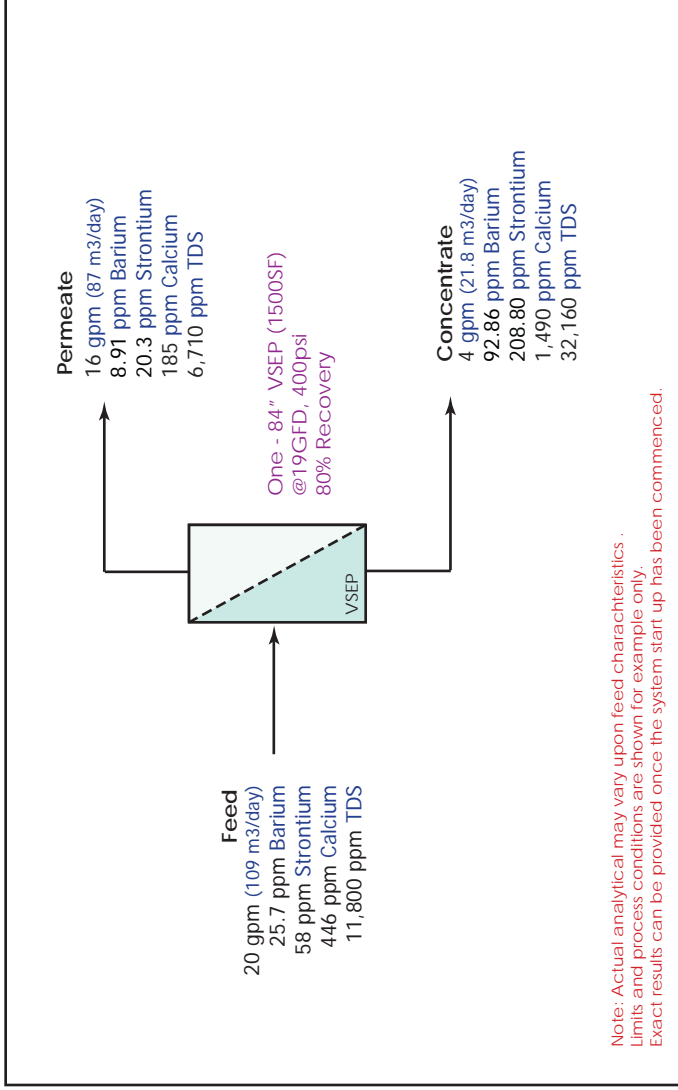
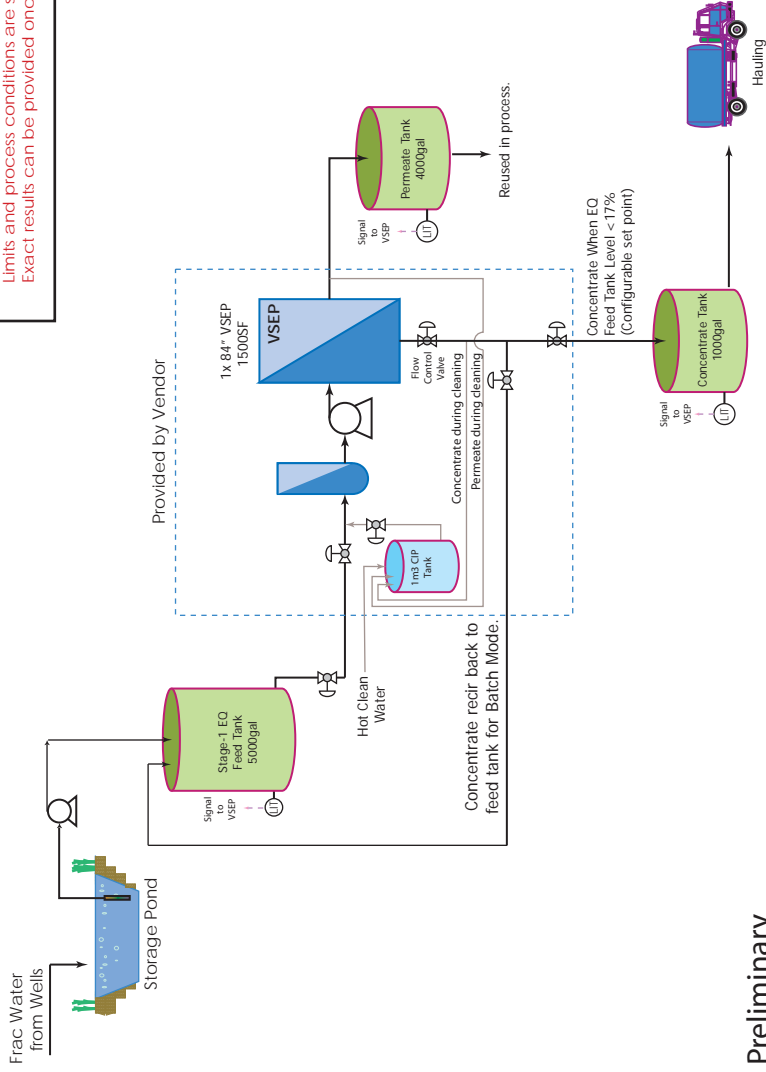


Frac Water Process Flow Diagram

- Process Objectives:**
High Filtrate Recovery
- VSEP Advantages:**
Minimal Chemical Addition and Pre-Treatment
Automated Controls
Quick online ability and good turn down ratio
Small Footprint
Energy Efficient
- Membrane: NF 270**
Cleaning: Warm Water, NLR 404 and NLR 505



Note: Actual analytical may vary upon feed characteristics .
Limits and process conditions are shown for example only.
Exact results can be provided once the system start up has been commenced.

Controls:

The automatic VSEP process is controlled with a PLC. There are PID loops for the inlet pressure and Concentrate Flow rate. This is accomplished using VFD's and throttling valves, respectively. The filtration method available for use will be Batch Operation. This method is done by filling the feed tank and then running in filtration mode, removing permeate from the tank while sending the reject back until desired% of the volume has been removed. Then, the concentrate valve opens to send the concentrate to the reject holding tank. This occurs until the feed tank is empty at which time the VSEP will flush while the feed tank is refilled for the next batch.

After a system shut down due to low feed tank level, or after any shut down, the system would auto flush using hot water and then go into Standby Mode. VSEPs will automatically clean at a predetermined timed interval. Spent cleaning chemicals would discharge to the Chemical Treatment Sewer or appropriate drain.

Setpoints: %Recovery, Feed Pressure, Concentrate Flow, Cleaning Time.

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Frac Water	06/16/10
PFD	