USA TRIATHLON

RACE DIRECTOR RESOURCE GUIDE:

SWIM: WATER QUALITY ANALYSIS

INTRODUCTION:

Before sending athletes into the water for the swim, it is important to confirm the water is safe. A body of water's levels of pollutants, bacteria, and acidity impact how athletes will react to prolonged exposure. Once levels increase above certain thresholds, the water quality presents a potential health risk to athletes and swimming-related illnesses become a potential threat. In these instances, consideration should be given to removing the swim portion of the race.

To be a USAT sanctioned event, water testing is a requirement, even for pool swims. USAT requires Race Directors follow the guidelines established by the agency that governs the body of water, such as the county, city, EPA, pool management, etc. USAT will accept whatever criteria the permitting agency has established for swimability and human contact. The information included within this guide is intended to be educational and supplementary. Please defer to the rules of the local jurisdiction for specifics on what is required for your area.

In this section, we will explore the fundamentals of water quality analysis:

- Factors that affect water quality
- Water testing
- Contingency plans

**Note: While this guide does provide recommendations for water quality thresholds and evaluation, all planning and decision-making regarding the event is at the discretion of the Race Director and the agency that governs the body of water.*

FACTORS THAT AFFECT WATER QUALITY:

Before settling on a location and date for your triathlon, research the body of water where you plan to host the swim portion of the event. Work with local municipal agencies to gather historical data on past test results to help provide a baseline of water quality levels. Data that details out the exact locations and the month/year the samples were collected helps to provide context on the water quality trends. This will help to highlight if there are cyclical changes that make certain seasons more conducive to swimming than others. For example, when USAT produced an event in Nathan Benderson Park in Sarasota, fall race dates had great results that easily passed local thresholds. When the same race was hosted in the spring, the results were usually a nail-biter as to whether the swim could occur. There were multiple years where water contingency plans were implemented as a result of poor water quality. Depending on the body of water, the time of year may be an important factor.

Gathering historical data provides baseline levels that can also help to shed light on environmental changes that are affecting the water over time. Changes in water quality can occur gradually or from one year to the next, so even established races should evaluate the water conditions annually.

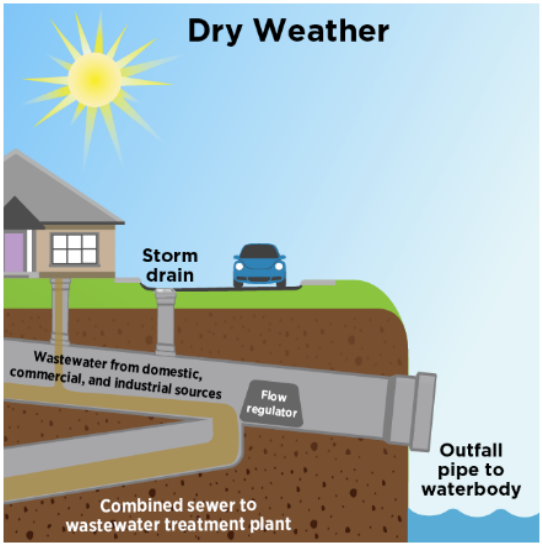
Below are some environmental factors that may affect the water quality in your area:

- **Sewer overflows:** The most prevalent threat to the water quality is sewage overflow into the body of water where the swim portion of the race is held. It's important to chat with your municipal contacts about whether the sewer systems in your area are combined systems or sanitary systems to understand if/when these overflows might occur.

COMBINED SEWER SYSTEM

SYSTEM FUNCTION

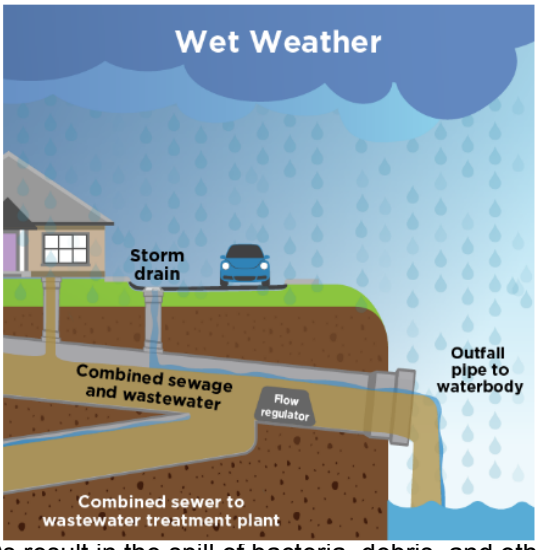
Designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe.This type of sewer system transports all combined waste to a local sewage treatment plant where it is treated, then discharged.



Combined Sewer Systems tend to exist in older cities and communities. State/Local authorities generally have not allowed the construction of new Combined Sewer Systems since the mid 1900s.

SYSTEM OVERFLOW

Heavy rainfall or rapid snow melt causes the system to become overwhelmed. Once it reaches capacity, the contents of the sewer spill directly into local bodies of water without first being treated. This is referred to as a Combined Sewer Overflow (CSO).



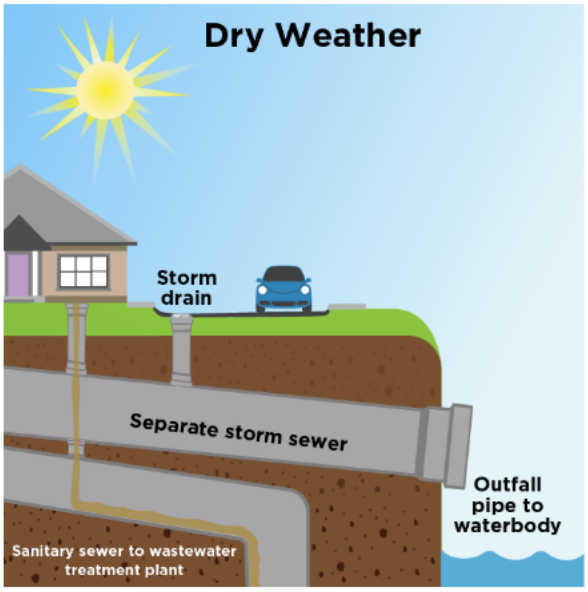
CSOs result in the spill of bacteria, debris, and other hazardous materials which poses risks for swimming, fosters algae growth, and reduces the oxygen levels in waterways.

If your community has a Combined Sewer System, consult your local municipal contacts about the thresholds of storm water the system is able to accommodate while maintaining its standard function. For example, they may be able to tell you that when there's rainfall more than XX inch per hour, CSOs are likely to occur. This provides you with a general trigger point for when water quality might be affected by your race week weather. As a general rule of thumb, light and steady prolonged rainfall tends to not be as disruptive to the system as periods of heavy downpour.

SANITARY SEWER SYSTEM

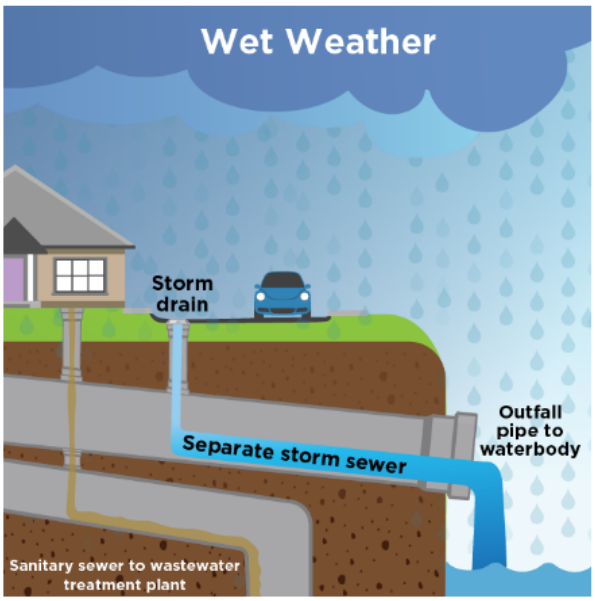
SYSTEM FUNCTION

In this system, there are two sets of pipes - one set that collects wastewater from homes and businesses and carries it to a wastewater treatment plant through sanitary sewers. A separate set of pipes collects stormwater from drains in parking lots and along the streets and carries it to a local waterway.



SYSTEM OVERFLOW

The separation of wastewater and stormwater decreases the likelihood that raw sewage is released into nearby bodies of water. While less frequent, these raw sewage spills can still happen and are referred to as Sanitary Sewer Overflows (SSOs). Possible causes of SSOs include: blockages, line breaks, power failures, vandalism, or sewer defects.



While rainfall does not directly result in the release of raw sewage into nearby bodies of water, all contents of the storm drains will still flow into the water. This can still lead to an increase in pollutants that affect the water quality.

- **Runoff from yards, fields, and paved surfaces:** When rain or snow melt flows over surfaces like paved streets, parking lots, and rooftops, it picks up pollutants. This includes pet waste, fertilizers, pesticides, chemicals, and other bacteria-laden substances, which then flow into bodies of water directly or via storm drains.

- **Discharge from ships and boats**: Bodies of water that are highly trafficked by on-water vessels can have higher levels of pollution. Discharge includes trash, fishing gear, and water from sinks and showers.

- **Growth of Harmful Algal Blooms (HABs):** HABs occur when colonies of algae grow out of control and produce toxins that can have debilitating effects on humans and other wildlife. All U.S. coastal states, as well as states surrounding the Great Lakes experience HABs. Here are the most common types of HABs that affect water quality:

    - **Red Tide Algal Bloom (Karenia Brevis)**: Naturally present in ocean water, typically off the coast of Florida and Texas. The algae releases toxins into the water which can be dangerous for swimmers. Additionally, when the waves break on the beach, the toxins can become airborne, which can cause severe respiratory irritation for anyone in the surrounding area.

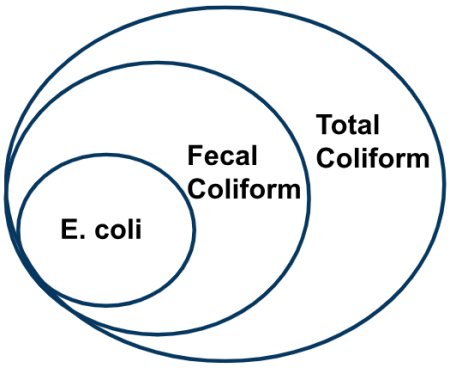
    - **Blue-Green Algae (Cyanobacteria):** Naturally present in lakes and streams, typically in areas with warm, shallow, undisturbed water that receives a lot of sunlight. Exposure to blue-green algae and their toxins can cause diarrhea, nausea or vomiting, breathing difficulties, and/or throat and eye irritation.

  The NOAA (National Oceanic and Atmospheric Administration) is at the forefront of HAB research and provides forecasts for areas prone to experience HABs (> Learn More).

WHY HABs DEVELOP	HOW HABs ARE DETECTED	HAB BULLETINS
Some HABs have been linked to "overfeeding" where nutrients from sources like lawns and farms flow into the sea. This "overfeeds" the algae that exist normally in the environment. Other HABs have occured in the aftermath of natural events such as unusually high water temperatures or extreme weather events like hurricanes, floods, our droughts.	In conjunction with NASA, NOAA uses satellite imaging to gather oceanic color data which provides a warning sign for algal bloom growth. They've also started to utilize underwater sensors on buoys to flag the existence of algal cells. Using this data, scientists are able to forecast HABs the same way they would forecast a hurricane to provide advanced warming to local groups.	Data forecasts are made into public HAB Bulletins that are posted twice a week during the bloom season. These bulletins predict the likelihood that people in the surrounding area will be impacted by the HAB toxins.

WATER TESTING:

To be a USAT sanctioned event, water testing is a requirement, even for pool swims. USAT requires you follow the guidelines established by the agency that governs your body of water, such as the county, city, EPA, pool management, etc.



Here are some common measures collected and analyzed during the water testing process:

- pH which refers to the acidity or basicity of the water
- Enterococcus bacteria
- Fecal Coliform including Escherichia coli (E.coli) bacteria
- Harmful Algal Blooms (HABs)

When to Sample: For the most accurate analysis, it is recommended that multiple tests are conducted and recorded to provide multiple data points for comparison. The test conducted closest to the event will inform the decision as to whether the water conditions are safe to swim. Ideally, this is conducted within 48-96 hours of the race start to provide the most accurate picture of the water's current state. World Triathlon also recommends conducting tests at the following times:

- 2 months prior to the race date
- 7 days prior to the race date
- On race day (for statistical purposes only)

How to Collect the Samples: Best practices dictate that water samples are collected at three different locations along the swim course (swim start, middle, swim exit). Work with the laboratory to provide one sterilized bottle per location to be able to collect three separate samples. Hold the bottles deep under the water to gather the water sample. It's important to clearly label each bottle with the location where the water was collected. Keep the samples on ice from the time of collection until they are delivered to the lab for testing.

Pro Tip:

Water Sample Collection Supply List:

- ☐ *(3) sterile collection bottles*
- ☐ *(3) labels + sharpie to mark the location where samples collected*
- ☐ *(1) cooler + ice to keep sample chilled*
- ☐ *Yardstick + tape: taping the bottles to a yardstick will allow you to get deeper under water to collect your sample. The deeper the better!*

Laboratory Testing: Discuss water testing with your local municipal contacts. If the body of water is utilized for public swimming, it's likely the city already conducts regular testing to monitor the water quality. If the collection areas and timeline match up with your event, you may be able to utilize existing results or request that additional samples be collected and analyzed prior to your event. If testing through your municipal contacts is not possible, there are private laboratories that offer water testing services. The cost for water testing varies from region to region, but this additional expense pays great dividends to ensure the safety of your athletes.

Keep in mind that it may take anywhere from 24-96 hours to get the results of the tests, depending on the methodology the laboratory is using. This time delay can become a factor if the weather/water conditions change between the time the sample is collected and the time the event will start.

How to Analyze the Results: USAT will accept whatever criteria the permitting agency has established for swimability and human contact. Below are thresholds set forth by World Triathlon to serve as a reference point. Note that if you have sampled in three locations along the swim course, you will have three separate sets of results. World Triathlon recommends the poorest results collected should be used to determine if the swim should take place. The swim will be allowed if the following values are below the level of tolerance in the different types of water:

WORLD TRIATHLON WATER QUALITY THRESHOLDS ***(per 2026 World Triathlon Competition Rules)***		
TEST	**SEA & TRANSITION WATER**	**INLAND WATER**
pH	Between 6 and 9	Between 6 and 9
Enterococcus	Not more than 200 per 100ml (cfu/100ml)	Not more than 400 per 100ml (cfu/100ml)
Fecal Coliform	Not more than 500 per 100ml (cfu/100ml)	Not more than 1000 per 100ml (cfu/100ml)
HABs	Absence of positive visual evidence of Red Tide Algal bloom	The presence of Blue-Green Algal blooms not more than 100,000 cells/ml. This test is only required in the case of positive visual evidence of Blue-Green Algal Bloom

If the water quality test shows values outside of the tolerance limits indicated above the swim will be canceled. However, due to the results delivery delay, which may vary from 24-96 hours it is possible water conditions may change. Making decisions based on data results that do not reflect the current conditions is not advisable. In these instances, the decision should also look to take into account the following:

DID YOU KNOW?

Sanitary inspection involves the evaluation of:

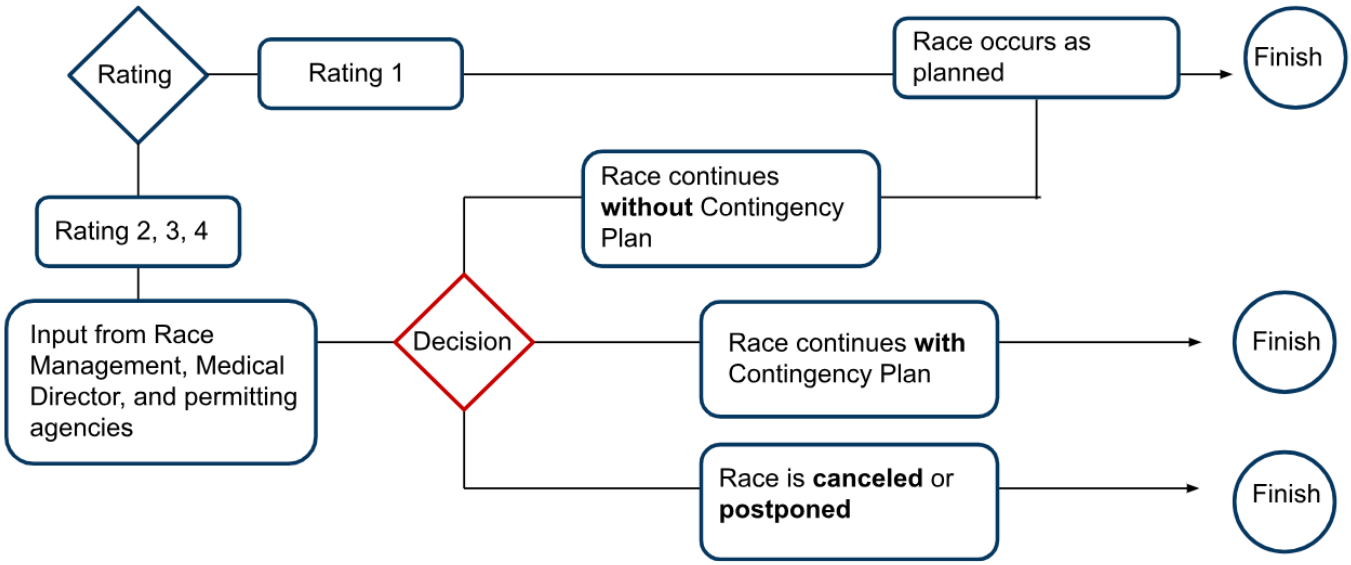
- Oils and smell of phenol
- Color of the water
- Visibility of the water of more than one meter
- Sewage discharge or the occurrence of houses and boats
- Presence of garbage / debris
- Bird colonies
- Algal bloom

- Sanitary inspection
- Water quality analysis
- Weather forecasts
- Data pertaining to the tides and currents (where applicable)

Decision-Making: Below is a matrix provided by World Triathlon to help quantify the factors above to assist with the evaluation of risk:

WATER QUALITY DECISION MATRIX				
TEST RESULTS *(Sea & Transition)*	**TEST RESULTS** *(Inland)*	**SANITARY INSPECTION**	**RAIN PROBABILITY**	**RATING**
Two past results: Fecal < 250 Entero < 100	Two past results: Fecal < 500 Entero < 200	Little to no visual pollution	No heavy rain forecasted	1
		Potential visual pollution	No heavy rain forecasted	1
		Poor visual pollution	No heavy rain forecasted	2
Last result: Fecal 250 - 500 Entero 100-200	Last result: Fecal 500 - 1000 Entero 200-400	No visual pollution	No heavy rain forecasted	2
		Potential visual pollution	No heavy rain forecasted	2
		Potential or poor visual pollution and/or heavy rain forecasted		3
Two past results: Fecal 250 - 500 Entero 100-200	Two past results: Fecal 500 - 1000 Entero 200-400	No visual pollution	No heavy rain forecasted	2
		Potential visual pollution	No heavy rain forecasted	3
		Potential or poor visual pollution and/or heavy rain forecasted		3
Last result: Fecal > 500 Entero > 200	Last result: Fecal > 1000 Entero > 400	Any potential pollution during sanitary check and/or potential forecast of heavy rain		4

For any circumstances where the Rating is greater than 1, medical personnel should be consulted to weigh in on the safety of hosting the event:



Swimming Related Illness: Exposing athletes to poor quality water can result in swimming related illnesses and infections which can sometimes take up to 1-3 days for symptoms to appear:

- Diarrhea
- Fever
- Skin rashes
- Eye pain or eye contamination
- Respiratory infections

CONTINGENCY PLANS:

Prior to the event, establish contingency plans for how the race will proceed with the elimination of the swim portion of the event. Depending on the size and scale of the event, consider switching the event to a Run-Bike-Run or a Bike-Run. Consult with your municipal contacts to have back-up plans approved prior to race week so that you are ready to flip the switch to one of these alternate scenarios if necessary.

When creating your plans, potential pinch points and bottlenecks along your course should be top of mind. When the race begins with the swim, this naturally helps to spread out athletes as they complete the swim at a variety of different paces. This creates some built in separation between athletes that help to alleviate pinch points that might exist at the entrances/exits to

transition and along the bike course. When you eliminate the swim, you may need to artificially create opportunities for spacing. For example:

CONTINGENCY PLAN EXAMPLES	
RUN-BIKE-RUN	**BIKE-RUN**
Add a short run to replace the swim portion of the event. If your swim was scheduled to start with waves or in a time trial format, keep this in tact to help with the spacing, but instead of releasing the athletes on the water, you will be releasing them on foot to begin the run. Do not forget to consider the location of your timing mats to ensure they are set up to capture the new race start location!	If adding a run to replace the swim is not possible, consider altering the event to a bike-run. The way you opt to start the bike portion of the event is largely venue dependent and how you will be able to safely release athletes onto the course. **If athlete bikes have already been racked** in transition, consider having a time trial start from within transition. Athletes will stage at their racks and race management will release one rack at a time. **If athlete bikes have not already been racked** in transition, there's the potential to have a wave start. Keep in mind that waves will need to be spread out to mitigate potential bottlenecks.

Contingency Communication: Prior to race week, draft your athlete communication so it's ready to deploy if the swim portion of the event is altered. This includes email blasts, social media posts, and also on-site race announcements. For more information about the best way to communicate race changes to athletes, spectators, and volunteers visit our **Communications Guide**. Here is an example of athlete communication:

SWIM CANCELLATION:
Due to the recent heavy rainfall, the water quality of the *BODY OF WATER* is unsafe for swimming. Following multiple rounds of water testing and consulting with local health officials, the decision has been made to cancel the swim portion of the *ABC TRIATHLON*. The race will be altered to a Run-Bike-Run/Bike-Run.

Provide updated detailed information re: start schedule & location

Altering the swim portion of the event will also affect some of your staff and volunteer positions. Think through how you'll redeploy this personnel to other areas along the new course route and clearly communicate new instructions for their on-site responsibilities.

Pro Tip:
Depending on how far in advance and the methods used to communicate race changes to athletes, it is inevitable that some athletes may not see the message prior to arriving on-site at the event. Have back-up plans in place if: ● *Athletes arrive at the wrong time (i.e. based on the previous timeline as opposed to an updated timeline released)* ● *Athletes arrive at the wrong location (i.e. show up at the Swim but need to be in Transition)* ● *Athletes arrive with the wrong equipment (i.e. if the race has been altered to a Run-Bike-Run and they show up at the start with their wetsuits on and without running sneakers. How will you address this issue with athletes?)*