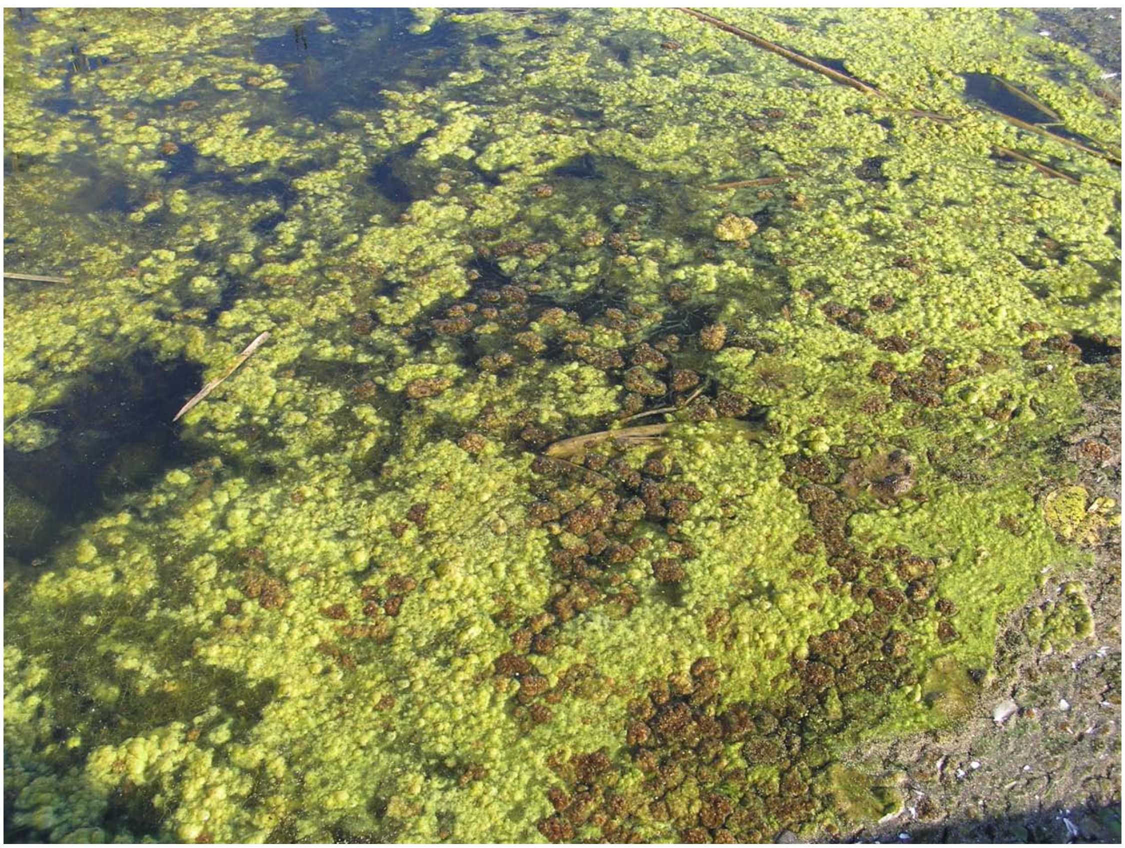
PHOSPHORUS MANAGEMENT PLAN 2013



(Algae bloom June 2012)

Revision: 6 February 2013

Approved by City Council 28 Jan 13 and update 11 Feb 13

PLAN PURPOSE

This phosphorus management plan defines: the existing condition of the lake and watershed; options to address these conditions; and a implementation plan to provide for short and long term solutions to the excessive phosphorus loading of Lake Stevens. The plan services as a guide document and will be used for funding consideration.

PROBLEM STATEMENT

Lake Stevens continues to have an influx of internal phosphorus loading from the lake's sediment and external phosphorus loading from the surrounding watershed[1]. While phosphorus is important to the health of the lake, high levels of phosphorus can result in water quality deterioration and unwanted algae blooms. The aerator has provided an acceptable level of phosphorus reduction resulting from internal loading from the lake's sediment since 1994. However, the long-term viability of aeration as the single treatment method for excessive phosphorus is unsustainable because there is not enough iron in the water and the sediments to bind all of the phosphorus in the lake. In addition, the aerator is very costly to operate and maintain and it is approaching the end of its life-span. With or without the use of the aerator, lake conditions will deteriorate unless a suitable in-lake treatment plan is implemented to help reduce phosphorus levels (TetraTech, 2009). The photo below shows a blue-green algae bloom that occurred in the spring of 2012 when oxygen levels were still high within the lake. This is an indicator of high phosphorus levels in the water column.

Figure 1 - June 2012 Algae bloom condition – indication of high phosphorus suspended in the water.

1 "Loading" refers to input of a nutrient per unit of time.

BACKGROUND

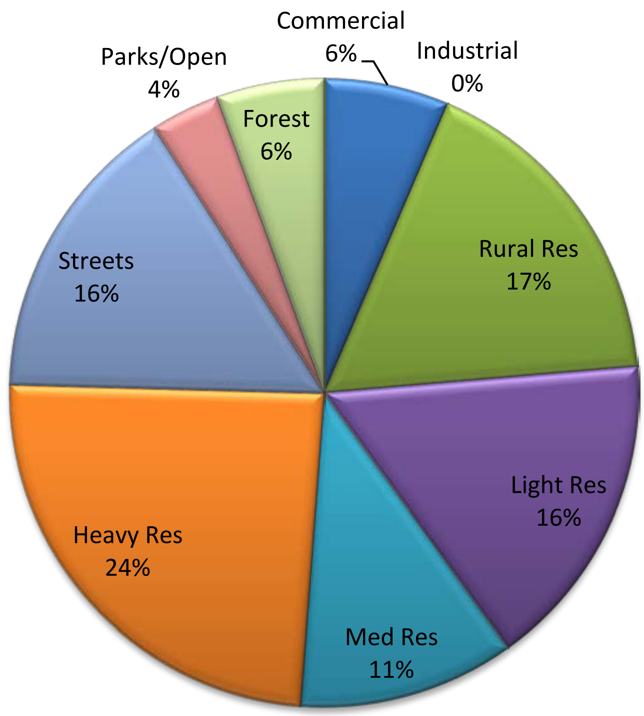
Lake Stevens is the largest natural lake in Snohomish County. The lake covers 1013 acres, and has an average depth of 62 feet (19 meters) and a maximum depth of 150 feet (46 meters). Lake Stevens is fed by Stevens, Lundeen, Kokanee, and Stitch creeks, which comprise the major sources of water feeding the lake. The Lake Stevens watershed area covers 4,536 acres including the lake's surface. This 4:1 watershed to lake ratio indicates a relatively small drainage basin for a lake of this size. The outfall of the lake drains into Catherine Creek and then to the Pilchuck River.

From the 1950's and into the 1980's, Lake Stevens experienced frequent algal blooms, a decline in water clarity, and poor water quality due to increases in phosphorus loading. Initially, external loading was due to forestry and agricultural practices, and in later years, nutrients came from housing and commercial developments (Snohomish County 2008). Internal loading was occurring simultaneously from a natural chemical cycling process involving phosphorus and iron. In the presence of oxygen, phosphorus binds with iron and remains in the sediment. During the warmer summer months, the sediment in the lake doesn't receive enough oxygen and the chemical reaction which originally immobilized phosphorus reverses, releasing phosphorus from its bond with iron. In 1994 an aerator system was installed to maintain the required dissolved oxygen levels in the bottom waters of the lake (the hypolimnion) to sustain iron and phosphorus bonding during months when oxygen levels at the lake bottom dropped.

Phosphorus is essential for plant and animal life in an aquatic ecosystem, however an excess of this nutrient acts as a fertilizer and stimulates the growth of algae. This increase dramatically accelerates the rapid growth and death of blue-green algae that clouds water, reduces dissolved oxygen, and can poison fish and wildlife – causing a threat to the health and overall quality of the lake and its surrounding environment (Ecology, 2011).

PHOSPHORUS SOURCES

Phosphorus is an element that is found is rocks, soils, and most life forms. It is a natural occurrence and important element to the life cycle of most organic life. As with most lakes, the phosphorus in Lake Stevens comes from internal and external loading sources. Internal loading comes from phosphorus that is already in the lake's sediment. In a review performed by Tetra Tech in 2012, it is estimated the average internal phosphorus load is 432 kg/year (952 lb/year).



Graph A – Existing external P loading/land use shown

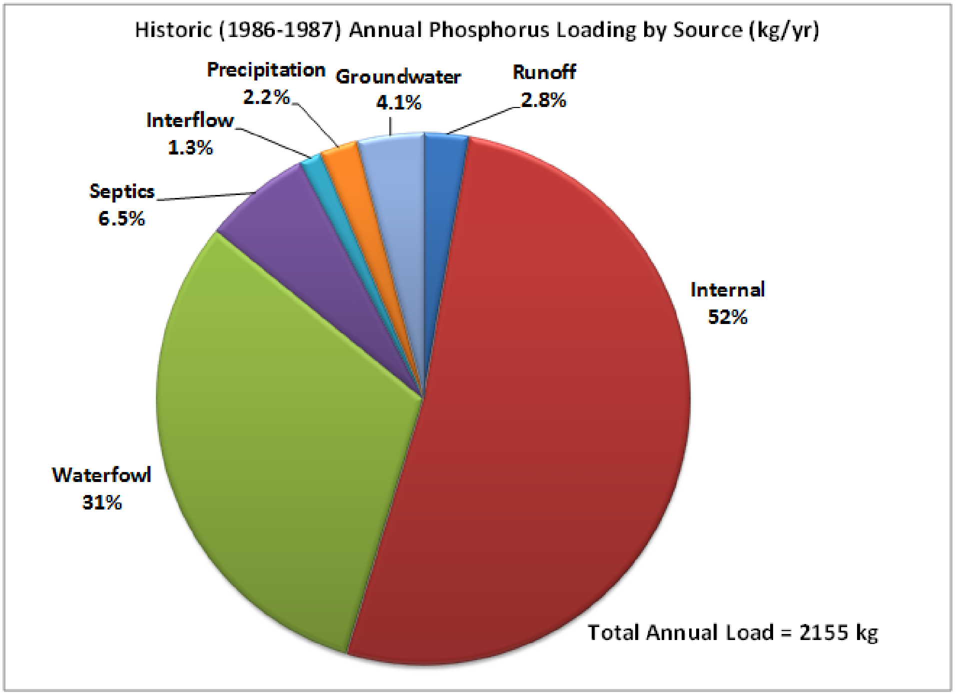
As described above, phosphorus that has settled over time in the lake bottom can be released back into the lake water when dissolved oxygen levels are low, causing the iron-phosphorus bonds to break apart. This process is also known as phosphorus cycling. Phosphorus can also be released in both deep and shallow water when organic matter breaks down. This can occur even when oxygen levels are high.

Although a small amount of external loading may come from natural sources such as the erosion of rocks and soils (where phosphorus originates) and plant and animal decay, the majority of external phosphorus is imported into the lake from other sources. The imported sources comes from such things as fertilizers, runoff from roofs, driveways, roads and other hard surfaces, soil erosion from land clearing, dirt collected on vehicles, leaking septic/sewer waste, water fowl and from pets and livestock. While the exact amount of external phosphorus loading is not known, an estimate was prepared by TetraTech in 2012 using current land uses and published loading coefficients for land-use types in King County. The results are shown in Graph A and Table 1.

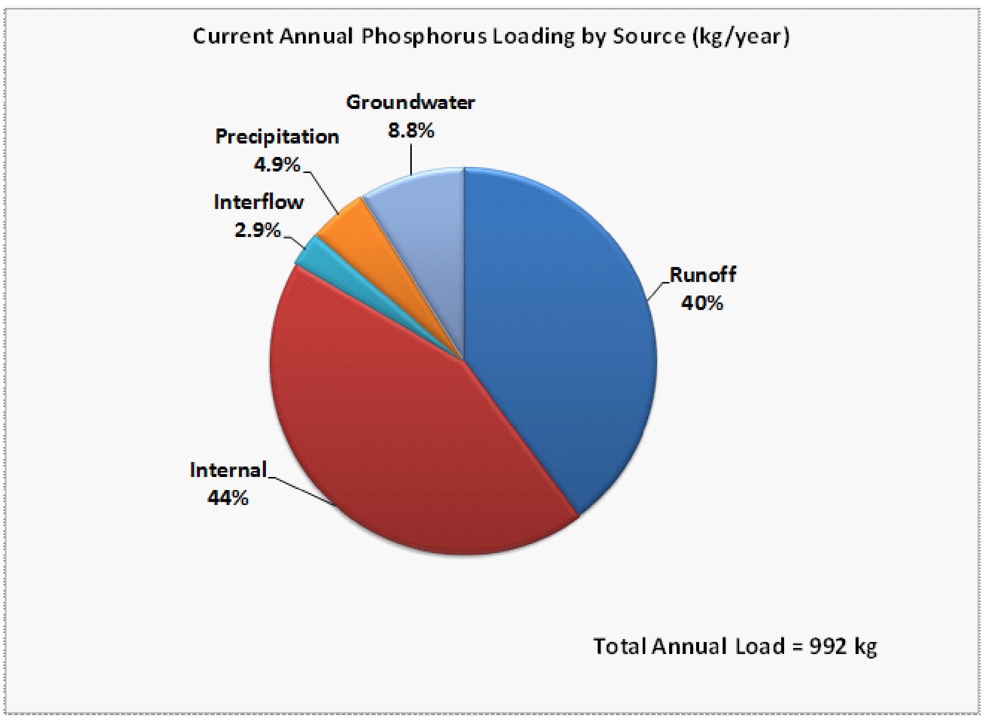
Table 1. Estimated Existing External TP Loads per Land-use Area (Tetra Tech 2012)

Land-use Categories	**Existing Phosphorus Loads kg/yr (lbs/yr)**
Commercial (Office/Commercial/Business)	25.2 (56)
Industrial	0.0 (0)
Light Rural Residential (<1.0 units/acre)	68.0 (150)
Light Urban Residential (1.0 to 4.0 units/acre)	65.0 (143)
Medium Urban Residential (4.0 to 6.0 units/acre)	43.8 (97)
Heavy Urban Residential (>6.0 units/acre)	95.8 (211)
Streets/ROW	61.2 (135)
Park/Open Space	14.2 (31)
Forested	21.8 (48)
Open Water	0.0 (0)
TOTAL PHOSPHORUS LOAD	395.1 (871)

From this table it is estimated that approximately 70% of the external loading comes from residential land uses with approximately 15% from streets. Since 1986-87, external loading from the watershed has increased by 54% because of continuing development of homes and businesses. At the same time, the total phosphorus loading to the lake has decreased by 53% (see Graphs B and C). The overall decrease is a result of closing access to a local landfill by thousands of seagulls that used Lake Stevens and a reduction in internal loading from the lake sediments because of the success of the aeration system. Internal loading is now about 44% of the total phosphorus loading to the lake. These changes mean that external loading from runoff from developed areas accounts for a much larger portion of the phosphorus in Lake Stevens. Controlling both internal and external phosphorus loading will be important in maintaining the water quality of the lake.



Graph B – Total Phosphorus Loading by Source in 1986-87



Graph C –Total Phosphorus Loading by Source 2007-2011

AERATOR SYSTEM

The aerator's function is to provide oxygen to the sediment to maintain a phosphorus-iron bond and control the release of phosphorus from the sediment. During the summer months oxygen levels are depleted, especially in the deeper water, and the aerator is activated to replenish the oxygen in the water column. The aerator typically operates from late June through October. The activation is determined based on oxygen level readings of the lake (performed by Snohomish County).

The cost to operate and maintain the aerator system is shared between the City and the County with the City covering the majority of the costs. The share paid by each agency is based on the amount of watershed area contributing to the lake. The annual cost to operate the aerator is approximately $35,000 which includes power consumption and staffing. However, for the past six years the estimated average annual cost including maintenance (repairs) has been estimated at over $110,000 per year.

In 2012, the aerator system in the lake stopped functioning when the float support structure failed. Emergency temporary repairs were performed to keep the aerator system from sinking but it was not operational following the work. The repairs to make the system operational were estimated to exceed $100,000 and would take months to complete. In addition, it was discovered that there may be other problems with the system that could not be inspected until the initial operational repairs were completed. A decision was made by the City and County to reassess the continued operations of the aerator system prior to expending further funds on repairs.

PHOSPHORUS MANAGEMENT

A phosphorus managing strategy needs to focus on activities in the watershed and in-lake restoration techniques. According to Washington State Department of Ecology, lake management approaches fall into two categories: 1) the quick-fix; and 2) the long-term. The quick-fix is addressing the symptom, such as an algae treatment but does not address the underlying causes of the problem. A quick-fix being only a short term solution is not considered a good investment of resources. To be effective, a phosphorus management plan needs to be a long-term strategy and commitment.

Long-term management should consider the environmental, cultural, and biological factors affecting the lake and sets a priority on finding lasting solutions. It will require a coordinated effort of community groups, individuals, landowners, and the City and County.

It is important to understand that the phosphorus problem that Lake Stevens is experiencing is a combination of both internal and external loading. If the external source could be entirely eliminated, Lake Stevens would continue to have a phosphorus problem for possibly several decades. This is because phosphorus would continue to recycle within the lake from vegetation and animal life cycles, as well as release from the sediment, continuing the cyclic recurrence of algal growth, death, decay, and overall eutrophication[2] of the lake. Conversely, if only the internal loading is addressed, the phosphorus condition in the lake will improve but the introduction of new phosphorus would offset the initial benefits of the treatment. Therefore in order to be successful the program should strive to manage both external and internal nutrients.

Aluminum sulfate (alum) is the most commonly used nutrient inactivation chemical for lake projects. Managers may apply alum in small doses to precipitate water column phosphorus. When applied to water, alum forms a fluffy aluminum hydroxide precipitate called a floc. As the floc settles, it removes phosphorus and particulates (including algae) from the water column (precipitation). The floc settles on the sediment where it forms a layer that acts as barrier to phosphorus. As sediments release phosphorus, it combines with the alum and is not released into the water to fuel algae blooms (inactivation). Algal levels decline after alum treatment because alum addition reduces phosphorus levels in the water. (Except from Washington State DOE web site)

2 Excessive richness of nutrients in a lake that stimulate excessive plant growth.

PHOSPHORUS CONTROL ALTERNATIVES

There are three basic alternatives to manage the phosphorus loading in Lake Stevens: 1) control internal loading within the lake; 2) reduce external loadings entering the lake; and 3) take no action. Within alternate one and two are possible options that can be considered standalones to accomplish some portion of the phosphorus control. A combination of option one and two is possible too.

<u>Control Internal Phosphorus Loading</u>

ID	Option	Discussion	Phosphorus Control	Estimated annual cost
IL 1	Operation of the aerator only	Aerator is near the end of its life span and has required annual repairs. It is expected that the aerator will need some major repairs in the next five years to keep it operational. The estimated annual cost for O&M is $120,000 with an additional $400,000 estimated for major repairs over the next five years. It may be possible to continue to extend the life of the system, vs replacement, by the performance of continued repairs and upgrades. While it is unknown the extent of this type of improvement needed to accomplish this, it is estimated that a set aside cost of $200,000 annually should be budgeted (include O&M)	Controls phosphorus bonded with iron in deep water lake sediment, but testing has shown that there is not enough iron to bind all the available phosphorus. Does not control phosphorus suspended in water column. Aerator abilities to control new phosphorus loading are currently near capacity and algae occurrences are expected to increase.	$200,000
IL 2	Aluminum sulfate (alum) Treatment only to water column	Aluminum is within the lake from natural occurrence. Addition of aluminum concentration in the lake water is an acceptable practice by the State DOE and would be applied to maintain the lake within EPA drinking water standards very shortly after application.	Controls phosphorus loading in water column. Over time, annual alum treatments can contribute to a permanent reduction of internal phosphorus loading from the sediment. Algae occurrences are expect to decrease shortly after an application.	$100,000
IL 3	Aerator and Alum Treatment	Combination of Option IL 1 and IL 2. With the use of the aerator, alum treatment area could be reduced. However, this would result in some phosphorus remaining in the water column.	In the short term, results are expected to be a decrease in algae however, if a reduction in Alum is applied (over IL 2), the sediment could continue to release phosphorus from the deeper waters.	$250,000 to $300,000

<u>Reduce External Source Loading</u> – The following options were developed using information provided from the City of Bellingham for phosphorus control on Lake Whatcom in an effort to reduce algae. The cost-benefit is defined solely as phosphorus reduction though there may be other benefit (eg: street trees also have a benefit of shade, reduction in runoff, and aesthesis). The costs shown only reflect costs to the City and not to others such as developers.

ID	Option	Discussion	Cost Benefit $/lb/P*
X 1	Reducing development land use	This could include the City's acquisition of developable land for open space, down zoning, lot consolidation, and incentives for open space	$190,000
X 2	Restoration of natural function of City land	City owned land would be restored to a natural condition such as re-forestation	$50,0000
X3	Vegetated swales	Creation of bio-filtering swales	$6,000,000
X 4	Rain garden	This could be a private or public bio-retention system that retains surface water runoff into a system that filters and infiltrates water on site. Due to soils conditions and water table levels, there are limited portions of the City where this could be used.	$6,600,000
X 5	Street trees	Planting of street trees along open spaces on	$9,405,000
X 6	Lawn replacement to bio-retention	Development of lands to retain water, similar to a rain garden, to prevent offsite runoff	$5,000,000
X 7	Dry wells	This is not considered feasible due to ground conditions within the City.	NA
X 8	Infiltration trench	It is likely used on private property with very limited usage on public roads	$318,000
X 9	Pervious pavement	New road construction would need to have both an infiltration system under the pavement and a off-site drainage system to accommodate higher volume storm events. The cost for maintenance of a pervious pavement for a roadway could be significant higher that a traditional paved roadway. Private parking is likely a good application.	$1,111,000
X 10	Infiltration basin	Storm ponds would be the common application of this type and would be best applied to new development. Due to the City's high water table and soil conditions, this application would be limited.	$172,721
X 11	Rainwater reuse	Benefits would be too low to estimate a cost to benefit number	NA
X 12	Onsite dispersion	This could be a private or public system that retains surface water runoff into a system that filters and infiltrates water on site. Due to soils conditions and water table levels, there are limited portions of the City where this could be used.	$4,853,000
X 13	Media filters	Installation of filtration systems would need to be installed at key locations prior to entering the streams. This would be difficult to provide an effective system due to the high number in outfalls.	$258,000

X 14	Sizing culverts to eliminate erosion	Benefits would be too low to estimate a cost to benefit number	NA
X 15	Street sweeping	The City performs this service regardless of the phosphorus benefit so cost is considered part of existing operation budget.	$28,500
X 16	Stream erosion control	Could provide indirect phosphorus reduction. Would be very time consuming to investigate and permit for work.	NA**
X 17	Ban phosphorus fertilizer	New State law bans use and sale of phosphorus in lawn fertilizers except for new lawns or where a soil test shows the need for phosphorus.	NA**
X 18	Watershed signs	Education effort to post signs around City. Estimate 300 sign placements. Estimated material cost $24,000. Staff time is not included.	NA**
X 19	Mass mailing	Preparation and mailing of education material. Mailing could be included in a utility billing. This assumes the cost of printing. Estimated material cost $3,000/year. Staff time is not included.	NA**
X 20	Online information	Post information on the City's web page	NA**
X 21	Newspaper articles	A press release a few times a year reminding the public of the impacts of phosphorus into the lake and methods to help reduce it.	NA**
X 22	Video presentations	This could be performed through the High School which has video capacity. This would then be posted on the City's cable site (Channel 21).	NA**
X 23	Community events	This is currently being practiced. The City has generated several handout flyers that are provided during community events when the City has a booth setup.	NA**
X 24	Onsite training	This would likely be in partnership with Snohomish County that is set up to provide this type of service to contractors, developers, and the general public. This would require a ILA with the County and it is anticipated that the City would share in the cost for staffing and information. It is estimated that this would be in the range from $6,000 to $20,000/year.	NA**
X 25	Resident contacts	Enforcement or education efforts to contact individuals based on observations or suspected practices that are generating phosphorus into the runoff. This could require extensive time to locate.	NA**
X 26	Project consultation	City would provide a consultation service to individuals (such as contractors) on methods to help in the control of phosphorus	NA**
X 27	Incentives	A fund account can be set up that provides monetary incentives for volunteer compliance in City identified methods of phosphorus reduction.	NA**
X 28	Forest condition to pre-development conditions	Does not apply to the City	$80.65

X 29	Design standard change	Update standards to reduce runoff from future impervious surfaces such as roads and sidewalks the use of infiltration and bio-filtering.	$371,171
X 30	Reconfigure roadside ditches	Existing roadside ditches would be modified to reduce erosion and provide plants to help with the removal of phosphorus. This would have a significant increase in O&M.	$6,000,000
X 31	Reconfigure streets	Modify streets to reduce runoff and improve filtration of surface water.	$4,755,000
X 32	Reduce vehicle trips	This has been incorporated into the two subarea plans and the sidewalk plan that helps reduce the dependents of vehicle for travel within the City.	NA
X 33	Improve recreation facilities	Provide enhancement to City recreation areas to reduce runoff. This study showed that the benefits to be very low.	NA
X 34	Watershed-wide enforcement	This would likely be in partnership with Snohomish County that is set up to provide this type of service to contractors, developers, and the general public. This would require a ILA with the County and it is anticipated that the City would share in the cost for staffing and information. It is estimated that this would be in the range from $10,000 to $40,000/year.	NA
X 35	Animal waste	City provides pick up bags at some recreation areas. Education material has been produced by the City that is provided at community events.	NA
X 36	Septic system to sewer connection	It is unknown the level of this condition within the watershed. City is talking with Sewer District on this item.	NA

"*" Cost information provided by "The Lake Whatcom Management Program Work Plan 2010-2014" – July 2010 CH2M Hill

- Costs do not include on-going maintenance and operations.

"**" The cost benefit is difficult to estimate and impossible to measure. It is important though that education can result in an accumulative result in phosphorus reduction.

Italic These are current practices in part or whole within the budget.

<u>Take No Action</u> - This is not considered a viable option as it is suspected that algae bloom events would be on an increase with the current internal and external loading.

DISCUSSION

Due to the high levels of phosphorus already in the lake water column and sediment, removal of external phosphorus sources is expect to not be enough to address the water quality problem with algae. The aerator has been the main method for managing phosphorus within the lake for the past 19 years. Its treatment has maintained the iron-phosphorus bond in the lakes sediments in the deepest part of the lake but has had no effect on water suspended phosphorus or the shallow sediments. It had been effective means to controlling most of the phosphorus problems but in recent years the loading has exceeded the aerator's capacity. In addition, the aerator is close to the end of its operating life and is in need of some extensive repairs and on-going maintenance.

In accordance with a study prepared for Snohomish County by Tetra Tech in September 2012, "Alum treatment, at even a modest maintenance dose, should control internal loading more effectively than continued aeration. Moreover, alum should have more of an effect on reducing the spring cyanobacteria blooms (algae) than aeration." This would address the condition in the lake from both internal and external loading. While alum treatment in the lake is a very cost effective solution, and can function as the only solution to addressing the condition, it does nothing to reduce the external loading condition.

The City of Bellingham had performed an extensive study to manage phosphorus condition in Lake Whatcom. This had an extensive list for reducing external loadings which was used in the development of the Reduce External Loading Source section of this plan. While the costs to benefit numbers are applicable to Lake Whatcom, most of their costs were used in this document for comparison purpose against the different options. From this information, the cost for controlling external loading can be beyond the ability of most public agencies. Especially when compared to the benefits. However, any effort that may reduce the external loading can have a long term effect to water quality and public's awareness.

IMPLEMENTATION

There are four segments to be implemented in this plan: 1) control of internal loading; 2) reduction of internal loading; 3) phasing out the aerator system; and 4) monitoring and review. These are presented in planning level detail to be used as the guidelines for the implementation efforts for the reduction of the phosphorus loading in Lake Stevens.

<u>Control internal loading</u> – This segment is for the treatment of the phosphorus within the water column and sediment of the lake. The following are the key guidelines that will be followed:

Treatment Method: Aluminum Sulfate (Alum)

Duration: Alum will be applied annually through 2019. In 2019 a review of the Alum treatment and a determination should be made for the continued phosphorus treatment method and re-evaluated for continuation.

Frequency: The target application is one time per year in the spring.

Estimated Dosage: 0.18 mg Al/L. (Estimated application volume is 65,000 gallons)

Estimated Annual Budget: $100,000 with an estimated breakdown

- $81,000 for Alum and application
- $4,000 for permitting
- $5,000 for monitoring
- $10,000 planning and administrative costs

Any cost saving in the permitting, monitoring, planning, and administrative costs can be used to increase the Alum application budget amount. This effort is to ensure that the highest amount of Alum treatment is applied within the budget.

<u>Reduce the external loading</u> – The effort is to control human generated phosphorus loading that enters into the surface and ground water system. The following methods shall be used:

Education:

- Brochures – to be provided at public facilities, public events (ie: AquaFest, Iron Man, and Oktoberfest), visits to schools, and handed out to general public. Brochures shall be produced by internal staff collecting information from sources such as the internet, other agencies, and special interest groups. Estimated annual cost is $200 for production. Funding is within existing budget for administration/supplies and grant funding if available.
- Presentation – presentation at public schools and visiting classes to the City. Estimated annual cost $500 for staff time. Funding is within existing budget staff costs under Surface Water.
- Signage at Parks – post signs at public access points to the Lake. Signs will state "don't feed water fowl". Estimated cost $500 ($100/sign) including post and installation. Funding is proposed within existing budget under Parks maintenance.
- Public Education Outreach – This is a onetime comprehensive outreach that would be provided by the Snohomish Conservation District. Details of this effort are included in Attachment D. Estimated onetime cost is $14,196 with the City's share being $9,996 (70%) with SCD contribution for the balance. Funding would come from the current DOE capacity grant.

The focus of the education effort is to develop a long term sustainable affect with the public to support and contribute activity in the reduction of phosphorus being released from activities under their control.

Regulations:

- BMP - City will enforce existing codes for Best Management Practices (BMP) that encourages construction methods that reduce the release of phosphorus from earth work and erosion. Estimated annual cost is $4,000 per year. Budget is within existing staff operation in site development review.
- Code - New codes regarding construction practices will include language, when appropriate to potential phosphorus release generation from an activity under such code, that will cite BMPs. Estimate annual cost is unknown.

Maintenance:

- Street sweeping – Follow the adopted Street Sweeping plan. This plan has elevated services for roadway near the lake and within the watershed of the lake. Estimated annual cost is $28,500. Funding is proposed within existing budget under Storm operations and maintenance.

Phase out aerator – aerator will remain in the lake at least through 2018 and a determination of it removal or reactivation will need to be made. City will perform minimum maintenance to keep the aerator system floating. Cost for removal is estimated at $300,000. Funding would be provided through the balance unallocated in the current budget project and grant dollars. Under the current budget projection, the estimated unallocated balance by 2019 will be approximately $177,000. A grant will be sought for the balance and if unsuccessful continued with an average annual contribution budget of $25,000 until the aerator removal is fully funded. Any costs associated with the minimum maintenance would come out of the "unallocated balance".

Monitor and review – determine success of treatment actions and revise as needed. Estimated annual budget is within the Internal Load treatment.

Budget Summary

Activity	Frequency	Duration	Est. Annual Budget	Fund source
Internal Control				
Alum application	1/year	6 years (1)	$81,000.00	Alum Line (2)
Permitting	1/year	6 years (1)	$4,000.00	Alum Line (2)
Monitoring	1/year	6 years (1)	$5,000.00	Alum Line (2)
Plan & Admin	1/year	6 years (1)	$10,000.00	Alum Line (2)
External Control				
Education				
- Brochures	NA	On-going	$200.00	SW Admin/Grant
- Presentation	Est 3/year	On-going	$500.00	Staff time (3)
- Signage	1 time	NA	$500.00	Parks O&M
- Public Outreach	TBD	TBD	$15,000.00	Grant (4)
Regulations				
- BMP	On-going	On-going	$4,000.00	Staff time (3)
- Code	TBD	TBD	TBD	Staff time (3)
Maintenance				
- Street Sweeping	On-going	On-going	$28,500.00	Existing budget
Phase Out Aerator				
- Removal	Annual	12 years	$25,000.00	Removal line (5)

Notes:
(1) - At the end of the 6th year a re-evaluation of the treatment dosage, duration, and frequency will be performed and this plan updated.

(2) - Alum Treatment line will be created in the annual adopted budget. This fund will consist of prior O&M and capital funds for the aerator system.

(3) -Using existing staff hours within the existing adopted annual budget

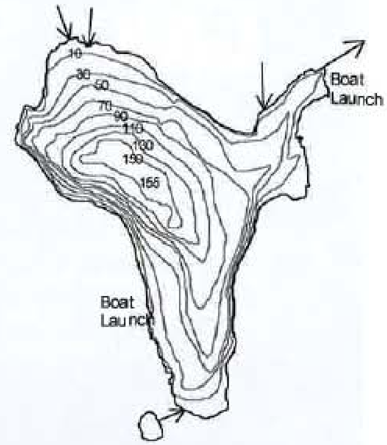
(4) - Outsource services through Conservation Dist or Sno Co. Funding would be through DOE grant. Frequency would be dependent on success of grant.

(5) - Aerator Removal line will be created in the annual adopted budget. This fund will consist of un-allocated capital funds for the aerator system. Note that the $25,000 is an average and the actual amount of the annual contribution is shown in the first table on Exhibit B.

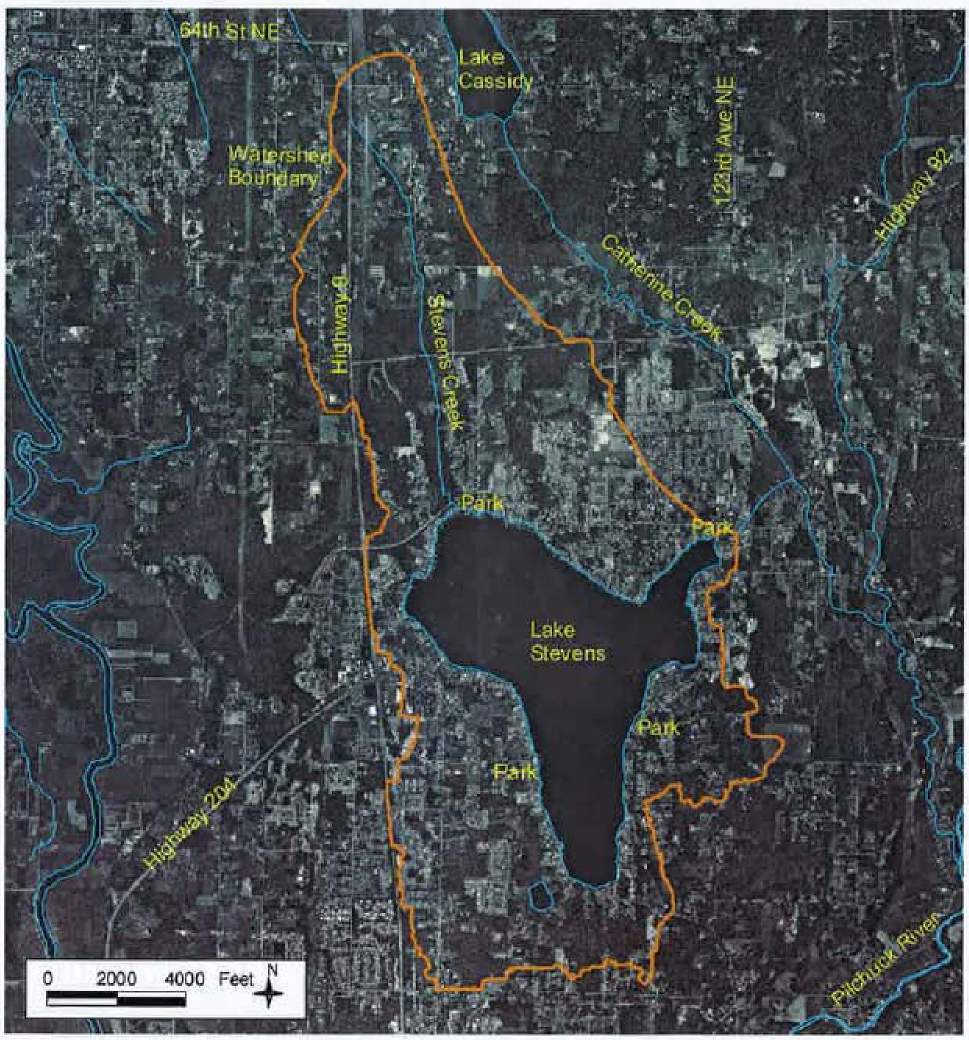
Attachment A

LAKE AND WATERSHED DATA

Lake Area:	1040 acres
Watershed Area:	4371 acres
Watershed to Lake Area Ratio:	4.2
Maximum Depth:	155 feet (47.3 meters)
Average Depth:	63 feet (19.4 meters)
Lake Volume:	65,000 acre-feet
Length of Shore:	7.1 miles



	1972	MID-90'S
# of nearshore homes	330	349
# of homes/1000' of shoreline	8.8	9.3
% of homes with bulkhead or fill		NA
% of homes with some native vegetation near shore		NA
% of watershed developed (residential or commercial)	20%	55% (est.)



Attachment B

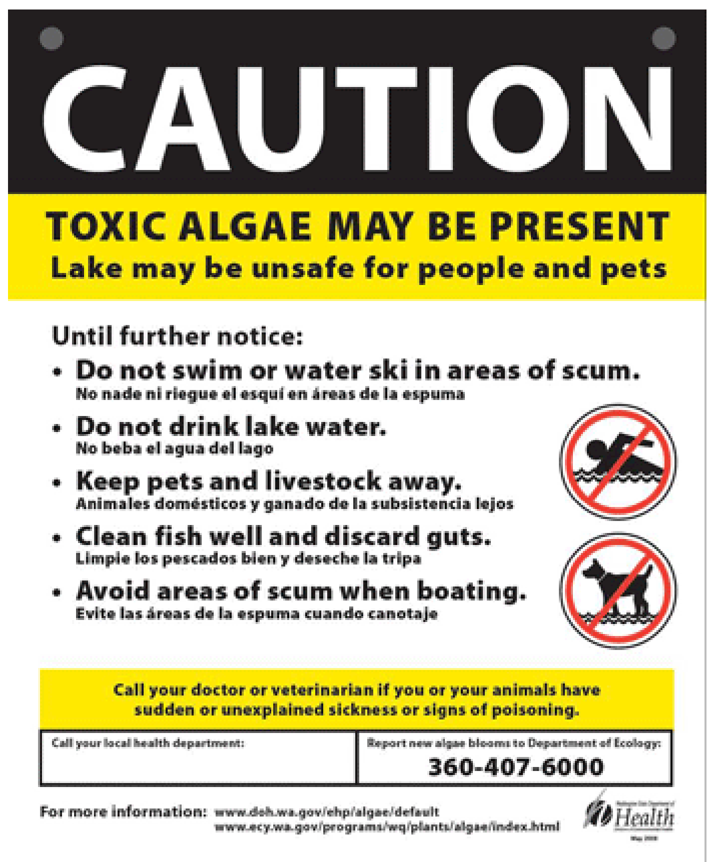
PRESS RELEASE – 27 June 12

Algae Blooms in Lake Stevens

The City of Lake Stevens and Snohomish County Surface Water Management (SWM) have been monitoring a series of algae blooms occurring this spring on Lake Stevens. Most of the observed algae has been harmless filamentous algae which appears as green and brown free-floating mats. However, in mid-June, blooms of potentially toxic blue-green algae were also detected in isolated parts of the lake.

Also known as cyanobacteria, certain species of blue-green algae can produce toxins that affect the health of people and animals that recreate in lake water. Pets that drink lake water are of special concern. Blue-green algae look like blue, green, or even white paint floating on the surface of the water and will quickly dissipate if agitated.

Water samples were taken within hours of the initial confirmation of blue-green blooms. Since toxin testing takes several days, precautionary notifications were issued to nearby lakefront residents and CAUTION signs (see below) were posted at the public access location around the entire lake. The signs, warn people not to swim or ski in areas of scum, avoid drinking lake water, keep pets away from the water; clean fish well; and avoid areas of scum when boating.



Fortunately, the toxins of concern were found at levels below the recreational standards set by the Washington State Department of Health. The blue-green algae bloom has also since dissipated. Therefore, the CAUTION signs posted at all public access sites will be removed. The County and the City will continue to monitor the algae bloom. It is possible that blue-green algae blooms may re-occur this summer or fall. Citizens should exercise caution if blue-green algae scum is present.

Algae are microscopic organisms similar to plants that can be found in all freshwater lakes including Lake Stevens. Algae are a natural and essential component to the lake because they serve as the base of the aquatic food chain. However, excessive amounts of algae can occur in response to high levels of nutrients and favorable weather conditions. Typical nutrient sources are lawn fertilizers, runoff from roofs and driveways, and pet and animal wastes. Last year's Eurasian water milfoil treatment may also be contributing to the growth. The decomposing plant matter can become a localized source of nutrients feeding algae. This is typical in the first year following a treatment.

To find out more information, track conditions at Lake Stevens, report blooms, or sign up for email toxic algae updates visit the County's web site at: http://www.lakes.surfacewater.info.

Attachment C

PHOSPHORUS TREATMENT
FINANCIAL PLAN

The following table is the cost projections for Alum treatment of the internal phosphorus only.

Year	Existing Aerator Operating Budget/ Forecast	Existing Aerator Capital Forecast	Alum Treatment *	Aerator Removal Contribution **	Aerator Removal Accumulative ***
2013	$66,000	$135,000	$100,000	$101,000	$101,000
2014	$68,000	$40,000	$100,000	$8,000	$109,000
2015	$70,000	$40,000	$100,000	$10,000	$119,000
2016	$70,000	$40,000	$100,000	$10,000	$129,000
2017	$74,000	$40,000	$100,000	$14,000	$143,000
2018	$76,000	$40,000	$100,000	$16,000	$159,000
2019	$78,000	$40,000	$100,000	$18,000	$177,000
TOTAL	**$502,000**	**$375,000**	**$700,000**	**$177,000**	**$177,000**

Note:

'*' Includes application of alum and permitting.

''** This is the annual set aside for the removal of the aerator and potential for emergency repairs. It is assumed that the total cost for the removal is $300,000. After year 2019, the annual contribution will be $25,000.

'*'** This is the sum of the accumulative set aside.

The following table is the cost projections for the aerator.

Alternative Treatment Type	Short Term (under 10 years)	Long Term (20 years)	Short Term Estimated Cost (12 year span)	Long Term Estimated Cost (replacement)
Alum Treatment	Aerator is left in place for 5 years during an evaluation period	Aerator is surpluses and removed from lake	$300,000	NA

Attachment D

SCD 528 91st Ave NE, Ste A, Lake Stevens, WA 98258-2538
Phone: 425-335-5634, ext 4   Fax: 425-335-5024   Website: www.snohomishcd.org

City of Lake Stevens

Estimate of Probable Costs for SCD 2013 Scope of Work

Develop and implement a city-wide education and outreach program addressing potential pollutants (with emphasis on phosphorous) and nutrient loading from homes and yards.

Task	Description	Estimated Cost	SCD Contributions	City's Costs
Administration	Project administration: Assist with grant reporting, billing and general project management.	$1,836	$600	$1,236
Adult Education	Develop and conduct a series of 3 workshops on the following topics: Natural Lawn Care, Naturescaping for Curb Appeal and Composting. Coordinate qualified speakers, venue, handouts and materials, publicity, registrations, and evaluations. SCD would also be responsible for set-up, clean-up and any required follow-up. Speakers will be asked to emphasize living near a lake and phosphorous reduction.	$3,806	$1,300	$2,506
	Coordinate 1-2 septic care workshops to be taught by Teri King, from the University of Washington SeaGrant program. Coordinate speaker, venue, handouts and materials, publicity, registrations, and evaluations. SCD would also be responsible for set-up, clean-up and any required follow-up.			
	Conduct behavior change survey six months after workshops to evaluate level of behavior change			
Youth Education	Develop high school water quality class curriculum specific to Lake Stevens phosphorous control/prevention. Update current elementary and middle school water quality and watershed classes to emphasize phosphorous reduction.	$2,808	$1,500	$1,308
	Make lessons available to all teachers in Lake Stevens School District, presenting in up to 10 classrooms in 2013.			
Long Term Strategy Development	Work with and support Snohomish County in developing a long-term education and outreach strategy to reduce phosphorous use and enhance water quality in Lake Stevens.	$4,160	$800	$3,360
	Note: Planning only in 2013, implementation depended upon future funding.			
Overhead	15% charged on top of staff time.	$758		$758
Materials	Refreshments for workshops, copies of handouts, newspaper articles, handouts and classroom supplies, and mailings for marketing.	$625		$625
Travel	Mileage for planning and coordination meetings and workshops.	$203		$203
	TOTAL ESTIMATED COSTS	**$14,196**	**$4,200**	**$9,996**