right for mitigation instead of irrigation. The differences between the ARMP calculations and calculations based on Guidance 1210 range from zero during November through April to between 0.001 cfs and 0.044 cfs from May through October. Table 6 summarizes predicted net effects in Toroda Creek based calculations following Guidance 1210, and the following sections discuss these results for each stream reach and time period. Tabulated values are the maximum predicted net effects within each listed time period.

Table 6 – Average Monthly Net Effects on Flow in Toroda Creek

Time Period	**Stream Reach and Change in Flow in cfs**		
Phase 1 - Mining (Years 0 though 7)	**Newman Ranch to Marias Creek**	**Marias Creek to Nicholson Creek**	**Downstream of Nicholson Creek**
January	-0.027	-0.028	-0.006
February	-0.027	-0.028	-0.006
March	-0.027	-0.028	-0.006
April	-0.082	-0.082	-0.060
May	0.027	0.027	0.049
June	0.297	0.297	0.319
July	0.471	0.471	0.493
August	0.343	0.343	0.365
September	0.195	0.195	0.217
October	-0.071	-0.071	-0.050
November	-0.027	-0.028	-0.006
December	-0.027	-0.028	-0.006
Phase 1 - Reclamation (Years 8 through 10)	**Newman Ranch to Marias Creek**	**Marias Creek to Nicholson Creek**	**Downstream of Nicholson Creek**
January	-0.027	-0.028	-0.070
February	-0.027	-0.028	-0.070
March	-0.027	-0.028	-0.070
April	-0.082	-0.082	-0.124
May	0.027	0.027	-0.015
June	0.297	0.297	0.255
July	0.471	0.471	0.429
August	0.343	0.343	0.301
September	0.195	0.195	0.153
October	-0.071	-0.071	-0.113
November	-0.027	-0.028	-0.070
December	-0.027	-0.028	-0.070

Table 6 continued on page 19

Table 6 continued from page 18

Time Period	Stream Reach and Change in Flow in cfs		
Phase 2 - Mine Refilling (Years 11 through 23)	**Newman Ranch to Marias Creek**	**Marias Creek to Nicholson Creek**	**Downstream of Nicholson Creek**
January	0	0.000	-0.045
February	0	0.000	-0.045
March	0	0.000	-0.045
April	0	0.000	-0.045
May	0.022	0.022	-0.023
June	0.076	0.076	0.031
July	0.111	0.111	0.066
August	0.085	0.085	0.040
September	0.055	0.055	0.010
October	0.002	0.002	-0.043
November	0	0.000	-0.045
December	0	0.000	-0.045
Phase 3 – Long-Term Re-Equilibration	**Newman Ranch to Marias Creek**	**Marias Creek to Nicholson Creek**	**Downstream of Nicholson Creek**
January	0	-0.0007	0.010
February	0	-0.0007	0.010
March	0	-0.0007	0.010
April	0	-0.0007	0.010
May	0	-0.0007	0.010
June	0	-0.0007	0.010
July	0	-0.0007	0.010
August	0	-0.0007	0.010
September	0	-0.0007	0.010
October	0	-0.0007	0.010
November	0	-0.0007	0.010
December	0	-0.0007	0.010

Note: Negative value indicates reduction in streamflow. Changes in flows are maximum predicted net effects within each listed time period.

Net Effects on Flow in Toroda Creek (Phase 1 - Mining, Years 0 through 7)

The net effects of the proposed mining project water rights on flows in each reach of Toroda Creek were estimated by summing the predicted effects of flow changes caused by the change in use authorized in Water Right Change Authorization No. CG4-CCV1-4P200 and the effects of water use at the mine site on each tributary stream. For example, the net effects on Toroda Creek downstream of the confluence with Marias Creek and upstream of Nicholson Creek would be the sum of effects of mine site activities on flows in Marias Creek and change in Water Right Change Authorization No. CG4-CCV1-4P200, but would not include effects of mine site activities on flows in Nicholson Creek.

The change authorized in Water Right Change Authorization No. CG4-CCV1-4P200 to year-round dust control would result in increased flows in Toroda Creek between Newman Ranch and Marias Creek for the period of May through September, and decreased flows from October through April. Decreased flows from October through April would be equal to the consumptive use for dust control during this period, except during October when the small amount of consumptive use for the current irrigation use must be accounted for. Estimated decreases in streamflow range from 0.027 cfs from November through March to 0.071 and 0.082 cfs in October and April, respectively. Estimated increased flows from May through September are equal to the difference between the current consumptive use for the irrigation right and the lowered consumptive use for dust control during this period. Predicted increased flows range from 0.027 cfs in May to 0.471 cfs in July. During mining, mine dewatering and water use at the mine site would result in a small (less than 0.001 cfs) decrease in flow from Marias Creek to Toroda Creek, while infiltration of water at the head of Nicholson Creek as part of mine operations and mitigation would result in an estimated increase in flows (0.022 cfs) from Nicholson Creek to Toroda Creek. Net effects of the proposed mining project, including dewatering and water management, and mining project beneficial uses on flows in Toroda Creek, were estimated between Marias Creek and Nicholson Creek and downstream from Nicholson Creek by adding these effects to the estimated change in flows caused by the change in the irrigation right. Estimated changes in flows in Toroda Creek between Marias Creek and Nicholson Creek are approximately equal to the estimated changes in flows in Toroda Creek between Newman Ranch and Marias Creek. Downstream from Nicholson Creek, estimated decreases in flows in Toroda Creek range from 0.006 cfs during November through March to 0.050 and 0.060 cfs in October and April, respectively. Increased flows between May and September are estimated to range from 0.049 to 0.493 cfs from May to September.

Net Effects on Flow in Toroda Creek (Phase 1 - Reclamation, Years 8 through 10)

During the three years of mine reclamation and initial mine flooding, irrigation Water Right Change Authorization No. CG4-CCV1-4P200 would continue to be used for dust control and no irrigation would occur. Mine flooding impacts on Marias Creek flows would remain unchanged from active mining conditions (less than 0.001 cfs). Water would no longer be infiltrated at the head of Nicholson Creek, and flows in the creek would be reduced by an estimated 0.042 cfs because of groundwater inflow to the mine that would have otherwise discharged to Nicholson Creek. Estimated net changes in flows in Toroda Creek between the Newman Ranch and Marias Creek and from Marias Creek to Nicholson Creek are unchanged from the estimated effects during mining. Net decreases in flows in Toroda Creek downstream from Nicholson Creek are estimated to range from 0.015 cfs in May to 0.124 cfs in April. Net increases in flows in Toroda Creek between June and September are estimated to range between 0.153 and 0.429 cfs.

Net Effects on Flow in Toroda Creek (Phase 2 - Mine Refilling, Years 11 through 23)

Following mine reclamation, Water Right Change Authorization No. CG4-CCV1-4P200 would no longer be used for dust control. Forty acres out of the original 50 irrigated acres at the Newman ranch would be put back into irrigated use. An annual total of 25.1 acre-feet of water currently used to irrigate the remaining 10 acres at the Newman ranch would remain in trust to mitigate for impacts to streamflows. Mine flooding impacts on Marias Creek flows would remain unchanged from active mining conditions (less than 0.001 cfs). Flows in Nicholson Creek would be reduced by an estimated 0.045 cfs because of groundwater inflow to the mine that would have otherwise discharged to the creek. Estimated net changes in flows in Toroda Creek between the Newman Ranch and Marias Creek and from Marias Creek to Nicholson Creek would range from zero between November and April (i.e., the same as current conditions), to an increase in flows of between 0.002 and 0.111 cfs between May and October. Estimated net decreases in flows in Toroda Creek downstream from Nicholson Creek would range from 0.023 to 0.045 cfs between October and May. Estimated net increases in flows in Toroda Creek between June and September would range between 0.010 and 0.066 cfs.

Net Effects on Flow in Toroda Creek (Phase 3 – Long Term Re-Equilibration, After Year 23)

As the mine refills, groundwater levels would establish new equilibrium elevations. Analyses in the SEIS indicates the groundwater divide beneath Buckhorn Mountain will shift to the west, resulting in an increase in groundwater discharge to Nicholson Creek of about 0.01 cfs. Reduction in flows in Marias Creek are estimated to remain less than 0.001 cfs. There would be less than a 0.001 cfs reduction in net flows in Toroda Creek between the Newman Ranch and Nicholson Creek. Downstream from Nicholson Creek, flows would increase by about 0.01 cfs throughout the year.

In summary, the net effect on surface water flows in Toroda Creek of the proposed mine dewatering water right application and mitigation would be to increase flows during summer when irrigation demand from the creek is highest and reduce flows during the winter. In comments on the Newman Ranch change request, WDFW recognized there would be an incremental improvement in flows during the irrigation season, although the benefits would be countered somewhat by expanded use outside the irrigation season; however, fish sensitivity and other out-of-stream water uses are less outside the irrigation season. An overall net benefit to surface water flows in the Toroda Creek drainage would result from approval of the requested mine dewatering and associated mitigation water rights.

Myers Creek and Tributaries

Impacts to surface water flows in Myers Creek associated with project water rights applications and mine dewatering would occur because of reduced groundwater discharge to Gold Creek, Bolster Creek, and Ethel Creek. Table 7 presents predicted unmitigated reductions in flows in Myers Creek and its tributaries. During mining (Years 0 through 7), predicted average annual reductions in flows in these tributaries range from less than 0.001 cfs in Gold Creek to 0.008 cfs in Bolster Creek, with a maximum net reduction in flow in Myers Creek of 0.009 cfs. During reclamation and mine flooding, impacts would continue to increase, reaching a maximum average annual reduction in flow in Myers Creek of 0.014 cfs starting four years after the end of mining (Year 11). Starting after Year 16, when refilling of the Gold Bowl is expected to be complete, predicted impacts gradually decrease, eventually reaching a new equilibrium with a long-term net flow reduction in Myers Creek of 0.009 cfs. This reduction is associated with a permanent shift westward in the Toroda/Myers Creek groundwater divide caused by mine development, and a corresponding decrease in the groundwater catchment area for the Myers Creek drainage.

Table 7 – Unmitigated Changes in Flows in Myers Creek and its Tributaries

	Stream and Change in Flow in cfs			
Mining Year	Ethel Creek	Bolster Creek	Gold Creek	Myers Creek
0	0.000	0.000	-0.0001	0.000
1	0.000	0.000	-0.0001	0.000
2	0.000	-0.001	-0.0001	-0.001
3	0.000	-0.002	-0.0001	-0.002
4	0.000	-0.003	-0.0002	-0.003
5	0.000	-0.005	-0.0002	-0.005
6	0.000	-0.006	-0.0002	-0.008
7	-0.001	-0.008	-0.0003	-0.009
8	-0.001	-0.009	-0.0002	-0.010
9	-0.001	-0.010	-0.0002	-0.012
10	-0.001	-0.011	-0.0002	-0.013
11	-0.002	-0.011	-0.0002	-0.014
12	-0.002	-0.011	-0.0002	-0.014
13	-0.002	-0.011	-0.0002	-0.014
14	-0.002	-0.010	-0.0003	-0.014
15	-0.002	-0.010	-0.0003	-0.014
16	-0.002	-0.010	-0.0003	-0.014
17	-0.002	-0.009	-0.0003	-0.013
18	-0.002	-0.009	-0.0003	-0.013
19	-0.002	-0.009	-0.0004	-0.012
20	-0.002	-0.008	-0.0004	-0.012
21	-0.002	-0.008	-0.0004	-0.012
22	-0.002	-0.008	-0.0004	-0.011
23	-0.002	-0.008	-0.0004	-0.011
24	-0.002	-0.008	-0.0005	-0.011
28	-0.002	-0.007	-0.0005	-0.010
33	-0.002	-0.007	-0.0006	-0.010
38	-0.002	-0.007	-0.0007	-0.010
43	-0.002	-0.007	-0.0007	-0.009

Negative value indicates reduction in streamflow.

Reduced groundwater discharge in the Myers Creek drainage will also affect seeps, springs, and wetlands. Based on groundwater flow modeling in the SEIS, flow in headwater springs, seeps, and wetlands in the Myers Creek drainage are predicted to decrease, resulting in some loss of wetland area and function. Mitigation of these impacts is discussed below in the Wetland section.

Proposed mitigation in the Myers Creek drainage includes temporary and permanent changes in use of existing water rights, streamflow augmentation, riparian enhancement, and wildlife watering at stream headwaters. Proposed mitigation includes:

- Transfer Myers Creek Adjudicated Certificate No. 45 (Leslie Ranch) to temporary trust (Change Application No. CS4-ADJ47P45).
- Transfer Myers Creek Adjudicated Certificate No. 36 (Thorp) to permanent trust (Change Application No. CS4-ADJ47P36).
- Install wildlife guzzlers near the headwaters of Gold Creek, Bolster Creek, and the Ethel Creek.
- Apply for a new Water Right No. G4-35084 (Lost Creek Ranch) for streamflow augmentation in Myers Creek.
- Transfer 13 acre-feet of water required for 10 acres irrigation at Lost Creek Ranch authorized under Water Right Certificate No. G4-22893C into permanent trust. This would be included as part of long term mitigation, starting in Year 8 or at the end of mining, whichever occurs first.

The net effects of the proposed mine dewatering and change in use of Certificate Nos. 36 and 45 and G4-22893C are identified for five reaches of Myers Creek:

- Between Ethel Creek and Leslie Ranch, where net effects are from actions at the mine site on flows in Ethel Creek.
- Between Leslie Ranch and Bolster Creek, where net effects are due to the proposed change to Certificate No. 45 and effects from actions at the mine site on flows in Ethel Creek.
- Between Bolster Creek and Gold Creek, where net effects are due to the proposed change to Certificate No. 45 and effects from actions at the mine site on flows in Ethel Creek and Bolster Creek.

- Between Gold Creek and the Thorp property, where net effects are due to the proposed changes to Certificate No. 45 and G4-22893C and to effects from actions at the mine site on flows in Ethel Creek, Bolster Creek, and Gold Creek.
- At the international border, where net effects are due to the proposed changes to Certificate No. 45, G4-22893C, and Certificate No. 36, and effects from actions at the mine site on flows in Ethel Creek, Bolster Creek, and Gold Creek.

Data from the ARMP and the SEIS were used to evaluate effects on surface water flows in Myers Creek for four time periods, based on anticipated mining activities and proposed changes to Certificate Nos. S4-ADJ47P45 and G4-22893C. Time periods evaluated were:

- During mining and mine dewatering when Change Application No. CS4-ADJ47P45, if approved, would transfer water required for irrigation of 12 acres to trust for mitigation of streamflows (Phase 1 – Mining, Years 0 through 7).
- During the three years of mine reclamation and mine flooding when Change Application No. CS4-ADJ47P45, if approved in full, would transfer an irrigation duty for 12 acres of irrigation to trust for mitigation of streamflows and 13 ac-ft/yr of water under No. G4-22893C is placed in permanent trust (Phase 1 – Reclamation, Years 8 through 10).
- During the subsequent 14 years of refilling of the Gold Bowl and Southwest Zone of the mine when Change Application No. CS4-ADJ47P45, if approved, is limited to use for irrigation of seven acres with the remainder remaining in trust for mitigation of streamflows and 13 ac-ft/yr of water under No. G4-22893C is placed in permanent trust (Phase 2 – Mine Refilling, Years 11 through 25).
- Long term, after equilibration of groundwater elevations in the mine, when use of CS4-ADJ47P45 reverts to the current use for irrigation of 12 acres and irrigation use of 13 ac-ft/yr under G4-22893C is placed in permanent trust (Phase 3 – Long Term Re-Equilibration, After Year 25).

The proposed change for Certificate No. 36, which authorizes surface water use near the confluence of Gold Creek and Myers Creek for stockwatering, is a permanent transfer to trust, with the effects of this change remaining the same for all time periods evaluated.

Effects on surface water flows in Myers Creek described for each of these time periods are presented in the ARMP. With one exception, net effects presented in the ARMP were selected as the maximum estimated impact during various phases of mining, reclamation, and re-equilibration. The results presented for Phase I – Reclamation were based on predicted impacts for Year 8, rather than Year 10, when the maximum impacts are predicted to occur. Results presented in this ROE were recalculated to correct this discrepancy. Additionally, the consumptive use quantities for the current use of the irrigation water right calculated in the ARMP are smaller than those that would be calculated by following *Water Resources Program Guidance 1210* because of differences in methods for estimating evaporative losses during irrigation. Quantities described below in this evaluation of the net impacts on flows in Myers Creek are based on calculations following Guidance 1210 (75 percent irrigation efficiency, 10 percent evaporation loss calculated as a percent of total irrigation requirements, irrigation requirements based on average requirements for Omak and Republic stations), and the quantities do not necessarily match those presented in the ARMP. Because of the different methods used, the ARMP underestimates the consumptive use for the current irrigation right and in turn underestimates the increases in flows in Myers Creek that would be expected if a portion of this right were used for mitigation instead of irrigation. Table 8 summarizes predicted net effects in Myers Creek, and the following sections discuss these results for each stream reach and time period. Tabulated values are the maximum predicted net effects within each listed time period.

Table 8 - Average Monthly Net Effects on Flow in Myers Creek

Time Period	Stream Reach and Change in Flow in cfs				
Phase 1 - Mining (Years 0 through 7)	**Ethel Creek to Leslie Ranch**	**Leslie Ranch to Bolster Creek**	**Bolster Creek to Gold Creek**	**Gold Creek to Thorp Property**	**International Border**
January	-0.0007	-0.0007	-0.008	-0.009	-0.002
February	-0.0007	-0.0007	-0.008	-0.009	-0.002
March	-0.0007	-0.0007	-0.008	-0.009	-0.002
April	-0.0007	-0.0007	-0.008	-0.009	-0.002
May	-0.0007	0.025	0.018	0.018	0.018
June	-0.0007	0.090	0.083	0.082	0.082
July	-0.0007	0.132	0.124	0.124	0.124
August	-0.0007	0.101	0.094	0.094	0.094
September	-0.0007	0.066	0.058	0.058	0.064
October	-0.0007	-0.0007	-0.008	-0.009	-0.002
November	-0.0007	-0.0007	-0.008	-0.009	-0.002
December	-0.0007	-0.0007	-0.008	-0.009	-0.002

Table 8 continued on page 23

Table 8 continued from page 22

Time Period	Stream Reach and Change in Flow in cfs				
Phase 1 - Reclamation (Years 8 through 10)	**Ethel Creek to Leslie Ranch**	**Leslie Ranch to Bolster Creek**	**Bolster Creek to Gold Creek**	**Gold Creek to Thorp Property**	**International Border**
January	-0.001	-0.001	-0.012	-0.012	-0.006
February	-0.001	-0.001	-0.012	-0.012	-0.006
March	-0.001	-0.001	-0.012	-0.012	-0.006
April	-0.001	-0.001	-0.012	-0.012	-0.006
May	-0.001	0.025	0.025	0.025	0.025
June	-0.001	0.090	0.118	0.118	0.118
July	-0.001	0.131	0.178	0.178	0.178
August	-0.001	0.101	0.134	0.134	0.134
September	-0.001	0.065	0.083	0.083	0.089
October	-0.001	-0.001	-0.012	-0.012	-0.006
November	-0.001	-0.001	-0.012	-0.012	-0.006
December	-0.001	-0.001	-0.012	-0.012	-0.006
Phase 2 - Mine Refilling (Years 11 through 25)	**Ethel Creek to Leslie Ranch**	**Leslie Ranch to Bolster Creek**	**Bolster Creek to Gold Creek**	**Gold Creek to Thorp Property**	**International Border**
January	-0.002	-0.002	-0.013	-0.013	-0.007
February	-0.002	-0.002	-0.013	-0.013	-0.007
March	-0.002	-0.002	-0.013	-0.013	-0.007
April	-0.002	-0.002	-0.013	-0.013	-0.007
May	-0.002	0.009	0.009	0.009	0.009
June	-0.002	0.036	0.065	0.064	0.064
July	-0.002	0.053	0.100	0.100	0.100
August	-0.002	0.041	0.074	0.074	0.074
September	-0.002	0.026	0.044	0.043	0.050
October	-0.002	-0.002	-0.013	-0.013	-0.007
November	-0.002	-0.002	-0.013	-0.013	-0.007
December	-0.002	-0.002	-0.013	-0.013	-0.007
Phase 3 - Long-Term Re-Equilibration	**Ethel Creek to Leslie Ranch**	**Leslie Ranch to Bolster Creek**	**Bolster Creek to Gold Creek**	**Gold Creek to Thorp Property**	**International Border**
January	-0.002	-0.002	-0.010	-0.010	-0.004
February	-0.002	-0.002	-0.010	-0.010	-0.004
March	-0.002	-0.002	-0.010	-0.010	-0.004
April	-0.002	-0.002	-0.010	-0.010	-0.004
May	-0.002	-0.002	0.002	0.001	0.001
June	-0.002	-0.002	0.030	0.029	0.029
July	-0.002	-0.002	0.048	0.047	0.047
August	-0.002	-0.002	0.034	0.034	0.034
September	-0.002	-0.002	0.019	0.019	0.025
October	-0.002	-0.002	-0.010	-0.010	-0.004
November	-0.002	-0.002	-0.010	-0.010	-0.004
December	-0.002	-0.002	-0.010	-0.010	-0.004

Note: Negative value indicates reduction in streamflow. Changes in flows are maximum predicted net effects within each listed time period.

Net Effects on Flow in Myers Creek (Phase 1 - Mining, Years 0 through 7)

The net effects of the proposed mining project water rights on flows in each reach of Myers Creek were estimated by summing the predicted effects of flow changes on each tributary stream and water right change affecting each reach. For example, during mining the net effects between Bolster Creek and Gold Creek would be the sum of effects associated with Ethel Creek, Bolster Creek, and change in Certificate No. 45, but would not include effects associated with Gold Creek or the change in Certificate No. 36 downstream of Gold Creek.

During mining, mine dewatering and water use at the mine site would result in decreased flows from Ethel, Bolster, and Gold Creeks to Myers Creek. A combination of temporary transfer to trust of Certificate No. 45 and permanent transfer to trust of Certificate No. 36 would result in increased flows in Myers Creek downstream from the associated points of diversion. Estimated decreases in flow between Ethel Creek and Leslie Ranch are less than 0.001 cfs. Between Leslie Ranch and Bolster Creek, flows in Myers Creek are estimated to increase during May through September by between 0.025 and 0.132 cfs. During October through April, flows are estimated to decrease by less than 0.001 cfs. Between Bolster Creek and Gold Creek, flows in Myers Creek are estimated to increase during May through September by between 0.018 and 0.124 cfs. During October through April, flows are estimated to decrease by 0.008 cfs. Estimated changes in flows in Myers Creek between Gold Creek and the Thorp property are essentially equal to the estimated changes in

flows in Myers Creek between Bolster Creek and Gold Creek. At the international border flows in Myers Creek are estimated to increase during May through September by between 0.018 and 0.124 cfs. During October through April, flows are estimated to decrease by 0.002 cfs.

Net Effects on Flow in Myers Creek (Phase 1 – Reclamation, Years 8 through 10)

During the three years of reclamation and initial flooding of the mine workings, Certificate No. 45 would remain in trust and no irrigation would occur. An annual quantity of 13 acre-feet of water used for irrigation of a ten acre portion of the Lost Creek Ranch authorized under No. G4-22893C would also be placed into permanent trust, increasing flows in Myers Creek downstream of Bolster Creek during the irrigation season. Mine flooding impacts on Myers Creek between Ethel Creek and Leslie Ranch would result in decreased flows of about 0.001 cfs. Similarly, during October through April, flows in Myers Creek between Leslie Ranch and Bolster Creek are predicted to decrease by about 0.001 cfs. Predicted flow increases in this stream reach during May through September would be similar to the predicted increases during mining. Between Bolster Creek and Gold Creek, flows in Myers Creek are estimated to increase during May through September by between 0.025 and 0.178 cfs. During October through April, flows are estimated to decrease by 0.012 cfs. Estimated changes in flows in Myers Creek between Gold Creek and the Thorp property are essentially equal to the estimated changes in flows in Myers Creek between Bolster Creek and Gold Creek. At the international border flows in Myers Creek are estimated to increase during May through September by between 0.025 and 0.178 cfs. During October through April, flows are estimated to decrease by 0.006 cfs.

Net Effects on Flow in Myers Creek (Phase 2 – Mine Refilling, Years 11 through 25)

Following reclamation the mine workings would continue to flood. Certificate No. 45 would be used to irrigate up to seven acres, while the remainder of the right would remain in trust to mitigate for impacts to streamflows. Thirteen acre-feet of water used for irrigation of a ten acre portion of the Lost Creek Ranch would remain in trust. Estimated decreases in flow between Ethel Creek and Leslie Ranch would be about 0.002 cfs. Flows in Myers Creek downstream from Leslie Ranch would increase relative to pre-mining conditions during May through September and decrease during October through April. Depending on month and location, increased flows would range from 0.009 cfs in May to about 0.100 cfs in July. Decreased flows would range from about 0.002 cfs between Leslie Ranch and Bolster Creek to about 0.013 between Bolster Creek and the Thorp property.

Net Effects on Flow in Myers Creek (Phase 3 – Long Term Re-Equilibration, After Year 25)

After Year 25, Certificate No. 45 would be placed back into use to irrigate up to 12 acres and stockwater right Certificate No. 36 and 13 acre-feet of irrigation right No. G4-22893C would remain in trust in perpetuity. As the mine refills, groundwater levels would establish new equilibrium elevations. Analyses in the SEIS indicate that the groundwater divide beneath Buckhorn Mountain will shift to the west, resulting in a permanent decrease in groundwater discharge to Ethel Creek, Bolster Creek, and Gold Creek of about 0.002 cfs, 0.007 cfs, and less than 0.001 cfs, respectively. The net effect on flows in Myers Creek between Ethel Creek and Bolster Creek would be about a 0.002 cfs reduction in flows. Flows in Myers Creek between Bolster Creek and the Thorp property would increase relative to pre-mining conditions during May through September, and decrease during October through April. Depending on the month, increased flows would range from 0.002 cfs in September to about 0.048 cfs in July. Decreased flows would be about 0.010 cfs. At the international border, flows in Myers Creek are estimated to increase during May through September by between 0.001 and 0.047 cfs. During November through April, flows are estimated to decrease by 0.004 cfs.

Additional Mitigation Proposed for the Myers Creek Drainage

Additional mitigation to address potential impacts to aquatic habitat in the Myers Creek includes riparian habitat restoration along Myers Creek and installation of wildlife watering "guzzlers" near the headwaters of each tributary. The applicant owns a 97-acre parcel extending from Gold Creek to the Canadian border, including both sides of a ¾-mile reach of Myers Creek. The riparian and upland areas of the property are currently grazed by livestock, resulting in stream bank damage, deposition of fine sediment in streambed gravels, and damage to riparian vegetation. The applicant proposes to install livestock exclusion fencing around riparian and wetland areas on this property and enhance existing riparian vegetation through a weed removal and riparian planting program.

To address potential habitat loss at the headwaters of tributary streams to Myers Creek, four guzzlers would be installed. A guzzler is a snowmelt or precipitation fed cistern used to provide a water supply for wildlife and/or livestock. Guzzler sizing and design has not been finalized and will be completed by the applicant in consultation with WDFW and the U.S. Forest Service. One guzzler would be installed near each of the headwaters of Ethel Creek, South Fork Bolster Creek, North Fork Bolster Creek, and Gold Creek. These would provide wildlife watering in areas with potential reduction in seep and spring flow at the upper elevations of Buckhorn Mountain.

The mitigation described above is intended to primarily address potential impacts to aquatic habitat resulting from decreased surface water flows. Additional mitigation is proposed to address potential impairment of the senior water right holder in the Myers Creek drainage. The most senior irrigation water right in the basin, the

Harpur right (Certificate No. 42), is located in Canada. Under the adjudication, a flow at the Canadian border equal to the authorized diversion of 0.617 cfs plus stream transportation losses between the border and the place of use is required. A flow of 1 cfs at the border has historically been sufficient to satisfy this right. There are relatively few streamflow data available for Myers Creek. It is estimated that on average streamflows could fall below 1.0 cfs at the international border for 10 to 15 days every three to four years. Under an extreme drought situation it is estimated that streamflows could fall below 1.0 cfs for up to 80 days.

The applicant proposes to augment surface water flows in Myers Creek with groundwater pumped under Water Right Application No. G4-35084 (Lost Creek Ranch) when flows at the border reach 1.0 cfs. The applicant currently holds Water Right No. G4-22893C, which nominally allows for irrigation of 120 acres with a Qi of 265 gpm and a Qa of 156 ac-ft/yr. The new appropriation under Water Right Application No. G4-35084 is non-additive to the existing certificated right. The planned use for the requested water right is to augment streamflows in Myers Creek as mitigation for the effects of mine related water use during the irrigation season. The proposed mitigation is intended to avoid potential impairment of the most senior irrigation water right in the basin (Certificate No. 42), and avoid potential curtailment of junior water users. A flow of 1.0 cfs at the international border, approximately two (2) miles downstream from the site, has typically been sufficient to satisfy this right. Historically, junior water users in the basin have been regulated in favor of this right when flows at the border drop below 1.0 cfs. In any year that streamflow augmentation is required, use of equivalent annual, and instantaneous quantities of water for irrigation under existing Water Right No. G4-22893C would temporarily cease. Further, the Qa authorized under No. G4-22893C of 156 ac-ft/yr could not be exceeded by the total use under Nos. G4-35084 and G4-22893C. The applicant has developed a predictive model to evaluate the likelihood that flow augmentation will be required in a given irrigation season and to estimate the total quantity of augmentation water that may be required. Each year, prior to April 1, the applicant is responsible to report to Ecology the amount of acreage which will be taken out of production (fallowed) to accommodate augmentation requirements.

Flow augmentation would occur, as needed, during the first 16 years of mining and mine flooding. During this period, the maximum predicted unmitigated streamflow reduction on Myers Creek is 0.014 cfs, starting about four years after the end of mining (Year 11). After 16 years, this mitigation would cease and Water Right Application No. G4-35084 will be retired. Initial analyses indicate that pumping 50 gpm of groundwater and discharging to Myers Creek would increase streamflows by 0.100 cfs over a period of 10 to 15 days and by 0.062 cfs after 90 days, offsetting the predicted impacts to streamflows in Myers Creek from actions at the mine site.

Rick Harpur, the owner of Certificate No. 42, has entered into an agreement with the applicant and stated in a letter to Ecology to forego any claim to any rights to or impairment of the adjudicated water right, up to 0.055 cfs during mining and mine refilling. Following re-equilibration, Mr. Harpur has also agreed to not divert water from Myers Creek under the adjudicated water right, up to 0.011 cfs (5 gpm) when the flow is less than 1.0 cfs at the border. This flow is equivalent to the predicted long term impact of the project on Myers Creek associated with the groundwater divide shift.

In summary, impacts to habitat due to flow losses in Myers Creek, would be mitigated by temporarily or permanently transferring existing water rights to trust and by completing riparian enhancement. Potential impairment of the Harpur right would be addressed through streamflow augmentation and an agreement with Mr. Harpur to not exercise his full right, up to 0.055 cfs during mining and mine refilling, and up to 0.011 cfs in perpetuity should impairment of his right occur. During mining and mine refilling through Year 16, the net effect on surface water flows in Toroda Creek of the proposed mine dewatering water right application and associated mitigation would be to increase flows during summer when irrigation demand from the creek is highest and reduce flows during the winter. Additional mitigation to address short term and long term impacts to aquatic habitat would include riparian enhancement and fencing of a ¾-mile reach of Myers Creek to exclude livestock. An overall net benefit to aquatic habitat would result from approval of mine dewatering and associated mitigation water right applications.

Wetlands

Wetlands potentially affected by the proposed mine project water rights derive water by a combination of groundwater discharge at seeps and springs, surface water flows in the creek drainages, and snowmelt runoff. Water rights associated with mining activities will potentially affect groundwater discharge and surface water flows; however the snowmelt component of wetland hydrology will be unaffected. Based on assessments in the SEIS, approximately 10.5 to 13 acres of wetlands would be impacted to some degree by changes in groundwater discharge and surface water flow resulting from actions at the mine site. Although wetland function would be affected, for the most part the loss of wetlands is not expected to occur. The affected acreage includes about 10 to 11 acres of wetlands supported in part by seeps and springs and about 0.5 to 2 acres of wetlands supported in part by surface water flows in the Marias Creek, Nicholson Creek, Bolster Creek, Ethel Creek, and Gold Creek drainages. Potentially affected wetlands are Category II and Category III based on wetland function. Predicted impacts to affected wetlands generally consist of flow reductions in the range of one to six percent, resulting in some loss of productivity but not a complete loss of wetland function. Two wetlands with a total area of less than 0.07 acres are predicted to cease to function as wetlands, one of which

may permanently disappear. The timing of impacts varies from temporary impacts during mining or reclamation to permanent changes.

To address potential impacts to wetlands the applicant has proposed the following mitigation measures:

- Flow augmentation at the headwaters of Marias Creek and Nine-Acre Wetland during the growing season.
- Restoration, enhancement, and preservation of 23.7 acres of Category II wetland at the Thorp Property on Myers Creek.
- Restoration, enhancement, and preservation of 6.02 acres of Category II wetland at the Pine Chee wetland on Myers Creek.
- Reclamation of one of the stormwater ponds to provide additional aquatic habitat following mine reclamation and closure.

Flow augmentation on Marias Creek and at Nine-Acre Wetland is described in the Marias Creek and the Nicholson Creek sections. Wetland restoration, enhancement, and preservation on the Thorp Property and at the Pine Chee wetland would include installing fencing to exclude livestock from wetland and riparian areas on the properties, stream bank stabilization and erosion control, planting of native species, and implementation of an invasive plant and noxious weed control program. Additionally, exiting channel diversions at the Pine Chee wetland would be rerouted to low lying areas on the site to create additional temporary and seasonal wetlands.

Discussion of Protests

Three letters of protest, from the Center for Environmental Law and policy (CELP), the Okanagan Highlands Alliance (OHA), and the Colville Confederated Tribes (CCT), were received by Ecology within the 30-day comment period following publication of the public notice. Concerns expressed in the protest letters, and the associated protesters, included:

- Defective application and public notice; the original application did not specify all wells currently requested as additional points of withdrawal; lack of clarity as to number of wells, volume of withdrawals, and concern about mine expansion (OHA, CELP, CCT).
- Well locations in Section 23 are outside the scope and analysis that was examined in originally approving No. G4-34904P. The original evaluation did not include adequate environmental review of the current application and groundwater modeling does not support withdrawal locations requested by this application (OHA, CELP, CCT).
- Wells in Section 23, above the headwaters of South Fork of Bolster Creek, may adversely affect stream flows, seeps and springs, and existing water rights; withdrawals in this location was not considered in the ARMP and the potential additional impacts have not been mitigated (OHA, CCT).
- Well location D-6 is outside the mine footprint and is outside the purpose of dewatering the mine.
- The wells in Section 24 may draw contaminants outside the mine capture zone, spreading groundwater contaminants beyond the mine footprint; the cone of depression from new wells would further spread contaminants in the future (OHA). The ARMP must be amended to address impacts of these wells (OHA, CELP).
- Pumping from the wells in Section 23, on the west side of Buckhorn Mountain hydrologic divide, and discharging to the east side of the hydrologic divide will transfer water from one basin to another and would adversely impact senior water rights in the Myers Creek Basin, and be detrimental to the public interest (OHA, CELP).
- There is no assurance that requirements for No. G4-34904 would be enforced. The applicant has not carried out requirements of the No. G4-34904P water right and Ecology has not enforced all of the requirements (OHA). The change raises the potential for water use in excess of the right (CELP).
- Lack of water available for appropriation. Every other water right application in past years in Toroda and Myers Creek basins have been denied due to lack of water. WDFW has recommended denial of new water rights as far back as 1950. Independent of impairment of rights, "a proposed withdrawal of groundwater from a closed stream or lake in hydraulic continuity must be denied if it is established factually that the withdrawal will have any effect on the flow or level of the surface water (OHA)."
- Water not put to beneficial use and is being wasted. Water that is being withdrawn and discharged will be degraded in quality (OHA).
- Not in the public interest. Expanding points of withdrawal into the Myers Creek Basin would affect senior water rights and spread mine contaminants (OHA).
- Aquatic Resources. Impacts to aquatic resources, including seeps, springs, wetlands, and flows in Bolster Creek must be fully considered (OHA).

- Aquatic Resources Mitigation Plan. The ARMP does not adequately describe aquatic resources in the affected area and mitigation does not offset impacts in conjunction with the impacts of the mine (OHA).
- Ecology is required to protect surface waters in order to preserve the natural environment, in particular, 'base flows' necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values and navigational values (CCT).
- Contaminants associated with mining are detrimental to fish. In the past the groundwater capture zone has failed to contain impacted water. Additional wells are likely to draw contaminated groundwater outside the mine footprint. Mine discharges resulted in a landslide in the Gold Bowl Creek basin (CCT).

Each of these concerns is addressed in the following sections.

Defective application and public notice, lack of clarity, mine expansion

The proposal under this change is to re-authorize wells D-6, D-8, and D-9 (a replacement for well D-7 that is no longer in use) that were authorized under a temporary approval of No. G4-34904P on October 29, 2009. These proposed wells are intended to maintain the groundwater capture zone around the mine workings and surface features, a condition of the NPDES permit. The purpose of the capture zone is to ensure that water impacted by mine activities is contained, collected, and treated prior to discharge. No expansion of the mine or mine life is requested under this change, and use of water for mining activities would not increase.

The public notice accurately summarized the proposal to add points of withdrawal to the mine dewatering system and meets the requirements for notice of a change application under RCW 90.03.280 and Ecology Procedure PRO-1000.

Well locations in Section 23 are outside the original scope and analysis; environmental review of the current application note adequate; and groundwater modeling does not support requested withdrawal locations

Environmental review under the existing SEIS evaluated and characterized the impacts of dewatering activities in order to create a capture zone. Wells D-8 and D-9 (replacement for D-7) in the SE¼SE¼ of Section 23 are located within the lateral extent of the mine workings considered in the groundwater flow modeling of the SEIS. The flow model did not explicitly include dewatering well locations, but instead applied "dewatering nodes" throughout the mine workings to "simulate the combined effects of groundwater pumping and seepage of groundwater into the mine" (Section 5.1.2, Regional Three-Dimensional Groundwater Flow Model of Buckhorn Mountain, URS, 2006). The SEIS evaluated the effects of groundwater withdrawals within the capture zone. D-8 and D-9 are within the capture zone.

Wells in Section 23, above the headwaters of South Fork of Bolster Creek, may adversely affect stream flows, seeps and springs, and existing water rights and were not considered in the ARMP.

Impacts associated with the removal of groundwater from the headwater areas of Bolster Creek via wells in Section 23 which are within the footprint of the mine workings and capture zone, were considered in the SEIS (see above response). Based on groundwater flow modeling, the SEIS identified potential impacts in the Bolster Creek drainage from mine dewatering, including flow reductions in the creek and flow reductions at seeps and springs that support wetlands near the headwaters. Mitigation is already in place for these impacts, including preservation and enhancement of the 29-acre Pine Chee wetland, riparian enhancement along Myers Creek, installation of a guzzler near the headwaters of Bolster Creek to provide an alternate source of water for wildlife, and replacement of a shallow domestic well for a group of families near the outlet of Bolster Creek. Further, under the ARMP (Section 6), Hydrologic Monitoring Plan (HMP; pages 5-9 and Appendix A), Ecological and Aquatic Resources Monitoring Plan (EARMP; Section 2.5), and Adaptive Management Plan (AMP; Appendices A, B, and E) flow monitoring and seep and wetland monitoring in South Fork Bolster Creek are required to assess actual versus predicted impacts, with criteria for determining when additional mitigation may be required.

Well location D-6 is outside the mine footprint and is outside the purpose of dewatering the mine.

The location of D-6 is within the currently defined capture zone, as agreed through the Adaptive Management Plan process. Mine dewatering, maintenance of a groundwater capture zone, discharge of water are authorized and regulated by the NPDES permit, and beneficial uses are currently permitted uses administered by Ecology's water quality program and water resources program.

New wells will draw contaminants outside the mine capture zone, spreading groundwater contaminants beyond the mine footprint. The ARMP must be amended to address impacts of these wells.

The purpose of the additional wells is to establish and maintain a capture zone around the mine workings and surface features to ensure that water impacted by mine activities is contained, collected, and treated prior to discharge. Impacts from dewatering activities associated with establishing and maintaining a capture zone were

contemplated and addressed in the suite of mitigation accepted by Ecology in 2006, including the Adaptive Management Plan, Aquatic Resources Mitigation Plan, and Hydrologic Monitoring Plan. New wells under this authorization may only be utilized if they are consistent with the fore mentioned plans and environmental review under SEPA.

Pumping on the west side of Buckhorn Mountain and discharging to the east side will transfer water from one basin to another and adversely impact senior water rights in the Myers Creek Basin.

The effects of removal of water and dewatering of mine workings on the west side of the hydrologic divide at the locations of the additional points of withdrawal in Section 23 were evaluated in the SEIS. No additional water quantities are proposed to be used under these proposed changes. Appropriate mitigation, monitoring, and adaptive management requirements to address the export of water from the west side to the east side of the divide and potential impacts to the Bolster Creek and Myers Creek drainage were developed through the EIS process and incorporated into No. G4-34904P; see above response to impacts to South Fork Bolster Creek. Appropriate mitigation, monitoring, and adaptive management requirements to address the existing water rights were also developed through the EIS process and incorporated into the water rights. Also, as per the SEIS, AMP, ARMP, and HMP, Crown augments Myers Creek with its private water rights in order to satisfy the needs of the senior water rights.

Ecology has not enforced all of the requirements of No. G4-34904 and the change raises the potential for water use in excess of the right.

It appears Kinross has not submitted water use data consistent with provision no. 3 of No. G4-34904P. Ecology has authority and discretion to enforce the provisions of a water right authorization. At this time, Ecology is seeking voluntary compliance. If voluntary compliance proves unsuccessful, additional measures may be taken. Ecology has and will continue to work with Kinross to ensure monitoring and reporting requirements are carried out in accordance with relevant permits and monitoring and mitigation plans. Beneficial use of the mine water under No. CG4-34904P will remain within the authorized quantities for this permit.

Lack of water available for appropriation, previous denials of applications, application for groundwater in continuity with closed surface water source must be denied.

The protest correctly points out that, previous applications for new water rights have been denied based on lack of water availability in the Toroda Creek and Myers Creek drainages, and that these basins have generally been treated as closed to further consumptive appropriation. Formal basin closures or minimum instream flows have not been established for these drainages based on administrative rule making. Instead, denials of new water rights due to lack of water availability have been based on recommendations from WDFW that remaining flows are necessary to maintain aquatic resources. WDFW recommendations to deny new water rights have historically been issued for applications that do not include sufficient mitigation of impacts to aquatic resources. The mitigation offered, including the monitoring and adaptive management approaches developed through the EIS process were incorporated into the water right approval. The existing mitigation, combined with monitoring and adaptive management, is sufficient and appropriate to address potential impacts under the proposed change to No. G4-34904P. Moreover, the subject change application does not request to increase the total or consumptive use under No. G4-34904P.

Water not put to beneficial use and is being wasted. Water that is being withdrawn and discharged will be degraded in quality.

The water right permitting process only covers water that is withdrawn or diverted for beneficial use, and the quantities specified in No. G4-34904P are limited to the portion of water required for mining and industrial uses. The additional groundwater removal required to dewater the mine and maintain a capture zone around the mine workings in excess of beneficial use requirements is not subject to the water right permitting process. However, these dewatering activities, including treatment standards to address the potential for degradation of water quality, are subject to compliance with the NPDES permit, and the accepted suite of mitigation for the mine.

Expanding points of withdrawal into the Myers Creek Basin would affect senior water rights and spread mine contaminants.

Potential impacts of the mine project on senior water right holders were fully evaluated in the SEIS. Adequate mitigation, monitoring, and adaptive management were developed to address impacts and were incorporated into the water right permits for the project. As discussed above, the purpose of the additional points of withdrawal is to establish and maintain a capture zone around the mine to avoid transport of contaminants.

Impacts to aquatic resources, including seeps, springs, wetlands, and flows in Bolster Creek must be fully considered.

Potential impacts to these aquatic resources were fully evaluated in the SEIS. The effects of the entire project, including groundwater removal near the headwater of Bolster Creek, were evaluated in the SEIS, and adequate mitigation, monitoring, and adaptive management were developed to address impacts and account for uncertainties. There is no change in the volumes or uses of water associated with this water right.

The ARMP does not adequately describe aquatic resources in the affected area and mitigation does not offset impacts in conjunction with the impacts of the mine.

Aquatic resources in the project area and potential impacts associated with project were thoroughly investigated and described in the SEIS, results of which were used to develop the ARMP. The effects of the entire project, including groundwater removal near the headwater of Bolster Creek, were evaluated in the SEIS, and adequate mitigation, monitoring, and adaptive management were developed to address impacts and account for uncertainties.

Ecology is required to protect surface waters in order to preserve the natural environment, in particular, 'base flows' necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values and navigational values.

Potential impacts of the project were evaluated fully in the SEIS, including impacts to surface waters and associated fish and wildlife habitat. Mitigation, monitoring, and adaptive management requirements to protect surface waters were developed based on potential impacts identified in the SEIS. The additional wells, as authorized, are not outside the scope of the project evaluated in the SEIS and the combination of existing mitigation, monitoring, and adaptive management is sufficient to protect potentially affected surface waters.

Contaminants associated with mining are detrimental to fish. In the past the groundwater capture zone has failed to contain impacted water. Additional wells are likely to draw contaminated groundwater outside the mine footprint. Mine discharges resulted in a landslide in the Gold Bowl Creek basin.

The new wells were developed in effort to establish and maintain the capture zone in accordance with the NPDES permit and to ensure that groundwater impacted by mining is contained, collected, and treated to water quality standards protective of aquatic resources (e.g., fish) prior to discharge to surface water and groundwater.

FINDINGS

In accordance with state law, the following considerations must be addressed during the process of evaluating this change request:

- Will the change create an enlargement of the original right?
- Do the additional points of withdrawal tap the same body of public groundwater as the original right?
- Will the change cause impairment to other existing rights?
- Will the proposal prove detrimental to the public interest?

Potential for Enlargement

The proposed change will not increase the originally authorized instantaneous or annual quantities for beneficial use during or after mining. Therefore, the proposed uses will not result in enlargement of the existing right.

Same Body of Public Groundwater

Joseph Morrice, LHG, of Aspect Consulting provided a Memorandum, dated April 23, 2013, regarding the authorized groundwater source/body and the proposed points of withdrawal. The memorandum concludes that the additional points of withdrawal tap the same fractured bedrock groundwater source/body beneath Buckhorn Mountain as the authorized points of withdrawal.

Impairment of Other Rights

The additional points of withdrawal will not increase beneficial use of water for mining or streamflow augmentation, and will not result in increased impacts to surface water flows or wetland habitat beyond what was predicted in the SEIS. Therefore, when combined with the offered mitigation measures, approval of the additional points of withdrawal will not result in impairment of senior water right holders.

Public Interest

The original project under which No. G4-34904P was approved was subject to extensive public and government agency review and evaluation of potential impacts through the SEPA process. Through this process mitigation was developed to address identified project-related impacts, including impacts to groundwater, surface water,

and aquatic and wildlife resources associated with mine dewatering and beneficial use of water under No. G4-34904P. The addition of points of withdrawal to establish and maintain a capture zone as described in the SEIS will not increase beneficial use of water, and will not result in increased impacts to surface water flows or wetland habitat beyond what was evaluated in the SEIS. Therefore, when combined with the offered mitigation measures, the additional points of withdrawal are not expected to prove detrimental to the public interest.

At this time, the Water Resources Program is unable to approve MW-2R and MW-14, or any other monitoring wells, for purposes of dewatering wells. To do so will prove detrimental to the public interest.

Provision 13 of No. G4-34904P states,

> "Continued use of water under this permit is conditioned upon compliance with monitoring, reporting, and adaptive management of water resources described in the *Aquatic Resources Mitigation Plan, Hydrologic Monitoring Plan, Adaptive Management Plan*, and requirements of the *Metals Mining, and Milling Operations Environmental Protection and Performance Security Bond* under Chapter 78.56 RCW. Monitoring and reporting schedules specified in these plans are incorporated by reference."

MW-2R and MW-14 are part of groundwater monitoring network described in the *Aquatic Resources Mitigation Plan, Hydrologic Monitoring Plan*, and *Adaptive Management Plan.* These mitigation plans were offered and accepted as part of the permit application review and subsequent approval. A loss of these monitoring wells, as critical points of compliance, would reduce environmental and mitigation monitoring efforts, as well as the effectiveness of adaptive management under these plans. In other words, conversion of MW-2R and MW-14 to dewatering wells would be in direct conflict with the existing Water Resources water right permit provision no. 13.

Additionally, the conversion of these monitoring wells to dewatering wells would be in direct conflict with Ecology's Water Quality Program's NPDES permit (WA-005243-4) for the mine. The mine NPDES permit requires Crown Recourses to establish and maintain a capture zone as described above. Groundwater monitoring is the mechanism by which Ecology's Water Quality Program evaluates the effectiveness of dewatering activities and determines the condition of the required capture zone. A loss of MW-2R and MW-14 would compromise the ability of Ecology to monitor or determine the establishment or preservation of a capture zone. In other words, the conversion of MW-2R and MW-14 to dewatering wells would compromise objectives and requirements of the Water Quality NPDES permit.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend that the request for change to No. G4-34904P be authorized, in the amounts and within the limitations listed below and subject to the provisions beginning on Page 2.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial.

100 gpm, 12.6 ac-ft/yr for mining and industrial use (Years 0 through 7)*, continuously.

100 gpm, 3.34 ac-ft/yr for streamflow augmentation from July 1 through September 30 (Years 8 through 16).

***As it relates to mining at the Buckhorn site, Year 0 = 2007.**

Points of Withdrawal

Dewatering wells and underground sumps to collect groundwater seepage in the mine:

Well D-1 – SE¼NW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-2 – SE¼NW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-3 – NE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-4 – NE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-5 – NW¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-6 – SE¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

Well D-8 – SE¼SE¼, Section 23, T. 40 N., R. 30 E.W.M.

Well D-9 – SE¼SE¼, Section 23, T. 40 N., R. 30 E.W.M.

Additional 2 Wells if within both the NPDES described capture zone AND NE¼SW¼ of Section 24, T. 40 N., R. 30 E.W.M.

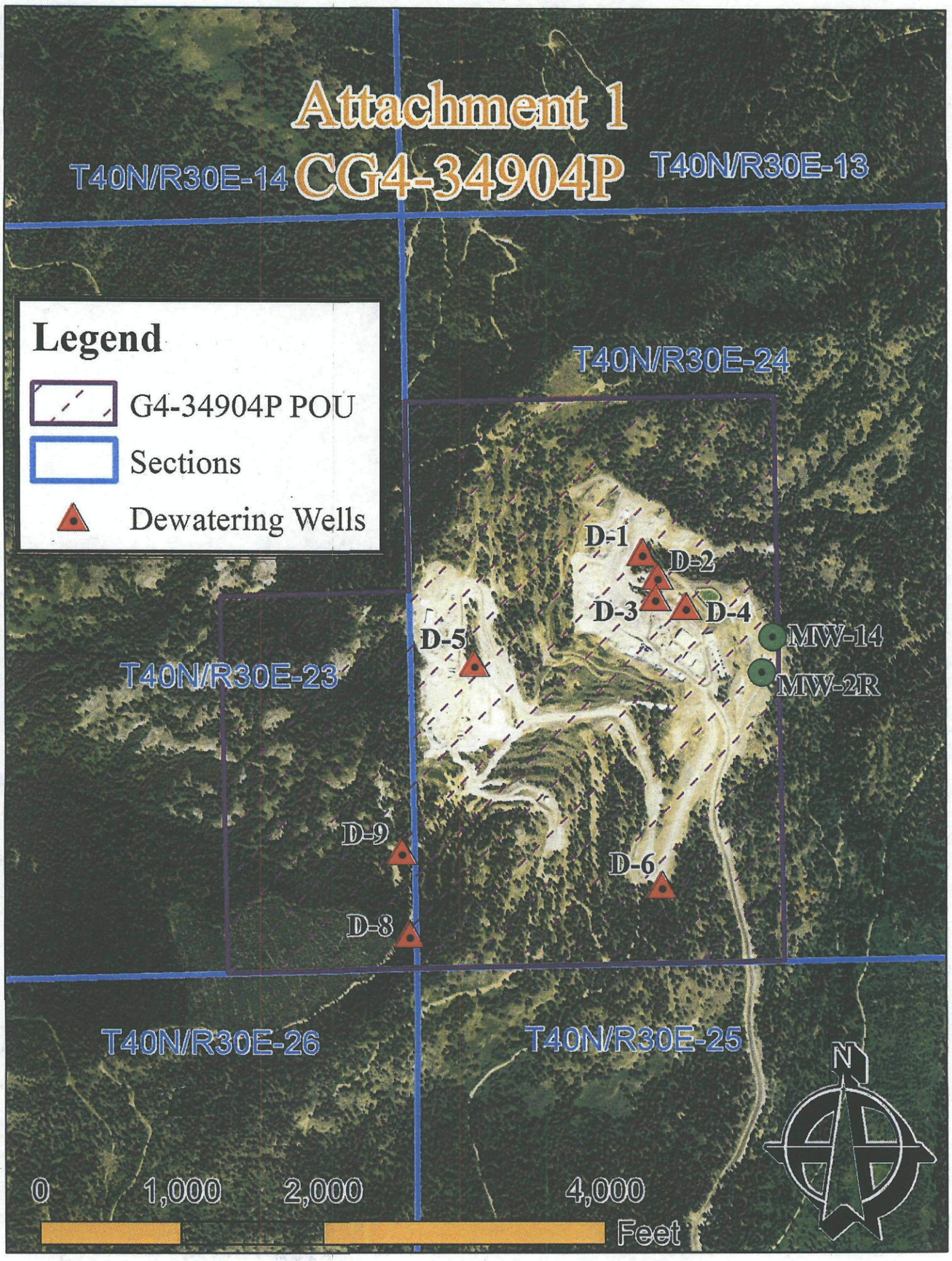
Underground Sumps – SE¼NW¼, NE¼SW¼, and NW¼SW¼, Section 24, T. 40 N., R. 30 E.W.M.

Place of Use

As described on Page 1 of this Report of Examination.

Report by: _____ 9-9-13
Kurt Walker, Water Resources Program Date

If you need this publication in an alternate format, please call Water Resources Program at 360 407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.


Attachment 1
CG4-34904P
T40N/R30E-14
T40N/R30E-13
T40N/R30E-24
T40N/R30E-23
T40N/R30E-26
T40N/R30E-25
Legend
G4-34904P POU
Sections
Dewatering Wells
D-1
D-2
D-3
D-4
D-5
D-6
D-8
D-9
MW-14
MW-2R
N
0
1,000
2,000
4,000
Feet