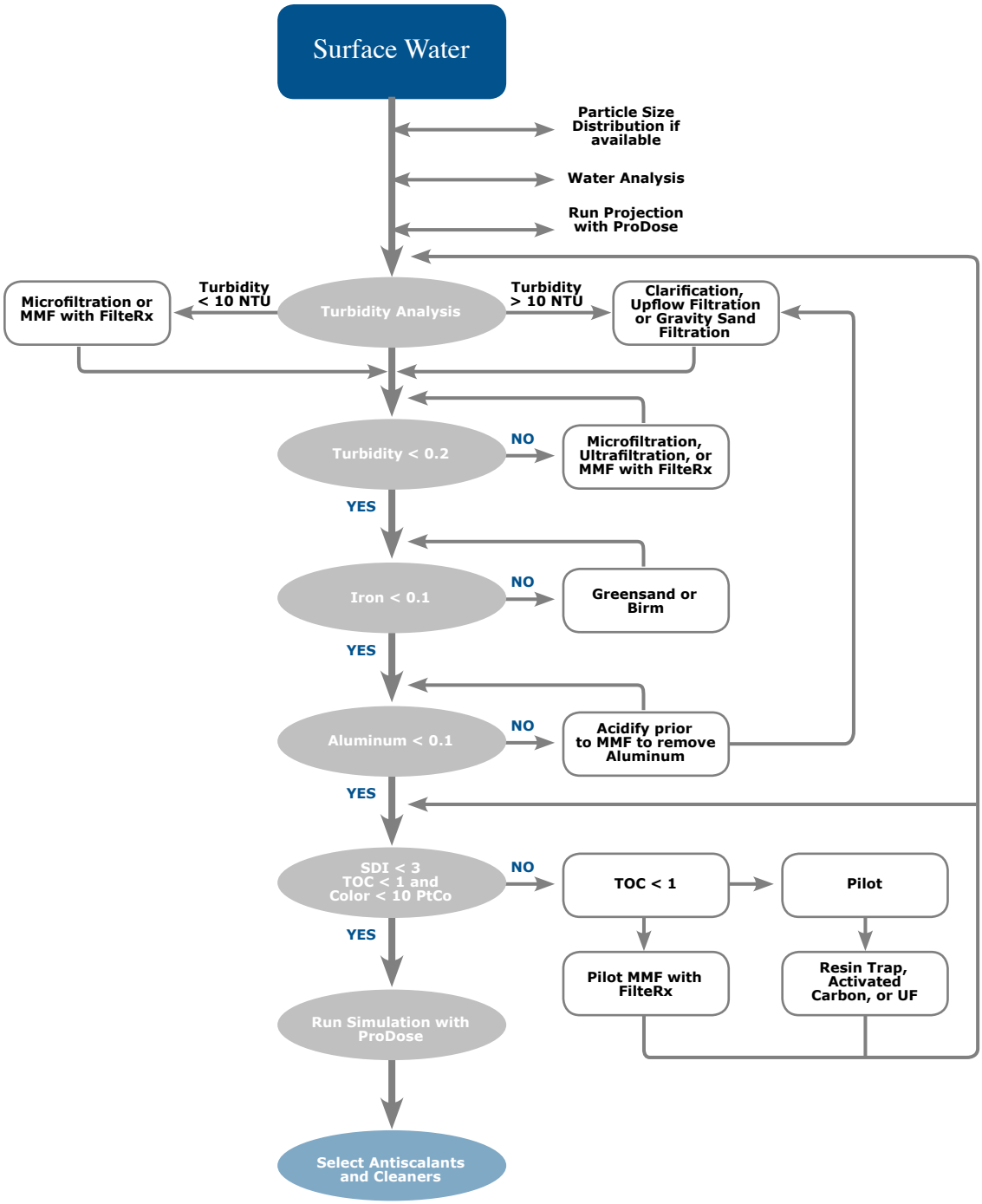
PROFESSIONAL WATER TECHNOLOGIES, Inc.

ELEMENT FLOW

Surface Water

For municipal water see pretreatment information.



Notes:

1) Birm is a natural Zeolite for the removal of Iron and Manganese. No regeneration is required. The pH must be maintained above 8.
2) Surface Water Systems may benefit from the use of a dispersant in addition to antiscalant.
3) Low Turbidity High SDI waters are difficult to treat. Pilot testing of such waters is strongly suggested.

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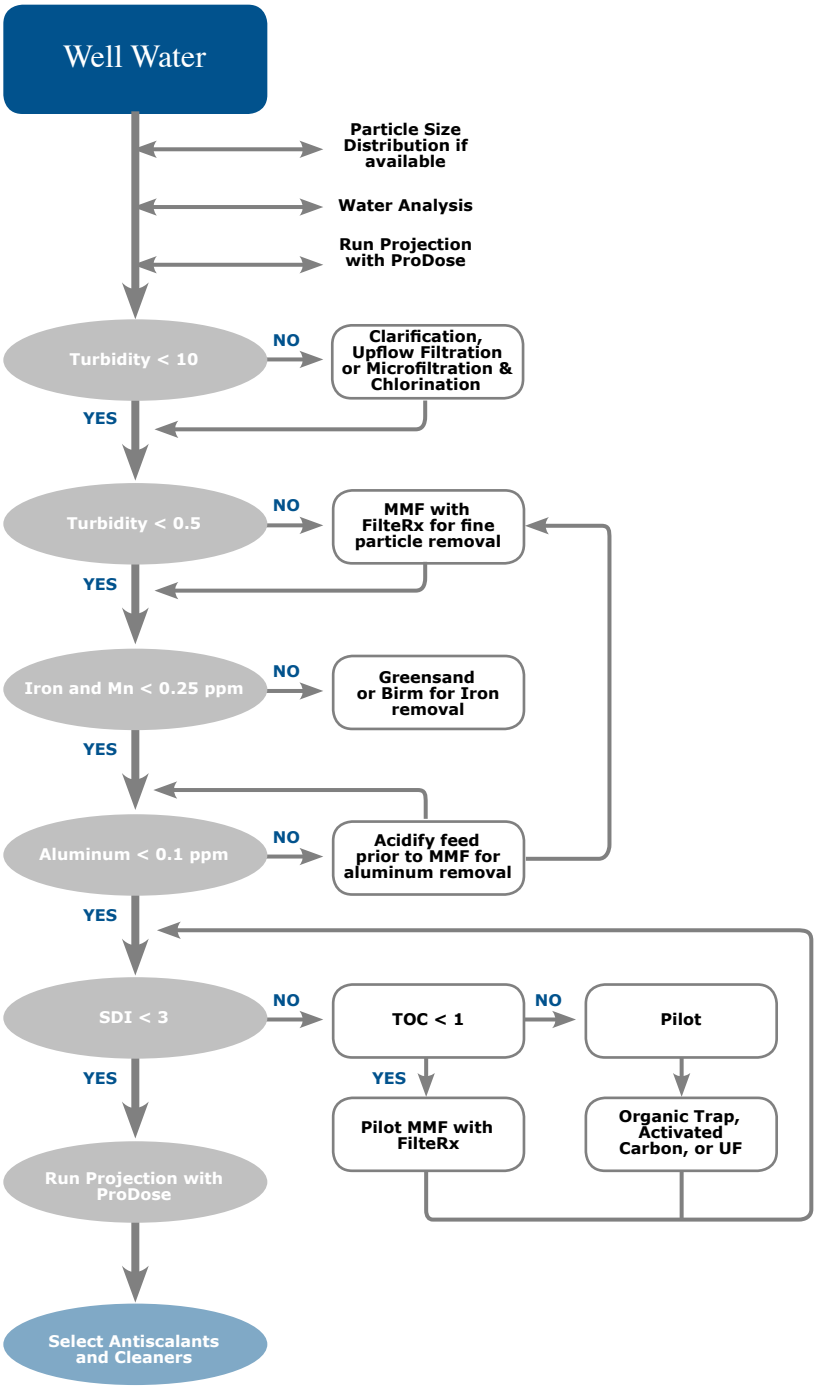
Well Water

Organics tend to be less fouling as compared to Surface Water Organics Well Water tend to have higher soluble iron and Manganese levels which can either be handled with low rejection rates, softening or dispersants.



Birm is a natual zeolite for the removal of iron or manganese. No regeneration is required but pH>8 is necessary

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Water Source

WATER SOURCE	CHARACTERIZATION	TURBIDITY	COLOR	TOTAL ORGANIC CARBON (TOC)	TOTAL DISSOLVED SOLIDS (TDS)	SILT DENSITY INDEX
River	Unstable, with seasonal fluctuations, especially during rainy periods and spring thaw	High, with seasonal variation	Moderate	Moderate to high	Low	Extremely high >5
Lake or large pond	Unstable, with seasonal fluctuations esp during warm months	Low, with seasonal variation	High, with seasonal variation	High, with seasonal variation	Low	High 4-5
Well	Relatively stable, with low or moderate seasonal changes. Many wells are contaminated with iron and iron reducing bacteria. Metals may be soluble due to lack of oxygen. Also barium is a potential contaminant in some wells	Low	Low	Moderate, in general. Well Water Organics tend to be easier to handle as they are not oxidized. Check to see if well pumps are oil or water lubricated	Low	Must be tested as it can range from 1 to >5 depending on the well
Municipal Water	Potential Seasonal Variations Potential carry over of organics and aluminum. Most Municipalities use alum and do not concern themselves with carryover--Al is death to membranes. Quite often will have high chlorine	Low to moderate	Low	Low to moderate	Low to moderate	Low to very high
Brackish	Relatively stable with moderate seasonal changes	Low	Low	Low to moderate	Moderate to high (up to 10,000 ppm)	High
Seawater	Relatively stable, with moderate changes in turbidity in spring and fall, and moderate other seasonal changes	Low to moderate	Low	Low to moderate	High (above 10,000 ppm)	Very Low to High
Tertiary Effluent	Relatively stable, with moderate seasonal changes, quality depends on treatment plant performance	Low to moderate	Moderate to high	High	Moderate	High

ANALYSIS	LOW	MEDIUM	HIGH
TurbidityNTU	< 10	10 to 25	>25
Color (PtCo)	<10	15 to 30	>30
TOC (mg/Liter)	< 1	2 to 10	> 10
Total Dissolved Solids (ppm)	10-150	150-300	> 10,000 (brackish water)

Note the characteristics of organics and color will vary depending on whether the water is from Wells or Surface Sources

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Water Source

WATER SOURCE	EXAMPLE CHARACTERISTICS	RECOMMENDED PRETREATMENT TECHNIQUE(S) AND EQUIPMENT
River	Turb> 50 NTU	Clarifier + Media filter, or possibly Microfiltration alone
	Turb> 50 NTU	Clarifier + MF or MF/UF membranes
	Turbidity <50 NTU	Upflow filter alone or MF alone
	Turb 10-50 NTU	MF/UFmembranes alone or MMF w ith Polymer
	Turb< 10 NTU	MF or MMF w ith polymer
Lake or large pond	Hard water + TOC	Enhanced coagulation + Lime Softening + Clarifier+Media Filter
	Turb> 50 NTU	Enhanced coagulation + Clarifier + MF/UFmembranes, or Upflow filters
	Turbidity <50 NTU	Enhanced coagulation + MFmembranes or Upflow Filters
Well	Iron and manganese	Greensand filter, Birmor chlorination and filtration
	Turb<10NTU	UF/MFmembranes or Multimedia (MMF)
	Turb>10NTU	Media filter (MMF)
Brackish Water	Turb >10 NTU	UF/MFmembranes
	Turb < 10 NTU	Media filter
Sea/Ocean Water	Turbidity > 100 NTU	Clarifier + MMF or MF/UFmembranes
	Turbidity <100NTU	
	Turbidity <50 NTU	Upflow filter alone
	Turbidity <25NTU	Media filter
Tertiary Effluent	All w ater characteristics	Media filter Upflow filter or MF/UF membranes, if Ammonia is an issue, lime clarification and stripping may be required or special membrane treatment

TSS = total suspended solids
TOC = total organic carbon
RO = reverse osmosis
MF = microfiltration
UF = ultrafiltration
MMF = Multimedia Filtration