Section 1: Community Benefits and Hazards of Aquatic Facilities

1.1 Community Benefits of Aquatic Facilities [2,3]

Evidence clearly indicates that the benefits of accessible aquatic programs that target all age groups, socioeconomic populations, and at risk populations including those with chronic illness will and can be a major tool for a healthy community. Swimming pools, spas, and therapeutic pools contribute greatly to the physical, mental, social, and rehabilitation wellbeing of the individual and therefore the community.

Pools, pool features, and water parks also offer employment opportunities across a variety of age groups for both the local and tourism industry. Providing a professional, safe and positive aquatic experiences for our visitors is a key component of a robust tourism industry.

As Canada's Ocean Playground, our province is rich in accessible water in the form of the ocean, lakes, streams, and rivers. We spend much professional and leisure time enjoying these bodies of water. Many Nova Scotians are also keenly aware of the dangers water may present and the need for accessible learn-to-swim programs that are often delivered in our community pools.

[2] http://www.cdc.gov/healthywater/swimming/health_benefits_water_exercise.html#seven
[3] European Conference on Evidence Based Aquatic Therapy-Bringing Research to Practice
Ben Waller, MSc, University presentation at the 2013 World Aquatic Health Conference

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Aquatic facilities can also offer a variety of other features and programs to individuals of all ages. Additional programming include competitive swim and diving opportunities, fitness classes including maternity aqua classes, rehabilitation classes for sport and other injuries, and classes specifically geared for the very young, seniors, and those that suffer from chronic illness. These programs contribute to the physical and emotional well-being of the community by decreasing depression and anxiety, improving overall mood, as well as encouraging family and social connections. Doctors Nova Scotia has stressed the role physical activity plays in healthy development, increased bone density, and chronic disease prevention including cancer, type 2 diabetes mellitus, and heart disease. Physical activity provides an increase in energy and leads to a more productive life. It decreases stress, promotes social interaction, and extends independence with advancing age..[4,5]

A 2003 aquatic study compared water exercise with other forms of exercise and found swimmers had lower mortality rates than those who were sedentary, walkers, or runners. It also noted that swimming, water jogging, and aqua aerobics are lifetime physical activities that provide many health benefits comparable to those of walking and running.[6]

A recent report for Recreation Nova Scotia and Sport Nova Scotia entitled *The Cost of Inactivity in Nova Scotia*, chronicled the cost of physical inactivity including medical intervention and premature death.[7] Inactivity costs the Nova Scotia health system an estimated $107 million in direct health care expenditures and costs the Nova Scotia economy an additional $247 million each year in indirect productivity losses due to premature death and disability. The report provides support that living a physically fit life extends the lifespan and allows for a healthier and fuller life. As summarized in the report, "regular physical activity also protects against obesity and assists weight control; fosters development of healthy muscles, bones, and joints; increases strength and endurance; improves behavioral development in children and adolescents; and helps maintain function and preserve independence in older adults."

Understanding the benefits of physical activity and the costs of physical inactivity, the Government of Nova Scotia has committed to healthy public policy through a variety of healthy living initiatives including those dedicated to developing a childhood obesity prevention strategy that focuses on healthy eating and physical activity for our youth, with the goal of a healthier and happier population, leading to a reduction in chronic illness.[8] Included in this program is the encouragement of youth access to a variety of physical activities and facilities including those associated with aquatics.

Pool owners, operators, and recreational facility program developers should be supported and encouraged to promote the health benefits of aquatic activity.

> Equally important, swimming and other water activities are fun! Linking fun with long-term health benefits can only be a win.

4 Doctors Nova Scotia. Retrieved from the www on Dec. 12, 2013 at http://www.doctorsns.com/en/home/issuesadvocacy/healthpromotion/physicalactivity.aspx

5 PHAC, http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pa-ap/02paap-eng.php

6 Chase, Nancy L; Sui, Xuemei; Blair, Steven, *Swimming and All-Cause Mortality Risk Compared With Running, Walking and Sedentary Habits in Men.* International Journal of Aquatic Research and Education, 2008, 2, 213-223 retrieved from the www on December 6, 2013 at http://journals.humankinetics.com/AcuCustom/Sitename/Documents/DocumentItem/16059.pdf

7 Colman, Ronald PHD GPI Atlantic, *The Cost of Physical Inactivity in Nova Scotia* retrieved from the www on December 6, 2013 at http://www.recreationns.ns.ca/wp-content/uploadhere/2012/05/Physical-Inactivity-Report1.pdf

8 Thrive! A plan for a healthier Nova Scotia retrieved from the www on December 6, 2013 at https://thrive.novascotia.ca/files/Thrive-May30-2012-Web.pdf

1.2 Aquatic Hazards and Risks

Aquatic-related hazards include physical, chemical, and microbiological hazards and their associated effects, which are collectively termed recreational water illnesses and injuries (RWII). These hazards and any potential risks depend on many factors including pool type, pool design, special play features, pool operation, maintenance, pool supervision, dose or introduction of microbial contamination, patron behavior, and patron susceptibility.

Table 1 (below) outlines the adverse outcomes as a result of exposure to pool-related hazards. The resulting physical impacts and RWII can be mild to severe, and include death.[9]

Table 1. Adverse Health Outcomes Associated With Hazards Encountered in Swimming Pools and Similar Water Facilities.

Types of Adverse Health Outcomes	Examples of Associated Hazards
Drowning/ Near-Drowning	Swimmers under the influence of alcohol, poor swimming ability, no supervision, poor pool design and maintenance (including entrapment)
Impact Injuries	Impact against hard surfaces (e.g., diving, use of water slides, collision), treading on broken glass and jagged metal, especially in outdoor pools
Physiological	Heat exposure in hot tubs or natural spas (using thermal water) or exposure in plunge pools.
Infection	Ingestion, inhalation, or physical contact with pathogenic (disease causing) bacteria, viruses, fungi, and protozoa present in water and pool surroundings as a result of a fecal contamination, carried by patrons, animals in or near the water, or the make-up water
Poisoning and other conditions that arise from long-term exposure.	Contact, inhalation, or ingestion of chemically contaminated water, ingestion of algal toxins, and inhalation of chemically contaminated air

Preventing recreational waterborne illness and injuries requires an understanding of the potential aquatic hazards and risks, followed by development of standard operating procedures, staff training, an audit system, and patron education that will encourage safe, enjoyable aquatic experiences.

[9] Guidelines for safe recreational waters. Retrieved February 2011, from WHO Water Sanitation and Health: http://www.who.int/water_sanitation_health/bathing/bathing2/en/index.html

1.2.1 Microbiological hazards

Microbial illnesses and infections are caused by bacteria, viruses, or parasites. They cause an illness or infection when patrons ingest, inhale, or physically come in contact with contaminated water. Good pool operational management includes an understanding of how these microorganisms get in the water, what conditions will promote their growth, and how to prevent either from happening. [10,11]

Table 2 (below) summarizes three different ways to consider and understand microbial hazards of recreational illness. This is not a conclusive list of microbial hazards but is intended to be illustrative.

Table 2. Microbial Hazards of Recreational Illnesses.

Fecal and Non-Fecal Microbes in Water or on Surfaces	Route of Patron Exposure	Chlorine Tolerant and Chlorine Sensitive Microbes
Spread in feces *Escherichia coli* Shigella Norovirus Giardia Cryptosporidium **Not associated with feces** Pseudomonas Legionella	**Ingestion** *E. coli* Shigella Norovirus Giardia Cryptosporidium **Contact with water** Pseudomonas **Inhalation** Legionella, Disinfection by-products	**Chlorine tolerant** Cryptosporidium Giardia **Chlorine Sensitive** *E. coli* Shigella Norovirus Giardia Pseudomonas Legionella

Non-fecal derived organisms

Organisms that do not originate from feces can enter pool water through the source water, by contamination with environmental sources like soil, plants, and leaves, or by the shedding of skin and hair from bathers. Non-fecal derived microbes have been implicated in causing dermal and respiratory illnesses. Legionella and *Pseudomonas aeruginosa* are two non-fecal derived organisms more commonly associated with hot tub or warm water venue outbreaks.[12] Ensuring a constant and minimum concentration of primary disinfectant is important in preventing the formation of populations of bacteria and algae that adhere to surfaces and grow (these are termed biofilms, and are also described as scum lines and slime layers). Effective operational management is essential in prevention of recreational water illnesses from these organisms.

[10] Yoder, H. L. (2008, Sept. 12). Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water Use and Other Aquatic Facility-Associated Health Events --- United States, 2005--2006. Retrieved Feb 24, 2011, from CDC: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a1.htm

[11] Vore, Roy, PhD, National Swimming Pool Foundation, Recreational Water Illnesses, 2012

[12] Guidelines for Safe Recreational Waters. Retrieved February 2011, from WHO Water Sanitation and Health: http://www.who.int/water_sanitation_health/bathing/bathing2/en/index.html

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Pseudomonas aeruginosa

Pseudomonas aeruginosa is a bacterium that is associated with untreated or poorly treated pools, fountains, splash pads, and especially hot tubs. The bacterium can cause skin rashes (hot tub itch) and ear infections. The warm water of hot tubs can be an ideal environment for this bacterium to thrive and multiply. *P. aeruginosa* is very common on skin, hair, and in soil, plants, water and leaves. If disinfection is insufficient or absent, *P. aeruginosa* can grow rapidly in a hot tub. It readily adheres to the hot tub surface and forms a slimy coating. Within the biofilm the bacteria are very resistant to chemical disinfectants. Many bacteria form biofilms. In an environment like a hot tub or pool, elimination of biofilms requires scrubbing of the surface followed by disinfection. An estimated 65% of human bacterial infections in aquatic facilities involve biofilms.[13]

Pseudomonas infection via contact with contaminated water causes a rash that can take a few days to show up and can last up to 8 days. The delay in appearance can prevent the infection from being linked to the pool water. *P. aeruginosa* also causes a painful ear infection known as swimmer's ear (otitis externa). *P. aeroginosa* is an opportunistic pathogen, meaning it can cause illness in someone who is more susceptible, such as someone with an undeveloped or weakened immune system. Infants, the elderly and those already ill can be at increased risk.

Legionella

Legionella is a naturally found bacterium that also thrives in warm water, such as hot tubs. Hot tubs that are not cleaned and disinfected effectively may become contaminated with Legionella. A person can become infected by inhaling Legionella-laden water droplets in the mist from steam of a contaminated hot tub. The infection will present as Legionnaire's disease, a serious and sometimes lethal pneumonia, or Pontiac Fever, an influenza-like illness.[14] Legionella can also be found in cooling towers, plumbing systems, and decorative pools or fountains.[15]

"The conditions in hot tubs are optimal for Legionella growth, especially when compared to the lower temperature of pools. The vigorous aeration in hot tubs, coupled with the proximity of the head to the mist zone, facilitates the efficient transfer of infective droplets into the lower respiratory tract via inhalation".[16]

[13] National Swimming Pool Foundation, Pool & Spa Operator Handbook, p. 84.
[14] Centers for Disease Control and Prevention. Legionellosis. MMWR 2011;60:1083-1086. Retrieved 08 20, 2011, from CDC: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6032a3.htm?s_cid=mm6032a3_e
[15] CDC. (2011, August 23). *Legionella.* Retrieved July 2011, from CDC Healthy water Swimming RWI: http://www.cdc.gov/healthywater/swimming/rwi/illnesses/legionella.html
[16] Vore, D. R. (2011). Aquatics Consultant Specializing in Public Health. *Recreational Waterborne Illness: A 2011 Comprehensive Review*, (http://www.ciphi.ns.ca/halifax2011/RoyVore.html). Halifax.

Fecal-derived organisms

Fecal-derived organisms originate in the gastrointestinal tract of humans and other warm-blooded animals. They cause gastrointestinal illnesses, such as diarrhea, and sometimes vomiting. Once ill, the individual excretes the organisms in their feces including formed stool and diarrhea. If pool patrons ingest the contaminated water they can become ill. An example microorganism is *E. coli*, especially a subtype designated 0157-H7, which can cause an infection that can destroy the function of the kidney and, at its most serious, be lethal. Fortunately, in water *E. coli* is easily killed by minimum level of disinfection. Another example is the protozoan Cryptosporidium. When present as a resistant form called an oocyte, it is not easily killed and is considered chlorine tolerant.

Preventing the spread of these microorganisms includes not swimming when ill, especially if the illness involves diarrhea, bather hygiene including a pre-swim cleansing shower, hand washing, sound operational procedures and policies including incident release plans, and consistent and constant minimum disinfection/pH level.

Chlorine-tolerant and chlorine-sensitive organisms

Not all organisms respond to chlorine disinfection the same way (Table 3, below). When chlorine disinfectant is maintained in the entire pool at the minimum level of 1 part per million (ppm; mg/L) it takes less than 1 minute to kill *E. coli 0157:H7.* But the same concentration can take over 10 days to kill *Cryptosporidium.*

Table 3. Chlorine Susceptibilities of Various Microbes.

Chlorine Disinfection Timetable[17]	
Agent	**Disinfectant Times for Fecal Contaminants in Chlorinated Water**
***E. coli* 0157:H7 (Bacterium)**	less than 1 minute
Hepatitis A (Virus)	approximately 16 minutes
Giardia (Parasite)	approximately 45 minutes
Cryptosporidium (Parasite)	approximately 15,300 minutes (10.6 days)

Notes:
- 1 mg/L (1 ppm) free available chlorine at pH 7.5 and 25° C (77° F)
- These disinfectant times are only for pools that do not use chlorine stabilizers, such as cyanuric acid. Disinfection times would be expected to be longer in the presence of a chlorine stabilizer.

Recent studies in the United States and outbreaks in Canada have highlighted the increasing concern and health effects of chlorine-tolerant microorganisms like Cryptosporidium. These same studies highlight the effects of poor pool management.

[17] http://www.cdc.gov/healthywater/swimming/pools/chlorine-disinfection-timetable.html

Cryptosporidium

Cryptosporidium is a microscopic parasite that can cause cryptosporosis in humans. Symptoms include stomach cramps or pain, dehydration, nausea, vomiting, fever, and weight loss. The severity of the symptoms will depend on the age and the health of the individual. Young children and pregnant women may be more susceptible to dehydration and those with severely weakened immune systems are at risk for more serious disease and even life-threatening illness.[18]

Cryptosporidium is found in the intestinal tract of infected humans and animals. It can be introduced into the pool as a result of the source water being contaminated and by a bather infected with the parasite who has a diarrheal fecal accident in the pool or who does not take a pre-swim cleansing shower. Oocysts in the water can be ingested, which leads to illness.

When Cryptosporidium is introduced into a pool it will take a residual of 20 mg/L of chlorine12.5 hours or a combination of a quality ultraviolet (UV) system plus an increased level of chlorine residual hours to effectively kill the oocyts.[19] The chlorine resistance of the oocyte form of Cryptosporidium can overwhelm even a well-balanced pool if an accidental diarrheal release of oocytes occurs increasing the risk of exposure to multiple bathers. Once in the water, the protozoan parasite can be ingested by another pool patron if pool water is swallowed. The following precautions should be in place:

- The source water should be approved and safe for use.
- An effective response plan for accidental release of diarrhea or formed stool should exist and be ready to put into action.
- The pool should always operate with a well-designed and maintained circulation and filtration system capable of effectively removing oocytes, or a combination of effective circulation, filtration, and other technologies (e.g., UV) found to be effective against oocytes.
- Pool patrons should be educated on good hygiene practices and instructed not to consume the water.

Giardia

Giardia is another protozoan parasite that is somewhat chlorine resistant. It takes up to 25 minutes in a pool with 2 mg/L of free available chlorine and with a pH of 7.5 to kill Giardia. Giardia also causes a gastrointestinal illness that is associated with contaminated source water, poor bather hygiene, and the release of formed stool and diarrhea contaminated with Giardia. When considering a policy concerning minimum chlorine residual, a convincing argument can be made to maintain a minimum chlorine residual of 2 mg/L in venues that are at increased risk of fecal contamination, such as those used by young children.

[18] http://www.cdc.gov/parasites/crypto/gen_info/infect.html
[19] CDC & MMWE. (2007, July 27). *Cryptosporidiosis Outbreaks Associated with Recreational Water Use--Five States.* Retrieved 03 21, 2011, from MMWR, CDC: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5629a1.htm

Norovirus

Norovirus is a highly contagious virus that can be transmitted from person to person and through ingestion of contaminated food and water or contact with contaminated surfaces. The resulting stomach or intestinal infection causes stomach pain, nausea, vomiting, and diarrhea. Norovirus illness can be serious, especially for young children and older adults whose immune systems are less able to combat the infection. Norovirus is readily inactivated in treated water and is therefore considered chlorine sensitive. If a pool is effectively managed, a norovirus outbreak should not be expected. Effective pool management includes ensuring that hand washing and baby change stations are available and effective surface cleaning and disinfection practices, including how to clean and disinfect a vomit accident, are in place.[20]

E. coli 0157-H7[21]

The gastrointestinal illness resulting from the consumption of water or food contaminated with *E. coli 0157-H7* can range from mild to severe. The latter can be life threatening and can cause permanent kidney malfunction in young children and those with a weakened immune system. Fortunately, the bacterium has been well-studied and is very susceptible to chlorine; death of this organism occurs in less than 1 minute in properly chlorinated and balanced pools.

Hepatitis A

Hepatitis A is a virus that infects the liver. The virus can be spread by consumption of food and water contaminated with infected feces. The virus is easily killed within 16 minutes in a properly managed pool with a minimum chlorine residual of 1.0 mg/L and a pH within the appropriate range.

Shigella[22]

Bacteria in the genus Shigella can cause an infection termed shigellosis. Depending on the health of the affected individual, diarrhea that can be bloody due to bacterial damage of the intestinal lining, fever, and stomach cramps lasting 5 to 7 days can develop. Shigella is present in the diarrheal stools of infected persons while they are sick and for several weeks after they have recovered. So, even though a person may appear well, they can still spread the infection. Water may become contaminated with Shigella from contaminating sewage or from a bather. The latter is especially important in venues having splash tables or untreated wading pools, or in shallow play fountains used by daycare centres. Patrons can be exposed through ingestion of contaminated water.

Other

Other disease-causing microorganisms that do not cause recreational water infections but are still notable include several fungi that cause athlete's foot and human papillomavirus, which causes plantar warts, since these can be spread from contaminated surfaces to the bare feet of pool bathers and patrons. Regular cleaning and disinfection of decks and locker room floors will reduce these infections.

This is not an exhaustive list of recreational waterborne illnesses. Further information is readily available. See additional resources in the appendix.

[20] http://www.cdc.gov/norovirus/about/overview.html
[21] Vore, Roy PhD, Recreational Water Illnesses, NSPF retrieved on January 11, 2014
[22] http://www.cdc.gov/nczved/divisions/dfbmd/diseases/shigellosis/#tips. Retrieved on January 11, 2014

1.2.2 Chemical hazards[23]

Chemical hazards associated with pools can be divided into two broad categories. The first includes chemicals used in and around the pool, and involves chemical spills, burns, and reactions from improper chemical storage and handling. The second category includes chemicals found in source water or compounds created as result of chemical reactions in the pool including disinfection by-products. The hazard from these compounds comes from inhalation, contact with skin, and ingestion.

Chemical (Disinfection) by-products (chloramines)

The oxidation of waterborne organic compounds by chlorine or other compounds is complex and can lead to the creation of disinfection by-products during treatment of aquatic water. Organic compounds find their way into the pool from the source water, bather waste (e.g., hair, bacteria, blood, soap residue, feces, urine, sweat, skin cells, saliva, vomit, and make-up), and environmental sources (e.g., dirt, bird droppings, pollen). When the contamination is high, new chemical bonds can form in the water, which often results in the creation of chloramines. Chloramines are volatile and are readily released into the air, creating the well-recognized chlorine smell. This aeration occurs as a result of bather use (splashing of water) and water-play features and air jets. The chloramines can accumulate in the air in an indoor aquatic venue. Health effects associated with their inhalation in the short-term and long-term are only beginning to be characterized for the aquatic environment.[24,25,26]

Known health effects from chloramine exposure in swimming pools or hot tubs can include eye irritation, throat irritation, nausea, and light-headedness. Asthmatics can be prone to asthma attacks.

The presence of chloramines is a consequence of a high contamination load due to

- poor pool operation and maintenance
- patron unhygienic behavior (contamination load)
- water aeration (play features, spraying water)
- improper or ineffective ventilation
- a combination of all[27]

With the recent popularity of large indoor public swimming pools with added features, such as wave action, slides, and spray features that agitate the water and the high bather loads adding to the contamination burden, indoor air quality is an increasingly important health concern.

[23] WHO, *Guidelines for Safe Recreational Waters.* Retrieved February 2011 www.who.int/water_sanitation_health/bathing/bathing2/en/index.html

[24] LaKind JS, R. S. (2010). *The good, the bad, the volatile: can we have both healthy pools and healthy people.* Enviro Sci Technology , 44(9):3205-10

[25] Weisel CP, R. S. (2009). *Childhood Asthma and environmental exposures at swimming pools: state of the science and research recommendations. Environmental Health Perspective* , 117(4):500-7.

[26] Zwiener C, R. S. (2007). *Drowning in Disinfection by-products? Assessing Swimming Pool Water. Environ Sci Technology*., 42:(2)363-72.

[27] Yoder, H. L. (2008, Sept. 12). *Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water Use and Other Aquatic Facility-Associated Health Events --- United States, 2005--2006.* Retrieved Feb 24, 2011, from CDC: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a1.htm

1.2.3 Physical hazards

Public swimming pools can present several physical hazards for users and workers. These include drowning, near-drowning, fall impact injuries, and injuries resulting from improperly designed and poorly maintained water circulation systems. The latter can result in swimmer entrapment and bodily injury. Maintenance and operational staff can also be at risk.

Anti-entrapment concerns

In June 2002, 7-year-old Virginia Baker became stuck to a hot tub drain and was unable to pull herself free. Efforts by her mother to pull Virginia from the drain proved unsuccessful. Two men who eventually freed the young girl pulled so hard that the drain cover broke from the force. Virginia died from drowning, but the real cause of her death was suction entrapment due to a faulty drain cover. Her mother became a strong advocate for aquatic safety that resulted in the Pool and Spa Safety Act (Virginia Grahame Baker act) in the U.S. This act specifically addresses the hazards associated with the drains that are part of the circulation system of swimming pools and hot tubs.[28] The concerns that prompted this act in the U.S. exist in Nova Scotia. Pool designers, owners, and operators shall use effective pool design, operation including pool specific hazard identification and equipment maintenance to reduce the risk of these physical hazards. These procedures and protocols shall be clearly outlined in the Aquatic Safety Plan.

Drowning and Near-Drowning

Drowning, near-drowning, and secondary drowning can occur in seconds in very shallow water, and is often silent. Pool operators can reduce the risk of drownings/near-drownings in a number of ways. The list, which is not exhaustive, includes

- ensuring that barrier gates/doors, guard rails, depth markings, warning signage, and pool decks are maintained to prevent tripping and other injuries
- ensuring the aquatic facility has had an up-to-date risk assessment to determine the need and level of supervision
- consider use of new technologies, such as computer motionless sensor technologies, to assist lifeguards
- ensuring emergency response procedures have been developed and include communication plans, emergency phone/signal, emergency shut off valves, and appropriate first aid
- ensuring emergency rescue equipment is accessible to bystanders
- ensuring that all staff are trained in water safety and patron rescue
- patrons/bathers can help reduce the risk of drownings by participating in recreational water activity consistent with their swimming ability, using flotation devices if a non-swimmer and for specific water-related activities, and learning how to swim

[28] Commission, T. U. (2011). *Who is Virginia Graeme Baker?.* Retrieved August 4, 2011, from Pool Safety (The U.S. Consumer Product Safety Commission): http://www.poolsafely.gov/pool-spa-safety-act/virginia-graeme-baker/

1.3 Hazard Mitigation – Aquatic Safety Plans

Hazards and risk are a part of everyday life. The key is identifying the hazard and taking steps to minimize or eliminate the risk where needed, which is the intent of an Aquatic Safety Plan. Potential hazards vary as do the levels of risk depending on many factors including the specific pool design, operation, staff education, patron hygiene compliance, patron swim ability, and any special pool features.

Operational daily inspections, risk assessment and hazard mitigation includes

- routine pool management
- emergency or incidence response management

A venue's specific Aquatic Safety Plan is intended to combine both of these by encouraging development of policy and procedures for routine pool management and for emergency (incident) response with the goal of preventing recreational waterborne illness and injury (RWII) and ensuring a swift and effective response to emergencies that do occur. Both strategies seek to prevent illness and injury, while promoting safe, healthy, and fun recreational experiences.

Risk Management and Assessment

Risk management and assessment involves a variety of factors in all aspects of the aquatic programming and services, as well as the physical facility. Depending on the organization, help of risk management experts may be needed to

- identify the risks and the potential hazards
- evaluate these risks, based on the nature of the hazard and the exposure to the hazard
- manage the risks, which includes monitoring and prevention (e.g., signage)
- determine the cost of the risk management to allow the best financial decision
- determine the liability and insurance issues of the risk and related decisions
- determine if the related legal mandates (codes, best practice, regulations) are being met, at least minimally
- prepare an Emergency Response Plan