

## **Questions NOT Answered during January 12<sup>th</sup> BI “Water Workshop”** *Includes Questions submitted before, during, and after the meeting*

1. I live on Mandus Olson next to the Grand forest with a well going down about-125 feet that has produced very nice water. Some years ago, the city put in a much larger capacity and deeper well uphill from me, I started to get the lovely sulfur rotten egg smell in the drier summer months. Adding sulfur removal to my filtering system is VERY pricey. This year for the first time I have had this odoriferous issue in the winter and worse than ever. My question is- Does this have anything to do with the level of aquifer water that is now being used by more and more islanders, i.e is the water table lower and wells are now pulling up water with different properties than in years past. Is this one of many symptoms of inadequate recharge/supply vs water extraction/demand?

Groundwater supply quantity and quality at private wells can be affected by one or more issues; for example: the age and conditions of the well, the age and condition of the piping and treatment systems between the well and the faucet, naturally-occurring conditions, water use and land use on neighboring lands, and pumping from other wells completed in the vicinity of the well. Diagnosing the specific cause of changes can be challenging. We recommend private well owners contact the Kitsap Public Health District Drinking Water Section (360-337-5235) for guidance on addressing specific changes in water quality that can affect health.

2. What does the term “exempt wells” mean? Does this mean exempt from standardized monitoring requirements? What is the scope of this group, in terms of the number of households served? Are some small commercial purveyors of water included?

An exempt well is a well that is exempt from the requirement to obtain a Washington State Water Right Permit. Below is an excerpt from Ecology’s website explaining the exemption. Although the majority of exempt wells are residential, agricultural, or small industrial users, this may include small public purveyors as long as they use no more than 5,000 gallons per day. However, this does not exempt public purveyors from Department of Health-required monitoring for water quality.

*In Washington State, prospective water users must obtain authorization in the form of a water right permit or certificate from the Department of Ecology (Ecology) before withdrawing groundwater. The groundwater permit exemption*

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*allows the users of small quantities of groundwater to construct wells and develop their water supplies without first obtaining a water right permit from Ecology.*

*The only exceptions to the permit requirement is for withdrawals of groundwater for:*

- Providing water for livestock (no gallon per day limit).*
- Watering a non-commercial lawn or garden one-half acre in size or less (no gallon per day limit, however limited to reasonable use).*
- Providing water for a single home or groups of homes (limited to 5,000 gallons per day).*
- Providing water for industrial purposes, including irrigation (limited to 5,000 gallons per day but no acre limit).*

(Department of Ecology Webpage, January 27, 2016)

The terms “private” wells or “residential” wells are often used interchangeably with “exempt” wells as they make up the greater majority of exempt wells.

3. Is it known how many households are served by private wells? (By “private” I mean wells that supply water free of charge except for costs involved in maintenance of the system.) It’s my impression that some individuals and groups of homes with private wells have encountered no problems with either quality or quantity, but that there have been complaints in some areas of the Island. What can COBI do? In general, do citizen on private wells have the option of hooking up to a larger system?

Approximately half of the Island’s population is served by large or small public water purveyor systems and approximately half own their own well. Generally, Island groundwater quality is excellent; however, there are localized areas that tend to have naturally high mineral content, specifically iron and manganese. In nearly all cases the mineral concentrations are well below EPA’s drinking water contaminant levels and are not a health concern, but these concentrations can influence taste and color and may stain fixtures. Some private well owners install filtering devices to reduce or remove these minerals.

If a citizen resides in a public purveyor service area and the purveyor has available capacity, the citizen may choose to obtain water from the purveyor.

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4. Best Available Science estimate for:

- How many gallons of rainwater fall on Bainbridge Island (average year)?
- How many gallons of the annual rainwater on Bainbridge Island becomes groundwater (i.e., does not run off as surface water)?
- How many gallons of that groundwater seeps or is used as transpiration (trees for example)?
- How many gallons get into one or more aquifers per year?
- How many gallons of water are currently withdrawn from all aquifers per year?

The USGS used the groundwater model to calculate each of these water budget components for the year 2008 in terms of acre-feet. These values can be found in [Conceptual Model and Numerical Simulation of the Groundwater-Flow System of Bainbridge Island, Washington \(USGS, 2011\)](#) on pages 68-69. One acre-foot is equal to 325,851.429 gallons. In order to convert acre-feet to gallons, just multiply the acre-foot value by 325,851.429.

As part of the upcoming Aquifer System Carrying Capacity model run, Aspect Consulting will be updating our water budget.

5. On p. 4 of the Aspect memo addressing Task 1, I want to make sure I understand the second paragraph under **Production**. Does “increased pumping in 2000-04” mean that more than 350 million gallons were produced, or that the aquifers’ capacity was depleted more than usual? (It is unclear to me how aquifer capacity is estimated, and how fluctuations in an aquifer’s content are measured.) Was it simply coincidental that drops in precipitation coincided with increases in production?

Increased pumping of approximately 400,000 million gallons per year in 2000 to 2004 was correlated with below average precipitation, and likely reflected additional water demand for lawn and garden irrigation. The aquifer capacity will be discussed in more detail in the upcoming Aspect memorandum describing the System Carrying Capacity Assessment.

6. In Figure 2 I see the dramatic jump upward in the green line between 2000 and 2004, and perhaps a ‘new normal’ of 350 M gallons is established around 2007, but then there may be another uptick in 2014. I must say that the generalization

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about “fairly steady” production “over the last 10 years” is not borne out by Figure 2, unless I am grossly misreading it.

The “fairly steady” characterization of the 10 year (January 2005 through December 2014) production trend was based on the observed relatively consistent pumping data, particularly as compared to the noted increased pumping trend during 2000 to 2004.

7. How many wells are actually being monitored? (Aspect report and City Groundwater program appear to have much differing numbers).

The City and the City’s consultants draw information and monitoring data from multiple sources to conduct assessments or studies. These sources include, but are not limited to, the City’s Groundwater Management Program, the City’s Operations and Maintenance group, the Kitsap Public Health District, other water purveyors, and private or residential wells.

The City’s Groundwater Management Program currently monitors monthly water levels in 45 wells and annual chloride concentrations in approximately 30 wells. The City’s Operations and Maintenance group (like other water purveyors on the Island) conducts monitoring in water utility production wells as necessary and/or required to operate the water system. Lastly, private/residential well owners are required to sample their wells by the Kitsap Public Health District each time a new drinking water well is drilled or the property changes hands. Private/residential well owners may choose to sample their well if they have a water quality concern.

Therefore, depending upon the task (routine monitoring data assessment, in-depth hydrogeological data assessment, aquifer system construct, modelling, etc.) there will be significantly different numbers of wells monitored/utilized. Each report will stipulate the number of wells monitored/utilized for that particular task.

8. Given what we now know, what population estimate can be supported on the island (potable water use)?

The aquifer capacity will be discussed in more detail in the upcoming Aspect memorandum describing the System Carrying Capacity Assessment. The assessment will look at increased groundwater production associated with increased population.

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9. What City Fund pays for the City’s Groundwater Monitoring program?

The Water Utility

10. What is the fully allocated annual cost of the City’s Groundwater Monitoring program?

Supplies are usually less than \$300/year and analytical costs associated with chloride sampling are less than \$700/year. Yearly staff allocations fluctuate from year to year depending upon each year’s workplan. We suggest you refer to the City’s Finance Department for record of staff allocations.

11. What is the logic of having that fund (whichever one it is) pay for such monitoring?

Funding source was a council decision. We suggest you refer to the record of council actions/meeting minutes in regards to the City’s Groundwater Management Program.

12. Will nitrate monitoring be concentrated in the shallow aquifers? Will nitrate monitoring be focused on higher density neighborhoods with septic tanks?

According to USGS research, nitrate is usually applied or introduced to the aquifer system at the surface/shallow subsurface and, therefore, we usually find higher nitrate concentrations in shallow aquifers (<100 feet below land surface) (*Distribution of Elevated Nitrate Concentrations in Ground Water in Washington State, Fact Sheet 2008-3063; Nutrient Concentrations in Surface Water and Groundwater, and Nitrate Source Identification Using Stable Isotope Analysis, in Barnegat Bay-Little Egg Harbor Watershed, New Jersey, 2010-11, Scientific Investigations Report 2012-5287; and Recent (2008-10) Concentrations and Isotopic Compositions of Nitrate and Concentrations of Wastewater Compounds in the Barton Spring Zone, South-Central Texas, and Their Potential Relation to Urban Development in the Contributing Zone, Scientific Investigations Report 2011-5018*).

Should the City choose to monitor nitrate in groundwater, it is logical that monitoring will be concentrated in the shallow aquifers (Perched, Semi-perched, and Sea Level, possibly others if located near land surface) and in areas where the potential sources are more prevalent such as density of row crop agriculture and density of on-site septic systems to name a few.

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13. Why is the water analysis so far down in the Comprehensive Plan process? Isn't water planning as important as Land Use planning?

The Growth Management Act (GMA) requires that the Land Use Element be consistent with and supported by the other elements in the comprehensive plan, including any optional elements that the City chooses to adopt, such as the Environmental, Utilities and Water Resources Elements. The GMA does not stipulate where the water analysis must fall within the sequence of updating the plan. As a practical matter, the updated aquifer information prepared by Aspect was not yet available when the Land Use, and several other elements, had to be undertaken. Depending on how the Planning Commission and City Council interpret and apply the Best Available Science, including the Aspect aquifer information, it may be appropriate to review and revise the Land Use and other Elements.

14. Can we develop a better question session for the third water meeting instead of having one person read them?

Thank you for your comment. We will consider it.

15. If the deep aquifers demonstrate drawdown for the last 20 years vs. 1000 year old water we are taxing the water system?

The degree to which we are taxing the groundwater system can be measured in a number of ways. Aspect is using the updated groundwater model to assess the relationship between drawdown and saltwater intrusion. This will be discussed in more detail in the upcoming Aspect memorandum describing the System Carrying Capacity Assessment.

16. Is it your position that auto pollution isn't the largest polluter to the environment and water? Or that the home chemicals aren't a large factor?

There are numerous sources of pollution including, but certainly not limited to, automobiles, roadways, parking lots, construction site sediment and concrete processes, commercial/industrial chemical use, and agricultural and residential chemical use, household waste, and pet/livestock waste. Even areal deposition (particles of pollutants that fall from the sky) can be a significant source of pollutants, particularly during rain events.

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The question of which pollutant source is the largest polluter to the environment and water depends upon the observed pollutant and sources of that pollutant in the contributing drainage area. Urban settings tend to have distinct pollution characteristics versus a rural setting. There may be significant differences even within a single watershed. It would take dedicated monitoring and research in a specific area or drainage basin to determine the most significant pollutant(s) and source of pollutants for that area.

17. But shouldn't maintenance of our forests and wooded areas be an important factor to maintain as EPA advised years ago?

Yes, forested and wooded areas are important to consider when balancing our community needs for many reasons beyond drinking water supply such as providing habitat and wildlife corridors, stabilizing stream banks and shorelines, controlling flooding, and minimizing impervious surfaces that generate stormwater runoff.

18. Do we know what fraction of wells on the Island are metered? Has the City considered incentives or programs to bring more private wells into metered status? Would that be helpful in understanding our groundwater budget? Similarly, how about incentives for private wells to self-test quality?

Wells/water use are generally metered for the following reasons:

1. Public purveyors meter to track production (water produced),
2. Public purveyor *customers* have a meter on their water *line* to track their water use for billing purposes, or
3. In some communities such as in California, Colorado, etc., water use is metered to monitor compliance with drought management/or water supply management restrictions (put in place either by the local water purveyor for their customers or the State for all other wells).

The City and other public purveyor's on the Island only have the authority to meter their own wells and their customers' water use. The Department of Ecology is the governing authority of water use and is the only agency authorized to require metering and/or restrict water use (or they may choose to delegate the authority). This is usually only done in cases when a proven extreme water

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shortage exists (i.e., several drought years in a row or significant over-production of water resulting in severe depletion of the water supply).

As individual water use is closely and well-tracked by public purveyors nationwide, estimates for average per capita water use are well-known and very good. Therefore, the costs and dedicated resources to implement Island wide metering (not to mention the legal ramifications) would far outweigh any potential gain.

However, exploring incentives for private/residential well owners to conserve water to protect the supply and annually test and self-report well water quality to the local health district for their own protection as well as to enhance the data repository available for groundwater quality assessments is a worthwhile pursuit.

19. Why would the city and city paid consultants mischaracterize Early Warning Level (EWL) data when their own documentation for the Fletcher Bay Aquifer Island Center Well # 1 demonstrates a continued concern of 4.9’ per year of draw down from 2008 to 2015, after already being placed on the EWL of 5’ per year from 1998 to 2008? Would the citizens of Bainbridge Island benefit from the required studies and evaluation established for the EWL system (designed to protect the water supply) for the problematic FB Island Center well?

Two points of clarification: 1) The well in question is the former Island *Utilities* Well #1 (now under the ownership of KPUD) and not a well at Island *Center* (the subject well is located in the Eagledale area south of Eagle Harbor), and 2) the City recognizes that although the water levels for this well do not strictly meet the EWL of ½ foot per year for ten years *for the last ten-year period of examination*, based upon its history and that fact that it is certainly *close* to triggering the EWL, additional investigation was, and is, warranted.

Management responses to exceedances of EWLs are stipulated in Section 4.3.2 on page 13 of the City’s [Groundwater Monitoring Program Update](#) (revised March 2009) and include analyzing water level data from other wells in the same aquifer and other nearby wells, which the consultant did and addressed in the program update (Section 5.5, page 16). Also in keeping with recommended management actions, the City attempted to follow up with the then-owner of Island Utilities to



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conduct a thorough analysis of the historic water level and production data for validity as some of the extreme variability suggested that some of the water levels were measured during pumping of the well. Only water levels that are measured during non-pumping, equilibrium conditions (static water levels) should be compared to EWLs, not water levels measured during pumping.

As soon as Island Utilities came under the ownership and management of the Kitsap Public Utility District (KPUD), the City (through its consultant) contacted KPUD with concerns about the well. KPUD assured the City that it would be thoroughly vetting historic data, investigating the production and performance of the well and other nearby wells, and sharing that information with the City as soon as it is available.

It is important to remember that EWLs are NOT confirmations of a problem, just an indication that further investigation is warranted.

20. Is the City Manager and the Council concerned when the taxpayer---funded consultant, tasked to update the USGS groundwater model and study for the City of Bainbridge Island, claims he has “not heard about drawdown in the Fletcher Bay Aquifer” when there is documentation regarding the known drawdown of water levels in this aquifer as reported in the USGS 2011 study itself, and the consultants’ own Aspect Reporting to the city 2008 (March 2009) update water reporting?

Aspect responded differently than indicated above to the question posed during the “Question and Answer” session (approximately 1 hour and 36 minutes into the workshop video). The figures in the 2011 USGS report extend only to the shoreline of Bainbridge Island, while the groundwater model results indicate drawdown in the Fletcher Bay aquifer extends across the Kitsap Peninsula. So, we interpret the condition in the Fletcher Bay Aquifer as a regional effect, and not one limited to Bainbridge Island. We expect this condition to be further described by the USGS in their upcoming report on modeling of the entire Kitsap region to include Bainbridge Island (anticipated in 2016).

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Under Task 1 of the current contract with the City, Aspect assessed Early Warning Levels (EWLs) based on reported conditions and methods described in the [Groundwater Monitoring Program Update \(Aspect, 2009\)](#). Although the observed water levels in wells completed in the Fletcher Bay Aquifer did not exceed the EWL from 2004 through 2014, the ‘Island Utilities Well # 1’ showed continued drawdown that was very close to triggering the EWL. This drawdown may be due to one or more conditions: increasing withdrawals over time; decreasing well efficiency over time; or withdrawals exceeding the local capacity of the aquifer. With the transfer of water system ownership to Kitsap Public Utilities District, we expect future monitoring to provide information on withdrawal data, which has not been provided previously (see response to question #19 above).

21. Does the fact that Bainbridge Island is both an EPA---designated Sole Source Aquifer and surrounded by saltwater (at high risk for Seawater Intrusion – DOE publications) place further obligation on city and state leaders to adequately and honestly study and report on the water supply and the impacts of growth to date? According to records requests there have been no Environment Impact Statements to date for development on Bainbridge Island.

The facts you cite here are part of the information available to inform the questions of waters supply and impacts of growth. The Aspect updated aquifer information, and any comments offered into the record by yourself and others is all part of the information that will be weighed and considered by the planning commission and city council. The City will be doing the environmental review required by the State Environmental Policy Act, which may or may not include an Environmental Impact statement. That decision will not be made until later in the process.

22. Why would the city geologist say she has not seen or heard, or have data for wells with Seawater Intrusion, (except for hearing about one or two in the Seabold area), when it is documented in 2006 city reporting by the same consultant

The key distinction here is *confirmed seawater intrusion versus speculated seawater intrusion*. A single data point is not a confirmation of seawater intrusion, it is only speculation.

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The purpose of the [Baseline Groundwater Technical Information Summary](#) (Aspect, 2006) was to use available aquifer system construct and groundwater chloride concentration data to establish a groundwater monitoring well network to inform and advise water managers, both public and private, regarding issues of saltwater intrusion and safe aquifer yield and support future development of the Bainbridge Island groundwater model.

To do so, the City and consultant choose to set a value of 40 mg/L chloride concentration (purposefully below Ecology’s suggested EWL of 100 mg/L) as a *screening tool* to identify particular geographical areas on the Island in which a monitoring network of wells should be established. This value was NOT selected as a confirmation of seawater intrusion.

Section 7.2, page 9, of the baseline summary discusses observed chloride concentrations within that context. In addition to ruling out one-time sampling data and data outliers which are usually discarded as their representativeness is questionable, the author specifically uses the terminology “may be” and “could be” in reference to potential upconing and seawater intrusion as it is simply speculation without further monitoring and investigation. Specifically, the report states, “Chloride levels may be elevated above background for other reasons, such as surface sources of contamination, relic seawater within an aquifer or sea spray” (page 8).

It would be misleading to state that a chloride concentration elevated above the screening level used in this case or the EWL used as part of the subsequently established monitoring network is *confirmation* of seawater intrusion without additional monitoring and investigation.

23. How well can the model predict Seawater Intrusion if documented wells with Seawater Intrusion on the Island are not part of the database or the model? Like any valid scientific study, Seawater Intrusion will only be adequately computed if an honest inventory of known wells on the Island impacted by seawater are part of the data base, and the consultant includes the appropriate data in the model run. There are several wells that are documented in reporting impacted by seawater on Bainbridge Island.

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The City of Bainbridge Island, Kitsap Public Health District, and Kitsap Public Utilities District maintain their own groundwater databases. Aspect compiled information from these sources as part of Task 1 of the current contract with the City. The updated groundwater model is designed to simulate regional-scale groundwater conditions (for example, extensive aquifer zones that support public water supplies). The updated groundwater model simulates the recently observed chloride conditions, including those data shown in Figure 4 of the memorandum [Task 1 – Hydrogeological Assessment of Groundwater Quantity, Quality, and Production](#) (Aspect, 2014). The updated groundwater model may not be able to simulate saltwater intrusion at an individual well completed near the shoreline. The model is not currently designed to simulate chloride from sources other than saltwater intrusion.

24. What typically happens to wells that have seawater intrusion, are they not typically decommissioned and no longer functioning? If this is the case, would it not be hard to include decommissioned well data for further testing, making it easy to omit critical data used to run the model, making it difficult to predict seawater intrusion accurately?
- Owners of wells that exhibit chronic poor water quality or limited production typically have the well decommissioned by a licensed driller. Alternatively, these wells could be pump-tested to determine the safe pumping rate that avoids saltwater intrusion, or monitored for changes in water quality over time. The updated groundwater model is designed to simulate regional-scale groundwater conditions (for example, extensive aquifer zones that support public water supplies). The updated groundwater model may not be able to simulate saltwater intrusion at an individual well completed near the shoreline.
25. Does the city or the county have reporting or data collecting requirements for wells impacted with seawater intrusion to help protect the Sole Source Aquifer water supply on Bainbridge Island?
- No
26. Besides extrapolating well stratigraphy and well testing across the Puget Sound, have there been any wells drilled in the Puget Sound between Bainbridge Island and the Kitsap Peninsula that proves a continuous

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uninterrupted flow of groundwater in the Fletcher Bay Aquifer from the Kitsap Peninsula to the Island?

We are not aware of any wells drilled in Puget Sound to confirm the continuity of deep aquifers between Bainbridge Island and the Kitsap Peninsula. Interpretation of geologic logs from wells on both sides of the water suggests the Fletcher Bay Aquifer is regionally extensive. The USGS presents this interpretation in their [2014 Kitsap Peninsula report](#). In addition, pumping the deep aquifers on one side of Port Orchard Bay results in pressure responses on the other side, indicating continuity.

27. Has the groundwater in the Deep Fletcher Bay Aquifer ever been age dated with scientific testing?

We are not aware of efforts to characterize the age of groundwater from the Fletcher Bay Aquifer.

28. There have been unsubstantiated comments that Island water is coming from the Olympics. Is there any testing or peer-reviewed technical journal references to verifying such claims? Hydrogeologists and water engineers familiar with BI/Kitsap County groundwater/drinking water resources know that such a reference does not exist, because this claim has never been proven.

We are not aware of documents supporting the theory that aquifers below Bainbridge Island are directly recharged in the Olympic Mountains.

29. What can the city do to more adequately report on issues concerning the entire aquifer system if the contracted consultant declares that most of the studies to date involves the deeper aquifers, and does not have equal data for shallow wells that involve over 50% of the water supply for private homeowner wells on the Island?

In terms of the understanding of the geological “makeup” of the Island’s aquifer system, there have been several quality studies that describe the individual layers and physical properties such as how well each layer transmits water and in what direction. In this respect, there are significantly more wells (data) in the shallow aquifers and, therefore, our understanding of the shallow aquifers is actually better.

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The consultant’s statement about having more data for the deeper aquifers (predominantly production wells) specifically addresses what we call empirical or actual “measured” data for water level, production, and water quality as private/residential well owners whose wells are predominantly in the shallow aquifers typically do not monitor their wells on a regular basis as public purveyors are required to do.

In order to account for this when assessing data or running a model, to assure representativeness for the entire aquifer system, a scientist has two options:

1. Use scientifically and statistically-sound estimates based upon well-studied and understood patterns such as was done with production or water use for the shallow, residential wells. Nationwide tracking of production and water use by thousands of public purveyors gives scientifically and statistically-sound estimates of a person’s average water use (including throughout drought and rainy years), or
2. Conduct additional monitoring in those areas/aquifers where more data are needed. That is the basis of the City’s monitoring well network which includes wells Island wide in all aquifers and was determined to be a sound network of monitoring wells to give good representation of the system as a whole.

The consultant recommended that if the City should want to explore other concerns such as nitrate accumulation in groundwater, we should consider establishing a representative network of monitoring wells and collect that data, as well as encourage private/residential well owners to self monitor and report to the health district in order to enhance the usable data record.

30. Many private homeowners with wells have reported problems with wells going dry, undrinkable water due to poor water quality (discoloration, bad taste, bad smell). Many homeowners are faced with the high cost involved to drill new deeper wells to maintain an adequate water supply for their homes. Is this any indication that there are problems with the water supply that are not adequately studied?

Not necessarily. Let’s take these concerns one by one.

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Wells going dry: Wells can, and do, go dry for a number of reasons some of which are known to be the case for some Island wells.

1. Most homeowners who have very shallow wells (surface wells) and have lived on the Island for several years know that they have measurably less water available during the summer than they do during the winter. This is because the water table is the water level in unconfined (surface) aquifers. Therefore, when it is not raining, the water level (water table) will drop. Depending upon how dry it is (i.e., during drought conditions) these wells may run dry. This is specifically due to lack of rainfall, not a problem developing in the aquifer or well. Most homeowners deal with this by reducing their water use during dry periods.
2. As we’ve discussed in the past two workshops, our aquifer system is made up of sandy layers that hold and yield a lot of water, making good aquifers, sandwiched between layers of clay that do not yield a lot of water and act to “confine” the sandy layers below. In very localized areas, especially in glacially-deposited materials, it is not unusual to have small pockets or “lens” of sand within, and completely surrounded by, a confining layer of clay. In these cases, the water stored in the sandy lens is limited. It will not recharge or refill very efficiently, because of the surrounding confining clay. Therefore, if a well or wells in that local area tap that lens for water, it will eventually run dry. The homeowner is then, unfortunately, required to drill deeper to get to an aquifer. Again, this is a result of the geological makeup of the subsurface, not a problem developing in one of the aquifers.
3. All wells eventually lose production due to the mechanics of the well itself. Pumps lose their efficiency-reducing their ability to pull water from the ground or well screens become clogged-not allowing water to flow into the well. This is something that even public purveyors grapple with, eventually having to replace pumps and rehabilitate the well or drill a new well. However, this is a matter of mechanical things wearing out and, again, not a problem developing in an aquifer.
4. Lastly, yes, sometimes wells run dry due to over-production and problems developing in the aquifer (declining water levels). In this case, other wells in the same aquifer and locations often show similar declines. Therefore,

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we monitor multiple wells in each of the aquifers Island wide to specifically look for these types of trends.

Discoloration, bad taste, and bad smell: There are localized areas around the Island where groundwater tends to have naturally high mineral content, specifically iron and manganese. These can result in discoloration, bad taste, and bad smell. Although in nearly all cases the mineral concentrations are well below EPA’s drinking water contaminant levels and are not a health concern, it is understandable that it is unpleasant for the homeowner. Some well owners install filtering devices to reduce or remove these minerals as opposed to drilling a new well, as the water is still of good quality and a filtering device (though not inexpensive) is a more affordable alternative to drilling a new well.

That being said, any homeowner on a residential well that is concerned about the quality of their water should seek assistance and guidance from the Kitsap Public Health District Drinking Water Section (360-337-5235) to ensure that there are no contaminants in the well water.

31. The consultant addressed a question regarding the responsibilities of sharing and safeguarding the deep Fletcher Bay Aquifer utilized by both the Kitsap Peninsula and Bainbridge Island for water supply. Knowing the groundwater flow direction is from west to east, and the Kitsap Peninsula is experiencing growth at a rate equal to or greater than Bainbridge, and has an extensive well network that withdraws groundwater from the Fletcher Bay Aquifer: Is it safe to say the Kitsap Peninsula actually has first dibs on the water and water rights, and as such can impact the water supply on Bainbridge Island significantly when sharing this deep aquifer with the Kitsap Peninsula which is also a Sole Source Aquifer heavily dependent on the deep Fletcher Bay Aquifer like Bainbridge?

The water rights on Bainbridge Island and elsewhere in Washington are defined by law, and enforced by the Washington State Department of Ecology. Proper use of groundwater models can inform water system managers of how the common groundwater resource can be shared with neighboring water systems without impairing water rights.

32. Do COBI licensed consultants have ethical obligations per contractual agreements with the city, and licensing laws in the State of Washington to



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report the facts as opposed to mischaracterizing Water Reporting for Bainbridge Island?

Each COBI consultant is subject to licensing requirements and ethical code of conduct applicable to her or his profession. Honest and accurate reporting of facts is a common component of most professional codes of ethics.

33. Do city employees, the city manager, and the council have ethical obligations to accurately and honestly report water data as a result of employment, and the oath of office, per the laws in the State of Washington?

This appears to be a rhetorical question. The answer is “of course.”

34. Can the city manager please post the ethical standards for city employees, committees, board members, and consultants, and the oath of office for council members on the city website during the Comprehensive Plan Update Process?

Your request has been referred.

35. Can the city and the Consultant provide the results of recommendations from the Last Aspect GW Monitoring program 2008 (updated March 2009) P 19. Recommendations:

- a. An updated review of water level trends and chloride data has been performed in this study. At this time, the following items are recommended for immediate implementation.
  - i. Implement Management Responses for safe yield in the Fletcher Bay Aquifer near Eagledale. As an initial step, this should include obtaining and evaluation production and chloride data for the Island Utilities Wells;  
(see response to question #19 above)
  - ii. Closely monitor production and water levels for several Fletcher Bay Aquifer wells (North Bainbridge Well 7, Sands Road 1, Sands Road 2, North Bainbridge Wells 9 and 10) and for one Sea Level Aquifer well (north Bainbridge 7), particularly during changes in production;  
These production wells have been, and continue to be, closely monitored by the City and KPUD. These data

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were utilized in the recent assesment of aquifer water level trends.

- iii. Survey chloride levels in wells completed within ¼ mile of the shoreline to investigate the areal extent of elevated chlorides. This survey should include investigation of elevated chloride concentrations in the Seabold area and confirmation of historic, single---time elevated chloride measurements;

The City established a chloride monitoring well network and began annual monitoring of chloride and specific conductivity for wells within ¼ mile of the shoreline and in aquifers vulnerable to seawater intrusion. Further, the City has begun an effort working with KPUD and the Kitsap Public Health District to scope a joint project to investigate chloride concentrations in the Seabold area.

- iv. Evaluate chloride levels by aquifer. Determine correlation curves between chloride concentration and specific conductance by aquifer. Identify data gaps and test additional wells as necessary;

The City established a chloride monitoring well network and began annual monitoring of chloride and specific conductivity. Once sufficient data has been collected, correlation curves will be evaluated for utility. As part of the recent assessment, the consultant determined that the monitoring well network provided good coverage Island-wide.

- v. Identify any significant tidal influence on water levels in near---shore wells. Where necessary, characterize the tidal effect and adjust water level data accordingly;  
Possible future work for nearshore wells if resources become available.
- vi. Monitor chloride levels in the deeper Head of the Bay Wells 4 and 6 whose location and depth, respectively, will provide early warning of seawater intrusion; and  
The City’s Operations and Maintenance group within the Public Works Department conducts chloride and specific

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conductivity monitoring in these wells on an on-going basis.

- vii. Acquire production data for additional private well systems to build as complete a record as possible of total groundwater withdrawals.

When conducting assessments, the City makes it a point to direct consultants to survey all available data including any private well data from the Kitsap Public Health District in order to have as complete a record as possible. Further, scientifically and statistically-sound estimates for residential water use (where not metered or tracked) was incorporated into the Bainbridge Island groundwater model both by the USGS during initial development and by Aspect Consulting in their current work for the City.

36. Did the data collection and reporting include the period of record drought this last summer? If not, the city should endeavor to include this information, and not miss an excellent opportunity to evaluate a dryer than normal season and the impacts on well pumping statistics.

The Bainbridge Island data assessment and groundwater model update was through December 2014, so did not include the dry conditions observed during 2015. However, the assessment looked at all historical data which included several very dry periods, specifically 2000 – 2004, which captures increased production and water use and lower water levels in response. 2015 conditions will be captured in future data assessment and modeling efforts.