Test Kits, Analyses, Written Procedures And Data Quality Objectives

Green Country Stormwater Alliance

Tulsa Technology Center

Broken Arrow Campus

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INCOG

Standard Operating Procedures

It is always a good idea to have standard operating procedures (SOPs) written for all routine work.

The end use of your data will dictate your data quality objectives.

Equipment Failures

- Keep all of your sampling equipment in good operating order to help avoid equipment failures in the field.
- Keep a supply of consumables such as standards and reagents. Watch expiration dates.
- Carry new batteries with equipment requiring them and spare parts as necessary.

Instrumentation Requirements

- Some instrumentation requires calibration before analysis. Calibration is the comparison of an instrument reading to a known value or standard. Do not use calibration standards or chemicals that are expired.

- In practice, calibration includes adjustments and corrections required to ensure that the instrument is reporting the correct values.

Instrumentation Requirements

- Calibrate or verify the calibration each day before use, whenever you think a curve might have shifted and after the last field reading.
- Check samples and standards are samples with a known concentration that are analyzed by the same procedure you will use to analyze the samples.
- What could cause an instrument to go “out of cal?” Dropping, rough handling, temperature changes, accumulation of dirt or dust, current or voltage changes, breakdown of mechanical or electrical components, etc.

Field Duplicate and Field Split

- A field duplicate is a second sample collected from the same location, the same way and as close to the same time as possible.
- Field splits are obtained by dividing one sample into two portions in the field.
- Field duplicates and splits are intended to reveal the precision in the sampling procedure and within the sample itself.

Blanks

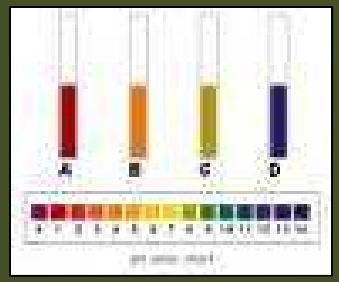
- A trip blank is a sample container filled in the lab with high purity reagent water, transported to the field with the empty containers and then back to the lab with the samples.
- A field blank is a clean sample container filled with reagent water in the field.
- An equipment blank is collected by rinsing or pouring high purity reagent water over or through the field equipment and collecting this in a sample container.
- These blanks are used to detect contamination while in the field.

Field Testing

- Some field kits can produce legally sound and defensible data.
- They are good for field screening, looking for "hot spots" and when you can not quickly get samples to the lab.
- Field testing also gives you fast results and the ability to act quickly before conditions change.

Field Testing

- Field tests can be performed with test strips, color comparators, by titration, probes or colorimeters.
- These kits are small, contain everything necessary to perform an analysis in the field and are made to withstand adverse conditions.
- These methods are relatively easy to learn so use them to screen a site and help keep costs down.



Field Testing Parameters

- Following are a few of the tests commonly measured in the field:

pH
Nitrate
Color
Temperature
Hardness
Phosphorus
Chlorine
Odor
Dissolved Oxygen
Conductivity
Flow
Ammonia

Chlorine

- Standard Methods 4500-Cl is for chlorine. This can be performed in the field or lab.

Chlorine

- Chlorine is *not* found in untreated water, but commonly used to disinfect drinking water.
- Chlorine is volatile and quickly dissipates to non-detectable levels when reacting with organic materials.
- The absence of chlorine does *not* rule out a treated source, but its presence is strong evidence for a treated source.
- Instead of chlorine gas, some municipalities use chloramines which leave a more stable residual.

Color and Turbidity

- Standard Methods 2120 B is for color and more easily performed in the lab.
- Standard Methods 2130 B is for turbidity and can be performed in the field or lab.

- Apparent color is the color you can see, often due to particulates in the water.
- True color is due to dissolved materials and cannot be filtered out.

Color and Turbidity

- Turbidity is a measure of how easily light penetrates a volume of water. Color refers to the tint of the water (apparent & true color).
- Color and turbidity can be used with other indicators to help identify dry weather discharge sources.
- High color and turbidity may be a warning sign. However, some natural flows may have high color and/or turbidity.

Turbidimeter

A turbidimeter or nephelometer is used to measure turbidity.

Conductivity (Specific Conductance)

- Standard Methods 2510 B is for specific conductance and can be performed in the field or lab.
- Conductivity is a measure of the water's ability to conduct electricity. Conductivity goes up as the amount of total dissolved solids (salts, minerals and ions) in the water increases.
- Conductivity field meters range from about $70.00 to several hundred dollars.

Conductivity (Specific Conductance)

- Distilled water has a very low conductivity while some industrial discharges can have very high conductivities.
- Naturally mineralized waters may also have high conductivities.
- De-icing agents from roads and airports will raise conductivities in runoff water.

Conductivity (Specific Conductance)

Pocket Meter

Multi Probe Meter

Bench Top Meter

Field Meter

Ammonia

- Standard Methods 4500-NH_3 is for ammonia.
- Ammonia can be determined in the field or lab.
- Ammonia is generally much higher in sewage than in groundwater or tap water.
- Ammonia may also be found in industrial discharges.
- The City of Tulsa action level for ammonia is 1.0 mg/l. Levels below 1.0 mg/l are considered naturally occurring and do not require follow-up investigations.

Surfactants (MBAS, Detergents)

- Standard Methods 5540 C is for surfactants.
- MBAS can be determined in the field or lab.
- MBAS (methylene blue active substances) is a test for certain organic surfactants used in industrial and residential detergents and soaps. The MBAS test is prone to positive interferences, but can be used as an indicator of a component commonly found in detergents.
- Caution! This method and methods similar to it use chloroform. Wear gloves and work in a ventilated area.

Detergents (MBAS)

- Many illicit discharges will contain residuals from detergents making this a good indicator of sewage and wash water discharges.
- Water used to wash clothes, dishes, industrial parts and containing commercial cleansers may show high MBAS levels.
- MBAS is not found in natural or tap water.

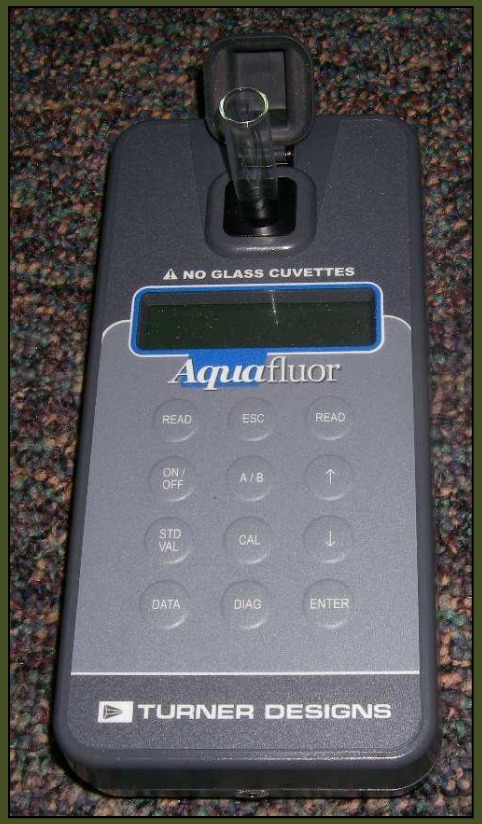
Color Comparator

Comparator Test Kits

These tests rely upon chemical reactions to indicate the presence and/or concentration of one specific parameter.

Fluorescence (Optical Brighteners)

- Optical brighteners are frequently added to detergents and soaps to make cleaned items appear "cleaner" than they really are.
- These brighteners fluoresce when exposed to specific wavelengths and their intensity can be measured by fluorometers.
- Due to the unstable nature of optical brighteners, they should be analyzed in the field.



Fluoride

- Standard Methods 4500-F is used to detect fluoride. Fluoride can be analyzed in the field or lab.
- Fluoride is frequently added to drinking water (about 2 mg/L) and therefore can be a good indicator of treated water.
- A colorimeter like this is about $352.00. Vials are ~ $26/25 vials.

Hardness

- Standard Methods 2340 C is the EDTA hardness test and can be analyzed in the field or lab.
- Total hardness primarily consists of the positive ions from magnesium and calcium.
- Unusually high or low hardness may indicate a potential problem.
- Low hardness values can increase the toxicity of other chemicals found in stormwater.

Oil & Grease

- Standard Methods 5520 B is the oil and grease (gravimetric) method. This is not a field test.
- In the field, visually look for the presence of oil and grease and its iridescent sheen.
- Samples can be collected and sent to a lab if you suspect oil & grease contamination.

Oil & Grease

Petroleum product or bacterial film?

Delaware Creek, 8-18-10.

Oil & Grease

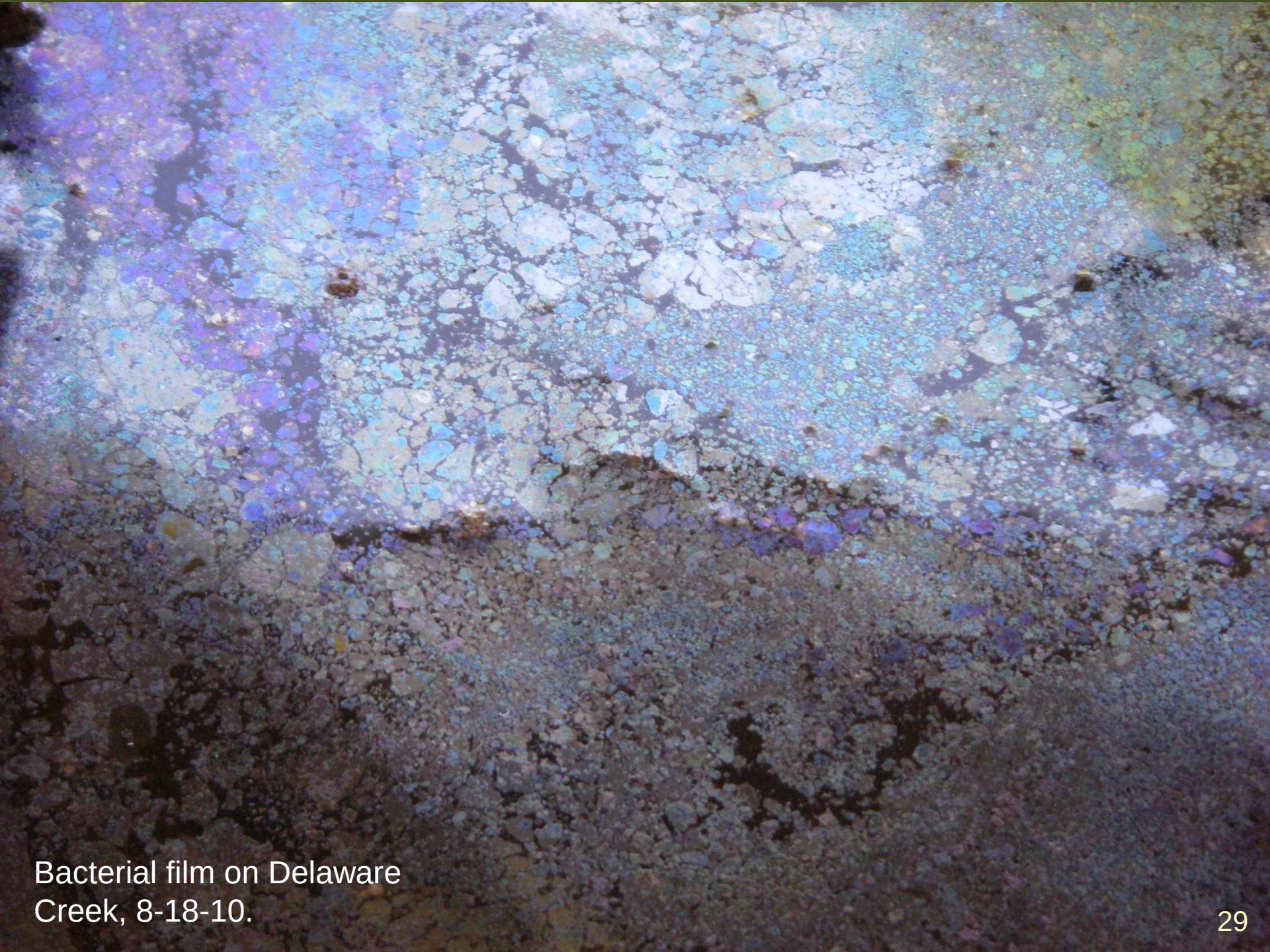
Petroleum product or bacterial film?

Gently stir the film.

If it breaks and cracks into sharp edged blocks and pieces it is a bacterial film due to bacterial activity.

If it forms flowing patterns and quickly and evenly spreads back across the surface it is due to a petroleum based material.

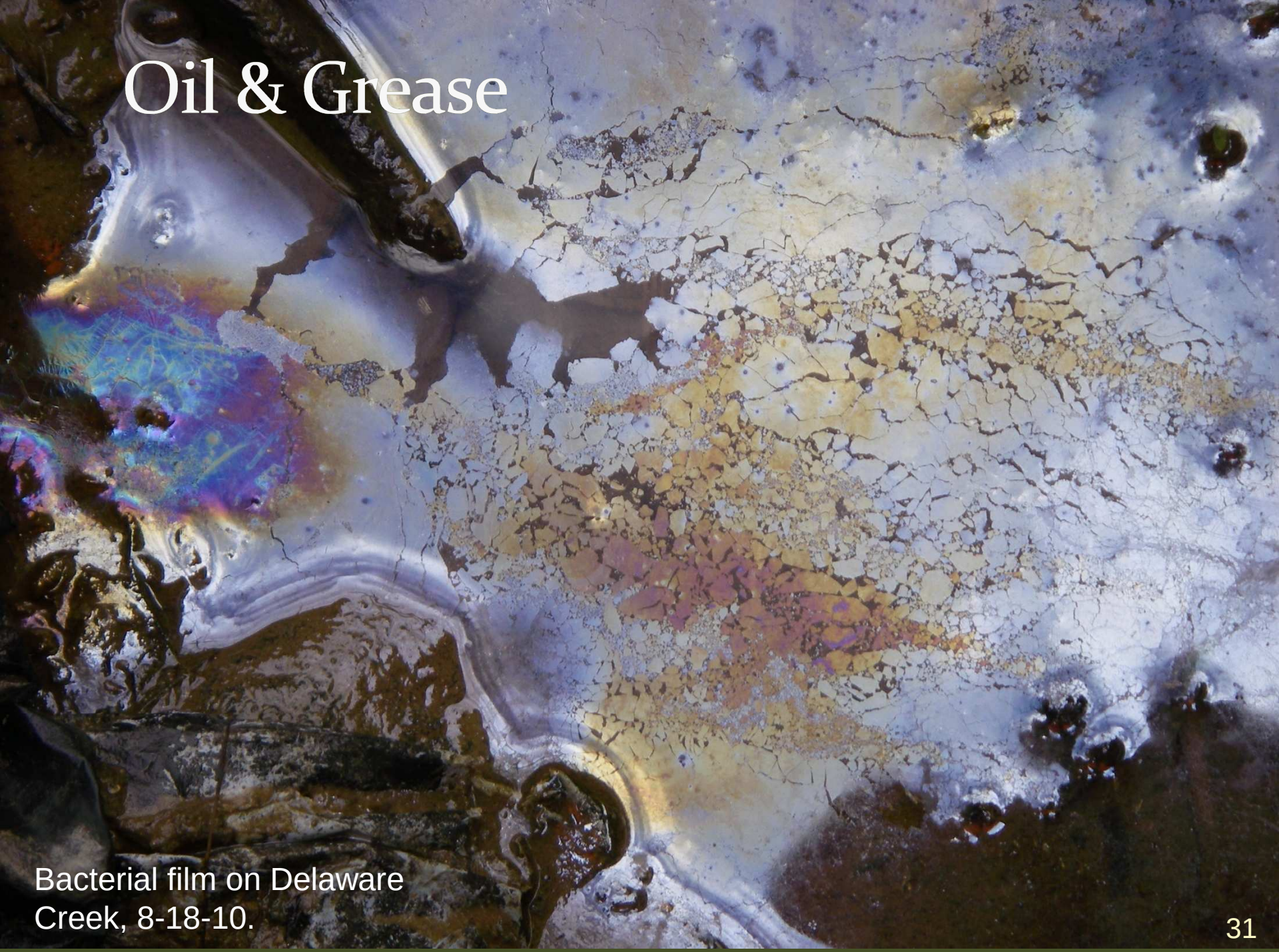
Delaware Creek, 8-18-10.



Bacterial film on Delaware Creek, 8-18-10.

Oil & Grease ?

Oil & Grease



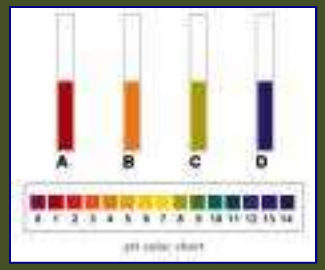
Bacterial film on Delaware Creek, 8-18-10.

Oil & Grease

- Gasoline Range Organics (GRO)
- Diesel Range Organics (DRO)
- Total Petroleum Hydrocarbons (TPH)

pH

- Standard Methods 4500-H^+ is the pH method.
- pH can be determined either in the field or lab.
- The pH of natural surface waters is frequently between 7 and 8 s.u.



pH

- Industrial discharges may be much higher or lower. Wash water and groundwater may have higher pH values.
- The pH 0-14 indicator strips are $15.00 for a pack of 100.
- The City of Tulsa action levels for pH are <6.5 or >9.0 s.u. pH values outside the 6.5 to 9.0 range require follow-up investigations.

Total Suspended Solids (TSS)

- Standard Methods 2540 D is the method for TSS. This is a laboratory method.
- This is a measure of the sediment and other solid particles suspended in the water column and does not include dissolved solids.
- Other pollutants such as metals, phosphorus, nitrogen, hydrocarbons and pesticides are commonly attached to suspended solids.

Total Settleable Solids

- Standard Methods 2540 F is the method for total settleable solids. This is a laboratory method.
- This is a measure of the solids that will settle out of a water column if agitation (currents) decrease.
- An Imhoff cone is sued to measure the solids.

Odor

- Odors such as sewage, gas, chemicals or solvents should be noted.
- Sulfides (rotten egg smell) may indicate sewage, industrial discharges or organics from meat packers, canneries or dairies.
- Rancid or sour odors are commonly traced to food preparation facilities.

Laboratory Testing

- The benefit is greater precision, better accuracy, lower detection limits, fewer interference problems, laboratory certification and the analysis is performed by highly trained personnel.
- The disadvantage is a longer analysis time, a higher cost and less flexibility.

Coordinate with the Laboratory

- Know the laboratory hours and how late they will receive samples before going into the field.
- Know how many samples the laboratory can process within required holding times.
- Check with the laboratory before going out to make sure their instrumentation and required personnel will be available to perform the analysis you need.

Communication with the Lab

Contact your lab or chemist to determine:

1. The volume of sample required;
2. Instrument load limits and special requests like analysis methods and rush requirements;
3. Sampling and analytical schedules.

Laboratories are frequently closed evenings and weekends. Watch sampling and holding times.

Holding Time

- Sample holding time is the maximum time the sample can be held before the start of the analysis.
- Sample composition can change over months, days, hours or even minutes. Preserving samples may extend holding times.
- Some parameters may have to be analyzed onsite due to short holding times, like temperature, pH, chlorine and dissolved oxygen.

Questions?

No man ever steps in the same river twice, for it is not the same river and he’s not the same man.
Heraclitus