November 21st, 2017

Trailhead Irrigation and Driving Range Workshop

I. Trailhead Irrigation – Jennifer Camp (Parks & Recreation Director)

II. Trailhead Driving Range Height and Netting – Chris Johnston (Golf Pro)

III. Clear Risk Solutions – Risk Assessment Summary - Mark Sherwood

IV. Financing Options – RJ Stevenson (Finance Director)

V. Next Steps

TRAILHEAD GOLF COURSE SITE VISIT REPORT

Introduction

This report documents the findings of our recent evaluation of the irrigation system at Trailhead Golf Course. The purpose of this site visit was to evaluate the current condition of the irrigation system and recommend any necessary upgrades. The site visit was made over two days, September 12 and 13, 2017.

Background

The golf course was first opened in 1973 as a privately owned 9-hole course and was purchased by the City of Liberty Lake around 2001. As far as can be determined, no significant changes have been made to the irrigation system since it opened, making the majority of the system approximately 44 years old. A properly designed and installed irrigation system should remain serviceable for approximately 30 years before major upgrades or complete replacement should be considered. This system has significantly surpassed the expected timeframe for updates and replacement. At this point in the equipment life-cycle, we would expect that a significant investment is due. This report will review the major components and sub-systems of the irrigation system and provide a qualitative analysis of each area.

There are no as-built drawings available for review, so our evaluation is based on interviews with the golf course staff and observation of what we saw on the surface. The golf course staff has kept some photographic records of repairs. That information was used to estimate the materials used in the original installation and their expected serviceable life.

The golf course has approximately 52 acres of irrigated turf along with an aesthetic pond that is about ½ acre in size but is quite shallow.

Water Sources and Quality

Water is supplied to the course from a well located at the extreme north end of the property adjacent to the range. The well pump discharge pressure to the golf course is set to approximately 85 pounds per square inch (psi) which may not be adequate

191 Cabrillo Street
Costa Mesa, CA 92627 USA
949/631-8998 fax 949/631/8999

for the needs of the existing sprinklers and system design. A well pump is a relatively trouble-free method of supplying water to the course with the caveat that if there are any issues with the water quality (such as pH) it is not as easy to treat the water as it might be if a lake were available for storage.

The pond is relatively small and we would not recommend utilizing it as an irrigation source unless it were essentially tripled in size, and increased in depth to a minimum of 8 feet.

We understand that the water quality is very good and there are no issues in this regard.

Pumping System and Capacity

The motor is 75HP with a direct drive pump. A start control package was installed about 2 years ago. The pump operates at 460v, 3ph, 60 Hz which is typical for this type of motor. The soft start will reduce the initial water surge pressure that would otherwise occur when the motor starts and will also reduce the wear on the motor contactors. An alternate piece of equipment that should be considered is a Variable Frequency Drive (VFD). The VFD regulates the speed of the motor to match water demand. The use of a VFD should significantly reduce electric costs as well as being gentler on the piping system by reducing pressure surges, sometimes known as water hammer. We highly recommend installation of a VFD drive for this pump equipment.

The pump control valve appears to be in good condition, however we noticed that it only has a pressure reducing control valve in the pilot system. It also needs to have a pressure relief control valve in the pilot system to prevent surge pressures from entering the irrigation system. It should also have opening and closing speed controls if it doesn't have them already. The arrow in the photo to the right points to the pressure reducing control valve. The pressure relief valve looks very similar and would be on the opposite side of the main valve body.

We recommend regularly scheduled service of the control valve since it controls the pressure that is ultimately seen in the irrigation system. Twice a year is a good idea; once a year should be considered to be the minimum service interval.

We were informed that the motor has been cleaned in the last few years, but to everyone's knowledge, it has not been re-wound, nor has the pump been tested or inspected since the city became responsible for the system. No service records from the previous owner were available, but it is the general feeling that little has been done to the original equipment.

The discharge pressure from the well pump is approximately 140 psi. This pressure was noted on the gauge on the pump side of the control valve. The discharge pressure from the control valve is currently set to regulate between 85 and 65 psi. This was confirmed by the gauge on the discharge side of the control valve which was reading 80 psi when we inspected the equipment. At the low end of this range (65 psi), we would expect to see a loss of sprinkler performance.

Capacity of the pump is estimated to be approximately 700 gallons per minute (gpm). The maintenance staff believes they are currently operating somewhere in the 500 to 600 gpm range, but we believe this estimate is a little on the low side. This could not be confirmed since the system does not include a flow meter. We recommend adding a flow meter to monitor and improve utilization of the pump capacity. A paddle wheel type flow meter such as the Data Industrial 220B or 220SS should be adequate for your needs. A magnetic flow meter could also be considered if more accuracy is desired. It should be noted that there are recommended minimum straight runs of pipe required before and after the flow meter that may not fit in the existing building configuration. It might be possible to address this by running the discharge 180 degrees back towards the motor and having the discharge pipe exit the building towards the range instead of towards the parking lot.

The pump does not have a sophisticated control package. Most modern packaged pump stations have control safeties that will shut the pump off if there are any occurrences that could damage the pump or cause problems in the field. Common safeties include the following:

- Low discharge pressure shut-off
- High discharge pressure shut-off
- Phase failure and low voltage alarms
- Motor overload shutdown

If a VFD is installed, the control package for the drive should generally include these safeties along with other monitoring capabilities specific to the drive.

There is a domestic supply line and check valve tied into the discharge pipe just outside the pump building. We were told that this is used to act as low flow line fill in

the event that the main line is drained for maintenance purposes. It can also be used to prime the pump if it loses prime for any reason.

We understand that your current cost for irrigation water is only the electricity required for the pump. You should be aware that this may change in time. In many parts of the country, well owners are being charged ground water extraction fees or replenishment fees and must track water use from their wells. It might be prudent to have the ability to track your water use in case it becomes mandatory in the future. It will also provide you with a valuable water use management tool.

Based on the total acreage and anticipated Evapotranspiration Rate (ET) for your area, we estimate the average peak daily water requirement to be approximately 250,000 gallons per day. With the 700 gpm capacity of the pump, we believe this can be accomplished in approximately 8 hours with the appropriate irrigation program.

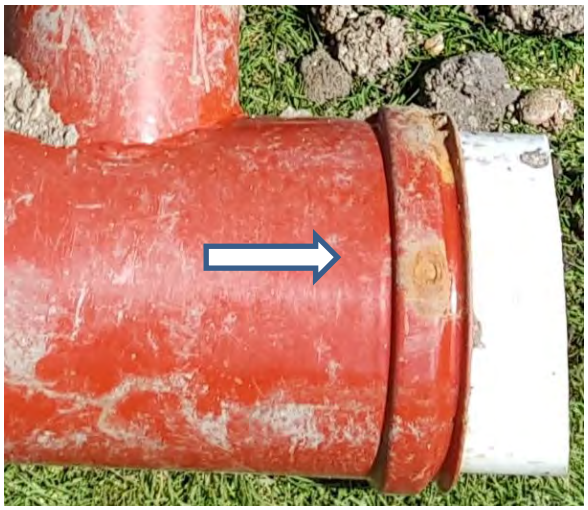
Hydraulic Design, Piping System and Valves

The existing system is designed as a block system, meaning multiple sprinklers operate from a single control valve as a group of sprinklers that come on at the same time. The golf course staff refers to these blocks of sprinklers as “zones” which is a common term used in the management of landscape systems for a group of sprinklers that operate from a common control station and usually irrigate a similar area of landscape material.

There are two design styles that were common in block systems. The more desirable system is designed with the blocks of sprinklers running the length of the golf hole; meaning that for the most part, fairway heads run with fairway heads, and rough heads run with rough heads. The less desirable design method runs lateral piping across the golf hole so that a single lateral line may have sprinklers in both the fairway and rough. This second design style provides less control over where water is applied and tends to create more wet and dry spots that a system that is designed up and down the hole rather than across the hole. Your system, unfortunately, was installed with the less desirable design. That being said, block systems in general result in a significant number of wet and dry areas compared to valve-in-head systems where each sprinkler is controlled individually. These wet and dry areas are generally caused by differences in soil types, slope, sun exposure and local highs and lows. The ability to control the individual run time for each sprinkler can help mitigate this to a large degree.

As noted in the previous section, the pump equipment was upgraded about 2 years ago to include a soft start. Consequently, for the previous 42 years, the piping system has been absorbing the initial shock of the hard pump start from 0 to 700 gpm in very

short order. This can produce a significant amount of water hammer in the system. We can only estimate the degree of the pressure surge, but suffice it to say it has been significant. In the last two years, there have been approximately 8-10 main line breaks, primarily for broken main line pipe. Additional repairs have been made for significantly leaking fittings. We were provided photos of the last main line break that was repaired. The pipe was split along the entire length and continued for two lengths of pipe for about 40'. This is more than likely damage from water hammer. At this point, the entire main line system has been compromised and future breaks are certain to occur, but it is impossible to predict when or where. From past experience, we would expect the frequency of these breaks to increase over time.



Some of the main line repairs have been made to repair leaks at the fittings where the lateral valves are attached to the main line pipe. These appear to be steel fittings. We are uncertain of the brand, but this type of fitting is no longer in use in the golf or waterworks industry due to frequent failures caused by corrosion. The arrow in the photo to the left points to what appears to be corrosion through the body of the fitting at the gasket location. The current standard is to use ductile iron fittings which are much more substantial. These are available with epoxy coating to prolong the life of the product.

Lending to the main line failures is the fact that there were no operational air relief valves on the system until recently. The hand full of air relief valves that were originally installed were simply isolated from the system as they failed instead of being repaired or replaced. Air trapped in the piping system increases the surge pressures as air is purged from the system through the sprinklers when they are turned on. There are currently four air relief valves on the system that we were able to locate, however they are not the appropriate type of valve for this application and we recommend that they be replace with a model specifically designed as a combination air relief - vacuum relief valve. These are critical system components, particularly in light of the frequent main line breaks that require draining the system. These components purge air from the system as it is refilling to help avoid water hammer. They also allow air to enter the system as water is drained to prevent a vacuum from collapsing the pipe.

We did not note any specific valves on the main line for draining the system for winterization. These are important in your area where the piping systems need to be drained to prevent water from freezing in the pipes during the winter. We recommend that drain valves be installed at the low point near the pond, and one at each dead end of the main line pipe. These should be at least 3" or 4" in size and be located laterally or at the bottom of the pipe and not on the top of the pipe.

There are only about five main line isolation valves on the system and they are all relatively new, having been installed during main line repairs. These will aid in maintenance of the system. We recommend installing these isolation valves between golf holes to minimize the amount of main line that needs to be drained when repairs are made.

The valves that supply the sprinkler blocks are teed directly off of the main line pipe without a lateral line isolation valve. We recommend installing a lateral isolation valve at each main line tap so that lateral line remote control valves and piping can be repaired without draining substantial portions of the piping system.

With the lack of actual as-built information, pipe sizing has been estimated by the golf maintenance staff based on what they have found during system repairs. Some of this information does not seem to follow typical design standards. For example, the information supplied to us suggests that 6" pipe comes from the pump and then increases in size to 8" somewhere between the range and 9 green. We suspect that the 6" pipe out of the pump increases to 8" right away and is only 6" from the pump discharge for a very short distance. It is not uncommon to have a smaller pipe coming off of the pump discharge in order to match the pipe size with the control valve size, but irrigation system design standards recommend keeping flow in the main line and lateral pipe under a velocity of 5 feet per second (fps). In a 6" steel pipe, 700 gpm would have a velocity of about 7.75 fps. In 8" PVC pipe, 700 gpm is about 4.7 fps which is more appropriate. For the purposes of this report, we will assume the pipe is sized as 8" starting immediately outside the pump and running down to the pond where it splits to two 4" pipes around the pond, then continues as 6" to the southern end of the course.

Based on how the system is currently being operated, pipe sizing is probably adequate, but the irrigation control program currently in use does not allow hydraulic management of the system. It is possible with the current control system to operate more sprinklers/valves in an area of the course than the pipe sizing is capable of supporting. We will address this in more detail in the Control System portion of this report.

The Remote Control Valves (RCV's) that are currently being used to turn on each block of sprinklers are basic on/off type valves. In a block system such as you have it is important to control the pressure that is being supplied to the sprinklers to ensure they are receiving at least approximately the same operating pressure. Varying

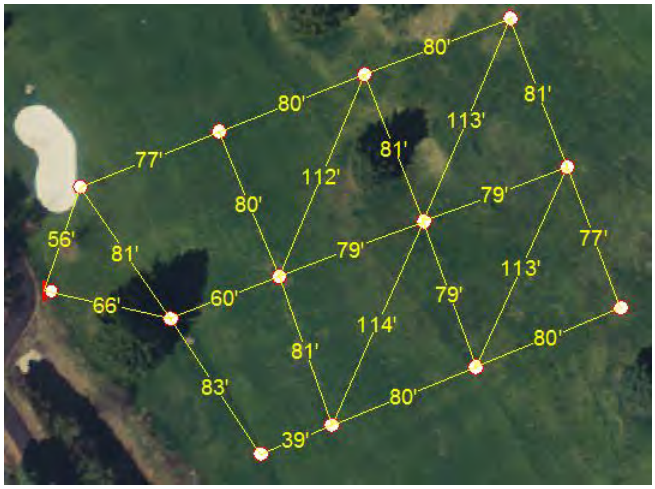
pressure results in varying amounts of water being discharged from each sprinkler. With the set up the way it is right now, sprinklers near the pump may have a relatively consistent pressure, but those sprinklers at the low point may have more pressure than necessary resulting in too much water being applied. Sprinklers at the far end of the course may have too low of a pressure due to the uncontrolled flow in the main line which may result in too low of a pressure as a result of friction losses in the main line pipe. With this type of a block system, it is important to have pressure regulation on each RCV to at least have a similar starting pressure for all the sprinklers.

The original valves were made of brass or bronze; however, they were plumbed to the main line using galvanized steel pipe and fittings. By using dis-similar metals without a di-electric union between them, a galvanic response occurs which essentially turns the connection into a battery. In this combination of metals, the brass or bronze stays mostly intact but the galvanized steel will corrode. Over time, the corrosion will be substantial enough to eat completely through the galvanized pipe and make the threaded connection between the two metals virtually inseparable. Leaking connections are inevitable. This is indeed what has been happening and a significant number of the valve assemblies have been replaced. The newer valves that are being installed are made of thermoplastic rather than brass, so the galvanic response is eliminated in the new assemblies. We recommend that replacement continue on an as needed basis, but that all future valves be purchased with the pressure regulation feature. Note that the pressure regulation feature can be added to the newer RCV's that have already been installed and we would recommend making this upgrade if you elect to not replace these valves in the near future.

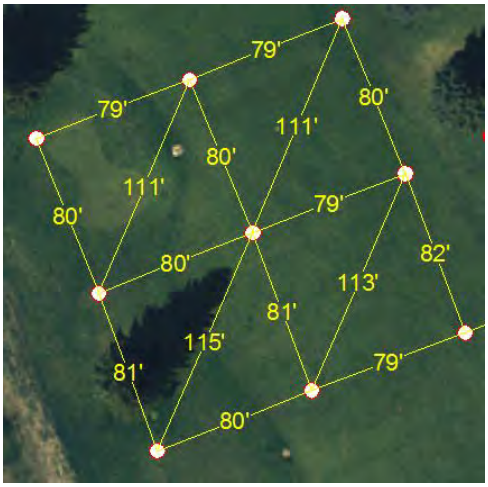
There are a few Quick Coupling Valves (QCV's) around the course. These are useful for connecting a hose to the system for spot watering by hand or setting temporary sprinklers for irrigating problematic dry areas. Many of the valve installations we saw were too deep to be useable. These will need to be extended to within about 3"-4" of the surface so that they can be used.

Sprinklers and System Coverage

The course was originally designed with Rain Bird model 47 (part circle) and 51 (full circle) impact sprinklers at 80' square spacing. We confirmed the spacing using GPS equipment and found it to be fairly consistent between 77' and 82'. The maintenance staff was under the impression that spacing was inconsistent, but we found it to be fairly consistent with the original design intent. We are assuming that their impression came from measuring across the square in which case you will measure approximately 113'. As you can see from the measurements on Hole 1 below, some spacing was adjusted because of trees and golf features such as bunkers, but overall, it seems to be fairly true to the original intent. The lower left measurement on Hole 1 fairway appears to be an anomaly; there may have been a tree behind that sprinkler at one point in time.



SPRINKLER SPACING
HOLE 1 FAIRWAY



SPRINKLER SPACING
HOLE 4 FAIRWAY

The Rain Bird 47 and 51 series sprinklers have not been available since 2007, and they have not been in wide spread use since the late 1990's when geared rotors were becoming the sprinkler of choice for smoother operation. As sprinklers are being replaced, the golf course staff has replacing these impact sprinklers with Toro model 835 (now FLX35) geared rotors.

We estimate there are approximately 350-400 sprinklers in the current irrigation system. The Toro distributor believes that they have supplied less than 100 replacement sprinklers which would leave at least 250-300 original Rain Bird impact sprinklers still in use. Most of the replacement sprinklers have the #33 nozzle set which is designed to produce the best results at 60 to 65' spacing.

Sprinkler manufacturers test their nozzle sets using a standard format in laboratory conditions when developing their products. This information is available to us to

review when we are selecting the best nozzle sets for a particular application. The primary parameter we rely on when selecting a specific nozzle for a project is the Distribution Uniformity (DU). The DU compares the amount of water applied to the lowest quarter of the irrigated area to the area as a whole, and is expressed as a percentage. As a guideline, DU's in the 80% range are considered to be "Excellent" and achievable, DU's in the 70% range are "Good" and should be expected on a properly designed and maintained golf course, DU's of 60% are "Fair", and DU's of 50% are "Poor". Typically, if DU's are measured in the 50-60% range, there is usually something wrong that can be corrected to improve the performance. If installed per a properly designed plan, the problem typically is found to be the wrong nozzle set, or something physically wrong with the sprinkler such as not being installed flush to the turf, the nozzles are plugged with debris or are excessively worn, or the sprinkler has stopped rotating due to mechanical failure.

At 80' square spacing, we estimate the Rain Bird 51 full circle sprinkler initially provided a Distribution Uniformity (DU) in the mid 70% range. As the nozzles wear over time, the uniformity typically drops, but without field verification through an audit, it is difficult to determine what the current DU might be.

The replacement Toro 835 sprinkler with the #33 nozzle set provides a DU of approximately 85% at a base pressure of 65 psi and 80' square spacing. Some locations have a #35 nozzle set which better approximates the spacing for a head-to-head throw, but because of the specific water profile for this nozzle at square spacing, it only provides a DU of approximately 68%. Consequently, we recommend staying with the #33 nozzle set even if it does not appear to throw water far enough.

It is important to note that these performance numbers are based on a consistent pressure at the base of the sprinkler and as noted before, with a block system designed as this one is, every sprinkler has a different pressure at the base since there is no pressure regulation at the lateral valve location and as you go out on the lateral, each successive sprinkler sees just a little bit less pressure due to friction losses in the lateral pipe.

With the improved testing capabilities that manufacturers have today, and greater emphasis on improved uniformity to both save on water costs and improve turf quality, sprinkler spacing in most markets has become closer and closer which provides improved distribution over a smaller area. Depending on the market, sprinkler spacing on golf courses today ranges from as little as 55' in some desert climates to as much as 80' and more in wetter, more forgiving environments. In your market, 60' to 65' equilateral triangular spacing is more common. The new system for the MeadowWood Golf Course is based on 65' equilateral triangular spacing.

The geometry of sprinkler spacing also plays an important role in distribution uniformity. Equilateral triangular spacing is considered to be the most efficient spacing for improved performance. For example, if the original Rain Bird 47 and 51 sprinklers

were spaced at triangular spacing that matched the sprinkler nozzle radius of throw instead of 80' square spacing, the DU's would theoretically increase from the mid-70's to the high 80's.

As far as coverage is concerned, the coverage along the western perimeter of the golf course adjacent to the trail is fairly irregular and a lot of dry areas were noted. Coverage on the range, and the eastern and southern borders of the course appeared to be more consistent with significantly fewer dry areas noted adjacent to the homes.

Greens are currently irrigated with full circle sprinklers operating on a block the same as the rest of the golf course. Individual sprinkler control for greens is considered to be mandatory for today's design standards. On future designs, we recommend that greens be irrigated using individual sprinkler control and that greens be irrigated separately from the greens surrounds. This generally requires side-by-side sprinklers around the greens with one sprinkler throwing on the green and the other throwing away from the green.

It appears that the original 47 and 51 series rotors were not purchased with a check valve in the base of the sprinkler that would maintain water in the lateral piping when the sprinklers were turned off. In fact, this may have not been an available option at the time the sprinklers were installed. Consequently, while not running, the water in the lateral piping drains out of the system through the lowest sprinkler on the lateral. As a result of this, air enters the lateral pipe and when the valve is initially opened for irrigation, the air is purged through the sprinklers. This will cause water hammer in the lateral pipe. We were surprised to hear that there have been very little or no issues with lateral pipe or lateral fitting leaks or failures.

Control System

The control system consists of two Rain Bird 48 station ESP-LXME field controllers. Both are located in the basement of the clubhouse. Central control is provided by a Rain Bird IQ system that is cloud based, without a physical computer in the maintenance area. This system is geared towards landscape and park type systems rather than golf courses that generally require a greater degree of control to maintain the turf in the best condition for play. We were told that the field controllers are only about 4-5 years old, so they should be close in functionality to currently available products.

The indoor location of the field controllers does not lend itself to convenient use for starting sprinklers from the field. However, using the features of the IQ central control system, the maintenance staff can activate sprinkler zones from a smart phone or tablet connected to the internet.

The IQ system does not have any method of managing how much water flows through each section of main line or lateral piping and simply relies on the irrigation tech or water manager to correctly sequence how many sprinklers, or zones, are operated at the same time in each area during a nightly irrigation cycle. This is a drawback of the IQ system. Every central control system that is designed for golf course use includes a hydraulic management system to protect the system from inadvertent surge pressures that can occur from improper station or zone sequencing.

When we look at control systems, we also look at what is known as the span of control, which basically refers to how finite a control you have over where water is applied, or more generally, how many sprinklers are controlled by a single control station. When you look at the progression of irrigation in the golf industry, the simplest form of managed irrigation was a quick coupler system. This was typically a row of quick coupling valves that went down the middle of each hole and a night waterman would move sprinklers from each quick coupler to the next throughout the night. Spacing was quite large, generally 100’ plus between quick couplers and large impact sprinklers were used for irrigation. Timing was inconsistent since it was completely dependent upon the night waterman to run each sprinkler for a predetermined time, or when he got back to moving the sprinkler on his rounds.

As time progressed, quick coupling systems evolved into block systems such as you currently have, and block systems became automated with the advent of automatic field controllers. The next innovations included the addition of a valve under each sprinkler to provide individual control over that sprinkler and eventually the valve was integrated directly into the sprinkler case which is the general product in use today for the majority of golf courses.

To save construction costs, the first valve-in-head (VIH) systems typically had multiple sprinklers operating on the same control station which was, in practice, very similar to a block system but had the advantage that each sprinkler had its own pressure regulated valve in the base of the sprinkler. Over time this has evolved to the point where each sprinkler is connected to its own control station as the advantages of individual control are more widely understood and the cost of control systems has

allowed the wider use of individual sprinkler control. In today's market, the vast majority of irrigation systems consist of individually controlled VIH sprinklers.

The only form of hydraulic control in use right now at Trailhead Golf Course is to operate no more than 4 stations at a time on each field controller. We estimate that this may exceed the pump capacity which will result in reduced performance of the sprinklers, mostly the result of lower pressures at the base of the sprinkler than intended in the original design.

Summary and Recommendations

As a reference point, we have included a guideline for the expected life cycle for golf course items that has been prepared by the American Society of Golf Course Architects (ASGCA) as Attachment 1. This guideline was prepared with input from many sources including the USGA, Golf Course Builders Association of America (GCBAA), the Golf Course Superintendents Association of America (GCSAA) and others. While reviewing this document, you will note that all of the items covered in this report have exceeded their expected service life.

Some of the recommendations below can be considered independently, and others only make sense to do when combined with other options.

Water Source

The water source is clean and reliable. We do not have any recommendations for changes or modifications to the current source. The location is not ideal since it is at the extreme end of the golf course. A centrally located water source could reduce pipe sizing requirements. That being said, Trailhead is a fairly compact course and the location is not a significant factor for design considerations.

The central pond could be considered as an optional pump location, but we do not believe the costs involved would justify any changes to the current configuration. The pond would need to essentially triple in size and depth, and 3-phase power would need to be brought to that location at significant cost, perhaps in the range of $250,000-$300,000 when everything is done.

Pump Equipment

The pump equipment is assumed to be 44 years old and is well past its expected useful life.

For improved performance and reduced power consumption, we recommend installing a VFD control package on the pump. This may allow the control valve to be

removed and replaced with a simple check valve. We estimate the cost of the VFD control package including installation to be in the $35,000-$40,000 range.

Rewinding the motor will eventually be required. For a 75 HP motor, replacing the motor will be within about 10% of what it will cost to rewind it. Installing a new motor will be in the vicinity of $10,000.

We recommend the installation of a flow meter for better management of the system and for keeping track of how much water is used on the golf course. We estimate the installation of a basic paddle wheel type flow meter will be about $10,000.

The current pressure is set to operate the between 65 and 85 psi. We feel this is a little bit on the low side to allow for friction losses in the main line and lateral piping systems. Since there is plenty of pressure available from the pump, we would recommend increasing the discharge pressure to about 100 psi, but only in conjunction with installing pressure regulation on the remote control valves that supply each block of sprinklers. If pressure regulation is not added to the remote control valves, we would not recommend a change to the current pressure settings since this may significantly affect the gpm discharge from each sprinkler to the point where it may increase overall flow rates beyond the desired pipe capacity. An increase in the set point may also result in an increase in main line breaks.

Hydraulic Design, Piping System and Valves

Based solely on the frequency and type of main line breaks that are occurring, we believe the main line piping system requires complete replacement at this time. It has already exceeded its expected service life by almost 50%. Additionally, over the years, it has not been operated in a fashion that would extend its usable life. Surge pressures from the pump have taken their toll on the piping system and that damage is currently showing up as split pipe and failed fittings. The lower than average system pressure is more than likely a contributing factor to the longevity you have enjoyed with the system so far.

We will address other options in the next section, but at a minimum, replacement of the main line would entail trenching in new pipe, installing lateral isolation valves for each set of block valves, and piping over to the existing valves (or moving the existing valves to the new main line). New main line would be installed offset approximately 10’ from the current main line. With the installation of a new main line, it would be appropriate to install all new remote control valves that include pressure regulation.

A sketch of the suggested new main line installation is attached for reference as Attachment 2. We would recommend using only 8” and 6” pipe to improve flows and reduced pressure losses. At prevailing wage rates, and including a 10% contingency, we estimate this work will be in the vicinity of $300,000-$350,000.

Sprinklers and System Coverage

The original sprinklers are well past their expected useful life. All remaining Rain Bird impact sprinklers should be replaced. If Toro sprinklers are the desired product, we recommend replacing the full circle sprinklers with the Toro FLX34 sprinkler with the #33 nozzle set. The comparable part circle sprinkler is the FLX35 with the #33 nozzle. The FLX35 can be used as either a part circle sprinkler or a full circle sprinkler, however the FLX34 provides better performance in full circle locations. The expected cost of replacing the remaining 250-300 sprinklers is approximately $45,000-$55,000 including installation, tax, overhead and profit. Whether Toro or Rain Bird is the desired product is a less important decision than making all product the same across the site to ensure performance compatibility and uniformity.

Simply replacing the remaining impact sprinklers with new rotor style sprinklers will not greatly improve the overall condition of the course. You will still have over-spaced sprinklers on 80’ square spacing in a block configuration with limited control over where you put your water.

To improve the overall conditions, we recommend a complete replacement of all sprinklers at the recommended 65’ triangular spacing. This will significantly improve your water utilization and reduce your power costs since you will have better control over where and when water is applied. At the same time, we recommend going from a block system to a valve-in-head system with single station control. The golf course staff has expressed a desire to improve the ability to control water around the greens. Our recommendation at greens is to install dual part circle sprinklers; one set for the greens, and the other set for the surrounds. We estimate the cost of a complete new irrigation system, including installation, tax, overhead and profit would be in the vicinity of $850,000 to $1,200,000 including a 10% contingency.

Control System

The existing control system is functional for the current needs of the golf course. However, it is not the most efficient and it does not have the desirable features that manage and protect the system hydraulic and electrical limitations. When the irrigation system is upgraded to valve-in-head sprinklers and individual sprinkler control, we recommend that a control system designed for golf course use be installed to replace the current system. The cost of these controls by themselves are around $200,000 installed, but before taxes, overhead and profit. This cost is included in the above full system replacement estimate.

Conclusions

Your water source appears to be adequate for the needs of the golf course and there are no reported issues with the quality of the water. This source should be more than adequate going forward.

The pump is an unknown factor. We suggest making the upgrades noted above in the Pump Equipment section of this report, but the condition of the pumps themselves is unknown at this point. Prior to making the upgrade investment, we recommend that the pump be tested to determine if it is still producing the volume and pressure that it should. The local power company may be able to test this for you. Many providers will do this at no charge, but you may have to wait until they have staff available to do the work. Most pump companies can also do this, but will charge you a nominal fee. If it is determined that a new pump and or motor is required, some power companies will assist with the cost of a pump upgrade if it is determined that significant power savings can be attained. We recommend that you investigate with your local provider to see if they offer these services and financial assistance.

The overall condition of the irrigation system is poor. At a bare minimum, the main line piping system needs replacement. Based on the age of the remainder of the system, in our opinion it should be replaced in its entirety as soon as is practical. We expect that the failures of the main line pipe and fittings will continue at the current rate for the foreseeable future. The existing sprinklers will continue to fail due to age and will need replacement with newer model sprinklers. Although the lateral piping does not appear to be a problem at this point, significant performance improvements can be attained by installing all new sprinklers at a more appropriate spacing.

Although the central control system is relatively new and can serve the current needs of the site, any system improvement will be better served with a control system designed specifically for golf course use.

ATTACHMENT 1

AMERICAN SOCIETY OF GOLF COURSE ARCHITECTES
LIFE CYCLE ESTIMATES

GOLF COURSE ITEMS
EXPECTED LIFE CYCLE

HOW LONG SHOULD PARTS OF THE GOLF COURSE LAST?

No two golf courses are alike except for one thing: deferring replacement of key items can lead to greater expense in the future, as well as a drop in conditioning and player enjoyment. The following information represents a realistic timeline for each item's longevity.

Component life spans can vary depending upon location of the golf course, quality of materials, original installation and past maintenance practices. The American Society of Golf Course Architects (ASGCA) encourages golf course leaders to work with an ASGCA member, superintendents and others to assess their course's components.

ITEM	YEARS
Greens (1)	15 – 30 years
Bunker Sand	5 – 7 years
Irrigation System	10 – 30 years
Irrigation Control System	*10 – 15 years*
Pump Station	*15 – 20 years*
Cart Paths – asphalt (2)	5 – 10 years (or longer)
Cart Paths – concrete	15 – 30 years (or longer)
Practice Range Tees	5 – 10 years
Tees	15 – 20 years
Corrugated Metal Pipes	15 – 30 years
Bunker Drainage Pipes (3)	5 – 10 years
Mulch	1 – 3 years
Grass (4)	Varies

NOTES: ***(1)*** *Several factors can weigh into the decision to replace greens: accumulation of layers on the surface of the original construction, the desire to convert to new grasses and response to changes in the game from an architectural standpoint (like the interaction between green speed and hole locations).* ***(2)*** *Assumes on-going maintenance beginning 1 - 2 years after installation.* ***(3)*** *Typically replaced because the sand is being changed – while the machinery is there to change sand, it's often a good time to replace the drainage pipes as well.* ***(4)*** *As new grasses enter the marketplace – for example, those that are more drought and disease tolerant — replanting may be appropriate, depending upon the site.*

ASGCA thanks those at the USGA Green Section, Golf Course Builders Association of America, Golf Course Superintendents Association of America and various suppliers for their assistance in compiling this information.

The materials presented on this chart have been reviewed by the following Allied Associations of Golf:

For more information, contact ASGCA at (262) 786-5960 or visit www.ASGCA.org

DATA COMPILED BY ASGCA, 125 NORTH EXECUTIVE DRIVE, SUITE 302, BROOKFIELD, WI 53005

ATTACHMENT 2

SCHEMATIC OF PROPOSED MAIN LINE REPLACEMENT

LEGEND

- Existing Remote Control Valve
- × New Lateral Isolation Valve
- New 8" CL200 PVC Main Line
- New 6" CL200 PVC Main Line

BTG
BRYANT TAYLOR GORDON
IRRIGATION DESIGN & CONSULTING
+1-949-631-8598 btg@waterlinks.net

TRAILHEAD GOLF COURSE

LIBERTY LAKE, WASHINGTON

MAIN LINE REPLACEMENT – SCHEMATIC PLAN

NORTH

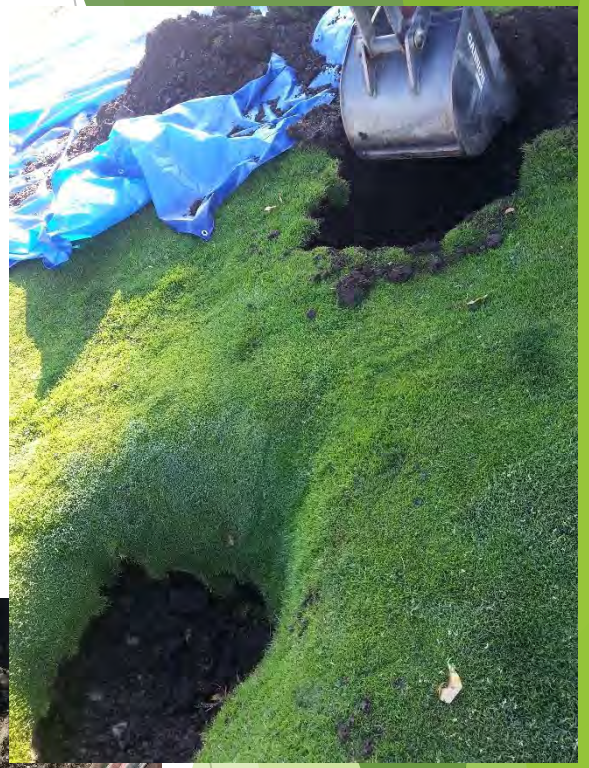
SCALE: NONE

DATE: 9/18/17

SHEET:

1

TRAILHEAD GOLF COURSE



Office (800) 955-6788 (714) 265-2200 **FAX** (714) 265-2400
Washington Contractors License #JUDGENI984QQ
www.judgenetting.com

PROPOSAL & CONTRACT

October 13, 2017

Mr. Chris Johnston
Head PGA Professional, Trailhead at Liberty Lake
1102 North Liberty Lake Road
Liberty Lake, WA 99019

Re: Netting Barrier Improvements, Trailhead at Liberty Lake Driving Range.

Dear Mr. Johnston:

Per the information provided, (Tanner N-3A and N-3B) we propose to supply the material, labor, and equipment necessary to remove and install new netting structures and netting on the driving range at your facility. We will remove and properly dispose of the existing wood poles and netting and install new painted steel poles designed for local wind conditions. All new netting will be UV treated polyester with sewn in rope border, middle, and vertical rib lines. Cable and hardware will be heavy duty ¾" galvanized and we will install 20,000 lb. end anchors as needed. **We are a licensed Washington Contractor and WSST and prevailing wages are included in this proposal. (Please initial, sign, and total where applicable)**

_____Mobilization for this project (one move on and off) is $7,000.
_____Demolish and dispose of existing wood poles is $19,300.

N-3A with steel poles as specified:

Left side poles #1-17 only is $621,200.
Rear of range poles #18-24 only is $214,400.
Right side poles #25-36 only is $485,300.
Tee Divider poles #37-39 only is $49,700.

N-3B with steel poles as specified:

Left side poles #1-17 only is $621,200.
Rear of range poles #18-24 only is $235,500.
Right side poles #25-36 only is $590,600.
Tee Divider poles #37-39 only is $49,700.

Option(s)

_____Provide Washington Stamped Structural Engineering add $4,600.
_____Provide performance and payment bonding add 1.5% of contract price.
_____Provide and install 6' vinyl coated chain link fence on the bottom of the barrier add $48.00 per L/F.
_____Provide and install 2" by 12" treated wood baseboard on the bottom of the barrier add $20.00 per L/F.

Discount(s)

_____Use 2 recycled wood poles for 40' poles discount $5,700.
_____Use 1 recycled wood pole for 50' pole discount $3,200.
_____Discount 5 percent of total project cost if more than one side of project is contracted concurrently.

Payment Terms:

30% due upon scheduling of work completion of work, 30% due upon erection of embedment sections, 20% due upon erection of middle and top sections, with the balance due upon completion. Invoices not paid when due are subject to a service charge of 1-1/2% per month. This is an annual percentage rate of 18%. Should suit be

instituted to enforce the provisions of this Proposal/Contract, the prevailing party shall be entitled to reasonable attorney's fees and court costs as determined by the court or other tribunal hearing the matter.

Standard Assumptions:

- Proposal pricing good for 60 days.
- Good digging conditions defined as being able to complete the excavation using our auguring equipment. Should rocky, sandy, or wet conditions be encountered, an additional charge will include cost, plus 10%.
- Excavation: the client will be responsible for locating any and all private underground utilities located on their property.
- The material that is excavated from the holes will be spread next to the hole.
- Necessary access "to," "from," and "at" work site during construction.
- Activities may require alteration during construction to provide a safe working environment for our employees and equipment.
- Mobilization costs included in our proposal are based on one move-on and move-off. Any cessation of work due to lack of permits or any reason by client will require a $3,000 re-mobilization charge with all work and materials invoiced to date.
- We are a non-union company and, as such, will not become signatory to any labor agreement.
- Our proposal is based on the 2012 IBC that are usual, standard and customary for the installation of structures such as anticipated by you. The foundation design is based on a 200 pound pcf allowable lateral soil bearing. The criteria is: 110 mph wind speed, Exposure 'B', and a wind speed up factor (kzt) of 1.38.
- If this standard is unacceptable to the governing code authority in your area, we will be pleased to install the structure to the necessary standards and requirements contingent upon acceptance of a revised proposal which will include any cost implications and/or modifications.

Standard Exclusions:

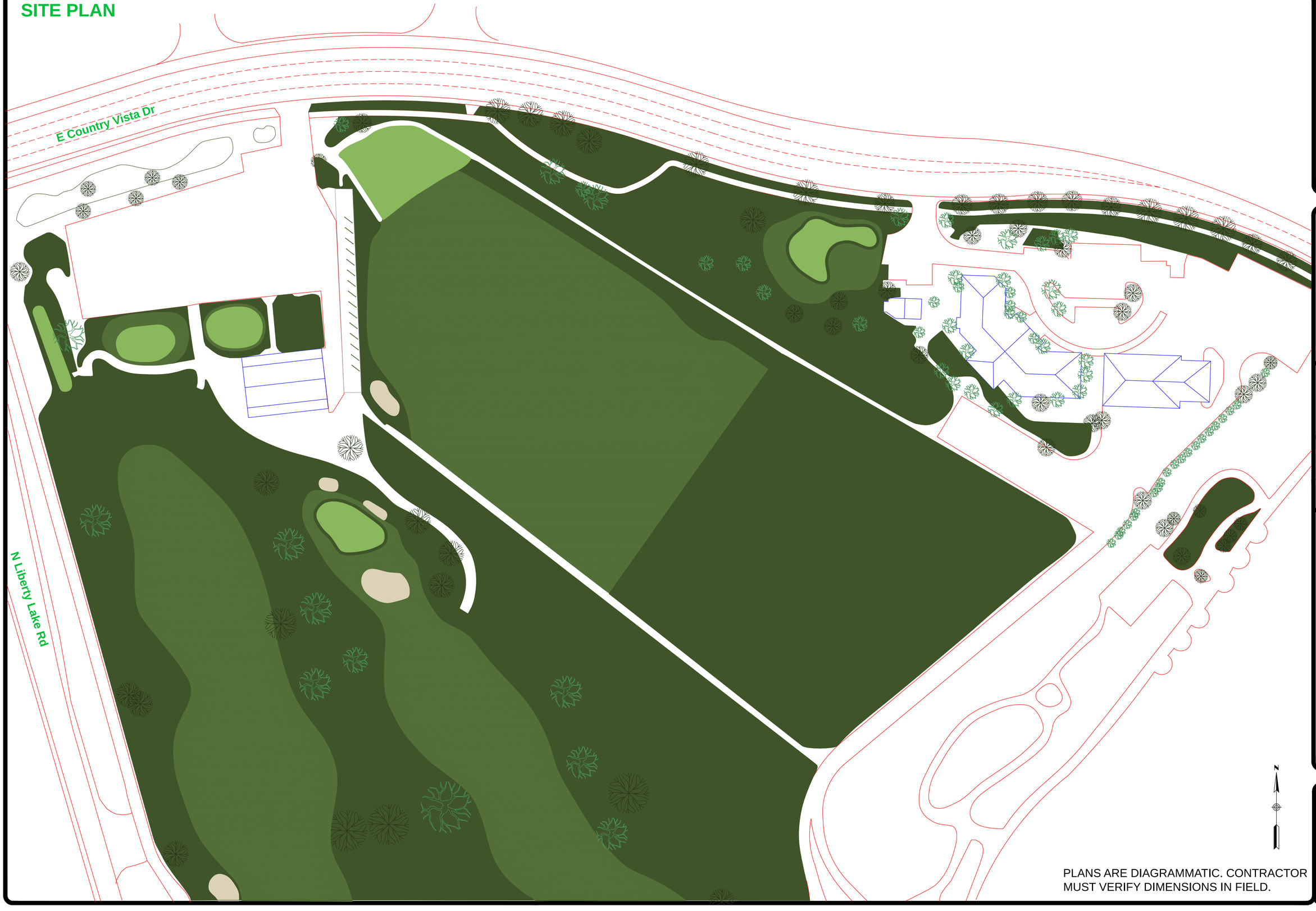
- Bonding, engineering, or prevailing wages, unless otherwise stated in this proposal.
- This bid does not include any permit fees or related costs involved in securing permits except as noted in this proposal. If Judge Netting is not contracted to pull permits, the client is responsible for acquiring all permits and any costs relating to permit requirements. Should a government agency require changes, additional construction costs will be assumed by the client. Should the project be stopped for lack of permits or for any reason by client or government agencies, material and work will be invoiced, and a remobilization fee shall apply.
- Indemnification: Judge Netting, Inc. will not indemnify any additional Owners, Architects, Contractors, or Agents.
- Damage to driveways, parking lots, tennis courts, irrigation systems, or sod, that may be caused by our equipment.
- Subsurface or latent physical conditions at the site differing from those indicated.
- Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.
- The owner shall promptly investigate the conditions, and if it finds that conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a Change Order in the amount of contractor's expenses incurred plus 10%.
- Judge Netting makes no warranty, either expressly or implied, as to the protective capabilities of netting or structures, including height requirements and/or performance of any existing material or material used during construction.

Judge Netting Inc. ACCEPTED BY: TRAILHEAD AT LIBERTY LAKE

By: Dan Judge _____ By: _____

Date: October 13, 2017 Date: _____

SITE PLAN



PLANS ARE DIAGRAMMATIC. CONTRACTOR MUST VERIFY DIMENSIONS IN FIELD.

TANNER
CONSULTING GROUP
603 Stanford Ct. Valley Springs, CA 95252
Ph (209)772-2233 Fax (209)772-2230
e-mail: tannerconsulting@aol.com website: www.tannerconsulting.com

SITE PLAN

TRAILHEAD GOLF COURSE
Driving Range

LIBERTY LAKE, WASHINGTON

DRAWN	DT
CHECKED	
	SEPTEMBER 26, 2017
SCALE	1" - 40'
JOB No.	
SHEET NAME	N-1

BALL TRAJECTORY STUDY "A"

Legend

Golf Club Driver: Taylor Made Rocketballz 10.5 deg. Superfast Matrix Ozik Xcon Graphite Shaft 45" long.

Golf Ball: Spalding Super Range Ball

FOR THE PURPOSE OF THIS STUDY, OUR ILLUSTRATIONS SHOW THE BALL HEIGHT AND DISTANCE HIT BY A SPECIFIC CLUB, BALL AND SWING SPEED. THESE ARE GOLF SHOTS THAT ARE HIT STRAIGHT AND CORRECT. THERE IS NO GUARANTY THAT A GOLFER WILL HIT AT THIS SAME SPEED OR ANGLE. IF A GOLF SHOT IS MIS-HIT IT WILL USUALLY NOT TRAVEL AS FAR OR STRAIGHT. FOR THIS REASON, OUR STUDY REFLECTS WHAT WE DETERMINE TO BE "A WORSE CASE SCENARIO." THE GOLF CLUB WAS SELECTED BY POPULARITY.

DESIGN TRAJECTORY

The USGA tests golf equipment to determine if it conforms to certain specifications relating to the speed with which golf ball leaves the ace of a driver. Their testing equipment uses a club head speed of 109 MPH. While it is possible for a person to swing with faster speeds (Tiger Woods driver sing speed has been measured 130 +- MPH) We selected a swing speed of 112 MPH for the driver in an effort to model a swing by a stronger or more proficient guest.

For the purpose of this study, this illustration prepared by Tanner Consulting Group depicts the path of a Spalding Super Range Ball, hit with a 10.5 degree lofted driver, a swing speed of 112 MPH. Additionally, it assumes the ball was struck in the middle of the club face that was square to a correct alignment at impact. There is no guarantee that a guest will be proficient enough to mimic the exact swing conditions to generate this ideal result. Furthermore, if a golf ball is struck with any less power and/or accuracy than modeled above, then the flight will not be nearly as straight or as far as shown.

E Country Vista Dr

N Liberty Lake Rd

Golf Ball Type: SPALDING SUPER RANGE BALL
Golf Club: PITCHING WEDGE
Loft: 45 DEGREE
Swing Speed: 83 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

Golf Club: 5 IRON
Loft: 28 DEGREE
Swing Speed: 94 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

Golf Club: DRIVER
Loft: 10.5 DEGREE
Swing Speed: 112 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

PLANS ARE DIAGRAMMATIC. CONTRACTOR MUST VERIFY DIMENSIONS IN FIELD.

TANNER CONSULTING GROUP
603 Stanford Ct. Valley Springs, CA 95252
Ph (209)772-2233 Fax (209)772-2230
website: www.tanerconsulting.com
e-mail: tanerconsulting@aol.com

BALL TRAJECTORY STUDY "A"

TRAILHEAD GOLF COURSE
Driving Range
LIBERTY LAKE, WASHINGTON

DRAWN
DT
CHECKED
SEPTEMBER 26, 2017
SCALE
1" - 40'
JOB No.
SHEET NAME
N-2a

NETTING PLAN "A"

Legend

Golf Club Driver: Taylor Made Rocketballz 10.5 deg. Superfast Matrix Ozik Xcon Graphite Shaft 45" long.

Golf Ball: Spalding Super Range Ball

FOR THE PURPOSE OF THIS STUDY, OUR ILLUSTRATIONS SHOW THE BALL HEIGHT AND DISTANCE HIT BY A SPECIFIC CLUB, BALL AND SWING SPEED. THESE ARE GOLF SHOTS THAT ARE HIT STRAIGHT AND CORRECT. THERE IS NO GUARANTY THAT A GOLFER WILL HIT AT THIS SAME SPEED OR ANGLE. IF A GOLF SHOT IS MIS-HIT IT WILL USUALLY NOT TRAVEL AS FAR OR STRAIGHT. FOR THIS REASON, OUR STUDY REFLECTS WHAT WE DETERMINE TO BE "A WORSE CASE SCENARIO." THE GOLF CLUB WAS SELECTED BY POPULARITY.

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E Country Vista Dr

N Liberty Lake Rd

#1 - 40'
#2 - 55'
#3 - 85'
#4 - 110'
#5 - 125'
#6 - 135'
#7 - 135'
#8 - 135'
#9 - 135'
#10 - 135'
#11 - 135'
#12 - 135'
#13 - 135'
#14 - 130'
#15 - 110'
#16 - 85'
#17 - 60'
#18 - 70'
#19 - 80'
#20 - 90'
#21 - 100'
#22 - 110'
#23 - 120'
#24 - 130'
#25 - 135'
#26 - 135'
#27 - 135'
#28 - 135'
#29 - 135'
#30 - 135'
#31 - 135'
#32 - 135'
#33 - 125'
#34 - 105'
#35 - 85'
#36 - 65'
#37 - 60'
#38 - 50'
#39 - 40'

Golf Ball Type: SPALDING SUPER RANGE BALL
Golf Club: PITCHING WEDGE
Loft: 45 DEGREE
Swing Speed: 83 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

Golf Club: 5 IRON
Loft: 28 DEGREE
Swing Speed: 94 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

Golf Club: DRIVER
Loft: 10.5 DEGREE
Swing Speed: 112 MPH
Wind Speed: Still
Tee Height: .75" - .92"
Direction of Flight: 0
Altitude: 2090

PLANS ARE DIAGRAMMATIC. CONTRACTOR MUST VERIFY DIMENSIONS IN FIELD.

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e-mail: tannerconsulting@att.com website: www.tannerconsulting.com

NETTING PLAN "A"

TRAILHEAD GOLF COURSE
Driving Range
LIBERTY LAKE, WASHINGTON

DRAWN	DT
CHECKED	
	SEPTEMBER 26, 2017
SCALE	1" - 40'
JOB No.	
SHEET NAME	N-3a


#1 - 40'
#2 - 65'
#3 - 85'
#4 - 110'
#5 - 125'
#6 - 135'
#7 - 135'
#8 - 135'
#9 - 135'
#10 - 135'
#11 - 135'
#12 - 135'
#13 - 135'
#14 - 130'
#15 - 110'
#16 - 85'
#17 - 60'
#18 - 70'
#19 - 80'
#20 - 90'
#21 - 100'
#22 - 110'
#23 - 120'
#24 - 130'
#25 - 135'
#26 - 135'
#27 - 135'
#28 - 135'
#29 - 135'
#30 - 135'
#31 - 135'
#32 - 135'
#33 - 125'
#34 - 105'
#35 - 85'
#36 - 65'
#37 - 60'
#38 - 50'
#39 - 40'
N Liberty Lake Rd

N-4a

N Liberty Lake Rd

Vista Dr

#1 - 40'

#2 - 65'

#3 - 85'

#4 - 110'

#5 - 125'

#6 - 135'

#7 - 135'

#8 - 135'

#9 - 135'

#10 - 135'

#11 - 135'

#12 - 135'

#13 - 135'

#14 - 135'

#15 - 140'

#16 - 85'

#17 - 60'

#18 - 70'

#19 - 80'

#20 - 90'

#21 - 100'

#22 - 100'

#23 - 120'

#24 - 130'

#25 - 135'

#26 - 135'

#27 - 135'

#28 - 135'

#29 - 135'

#30 - 135'

#31 - 135'

#32 - 135'

#33 - 135'

#34 - 135'

#35 - 135'

#36 - 95'

#37 - 40'

#38 - 40'

#39 - 40'

N-5a

CLEAR
risk solutions

451 Diamond Drive | Ephrata, WA 98823
chooseclear.com

October 4, 2017

COPY

Ann Swenson, Clerk
City of Liberty Lake
22710 E Country Vista Drive
Liberty Lake, WA 99019

RE: Risk Assessment

Dear Ms. Swenson,

The assistance I received on September 20, 2017, in completing the risk assessment was greatly appreciated. The purpose of a risk assessment is to identify areas of potential loss and to offer recommendations on how the City can eliminate or minimize losses due to the identified hazard. By being proactive in regard to risk management, each city has the opportunity to reduce expenditures due to losses, to both itself and the Cities Insurance Association of Washington, of which City of Liberty Lake is a member.

Based upon discussions and observations, I am submitting the following safety concerns, which have been separated into the following categories:

A. Conditions that need to be remedied by City personnel as soon as the City can address this issue.

B. Summary of risk.

This report is based upon observations or information available at the time of the survey. This survey may not have allowed discovery of all hazards present. The purpose of the risk manager conducting this survey is to warrant compliance with regulatory, industry standards or best practices as set forth by the insurance program. We will make every effort to identify hazards, identify compliance standards and offer assistance to rectify the situation permanently.

RECEIVED
OCT 11 2017

Local: 509.754.2027 | Toll Free: 800.407.2027 | Fax: 509.754.3406

There will be follow-up within 45 (forty-five) days to ensure that items identified in this report have been corrected.

It has been a pleasure working with you and your staff on this risk assessment. Should you have any questions or if we can be of any assistance, please feel free to contact us at (509) 754-2027 or (800) 407-2027.

Sincerely,

Blair Kok
Risk Control Representative

/pf

Enclosures

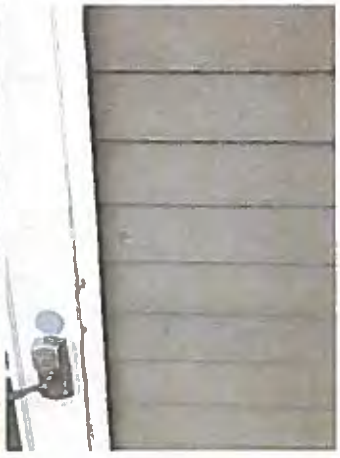
cc: Brian Asmus, Police Chief (w/enclosures)
RJ Stevenson, Administrative Services (w/enclosures)

SAFETY ADDENDUM
FOR
MEMBER NAME
****Driving Range****
1102 N Liberty Lake Rd, Liberty Lake, WA


A. Conditions that need to be remedied by City personnel as soon as the City can address this issue.

1. The height of the fencing on the left of the driving range is low, allowing golf balls to be hit over the fencing, which can result in damage to City buildings as well as cars parked in the area. Apparently, there have been multiple broken windows, and there is also visible damage to the siding on the buildings.





2. The back fencing is too low for the length of the driving range allowing balls to clear the fencing. This causes problems due to the location of the community garden as well as a grassy area for the public to enjoy. There are also homes that have been damaged in the past.

3. The fencing located on the right side of the driving range is lower than the fencing on the left side and the rear section. Located on this side of the driving range is the fairway to the golf course. There are multiple balls being hit over this fence daily. The fencing on this side is aged and has been damaged in the past. A section has been replaced, however, the newer fencing has openings that are too large and can allow golf balls to pass through the openings.

B. Summary of risk.

The City has a high liability exposure for this driving range with the number of golf balls being hit over/through the fencing. It is only a matter of time before someone gets hit by a golf ball causing serious injury or death. We recommend following the recommendations by the specialist you are working with concerning these items, including his recommendations regarding the metal poles and the height of the netting. We highly recommend the City begin the process of budgeting for these repairs in the near future.