CHEMAINUS WELLS PROJECT EAC AMENDMENT APPLICATION
ISSUES TRACKING TABLE

ID	A. 2015 SUMMER TESTING PROGRAM - ISSUES			
	COMMENTS	**RESPONSE**	**Status**	**Date and Event**
	Comments from FLNRORD to MNC forwarded from EAO	**Response from MNC**		EAO provided Comment Tracking Table with EAO reponses to Halalt on August 28, 2015. Summer pump testing never commenced since the flow in the river never reached 400 L/sec.
1	1. FLNRORD supports the proposed alternative that water pumped during the testing period be chlorinated and used in the Chemainus Water System, noting that the Municipality of North Cowichan does have Health Authority source approval for this groundwater source. As noted in the application, Vancouver Island is presently at a Level 4 Drought and we are encouraging all water users to conserve and use water wisely.	Thank you for your review and input on the experimental design of the test pump program for the Chemainus Wells Project. MNC is doing our utmost to conserve and use water wisely.	Addressed for the purpose of the EA.	Received by EAO on August 20, 2015
2	2.. We encourage the MNC to play close attention to monitoring baseline and pre-test and between-test conditions as changes in stream level are expected to be small (if measurable) and may be masked by other conditions. I am pleased to see that pumping data from the other users in the area (e.g. Sea Spring Farms) will be obtained to aid in the analysis.	MNC has considered a wide array of factors that may influence interpretation of results and has attempted to build in data collection procedures to aid in interpretation of the data. MNC maintains a system of 12 groundwater monitoring wells in and around the aquifer, 2 stilling wells in the Westholme Side Channel, and 3 surface water hydrometric stations that will be collecting data prior to, during, and after the test pumping. We recognize that we have only partial control over the test procedures, in that other users may be pumping at the same time. Data from the surface and groundwater monitoring system, in combination with available operational data of other users in the area, will be used to interpret results of the test pump program.	Addressed for the purpose of the EA.	Received by EAO on August 20, 2015
	Comments from Halalt First Nation to EAO	**Response from EAO**		EAO provided Comment Tracking Table with EAO reponses to Halalt on August 28, 2015
3	1. I would like to meet with you in person to discuss the EAO's role in Aboriginal consultation and accommodation concerning the Province's consideration of whether to end the ban on summer pumping (more broadly than just MNC's application for approval of testing).	**EAO:** EAO is happy to meet with Halalt at anytime. EAO is open to meeting with the Halalt First Nation to continue consultation on the Amendment Application that the MNC submitted at the end of March to amend Commitment #A1 to allow the wells to operate on a year.	EAO - Halalt to meet to discuss the March Amendment Application	
	Comments from Halalt First Nation to MNC	**Response from MNC**		EAO provided Comment Tracking Table with EAO reponses to Halalt on August 28, 2015. Summer pump testing never commenced since the flow in the river never reached 400 L/sec.
4	1. Technical changes to the testing program as outlined in the attached letter from Halalt's hydrogeological consultant Dr. Gilles Wendling.	See response 1.1 through 1.8 below (under "Comments from GW Solutions")		
5	2. A requirement that MNC have a qualified professional with fisheries expertise on call with authority to immediately stop the test pumping in the event of harm to fish or fish habitat.	MNC will have a qualified professional with fisheries expertise from Ecofish Research Ltd. on call with authority to stop the test pumping in the event of harm to fish or fish habitat.	Addressed for the purpose of the Amendment Review	
6	3. A requirement that MNC involve Halalt and our consultants in the testing program on an ongoing basis, including data analysis and reporting.	MNC will involve Halalt and their consultants in the testing program through ongoing communications and updates, and will provide the results of the data analysis when available.	For the amendment review response adequately addresses concern raised	
7	4. A requirement that water pumped out during the testing be removed so that it cannot return to the Chemainus River or Aquifer and invalidate the test results.	The water pumped during the test will not be returned to the Chemainus watershed.	Water to be used in MNC water system, especially since infrastructure is already in place	
8	5. Acknowledgment that the results of the testing program will be only one part of the information the EAO will require in order to properly decide whether to remove the ban on summer pumping.	The results of the testing program will be made available to the regulatory agencies to assess potential effects of the project and will be considered during assessment of the amendment application for summer pumping.	EAO notes that this Amendment Application is only for summer test pumping program. See EAO response above to Halalt's First Nation comment to EAO.	
9	6. Acknowledgment that it remains to be determined whether test pumping in future years will be needed before summer pumping can be safely allowed.	The results of the pump test will be used to determine whether test pumping in future years will be needed before summer pumping can be safely allowed. It is anticipated that the pump test will provide valuable information on the potential effects of drawdown on river levels.	Addressed for the purpose of the Amendment Review	
10	7. Acknowledgment that the long-term sustainability of the Holyoak Lake water release concept is a separate matter that has not yet been addressed.	MNC has modelled the long-term sustainability of the Holyoak Lake water release, and has provided this information as part of the amendment application. Halalt are encouraged to review this information and provide comments or considerations for additional analysis.	EAO notes that besides the release of water for one 14 day trial, the release of water is a mitigation measure to be used if flows decline more than 20% when pumping. Comment addressed.	
11	We are aware that there is a short window for completing the test pumping before the rains begin in the Fall. We support MNC's request that the EAO deal with this test pumping approval sooner rather than later.	MNC sincerely appreciates this support for the test pumping program.	Noted	

	COMMENTS	RESPONSE	Status	Date and Event
	Comments from GW Solutions to MNC	**Response from MNC**		EAO provided Comment Tracking Table with EAO reponses to Halalt on August 28, 2015. Summer pump testing never commenced since the flow in the river never reached 400 L/sec.
12	1.1 The short duration tests should last 3 days. The 1-2 days proposed by MNC may not be sufficient. No precipitation should occur during the short tests.	Thank you for your review and input on the experimental design of the test pump program for the Chemainus Wells Project. The short duration tests will be used primarily as systems checks to ensure equipment and methodologies are sound before implementing the longer duration tests (7-14 days). The longer duration tests will provide the most insight on potential impacts that pumping may have on river flows. For this reason, we feel it is important to maximize the potential duration of the longer term testing. The sooner the long term test is initiated the better chance it can be completed before onset of the rainy season.	Response explains the rational for the short term test of up to two days. Addressed for the purpose of the Amendment review.	
13	1.2 For the moderate duration tests (7-14) days, a threshold for the minimal allowable flow rate of the river needs to be defined in agreement with Halalt fish biologist. Pumping will be interrupted or water will be released from Holyoak Lake and Banon Creek to supplement flow in the river should this threshold be reached.	A flow relationship between the Site B1-2 gauge and an upstream gauge (either Site A or WSC 08HA001) will be developed. Flows will be monitored on a daily basis to determine if there is a departure from expected values. Since flows may fluctuate for a number of reasons (e.g., precipitation, diel variation in evaporation and transpiration) the threshold is set relative to this expectation, and not flows in the river. From the flow relationship between the upstream and downstream gauges, a 20% drop in flow at Site B1-2 will be defined. Should flows at Site B1-2 drop below this threshold, water will be released from Holyoak Lake or the pumping will be terminated.	Addressed. Further clarification provided on how the flow relationship will be developed. Response #3 above to Halalt comment has on-going communication between the two parties. FLNRORD has no objections/concerns with the summer test pumping program.	
14	1.3 The testing program should define how recovery of the river will be assessed once the pumping stops, in the event that the river does respond to the well pumping. Will the river flow be compared to upstream flow (i.e. nested approach) or to a different stream (i.e. paired approach)?	A nested approach, comparing river flow from an upstream gauge (see response 1.2), will be used to assess recovery after pumping has ceased.	Adequately addressed for the purpose of the EA of the Amendment Application.	
15	1.4 The level of accuracy of the tools and methods to monitor stream flows must be adequate to a) quantify the diurnal cycles of the low flows and b) quantify the effect of a small precipitation event. Such responses should be quantified so that their signals do not mask any change in stream flow or water level due to pumping.	Two Solinst sensors are installed on the river next to the pumping site (B1-2), one of which provides real-time data. These sensors log data every 5-minutes and have an accuracy of 0.0025 m, which is sufficient to detect small perturbations caused by precipitation events and the diurnal cycles of low flow caused by evaporation. In addition, we are able to compare water levels with those at two other sites (one upstream and one downstream), to ensure we are accurately assessing the cause of any changes to water level or flow in the river at the pumping site.	Responsed adequately addresses comment raised.	
16	1.5 The level of uncertainty in the rating curve must be minimal for the low flow to be monitored. The use of electromagnetic technology (e.g. Marsh McBirney or Hach FH950), or (even better) tracer-based measurements (e.g. salt dilution) are recommended.	The potential impact of pumping on the river will largely be determined by changes in water level (which has a high level of accuracy), and not flow. However, we agree rating curve accuracy is important and are doing our best to increase the reliability to convert stage measurements into flow, including the collection of additional discharge measurements. The collection and processing of hydrometric data and the development of the rating curve follow provincial guidelines (RISC 2009). We have discussed use of salt dilution to measure discharge, but there are considerable challenges for use of this technique at this site. There is very poor mixing in the target reaches and the glide habitat is stagnant. We are using a Price Pygmy meter and Aquacalc 5000 to collect flow velocity and depth measurements, which are suitable for low flow velocities. Tests carried out by USGS show the performance of electromagnetic current meters at low velocities are not as reliable as Price meters (Turnipseed and Sauer 2010).	Adequately addressed for the purpose of the EA of the Amendment Application.	
17	1.6 A very high level of communication is required between MNC, its consultant, and Halalt and its consultants during the whole duration of the proposed testing.	MNC will communicate with Halalt and its consultant on a daily basis.	Daily communications adequately addresses comment raised	
18	1.7 GW Solutions will need a one-week notice prior to starting any test for scheduling purposes.	To provide one week's notice prior to pumping is unrealistic given the short time frame for which we have to carry out these pump tests. We will begin the short duration pump test within 48-hours after receiving the permit from EAO. We will notify Halalt and its consultant as soon as we have received the permit to pump.	Addressed for the purposes of the Amendment Review. Due to the time constraints around the work window EAO is of the view that the one week notification may not be realistic.	
19	1.8 Data should be shared with Halalt and its consultants, in real time when available, and otherwise within 24 hours of data collection and download.	MNC can provide data that has been quality assured by professionals as soon as it is available.	Addressed for the purposes of the Amendment Review. Due to the time constraints around the work window EAO is of the view that the one week notification may not be realistic.	
20	1.9 MNC must provide Halalt with a copy of the digital files (excel spreadsheets) that have been built to date to compile the recorded information both on surface water and groundwater. When these files are updated with new data, a copy of the files should be forwarded to Halalt within one week of the update.	Halalt has received copies of all previous monitoring reports submitted to regulators since the monitoring program began. MNC will make efforts to provide historical data in Excel format. New data will be made available upon collection and compilation as noted in 1.8.	Response is reasonable. Amendment is for a summer test program.	

	COMMENTS	RESPONSE	Status	Date and Event
	B. 2016 SUMMER TESTING PROGRAM - ISSUES			
	COMMENTS	**RESPONSE**	**Status**	**Date and Event**
	Comments from Halalt First Nation to EAO	**Response from MNC**	**Status**	Letter dated June 21, 2016 from Halalt to EAO.
21	1.1 Halalt approve MNC's proposed test pumping for the summer of 2016 on the following conditions:			
22	• i. MNC will comply with the commitments it made in its May 27, 2016 presentation to Halalt and in the June 10, 2016 Working Group meeting regarding the test pumping proposal.	• i. The Municipality will comply to the commitments made at the May 27, 2016 meeting with Halalt and the June 10, 2016 Working Group meeting regarding the test pumping proposal, which are detailed in the Municipality's May 30, 2016 application to the Environmental Assessment Office (EAO) and the accompanying May 10, 2016 report.	Addressed	
23	• ii. MNC will involve Halalt and our consultants in the testing program on an ongoing basis, including data analysis and reporting.	• ii. The Municipality will involve Halalt and its consultants in the testing program on an ongoing basis as detailed in the May 10, 2016 Groundwater and Surface Water Data Collection Program report.	Response adequate and EAO made this Halalt request Condition #A1 d to Schedule B, Table of Commitment in the Amendment Certificate #2.	
24	• iii. MNC will have a qualified professional with fisheries expertise on call with authority to immediately stop the test pumping if necessary to prevent harm to fish or fish habitat.	• iii. The Municipality will have a qualified professional with fisheries expertise, Todd Hatfield, Ph.D., R.P.Bio., on call who has authority to stop the test program in the event of harm to fish or fish habitat.	Response adequate and EAO made this Halalt request Condition #A1 C to Schedule B, Table of Commitment in the Amendment Certificate #2.	
25	• iv. MNC will put the environmental assessment of the permanent summer pumping amendment application on hold until the results of the 2016 test pumping are finalized.	• iv. As a gesture to accommodate Halalt's concerns, we support Chief Thomas' request to delay review of the Amendment to Operate the Chemainus Wells Year Round until the 2016 Summer Testing Program has been completed. Should summer testing not be possible in 2016 due to weather or other circumstances, we would not support delay of the review of the Amendment to Operate the Wells Year Round.	Response addresses the comment raised by the Halalt	
26	• v. The results of the testing program will be only one part of the information the EAO will require in order to properly decide whether to remove the ban on summer pumping.	• v. The Municipality understands that its Application to Amend the EAO Chemainus Wells Certificate #W09-01 to Permit Year Round Well Use is complex and involves a number of subjects in addition to the data collected from the 2016 Groundwater and Surface Water Data Collection Program.	Response is adequate for the summer pumping Amendment Application.	
27	• vi. It remains to be determined whether test pumping in future years (after 2016) will be needed before the EAO can decide on the Holyoak Lake water release concept removing the ban on summer pumping.	• vi. & • vii. The Municipality has undertaken detailed technical studies to address the biological, hydrological, and hydrogeological issues raised during the assessment of the Chemainus Wells Project. These analyses are compiled and included in the EAC Amendment Application, submitted to the EAO on March 31, 2015. These assessments, in combination with proposed mitigation, indicate a low risk of environmental effects, and the degree of confidence in the overall assessment is high. The remaining technical uncertainty is low, and extensive and detailed monitoring is proposed as part of the project to address remaining uncertainties. We believe the existing technical assessment and the proposed mitigation are sufficient to satisfy the regulatory requirements for permitting year-round operation of the Wells Project, and are sufficient to support a detailed technical review of the project by regulatory agencies. The Municipality is nevertheless willing to advance the collection of information by undertaking additional test pumping during the summer of 2016 to address concerns expressed by Halalt First Nation and has made efforts to set up a suitable program for this purpose. A description of the proposed Test Pumping Program has been prepared and submitted to EAO on May 30, 2016 as an Amendment to Certificate #W09-01.	Adequately addressed for the purpose of the EA of the Amendment Application. Further details are contained below in the tracking table that respond to these comments by the Halalt.	
28	• vii. It remains to be determined whether the water release concept is sustainable in terms of the effect on Holyoak Lake.			
29	• viii. MNC will comply with the protocol with Halalt regarding MNC personnel obtaining permission and an escort when coming onto Halalt land.	• viii. The Municipality will comply with the protocol with Halalt regarding the Municipality's personnel obtaining permission and an escort when coming onto Halalt land.	Addressed.	
	C. CHEMAINUS WELLS AMENDMENT : JUNE 10, 2016 ADVISORY WORKING GROUP MEETING - COMMENTS RAISED BY HALALT FIRST NATION			
	COMMENTS	**RESPONSE**	**Status**	**Date and Event**
	Comments from Halalt First Nation	**Response from MNC and EAO**		**MNC's response letter dated June 30, 2016 to Halalt comments raised at the June 10, 2016 EAO's Advisory Working Group Meeting**
30	Chief Thomas expressed a concern about the impact of discharging well test pump water into the Chemainus River during the 2003, 2004 and 2005 test pumping of the Chemainus Wells and that this was not accounted for in the testing.	Unlike the 2003, 2004 and 2005 summer well pump testing ,the pumped water during the 2016 testing will be used by the Chemainus Water System as opposed to dischargin it int the Chemainus River. The amount of water dischared to the Chemainu River during the 2003, 2004 and 2005 summer testing as accounted for and was added to the river flow at Site D (rialway bridge)	Adequately addressed for the purpose of the EA of the Amendment Application.	
31	Chief Thomas expressed a concern that the Chemainus Wels were not operating during the six (6) test flow releases from Holyoak Lake to the Chemainus River undertaken in July and September 2014.	The 2016 Summer Testing Program included at least one long term 7 - > 14 days test during which time water will be released to Chemainus River from Holyoak Lake.	Adequately addressed for the purpose of the EA of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
32	Chief Thomas requested that additional monitoring be undertaken of Bonsall Creek water levels.	The Municipality is confident that the existing system of monitoring wells is adequate to measure any potential impact of summer pumping of the Chemainus Wells. Based upon monitoring data since this well start-up in 2010, it is clear that operation of the Chemainus Wells has had no impact on Bonsall Creek. We believe collection of data on Bonsall Creek water levels is not relevant to the two (2) EAC Amendments, however, as acourtesy to Halalt's request, the Municipality has installed two level loggers to measure Bonsall Creek water levels at the Westholm Road Bridge and the Crofton Road Bridge in the locations recommended by Gilles Wendling of GW Solutions Inc. In addition, the Municipality hasagreed to install a water level logger in the old (orignal) Halalt well, noted by GW Solutions Inc. as Well #4 if Halat can provide access to this well and it is possible to install a logger in it.	EAO acknowledges the efforts being taken by MNC on a request that is outside of the scope of the amendment.	
33	Chief Thomas suggested that studies concerning the Chemainus Well Project did not take into account potential impacts from climate change.	The water balance undertaken by SRK Consulting for the project, considered a water extraction rate of 131 L/sec, which is well in excess of the <75 L/sec approved by the Certificate, also included the influence of climate change. **EAO note:** Additional climate change reports submitted by MNC's consultants on October 27, 2017.	Adequately addressed for the purpose of the EA of the Amendment Application.	
34	Chief Thomas expressed that there needs to be an ability to shut the Well Project down if there is an impact on the Chemainus River or Aquifer.	The EA Certificate Condition D3 allows the Regiona Water Manager with the BC Ministry of Environment to reduce the groundwater extraction rate from the Chemainus Wells if, in hteir opinion, a reduction is needed to mitgate adverse effects identified during annual monitoring. **EAO note:** new clause in Schedule B of the Certificate - (j) In condition D3, the last paragraph is rescinded and replaced with "If, in the opinion of the EAO in consultation with FLNRORD and Halalt, a reduction in groundwater extraction rates from PW#2 and PW#3 is needed to mitigate adverse effects identified in monitoring and reporting required by this Certificate, the Holder must reduce groundwater extraction rates to the satisfaction of the EAO until such time as the EAO determines that appropriate adaptive management measures to the satisfaction of a QP have been implemented or that a reduction in groundwater extraction rates is no longer required to mitigate adverse effects.	Addressed though Condition 3D and other conditions in the Schedule B of the Environmental Assessment Certificate.	
35	Chief Thmas was concerned that the Municipality would no longer implement water restrictions during droughts should approval to operate the Wells year-round be approved.	Activation of the Municipality's water restrictions is by bylaw and Stage 1 Water Conservation Measures are activated yearly between May1 and October 31, regardless of drought conditions. Activation of Stage 2 and Stage 3 Water Conservation Measures follows the Province of BC's Drought Response and has no relation to the Munic ippality's well water levels.	Adequately addressed for the purpose of the EA of the Amendment Application.	
36	Eli Enns (Director of Operations, Halalt First Nation) expressed concern about the lack of watershed governance for the Chemainus River watersshed.	The Municipality has requested that the Cowichan Valley Regional District (CVRD) prepare a watershed plan for the Chemainus River as the majority of the watershed is outside the Municipality's boundary and jurisdiction.	Addressed during the original EA for the Project. Watershed Management Plan is outside the scope of the original EA and the EA of the 2015 Amendment Application.	
37	Eli Enns spoke about trust issues between Halalt and the Municipality, and a recent violation of an access protocol.	The Municipality will continue to strive to build trust with Halalt First Nation. The violation of the access protocol was an isolated event and the Municipality has apologized for its oversight. A jount Council meeting is presently in the planning stge to further discuss respect, reconciliation and water.	Response adequate.	
38	Chief Thomas commented on increasing bed load of gravel in the Chemainus River.	The Municipality has worked with Halalt in the past to survey, apply for permits and supervise removal of gravel bars on the Chemainus River between the Highway 1 Bridge and the Chemainus River Bridge. Contractors would remove the gravel in exchange for being able to use the gravel for their projects. A watershed management authority does not exist for management of the Chemainus River and the majority of the river is outside the Municipality's boundary and jurisdiction. The Municipality has requested that the CVRD undertake a Chemainus River Watershed Plan.	Addressed for the purpose of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
39	Chief Thomas requested that review of the Amendment to Operate the Chemainus Wells Year Round be delayed until the 2016 Summer Testing Program is completed.	The Municipality would like to clarify why it has proposed to undertake test pumping in 2016, while at the same time continue with its Amendment Application to allow year-round opeation of the Wells Project. The Municipality has undertaken detailed technical studies to address the biological, hydrological, and hydrogeological issues raised during the assessment of the Chemainus Wells Project. These analyses are compile and included in the EAC Amendment Application, submitted to the EAO on March 31, 2015. These assessments, in conmbination with proposed mitigation, indicate a low risk of environmental effects, and the degree of confidence in the overall assessment is high. The remaining technical uncertainty is low, and extensive and detailed monitoring is proposed as part of the projet to address remaining uncertainies. We believe the existing technical assessment and the proposed mitigation are sufficient to satisfy the regulatory requirements for permitting year-round operation of the Wells Project, and are sufficient to support a detailed technical review of the project by regulatory agencies. The Municipality is nevertheless willing to advance the collection of information by undertaking additional test pumping during the summer of 2016 to address concerns expressed by Halalt First Nation and has made efforts to set up a suitable program for this purpose. A descrition of the proposed Test Pumping Program has been prepared and submitted to EAO on May 30, 2016 as an Amendment to Certificate #W09-01. We, however, support Chief Thomas' request to delay review of the Amendment to Operate th Chemainus Wells Year Round until the 2016 Summer Testing Program has been completed as a gesture to accommodate Halalt's concerns. Should summer testing not be possible in 2016 due to weather or other circumstances, we would not support delay of the review of the Amendment to Operat the Wels Year Round. **EAO Note:** 2016 Test Pumping Program was completed and reports prepared and revised during the winter of 2016/2017 based on Halalt and FLNRORD comments and finalized and submitted in April 2017. Additional response and reports were prepared and submittedi in October through December 2017.	Addressed for the purpose of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
	C. CHEMAINUS WELLS AMENDMENT SUMMER TESTING PROGRAM REVIEW: FEBRUARY 28, 2017 HALALT FIRST NATION MEETING WITH MNC			
	COMMENTS	**RESPONSE**	**Has the issue been addressed?**	**Date and Event**
	Comments from Halalt First Nation	**Response from MNC**		**February 28, 2017 Halalt First Nation Meeting Points**
40	1. Information and records regarding water released from Holyoak Lake and Banon Creek during the 2016 summer pumping test and prior to that. This request includes the time-framed, measured-released water data, and; the supplementary information about the method of releasing and the method of measurements as well as clarification on how the released water was controlled.	**Holyoak Lake Dam Release** The Holyoak Lake Dam outlet gate is traditionally opened in mid-June to mid-July, depending on the weather, to supply water to Banon Creek from Holyoak Lake when supply from rainfall ceases. Flow is released from the concrete dam to Banon Creek by opening a slide gate. The outlet flow released to Banon Creek is measured using a V notch weir . During the 2014 Flow Release tests conducted by Ecofish Research, which are documented in Appendix G of the Amendment Application, Banon Creek flow was also measured using a hydrometric gauge installed 200 metres downstream of Banon Creek Dam for the tests. **Banon Creek Dam Release** The 2016 Banon Creek Dam release was undertaken just downstream of the dam using a metered pipe connection to the water supply trunkmain. The level of the reservoir was dropped to below the level of the spillway during the test so that the only water entering Banon Creek was from the metered pipe. Banon Creek discharges to the Chemainus River upstream of flow measurement gauge at site SW-A-1. All river flows, including Banon Creek flows, are measured at gauge SW-A-1.	Addressed. Information provided in response.	
41	2. More explanation and clarification about the discrepancies between reported data in the Aug 12 and Dec 16 reports regarding actual flow data, residuals calculation and predicted estimate flow at/for the SWB1-2 station.	The data used and results presented in the August 12 memo were preliminary, as Ecofish had not completed the summer flow monitoring program. In consideration of comments/questions brought forward by Halalt First Nation and their consultants, as well as FLNRORD, a number of improvements were made to the analysis, and revisions to the Dec 16 draft report have been made. **EAO Note:** Based on comments from the Halalt and FLNRORD the reports were revised to address the concerns raised. Final ECOFISH reports April 6, 2017 and Western Water Associated Ltd. Report dated April 5, 2017 were submitted to EAO.	Adequately addressed for the purpose of the Amendment Application.	
42	3. More explanation and clarification about the discrepancies between reported flow data for the SWB1-2 station (dated on Dec 16) and downloaded data from the real time gauge SW1-2	These discrepancies are due to updates in the stage-discharge relationships developed after the pump test program. Flow measurements were still being collected on the Chemainus River in September 2016 for the purpose of updating the rating curve.	Comment adequately addressed comment raised	
43	4. Raw data measured at Station SWA and SWB1-2 that were used to develop the rating curves and the function to estimate/ predict the flow at SWB1-2.	Sent to Halalt First Nation on April 06, 2017.	Addressed. No further follow-up required.	
44	5. Having access to estimated numbers based on the generated function	Sent to Halalt First Nation on April 06, 2017.	Addressed. No further follow-up required.	
45	6. Raw data of monitored groundwater levels and temperatures during and prior to the pumping test (Excel sheet)	Raw data up to August 30, 2016 were previously provided. Remaining raw data up to September 22, 2016 have been provided in file named 'cwp_16-075-01_tbl_ Jun 23 to Sep 22 16 Precip WLs and Temp during Summer TPing_DISTRIBUTE.xls'. Sent to Halalt First Nation on April 06, 2017.	Addressed. No further follow-up required.	
46	7. Raw data of monitored surface water discharges and temperature during and prior to the pumping test (Excel sheet)	Sent to Halalt First Nation on April 06, 2017.	Addressed. No further follow-up required.	
47	8. Doing some calculations based on the temperature changes during the pumping tests for the PW2 and PW3 wells, considering the mass of the water (Water Volume) that was pumped from the pumping wells; to estimate/understand the contribution of groundwater and surface water to the pumped wells, particularly	We do not believe that this proposed mass-balance approach is appropriate for determining the relative contribution of surface water in the pumping wells since heat flow and transport in groundwater is a complex process involving density-driven flow as well as conduction and advection. Furthermore, we note that the River temperature at nearby site SW-B1-2 is actually lower than the temperature of the groundwater in operational PW 3 during the later parts of Long Test #2 and for most of Short Test #2. In our opinion a more suitable method to estimate the relative surface water contribution is from 'stream depletion' estimates determined through surface water monitoring as has been conducted by Ecofish.	Response adequate.	
48	9. Turbidity data / information of the tested wells during pumping test, if it is available, or prior to that.	Well water turbidity during, prior to, and after the summer testing appears to remain consistently about 0.2 NTU except when well pumps were started, creating short duration turbidity spikes. The turbidity spikes appear to be in the order of 10 minutes in duration for the well to clear up after being started. The magnitude of the turbidity spikes appears to be related to the duration the well sat idle before start up. Turbidity spikes are generally not present during winter pumping as wells are running daily and are not idle for long periods. Two screen shots from MNC SCADA system showing turbidity for the July 22-Sept 19 2016 period of the summer testing as well as the January 1-March 17 2016 period were sent to Halalt First Nation on April 6, 2017.	Addressed. No further follow-up required.	
49	10. Ecofish Dec. 16, 2016 Draft. Please provide more information on the regression analysis used to predict flows at SWB1-2 based on the flow at SWA-1. Perhaps also a separate figure to show the time period over which the model is based (i.e., back to mid-June), the Banon Creek flow, and the SeaSpring pumping rate. Show the regression line and discuss if it's not flat.	Section 3.2.1 of the revised memo has been updated to provide an expanded description of model development. Figure 4 has been updated to show the entire period for which the model was trained (June 15 to July 26), and includes Banon flow for this period. The SeaSpring pumping rates were ~240 L/s in July and 254 L/s in August and September, and this information is now included in the report. A figure of the regression equation is provided in the report.	Adequately addressed for the purpose of the EA of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
50	11. Ecofish Dec. 16, 2016 Draft. Pls describe and provide the rationale for the methodology for assessing the effect of groundwater pumping on river flow. Page 12 and Table 4 introduces the use of 24 hours before and after the start and the end of test pumping (not in the Methods section). Table 4 provides data but is difficult to interpret. Can you provide a table or figure that highlights your interpretation?	The description and rationale have been added to the methods, Section 3.2.1 of the revised report. Table 4 has been improved to allow easier interpretation of the results.	Adequately addressed for the purpose of the EA of the Amendment Application.	
51	i. Please discuss whether the 24-hour before and after concept is the result of statistical analysis or something else. Is there a statistical basis to conclude that the start and end of test pumping is associated with a change in river flow that is different than the noise in the estimate of flows at SWB1-2?	The assessment of groundwater pumping effects on surface flow is focused on the change in residuals before, during and after each pump test. The mean residual values (computed from the difference between SWB1-2 observed and SWB1-2 calculated discharge) computed 24 hours before and after initiation of pump tests, and 24 hours before and after the end of the pump tests; this period was chosen because the greatest change in residuals occurred within 24 hours of pump start-up and shut-down. This is explained in the methods. In addition to this method, the maximum decline or rise in residuals before and after a pump test is provided in the description of each individual pump test. The improved regression model also allows for investigation of the trends in residuals during each pump test; however, the trends are minor so have not been quantified.	Addressed. Response provides clarification on comment raised.	
52	ii. You said you would make clarifications to Table 4. Pls include a clarification of "A negative difference represents a decline in residuals."	Table 4 has been improved, and clarification provided in the revised report. Negative residuals occur when observed flows are less than predicted flows.	Addressed. Response provides clarification on comment raised. Updated report provided to EAO in April 2017.	
53	12. Ecofish Dec. 16, 2016 Draft. P.4, Table 2.	Table 2 has been revised. Note that the rating curves have been updated since the December 2016 memo, considering hydraulic control shifts in the winter of 2015/2016.	Addressed. Updated report provided to EAO in April 2017.	
54	i. Pls discuss footnote 2 in relation to the RISC manual (6 discharge measurements versus 10 recommended).	This has been added to the report and is discussed on page 4. RISC (2009) guidelines recommend a minimum of 10 flow measurements, collected across a range of flow conditions, for rating curve development. However, this is not always possible, especially in rivers with frequent bed shifts during high flow events such as we see in the Chemainus River. In addition, fewer measurements can be justified given that we are only concerned with the summer low-flow range of discharge, and not a wide-range in flows as would be typical for year-round monitoring. Due to a hydraulic control shift during the winter of 2015/2016, the stage-discharge relationship at SWA-1 was developed with 4 discharge measurements collected in the summer of 2016.	Addressed. Response provides clarification on the comment raised.	
55	ii. Please address the sensitivity of the effects of groundwater pumping on river flow results to the accuracy of the stage-discharge curves.	The accuracy of the rating curves are high (as indicated by the RMS error of the rating curves are less than 7%). The rating curves are only applicable for the range of actual discharge measurements. For flows between 200 and 500 L/s, the RMS error for SWA-1 is 30 L/s, on average, and 18 L/s, on average, for SWB1-2. However, the rating curve accuracies are less meaningful than the RMSE derived for the flow relationship between site A and site B, because the difference in flow between sites is more important than the absolute flow values. This uncertainty is estimated to be 12.9 L/s.	Addressed. Response provides clarifiction on the comment raised.	
56	13. Ecofish Dec. 16, 2016 Draft. Effect of Groundwater Pumping on River Temperature. i. Please provide a graph showing river temperatures and the provincial guidelines for MWMT for Steelhead/Rainbow Trout.	This has been added to the revised memo; Figure 15.	Addressed for the purpose of the EA. Report updated and submitted to EAO in April 2017.	
57	ii. Please discuss whether and how the analysis considers the potential effect of the Banon Creek release (background and test conditions) on river temperature at SWB1-2.	We provide a figure with the temperature data for SW-A0-1 and SW-A0-2 located in the upper part of the Chemainus River and in lower Banon Creek, respectively. The analysis does not quantify the potential effect of Banon Creek release on river temperature at SWB1-2, as this was done as an extensive study in 2014 as part of the Amendment application (see Appendix E - October 2014 Ecofish report on Effect of Groundwater Pumping on Chemainus River Temperature). However, the revised report does note that Banon water temperatures are colder than Chemainus River, and thus will have an ameliorating effect on river temperatures.	Addressed. Response provides clarification on the comment raised.	
58	14. Ecofish Dec. 16, 2016 Draft. The Summary on pages 24-25 compares the volume of the estimated reduction in river flow due to groundwater pumping (average and max) to the volume of the proposed Banon Creek water release (upstream). Is this a valid comparison? Shouldn't the comparison be to the change in river flow at the pumping location due to water release?	The report provides an estimate of the potential effect on surface flows in Chemainus River. Guidelines for assessing effects to Valued Components (EAO 2013) indicate that significance should be assessed considering application of all proposed mitigation, thus creating a reference point to mitigation. In this case, proposed mitigation in the form of flow releases from Holyoak Lake is substantially greater than the predicted effect of groundwater pumping. This is an appropriate point of reference.	Addressed for the purpose of the Amendment review.	
59	i. Please discuss in the conclusion the relationship between the average and max volume of estimated reduction in river flow due to groundwater pumping to the volume of river flow at the extreme low flow point. Confirm, or otherwise discuss, that groundwater pumping in the absence of water release during seasonal low river flow would have a significant adverse effect on the river environment.	We have added a discussion of the relationship between the average and max volume of estimated reduction in river flow due to groundwater pumping to the volume of river flow in the summary of the report, and have confirmed that groundwater pumping combined with the flow release from Holyoak Lake will have no significant effect on the river environment during seasonal low river flow.	Addressed. Response provides clarification on the comments raised. Updated report provided to EAO in April 2017.	

	COMMENTS	RESPONSE	Status	Date and Event
60	15. The temperature in PW2 is sensitive to whether pumping is occurring or not. Please address this and whether effects the conclusions regarding the effect of pumping on river temperature.	The temperature sensors for the pumping wells are located above the well screens. We therefore do not believe that the non-pumping temperatures in these wells are indicative of groundwater or surface water conditions but that of the water stored in the well casing, which is likely affected by atmospheric conditions. As can be seen from initiation of pumping in these wells, the temperatures quickly trend to near 10 ºC which is believed to be indicative of the ambient groundwater temperature. This wording has been added to the report.	Addressed. Response provides clarification on the comment raised. Updated report provided to EAO in April 2017.	
61	16. Re the figure Aquifer Temps – All Wells, please discuss why the temperature patterns over the season are different for different wells.	Temperatures in the monitoring wells are believed to be influenced by relative connection to the atmosphere and surface water. The different temperature patterns are, therefore, related to well completion depth, proximity to the River, and local stratigraphy. This wording has been added to the report.	Addressed. Response provides clarification on the comment raised. Updated report provided to EAO in April 2017.	
62	17. Re the figure Aquifer Temps – Pumping Wells, please discuss in more detail the observation that for PW2 and for PW3 (somewhat differently) it seems that pumping induces recharge of warmer surface water. Does this imply that pumping during times of low river flow produces some portion of surface water for distribution?	From Figure 19 of the draft report, the increases in temperature with test pumping in PW 2 and PW 3 are quite similar. We note in the report that while pumping PW 2 in Long Test #1, the water temperature in the well increases from approximately 11 to 15 ºC and while pumping PW 3 in Long Test #2 the water temperature increases from 10 to 16 ºC. As stated in the report, we believe this supports the concept that a component of River water supplies the wells during pumping and the increasing temperature trend in the pumping wells during testing could be attributed to the induced recharge of (warmer) surface water to the aquifer during the tests; with the resultant transport of heat energy from the river to the adjacent aquifer.	Addressed. Response provides clarifiication on the comment raised.	

	COMMENTS	RESPONSE	Status	Date and Event
	C. CHEMAINUS WELLS - AMENDMENT #2 SUMMER TESTING PROGRAM 2016 - FLNRORD COMMENTS ON THE TWO DRAFT REPORTS, FEBRUARY 9, 2017			
	COMMENTS	**RESPONSE**	**Has the issue been addressed?**	**Date and Event**
	Comments from FLNRORD to EAO	**Response from MNC**		**February 9, 2017, FLNRORD Memo**
63	1. There are inconsistencies between the two reports that should be reconciled. For example, Table 1 in Western Water Report (WW) states no Holyoak releases occurred during the two short pumping tests and long Test #2 while Table 1 in the Ecofish report states that Holyoak releases of 25 L/s occurred during the same tests. Also, the noted pumping rates differ between the two reports.	The inconsistencies in Table 1 of both reports have been resolved.	Addressed. Updated report provided to EAO in April 2017.	
64	2. The WW report should include a description of the pumping wells (e.g. depth of wells).	A description of the wells has been added to the text of the WWAL report and well logs have been attached to the report.	Addressed. Updated report provided to EAO in April 2017.	
65	3. In Table 2 (WW report) we would suggest changing the units of the "Average pre-testing water level decline" to m/day for easier comparison to the measured drawdown values.	This suggested edit has been made in the WWAL report.	Addressed. Updated report provided to EAO in April 2017.	
66	4. On the first page (WW) it is stated that 'there does not appear to be a direct hydraulic connection between the ground water and the surface water in the immediate area of the well field although the geology suggests a nearby connection'. The report notes a low permeability till layer, although no depth is noted, that extends from about 250 m upstream to 50 m downstream. Given the area of influence was determined to be 500 m, and the response time of the more distant wells was slower, how is the connection to flow so strong in the Ecofish report where an immediate drop in water levels is noted in the river by averaging the residuals for 24 hours on either side of the pump changing operations (i.e. on/off)?	Assuming a connection exists between the pumping wells and the river somewhere outside the extent of the till layer (i.e. ~50 to 250 m from the well field), the delay in response in the River is generally consistent with that observed in the aquifer (delay of approximately 2 hours at locations <250 m from the well field and ~20 hours at locations up to 500 m away from the well field) as noted in the report.	Addressed. Response provides clarification on the comment raised.	
67	5. (WW) The "steady-state" drawdown in PW2 is about 6 m while in PW3 it is about 2 m. PW2 is closer to the river than PW3. What accounts for the difference in response between the two wells?	The following wording has been added to the WWAL report "The maximum drawdowns in the operating pumping wells during testing reached approximately 6 m in PW 2 and 2 m in PW 3. As observed in the annual monitoring reports, similar long-term drawdowns are observed during operation of the wells in the winter. The difference in drawdowns is largely attributable to the individual well performance in terms of specific capacity and well efficiency, which vary according to well screen design, well development, and adjacent aquifer properties. According to the well logs, PW 2 may be completed in a siltier unit of the aquifer, which results in a steeper drawdown curve in the vicinity of the pumping well compared to PW 3, which also has a longer well screen assembly with a shallower top of screen depth.	Addressed. Response provides clarification on the commeent raised.	
68	6. (WW) Why were the wells being pumped temporarily switched during long test #2? Does this affect the results?	During Long Test #2, between August 21 and September 12, 2016, PW #3 Well was running continuously, however, Well #3 was temporarily shut down and PW #2 Well started 4 times during this test (August 31st, September 1st, 2nd, and 5th). Upon investigation, the Municipality confirmed on September 6, 2016 in an email to Halalt First Nation, and included within the September 6, 2016 EAO Weekly Report for August 30 to September 6, 2016, the reason for this temporary switchover. What we discovered is that when our Utilities Operations Manager was viewing the SCADA System, he inadvertently pressed the Change Lead Pump button which turned off Well #3 and turned on Well #2. These switchovers were temporary and at all times during the test a well was operating. Since groundwater was still being continuously pumped from the aquifer throughout the test despite the well source switching, we do not believe the results are affected for assessing the potential impacts to the River.	Addessed. Response provides clarification on the comment raised.	
69	7. On page 3 (WW), more temperature data was noted that is not in the Ecofish report, why was this data not considered?	Temperature data from SW-A0-1 (Chemainus River upstream) and SW-A0-2 (lower Banon Creek) have been added to the Ecofish report. The data are from locations upstream of the groundwater wells; thus, the effect of groundwater pumping on these upstream sites is thought to be negligible.	Addressed. Response provides clarification on the comment raised. Updated report provided to EAO in April 2017.	
70	8. The paragraph on the Seaspring wells on page 8 (WW) has several conflicting sentences. In one paragraph it is noted that there is no observed impact, but that the impact is unknown. Data from Seaspring was previously acquired by Thurber, is there a possibility to collect this data again for comparison and interpretation?	Wording in the WWAL report has been changed and a description of the observed drawdown at monitoring wells due to Sea Spring extraction has been added. Operational data for the Sea Spring wells during 2016 test pumping was collected and included as noted in the 'Methods' section of the report. It is our intention to continue to collect and include these data in the annual reports.	Addressed. Udpated report provided to EAO in April 2017	
71	9. The resolution of the graphs, size of text and choice of colours (different shades rather than contrasting colours) in the WW report figures makes it difficult to identify different lines and understand the graphs.	The number of data sets necessitates the similarity of some colours in the graphs. The difficulty in distinguishing between monitoring locations is particularly evident in Figure 3 which includes the water levels for all wells. For this reason the same data are separated out by location in figures 5 to 9. This has also now been done for temperatures (added figures separated by location). The font size of the figure legends has also been increased improve visibility.	Addressed for the purpose of the EA. Updated report provided ot EAO in April 2017	

	COMMENTS	RESPONSE	Status	Date and Event
72	10. (Ecofish) The choice of hydrograph period used to determine maximum impact of pumping on the riverflow is not clear. Ecofish have chosen to compare 24 hours prior to pump operation changes to the 24 hours following. The report does not consider the impact at the end of the pump tests when it would be expected that the channel losses would be at a maximum. The plots during the period at the end of long test 1 and just prior to the start of precipitation in long test 2 show SWB1-2 measured higher than SWB1-2 calculated. Intuitively the opposite is expected if in fact there is a measurable impact to flow from the pumping. Could a rationale and limitations for the method used be provided?	The revised report provides results from an improved regression model relating flows at site A to those at site B. The report also contains a clearer description of the various metrics used to infer effects to surface flows, including: - comparison of mean residuals before, during and after each pump test, - trend of residuals during each pump test, and - a qualitative assessment of trend across all four pump tests. The report provides a discussion of sources of error and their potential influence on the results. The consistency of observed effects across all tests indicate that the results are valid.	Addressed for the purpose of the EA. Updated report provided ot EAO in April 2017	
73	11. i. In Figure 6 (WW), there is an initially rapid drawdown, but the ground water levels in the pumping wells don't seem to reach equilibrium during the short test and even in the longer tests, steady state appears to happen after about 5 days.	Re-evaluation of the semi-log drawdown curves for the pumping well (PW 2) suggests that drawdown continues to increase throughout Long Test #1. It is anticipated that the same would be the case for PW 3 in Long Test #2 but precipitation and the pumping source switching causes recharge events. The wording in the report has been changed to reflect this. During year-round operation of the pumping wells, it is expected that they will cycle on/off based on demand, which is the case during winter operation. The drawdown observed, and the relative stream depletion estimated during summer testing are believed to be near the maximums expected during summer operation. As was observed during Long Test #2, even minor recharge events appear to limit the long-term drawdown in the pumping wells and significantly increase River flows.	Adequately addressed for the purpose of the EA of the Amendment Application.	
74	ii. The surface water study (Ecofish) looks at the initial drawdown only and not the continued losses. Will this be important during operation of the wells, or will they pump for short periods with longer breaks?	ii. The revised Ecofish report uses several metrics to estimate effects, including trends within tests and across test periods. The control system for the pumps will adjust to demand and water level within the reservoirs. This will result in the pumps cycling on an off, rather than running continuously. The request to pump at <75 L/sec for the June 15 to October 15 period assumes at some point in time this rate of flow will be needed by the Chemainus Water System to supply summer user demands. Water system demands from 2006-2015 are provided in an email sent to FLNRORD on April 06, 2017. The average daily consumption rate for the past 10 years (2006 to 2015) during the June 15 to October 15 period has been between 35.1 L/sec and 42.4 L/sec which are well below the 75 L/sec maximum flow requested. It is expected that it will take many years to transition from the present demand to 75 L/sec given the present growth rate of the Chemainus Water System which is <1%. The wells will initially pump for short periods. This will allow considerable time to monitor and respond to potential impacts from summer pumping at <75 L/sec.	Adequately addressed for the purpose of the EA of the Amendment Application. Updated report provided ot EAO in April 2017	
75	12. i. (Ecofish and WW) The impacts of increased releases from Holyoak reservoir is not well explained, it is stated in the WW report that increased releases in previous trials raised ground water levels, would this impact surface and groundwater temperatures?	These questions are answered in the Amendment application, which includes the Ecofish and Thurber reports documenting the flow releases and the impact on flow at the well site, as well as the Ecofish report concerning temperature improvements from the mitigation release (see Appendix A - Thurber October 2014 Groundwater Levels during Holyoak Lake Test Release at Chemainus Well Field; Appendix E - October 2014 Ecofish report on Effect of Groundwater Pumping on Chemainus River Temperature; and Appendix G - October 2014 Ecofish Mitigation Plan and Holyoak Test Release Results). There was no measured effect from the additional Banon Creek releases on groundwater temperatures during 2016 test pumping. In addition, there did not appear to be any impact on groundwater temperatures from the short term test releases conducted in 2014 as noted in the Thurber Engineering Ltd. report (included as Appendix H in the Amendment Application). Heat transport in groundwater, however, is a complex process driven by conduction and advection. Temperature changes are therefore expected to propagate at a slower velocity than the average groundwater flow in the aquifer. This wording has been added to the report.	Addressed for the purpose of the 2016 pump testing amendment and response provides clarification on flow release and temperature improvemenets.	

	COMMENTS	RESPONSE	Status	Date and Event
76	ii. What amount of Holyoak release is being proposed or may be required for mitigation?	The mitigation release proposed is 73 L/sec for the June 15 to October 15 period. The mitigation release was tested by Ecofish Research and Thurber Engineering in 2014 and the findings are summarized in Appendix G and Appendix H of the Amendment Application. The mitigation release is discussed in Section 5 of the Amendment Application. The actual release will be made at the Banon Creek Dam using a metered pipe connection into Banon Creek. The 2014 trial releases were from Holyoak Lake Dam which is 10 km upstream of the Banon Creek Dam. Releasing from the Banon Creek Dam metered pipe connection will improve the accuracy and reliability of the release system.	Addressed.	
77	13. (Ecofish) The regression plot and equation used for the regression model between SWA-1 and SWB1-2 that was used to synthesize the dataset should be included in the report, including descriptive statistics and confidence limits. Was there any analysis of bias in terms of representativeness of the data, i.e. flow levels or times where the relationship is not appropriate?	The regression plot and equation have been included in the revised report, as well as confidence limits, and a description of the bias and representativeness of the data (Section 3.2.1).	Addressed. Information provided in the updated report that was submitted to EAO in April 2017.	
78	14. (Ecofish) The rating curves for the monitoring sites should also be included in the report.	These have been included in the revised report (Section 3.1).	Addressed. Information provided in the updated report that was submitted to EAO in April 2017.	
79	15. (Ecofish) The temperature data from the WSC station and SWA1 (and possibly the other stations noted in the WW report) as well as a more specific rationale for why it was not used should be included.	Rationale for the exclusion of SWA-1 data is provided in Section 3.2.2. We have added the data from WSC station, and have noted that these data were only available from August 17 to October 28, 2016 (i.e., only a portion of the testing period). Temperature data from SW-A0-1 and SW-A0-2 mentioned in the WW report have been included in the revised Ecofish report.	Addressed. Clarification provided on where information can be fund and the report was updated with temperature information.	
80	16. The Ecofish method mainly assesses the difference in residual flows across the start and end points of the pumping period. The analysis does not generally address stream losses during steady state pumping. The residuals fluctuate during the pumping periods sometimes with a consistent upward or downward trend, but there is little comment on the reasons why this is occurring. The conclusions seem to focus on relatively narrow time periods with broad generalizations to the overall impact. A discussion on this should be provided.	The revised report provides results from an improved regression model relating flows at site A to those at site B. The revised report also contains a clearer description of the various metrics used to infer effects to surface flows, including: - comparison of mean residuals before, during and after each pump test, - trend of residuals during each pump test, and - a qualitative assessment of trend across all four test pumps. The report provides a discussion of sources of error and their potential influence on the results. The consistency of observed effects across all tests indicate that the results are valid.	Addressed. Additional information provided in the updated report that was submitted to EAO in April 2017.	
81	17. (Ecofish) The magnitude of the residual values is very small (<45 L/s). Is there any consistent error in the residual for the calibration period? Are the measured results beyond the potential measurement and instrument error and any error in the linear relationship, used to synthesize data for SWB1-2 calculated values?	The revised report provides results from an improved regression model relating flows at site A to those at site B, with less error than the previous model. A discussion of potential errors and data constraints are provided in **Section 3.2.1 of the March 2017 memo.** We restricted development of the model to those flows that have been calibrated by the rating curves. We had a short range of data in which to develop the relationship (June 15- July 26; pre-pumping) and an even shorter period for validation (between pump tests). Data from previous years could not be used in model development due to the hydraulic control shift that occurred at SWA-1 during the 2015-2016 wet season.	Addressed. Additional information provided in the updated report that was submitted to EAO in April 2017.	
82	18. (Ecofish) There is considerable noise in the data, has this been attributed to anything in particular? Could some of the natural variability which originates upstream of SWA1 could be removed by analysis of this data?	The revised report provides results from an improved regression model relating flows at site A to those at site B, with less error than the previous model. The noise in the data is largely due to sources of error in the model as discussed in Section 3.2.1 of the revised report.	Addressed. Additional information provided in the updated report that was submitted to EAO in April 2017.	
83	19. In table 4 (Ecofish), both short and long test #1 have different impacts (~7L/s and ~23L/s) but both are comparing the initiation of pumping at 72 L/s from the same well. Can an explanation of why this occurs be provided?	The model and input data have been re-evaluated and re-run; thus the magnitude of impacts are slightly changed. The revised report provides a discussion of sources of error and their potential influence on the results. The consistency of observed effects across all tests indicate that the results are valid.	Addressed. Additional information provided in the updated report that was submitted to EAO in April 2017.	
84	20. (Ecofish) Has the correlation between water temperature and air temperature been considered?	Air temperature has been plotted with water temperature at SWB1-2 and SWD-1 (Figure 13).	Addressed. Response provides clarification on the comment raised.	
85	21. (Ecofish) It appears that SWD-1 is used as a control for the temperature test. SWD-1 is downstream of the impacted reach. Is the use of this station appropriate?	We agree that it is not appropriate to use SWD-1 as a control, and we have not intended it as such. We have plotted the SWD-1 time series along with SWB-1 for comparison and have removed the comparison of differences in water temperature between the two sites.	Addressed. Response provides clarification on the comment raised.	
86	22. In the summary (Ecofish) is the statement "the pump test resulted in a reduction in observed flow at SWB-1 relative to calculated flow" and later "The effect occurred under test conditions of continuous pumping through each test period". The discussion in this report does not appear to support applying this statement to the entire pumping period. There did not appear to be any analysis of the total or average losses experienced during the entire pumping periods, just the transition periods. Can the results of the method employed be extrapolated to represent the entire pumping period?	The revised report contains a clearer description of the various metrics used to infer effects to surface flows, including: - comparison of mean residuals before, during and after each pump test, - trend of residuals during each pump test, and - an assessment of trend across all four pump tests. The consistency of observed effects across all tests and the apparent absence of trends within and across tests imply that the average effect of pumping across a broader period is equivalent to the average of all transition periods (i.e., the average of all before and after comparisons).	Addressed. Response provides clarification on the comments raised. Updated report provided to EAO in April 2017.	

	COMMENTS	RESPONSE	Status	Date and Event
87	23. The summary in the Ecofish report does not comment on whether the maximum or average measured change in flow will impact aquatic habitat in the River. We would suggest that this is the key question that should be addressed by this study. Perhaps referring back to the Hatfield studies would be appropriate.	A conclusion with respect to fish and fish habitat is provided in the revised report, in the summary. The conclusion reiterates conclusions from the EAC Amendment Application.	Addressed. Additional information provided in the updated report that was submitted to EAO in April 2017. Ecofish's Update to Chemainus River Instream Flow Assessment dated August 17, 2017 provides empirical information on stream flow and habitat and fish. It takes into consideration no release and release of water to augment the flow.	
	D. CHEMAINUS WELLS - AMENDMENT #2 SUMMER TESTING PROGRAM 2016 - GW SOLUTIONS FOLLOW-UP QUESTIONS ON THE REPORT, May 3, 2017			
	COMMENTS	**RESPONSE**	**Has the issue been addressed?**	**Date and Event**
	Comments from GW Solutions	**Response from Ecofish**		**May 3, 2017, GW Solutions Meeting with Ecofish**
88	1. Is it possible to use a stage-stage regression rather than a flow-flow regression to assess response to pumping, and would this reduce statistical error in the assessment?	Yes, we could have developed a stage-stage relationship between the SWB and SWA gauges, but this would not have reduced statistical error in the assessment, as we still would have needed to convert stage to discharge to be able to evaluate flow changes in real-time during the pump tests, and to provide a meaningful evaluation of groundwater effects on river flows.	Response adequate.	
89	2. GW Solutions would appreciate receiving the surveyed elevation data for each gauge.	Survey data were provided to GW Solutions via email on May 16, 2016.	Adequately addressed for the purpose of the EA of the Amendment Application.	
90	3. Please provide additional discussion on the exploration of lag times used in the analysis.	Lag time was investigated using pre-test flow data (between June 15 and July 26), within the range over which the rating curve is valid (i.e., up to 500 L/s). Lags of varying lengths were applied to the data and cross-correlation between SWB and lagged SWA was calculated. The lag corresponding to the maximum cross-correlation was then used. In this case, the lag was 1 hour (r = 0.985)	Addressed. Response provides clarification on the comment raised.	
91	4. The analysis makes use of the flow-flow relationship when flows at site B are between 300 and 500 L/s, but the test pumping occurred primarily when flows were less than 300 L/s. Please provide additional explanation of how the regression was validated for use at these lower flows.	The flow estimate uncertainty associated with the model was found to be 12.9 L/s from validation and 8.4 L/s from calibration. The larger uncertainty value, 12.9 L/s, was used to provide an error bound for the difference in residuals (observed discharge at SWB1-2 minus predicted discharge at SWB1-2). The calibration consisted of fitting a regression between flow and SWA-1 and SWB1-2 for the period prior to pumping. Since flows of less than 300 L/s were not available prior to pumping, the model was validated for lower flows with the following steps: 1) The SWB1-2 flow was estimated using the regression with SWA-1 for the entire pumping period. 2) A set of periods between pumping tests were selected where the pumping effects were not expected to affect flow at SWB1-2, and while flows were in the range observed during the pumping tests. This was done by removing 3 hours of data immediately following pumping shutdown to allow for groundwater recovery. The flow levels during these periods appeared to be natural based on a visual analysis of the hydrograph trend. 3) The observed flows were then subtracted from the predicted natural flows for each of these periods, and the difference was averaged using the root mean square equation. Completing predictive model calibration and validation with this method is common in the field of hydrology (e.g., Vilaysane et al. 2015). Reference: Vilaysane et al. (2015) Hydrological stream flow modelling for calibration and uncertainty analysis using SWAT model in the Xedone river basin, Lao PDR. Procedia Environmental Sciences 28 (2015) 380 – 390.	Adequately addressed for the purpose of the EA of the Amendment Application. Response provides clarification on the comment raised.	
92	5. Please also provide additional explanation of the data used to validate the regression at lower flows.	See description in previous response (to question number 4 - Tracking Table #91). The model was validated using data corresponding to the periods between pump tests (along with a buffer after pumping ends to ensure a return to the pre-pumping state). The specific dates and times used for validation are as follows: 2016-07-30 14:40 – 2016-08-02 10:00 2016-08-19 14:40 – 2016-08-21 11:20 2016-09-12 14:40 – 2016-09-14 11:20 The model performed well for these periods, despite the fact that all flows during the validation periods were less than ~250 L/s. The RMSE for this validation set was 12.9 L/s – an increase compared to the training RMSE of 8.4 L/s, but still well within the estimated impact of pumping.	Adequately addressed for the purpose of the EA of the Amendment Application. Response provides clarification on the comment raised.	

	COMMENTS	RESPONSE	Status	Date and Event
93	6. Please provide additional explanation of the flow measurements that were used in developing the stage-discharge relationships and whether any of the excluded measurements were from 2016.	The stage and flow measurements used in developing the stage-discharge relationships (including excluded measurements that were depicted in gray font) were emailed to GW Solutions on April 6, 2017, and are shown in Figure 1 of the April report. All discharge measurements collected in 2016 were used for rating curve development. Due to a hydraulic control shift in the winter of 2015/2016, only four discharge measurements were used to develop the SWA-1 rating curve, these included all 3 discharge measurements collected in 2016 and 1 measurement collected in 2014. Fourteen discharge measurements were used to develop the SWB1-2 rating curve, and included all 3 discharge measurements collected in 2016, plus an additional salt dilution discharge measurement, also collected in 2016.	Adequately addressed for the purpose of the EA of the Amendment Application. Response provides clarification on the comment raised. Updated report provided to EAO in April 2017 that has an updated Figure 1.	
94	7. Please provide the dates of the excluded flow measurements in the stage-discharge relationships.	Our records include discharge measurements dating back to 2010, and include a number of measurements excluded in the current rating curve due to previous shifts in the hydraulic control during the winter high flow season. Please refer to the two excel files sent on April 6, 2017 (SWA-1 Stage-Discharge Measurements and SWB1-2 Stage Discharge Measurements) for a list of the excluded measurements (denoted in gray text), including date and time of measurement, measurement method, stage, measured discharge, estimated discharge, and % error. Note that Ecofish took over the summer hydrometric monitoring program in 2014 and records prior to this year do not include all the aforementioned data.	Adequately addressed for the purpose of the EA of the Amendment Application. Data provided to Halalt and clarification provided on the discharge measurement.	
95	8. Please explain why MNC releases from Banon were variable during the test pumps.	MNC Water Utilities operators set a minimum of a 25 L/sec release volume during the testing program to help keep turbidity levels below 1.0 NTU. When there is no water flowing past the Banon Dam, the turbidity level in the water stored in the Banon Creek Reservoir increases. Flow release data, and information on flow adjustments (dates and rationale) were provided to GW Solutions via email on May 25, 2017. If the EAO Amendment to allow year round well use is approved, there will not be a requirement to keep water turbidity below 1.0 NTU as Banon Creek will not be supplying water to the community.	Addressed. Response provided clarification on the variabilty comment.	
96	9. Please provide additional explanation of the sources of error in the flow estimates and what level of confidence can be attached to the error estimates used in the technical memo.	There are a number of potential sources of error and accuracy limits for instruments and methods used to develop the SWB1-2 and SWA-1 discharge-discharge relationship. These accuracies/potential errors are as follows: The submersible KPSI Series 500 SDI-12 pressure transducers have an accuracy of ±0.002m for water level Survey method to verify stage has an accuracy of 0.003 m or less. Uncertainty in the wading measurements is low given the number of verticals and is reflected in the stage-discharge curves. The root mean square error (RMSE) for the SWA-1 curve is 3.8% and 5% for SWB1-2. The RMSE for the curves is well within the 7% criterion for RISC Grade A, showing excellent agreement between the discharge measurements and the stage-discharge curves. The RMSE of the model residuals (observed discharge at SWB1-2 minus predicted discharge at SWB1-2) was 8.40 L/s during the calibration period and 12.9 L/s during the validation period. The latter provides a conservative estimate of uncertainty for the model. Given the low compounding errors and uncertainties, there is high confidence in the error estimates provided in the technical memo.	Addressed. Response provided clarification on the sources of error and level of confidence.	
97	10. Please explain why the content of the most recent report is different than the earlier report.	The report has been revised to address review comments by FLNRORD and Halalt First Nation on an earlier version dated December 16, 2016. The recent version provides additional information requested by reviewers and shows the recent updates made to the rating curves and the flow relationship between SWA-1 and SWB1-2.	Addressed. Response provides clarification on the difference between the December 2016 and April 2017 Reports	
98	11. At an earlier meeting we discussed the potential for using a mass balance approach to assess the effect of test pumping. Why was this approach not used?	We do not believe that this proposed mass-balance approach is appropriate for determining the relative contribution of surface water in the pumping wells since heat flow and transport in groundwater is a complex process involving density-driven flow as well as conduction and advection. Furthermore, we note that the river temperature at nearby site SW-B1-2 is actually lower than the temperature of the groundwater in operational PW 3 during the later parts of Long Test #2 and for most of Short Test #2. In our opinion a more suitable method to estimate the relative surface water contribution is from 'stream depletion' estimates determined through surface water monitoring as has been conducted by Ecofish. More detail on the groundwater temperatures and heat transport is also provided in the WWAL report.	EAO note: This response is also contained in Tracking Table #47 comment above. Addressed for the purpose of the EA. The WWAL April 2017 report contains additional informatioln that would respond to the comment raised.	

	COMMENTS	RESPONSE	Status	Date and Event
99	12. Please provide turbidity data from the wells during the test pumps.	Turbidity data were provided to GW Solutions in an email dated April 6, 2017.	Addressed. Same comment as raised under #48 above	
	E. CHEMAINUS WELLS - AMENDMENT #2 SUMMER TESTING PROGRAM 2016 - Halalt FN Comments at the EA Working Group Meeting, July 6, 2017			
	COMMENTS	**RESPONSE**	**Has the issue been addressed?**	**Date and Event**
	Comments from Halalt First Nation	**Response from MNC and EAO**		**July 6, 2017, EA Working Group Meeting**
100	1. The 'no summer pumping' condition in the Certificate was an accommodation of the impact on HFN rights and title, and of the government's 2009 decision to allow the Wells to be built and to be operated during the winter.	The Amendment Application proposes to operate the Chemainus Wells for an additional 4 months each year (June 15 to October 15). MNC proposes to accommodate concerns from Halalt First Nations about potential impacts on the River from this additional operation. New enhanced accommodation is being proposed to replace the accommodation which was provided for winter operation of the wells between October 15 and June 15 authorized by Environmental Assessment Certificate #W09-01. The new enhanced accommodation proposed in the Amendment Application provides for release of water from Holyoak Lake to the Chemainus River during the June 15 to October 15 period at a rate of 73 L/sec (7 times higher than the Chemainus Wells average measured impact of 9.9 L/sec). Accommodation also includes support for operation and improvements to the Westholme side channel and extension of the Monitoring Program by 3 years. This enhanced accommodation provides a benefit to the Chemainus River flows, fish habitat and temperature. This was not possible to provide in the original application as Holyoak Lake water was being used in the June 15 to October 15 period to supply the community of Chemainus. More details of the accommodation are described on Line 146 of the Tracking Table. In the original EA application, the project, which included 3 wells pumping year-round at up to 131 L/sec, was modified to accommodate Halalt First Nation's concerns about the impact of the wells on the Chemainus River and the Chemainus River Aquifer, particularly during the summer months. The project was modified to reduce the number of operating wells from 3 to 1 (with 1 backup well), operating at a maximum rate of <75 L/sec only between October 15th and June 15th. Response continued below.	Adequately addressed for the purpose of the EA of the Amendment Application.	
	continued from Line 90, Comment 1. above	The Municipality of North Cowichan's decision to apply for an amendment of Certificate #W09-01 was made with the understanding that additional studies and testing needed to be undertaken to support approval for year-round operation of the wells. This additional information is included in the Amendment Application. Additional testing and studies have also been completed and communicated following submission of the Amendment Application. The proposed amendment changes the location of extraction (from Holyoak Lake to the groundwater wells) and the type of water supply (from surface water within the Chemainus River Watershed to well water from the Chemainus River Aquifer) for the June 15th to October 15th period. **EAO Response:** - EAO acknowledges that modifying the project to remove summer pumping was a way to address Halalt's concerns about the Chemainus Wells Project during the original EA and to avoid potential adverse effects that could result from summer pumping, and hence, constitutes an accommodation of Halalt Aboriginal Interests - The proposal that is currently before EAO does contemplate summer pumping, but with a measure that was not contemplated during the original EA, which is that water would be released from Holyoak Lake and Banon Creek, premised on the notion that with this water release measure, potential adverse effects arising from summer pumping would be avoided.		
101	2. Summer pumping would clearly be absolutely unacceptable in the absence of an effective and reliable long-term water release program but... MNC has not proven that the water release program would be both effective, and reliable	The Municipality (MNC) has demonstrated that the Amendment Application to operate the Wells between June 15 and October 15, while releasing water from Holyoak Lake to the Chemainus River, is sustainable, effective and reliable and will improve summer Chemainus River flows, fish habitat and water temperature, while not impacting the Westholme Channel and Halalt's water supply well. This statement is based upon considerable in-the-field testing, monitoring, and expert study, which is presented in the March 2015 Amendment Application and additional studies completed since the application was made.		

	COMMENTS	RESPONSE	Status	Date and Event
102	3.Water Release effective? i.) temperature of Holyoak Lake release water?	In response to specific questions, MNC provided an email on October 27, 2017 with additional information on temperature of the Banon Reservoir release water relative to Chemainus River temperature. To summarize, temperature models predict that increasing flow from Banon Creek to Chemainus River by releasing stored water from Holyoak Lake would cool the water temperature in Chemainus River and mitigate increases in water temperature due to flow reduction from groundwater pumping. With the additional flow from Holyoak Lake, the predicted decrease in mean weekly maximum daily water temperature (MWMT) leads to smaller and less frequent exceedances of the optimum MWMT ranges for fish. We further assessed this issue by examining the surface water temperature time series at several locations during the pump tests in 2016, and found no immediate or apparent changes or distinct trends in river water temperatures when pumps started up or shut down at any of the gauges on the Chemainus River.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D6 have clauses that address the need to monitor temperature at the Banon reservoir and the Chemainus River.	
103	ii.) temperature of release water vs. pumped groundwater?	Surface water temperatures have been monitored and assessed in annual reporting since June 2013, including two sites of relevance to this question: in the Chemainus River upstream of its confluence with Banon Creek (station SW-A0-1) and lower Banon Creek just below Banon Reservoir (station SW-A0-2) . Data from these locations are collected on an hourly basis with occassional data gaps due to vandalism, logger malfunction, or setting error. Up until the 2015-2016 monitoring season, the temperature sensors at these stations were removed in the winter. Historical data from annual monitoring indicates that the summer temperature at SW-A0-1 ranges from ~12 to 25 ºC and at SW-A0-2 ranges from ~11 to 26 ºC. The high temperatures result in part from daily fluctuations due to the sensors being installed in shallow water and therefore being strongly affected by atmospheric conditions. Where data are available from both locations, the temperature at SW-A0-2 is noted to be generally ~2 to 7 ºC cooler than at SW-A0-1 by the late summer. Stations SW-A0-1 and -2 were also continuously monitored during 2016 test pumping. As noted in the April 5, 2017 report by WWAL on the results of the testing program: 'the temperature at SW A0 1 varies from 10 to 24 ºC and the temperature at SW A0 2 varies from approximately 13 to 19 ºC over the monitoring period. Based on the data collected, the surface water temperature in the River at SW A0 1 is generally 1 to 4 ºC higher than Banon Creek at SW A0 2 throughout the monitoring period.' The water temperature in the pumping wells varied from 11 to 16 ºC during test pumping operation. **EAO Note**: Temperatue Monitoring - Condition D6 has clauses 4, 5, and 6 requires continuous monitoring year round of the aquifer level and temperatures, while clause 8 has continuous monitoring of temperature at the Banon Creek gauge.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D6 of Schedule B of the Environmental Assessment Certificate.	
104	4. Halalt not convinced that MNC has proven its water release proposal would be sustainable for Holyoak Lake, and effective and reliable every year into the future for so long as the Municipality continues to rely on the Chemainus Aquifer for potable water.	A detailed response was provided by email on October 27, 2017, and is summarized below. MNC has been releasing water from Holyoak Lake to Banon Creek for over 60 years, to supply Chemainus with water. The release from Holyoak Lake to the Banon Creek Dam intake has been effective and reliable and Holyoak Lake storage has been sustainable over decades. The water released from Holyoak Lake to Banon creek, if the Amendment is approved, will no longer be removed at the Banon Dam intake to supply the Chemainus Water System. It will be allowed to flow an additional 1.7 KM in Banon Creek to the Chemainus River where it will supplement the flow in the river. The sustainability of Holyoak Lake to supply sufficient water for the proposed mitigation release is discussed in two communications: a) Ecofish, 11 October 2017, Memorandum entitled Long-term sustainability of Holyoak Lake which includes an analysis of the impact of Climate Change on Holyoak Lake Storage to 2050. MNC provided this report by email on October 27, 2017. b) MNC, October 27, 2017, Updated Appendix F Amendment Application-Holyoak Lake Storage Review. MNC provided this report by email on October 27, 2017. To demonstrate the reliability and effectiveness of the flow release from Holyoak Lake to Banon Creek and Chemainus River, testing was undertaken in 2014 and is documented by Ecofish in the Amendment Application in Appendix G. Six test releases were undertaken. The data collected and documented provide clear evidence that mitigation in the form of water releases will reliably supplement flows in the Chemainus River and can be used to mitigate potential effects from groundwater pumping during the June 15 to October 15 period.	Adequately addressed for the purpose of the EA of the Amendment Application. Holyoak Lake has a water works licence and MCN will need to provide information to FLNRORD on water sustainability.	

	COMMENTS	RESPONSE	Status	Date and Event
105	5. March 2015 application document has substantial deficiencies and gaps in the document have not yet systematically defined	This tracking table provides responses to review comments provided by HFN and their consultants. Additionally, numerous technical discussions to address questions and comments have occurred between MNC and HFN at meetings, in writing, and by phone. A record of consultation has been provided to EAO. **EAO Note:** Since the Application was submitted additional studies have been completed that provide updates to the information contained in the Amendment Application.	Adequately addressed for the purpose of the EA of the Amendment Application.	
106	6. Summer Pumping and Water Release: Benefit and Risk Not Aligned. i.) MNC gets the benefit: $ cost saving for surface water treatment and drinking water supply for residents and growth.	It is MNC's legal duty to supply water to Chemainus residents in a cost-effective manner while limiting and mitigating any impact from well operation on the environment. MNC has provided documentation confirming that operation of the wells year-round with water releases to the Chemainus River from the Holyoak Lake /Banon Creek system during the June 15 to October 15 period provides a benefit substantially above potential impacts to the River flows, fish habitat and water temperature. **EAO Note:** Condition D6, clause 11 in the Certificate provides a measure to report out on growth or decline of water system customers, summary of water use and implementaiton of water restrictions and othe conservation measures.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D6, clause 11 of Schedule B of the Environmental Assessment Certificate.	
107	ii.) HFN gets the risk: water release fails at critical low flow period, Holyoak Lake can't provide enough water, water release not as effective as predicted, future MNC loses commitment to water release, MNC abandons surface water system, becomes totally dependent on Chemainus Wells water, demand for summer water grows but water for release stays same or declines, and impact on Aboriginal rights and title.	The proposed summer use of the wells is linked to the release of water from the Holyoak Lake/Banon Creek system to the Chemainus River. MNC assumes that the Water Licence would stipulate that wells cannot be operated in the June 15 to October 15 period unless water is released from the Holyoak Lake/Banon Creek system to the river. MNC further assumes that an EAC Amendment would include water release as a requirement for well operation. MNC would therefore be legally required to release water when the wells are operated in the June 15 to October 15 period. MNC's plan is to maintain the Holyoak Lake/Banon Creek supply in operating condition so it can meet the requirement of releasing water to the Chemainus River, and so it can be used as a backup supply for Chemainus. This is a similar practice to the one MNC has followed for the Crofton Water System where Crofton Lake is maintained as a backup supply to the main water supply from the Crofton Pulp Mill and MNC releases water to Richards Creek from Crofton Lake to supplement summer flows to improve fish habitat. **EAO Note:** Clause (J) of Schedule B in the Certificate provides a measure to reduce or curtail pumping if the release measure is not funcitioning properly. Under Clause (J) and Condition D6, MNC must employ adaptive management measures if the flow release in not functioning properly to ensure there are no adverse impacts.	Adequately addressed for the purpose of the EA of the Amendment Application. Clause (j) of Schedule B of the Environmental Assessment Certificate.	
108	7. Control and Risk Misaligned. i.) MNC has control over supply, demand and mitigation (e.g., pumping rates, water demand/growth, and Holyoak Lake water release).	A detailed response was provided by email on October 27, 2017, and is summarized below. The EA Certificate limits well water extraction to less than 75L/sec. Growth of the Chemainus Water System customer's use must be accommodated within this limit. Growth of Chemainus Water System customers between 2012 and 2017 has been a total of 0.70%, or 0.14% per year. Statistics Canada growth figure for Chemainus between 2006 and 2011 was 0.66% per year and between 2011 and 2016 was 0.74% per year. **EAO Note:** EAO Note: Condition D6, clause 11 in the Certificate provides a measure to report out on growth or decline of water system customers, summary of water use and implementaiton of water restrictions and othe conservation measures. Assuming a 0.74% growth rate, the time it will take to transition from the present June 15 to October 15 well use of 38.1 L/sec to the 74.99 L/sec (<75L/sec) would be 95 years. This time would reduce to 68 years if the Chemainus growth rate increased to 1% and would increase to 484 years if the growth rate reduced to 0.14 % per year. It will take many years for the Chemainus Water Use to reach the 74.99 L/sec well flow requested in the Amendment Application. This will allow the Municipality considerable time to further enhance its water conservation measures to reduce the growth in water consumption and monitor impacts of well operation. Water conservation efforts have resulted in considerable water savings over the years. The Chemainus Water System is fully metered, and a number of initiatives have resulted in substantial water savings. There has been a 28% reduction in water use since 1979. Seven summer tests have been undertaken between 2003 and 2016 operating the wells close to or above the requested 74.99 L/sec well flow rate. The testing showed a 9.9 L/sec reduction of Chemainus River flow when the wells are operating close to the maximum requested well pumping rate of 74.99 L/sec. The proposed release rate from Holyoak Lake is based on the impact on low summer river flows when the wells are pumped at the maximum 74.99 L/sec well water extraction rate.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D6, clause 11 and Condition D3 of Schedule B of the Environmental Assessment Certificate.	

	COMMENTS	RESPONSE	Status	Date and Event
		There is therefore no necessity to increase the release rate as the well use volume increases from the present 38.1 L/sec to 74.99L/sec over the next 68-95 years (assuming a 0.74 % to 1 % growth rate). **EAO Note:** Condition D6, clause 11 of Schedule B of the Certificate requires that MNC in its annual report provide information on the previous year's growth or decline of water system customers, summary of water use and implementation of water restrictions and other conservation measures. Condition D3 provides for EAO to have control over the groundwater extraction rates for the production wells, if needed, to mitigate adverse effects identified in the Annual Monitoring Reports.		
109	ii.) HFN has no control over its own risks: water release operate as promised; no legally enforceable guarantee that MNC will meet Certificate requirements; no way to prevent MNC from applying for further amendments to Certificate; no guarantee EAO will honour Certificate conditions (e.g., no-summer-pumping); and no recourse if water release fails to operate as promised.	The Environmental Assessment Office provides protection to Halalt and the Public in that the conditions of the Environmental Assessment Certificate must be followed by MNC. The conditions of the Certificate are legally binding on MNC. The EAO has the duty to monitor compliance and enforce the conditions of the Environmental Assessment Certificate. FLNRORD has the duty to monitor compliance with the water licence. MNC has the right to apply to amend their Environmental Assessment Certificate following the established Environmental Assessment requirements and procedures, which include First Nation consultation. MNC has met all conditions of Environmental Assessment Certificate #W09-01 including the requirement for no summer pumping. Amendments to the Environmental Assessment Certificate were made in 2015 and 2016 to authorize summer pumping for testing purposes.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions C7, C8, D4, D6, D7 and D8.	
110	8. Deficiencies in the Application: i.) cursory rejection of VIHA-order improvements in treatment for surface system	MNC did not cursorily reject the conditions of the February 18 2014 VIHA Permit for the Chemainus Water System. VIHA's permit for the Chemainus Water System requires that MNC: 1. File an amendment to Certificate #W09-01 to allow year-round operation of the wells by June 1 2014; 2. Plan for treatment of the Banon Creek supply should EAO not allow year-round well use; and 3. Plan and design the treatment works to be completed by January 1 2016 and construction by January 1 2017 **subject to the date of a decision by the EAO on the use of the wells year-round**. (emphasis added) MNC advised VIHA that extension of the dates in the Permit may be required as discussions with Halalt FN and the Public, additional summer testing, completion of the EAO Amendment requirements and a decision by the EAO were going to take more time than the Permit anticipated. MNC started discussions concerning the Amendment with Halalt First Nation in a letter dated January 7, 2014 to Chief Thomas and undertook 4 meetings (May 20 2014/August 13 2014/September 5 2014/January 7 2015) to discuss the Amendment prior to making the application. In these meetings Halalt expressed a desire for MNC to do additional summer testing of the wells and wanted additional meetings before MNC applied for the Amendment. MNC felt that further discussions with Halalt could occur during the Amendment process. MNC applied to Amend Certificate #W09-01 in March of 2015. The VIHA Permit allows for extension of the requirements by including the statement "subject to the date of a decision by the EAO on the use of the wells year round." This means that the timelines of the permit are flexible to match the EA Amendment process timing.	Adequately addressed for the purpose of the EA of the Amendment Application. The proposal that is currently before EAO contemplates a change to A1 in Schedule B to allow for summer pumping. MNC is proposing a measure that was not contemplated during the original EA, which is that water would be released from Holyoak Lake and Banon Creek, premised on the notion that with this water release measure, potential adverse effects arising from summer pumping would be avoided. This Amendment Application request is what the EAO is reviewing.	
111	ii.) modelling of long-term sustainability of Holyoak Lake with water release is inadequate	The sustainability of Holyoak Lake to supply sufficient water for the release into the future is discussed in two communications: 1. Ecofish, October 11, 2017, Memorandum entitled Long –term sustainability of Holyoak Lake, which includes an analysis of the impact of Climate Change on Holyoak Lake Storage to 2050. MNC provided this report by email on October 27, 2017. 2. MNC October 27, 2017, Updated Appendix F Amendment Application-Holyoak Lake Storage Review. MNC provided this report by email on October 27, 2017. □	Addressed. Holyoak Lake has an existing licence. FLNRORD has advised EAO that the water supply in Holyoak Lake is sustainable based on their assessment review.	
112	iii.) environmental impact of water release on Holyoak Lake is not examined	Storage and release would operate within the conditions of the existing Water Licence for Holyoak Lake, which authorizes the use of up to 1000 Acre Feet annually. At present the live storage capacity of the Holyoak Lake facility is 800 AF.	Adequately addressed for the purpose of the EA of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
113	iv.) ecological effectiveness of water release is not fully analyzed	Detailed analyses have been provided in the EAC Amendment Application that describe the effects in terms of aquatic habitat and water temperature. Substantial benefits to the aquatic environment accrue from the release. Quantification of effects on fish habitat have been updated using data from the 2016 pump testing and provided in a revised technical memo by Ecofish and circulated to the Working Group on October 27, 2017. In addition, recent temperature data and analyses indicate benefits from the release in terms of reduced surface water temperatures. The revised analyses continue to indicate accrual of substantial benefits to the aquatic environment from the proposed mitigation release. [details are provided by email on October 27, 2017] **EAO Note:** Condition D1 addresses the Aquifer Monitoring Program and Condition D6 addresses addition amonitoring and reporting.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D1 and D6 of Schedule B of the Environmental Assessment Certificate.	
114	v.) no surface water supply contingency plans if water release not available	It is the intention of MNC to maintain the Banon Creek supply as a backup supply to the Chemainus Well Water supply. In case of a disruption to the well supply, the Banon Creek supply will be maintained such that it can be put into operation to supply water to the community of Chemainus. MNC has a similar arrangement in Crofton, where Crofton Lake is maintained as a backup supply should the Crofton pulp mill supply not be available. Prior to June 15 each year, MNC will know if Holyoak Lake has sufficient storage to meet the required release to Banon Creek. If Holyoak Lake does not have sufficient storage, a variety of alternative operations are feasible. For example, the well operation duration could be modified such that the wells do not operate for the full June 15 to October 15 period. At some point the well supply could be shut down and the Banon Creek supply could be used. Implementation of Level 3 Water Restrictions could be used to reduce community water use to essential levels in the order of 27 L/sec, which is substantially lower than the 73 L/sec maximum pumping rate. Holyoak Lake has approximately 280 Acre Feet of dead storage, which is below the Banon Creek outlet from Holyoak Lake. In the event of an extreme drought it may be possible to use this dead storage. The Water Licence does not permit the use of dead storage unless it is authorized by an approval under Section 10 of the BC Water Sustainability Act for short term use of water. Dead storage water would have to be pumped or siphoned from the lake into Banon Creek.	Addressed for the purpose of the EA of the Amendment Applcation.	
115	vi.) Wells drawing water from the River	The EAC amendment application (2015) included an updated assessment of the potential environmental effects to hydrology from year-round groundwater extraction, and was based on additional river level and discharge data collected since 2005. Discharge data reviewed and direct observations during the 2005 groundwater pumping study demonstrate hydraulic connection of surface water and the aquifer along the reach near Site B (Thurber et al., 2006). This suggested that groundwater extraction during the summer months could induce recharge from the river to the aquifer along this reach, thereby reducing river flows, unless mitigation measures are implemented. During the 2016 pump tests, the average absolute net effect of groundwater pumping on surface flow was 9.9 L/s, which is approximately 13.6% of the proposed flow releases of 73 L/s from Holyoak Reservoir. Taking into account the estimated uncertainty in effect (i.e., ±12.1 L/s) during the 2016 summer pump tests, the upper bound of the average net effect is estimated as 22 L/s, or ~30% of the proposed mitigation release. The 2016 results are similar to observations during the 2005 Summer Test Pumping Program undertaken by MNC as part of the original Environmental Assessment. During the 2005 pump test, wells were pumped at a rate of 127 L/s. A decline in river flow of ~13 L/s was observed 22 hours after the start of the pump test, which was equivalent to 9% of the flows at the time (SRK and Thurber 2014). Releases from Holyoak and Banon Reservoir will not only mitigate the reduction in Chemainus River flow caused by groundwater pumping, it will also supplement flow in the river during a period when flows are naturally at their lowest, thereby improving habitat conditions for fish.		
116	vii.) inadequate analysis of sensitivity of results to extreme weather conditions, e.g., multi-year drought	The sustainability of Holyoak Lake to supply sufficient water for the release into the future is discussed in two communications: 1. Ecofish, October 11, 2017, Memorandum entitled Long –term sustainability of Holyoak Lake, which includes an analysis of the impact of Climate Change on Holyoak Lake Storage to 2050. MNC provided this report by email on October 27, 2017. 2. MNC October 27, 2017, Updated Appendix F Amendment Application-Holyoak Lake Storage Review. MNC provided this report by email on October 27, 2017.	Adequately addressed. See #104 above.	

	COMMENTS	RESPONSE	Status	Date and Event
117	viii.) inadequate monitoring plan - general comments	The proposed mitigation consists of flow releases from Holyoak Lake, a three-year extension of the Chemainus wells monitoring program, and (completed) enhancement of fish habitat at the Westholme side-channel on the Chemainus River. These mitigations all contribute to avoiding and/or minimizing potential adverse effects from groundwater extraction during the low-flow period. All proposed mitigations are proven techniques that have been tested locally or implemented elsewhere to ensure feasibility. Halalt First Nation and their consultants (GW Solutions) contributed to the development of the surface and groundwater monitoring program. **EAO Note:** The Aquifer monitoring plan was approved in May 2009. Condition D3 places EAO as the authority for the Aquifer Monitoring Program and EAO will be consulting with both FLNRORD and Halalt on need to address adverse effects. Since that time MNC has added more monitoring station which are addressed in Condition D6 of theEnvironmental Assessment Certificate.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D3 and D6 of Schedule B of the Environmental Assessment Certificate.	
118	viii.) inadequate monitoring plan - surface water monitoring	A surface water monitoring program for the Chemainus River was developed with input from HFN and implemented by MNC in 2005 to develop long-term baseline water level and discharge data for the low-flow season. As part of this monitoring program, stage discharge, and water temperature data have been collected at three locations on the Chemainus River every summer (approximately July-October) since installation. These gauging stations are located upstream (SWA-1), in the immediate vicinity (SWB1-2), and downstream (SWD-1) of the groundwater wells. In addition to the data collected by MNC, additional river hydrologic data are acquired regularly from the WSC Chemainus River Gauge 08HA001. The monitoring data for each year have been presented in annual monitoring reports (Thurber 2008, 2009a, 2010, 2011, 2013, 2014b, 2015, 2016). These reports include analysis and reporting by a qualified professional on the following potential impacts of groundwater pumping: • Whether the operation of the groundwater production wells has affected the groundwater levels in the Chemainus River Aquifer, the surface flows in the Chemainus River, the yield of the Halalt First Nation's well, or the level in the Westholme side-channel; and • The magnitude of any effects identified above. As noted in the Amendment Application, MNC proposes to extend the Chemainus Wells Monitoring Program by three years after the implementation of June 15 to October 15 operations.	See #117 above	
119	viii.) inadequate monitoring plan -groundwater monitoring	The Amendment Application proposed ongoing annual groundwater and surface water monitoring as per the original EAC. This monitoring plan was developed in 2009 with input from Halalt First Nation and approved by MOE. Continuous monitoring has been in place since 2006 and will be maintained. This includes: • 15 groundwater monitoring wells (including MOE and Halalt wells) • 2 MNC Pumping wells • 2 stilling wells in Westholme side channel	See #117 above	
	Comments from Halalt First Nation	**Response from EAO**		**July 6, 2017, EA Working Group Meeting**
120	1. Vancouver Island Health Authority (Island Health) is driving summer pumping. Island Health is a government agency, that has duty to consult and accommodate. i.) VIHA states surface system "is putting the public's health at risk".	Island Health provided a response to these issues on August 11, 2017.	Commented acknowledged. See response in #100 above on the scope of the Amendment Review.	
121	ii.) Island Health openly supports year-round pumping.	Island Health provided a response to these issues on August 11, 2017.	Comment acknowledged. See resonse in #100 above on the scope of the Amendment	
122	iii.) No apparent enforcement of order to MNC to add treatment of surface system by January 1, 2017.	Island Health provided a response to these issues on August 11, 2017.	Comment acknowledged.	
123	iv.) Paints HFN's stewardship of River and Aquifer and Aboriginal rights and title as blocking public health	Island Health provided a response to these issues on August 11, 2017.	Comment acknowledged.	
124	2. Deficiencies in the Application: i.) cursory rejection of Island Health's-order improvements in treatment for surface system	Island Health provided a response to these issues on August 11, 2017.	Comment acknowledged.	
125	1. Halalt want EAO to take an active role. - not just clearinghouse for referral comments and ticking off items on issues list, but noting if responses are valid	EAO has been taking an active role in the Amendment process and will determine if responses are sufficient or if more information is needed.	Addressed for the purpose of the EA.	
126	2. Halalt want EAO to: identify deficiencies in Application; disclose its criteria for yes or no recommendation; explain how it will incorporate into the recommendation the impacts of the proposed action on Halalt's Aboriginal rights and title; and to require MNC to include in the proposal a fully adequate surface water system as a backup	EAO has been requesting additional informaiton and clarification on information presented throughout the Amendment process. EAO will also be describing environmental impacts and impacts to Aboriginal interests and the proposed mitigation. A fully adequate surface water system is beyond the scope of the Amendment Application review.	Addressed for the purpose of the EA.	

	COMMENTS	RESPONSE	Status	Date and Event
127	3. Reminder: Halalt has an ownership interest in the groundwater that MNC is pumping out during the winter and proposes to pump out during the summer	EAO acknowledges Halalt's assertion of ownership of groundwater under Halalt's reserve - EAO acknowledges its constitutional obligation to consult with Halalt regarding its Aboriginal Interests consistent with the Haida case - Following the 2014 SCC case in Tsilhqot'in Nation v. BC, EAO has revised its assessment of the strength of Halalt's claims of Aboriginal rights and title to the project area to be strong – this was shared with Halalt in spring of 2015 - As you are probably aware, the SCC in the Tsilhqot'in case was not asked to consider whether Aboriginal title can exist over submerged lands – the law is currently unsettled on this issue - Regardless of that legal uncertainty, and given that the EA process is not a rights-determining process, EAO has previously acknowledged that we view the scope of consultation owed to Halalt for this proposed amendment to be at the deep end of the Haida consultation spectrum. At this end, EAO continues to work with Halalt to ensure that Halalt's concerns with MNC's proposed amendment, and in particular, whether the water release measure can effectively address Halalt's concerns regarding summer pumping	Adequately addressed for the purpose of the EA of the Amendment Application. EAO's opinion of ownership of the water remains the same as in the original EA.	
	Comments from Gilles Wendling (GW Solutions)	**Response from MNC**		**July 6, 2017, EA Working Group Meeting**
128	1. Issue #1-Pumping reduces river levels/flow "…..the largest effect caused by the pump tests was a 30L/s decline in surface flow…." (Ecofish April 6 2017)	The maximum difference in residuals during the 2016 pump tests was a 30 L/s decline in surface flow observed within the period of 24 hours before and 24 hours after the start of Long Test #1. This maximum difference in residuals is the difference between the highest and lowest residual within this period and therefore does not represent a continuously occurring effect during the pump tests. Hence, the average effect (which was 9.9 L/s) is a better metric for determining a consistent effect on Chemainus River flows under continuous groundwater pumping.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D6, D7 and D8 of Schedule B of the Environmental Assessment Certificate.	
129	2. Issue #2 –River Temperature: i.) Ecofish does not comment on validation of regression model presented in 2014 application (Appendix E)	A discussion of the validation results is provided in Section 3.1, Appendix E, of the 2014 Amendment Application. The regression models were validated with data from June to August, 2014, and used to estimate the daily-maximum water temperatures at SWB1-1 and SWD-1 with and without flow reduction. The model results show good agreement between the estimated temperatures and observed temperatures during the validation period (Figure 2, Appendix E). Table 6 (Appendix E) shows quantitative measures of agreement between estimated and observed daily maximum water temperatures for the validation period. The Nash-Sutcliffe model efficiency coefficient (NSE) was 0.89 for sites SWB1-1 and SWD-1. This NSE value is lower than NSE for the 2008-2012 data used for model calibration, but is still close to 1.0 and confirms that the regression models give reliable estimates of daily-maximum water temperature.	Adequately addressed for the purpose of the EA of the Amendment Application.	
130	ii.) Regression model for daily max temperature indicates different trends versus flow for site SWB1-2 and SWD-1	The regression model results (Appendix E of the 2014 Amendment Application) indicate that flow reduction due to well operation would decrease water temperatures at site SWD-1 and increase water temperatures at site SWB1-1. For site SWD-1, the decrease in daily-maximum water temperature reduces exceedances of the optimum temperature ranges specified by provincial guidelines and leads to a better thermal regime for fish. The water temperature data available for lower Banon Creek indicated that the creek water temperature was colder than water temperature in Chemainus River. Increasing flow from Banon Creek to Chemainus River by releasing additional flow from Holyoak Lake would cool the water temperature in Chemainus River and mitigate the increase in water temperature due to flow reduction from groundwater pumping at site SWB1-1. This predicted decrease in daily-maximum water temperature would lead to a thermal regime that is better for fish than the baseline thermal regime.	Adequately addressed for the purpose of the EA of the Amendment Application.	
131	iii.) 2016 results indicate temperature at SWB1-2 and SWD-1 have a similar trend and how does this affect validity of model and conclusions drawn from it?	River temperatures at sites SWB1-2 (~ 120 m downstream of site SWB1-1) and SWD-1 showed a similar trend during the 2016 pump tests; temperatures generally decreased during pumping. Mitigation flows were released from Banon Creek and Holyoak Lake during the 2016 pump tests. The trend in water temperatures at sites SWB1-2 and SWD-1 during the 2016 pump tests provides assurance that the mitigation flow releases from Banon Creek and Holyoak Lake ameliorate the effect of groundwater pumping on river temperatures.	Adequately addressed for the purpose of the EA of the Amendment Application.	
132	iv.) Are the summary and recommendations (section 5, Appendix E of 2014 Application) still valid?	The summary of conclusions provided in section 5, Appendix E of 2014 Application is still valid, as is the recommendation to provide mitigation flow releases from Banon Creek and Holyoak Lake during groundwater pumping in summer months. Releases from Holyoak Lake were expected to mitigate increases in water temperature and the 2016 test pumping results were consistent with this prediction. The empirical test demonstrated the effectiveness of the proposed mitigation.	Adequately addressed for the purpose of the EA of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
133	3. Issue #3 Holyoak Lake i.) Estimates based on: Pre-1976 design? There was a drought in 2002-2003. Need proper historical +projection (e.g., 2017-2050) taking into account climate change	i) Holyoak Lake storage calculations are based upon 1975 topographic mapping undertaking by the BC Water Rights Branch using field surveys and air photography and Ker Priestman and Associates in 1977 who produced as built construction drawings for the Holyoak Lake Dam. The facility drawing was provided in an email on October 27, 2017. The total volume of live and dead storage of the Holyoak Lake facility is 1,332,158 m^3 (1080 Acre feet). The licenced live storage of 986,784m^3 (800 Acre feet) is 74% of the total storage. The unlicenced dead storage of 345,374 m^3 (280 acre feet) is 26% of the total storage. ii) Detailed responses to this question have been provided by the following two communications: 1. Ecofish, October 11,2017, Memorandum entitled Long –term sustainability of Holyoak Lake, which includes an analysis of the impact of Climate Change on Holyoak Lake Storage to 2050. MNC provided this report by email on October 27, 2017. 2. MNC October 27, 2017, Updated Appendix F Amendment Application-Holyoak Lake Storage Review. MNC provided this report by email on October 27, 2017. See also Line 94 Response.	Adequately addressed for the purpose of the EA of the Amendment Application.	
134	ii.) Need sensitivity to turbidity as lake level drop	Storage and release would operate within the conditions of the existing Water Licence for Holyoak Lake.	Adequately addressed for the purpose of the EA of the Amendment Application.	
135	iii.) Need Impact on wildlife (Environmental Assessment)	Storage and release would operate within the conditions of the existing Water Licence for Holyoak Lake.	Adequately addressed for the purpose of the EA of the Amendment Application.	
136	4. Issue # 4 Turbidity of wells during 2016 summer testing	See response on Line 38, which was made in answer to a question at the February 21, 2017 meeting between Halalt FN and MNC. An email with additional information was sent to Halalt FN on April 6, 2017 as noted below: "In the February 28, 2017 meeting notes, Halalt First Nation requested turbidity information and data recorded prior to and during the 2016 summer pumping test. Attached are 2 screen shots from MNC scada system showing turbidity for the July 22-Sept 19, 2016 period of the summer testing as well as the January 1-March 17, 2016 period. Well water turbidity during, prior to, and after the summer testing appears to remain consistently about 0.2 NTU except when well pumps were started. Pump start-up created short duration (~ 10 minute) turbidity spikes. The magnitude of the turbidity spikes appears to be related to the duration the well sat idle before start up. Turbidity spikes are generally not present during winter pumping as wells are running daily and are not idle for long periods. [sent on behalf of Municipality of North Cowichan]"	Adequately addressed for the purpose of the EA of the Amendment Application.	
	Comments from Gilles Wendling (GW Solutions)	**Response from EAO and DFO**		**July 6, 2017, EA Working Group Meeting**
137	1. Issue #5 DFO Involvement. DFO not to be involved. Reason: River is not impacted. Halalt considers this decision was premature and based on unconfirmed facts (2004).	EAO extended another invitation to DFO for input to the environmental assessment. DFO declined EAO's offer to particpate in the EA, but did provide their opinion on the mitigation proposal. DFO reviewed the mitigation proposed and are of the opinion that it is possible to avoid serious harm through the application of appropriate mitigation measures.These communications were provide to the Advisory Working Group Members by EAO (Karie Hardie) via email on October 19, 2017.	Addressed.	
	Comments from William Andrews	**Response from MNC and EAO**		**August 2, 2017, letter from William Andrews**
138	A1. Confirmation from EAO and MNC that they acknowledge that Halalt is opposed to government approval of summer pumping due to adverse impacts on the Chemainus River and Aquifer and on Halalt's Aboriginal rights and title.	MNC listened to the concerns from Halalt about the potential impact of operating the Chemainus wells in the summer between June 15 and October 15. MNC has demonstrated its proposal to mitigate potential adverse effects on the Chemainus River and Aquifer with the flow releases from Holyoak Lake and Banon Creek to the Chemainus River. MNC has documented that this proposal results in improvements to Chemainus River flows and fish habitat. **EAO response:** In letter correspondence dated November 23, 2017 EAO acknowledges Halalt's opposition to the approval of the amendment to allow year-round operation of the wells.	Addressed.	

	COMMENTS	RESPONSE	Status	Date and Event
139	A2. Confirmation from EAO and MNC that Halalt has participated reasonably and in good faith with the EAO and with MNC regarding review of the summer pumping application and the test pumping applications.	The following is a summary of discussions between MNC and Halalt FN concerning the Amendment to Certificate #W01-09 to operate the wells between June 15 and October 15 each year. MNC had considerable discussions with Halalt FN prior to issuance of Certificate #W09-01 in 2009 about using water stored at Holyoak Lake to supplement Chemainus River flow but set this option aside for future discussion. MNC started discussions with Halalt First Nation concerning the Amendment to operate the wells between June 15 and October 15 in a letter dated January 7, 2014 to Chief Thomas. MNC and Halalt had 4 meetings (May 20, 2014/August 13, 2014/September 5, 2014/January 7, 2015) to discuss the Amendment prior to making the application. MNC applied to Amend Certificate #W09-01 on March 27, 2015. April 13, 2015 Halalt and MNC meet to discuss Amendment and summer testing June 9, 2015 Halalt and MNC meet to discuss 2015 summer testing June 24, 2015 Halalt and MNC meet to discuss Amendment and summer testing July 20, 2015 Halalt, EAO and MNC meet to discuss Amendment for 2015 summer testing August 20, 2015 Chief Thomas letter supporting 2015 summer testing subject to conditions August 27, 2015 EAO approves Amendment # 1 to allow 2015 summer testing of wells Testing didn't happen in 2015 due to a wet late summer May, 27 2016 Halalt and MNC meet to discuss 2016 Amendment for summer testing June, 10 2016 EAO working group meet to discuss Amendment for year round operation and 2016 summer testing amendment Response continued below. **EAO response:** EAO acknowledges the Halalt's continued continued engagement in the Amendment Process. This acknowledgement was conveyed in letter correspondence date November 23, 2017	Addressed for the purpose of the EA.	
	continued from Line 129, Comment A2. above	June 21, 2016 Chief Thomas letter supporting 2016 summer testing subject to conditions July 26 to September 17 2016 summer testing program is undertaken February 21, 2017 Halalt and MNC meet to discuss results of 2016 summer testing program February 28, 2017 Bill Andrews letter with 17 points about the 2016 summer testing April 17, 2017 MNC's response to Bill Andrews letter. July 6, 2017 EA working group meeting to discuss 2016 summer testing August 2, 2017 Bill Andrews 10 page letter with comments summarizing Halalt concerns on the Amendment to operate the Chemainus wells year round Between meetings there were over 300 emails including daily emails during the 2016 summer testing between MNC and Halalt.		
140	A3. Confirmation from EAO, and acknowledgement from MNC, that the 'no summer pumping' condition in the Certificate was an accommodation of the impact on HFN rights and title of the government's 2009 decision to allow the Wells to be built and to be operated during the winter.	See Line 90 and 146 responses. EAO acknowledges that the modification to the original Chemainus project to avoid summer pumping was in response to concerns of Halalt and was considered an accommodation to Halalt's Aboriginal Interests when the ministers decided to issue the Environmental Assessment Certificate for the Chemainus Wells project in March 2009. This acknowledgement was also conveyed in letter correspondence to the Halalt dated November 23, 2017. The proposal that is currently before EAO does contemplate summer pumping, but with a measure that was not contemplated during the original EA, which is that water would be released from Holyoak Lake and Banon Creek, premised on the notion that with this water release measure, potential adverse effects arising from summer pumping would be avoided.	Addressed for the purpose of th EA of the Amendment Application	
141	A4. Confirmation from MNC and EAO that the results of the test pumping during summer of 2016 confirm that pumping of the Chemainus Wells during very low flows in the Chemainus River reduces the River flow.	The 73 L/sec release from Holyoak was established in March 2015 when the Amendment Application was submitted. This was before the 2016 summer tests were completed. The purpose of the 2016 summer testing was to determine the magnitude of impact on river flows from operation of the wells in the summer. Determining the impact would then allow MNC to confirm that the proposed mitigation flow release would mitigate any impact from the well operation. As it turned out, the mitigation flow release from Holyoak Lake of 73 L/sec is 7.4 times the average estimated impact of 9.9 L/sec as measured in the 2016 summer testing program. The proposed mitigation flow release results in a substantial increase in low Chemainus River summer flows and provides benefits to fish habitat. Chemainus River flows have been documented to drop as low as 100 L/sec in the summer months. The 73 L/sec release provides a substantial increase in flow during periods of low flow in the river. Further details of the benefit of the flow release on the Chemainus river are included in the Ecofish August 17 2017 Memorandum entitled Updated Chemainus River Instream Flow Assessment. MNC provided this report by email on October 27, 2017. **EAO:** The information in the MNC presented in its reports and in the comment table indicates a reduction in the Chemainus River flow of 9.9 L/sec during the summer testing program.	Addressed for the purpose of the EA.	

	COMMENTS	RESPONSE	Status	Date and Event
142	A5. Confirmation from MNC and EAO that Chemainus River summer low flows are critically low.	MNC confirms that Chemainus River flows are low in the summer months. Water Survey of Canada historical records indicate flows as low at 100 L/sec. The transfer of the source of Chemainus' summer water supply from the Holyoak Lake/ Banon surface water supply to well water supply from the Chemainus aquifer presents an enhancement opportunity that has not existed until now, that being the use of the Holyoak Lake /Banon Creek supply to supplement flow in the Chemainus River. Releasing water from Holyoak Lake and Banon Creek for the June 15 to October 15 period will increase the flow in the river substantially when the river is at its lowest. Further details of the benefit of the flow release on the Chemainus river are included in the Ecofish August 17, 2017 Memorandum entitled Updated Chemainus River Instream Flow Assessment. MNC provided this report by email on October 27, 2017. **EAO:** Response from MNC confirms low flows during the summer.	Addressed for the purpose of the EA.	
143	A6. Confirmation from MNC and EAO that summer pumping is absolutely unacceptable in the absence of an effective and reliable long-term water release program that respects Halalt's Aboriginal rights and title.	MNC does not propose to operate the Chemainus Wells during the summer without releasing water from the Holyoak Lake/Banon source to the Chemainus River. Furthermore, MNC expects the release to be a condition of any EAC Amendment or Water Licence revision. The release will result in a substantial increase in low Chemainus River summer flows and will be a benefit to fish habitat. **EAO:** As discussed at the May meeting with the Halalt and during the July working group meeting the EAO is approaching the review of the propsed amendment with the view that there should be no impactss to Halalt's Aboriginal Interests should the amendment be approved. This was reconfirmed in letter correspondence to the Halalt dated November 23, 2017. In Schedule B of the Environmental Assessment Certificate, Condition D4 has clauses around releasing stored water from Banon Reservoir, D5 flow release gauging and D6 has clauses around monitoring and reporting requirements.	Addressed for the purpose of the EA. Conditions D4, D5 and D6 in Schedule B.	
144	A7. Confirmation from EAO that the EAO will recommend against approval of the summer pumping application unless it is satisfied that there would be no adverse impacts on the environment or Halalt's aboriginal rights and title.	EAO is approaching the review of the proposed Amendment with the view that there should be no impacts to Halalt's Aboriginal Iinterests or the environment should the Amendment be approved. See also comment #113 above on ecological effectiveness. In Schedule B of the Environmental Assessment Certificate, Condition D4 has clauses around releasing stored water from Banon Reservoir, D5 flow release gauging, D6 has clauses around monitoring and reporting requirements while Condition D7 requires Annual Meeting with EAO, FLNROrD and Halalt on the results of monitoring and the ability for Halalt and FLNRORD to provide input on the Holder's management of flow release for the opertion of the wells from June 15 to October 15. Condition D8 requires a Five Year Effectiveness and Evaluation Report to assess whether the operation of the wells each year has adversely affected groundwater levels in the Chemainus River Aquifer, flows and temperature in the Chemainus River, the yield of the Halalt well and water levels and temperatures in the Westholme side-channel.	Addressed for the purpose of the EA. Conditions D4, D5, D6, D7 and D8 in Schedule B.	
145	A8. Confirmation from EAO that it will provide a written explanation of how it will incorporate the impacts of the proposed action on Halalt's Aboriginal rights and title into EAO's recommendation to the EAO executive director.	EAO will be including an analysis of the potential impacts to Halalt's Aboriginal Interests in EAO's Assessment of a Certificate Amendment report and will provide an opportunity for Halalt to review the Amendment report and if necessary discuss with the EAO. EAO provide a draft of EAO's Assessment of Appliction Amendment report to the Halalt on February 6, 2017. Bill Andrew's responded to the report providing three preliminary revisions and EAO made revisions to the report to address Halalt's concerns with accommodation, ownership of water and compensation for water taken from the aquifer. Halalt and EAO are meeting on March 1 to discuss the information provided to the Halalt for review.	Addressed. Draft material provided to the Halalt for their review and comment. Meeting to discuss the referral material on March 1, 2018.	
146	A9. Acknowledgment by EAO and MNC that Halalt's view is that MNC has not proven that its water release proposal would be sustainable for Holyoak Lake in perpetuity (or for the duration of the proposed summer pumping, which also has not been defined).	See line 100 and 133 responses. **EAO:** We have asked the technical experts at FLNRORD to provide comments on the viability of Holyoak Lake to sustain the proposed water release. See FLNRORD responses #191 and #192 on the viability of Holyoak Lake being able to provide adequate water supply for the release of water for the mitigation of flow reductions in Chemainus River.	Adequately addressed for the purpose of the EA of the Amendment Application.	
147	A10. Acknowledgment by EAO and MNC that Halalt's view is that MNC has not proven that its water release proposal would be effective and has not addressed whether its water release proposal would be effective in perpetuity or for the duration of the proposed summer pumping, which has not been defined.	See line 104 and 133 responses. **EAO:** We have asked the technical experts at FLNRORD to provide comments on the viability of Holyoak Lake to sustain the proposed water release. See FLNRORD responses #191 and #192 on the viability of Holyoak Lake being able to provide adequate water supply for the release of water for the mitigation of flow reductions in Chemainus River. Conditions D4 and D5 address the water release requirment.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D4 and D5 of Schedule B of the Environmental Assessment Certificate	
148	A11. Acknowledgment by EAO and MNC that Halalt's view is that there needs to be three to five years of monitoring of the Chemainus River and Aquifer concurrent with any additional testing of groundwater extraction combined with the release of surface water before summer pumping and water release can be properly decided.	**EAO:** The FLNRORD technical experts will advise EAO on the need for additional testing. EAO notes that MNC has been monitoring the Chemainus River and Aquifer since 2006. Conditions D1 continues the Aquifer Monitoring Program and D6 addresses ongoing monitoring for five years, while D7 requires Annual Meetings to discuss the monitoring and water release program. Condition D8 requires a Five Year Effectiveness and Evaluation Report.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D1, D6, D7 and D8 of Schedule B of the Environmental Assessment Certificate.	

	COMMENTS	RESPONSE	Status	Date and Event
149	A12. Confirmation from EAO that there has yet to be, but there will be in the future, a systematic identification of the deficiencies in MNC's March 2015 application document, and that the EAO will either recommend rejection of the application or direct MNC to correct the deficiencies in the application.	EAO: Since the MNC have submitted the March 2015 application, there has been additional information provided by the MNC to supplement the original application. The technical experts from FLNRORD has not identified any big problems with the Amendment Application but did seek further clarification on the 2016 summer testing findings. Additonal information including the 2016 summer pumping reports and other response documents provided in October 2017 become information that is added to the review documents.	Adequately addressed for the purpose of the EA of the Amendment Application.	
150	A13. Confirmation from EAO that MNC will be required to include in the Application the details of a fully adequate surface water system as a backup.	**EAO:** This is outside the scope of the Amendment process	Adequately addressed for the purpose of the EA of the Amendment Application.	
151	A14. Confirmation from MNC that in the hypothetical event that summer pumping is approved the certificate amendment would state that summer pumping is prohibited at any point in time when the water release is not operating for whatever reason.	See line 107 MNC response. See line 191 FLNRORD response. Condition D4 addresses release of water and notifying EAO, FLNRORD and Halalt if there is a problem with release of water. Mitigation measures or adaptive management measures to be implemented.	Adequately addressed for the purpose of the EA of the Amendment Application.	
152	A15. Confirmation from MNC that the proposal is that the water release would be at 73 L/s from June 15 to October 15 regardless of the volume of groundwater being pumped. [Application, p.51]	MNC's proposal is to release 73L/sec (6307 m^3/day or 769,478 m^3/year) from the Holyoak Lake/ Banon Creek system over the 122-day June 15 to October 15 period when the wells are in operation. The EA Certificate #W01-09 limits well extraction to < 75 L/sec. MNC is willing to discuss an alternate release schedule to maximize benefits to the river, subject to the total water budget noted here. Schedule B of the Environmental Assessment contains Condition D4 which addresses stored water release and Condition D5 which addresses gauging of water release.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D4 and D5 in Schedule B of the Environmental Assessment Certificate.	
153	A16. Confirmation from EAO that MNC should revise the March 2015 application to take into account the subsequent summer test pumping results and the commitments made by MNC during discussions with Halalt.	**EAO:** MNC has provided additional information based on comments and requests from the Halalt and the Advisory Working Group. This information becomes part of the Amendment Application.	Address for the purpose of the EA.	
154	A17. Confirmation from EAO that MNC must provide full descriptions of how it will try to prevent, and what it will do, if: a. the water release fails during a critical low flow period, b. Holyoak Lake can't provide enough water for the water release, c. the water release is not as effective as predicted, d. a future MNC council loses commitment to the water release, e. MNC abandons its surface water system, and becomes totally dependent on Chemainus Wells water, f. demand for summer water grows but water for release stays same or declines.	See MNC responses on lines 107, 108 and 114. EAO with the assistance of the Advisory Working Group will evaluate the information presented on the water release program proposed by MNC. If the Amendment were approved, there would be leagally binding condition(s) that MNC would have to comply for the water release program. **EAO Note:** Conditions D5 has gauge measuring of water release and D4 has water release requirements including measure that will be taken if the flows do not meet the requirements of Condition D5.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D4 and D5 in Schedule B of the Environmtal Assessment Certificate.	
155	A18. Acknowledgment from EAO and MNC that Halalt's position is that it has an ownership interest in the groundwater removed by the Chemainus Wells.	EAO acknowledges Halalt's assertion of ownership of the groundwater. This issue was also raised in Comment #127 above.	See #127 for conclusion.	
156	A19. During the July 6, 2017 Working Group meeting, MNC pointed to various payments from MNC to Halalt regarding other matters and implied incorrectly that these were accommodation measures relevant to the summer pumping application. Similarly, the Application, section 5.3, p.57, discusses MNC's support for the Westholme Side-channel Restoration project and implies incorrectly that this support is an accommodation measure relevant to the summer pumping application. This must be corrected.	As part of the construction of a new Chemainus River Bridge on Chemainus Road in 2013 an Environmental Assessment of the project was undertaken by Current Environmental. The replacement of the old bridge with a new 2 span bridge resulted in the removal 76.5 m2 of creosoted wood piles and their replacement with 1.3 m^2 of steel piles. Current Environmental estimated 2 m^2 of river bank restoration would be required for the new bridge to compensate for this work. The restoration, recommended by Current Environmental, was completed as part of the bridge construction. However, Halalt First Nation requested that additional environmental compensation be provided for the Bridge construction, which MNC agreed to. The compensation requested by Halalt FN was to make improvements to the Westholme side channel. Halalt had concerns about potential impacts of the Chemainus Wells project on the Westholme side channel and wished to rehabilitate the channel. The upper portion of the channel was drying up annually prior to the operation of the wells. The work involved removal of sediments to restore spawning beds and holding pools, adding spawning gravel and connecting the decommissioned Halalt well with new piping to a new storage pond. The pond was designed to store and release the well water into the Westholme side channel to ensure the channel is supplied with water in the summer. More specifically the work involved: 1. In 2012, $10,000 funding was provided by MNC for the survey of the Westholme side channel to determine a restoration plan 2. In 2012, $30,000 funding was provided by MNC to Halalt FN for Westholme side channel restoration. 3. In 2013, $75,000 was provided by MNC to Halalt FN for the second phase of Westholme side channel restoration, which included the connection of the old Halalt well to a new storage pond to regulate the flow to the channel and a future hatchery. Response continued on next line.	Response provides MNC's view of accommodations provided to the Halalt. **EAO Note:** The Holder has also communicated to Halalt that they would be interested in discussing opportunities to provide Halalt with capacity funding in order for Halalt to effectively review and participate in ongoing requirements of the Environmental Assessment Certificate.	

	COMMENTS	RESPONSE	Status	Date and Event
	continued from Line 146, Comment A19. above	The above work was funded by and was considered accommodation to Halalt First Nation as an obligation of the Chemainus River Bridge Project. Chemainus Wells Project MNC is proposing the following accommodation related to the Amendment Application to operate the Chemainus Wells 12 months a year: 1. MNC agrees to contribute up to $4000 annually to Halalt FN for BC Hydro charges to operate the old Halalt well to supply the Westholme side channel with water. 2. MNC agreed to contribute $5000 in 2016 to Halalt FN to assist with construction costs for the Hatchery on the Westholme side channel. 3. MNC agreed in 2015 to assist Halalt FN funding of its pre and post Amendment Application costs for consultants in the amounts of $5000 and $10,000. 4. MNC agrees to the release of 73 L/sec from the Holyoak Lake and Banon Creek system to the Chemainus River between June 15 and October 15 to supplement Chemainus River flow. 5. MNC agrees to continue the existing Monitoring Program and reporting of river flow and groundwater levels for an additional 3 years.		
157	A20. Confirmation from EAO that there is no legally enforceable guarantee that MNC will meet Certificate requirements. For example, if MNC fails to provide water release required by the Certificate then any enforcement action would be after-the-fact and at EAO's discretion.	**EAO:** If the Amendment is approved, there would be legally binding condition(s) the MNC would have to comply with. EAO's Compliance and Enforcement group does both inspection and reports on compliance with the Certificate. Conditions C7 (Compliance Verification and Reporting with a copy of the report to Halalt), C8 (Compliance Notification which includes notification to Halalt), D6 (Monitoring and Monitorng Reporting), D7 (Annual Meeting with the EAO, FLNRORD and Halalt) and D8 (Five Year Effectiveness and Evaluation Review) speak to compliance requirements. Also since the time the original Certificate was issued the EAO has established a Compliance and Enforcement Team that ensure Projects meet the legally binding requirements of the Certificate, including amendments.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions C7, C8, D6, D7 and D8 of Schedule B of the Environmental Assessment Certificate.	
158	A21. Confirmation from EAO that there is no way to prevent MNC from applying for further amendments to Certificate, for example to limit or remove a water release condition.	**EAO:** EAO cannot prevent certificate holders from applying to amend a certificate.	Adequately addressed for the purpose of the EA of the Amendment Application. Section 19 of the BC *Environmental Assessment Act* allows Holders of Certificates to apply for	
159	A22. Confirmation from EAO that there is no guarantee EAO will honour (e.g., reject applications for amendment of) Certificate conditions (e.g., no-summer-pumping) that were made as accommodation of the impact of building the Wells on Halalt's rights and title.	**EAO:** EAO acknowledges that modifying the project to remove summer pumping was a way to address Halalt's concerns about the Chemainus Wells Project during the original EA and to avoid potential adverse effects that could result from summer pumpng, and hence, constitutes an accommodation of Halalt Aboriginal Interests. The Certificate condition prohibiting the operation of the Chemainus wells from June 15 - October 15 has been complied with through a legally binding condition. The purpose of this amendment process is to determine the impacts including impacts to Halalt's Aboriginal Interests should the Chemainus Wells be allowed to operate year-round and the mitigation and accommodation proposed. The proposal that is currently before EAO does contemplate summer pumping, but with a measure that was not contemplated during the original EA, which is that water would be released from Holyoak Land and Banonb, premised on the notion that with this water release measure, potential adveerse effects arising from summer pumping would be avoided.	Adequately addressed for the purpose of the EA of the Amendment Application.	
160	A23. Confirmation from EAO that Halalt has no recourse short of litigation if water release fails to operate as promised.	**EAO:** If the water release is included as a condition if a certificate is issued then it would be legally binding and EAO would enforce the condition. Condition D4 addresses release of water and notifying EAO, FLNRORD and Halalt if there is a problem with release of water. Mitigation measures or adaptive management measures to be implemented.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D4 of Schedule B of the Environmental Assessment Certificate.	
161	A24. Confirmation from EAO that under MNC's summer pumping proposal MNC gets all the benefit of summer pumping in terms of a. financial cost savings for surface water treatment, and b. drinking water supply for residents and future growth.	**EAO:** EAO assesses environmental impacts from projects including impacts to Aboriginal interests and does not undertake a cost benefit analysis.	Addressed. Clarification provided.	
162	A25. And Halalt bears all the risks of summer pumping, including: a. water release fails at a critical low flow period, b. Holyoak Lake can't provide enough water, c. water release is not as effective as predicted, d. in the future MNC loses commitment to water release, e. MNC abandons the surface water system, and becomes totally dependent on Chemainus Wells water, f. demand for summer water grows but water for release stays same or declines, and g. impact on Aboriginal rights and title.	See response to Comment #154 above. **EAO:** EAO has stated that our approach to this Amendment is to ensure no impacts should the Amendment be approved. Condition D4 addresses release of and notifying EAO, FLNRORD and Halalt if there is a problem with release of water. Mitigation measures or adaptive management measures to be implemented. See Comments #104, #197, #108, #111, #133, #146, #171, #200 and #201 for additional responses on Holyoak Lake water supply, sustainability and water release.	Adequately addressed for the purpose of the EA of the Amendment Application. Conditions D4 and D5 in Schedule B of the Environmtal Assessment Certificate.	
163	A26. Acknowledgment by EAO that Halalt is concerned that Island Health is driving summer pumping.	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
164	A27. Confirmation by EAO that Island Health's conduct in relation to the Application is a component of the Crown's actions to meet its duty to consult and accommodate.	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	
165	A28. Island Health states that the surface system "is putting the public's health at risk." If so, what is Island Health doing to require development of an alternative to summer pumping?	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	
166	A29.Island Health openly supports year-round pumping despite incomplete information about summer pumping, water release, and impacts on Halalt's rights and title.Island Health should withdraw this position.	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	
167	A30. Island Health should confirm and explain its apparent lack of enforcement of the order to MNC to design surface water treatment by January 1, 2016 and to complete construction by January 1 2017.	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	
168	A31. Halalt objects that Island Health paints HFN's stewardship of the River and Aquifer and Aboriginal rights and title as blocking public health.	**EAO:** Island Health has provided a letter to the Halalt clarifying their role in the Amendment process and their role in ensuring safe drinking water.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	
169	A32. Confirmation by EAO that it will take a substantive role by determining whether MNC's responses to issues are actually valid and not just that a response has been provided. Halalt does not want to be taken by surprise by EAO stating conclusions in EAO's draft report to the EAO executive director that EAO has not disclosed to Halalt during the ongoing dialogue.	**EAO:** EAO will be sharing in meetings or through ongoing communication the early findings of the Amendment process. EAO will also share EAO's draft Assessment of a Certificate Amendment report with the Halalt.	Addressed for the purpose of the EA.	
170	B1. Cursory rejection of Island Health's-ordered improvements in treatment for surface system a. The Island Health Permit to Operate a Water Supply System is Attachment 2 of Appendix B of the Application, pdf p.157. The February 18, 2014 Appendix A of the Permit notes that MNC has applied to EAO for a Certificate amendment to allow summer pumping. The VIHA permit orders MNC during the Certificate amendment process to "begin to plan for the treatment of the Banon Creek [surface] supply should the EAO not allow the deep wells to be used." b. Further, Island Health requires MNC to complete the construction of surface water treatment works by January 1, 2017. Appendix A of the VIHA Permit requires the design for these treatment works (a new UV/filtration treatment system for the Banon Creek supply) to be completed by January 1, 2016, with construction completed by January 1, 2017, subject to the date of a decision by the EAO on the use of the deep drilled wells." c. The Application does not discuss whether MNC has complied with the requirement to complete the design for treatment works by January 1, 2016. This is a deficiency that should be corrected. d. The Application does not discuss whether MNC has complied with the requirement to complete the construction of the treatment works by January 1, 2017. This is a deficiency that should be corrected. e. To Halalt's knowledge, MNC has not provided any information in the amendment process about MNC's planning for surface water treatment.	See MNC's Response on Line 110.	Adequately addressed for the purpose of the EA of the Amendment Application. Alternative water supply is not within the scope of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
171	B2. Modelling of long-term sustainability of Holyoak Lake with water release is inadequate a. Reference: Application, Appendix F, Holyoak Lake Storage Review, October 6, 2014, by MNC. Has there been any additional examination of Holyoak Lake water storage? If so, please provide it. b. "800 acre feet (217 million gallons, 985,390 m3) of water stored at Holyoak Lake will be available to supplement summer flows in the Chemainus River." [p.1 of 9] Is this licenced storage, active storage? c. Has there been any previous instance in which 800 acre feet of storage has been drawn down in Holyoak Lake? If so, please describe the circumstances. If not, what is the largest annual draw down of Holyoak Lake on record? d. How does MNC know that 800 acre feet is actually available? Please provide information (e.g., lake bathymetry, water balance for the Holyoak Lake watershed, etc.) to support this volume estimate. e. How does the 800 acre feet relate to the flow release measured at the metered discharge point at the Banon Creek Dam/reservoir site? Is there an adjustment for water loss between the Holyoak Lake weir and the metered discharge point? f. Confirm that annual recharge of Holyoak Lake failed twice (i.e., the level of the lake was not at its maximum early in the summer, thus reducing its available stored volume) in the 10 year period on which the conclusions are based (2002/2003 and 2004), once due to drought and once due to mechanical failure/human error. g. Two mitigation release options of 73 L/sec and 37 L/sec continuously between June 15 and October 15. Confirm that "continuously" means 24/7.	a. See line 133 and 111 Responses which provide additional information b. Licenced storage is 1000 acre feet. The Holyoak Lake facility stores 800 acre feet in live storage, which is available to supplement summer flows in the Chemainus River. c. See line 133 Response which provides additional historical records and summary of events such as droughts and water conservation measures. d. See line 133 Response e. The flow over Banon Dam and community water use are deducted from historical Lake level curves resulting in the normalized lake level curves. The normalized lake level curves reflect the level of the lake accounting for evaporation from the lake and seepage losses to Banon Creek. The normalized lake level curves are then used to deduct the 73 L/s release to predict the lowest lake level for the year examined. f. See line 111 and 133 Responses, which provide additional historical records and analysis. g. Yes, the 73 L/sec and 37 L/sec release options were analyzed running continuously or 24hr/day, 7 days/week between June 15 and October 15. **EAO note:** Ecofish provided an updated report dated October 11, 2017 on Long-term sustainability of Holyoak Lake which was shared with the Working Group on October 27, 2017. See also #200 and #201 below for responses on the sustainability of Holyoak Lake.	Adequately addressed for the purpose of the EA of the Amendment Application. Beyond the scope of review as MNC already has a water works license for Holyoak Lake from FLNRORD.	
172	(B2. Continued) h. Why is 37 L/sec modeled? Isn't the concept to release 73 L/sec? i. "...the peak daily flow rate will not reach the 75 L/sec max flow allowed in Certificate #W09-01 for more than 30 years." [p.3] Why is this relevant to the modeling of the water release concept? j. Storage curves for Holyoak Lake. How recent is the bathymetric data on the shape of the Lake behind the dam? k. What information does MNC have on the extent to which Holyoak Lake is subject to sedimentation? What are the projections for future sedimentation? l. Stage-storage curve data was limited to 2002 to 2013. What is the effect of considering earlier stage-storage curve data? m. What analysis has been done to correlate stage-storage curve data with temperature and precipitation data? How far back does the temperature and precipitation data go? Would weather data provide useful information about historical drought severity and duration? n. The 2002 and 2003 curves were considered representative of the worst case scenario. These are two years out of a sample of 10 years. What makes these a "worst case" scenario? o. Using approximation techniques, if 2002 and 2003 are the worst case in a ten year period, what is the estimated worst case in a 100 year period? Show the results on the stage storage curve graph. p. Can MNC's Appendix F worst case scenario be described as a 10-year worst case scenario? If not, how should it be characterized? q. Confirm that the concept is that water would be released from Holyoak Lake by gravity, and that no pumping is contemplated.	h. The 37 L/sec release option was modeled in the 2014 Holyoak Lake review. The average Chemainus community water use in 2014 when the review was completed was about 37 L/sec. i. Since the 2014 Report in Appendix F was completed MNC has updated the community growth estimates. (see line 108 Response) At the 2011-2016 growth rate of 0.74 % it is estimated that the 75 L/sec well extraction rate won't be reached for 95 years. This is relevant as it confirms that a 73 L/sec release is very conservative. This provides a significant accommodation of Halalt FN's concerns about the impact of summer well operation on Chemainus River flows. j. See line 133 Response k. MNC has worked with logging companies who have logged within the Holyoak Lake Watershed over the years to ensure they are logging in a manner that controls sedimentation including decommissioning of old logging roads. MNC does not have a projection for the sedimentation of Holyoak Lake. l. See line 133 Response m. See line 104, 133 and 111 Responses which provide additional information. n. See line 133 and 111 Responses which provide additional information. o. See line 133 and 111 Responses which provide additional information. p. See line 133 and 111 Responses which provide additional information. q. It is proposed that the 800 acre feet of Licenced live storage will be used for the release. However, Holyoak Lake also has approximately 280 acre feet of dead storage below the Banon Creek outlet. This would have to be pumped or siphoned in order to use it. See line 114 Response for information concerning short term use of dead storage.	Addressed. Responses provide clarification on the comments raised.	

	COMMENTS	RESPONSE	Status	Date and Event
173	(B2. Continued) r. Is 800 acre feet the amount of active storage above the Holyoak Lake weir/controlled discharge point? If not, what is the active storage above the weir? Show this on the stage storage curve graph. s. "...once the normalized curves are drawn down for the various water release scenarios, that water would no longer flow over the weir and so must be allowed to remain in the Lake. This means that we need to determine the typical volume of precipitation that falls on or runs-off into the Lake." [pp.4-5] Please provide the precipitation assumptions used for the results of the models presented in the Application including assumed precipitation between June 15 and October 15. t. How does the model link precipitation data to the quantity of water in the Lake (e.g., run-off, evapotranspiration)? u. Fully describe the precipitation data and the precipitation numbers used in the model runs. v. Were any adjustments made between precipitation data and precipitation numbers used in the model runs? w. Does the "worst case scenario" run use combined 2002 and 2003 precipitation data? What amount of precipitation is this? x. What are the results of a model run in which zero precipitation is assumed for June 15 to October 15? y. "For the worst case scenario, the 73 L/sec release users approximately 94% of the volume of Holyoak Lake..." [p.5] Define fully "volume of Holyoak Lake" used in this measure. z. If 94% of the volume of Holyoak Lake is a 10-year worst case scenario, what is the estimate for a 100-year worst case scenario?	r. See line 133 Response. Holyoak Lake has 800 acre feet of live storage above the outlet gate. s. See line 133 and 171 Responses and also Ecofish October 11 2017 memorandum, which analyzes the effect of climate change on Holyoak storage. t. See response for item s). u. See response for item s). v. See response for item s). w. See response for item s). x. See response for item s). y. The total volume (licenced live storage and unlicensed dead storage) of Holyoak Lake is 1,332,158 m3. (1080 Acre feet). The licenced live storage of 986,784m3 (800 Acre feet) is 74% of the total lake volume with unlicensed dead storage being the remaining 26%. For the worst-case scenario in the 2017 update to the 2014 Holyoak Lake Storage Review the 73L/sec release uses approximately 92% of the live storage volume or 68% of the total lake volume. z. See Ecofish, October 11, 2017, Memorandum entitled Long–term sustainability of Holyoak Lake which includes an analysis of the impact of Climate Change on Holyoak Lake Storage to 2050 and Updated Appendix F Amendment Application-Holyoak Lake Storage Review.	Addressed. Responses provide clarification on the comments raised. Additional information provided on October 11, 2017	
174	B3. Environmental impact of water release on Holyoak Lake is not examined a. Provide an analysis of the environmental impact of the water release concept being carried out into the indefinite future. Include the impacts of a defined worst case scenario. b. Confirm that MNC has in hand any and all regulatory approvals for it to use 94% of the volume of Holyoak Lake for the purpose of the water release concept. Alternatively, what additional approvals would be required? c. Please provide examples of environmental impact assessments of projects involving the annual removal of up to 94% of the volume of a B.C. lake. If there are none, please confirm. d. For the record, does MNC consider that using 94% of the volume of Holyoak Lake is fully acceptable? e. Can MNC guarantee that it will be legally and practically able to use 94% of the volume of Holyoak Lake in one or more years for duration of summer pumping?	a. An impact assessment of Holyoak Lake is not required, as a Water Licence is already in place for storage and release. b. MNC has a Water Licence for 1000 acre feet of water from Holyoak Lake, and the current facility to store 800 acre feet of live storage and 280 acre feet of unlicensed dead storage. All scenarios of water use for mitigation release are with respect to the 800 acre feet of licenced live storage, not the entire lake volume. See also Line 114 Response. c-e. All scenarios of water use for mitigation release are with respect to currently Licenced active storage, not the entire lake volume. See also Line 192 FLNRO Response.	Adequately addressed for the purpose of the EA of the Amendment Application. Beyond the scope of review as MNC already has a water works license for Holyoak Lake from FLNRORD.	
175	B4. Ecological effectiveness of water release is not fully analyzed a. What will be the effect on the quality (temperature, turbidity, sediment, algae, etc.) of the water released from Banon Creek to the Chemainus River when drawing down Holyoak Lake to as much as 94% its volume? b. Please fully discuss whether and under what circumstances MNC would halt summer pumping due to a risk of harm to Chemainus River flows or to the Chemainus River ecosystem.	a. The ecological effectiveness of the release has been analyzed in detail with respect to habitat suitability for fish in the Chemainus River, and surface water temperature. Holyoak Lake has been providing drinking water to Chemainus for over 60 years. Drinking water guidelines are much more stringent for most water quality parameters than those for the protection of aquatic life. The Holyoak and Banon watersheds are a natural source of inflow to the Chemainus River. b. Any conditions for cessation of pumping from the Chemainus Wells would be clearly articulated as conditions in the water licence and Amended Certificate. MNC has provided documentation confirming water releases to the Chemainus River from the Holyoak Lake /Banon Creek system during the June 15- October 15 period will provide a substantial benefit to the Chemainus River flows, fish habitat and water temperature.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D3 requires the extraction rates to be reduced to mitigate adverse effects identified in the Annual Monitoring Reports and Conditions D6 addressed monitoring requirement.	

	COMMENTS	RESPONSE	Status	Date and Event
176	B5. No surface water supply contingency plans if water release not available a. MNC should fully describe how it will provide drinking water in the event that the Certificate amendment application is rejected. What exactly is MNC's best alternative to approval of its summer pumping request? b. Confirm that summer pumping of the Chemainus Wells is not the only way for MNC to provide safe drinking water to the users of its water supply system. c. Confirm that Halalt's concerns about the effect of summer pumping and water release on the watershed and its Aboriginal rights and title are not standing in the way of MNC providing safe drinking water to its residents. d. Confirm and fully describe MNC's plans to maintain the Banon Reservoir surface water supply works in the hypothetical event that summer pumping is approved. e. Please confirm, if this is the case, that MNC plans to rely on a secondary water supply that does not comply with VIHA's requirements for a safe drinking water supply. If so, does MNC have VIHA's approval for this approach? f. Confirm that if summer pumping is approved MNC's contingency plan to supply water to customers in the event of any interruption in supply from the Chemainus Wells is to use surface supply from the Banon Reservoir with a boil water advisory regardless of turbidity measurements. g. What is MNC's plan for water supply when the Chemainus Wells are fully utilized in accordance with the Certificate? Does MNC intend to use surface supply from Holyoak Lake/Banon Creek reservoir or is that source fully committed to the water release concept?	a. MNC's alternate supply option, should the Amendment to operate the wells year round not be approved, is to provide treatment of the Banon Creek supply. b. It is MNC's legal duty to supply water to Chemainus residents in a cost-effective manner while limiting and mitigating any impact from well operation on the environment. MNC has selected the option of operating the wells year round as there are no extra costs to the water users other than extra hydro costs for 4 months of additional well operation. However, as documented in the Amendment Application the cost to provide treatment on the Banon Creek supply is in excess of $10M plus substantial operating costs. The transfer of the source of Chemainus' summer water supply from the Holyoak Lake/ Banon surface water supply to well water supply from the Chemainus aquifer presents an enhancement opportunity that has not existed until now, that being using the Holyoak Lake /Banon Creek supply to supplement flow in the Chemainus River. Releasing water from Holyoak Lake and Banon Creek for the June 15 to October 15 period will substantially increase the flow in the river when the river is at its lowest. MNC has provided documentation confirming that operation of the wells year round with water releases to the Chemainus River from the Holyoak Lake /Banon Creek system during the June 15 to October 15 period provides a benefit substantially above potential impacts to the River flows, fish habitat and temperature. c. See line 138 and 139 Responses d. See line 114 Response e. See line 114 Response. Should MNC be required to use the Banon Creek water supply, it will consult with VIHA at the time to determine their requirements. f. See line 114 Response Response continued on next line.	Addressed for the purpose of the EA. Responses provide clarification on the comments raised.	
	continued from Line 176, Comment B5. above	g. At the 2011-2016 - 0.74 % growth rate it is estimated that the Certificate- 75 L/sec maximum well extraction rate will not be reached for 95 years. (Or, 68 years if a 1% growth rate is used.) Holyoak Lake storage is committed to the release to the Chemainus River as part of the summer operation of the wells. In the future, the option of raising the dams at Holyoak Lake to increase live storage by 200 acre feet may be explored, given that MNC is using only 800 acre feet of its 1000 acre feet Licence.	See above.	
177	B6. Wells drawing water from the River a. Please confirm that the groundwater supply from the Chemainus Wells system is shown by the summer test pumping to be "under the direct influence of surface water" i.e., the Chemainus River. b. Has MNC reported to Island Health that the groundwater from the Chemainus Wells may be at risk of containing pathogens (GARP)? If so, what is Island Health's response? If not, why not? c. Should the Wells fall under the GARP regulation, will it mean that treatment of the groundwater will be required? If so, confirm that this lends support for MNC installing treatment of the surface water system instead of using summer pumping.	a. MNC believes that summer pump testing of the wells does not show that the wells and the river are directly hydraulically connected. Information suggesting that the connection between the wells and the River is indirect is provided by the 2016 test pumping data. More specifically, there is continued drawdown with log-time in the pumping and observation wells, whereas it would be expected to be constant if there was a direct connection to the River. From lithology gathered during well drilling, the low-permeability till layer is discontinuous throughout the areal extent of the aquifer. However, the till was found to be approximately 0.3 to 1.3 m thick in the area of the DNC production wells. The production wells have been built to the requirements of the current Groundwater Protection Regulation. All wells contain surface seals and are completed above the 200 year flood level. Well monitoring results since 2010 have shown that well turbidity is unaffected by high turbidity events in the Chemainus River. Turbidity levels in the well water remain consistently low. MNC (Thurber Engineering Ltd.) in June 2007 undertook a GUDI assessment of PW#1, PW#2 and PW#3, which included microscopic particulate analyses (conducted by Hyperion Research Ltd.) and the results showed a risk factor of zero. MPA testing was also undertaken for PW#2 and PW#3 in June 2014 by Hyperion with the same results. This information was provided to VIHA. MNC provides treatment of the well supply using chlorine. b. Well sampling results have been provided to Island Health regularly since the wells started in October 2010. Island Health, as a member of the EA working group, is aware of the summer testing results. Island Health have requested that MNC meet with them to discuss the GARP status of the wells. Response continued on next line.	Adequately addressed for the purpose of the EA of the Amendment Application.	
	continued from Line 167, Comment B6. above	c. MNC does not believe that additional treatment is required for the Chemainus Well water supply over and above the present chlorination provided. If treatment of the well water supply is required it will most likely involve the installation of UV treatment which would cost about $1 M. This would be approximately 10% of the cost to treat the Banon Creek supply. (see Appendix B of the Amendment Application for estimated Banon supply treatment costs undertaken by Delcan in 2008)		

	COMMENTS	RESPONSE	Status	Date and Event
178	B7. Inadequate analysis of sensitivity of results to extreme weather conditions, e.g., multi-year drought a. The only "worst case scenario" analyzed by MNC is based on the worst two years out of a ten year period. This is inadequate. b. Pulse tests were used to show that water released from Banon Creek to the River would reach the Wells area. To what extent is this affected by extreme drought conditions?	a. See line 111 and 133 Responses. b. See line 104 Response. Holyoak releases have been reliable and have effectively supplied the community of Chemainus with water supply for over 60 years (since 1955), even in extreme drought years. Water releases will be measured at the outlet of Banon Reservoir, which is a short distance from the Chemainus River. The morphology downstream of Banon Reservoir is steep and ends at a bedrock falls. There is no a priori reason to expect releases to not reach the Chemainus River, where they will have an immediate benefit during periods of low flow, especially during extreme drought conditions.	Addressed for the purpose of the EA. Response provided clarification on the comments raised.	
179	B8. Monitoring plan associated with summer pumping is inadequate a. Halalt must be involved in both developing a plan and participating in implementation of a monitoring plan. b. Zero proposed changes in the winter pumping monitoring plan to account for summer pumping and water release. c. The only proposed change is to extend the existing monitoring by three years, extendable by Regional Water Manager, MOE. Why only three years? d. The monitoring plan fails to address the water release program at all. Nothing about how it's actually operating (e.g., from monitoring the status of Holyoak Lake – water level, temperature, discharge rates, to the water quality and ecosystem health downstream of the well field), whether it maintains River flows during summer low flow periods, whether it is effective in protecting fish, fish habitat and river VECs, effect of pumping and water release on temperature of River, environmental impact on Holyoak Lake. e. The application p. 56 states that annual monitoring reports have been presented: to whom? f. The application cites Thurber 2008, 2009a, 2010, 2011, 2013, 2014b. Where are they? If they are on the internet, they are not easily found. g. Only three of those cites are titled "Annual Monitoring Report" – why? Where are the annual monitoring reports for 2015 and 2016?	a. The Amendment Application proposed ongoing annual groundwater and surface water monitoring as per the original EAC. This monitoring plan was developed in 2009 with input from Halalt First Nation and approved by the MOE. Continuous monitoring has been in place since 2006 and will be continued. This includes: • 15 groundwater monitoring wells (including MOE and Halalt wells) to monitor levels and temperatures • 3 river gauges in addition to the WSC gauge • Monitoring of the 2 MNC Pumping wells • Monitoring of the 2 stilling wells in Westholme side channel Implementation of the Monitoring plan is undertaken by MNC's expert consultants Ecofish Research Ltd. and Western Water Associates Ltd. MNC assists with downloading the level loggers and are escorted by a Halalt First Nation employee. See also Line 107, 108 and 109 Responses. b. The EA Certificate under D3 (shown highlighted below) requires an annual review of the operation of the wells: **D3 In the Annual Monitoring Report, a person registered as a member of the Association of Professional Engineers and Geoscientists of British Columbia with competency in the field of hydrogeology, will provide an opinion, with reasons on:** **a) Whether the operation of the groundwater production wells have impacted:** **i) Groundwater levels in the Chemainus River Aquifer, ii) flows in the Chemainus River; iii) the yield of the Halalt First Nation's well; iv) the Westholme side channel; and** **b) The magnitude of the effects resulting from the impact identified in a).** Response continued on next line.	Addressed for the purpose of the EA. Aquifer monitoring plan was addressed during the original EA. Plan developed by EAO's hydrogeologiy consultant, Halalt's consultant and MNC's consultant. MNC has been monitoring for river flow, groundwater and temperature during the dry summer period. MNC also added additional locations besides the one identifiied in the plan. Condition D6 addresses these additional locations. Condition D7 requires annual meeting between EAO, FLNRORD and MNC to discuss to review and discuss the results and provide input into MNC's management of flow. For easy access to the Annual Monitoring Reports, EAO has posted the Annual Reprts prepared to date to ePIC and these reports can be view under the following link: https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=77	
	continued from Line 179, Comment B8. above	**If, in the reasonable opinion of the Regional Water Manager BC Ministry of Environment (Nanaimo), a reduction in groundwater extraction rates from the Project's groundwater production wells is needed to mitigate adverse effects identified during annual monitoring, the DNC will reduce groundwater extraction rates to the satisfaction of the Regional Water Manager, BC Ministry of Environment (Nanaimo)** EAO Note: **This Condition clause was rescinded and replace with EAO being the Authority and in consultaiton with FLNRORD and Halalt, any reduction in groundwater extraction rates if needed.....** This requirement, to have Qualified Professionals undertake an annual review, is valid for both the present operation of the wells from October 15 to June 15 period and the expanded year round operation of the wells. MNC considers that by addressing a and b above annually MNC directly addresses Halalt's concerns about impact of summer well operation. c. MNC has been monitoring the Chemainus aquifer and river as noted in a. above since 2006. An additional 3 years of monitoring is considered reasonable by MNC to detect changes related to year-round operation of the wells. The Certificate states the Ministry of Environment may extend the Monitoring Program d. MNC presently monitors and will continue to monitor levels of Holyoak Lake and the Banon Creek Reservoir. The release from the Holyoak Lake/Banon Creek system of 73 L/sec will be monitored at the Banon Dam meter. The 73L/sec release (7 times the measured 9.9 L/sec impact of the wells when pumping at their maximum capacity) is considered to provide a significant factor of safety. Existing monitoring gauges will continue to monitor river flows and temperatures and aquifer levels and temperatures and the results will provide the information required by the Qualified Professionals to respond annually to D 3 of the Certificate. See also the Line 175 a Response.		

	COMMENTS	RESPONSE	Status	Date and Event
	continued from Line 179, Comment B8. above	e. A hard copy of the Annual Monitoring Report has been sent directly to Halalt FN yearly. See also Line 118 Response. f. See e. Response. MNC has also sent these Annual Reports to EAO, BC Ministry of Environment, Western Economic Diversification Canada and DFO (Nanaimo Office). MNC has not posted these reports on the MNC website but can do so, if required. See also Line 118 Response. g. See e Response.		
180	C1. The May Issues Tracking Table has no entries in the column "Has the issue been addressed." This significantly reduces the value of having an issues tracking table. The parties need to know whether MNC considers a certain point to be resolved or not.	**EAO:** That column is for EAO use and at this point we haven't receive input from the Advisory Working Group to make that determination	Addressed. Responses added to column	
181	C2. It is very awkward to provide comments on Issues Tracking Table. There is no sequential numbering of the issues. The original version is an Excel spreadsheet, which doesn't (easily?) allow track changes, doesn't have page numbers and the row numbers are not necessarily fixed. The pdf version allows "add text" boxes and "comments" but these are awkward and difficult to line up with the appropriate text.	Unique IDs have been provided to allow easier reference to individual comments and responses.	Addressed.	
182	C3. Halalt wish to highlight that there is no resolution of the following issues: a. "5. Acknowledgment that the results of the testing program will be only one part of the information the EAO will require in order to properly decide whether to remove the ban on summer pumping." b. "6. Acknowledgment that it remains to be determined whether test pumping in future years will be needed before summer pumping can be safely allowed." c. "7. Acknowledgment that the long-term sustainability of the Holyoak Lake water release concept is a separate matter [than test pumping] that has not yet been addressed." d. "v. The results of the testing program will be only one part of the information the EAO will require in order to properly decide whether to remove the ban on summer pumping." e. "vi. It remains to be determined whether test pumping in future years (after 2016) will be needed before the EAO can decide on the Holyoak Lake water release concept removing the ban on summer pumping." f. "vii. It remains to be determined whether the water release concept is sustainable in terms of the effect on Holyoak Lake."	**EAO:** All of these questions and input are part of the review for the Amendment and will be answered during the review. Additonal information from the 2016 summer pumping provided empirical information to allow Ecofish to provide an updated report on Chemainus River instream flow (August 17, 2017), the Long-term Sustainabilty of Holyoak Lake (October 11, 2017). This updated information can be found under the following link: https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=86	Adequately addressed for the purpose of the EA of the Amendment Application.	
183	(C3 Continued) g. "14. Ecofish Dec. 16, 2016 Draft. The Summary on pages 24-25 compares the volume of the estimated reduction in river flow due to groundwater pumping (average and max) to the volume of the proposed Banon Creek water release (upstream). Is this a valid comparison? Shouldn't the comparison be to the change in river flow [and quality] at the pumping location [and downstream of it] due to water release?" h. "14 i. Please discuss in the conclusion the relationship between the average and max volume of estimated reduction in river flow due to groundwater pumping to the volume of river flow at the extreme low flow point. Confirm, or otherwise discuss, that groundwater pumping in the absence of water release during seasonal low river flow would have a significant adverse effect on the river environment." i. "17. Re the figure Aquifer Temps – Pumping Wells, please discuss in more detail the observation that for PW2 and for PW3 (somewhat differently) it seems that pumping induces recharge of warmer surface water. Does this imply that pumping during times of low river flow produces some portion of surface water for distribution?"	g. The Ecofish Dec. 16, 2016 draft report has been superceded by the April 6, 2017 report. In both reports, the estimated reduction in river flow due to groundwater pumping is compared to the observed flows at the gauge nearest to the pumping location (SWB1-2) - this is the change in in river flow due to groundwater pumping. In addition, the average and maximum change in flow at the gauge is quantified in relation to the Banon flow releases to provide a measure of the effectiveness of mitigation flows. The response to river flows at SWB1-2 and SWD-1 to Banon flow releases is discussed in Appendix G of the Amendment Application. This Appendix summarizes the Holyoak Lake Test Release results and the MNC mitigation plan. h. This question was asked previously by Gilles Wendling (GW Solutions). A response to the question has been provided in row ID 59 in this tracking table. i. This question was asked previously by Gilles Wendling (GW Solutions). A response to the question has been provided in row ID 62 in this tracking table.	Adequately addressed for the purpose of the EA of the Amendment Application. Responses provide clarification on the comments raised.	
184	C4. Regarding points 16, 17, 18, and the follow-up point 9, Halalt is not convinced that the test pumping methodology can be relied upon for an accurate quantitative estimate of the reduction in river flows due to pumping during low flow conditions.	MNC and its consultants worked with Halalt to design the approach to the test pumping program and the data to be collected during the program. MNC and its consultants provided draft technical memos for consideration by Halalt, met multiple times to discuss the methods, results and analyses, adjusted approaches, and clarified conclusions in response to review comments by Halalt.	Adequately addressed for the purpose of the EA of the Amendment Application.	
185	C5. Regarding point 23, Halalt's view is that the stated conclusion that summer pumping with water release would not impact aquatic habitat in the River is not adequately supported.	MNC and its consultants worked with Halalt to design the approach to the test pumping program and the data to be collected during the program. MNC and its consultants provided draft technical memos for consideration by Halalt, met multiple times to discuss the methods, results and analyses, adjusted approaches, and clarified conclusions in response to review comments by Halalt. **EAO note:** Based on the empirical data from 2016 Ecofish provided an update to Chemainus River Instream Flow (August 17, 2017) that assessed stream flow, fish and fish habitat. This update can be reviewed here: https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=108	Adequately addressed for the purpose of the EA of the Amendment Application.	

	COMMENTS	RESPONSE	Status	Date and Event
186	C6. Regarding point 4, it still appears that defining and modeling the behavior of the river and its interaction with the aquifer under low flow conditions is complex and that the level of confidence relatively low. Please provide further details regarding item 2) of MNC's response.	Hyporheic flow varies at different times and areas on the Chemainus River. For the scope of our study, the flow reduction measurement of 9.9 L/s and the stream depletion estimates previously done by SRK and Thurber provide a quantity on the temporary loss of groundwater input to the River due to pumping. The limited extent of drawdown (described further in Western Water Associates Ltd., 2017) suggests that the zone of influence on groundwater flow is limited to a small area. It is therefore reasonable to expect that impact to river temperature would occur over a small area.	Addressed. Response provides clarification on the comment raised. Updated Western Water Associates Ltd. report provided to EAO in April 2017.The report can be reviewed here: https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=102	
187	C7. Regarding point 5, Halalt is concerned that the periods used for validation are short (e.g., maximum three days), between pumping tests (i.e., not taking into account delayed/leaky aquifer effects). Halalt questions whether the critical low flow conditions (e.g., flows between 200 L/s and 100 L/s) are adequately addressed.	The model was validated over 3 periods (a total of 9 days; see #92 for specific dates), when flows were between ~95 - 223 L/s. All validation periods included a buffer after pumping ended to ensure a return to the pre-pumping state. The model performed well for each of these periods. The RMSE for this validation set was 12.9 L/s – a 4.5 L/s increase compared to the training RMSE of 8.4 L/s, but still well within the estimated impact of pumping. The performance of the model during the low flow validation period provides confidence in the results of the model and the magnitude of effect that pumping has on river flows during the lowest flow periods. The RMSE during the validation period was used as an a estimate of uncertainty for the model results.	Addressed. Response provides clarification on the comments raised.	
188	C8. Regarding MNC's response to point 8, "If the EAO Amendment to allow year round well use is approved, there will not be a requirement to keep water turbidity below 1.0 NTU as Banon Creek will not be supplying water to the community," – What about turbidity and pathogens introduced into the River by the released water?	See Line 175 a Response. Responses from FLNRORD Water Authorizations- Aug 10 2017	Adequately addressed for the purpose of the EA of the Amendment Application.	
	Comments from Working Group	**Response from MNC, EAO, others**		
189	EAO has requested a map showing zone of influence of river effects from summer pumping around wells and area of river that will benefit from flow releases.	This is provided in the updated Chemainus River instream flow assessment memo, sent via email on October 27, 2017.	Addresssed.	email request to MNC from EAO
190	Below is a summary of Water Authorization's (WA) perspective on how the licencing phase may address issues related to the certificate amendment application raised by Halalt First Nation.	General comment - no response required.		email to Working Group from EAO, 11 August 2017
191	Issue: Well pumping reduces river flow	FLNRORD Water Authorizations: It has been shown that reduction in river flow can be mitigated by releases from Holyoak/Banon reservoirs. Existing authorizations/licences in terms of storage and release volumes of Holyoak and Banon reservoirs could support a mitigation plan as such. Amendment of the existing rights may involve adding "conservation" purpose to each existing "waterworks" purpose if the release is in excess of what is diverted from the aquifer. Mitigation of flows could be assured through results-based licence conditions where well pumping is contingent on flow releases. North Cowichan would not be in a position to exercise their water rights if the release conditions on the licence were not being fulfilled. Additionally, a condition of the licence could be to monitor and report flows to the province and Halalt.	Adequately addressed for the purpose of the	email to Working Group from EAO, 11 August 2017
192	Issue: Flow release impacts to Holyoak Lake	FLNRORD Water Authorizations: Storage rights on Holyoak Lake (1000 acre-feet) exist regardless of potential impacts related to shoal area exposure from diversion. This is not within the scope of the current decision as these rights have already been established. At present, the storage capacity of Holyoak lake is 800 m3, which at full capacity would exceed the flow requirement (73 L/s) of the mitigation plan.	Adequately addressed for the purpose of the EA of the Amendment Application. Beyond the scope of review as MNC already has a water works license for Holyoak Lake from FLNRORD.	email to Working Group from EAO, 11 August 2017
193	Issue: Impacts to Chemainus River temperature	by well pumping appears to remain uncertain. Potentially impacted habitat due to temperature increases due to loss of groundwater inputs also seems uncertain. We suggest that temperature monitoring should be conducted for at least three seasons to determine impacts at the wells. If the temperature is significantly warmer (>2 deg C), an option could be that North Cowichan offset impacts by habitat compensation e.g. enhance existing or create deep pool habitats fed by cooler groundwater. This would involve mapping to determine where the Chemainus River is gaining groundwater in the lower reaches. We also suggest that if Halalt has knowledge of any existing groundwater upwelling spots that the focus is on enhancing those areas instead of building pools from scratch. However, a condition as such may only be necessary if there is actual impact to habitat.	Adequately addressed for the purpose of the EA of the Amendment Application. Condition D6 requires temperature monitoring for at least five years.	email to Working Group from EAO, 11 August 2017
194	Issue: "Control and Risk Misaligned"	FLNRORD Water Authorizations: With a condition in the licence that would require a release or perhaps an in-stream flow requirement, the ability to exercise those water rights would be contingent upon the licensee ensuring that the release or instream flow requirement (IFR) is maintained. In other words, DNC would need to ensure the releases or IFR were being met in order to divert and use any water. If North Cowichan fails to meet licence conditions/fails to make beneficial use of the water due to an inability to meet licence conditions over a 3 year period (climate change for example), the rights become subject to cancellation (section 94 of the Water Sustainability Act). In this way, the risk is held by North Cowichan – it is their responsibility to ensure the licence conditions are met. With a reporting requirement, all interested parties would be informed.	Comment noted.	email to Working Group from EAO, 11 August 2017

	COMMENTS	RESPONSE	Status	Date and Event
	F. HALALT FIRST NATION COMMENTS ON MNC APPLICATION FOR AMENDMENT OF CERTIFICATE #W09-01 FOR APPROVAL OF SUMMER PUMPING, CHEMAINUS WELLS			
	COMMENTS	**RESPONSE**	**Has the issue been addressed?**	**Date and Event**
	Comments from William Andrews			**September 5, 2017, memo from William Andrews**
195	This is further to my August 2, 2017 memo listing Halalt's comments. Since then Halalt, EAO, MNC and FLNRORD had the site visit on August 21 and Halalt has met to discuss the situation. The purpose of this memo is to highlight several areas of concern. These may be partially addressed in by August 2 list, but I thought it would be useful to set them out specifically.	General comment - no response required.		
196	**1. Deep pools cooled by groundwater.** In summer when River flow is low and warm, fish take refuge in deep pools where the water is cooled by an influx of groundwater. The concept of water release and summer pumping is that the volume of release water will counteract the volume of reduction in River flow due to summer pumping. And, further, that the temperature of the release water1 is below the River temperature and so the release water will not raise the temperature of the River water. Question: What about the potential for the summer pumping to lower the water table and reduce the influx of cool groundwater to the deep pools in the River where the fish are, allowing the groundwater-fed pools to become less cool and less conducive of fish survival? Getting confirmation that the release water is cooler than the main flow of water in the River is important of course. But will summer pumping result in less cool groundwater feeding the deep pools and so the deep pools would be warmer than they would be without summer pumping?	In response to specific questions, MNC provided an email on October 27, 2017 with additional information on temperature of the Banon Reservoir release water relative to Chemainus River temperature. There was no significant change in the river temperatures observed during testing that can be attributed to pumping. In addition, river temperatures at SWD-1 were on average 1.7 °C cooler than the temperatures at SWB1-2 from June 15 to October 1, 2016 (a figure and table are provided in an email sent on October 27, 2017). The SWD-1 gauge is located in the first deep pool downstream of SWB1-2. The SWD-1 water level and temperature logger is mounted at the bottom of a stilling well at the bed of the river, thus it is more likely to pick up groundwater influences than temperature probes located at the surface. The cooler temperatures recorded at SWD-1 during the pump tests and throughout the summer, provide confidence that there is little effect due to groundwater pumping on the temperatures of deep pools within the vicinity of the projected aquifer drawdown. Temperatures at SWD-1 will continue to be monitored during summer pumping to assess effects on deep pools within the Chemainus River.	Adequately addressed for the purpose of the EA of the Amendment Application. Response and updated information addresses concern raised. The email can be accessed at: https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=113	
197	**2. Westholme Channel.** What is the effect of summer pumping and water release on the Westholme Channel? It seems that at the upstream beginning of the Westholme Channel it is unknown what portion of the flow comes from groundwater and what portion comes from River water moving through the dyke. Does the zone of influence of the summer operation of the Wells reach the Westholme Channel? Assuming for discussion that all of the flow at the top of Westholme Channel comes from groundwater and not surface water, then is it likely that summer pumping would lower the water table and reduce the level of water in Westholme Channel while the water release would counteract the reduction in River flow due to summer pumping but not the reduction in flow in the Channel? What reason do we have to be confident that by counteracting the reduction of flow in the River due to summer pumping water release will also counteract a reduction of flow in Westholme Channel due to summer pumping?	Recent restoration efforts have provided Halalt with the capacity to ensure adequate water supply to the Channel during summer, with or without the Chemainus Wells pumping. MNC, working with Halalt, funded and supervised construction of a storage pond on the Westholme side-channel, which is fed from the old Halalt well. Halalt have a new well water supply for the community and the old well was no longer required for this purpose. The Westholme side-channel restoration project can provide an additional 15 L/s of base flow to the side-channel during the summer low-flow period (D. R. Clough Consulting 2014). Halalt had concerns about potential impacts of the Chemainus Wells project on the Westholme side channel during discussions for the original Environmental Assessment when summer pumping was still part of the scope of work. The upper portion of the channel was drying up annually (prior to the operation of the wells). As part of the Chemainus River Bridge project in 2013 a plan was prepared for the Westholme side channel by Dave Clough, of D.R. Clough Consulting (Halalt's Fisheries consultant), to remove sediments to restore spawning beds and holding pools, add spawning gravel and connect the decommissioned Halalt well with new piping to a new ground storage pond. The pond was designed to store and release the well water into the Westholme side channel to ensure the channel is supplied with water in the summer when the river flow and water table is lower. More specifically the work involved: 1. In 2012, the survey of the Westholme side channel to determine a restoration plan 2. In 2012, the first phase of Westholme side channel restoration was undertaken. 3. In 2013, the second phase of Westholme side channel restoration was completed, which included the connection of the old Halalt well to a new storage pond to regulate the flow to the channel and a future hatchery. The above work was funded by the Chemainus River Bridge Project. Response continued on next line.	Adequately addressed for the purpose of the EA of the Amendment Application.	
	continued from Line 187, Comment 2. above	As part of the Chemainus Wells project, MNC is proposing the following works to further support sustained summer flow in the Westholme side channel when the Chemainus Wells are operating in the summer: 1. Funding of up to $4000 annually to Halalt FN for BC Hydro charges to operate the old Halalt well to supply groundwater to the Westholme side channel to maintain flow in the channel. 2. Funding of $5000 in 2016 to Halalt FN to assist with construction costs for the Hatchery on the Westholme side channel to improve the Chemainus River fishery. 3. Continuation of monitoring of the Westholme side channel as part of the Monitoring Program.		

	COMMENTS	RESPONSE	Status	Date and Event
198	**3. Holyoak Lake summer outflow rate.** During the site visit we understood MNC to say that typical summer outflows from Holyoak Lake are about 100 L/s and that this is fairly constant after spillage from the Lake ends. A portion of the 100 L/s is diverted to the water distribution system, and a portion is intentionally spilled at the Banon Reservoir to prevent turbidity. And, if we understood correctly, under the proposed summer pumping and water release regime the outflow from Holyoak Lake would be some 75 L/s (being the amount required to release the 73 L/s measured at the Banon dam in order to provide release water to the Chemainus River). One significant implication is that the amount of water being released from Holyoak Lake would be less during times of summer pumping and water release than it would be during times of surface water supply (75 L/s compared to about 100 L/s). If this is accurate, then it would appear that summer pumping and water release would have less of an impact on Holyoak Lake than the status quo use of surface supply. Halalt would like confirmation that MNC's view is indeed that summer pumping with water release involves less summer outflow from Holyoak Lake than summer surface water supply. And, Halalt would like a written breakdown of the 100 L/s. The estimates of flow to distribution and spillage at Banon Reservoir provided during the site visit are a little difficult to reconcile to 100 L/s.	For 2017 the combined flow for Chemainus community use and flow over Banon Dam varied between 51 L/sec and 77 L/sec between July 18 and October 10. The 2017 flow release from Holyoak Lake to Banon Creek was between 52 L/sec and 101 L/sec between July 18 and October 10. The average release for the July 18 to October 10th period was 81 L/sec. A summary of this information was provided in an email on October 27, 2017. During the release period MNC adjusts the Holyoak release to maintain a small flow over the Banon dam. Setting the volume of release from Holyoak Lake is an operation which MNC has been performing over the past 60 years. The objective of each Holyoak Lake gate setting adjustment is to release sufficient water which in addition to natural flow from the watershed will keep the Banon Reservoir storage pond full without excessively overflowing the Dam and wasting water. MNC has committed to release 73 L/sec at the Banon Creek Dam meter into Banon Creek. Metering the water will provide an accurate measured flow release. In order to provide 73 L/sec it will be at times necessary to release a higher flow of water from Holyoak Lake to account for losses in Banon Creek. Rain and snow melt in the Banon Creek watershed also contributes to flow in Banon Creek during the June 15 to October 15 period although mostly in June and October. In 2017 the Holyoak Lake release started July 18. Between June 15 and July 18 the Banon Creek watershed supplied Banon Creek. MNC believes that summer well use with the 73 L/sec release will generally use more of the Holyoak Lake storage than the present water system use as shown in the 2014 and 2017 Update to the Holyoak Lake Storage Review and the Ecofish, October 11, 2017 Memorandum entitled Long-term sustainability of Holyoak Lake which includes an analysis of the impact of Climate Change on Holyoak Lake Storage.	Adequately addressed for the purpose of the EA of the Amendment Application. Response provided clarification on the comments raised. Additional information provided updated reports.	
199	**4. Effect of summer pumping and water release on River temperature below Chemainus Wells.** Halalt needs more information on the effect of summer pumping and water release on the temperature of the River at and below the Chemainus Wells. We understand that MNC is going to provide further information on the temperature of the release water at the confluence of Banon Creek and the River (as distinct from at the Banon Reservoir) in comparison with the temperature of the River water. In addition, could MNC provide a comparison of the temperature of the release water at the confluence with the temperature of the produced water (groundwater) at the Wells during the summer? And, does MNC have an estimate of the reduction in groundwater influx to the River due to summer operation of the Wells? The concern is that simultaneously reducing the flow of groundwater to the River, reducing the flow in the River due to summer pumping, and increasing the River flow with release water might result in a net increase in the temperature of the River water.	A detailed response to this inquiry has previously been provided in row #103. Also, the well and release water temperatures (before, during and after testing) were provided in Figures 19 and 25 in the WWA report (2017)(https://projects.eao.gov.bc.ca/p/chemainus-wells-water-supply/docs?folder=101).	Adequately addressed for the purpose of the EA of the Amendment Application.	

G. HALALT FIRST NATION QUESTIONS ON MNC APPLICATION FOR AMENDMENT OF CERTIFICATE #W09-01 FOR APPROVAL OF SUMMER PUMPING, CHEMAINUS WELLS

	COMMENTS	RESPONSE	Has the issue been addressed?	Date and Event
	Comments from William Andrews	**Response from MNC**		**November 24, 2017, memo from William Andrews**
	This is further to my September 5, 2017 memo listing Halalt's comments. The purpose is to ask questions about specific topics arising from the package of material from the Municipality of North Cowichan (MNC) that Halalt received on October 27 and November 2, 2017. This memo is not a response to each point addressed by MNC. It should not be inferred that Halalt agrees with points not mentioned in this memo.	General comment - no response required.		

	COMMENTS	RESPONSE	Status	Date and Event
200	**1. Holyoak Lake live storage depletion** GW Solutions has made the attached graph showing Holyoak Lake live storage (%) for summer months by various years and 2017. I understand that the source for the 2017 line is the table on p.50 of MNC's October 27, 2017 memo responding to comments #90 to #189 (51 pages) emailed to us on Nov. 2.1 The line for live storage of the summer of 2017 is noticeably more steeply declining than the decline in other years and the 2017 line reaches a low point about as low as the lowest point of the other years (2002 and 2003). **a)** Can MNC explain this odd result? Is there a data comparability issue? Or did the Holyoak Lake live storage percentage really decline rapidly and to a very low level in summer 2017? If the latter, why? We have potentially related questions regarding Email 7, Update Memorandum of 2014 Holyoak Storage Review, p.5, Graph titled "Historical Holyoak Lake Levels, % of Active Volume." **b)** Q: What year is the steeply dropping straight line that bottoms out at approx. 20 Aug? What is the explanation of the shape of this drawdown? **c)** Q: What is the year of the brown line that starts very low just after 01 March? What is the explanation? **d)** Q: Please show 2017 clearly, for reference.	**a)** MNC Operations staff, in order to supply slightly higher community use and to avoid enactment of a boil advisory when water turbidity exceeds 1 NTU, were in 2017, releasing water from Holyoak Lake at a higher rate. This can be seen in the table on page 50 of Response 188 of October 27 2017. Island Health previously allowed some flexibility when a short duration exceedance of 1 NTU was experienced but is no longer supporting this option. The summer of 2017 was dry with 4.8 mm of rain in July and August vs the 37 year average of 28.3 mm. The community used an average of about 41 L/s over the June 15 to October 15 period which is about 3 L/s higher than the past 5 year average. Chemainus water restrictions remained at Stage 1 until August 31 when the water restrictions went to Stage 2. This corresponded with the Province of BC Drought Level Classification going from a Level 2 to Level 3 Drought on August 31. The Province's 2017 Drought Levels are summarized for East Vancouver Island in a memo to EAO dated December 4, 2017. An explanation of the levels was also attached for information. **b)** This water level curve was for 1980. The shape of the curve appears to be irregular when compared to the other year's levels. MNC records do not provide an explanation as to why so much water was released resulting in the water levels dropping so steeply. The community was using approximately 30% more water than they are presently and were not metered in 1980 which might partially explain the steep drop in the curve. **c)** The brown line is for 1981 lake levels. This is the year the Holyoak Lake outlet gate was opened by vandals resulting in a lower than normal March lake level. After this event the gate mechanism was modified to make it more secure. **d)** The Holyoak Lake level curve for 2017 was provided in a memo to EAO dated December 4, 2017.	Adequately addressed for the purpose of the EA of the Amendment Application. See also FLNRORD response #192 about storage and flow release of 72 L/s. There is already an existing Water Works Authorization for Holyoak Lake.	
201	**Effect of climate change on Holyoak Lake storage availability** Re: Email 6, Ecofish memo October 11, 2017 to MNC re Long-term sustainability of Holyoak Lake. Table 3, Mean annual and monthly past, future projected (taking into account climate change predictions), and change in water inputs to Holyoak Lake using climate data from 1983-2016 and PCIC modelled climate data. Seasonal changes lower water input in Spring-Summer and greater water input in Fall-Winter. Annual change in water inputs is: 101 m3/d. This implies a small net increase in annual water inputs in future years due to climate change predictions. Halalt wants to understand better how the seasonal and annual climate change predictions affect the availability of live storage in Holyoak Lake. **a)** Does the slight increase in predicted annual water inputs mean any increase in live storage? In other words, would increased water inputs in Fall-Winter mean additional water in the Lake before the summer? **b)** Or is the 100% live storage that in almost all years occurs at the beginning of summer the result of overflow into Banon Creek? **c)** Would the storage of additional water expected from more winter rain due to climate change require a modification of the existing infrastructure (i.e., raising of the height of the dams on each end of the Lake)? Table 4 shows Minimum Storage w/ climate predictions and 73 L/s mitigation flow release at a low of 5,119 m3 for the case of 2002 Worst Case Scenario 1. (p.9) **d)** Does this mean that in that (extreme) case there is almost no remaining live storage from which to conduct mitigation flow release?	**a)** and **b)** MNC's experience since 1955 (some 62 years) is that Holyoak Lake fills to overflowing each year prior to the summer use period. The live storage capacity of Holyoak Lake is 800 acre feet and once this is full, excess water flows over the Holyoak Lake Dam spillway to Banon Creek. The slight increase in annual water inputs predicted with Climate Change will result in a more secure water supply (i.e., a higher likelihood that the lake is fully filled each winter). **c)** Modification of the existing Holyoak Lake infrastructure is not required. **d)** The 2002 Worst Case (including Climate Change) Scenario 1 from the October 11, 2017 Ecofish Report predicts that there will be approximately 5,119 m3 of live storage remaining in Holyoak Lake. Yet, in this extreme case there is still 5,119 m3 remaining live storage to conduct the mitigation flow release to supplement Chemainus River flows. This is reassuring as many of the assumptions made by Ecofish in their assessment are very conservative. As noted previously in Response 114, Holyoak Lake has an additional 345,374 m3 (26% of total lake volume) of dead storage. Although this dead storage is not licensed, in the event of an extreme drought it may be possible to use this dead storage to supplement flows in the Chemainus River with approval of the Province under section 10 of the BC *Water Sustainability Act* for short term use of water.	Adequately addressed for the purpose of the EA of the Amendment Application.	

Key Acronyms:
DFO - Fisheries and Oceans Canada
EA - Environmental Assessment
EAO - Environmental Assessment Office
ECOFISH - ECOFISH Research
FLNRORD - Forests, Lands, Natural Resources Operations and Rural Development
Halalt - Halalt First Nation
HFN - Halalt First Nation
Island Health - Vancouver Island Health Authority
MNC - Municipality of North Cowichan
Municipality - Municipality of North Cowichan
PW - Production Well
WSC - Water Survey of Canada
WWAL - Western Water Associates Ltd.