Appendix A

Membrane Tests

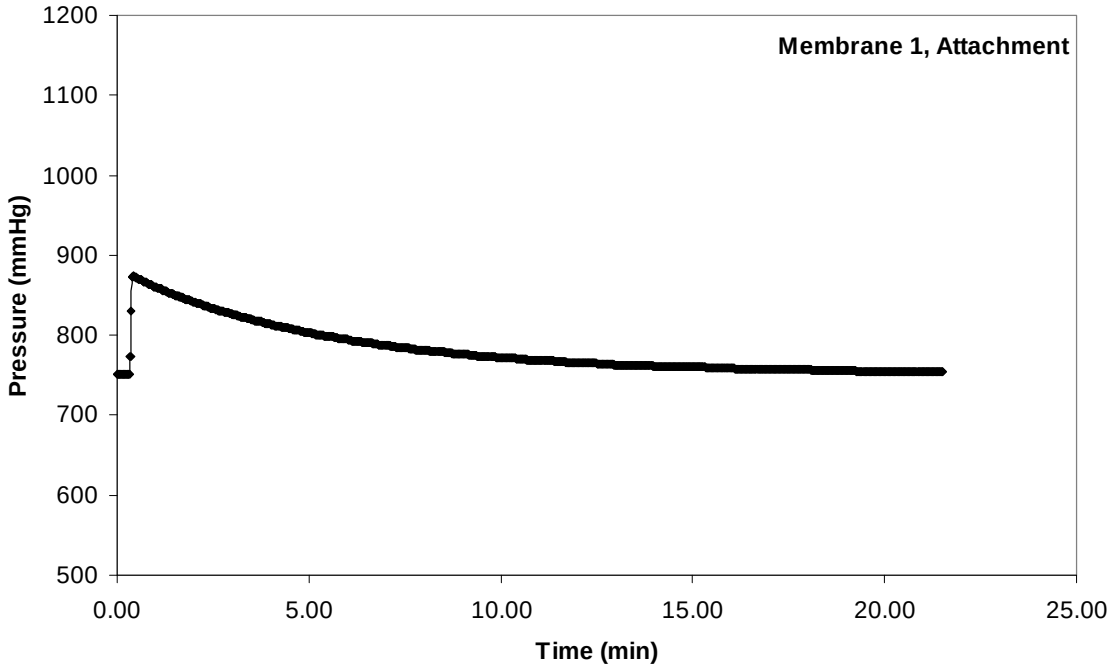
Appendix A

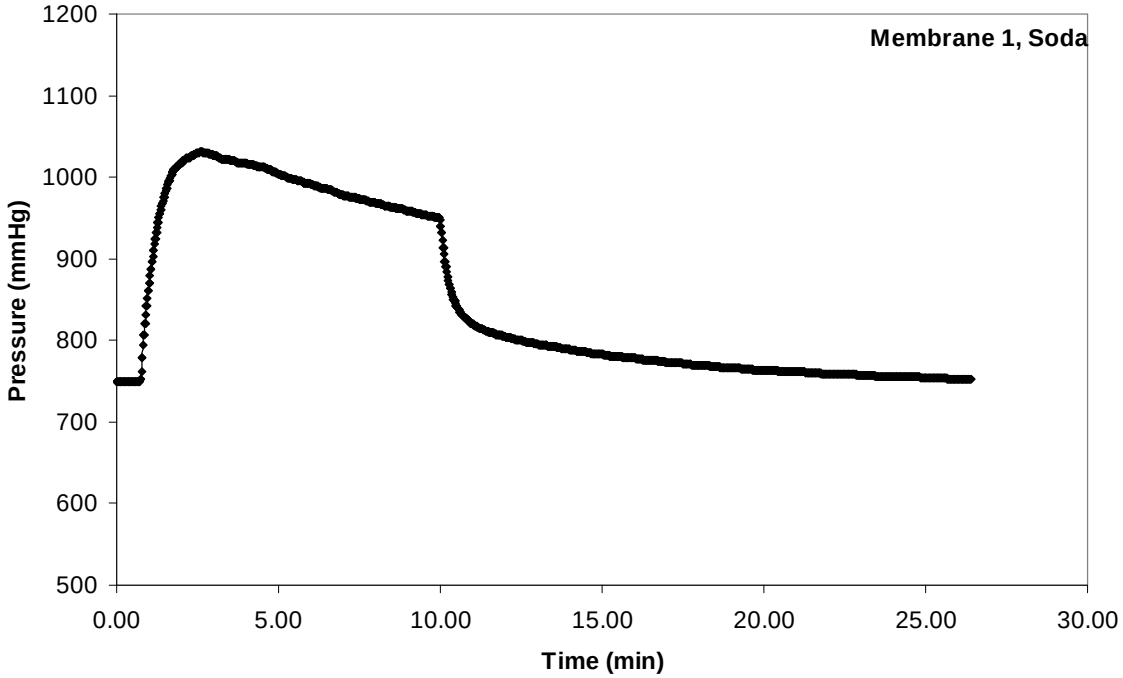
Membrane Tests

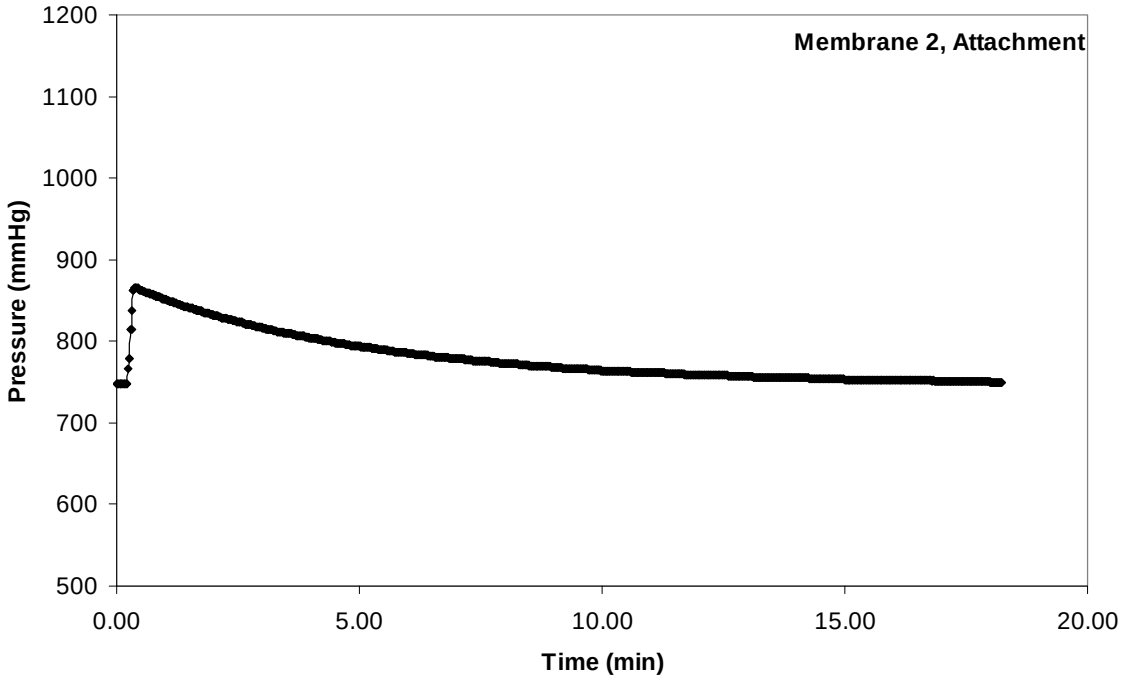
The following graphs represent membrane tests done before and after deployments. Dates listed for each membrane are the dates during which sensors collected data. The *attachment tests* show the pressure increase as the membrane was attached to a data-logging sensor, followed by a reduction in pressure toward atmospheric equilibrium over time. The *soda tests* show the response when the sensor tip was inserted into a beaker of soda water. A functioning membrane would show a rapid increase in pressure well above barometric pressure followed by a gradual return to barometric pressure. The steeper decrease in pressure corresponds to the time at which the tester removed the membrane from the soda water (after approximately 10 minutes). Post-deployment testing was performed to establish whether the data we collected were reliable. Following quality testing to confirm that the integrity of the membranes was fully functional, many were reused in additional deployments.

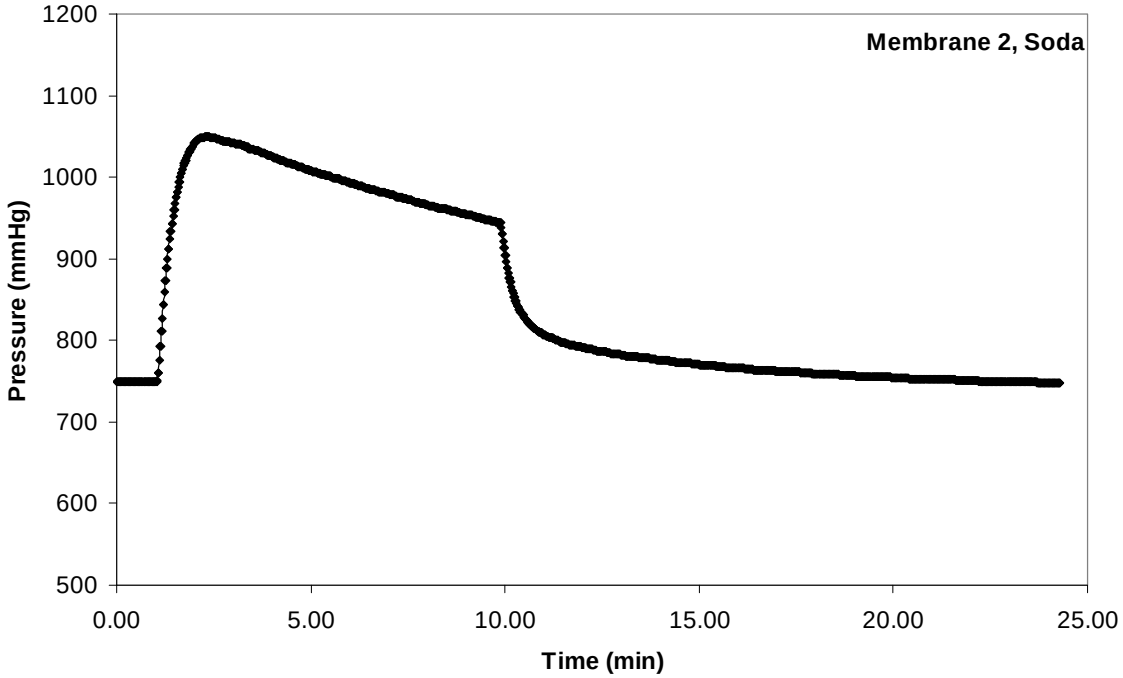
Pre-Deployment

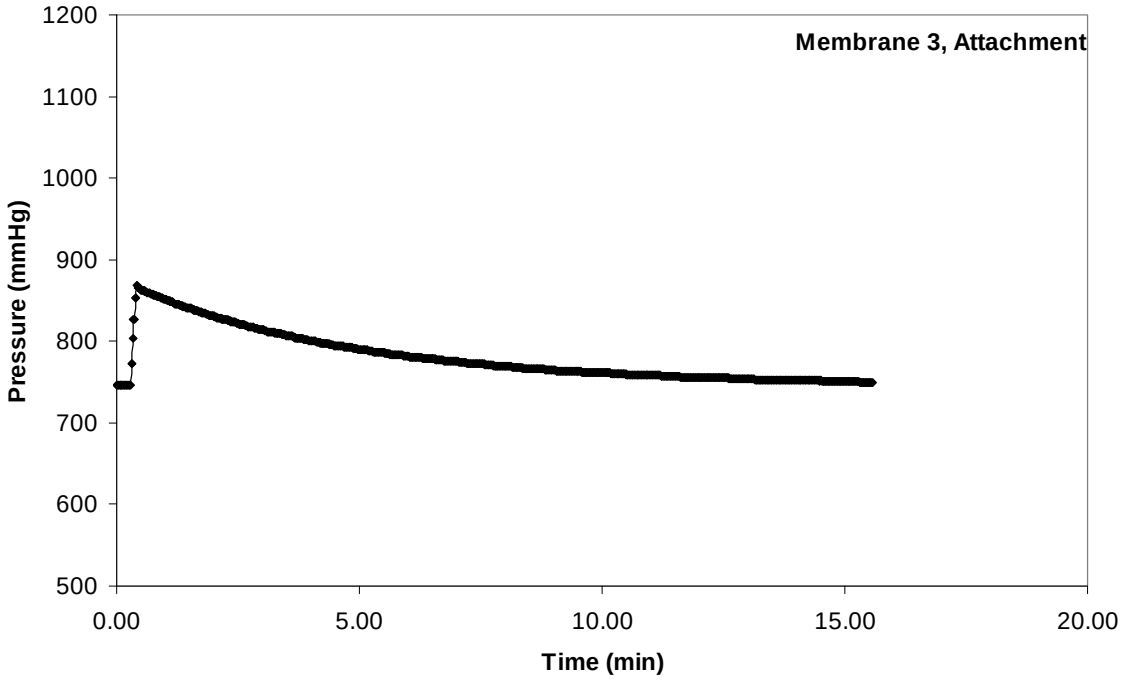
All membranes were tested prior to use.

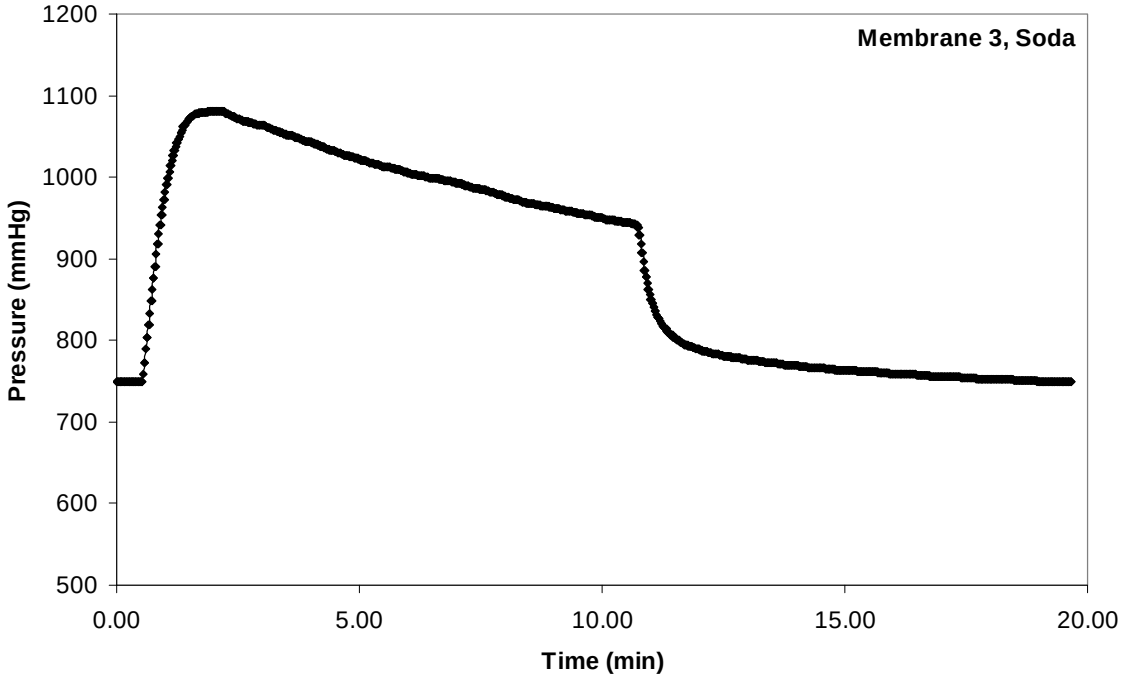


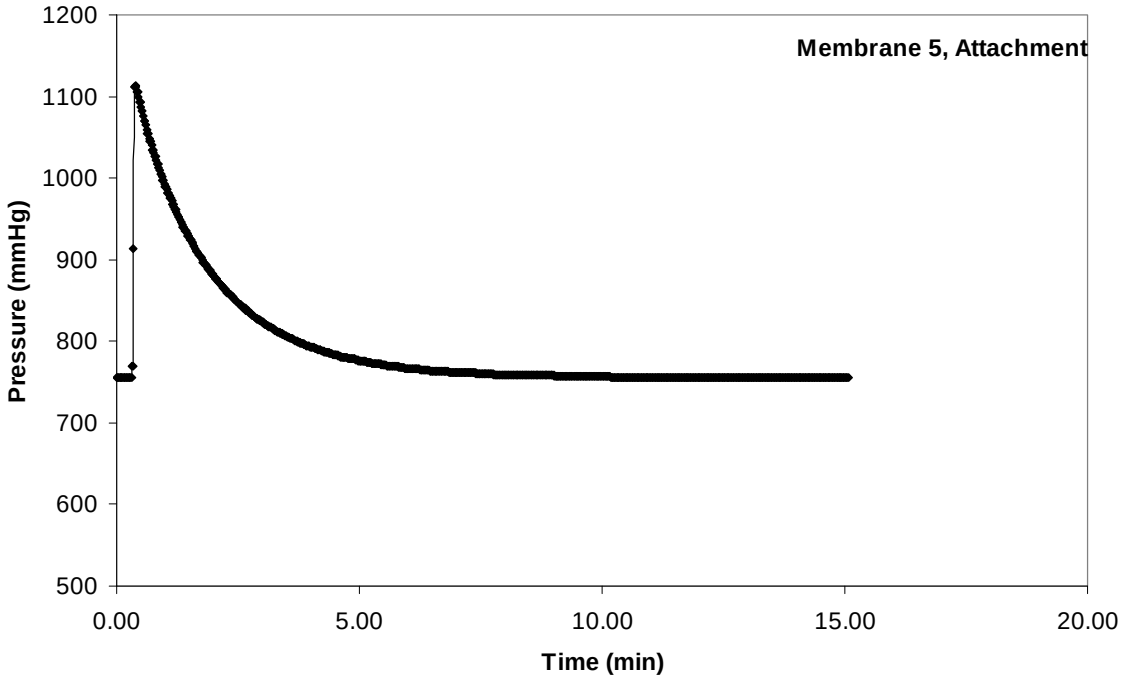

Membrane 1, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Time (min)

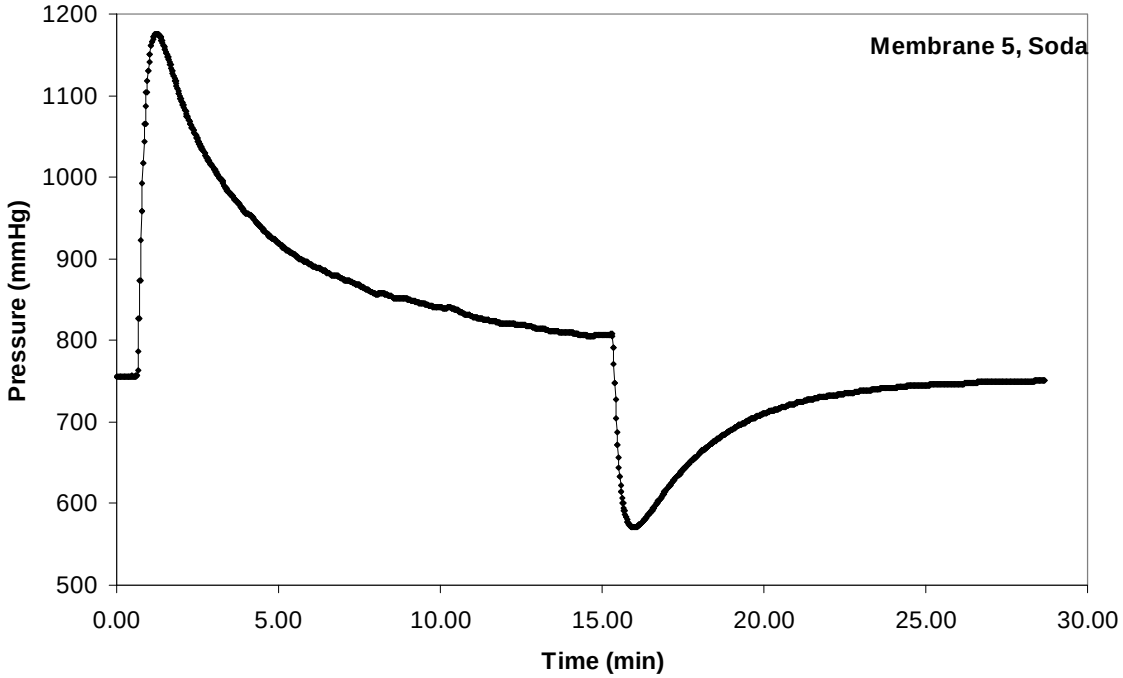

Membrane 2, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

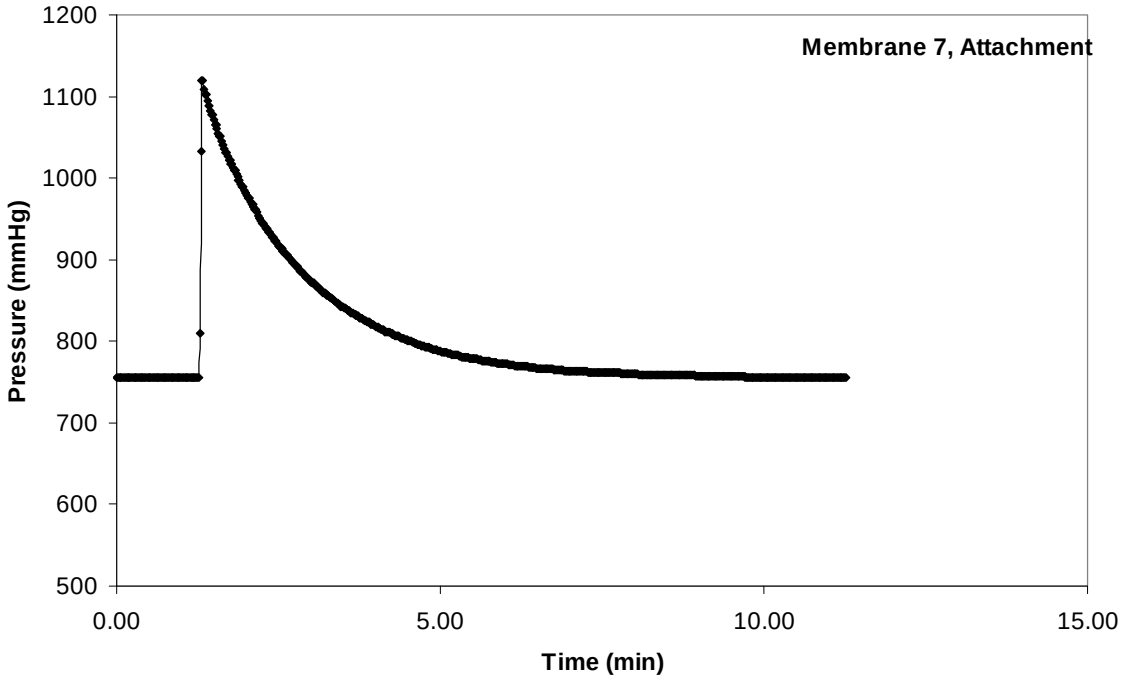

Membrane 2, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

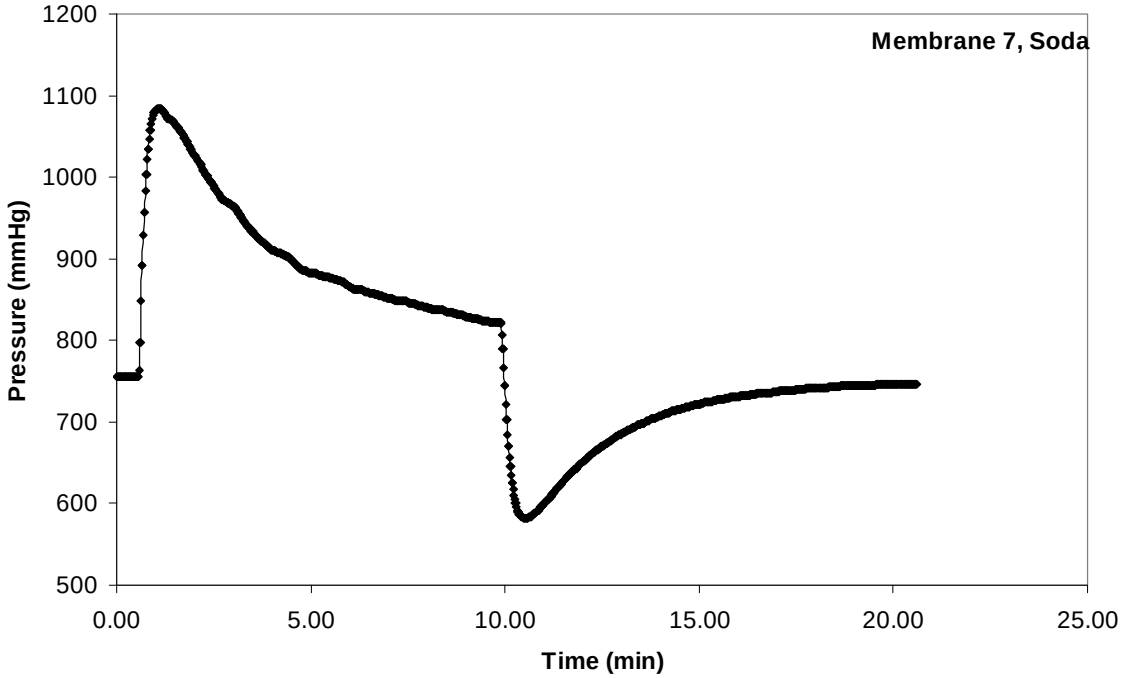

Membrane 3, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

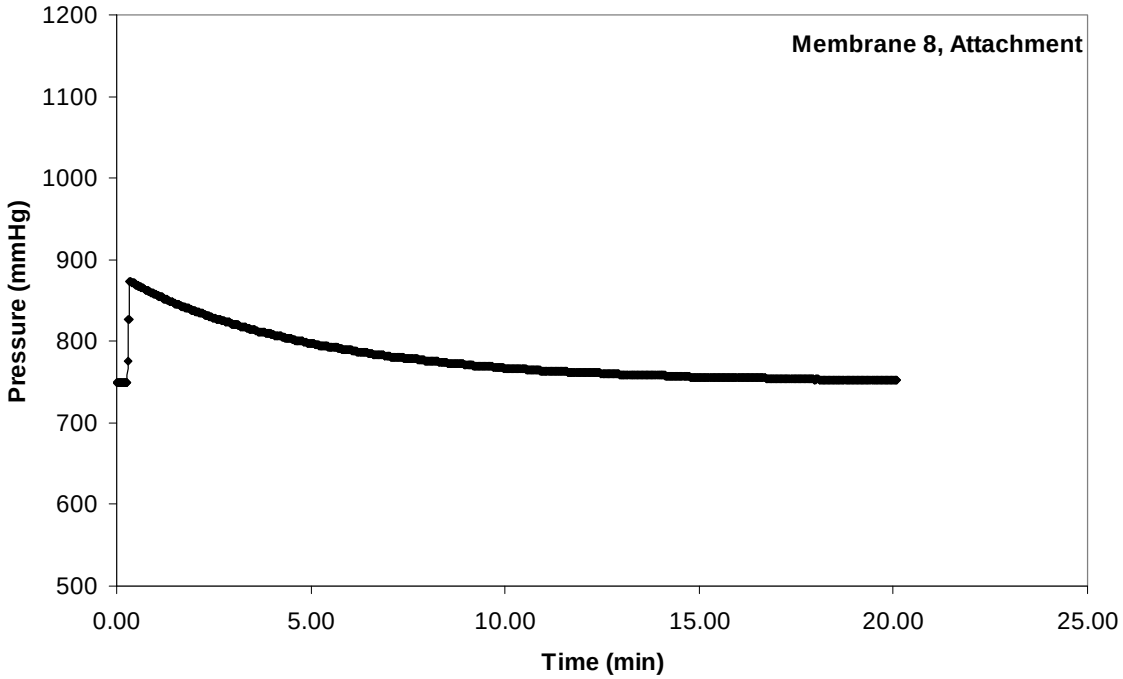

Membrane 3, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

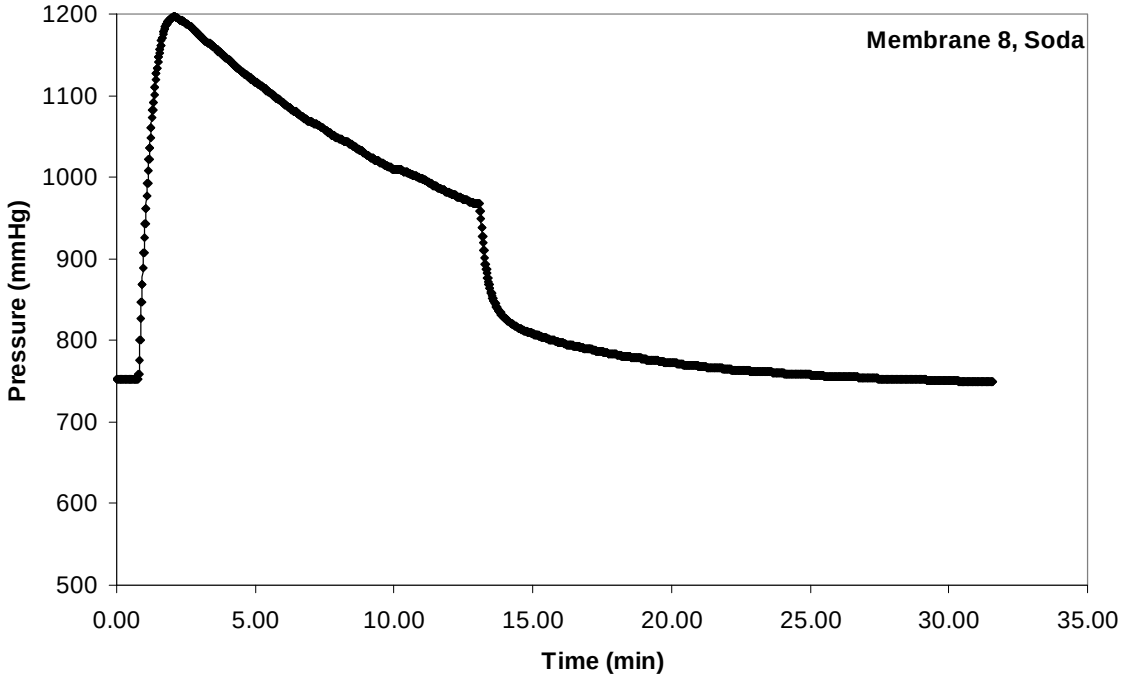

Membrane 5, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

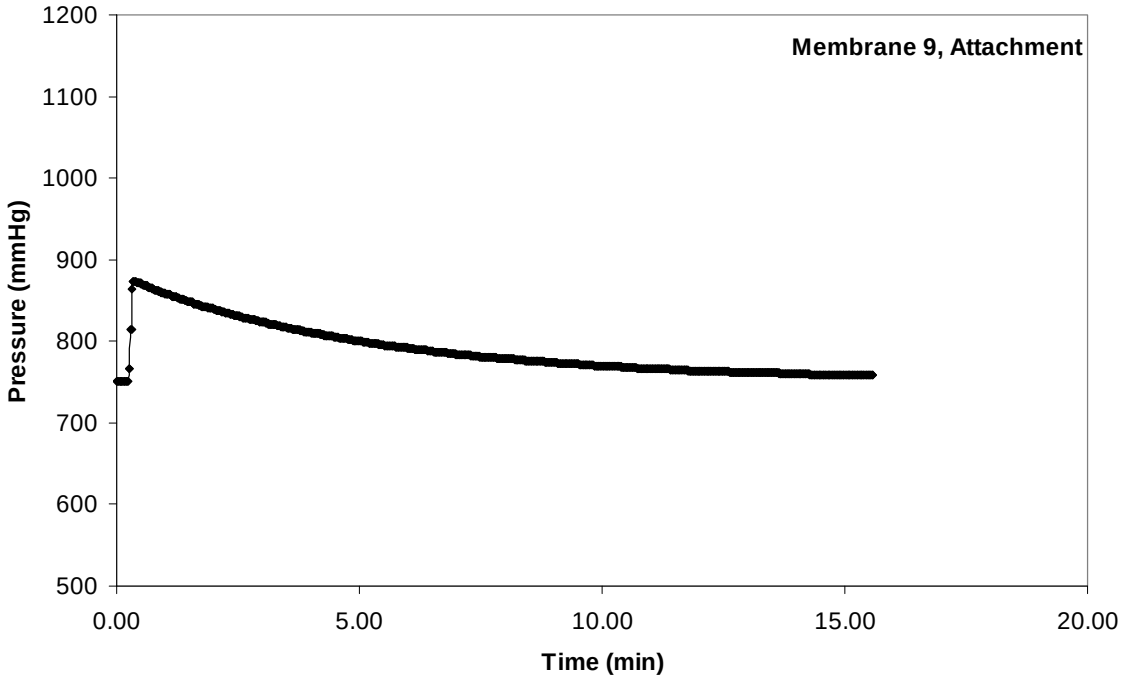

Membrane 5, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Time (min)

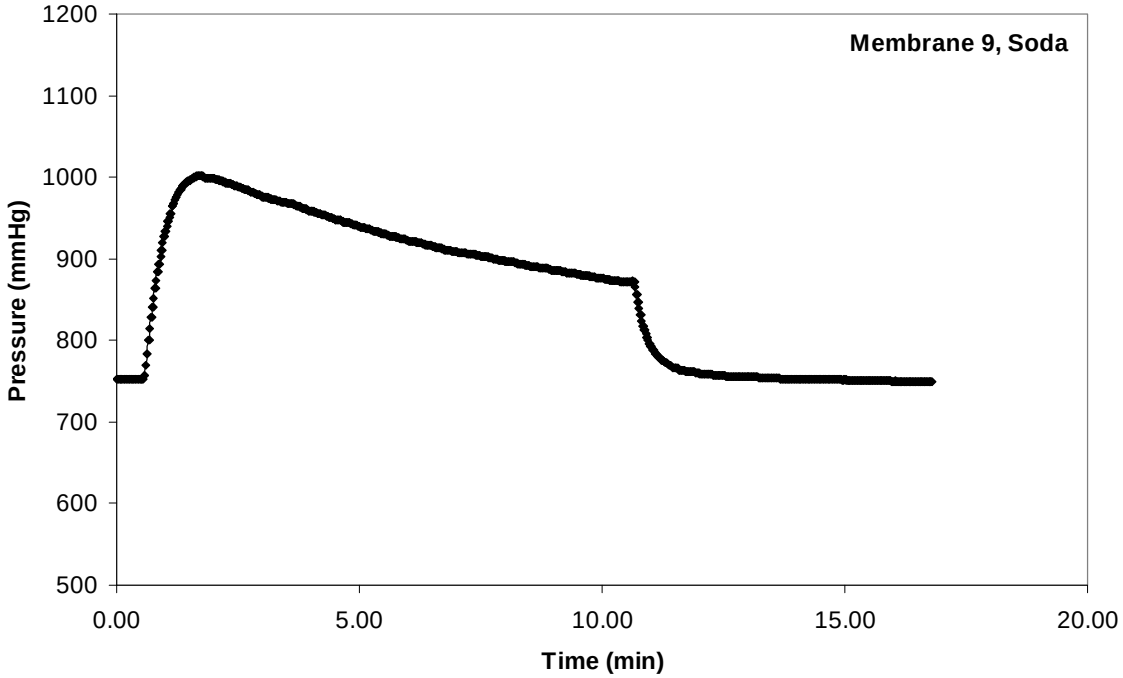

Membrane 7, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

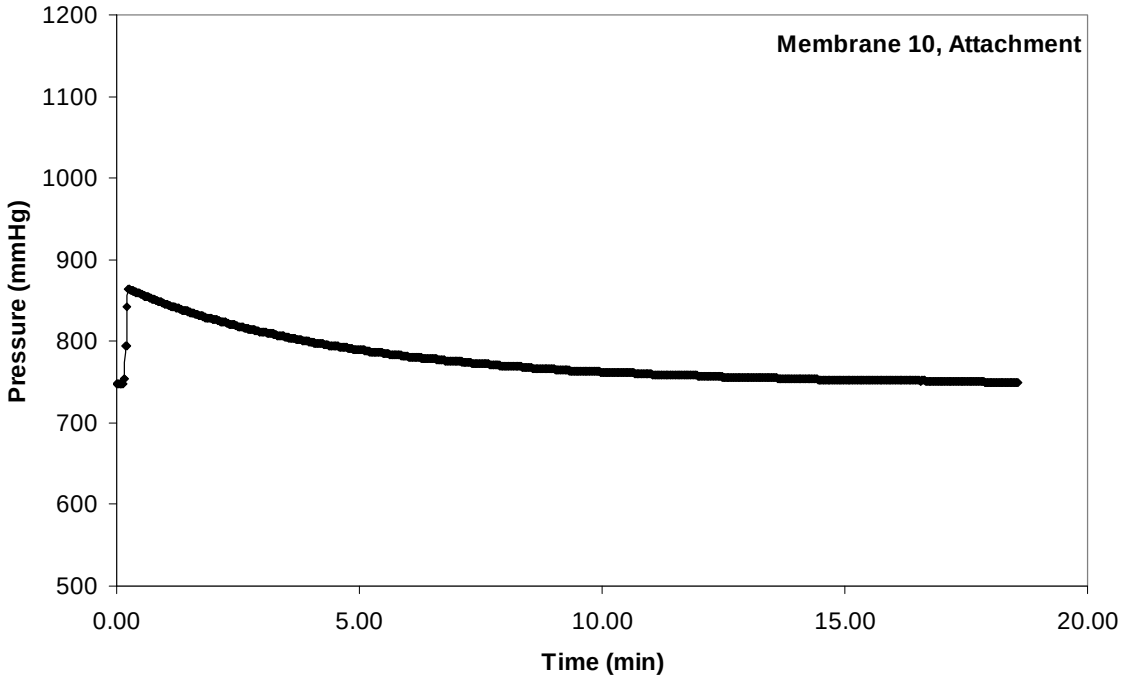

Membrane 7, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

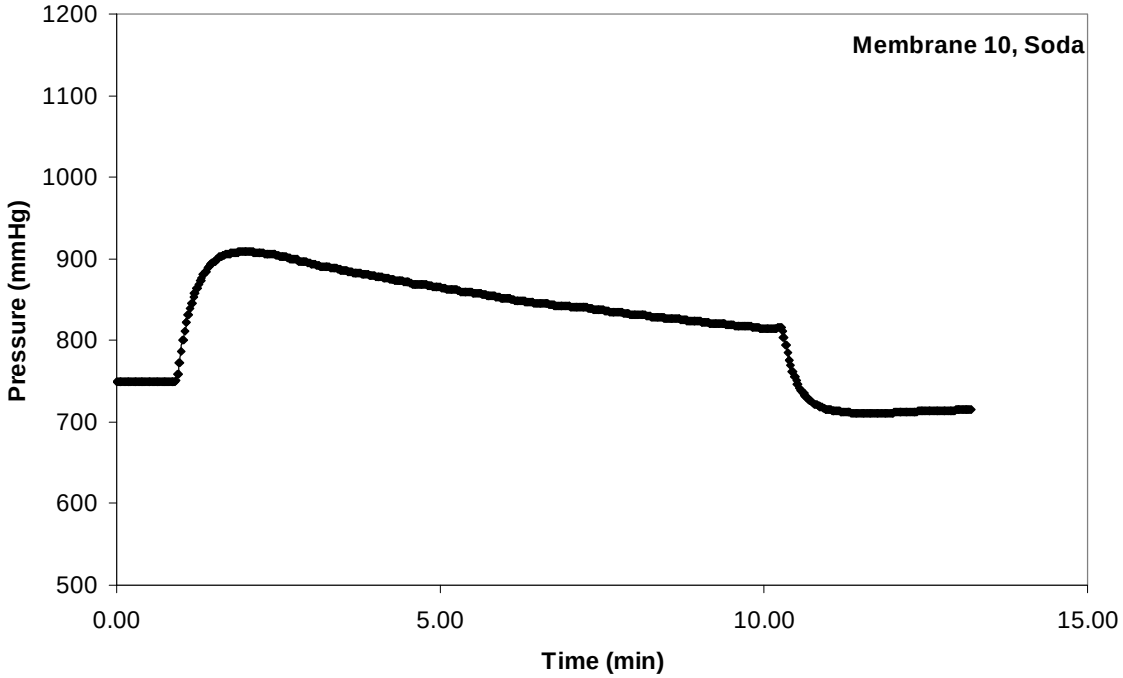

Membrane 8, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

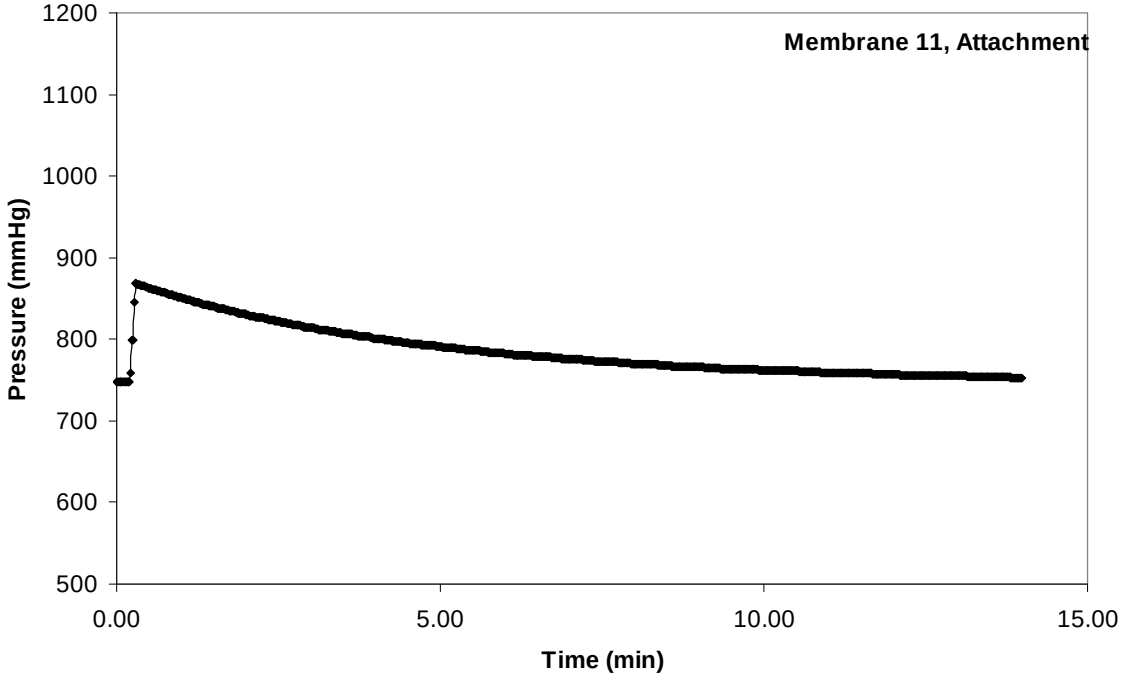

Membrane 8, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Time (min)

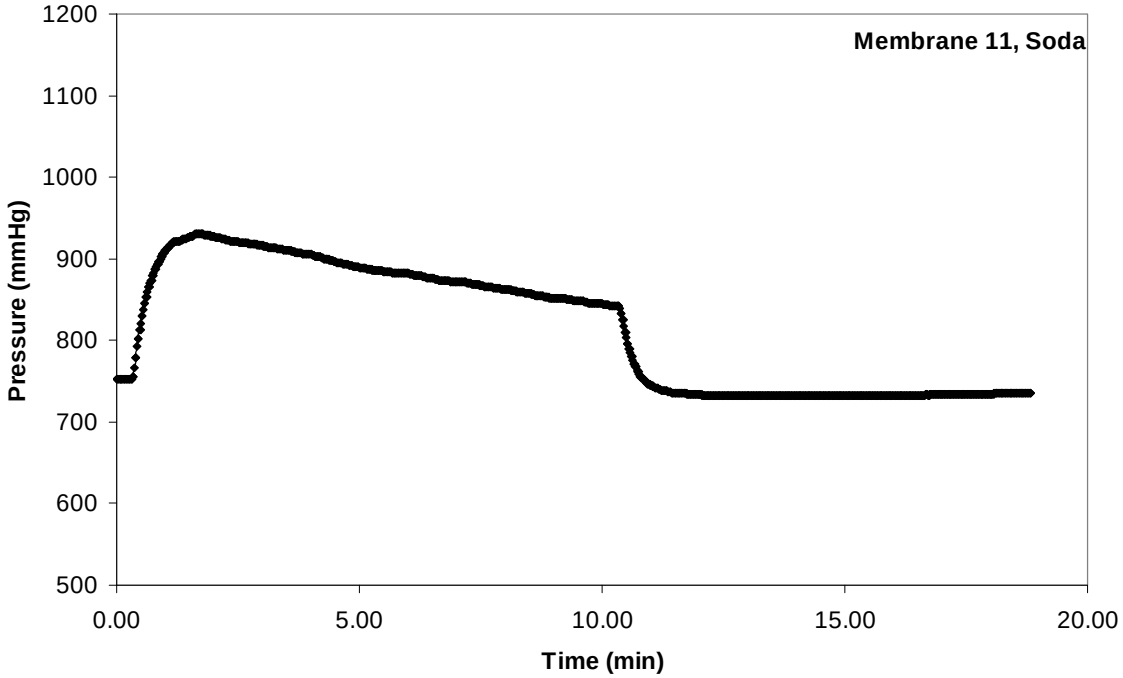

Membrane 9, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

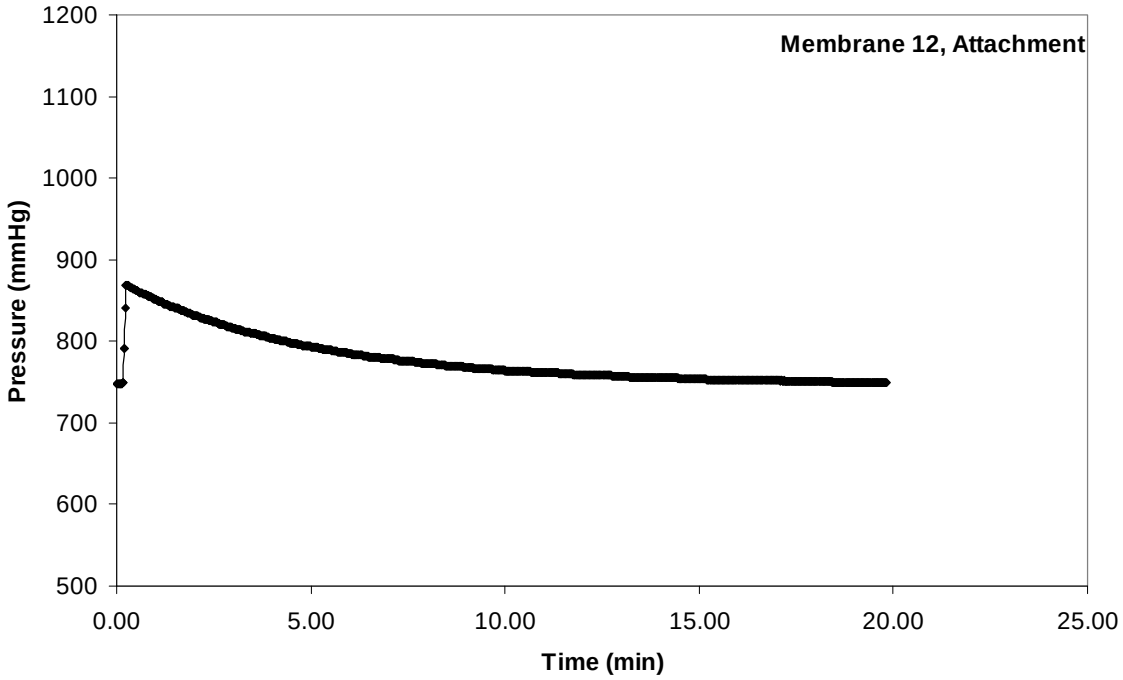

Membrane 9, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

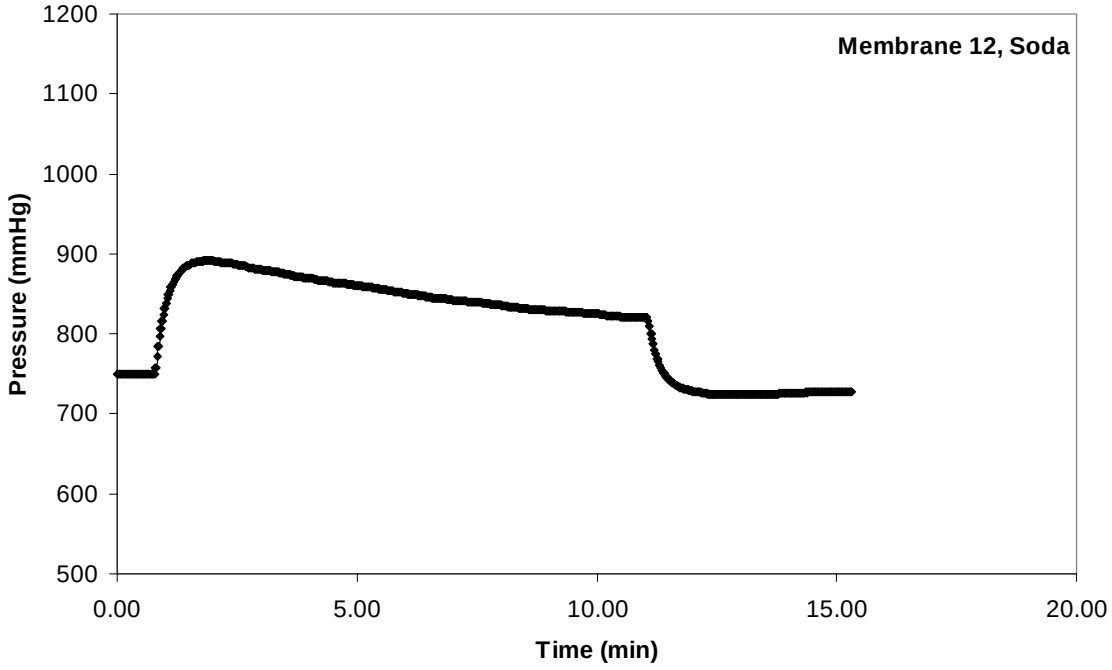

Membrane 10, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

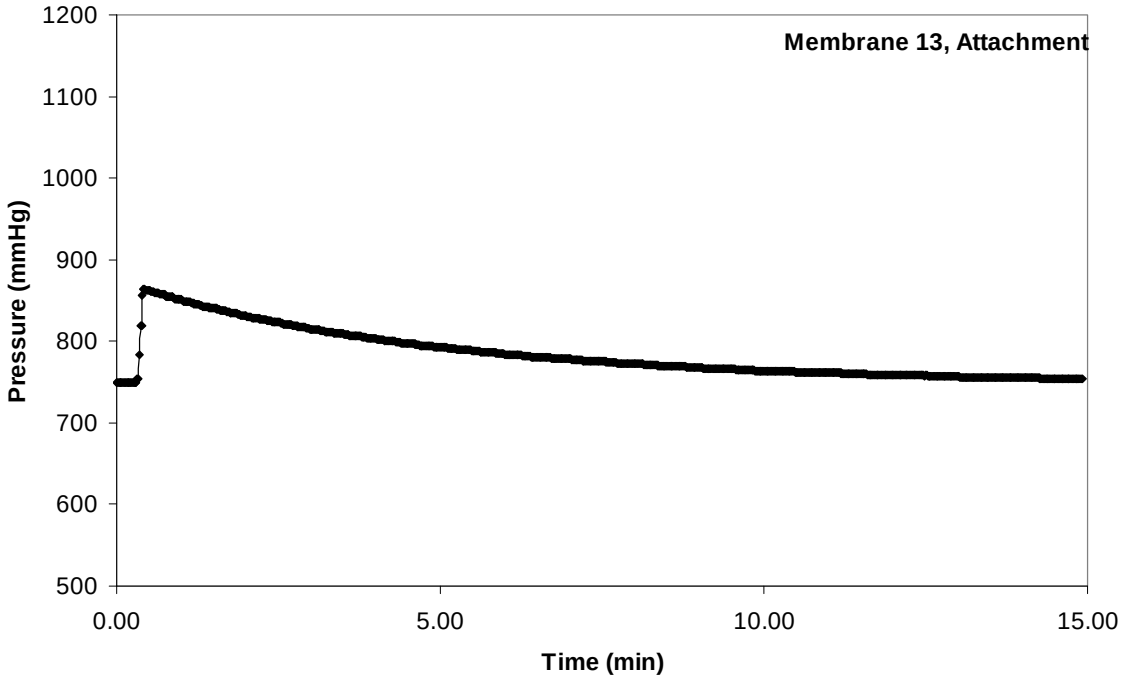

Membrane 10, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

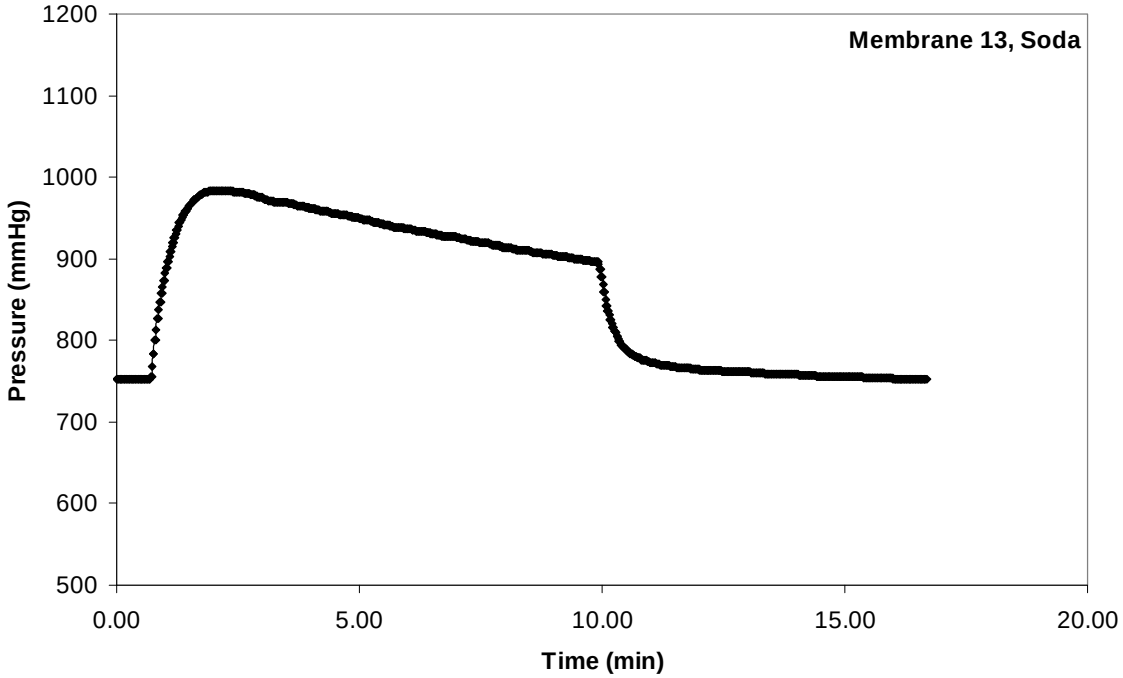

Membrane 11, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

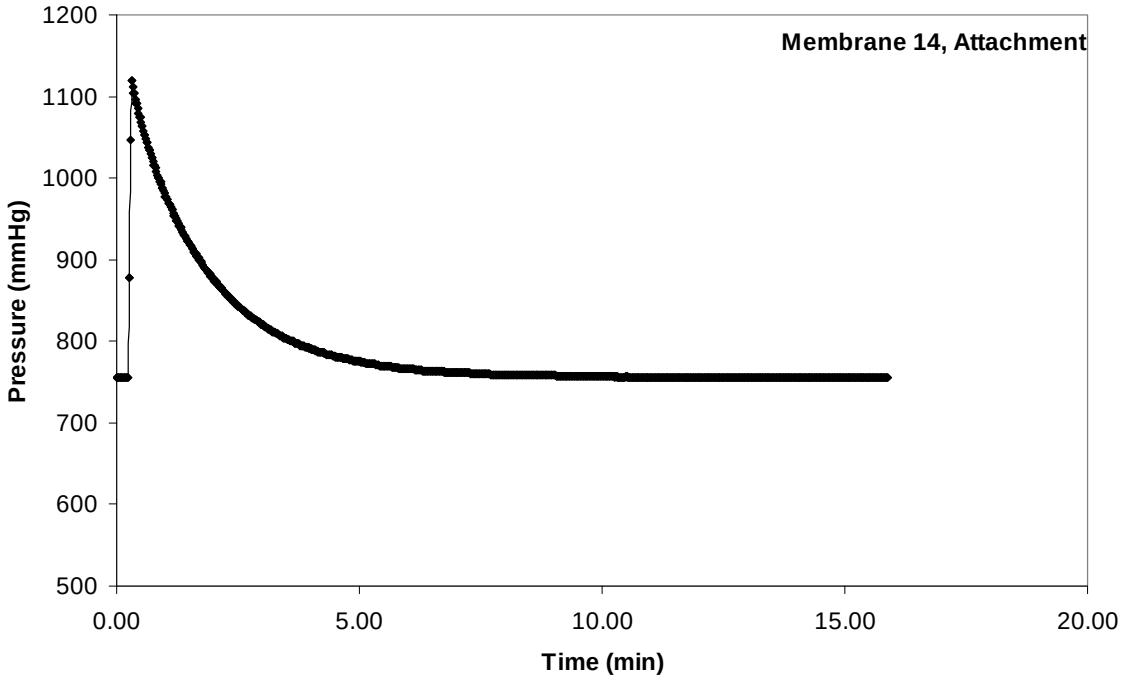

Membrane 11, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

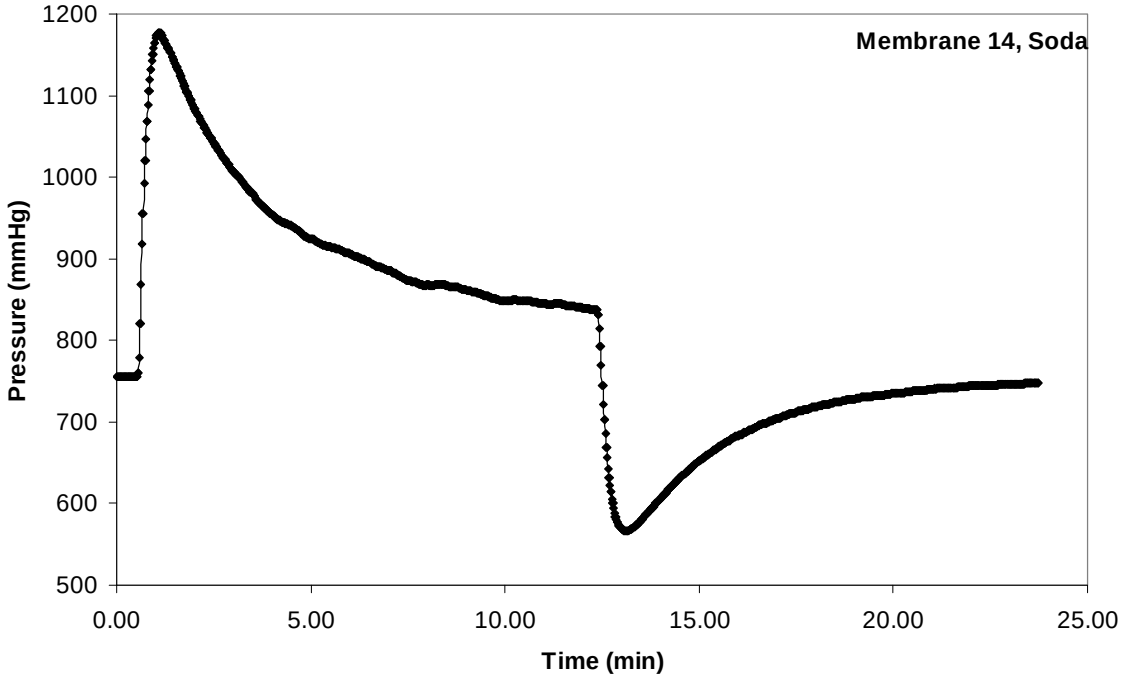

Membrane 12, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

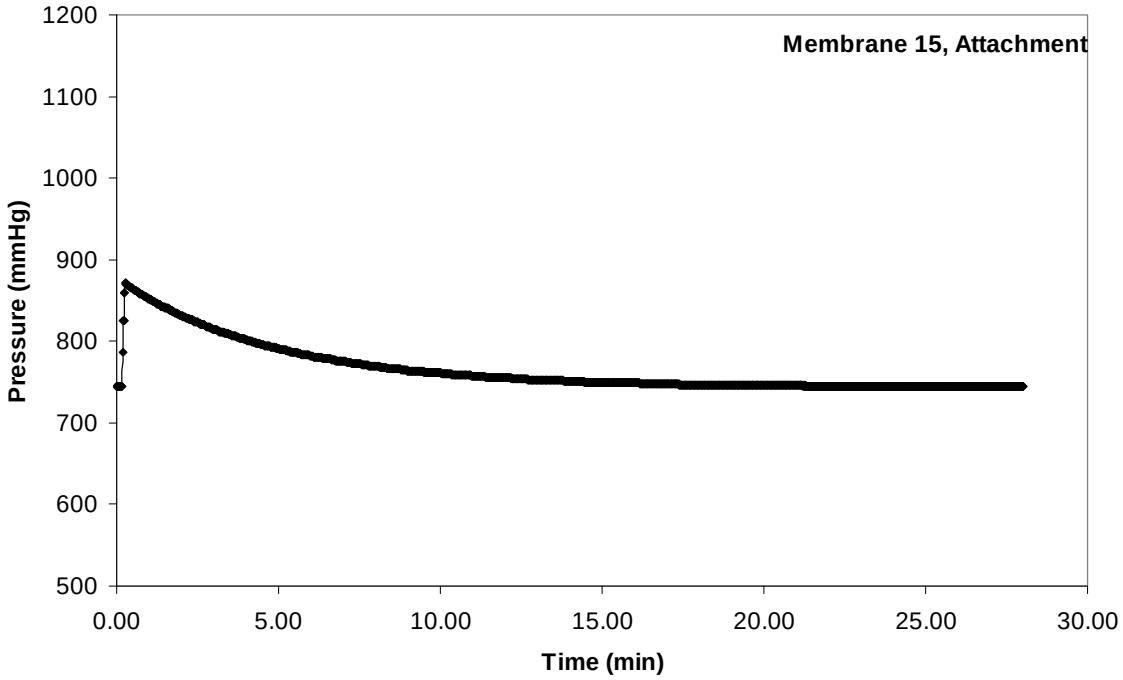

Membrane 12, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

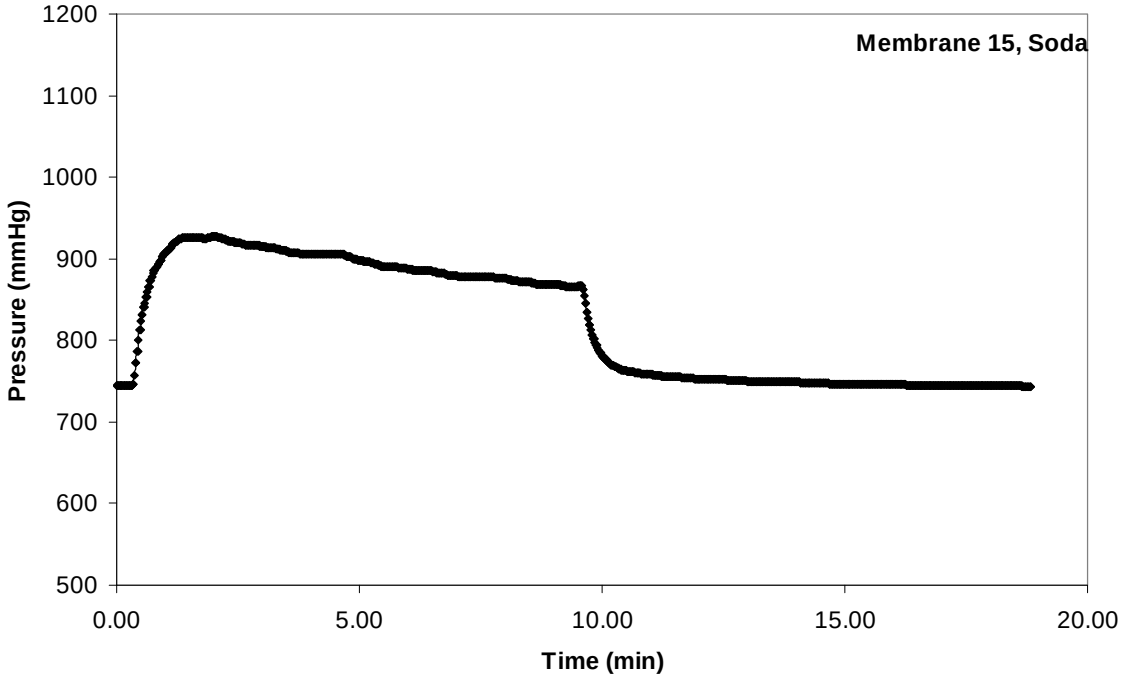

Membrane 13, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

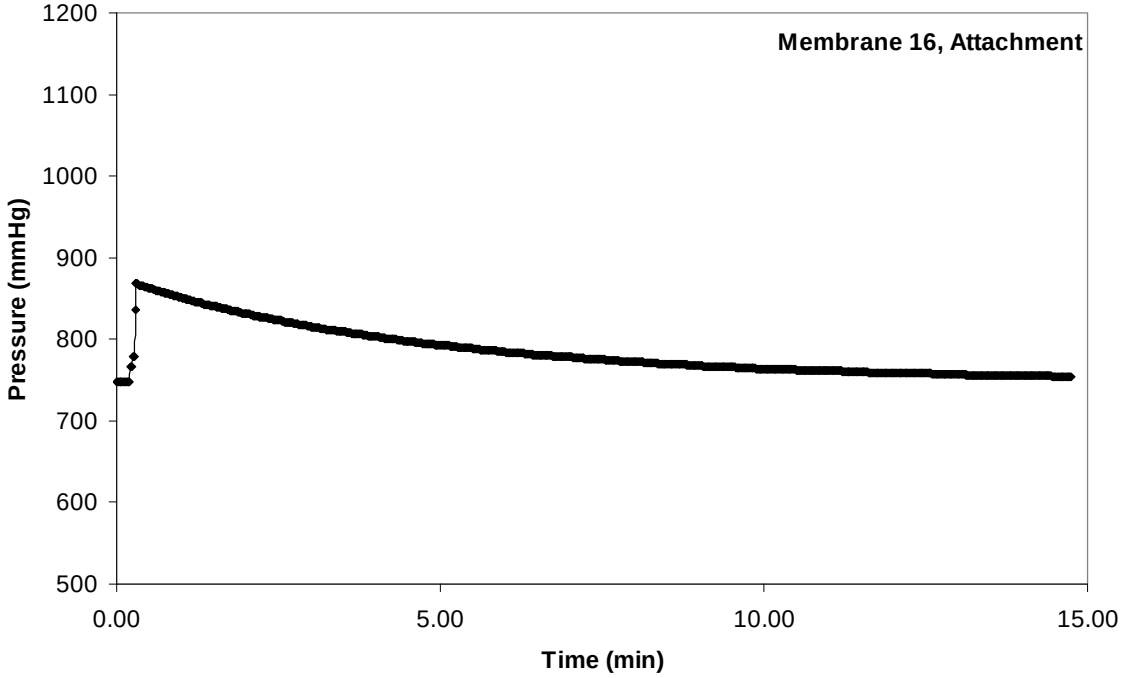

Membrane 13, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

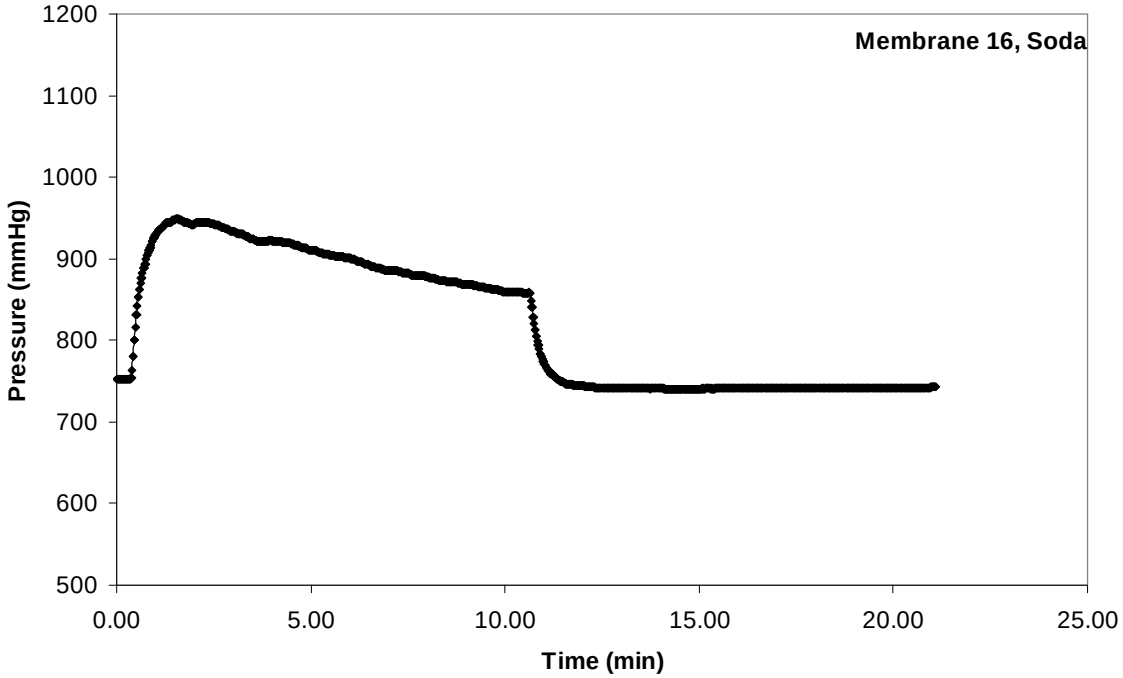

Membrane 14, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

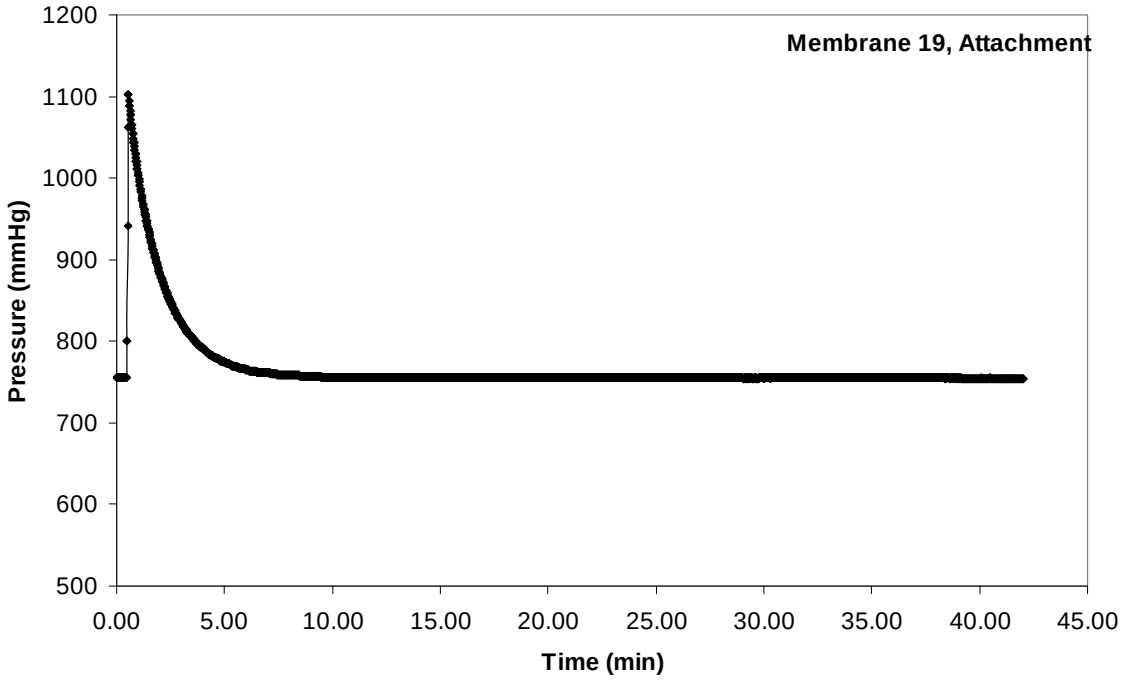

Membrane 14, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

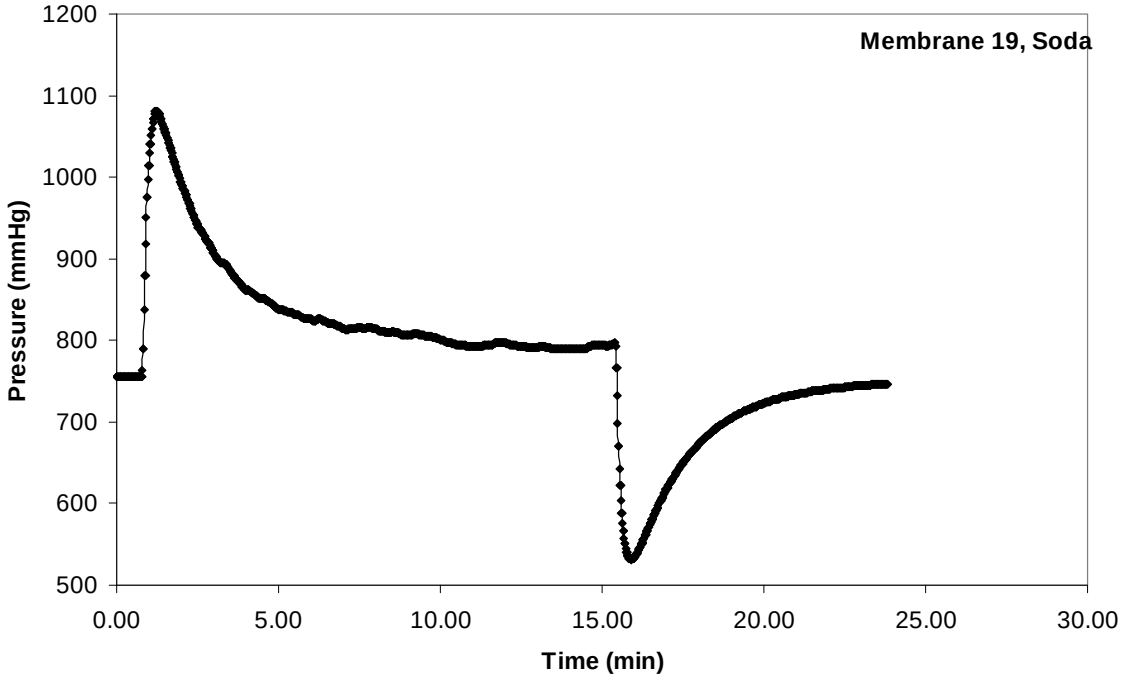

Membrane 15, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Time (min)

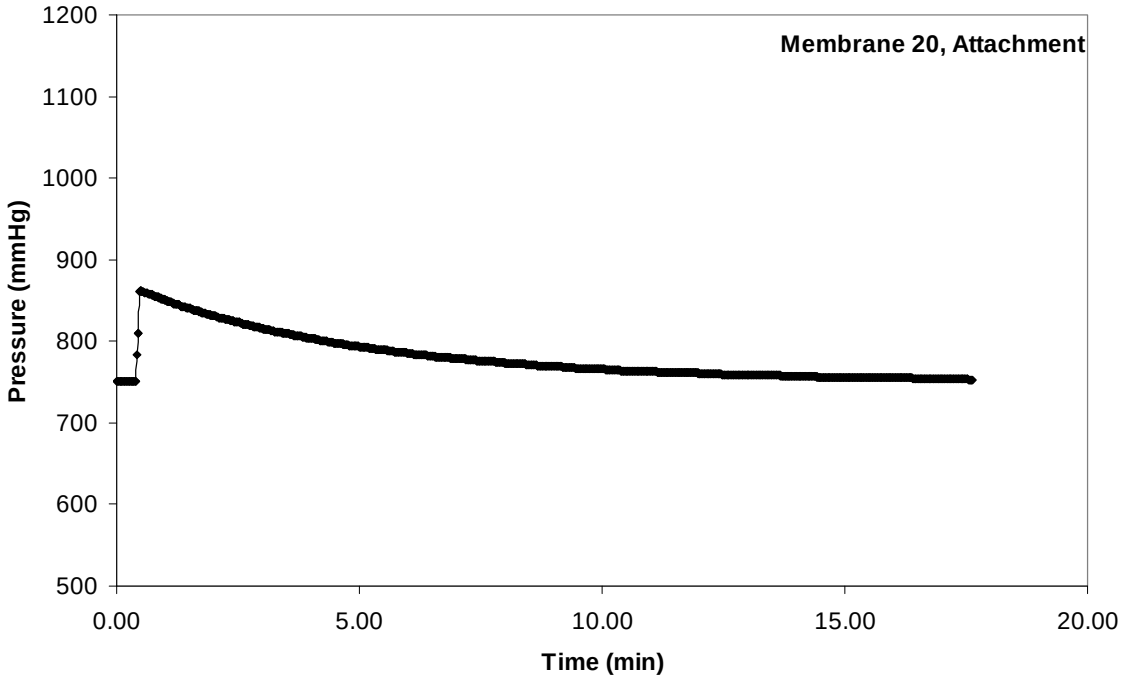

Membrane 15, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

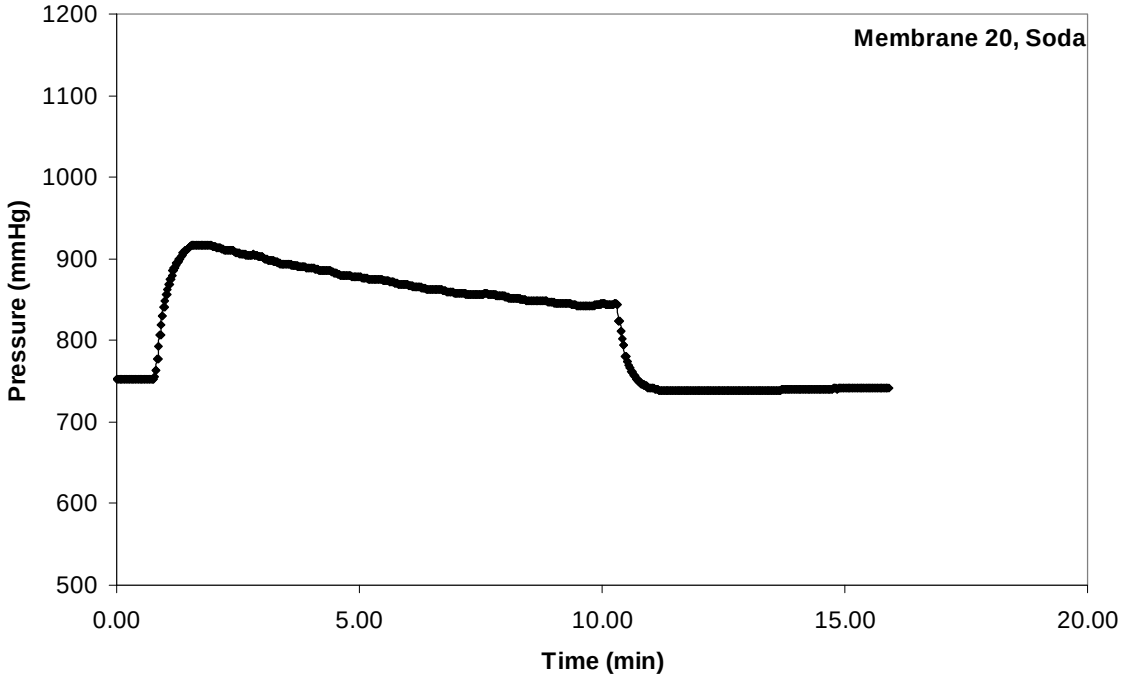

Membrane 16, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

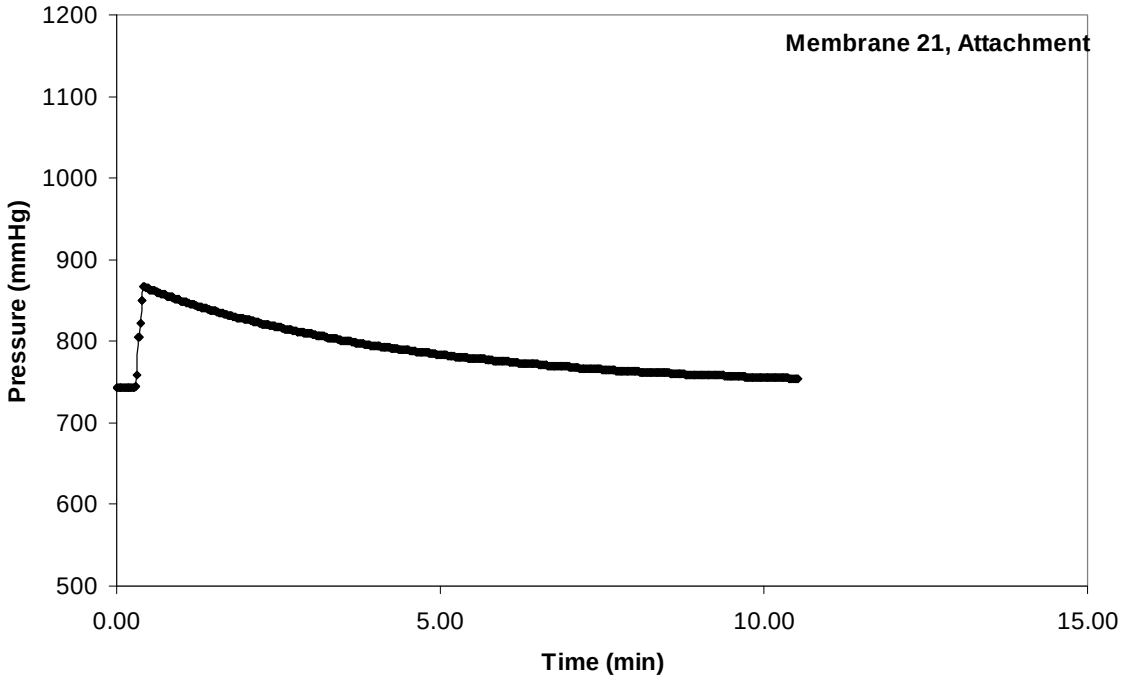

Membrane 16, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
Time (min)

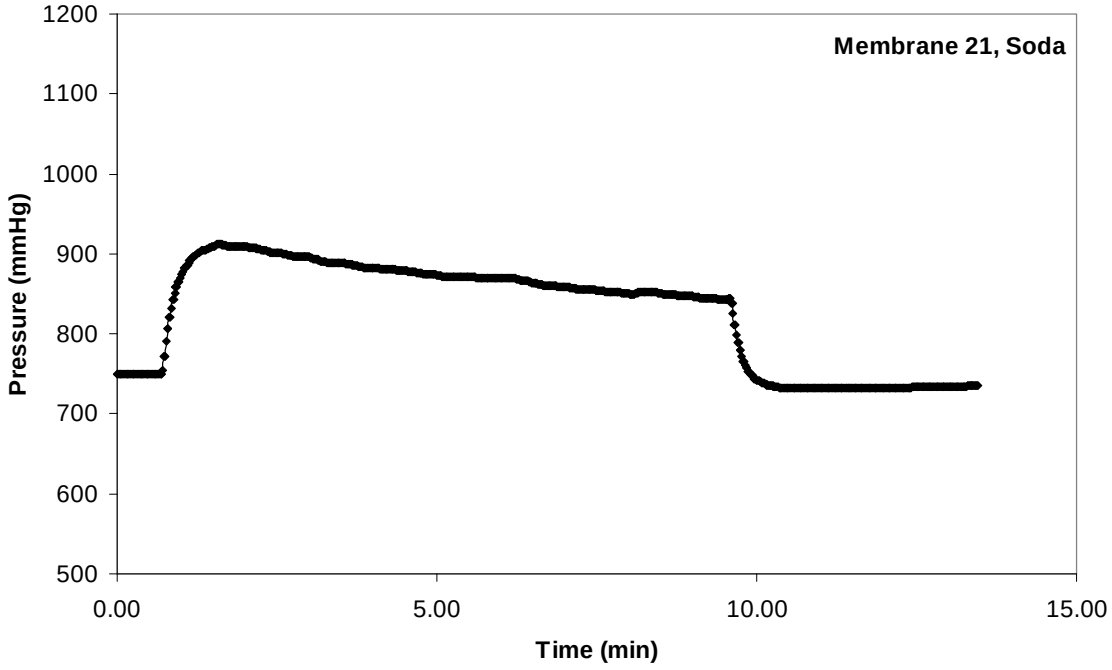

Membrane 19, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Time (min)

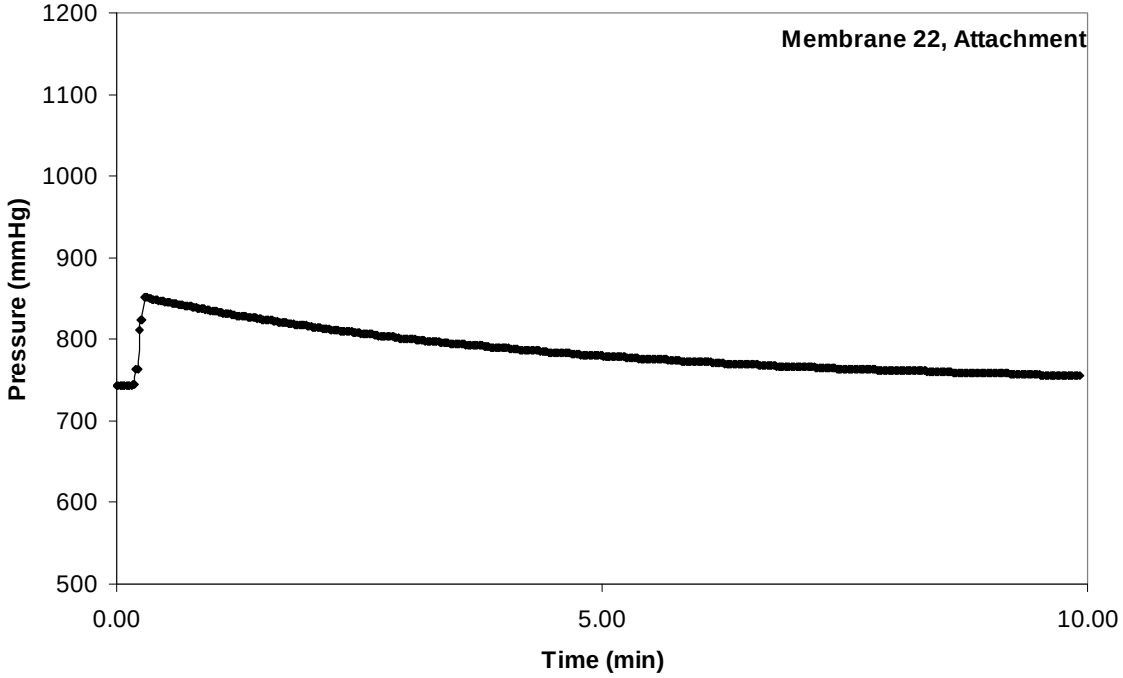

Membrane 19, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Time (min)

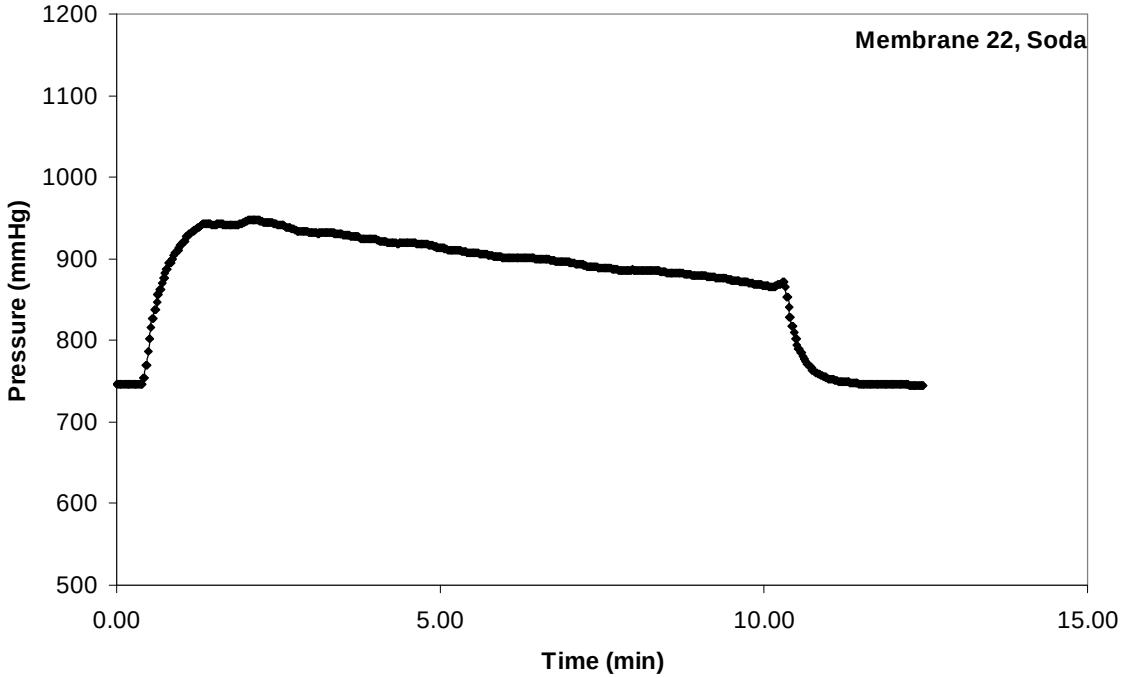

Membrane 20, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

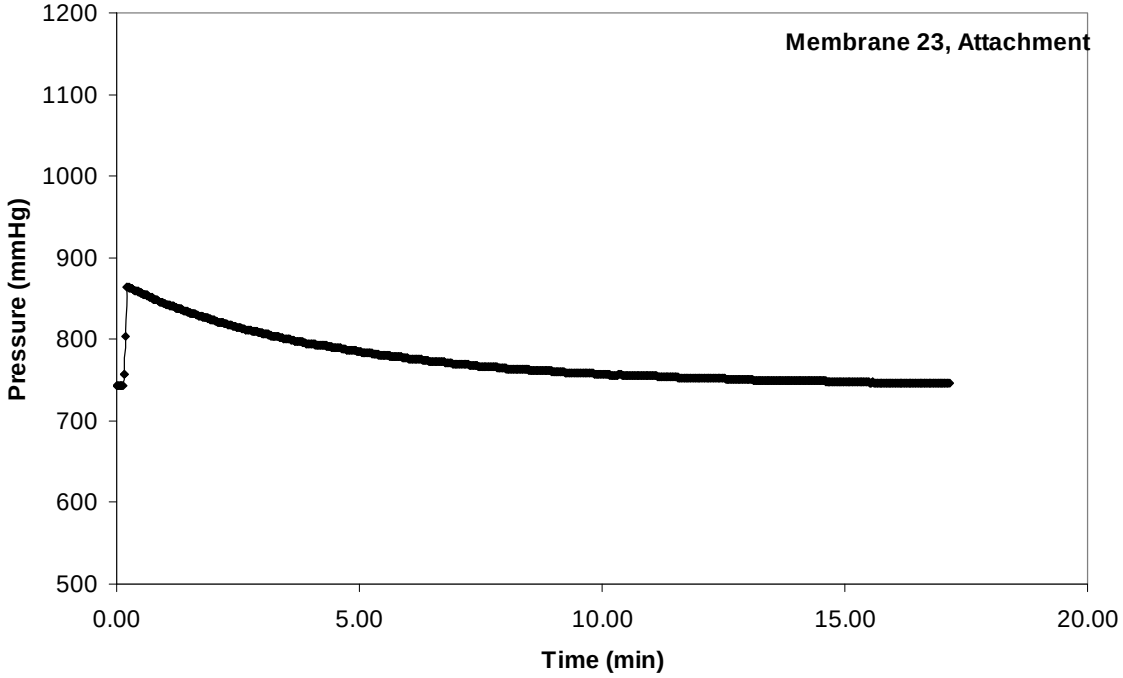

Membrane 20, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

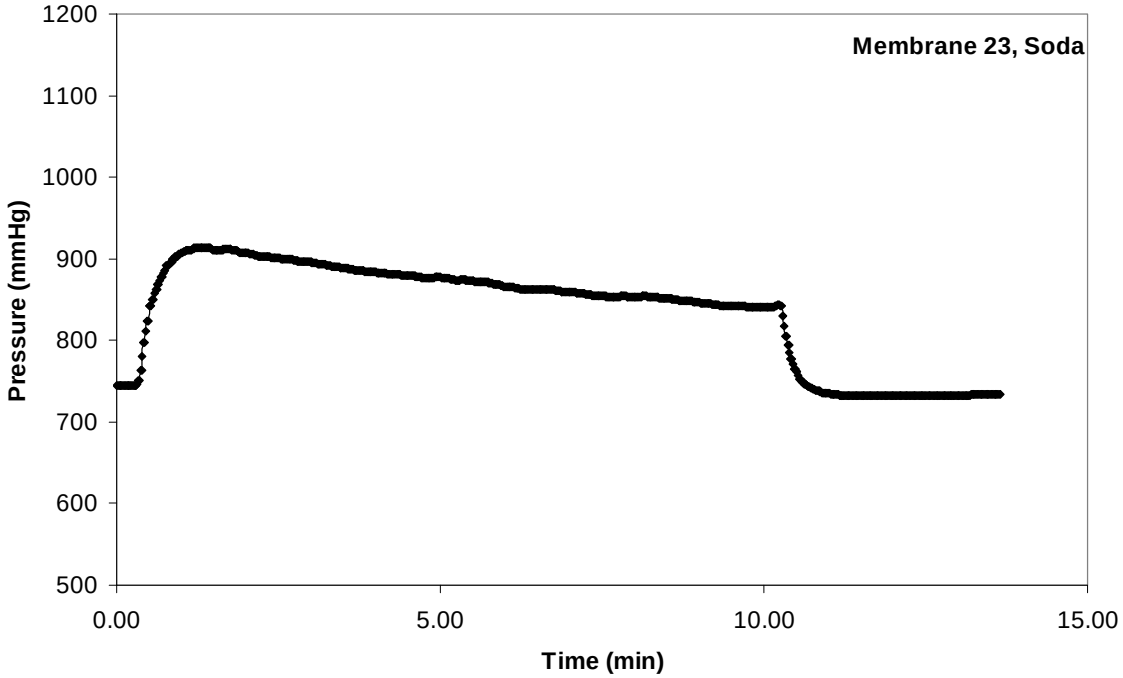

Membrane 21, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

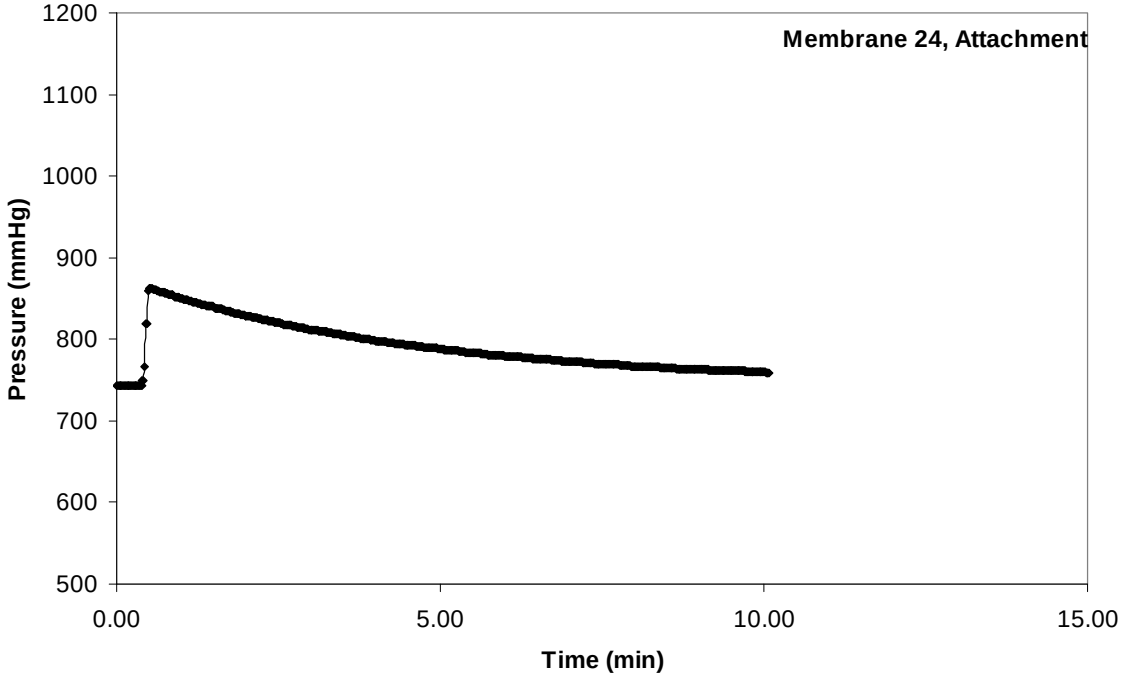

Membrane 21, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

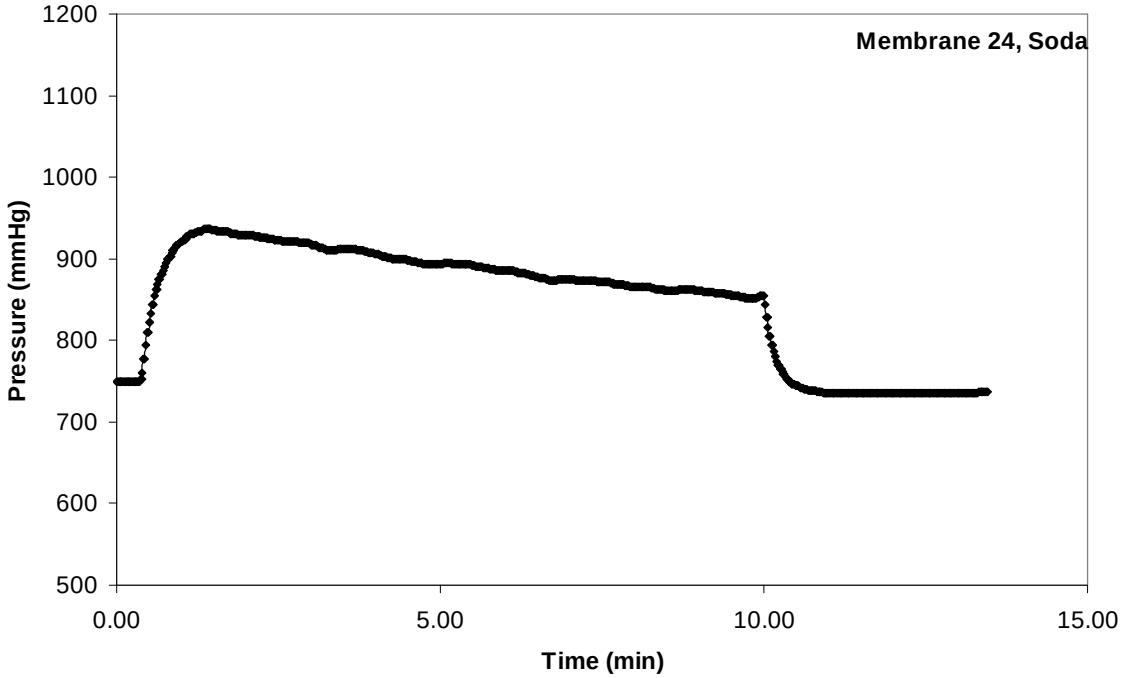

Membrane 22, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
Time (min)

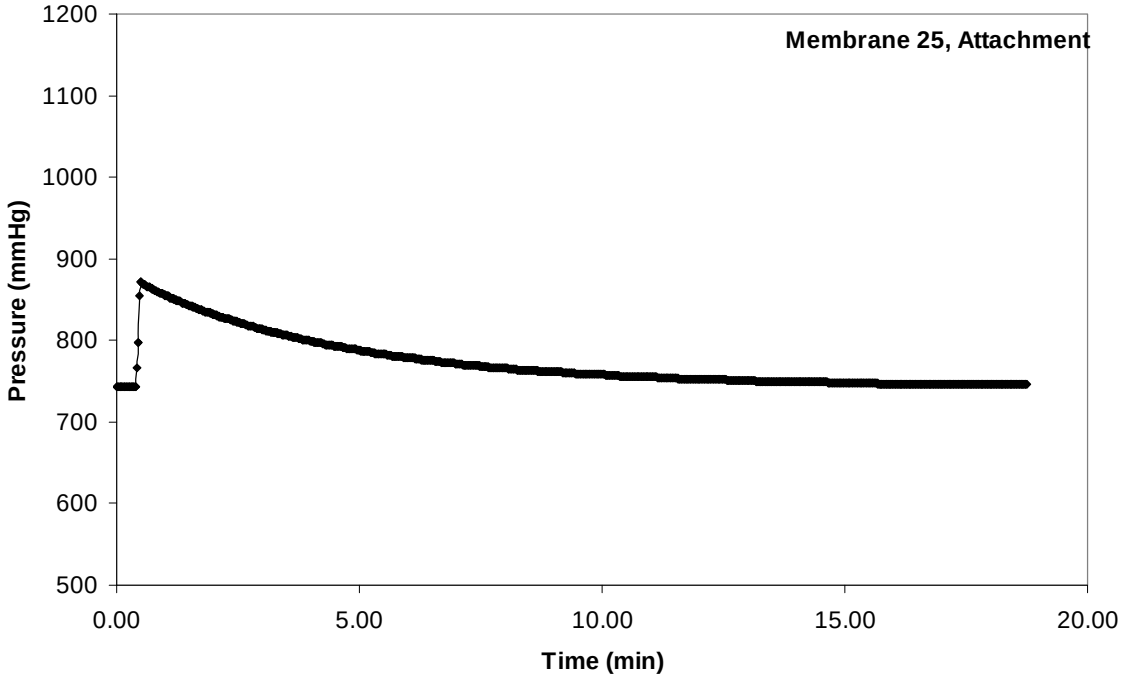

Membrane 22, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)


Membrane 23, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)

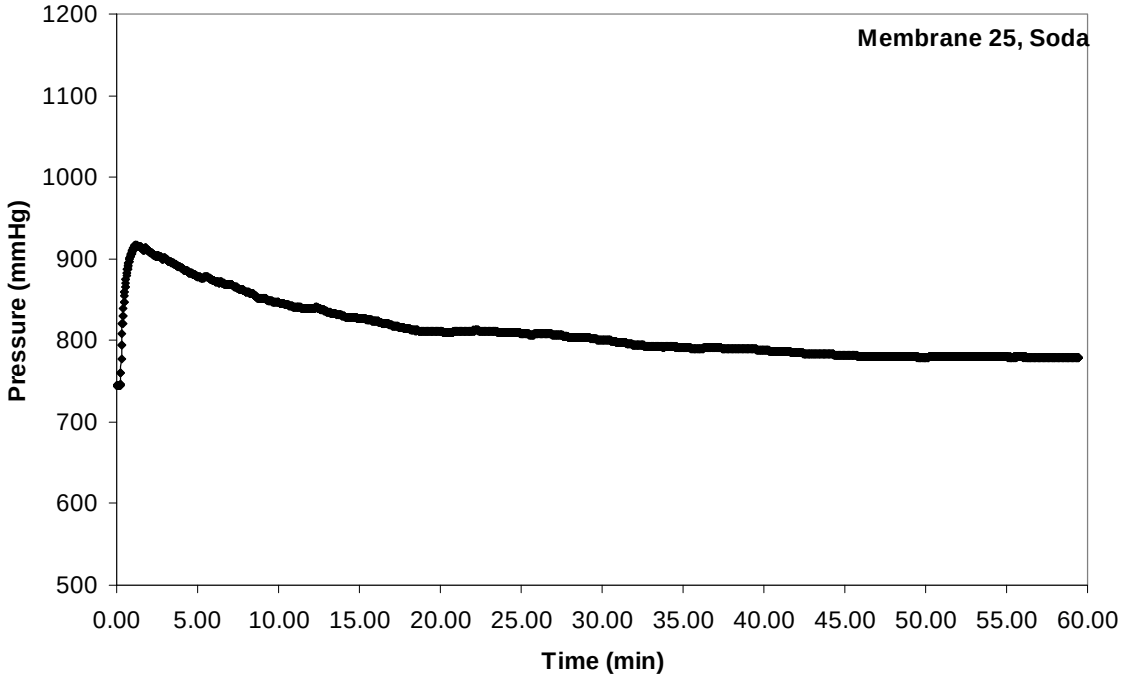

Membrane 23, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

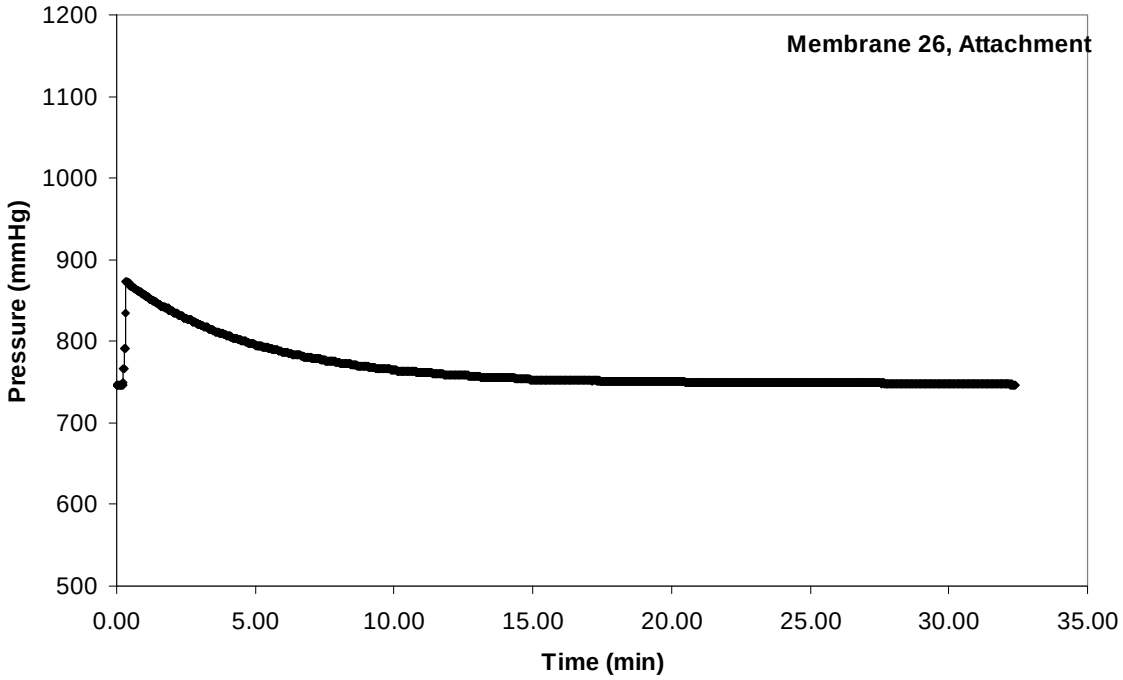

Membrane 24, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

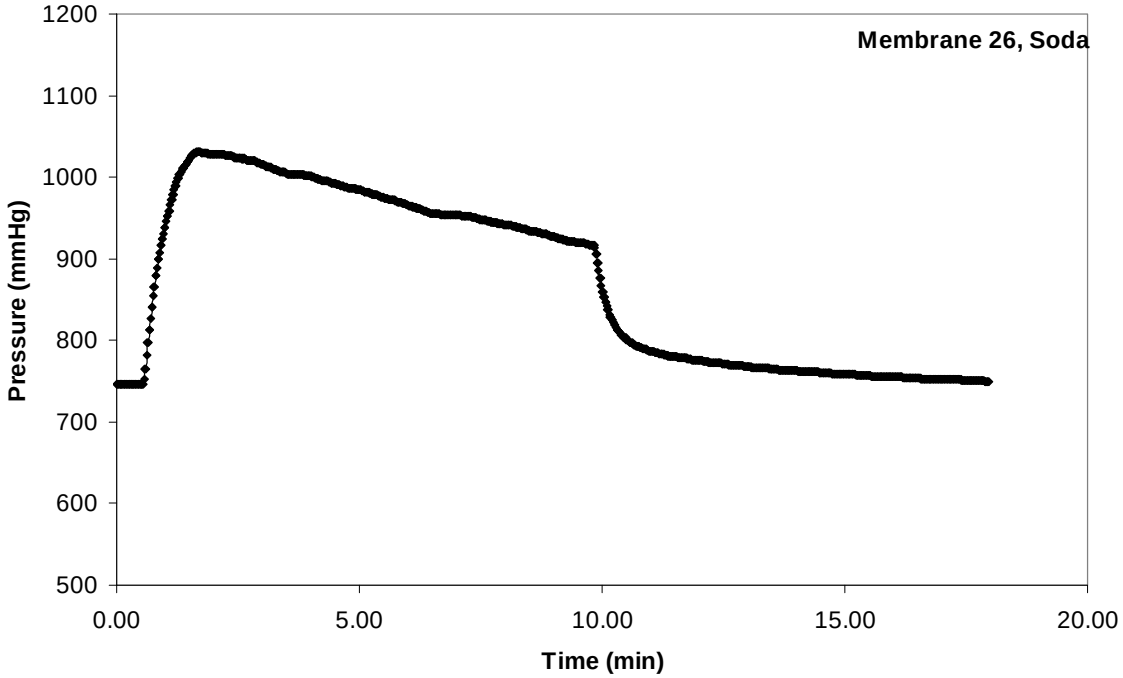


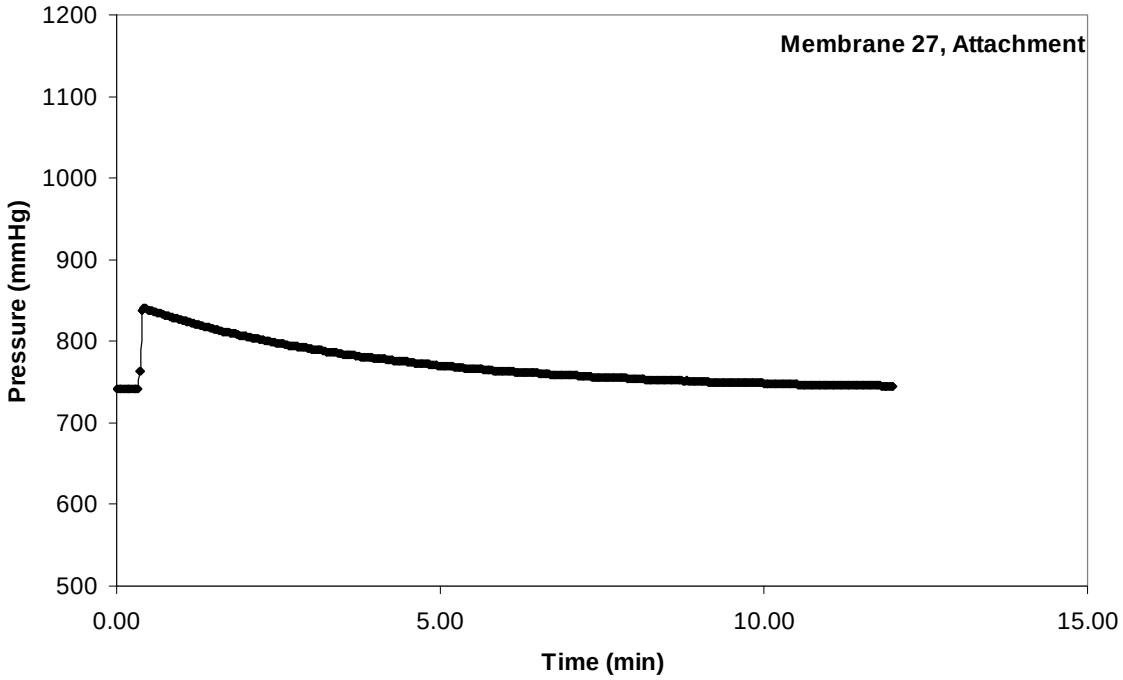


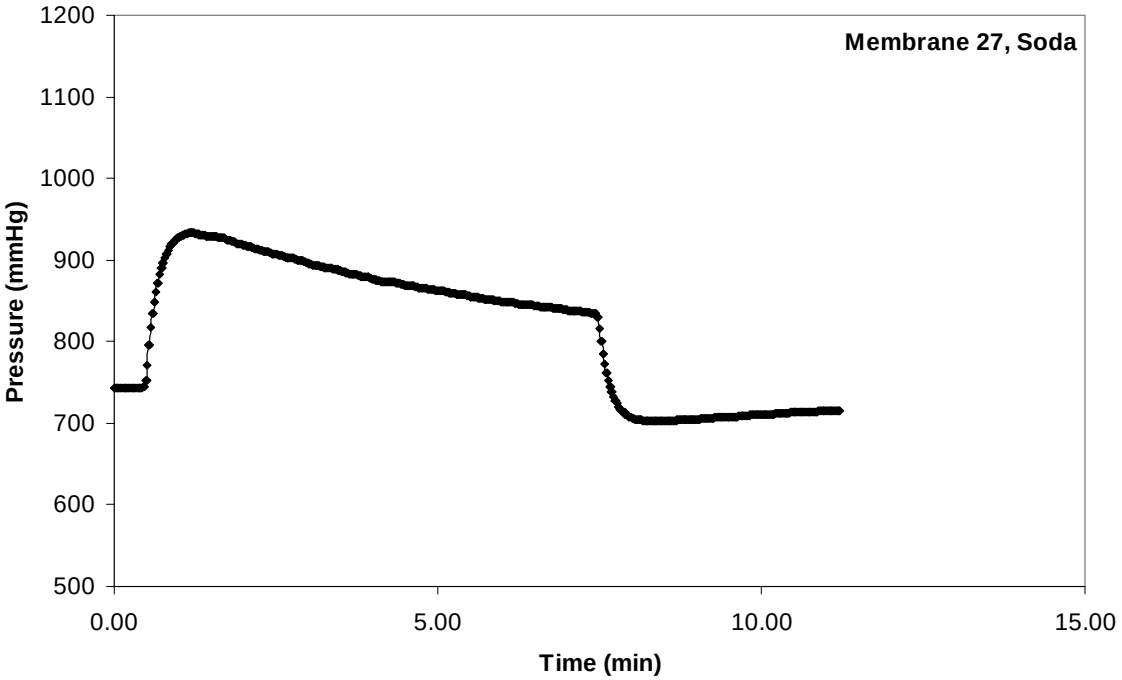
For membrane 25, soda test, the sensor was not removed after 10 minutes, so it dropped to atmospheric pressure on its own. There is no sudden drop in pressure at the ten minute mark.

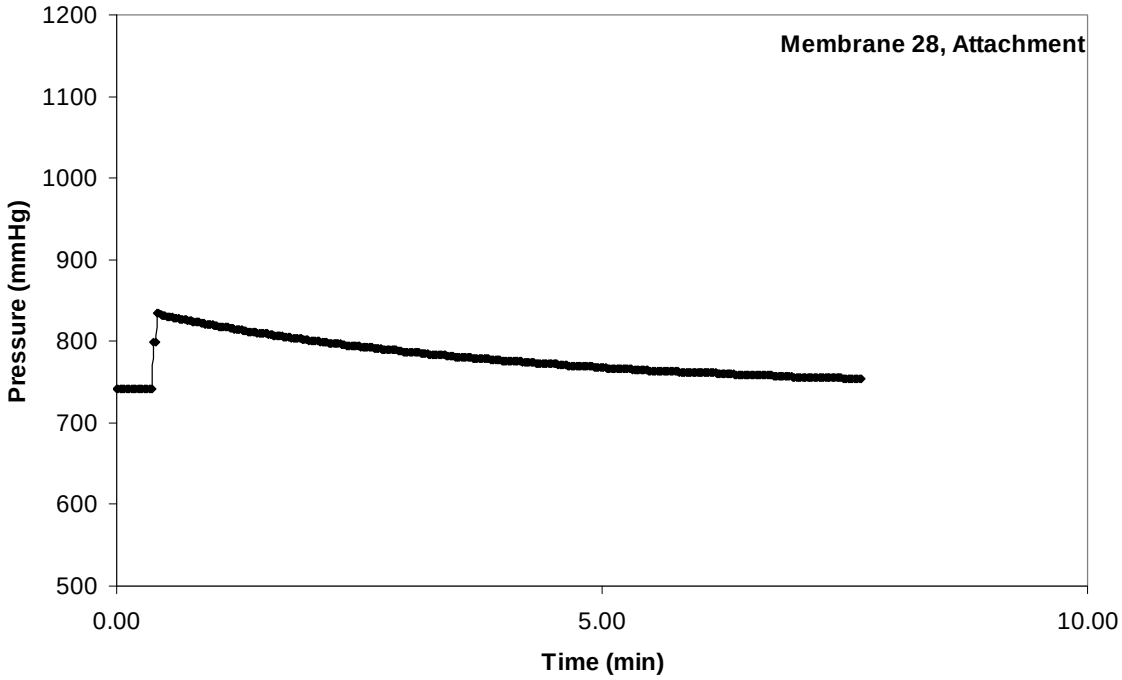

Membrane 25, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
55.00
60.00
Time (min)

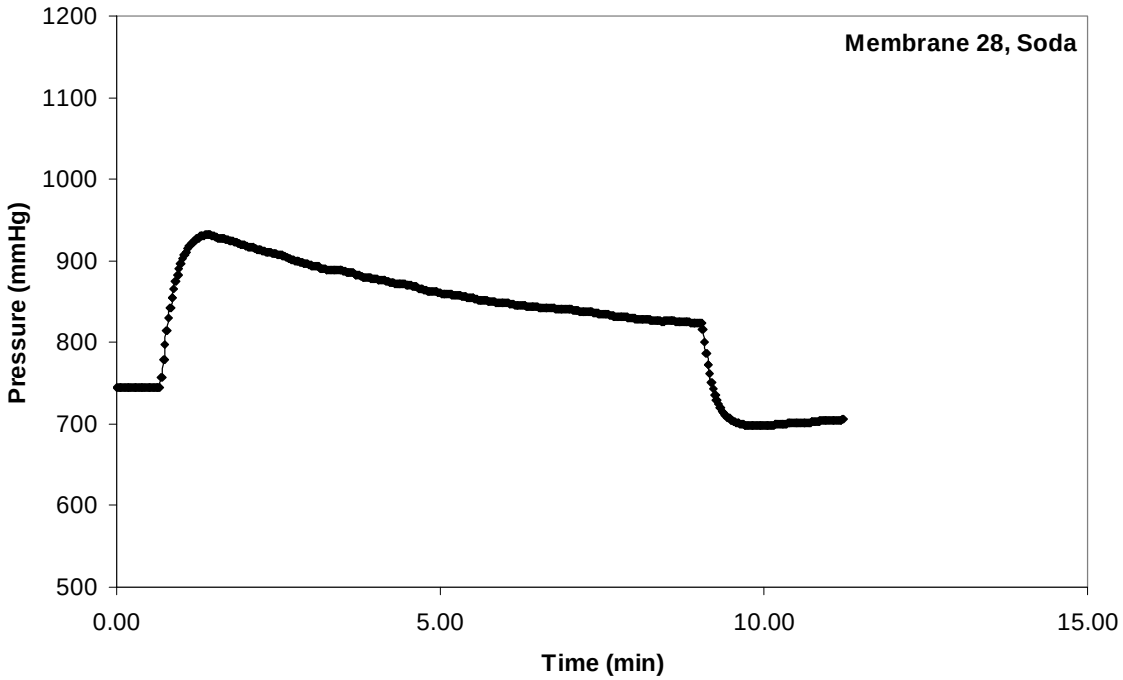

Membrane 26, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Time (min)


Membrane 26, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
20.00
Time (min)


Membrane 27, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

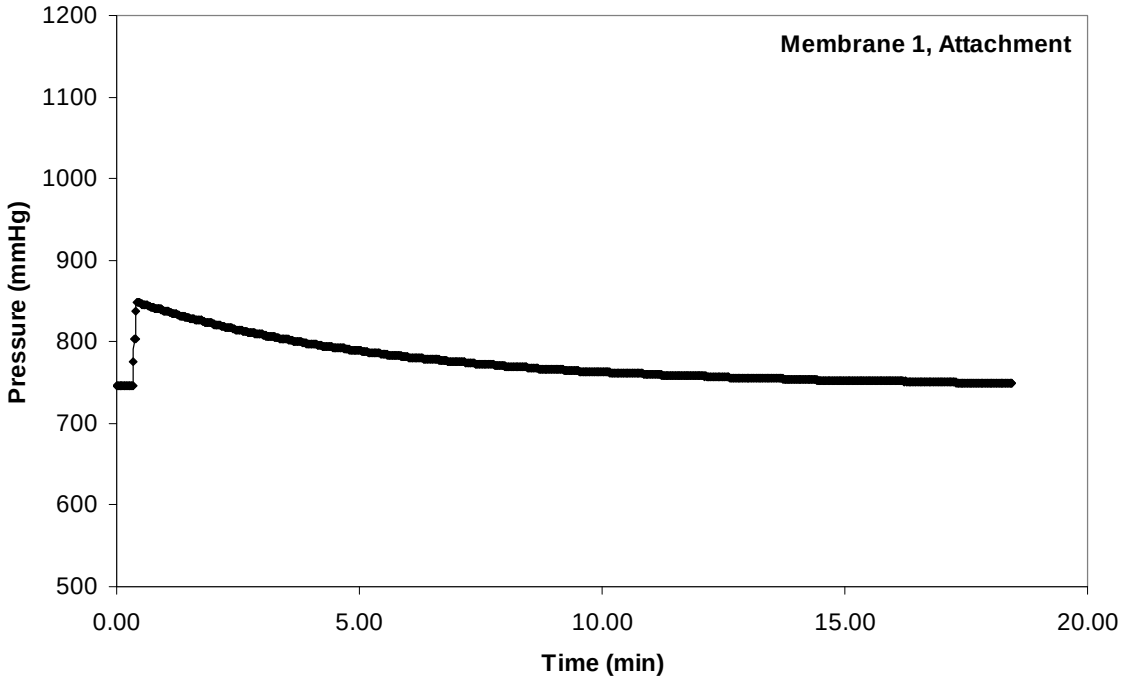

Membrane 27, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)


Membrane 28, Attachment
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
Time (min)

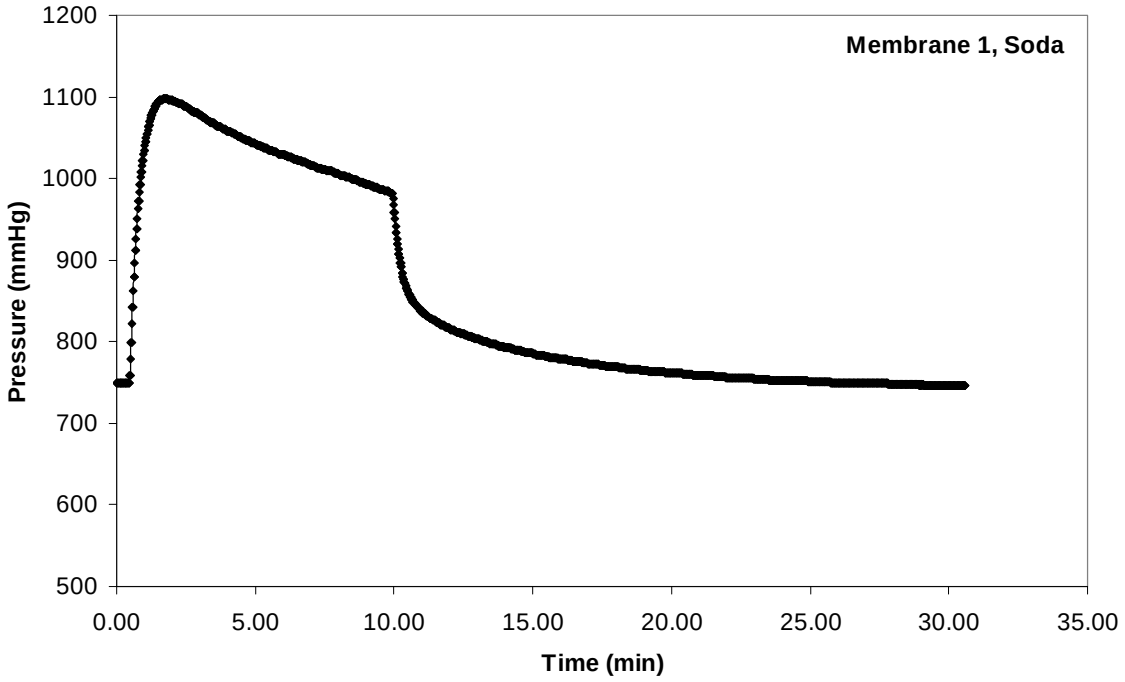

Membrane 28, Soda
Pressure (mmHg)
1200
1100
1000
900
800
700
600
500
0.00
5.00
10.00
15.00
Time (min)

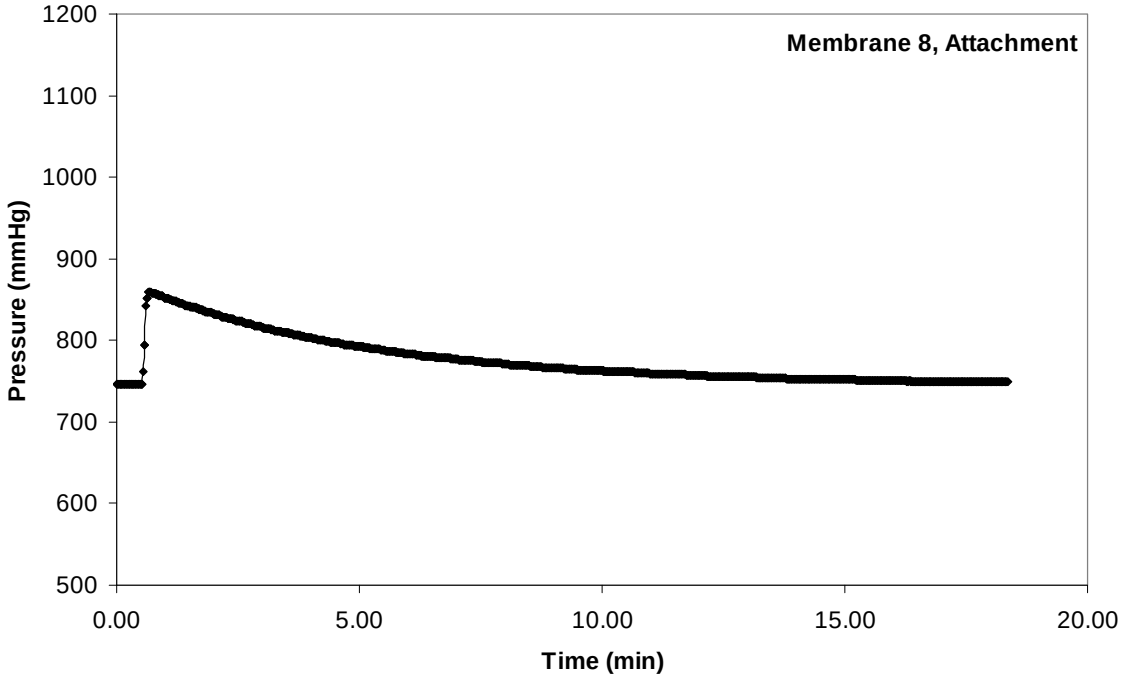
.

Post-Deployment 1

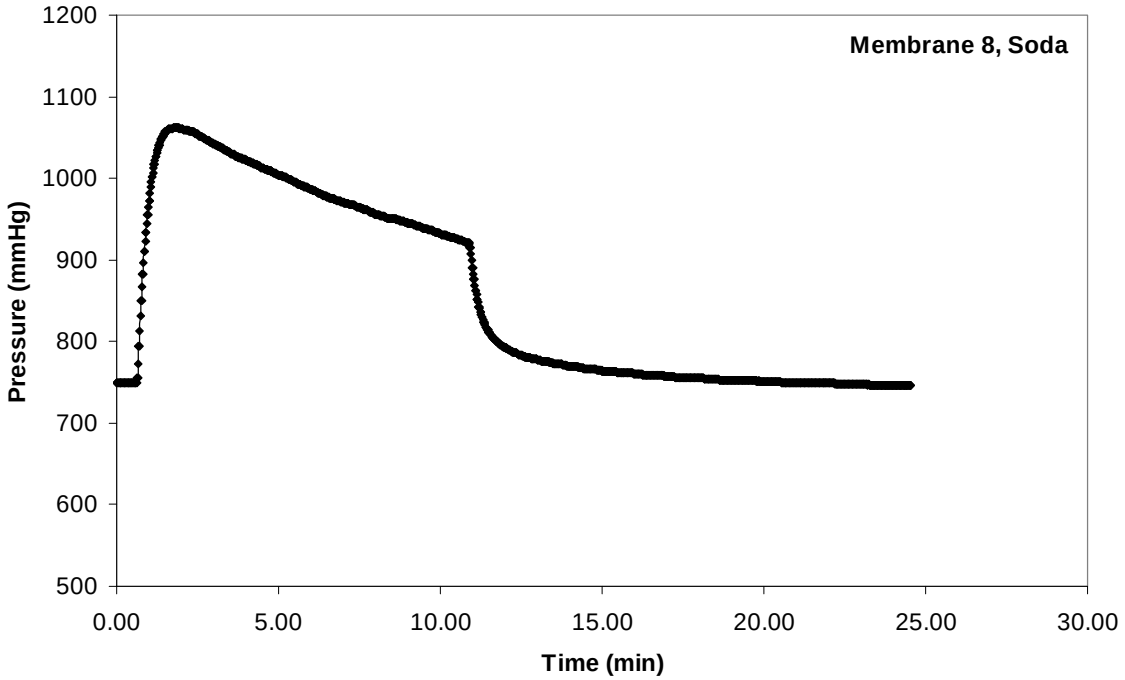


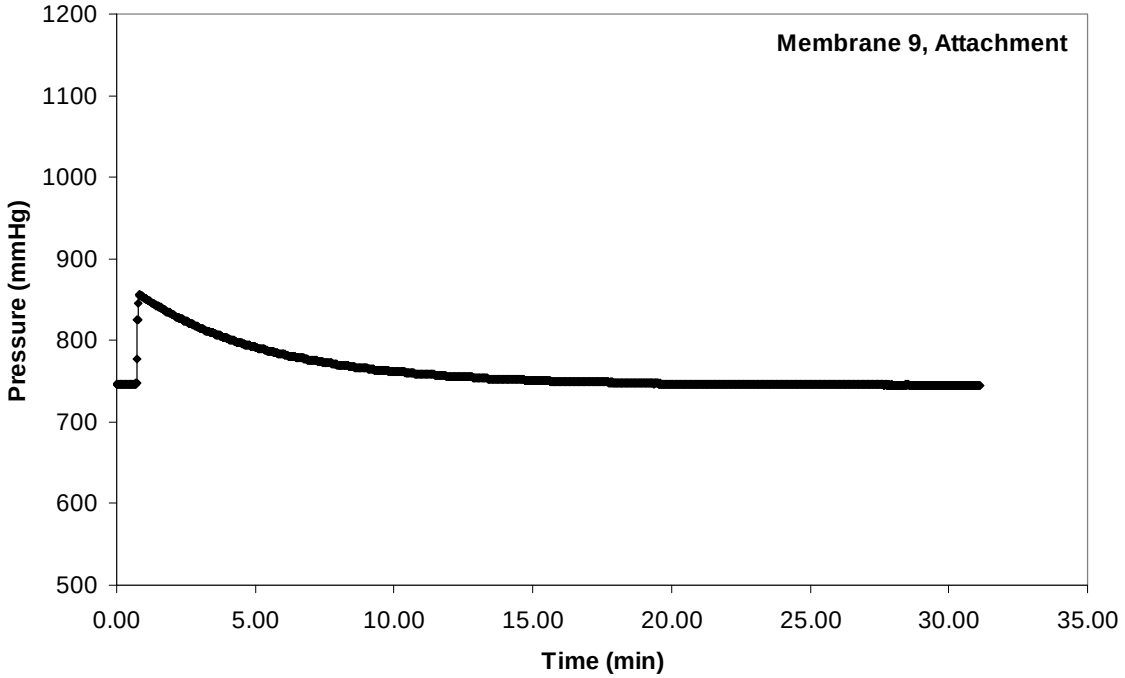
Membrane 1 was used at Multnomah Falls 3 hyporheic from 2/28/2007 to 3/21/2007 with MiniSonde 43656.



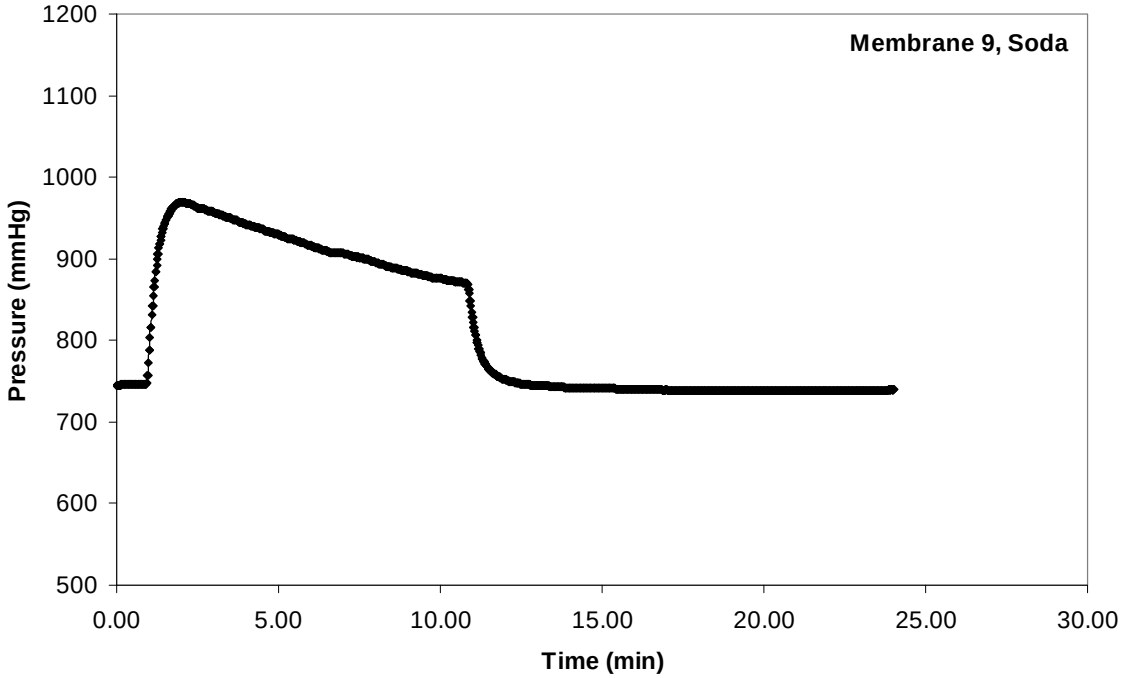


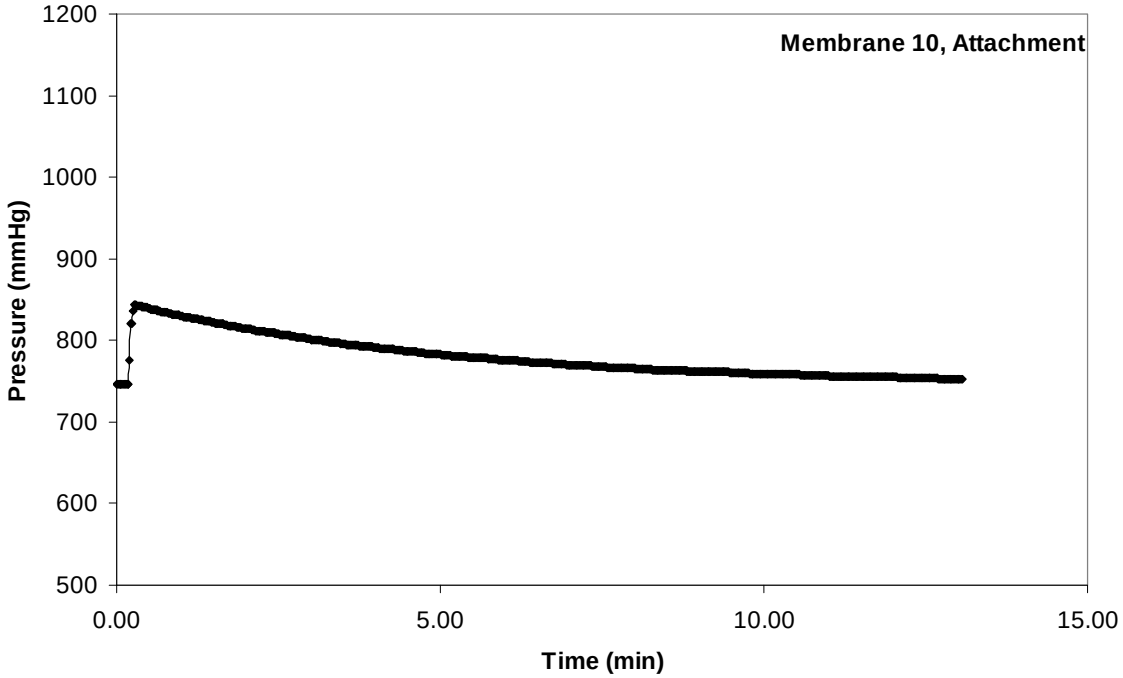
Membrane 8 was used at Multnomah Falls 1 hyporheic from 2/28/2007 to 3/11/2007 with MiniSonde 44947.



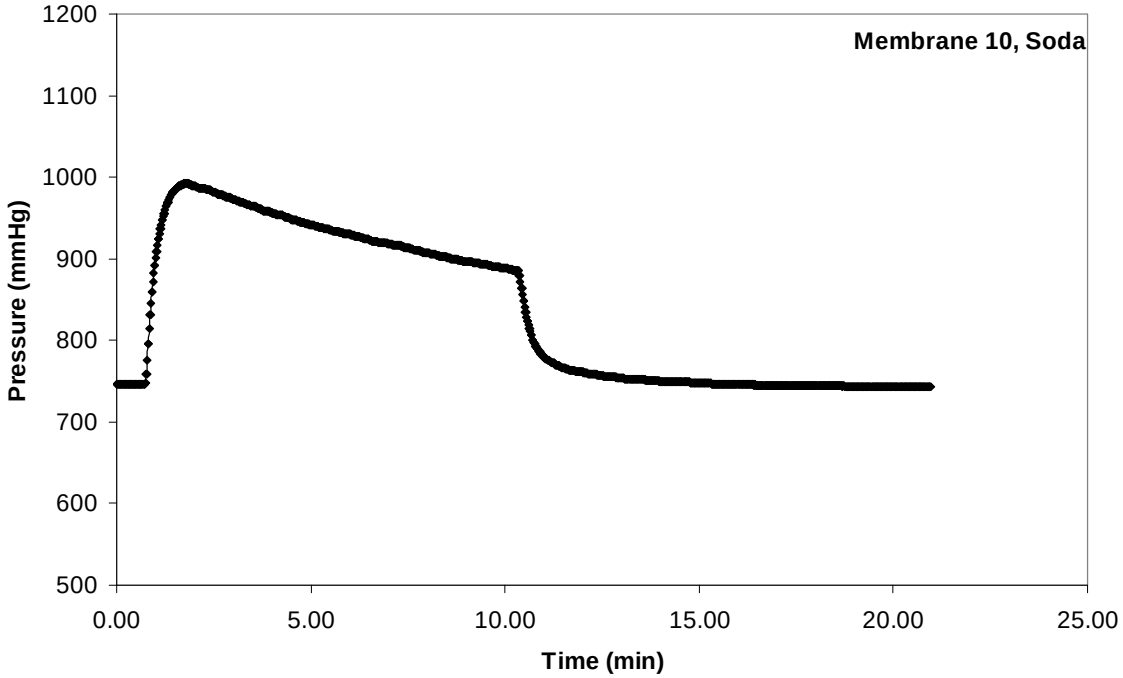


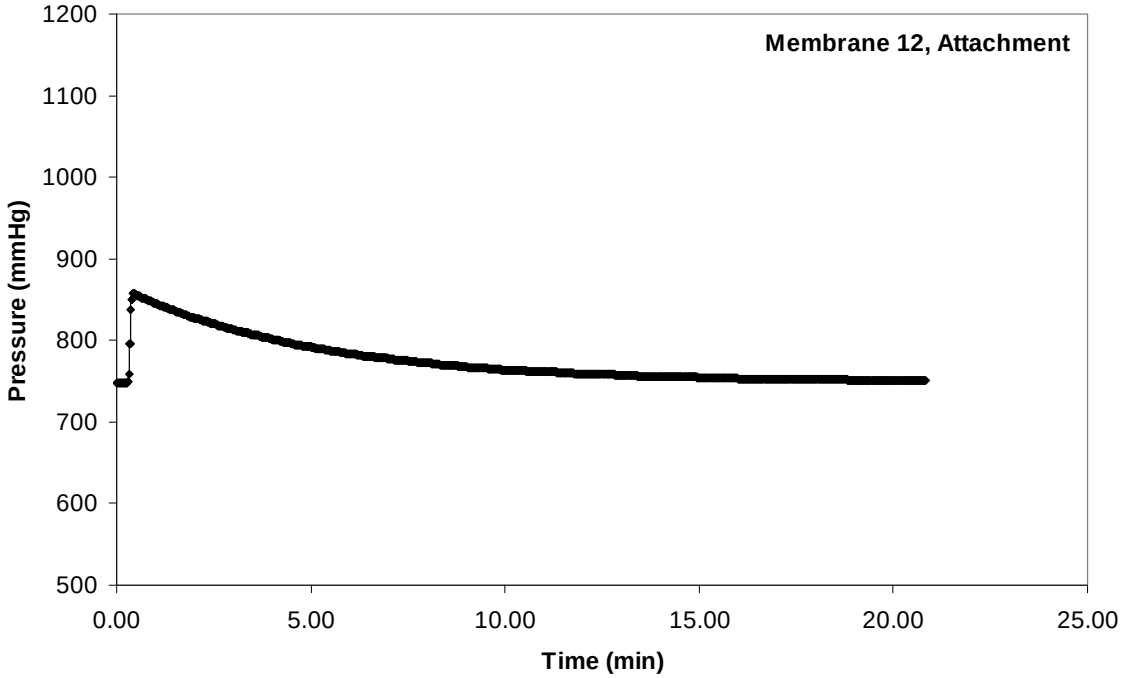
Membrane 9 was used at Multnomah Falls 3 river from 2/28/2007 to 3/18/2007 with MiniSonde 44948.



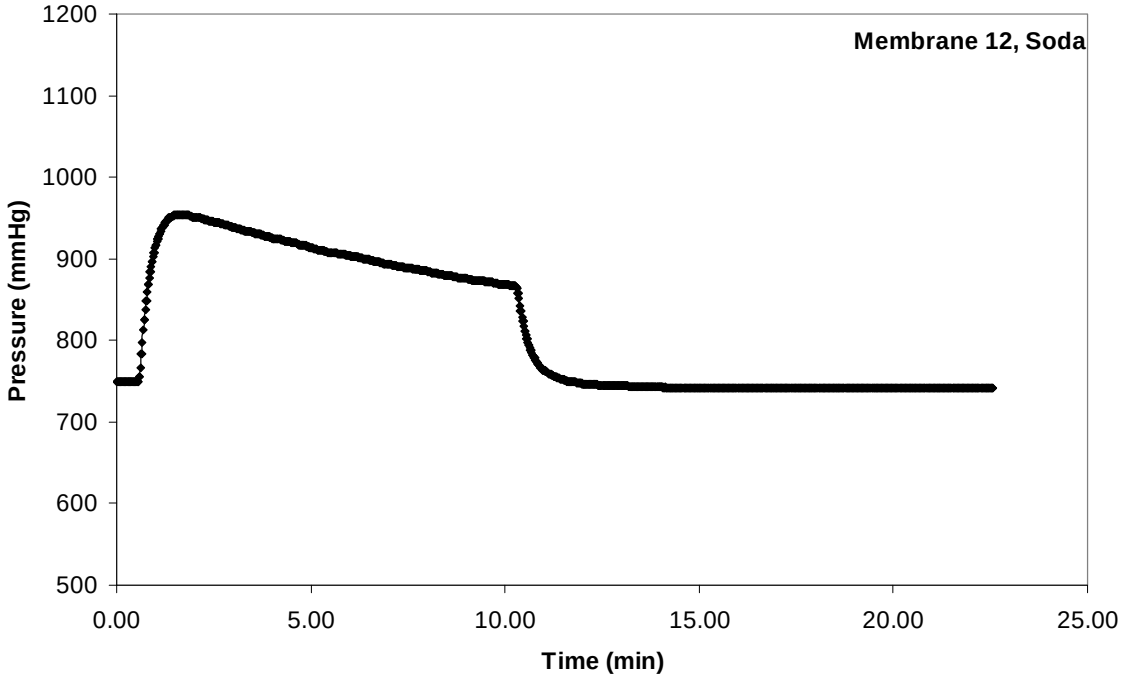


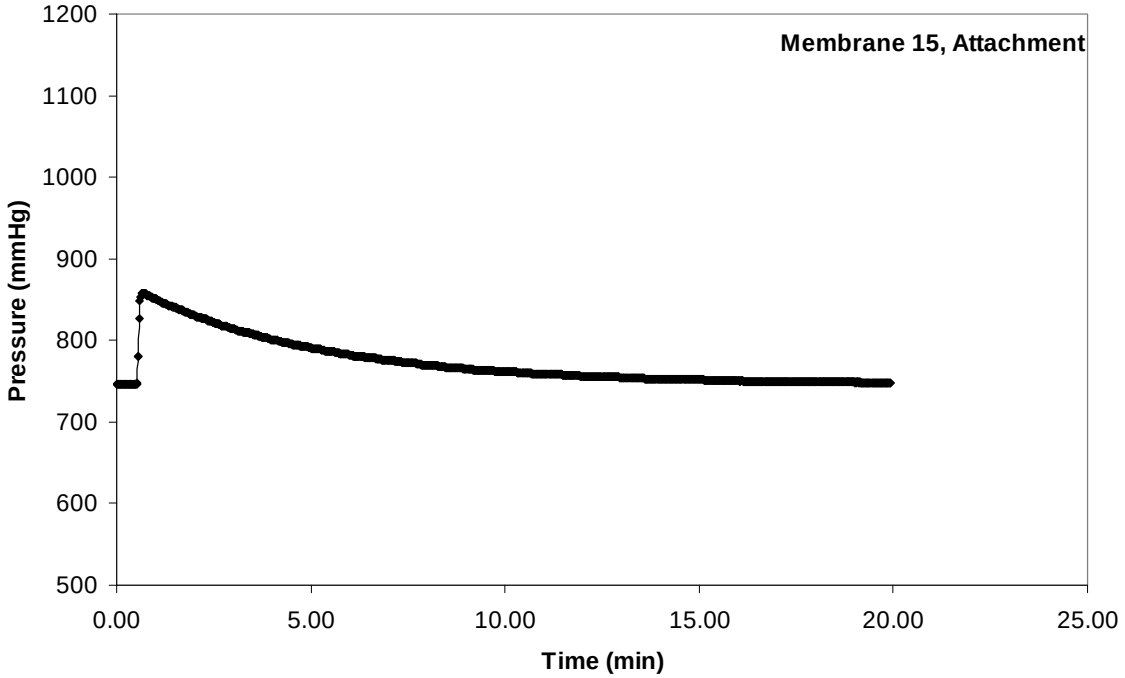
Membrane 10 was used at Ives 1 hyporheic from 2/28/2007 to 3/9/2007 with MiniSonde 43639.



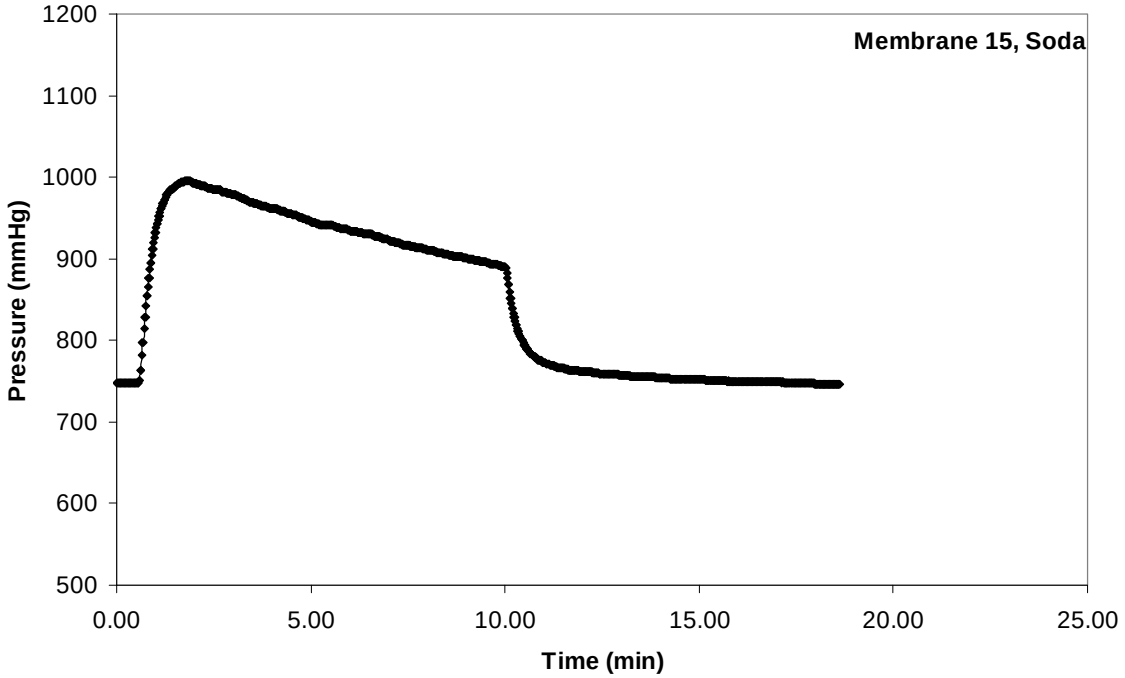


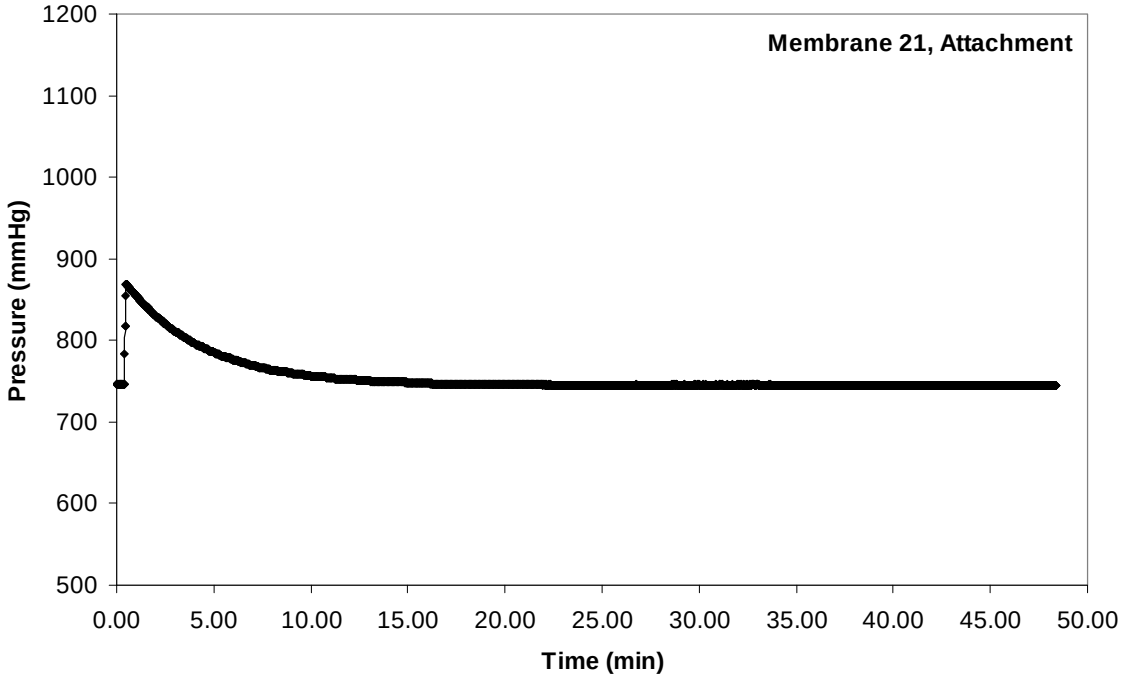
Membrane 12 was used at Ives 5 river from 2/28/2007 to 3/20/2007 with MiniSonde 44945.



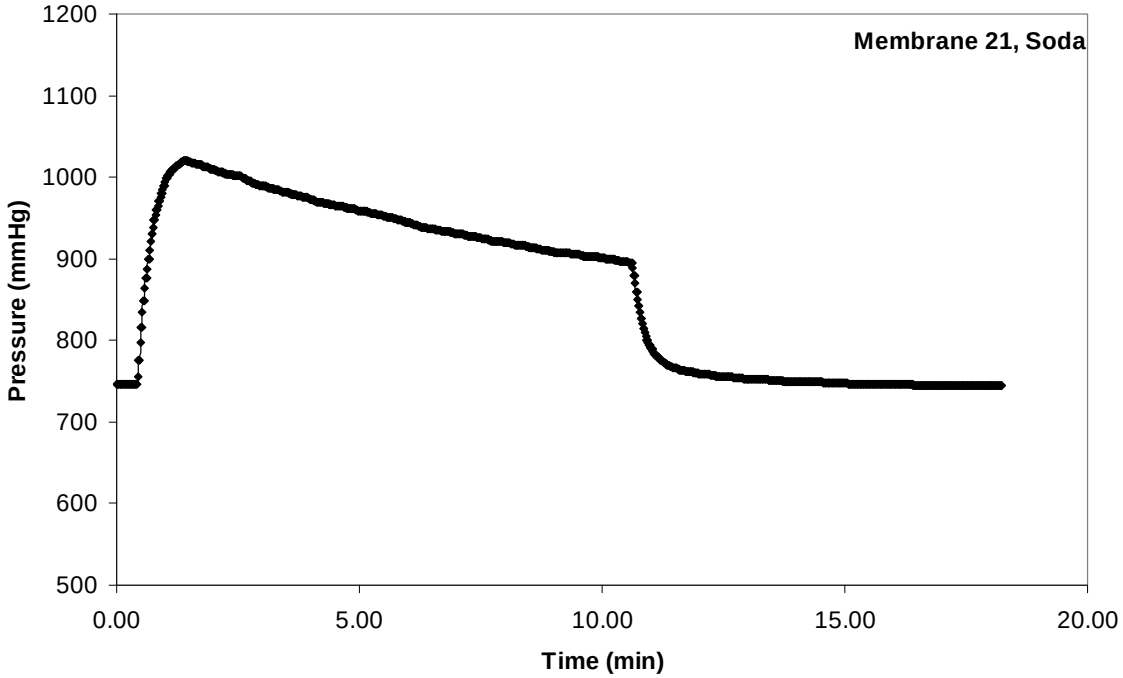


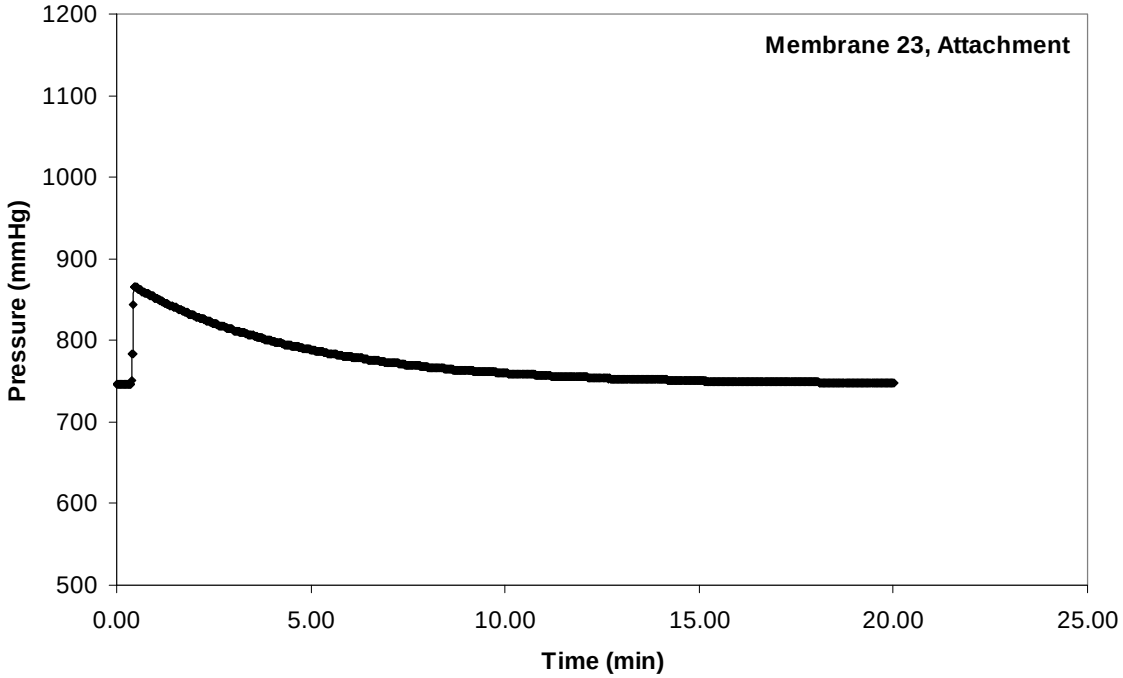
Membrane 15 was used at Multnomah Falls 1 river from 2/28/2007 to 3/19/2007 with MiniSonde 43659.



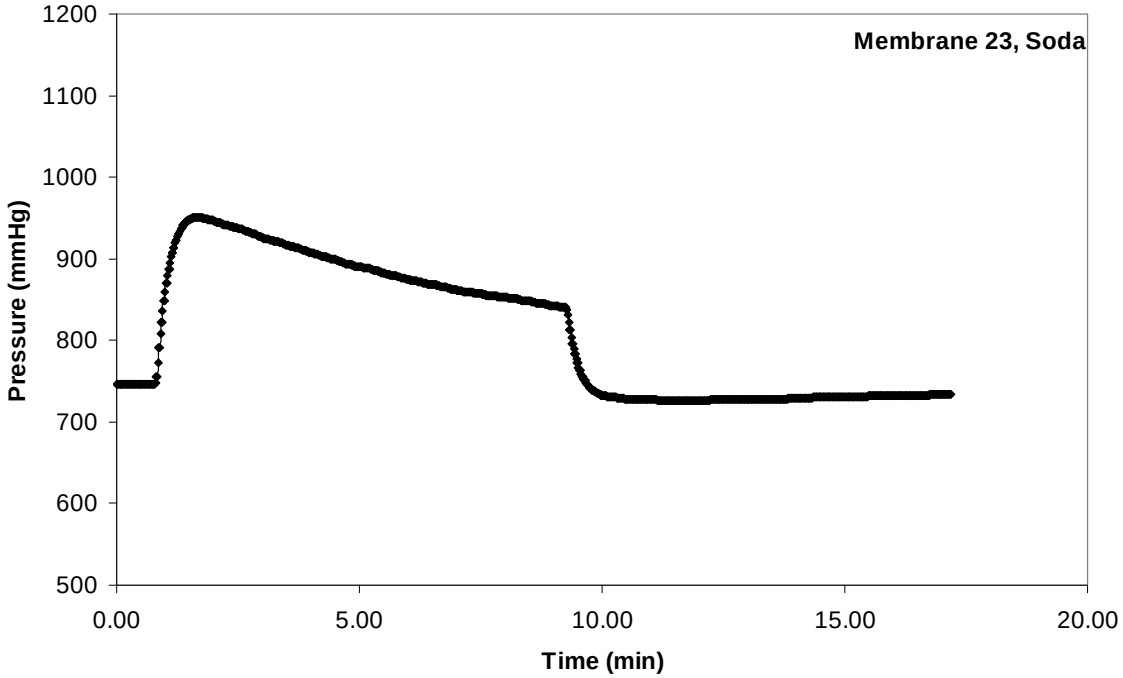


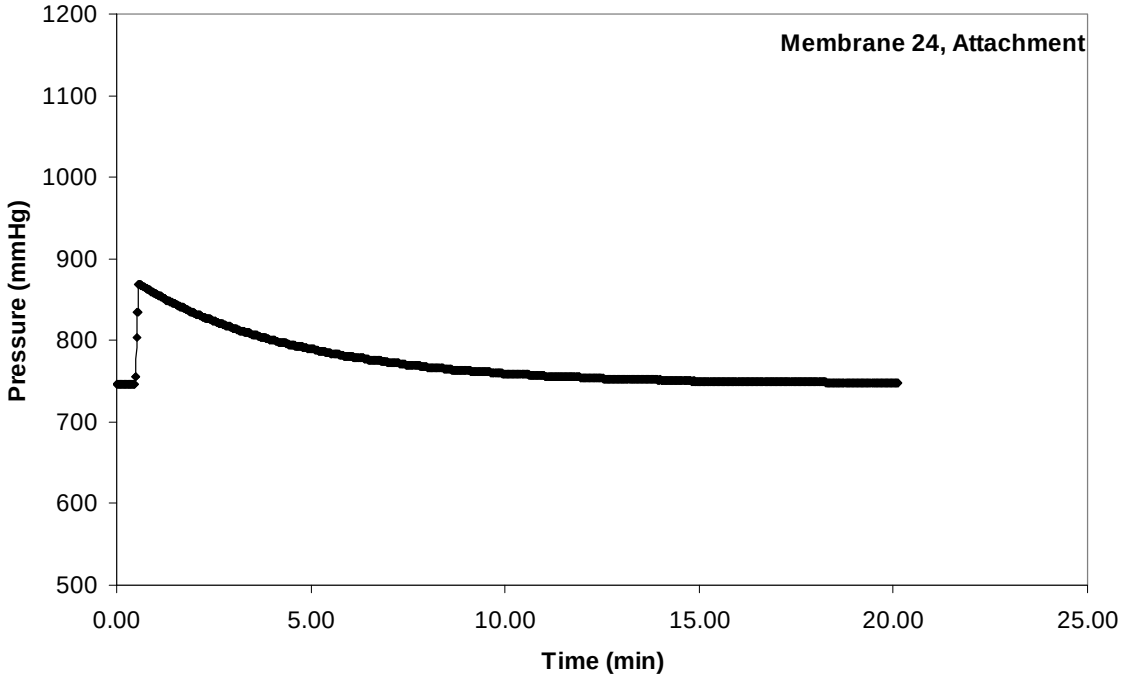
Membrane 21 was used at Ives 5 hyporheic from 2/28/2007 to 3/22/2007 with MiniSonde 43654.



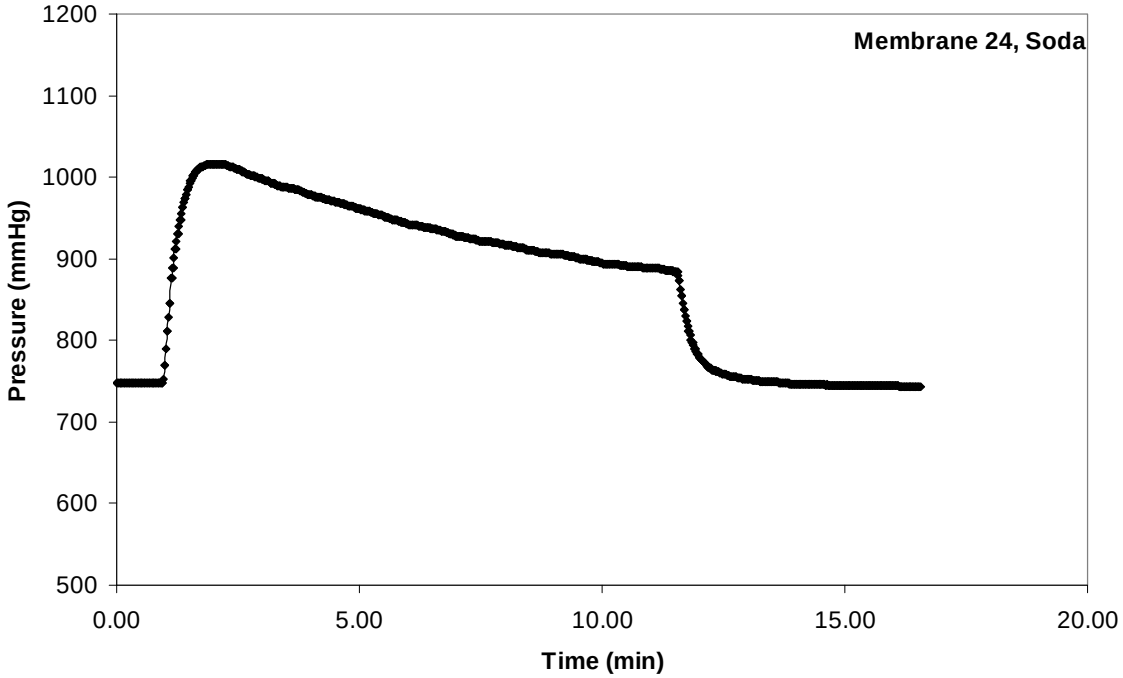


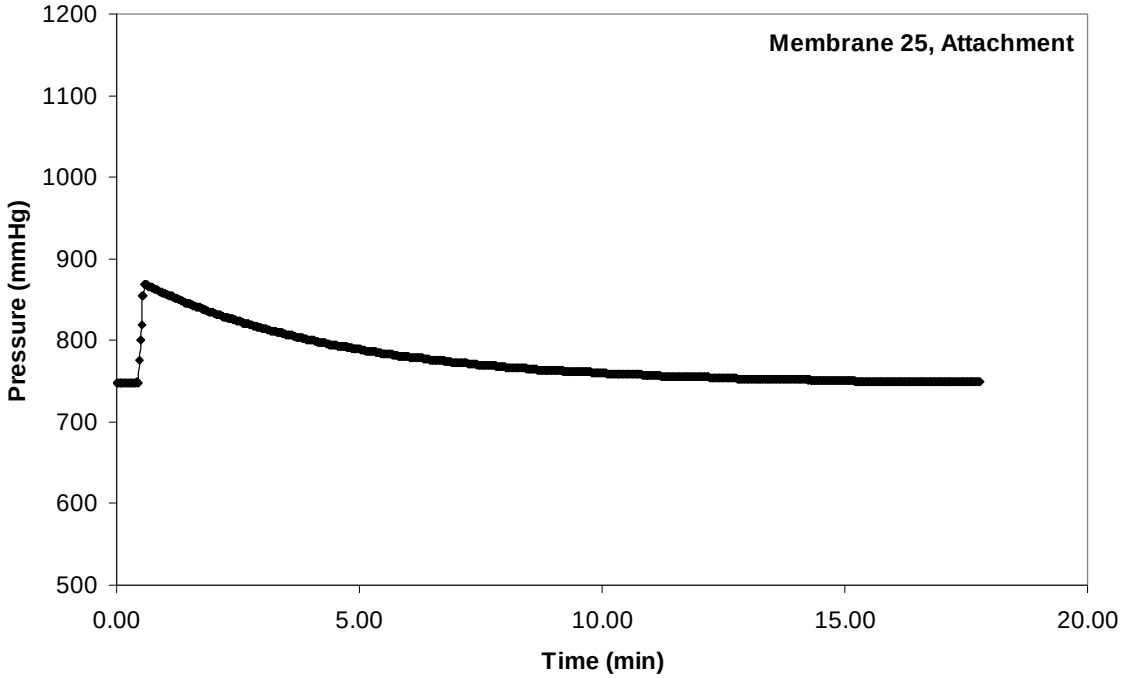
Membrane 23 was used at Ives 4 river from 2/28/2007 to 3/19/2007 with MiniSonde 44927.



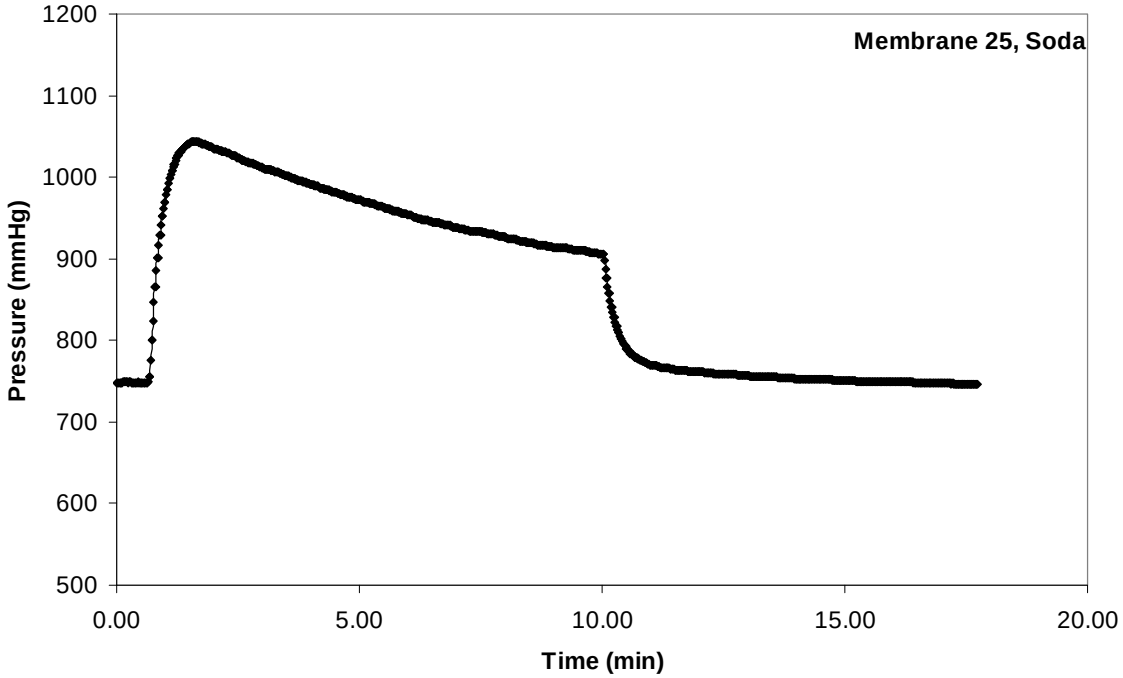


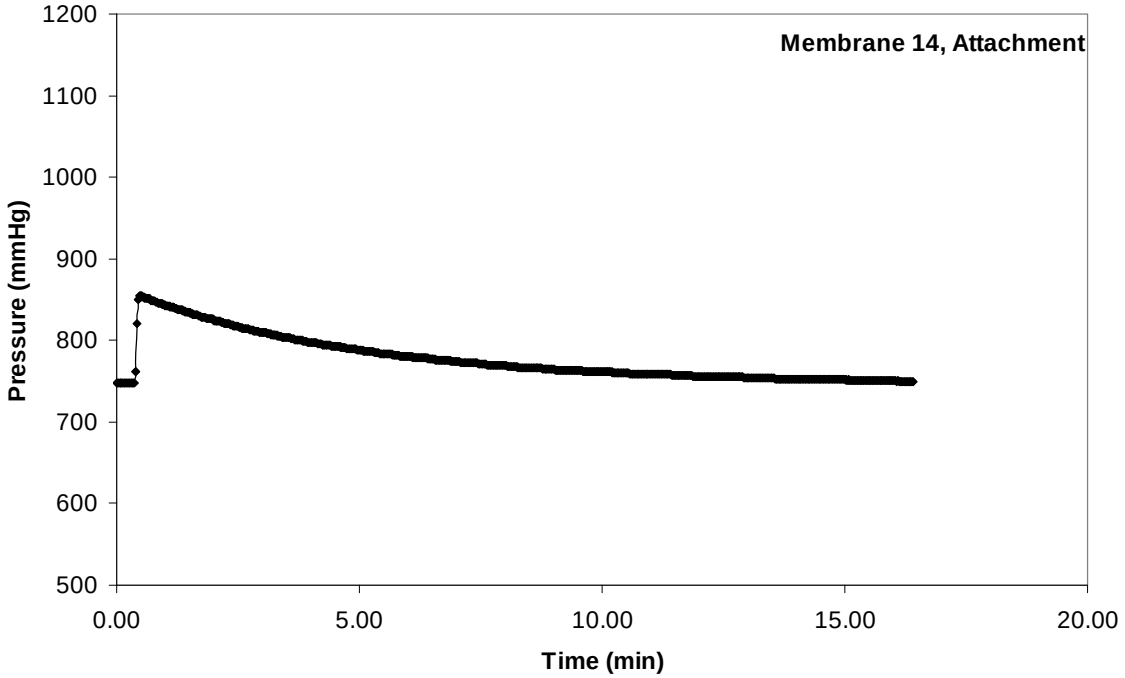
Membrane 24 was used at Ives 4 hyporheic from 2/28/2007 to 3/20/2007 with MiniSonde 43655.



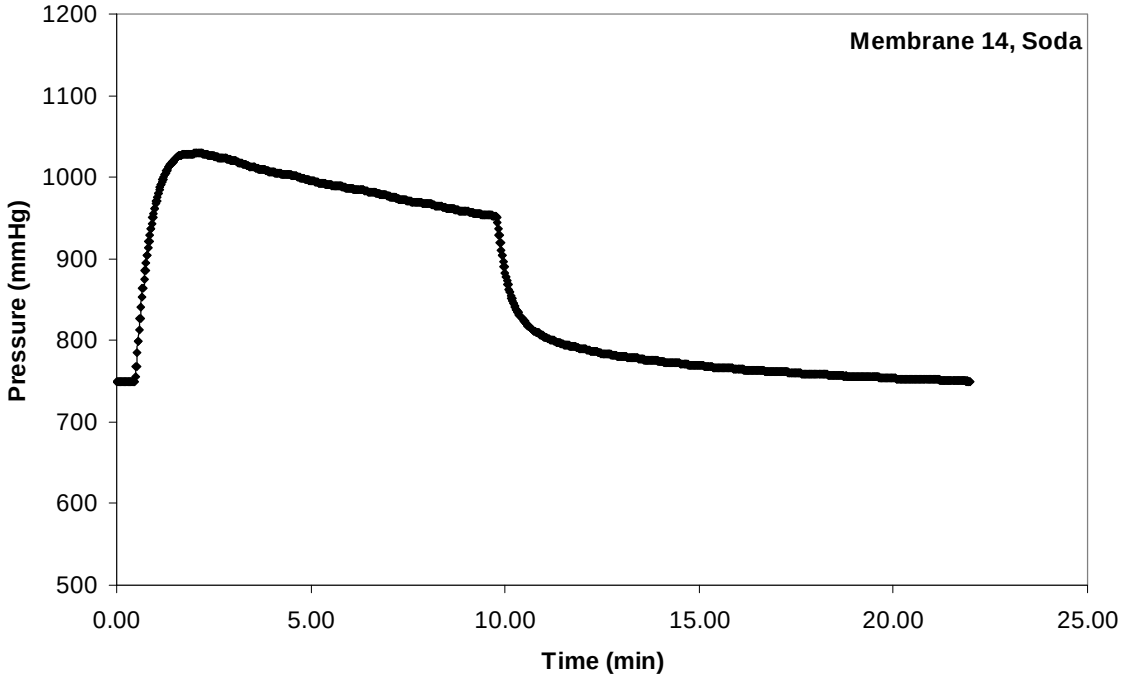


Membrane 25 was used at Ives 1 river from 2/28/2007 to 3/19/2007 with MiniSonde 44946.

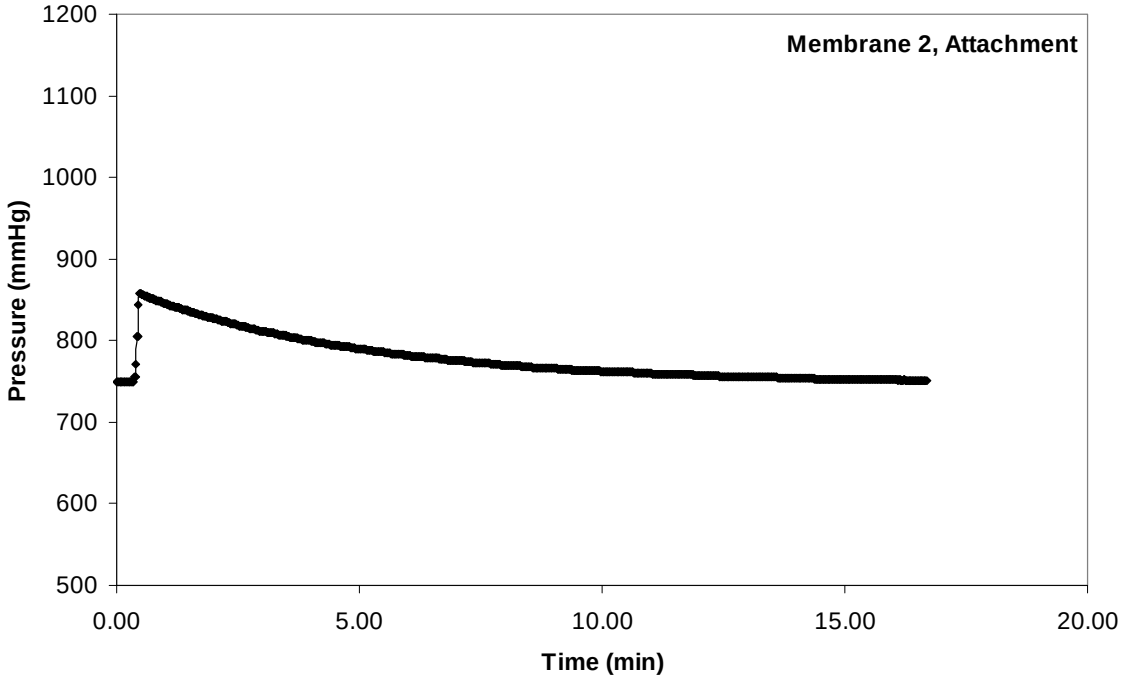




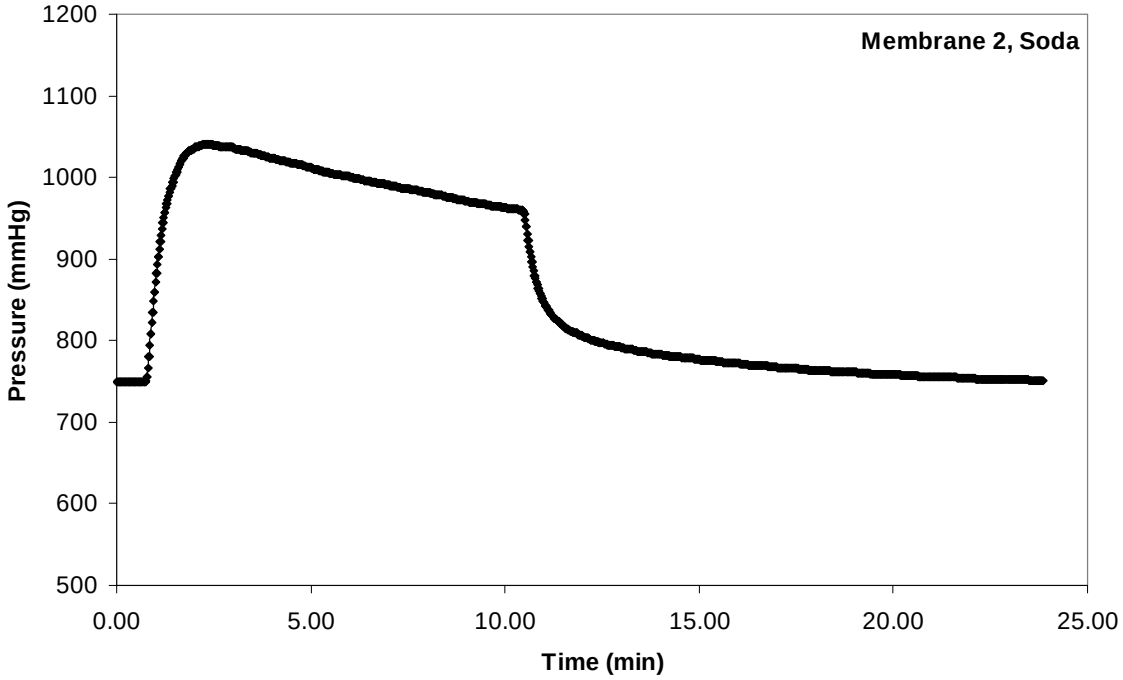
Membrane 14 was used as the control for the side-by-side after deployment 1 with MiniSonde 42970.

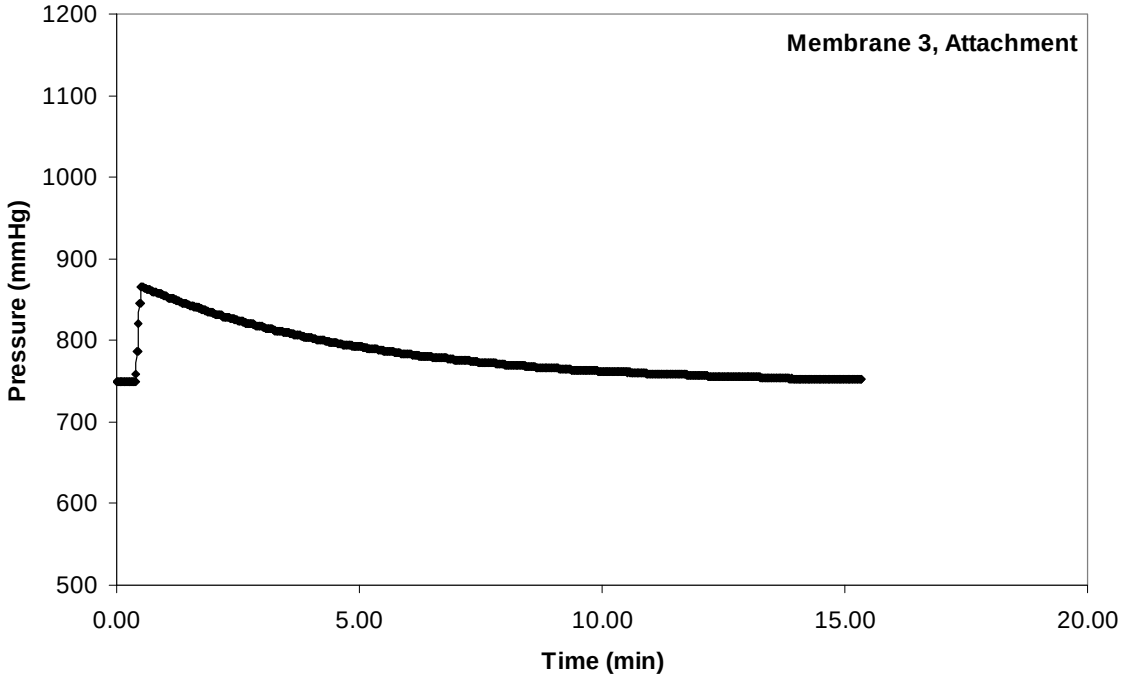


Post-Deployment 2

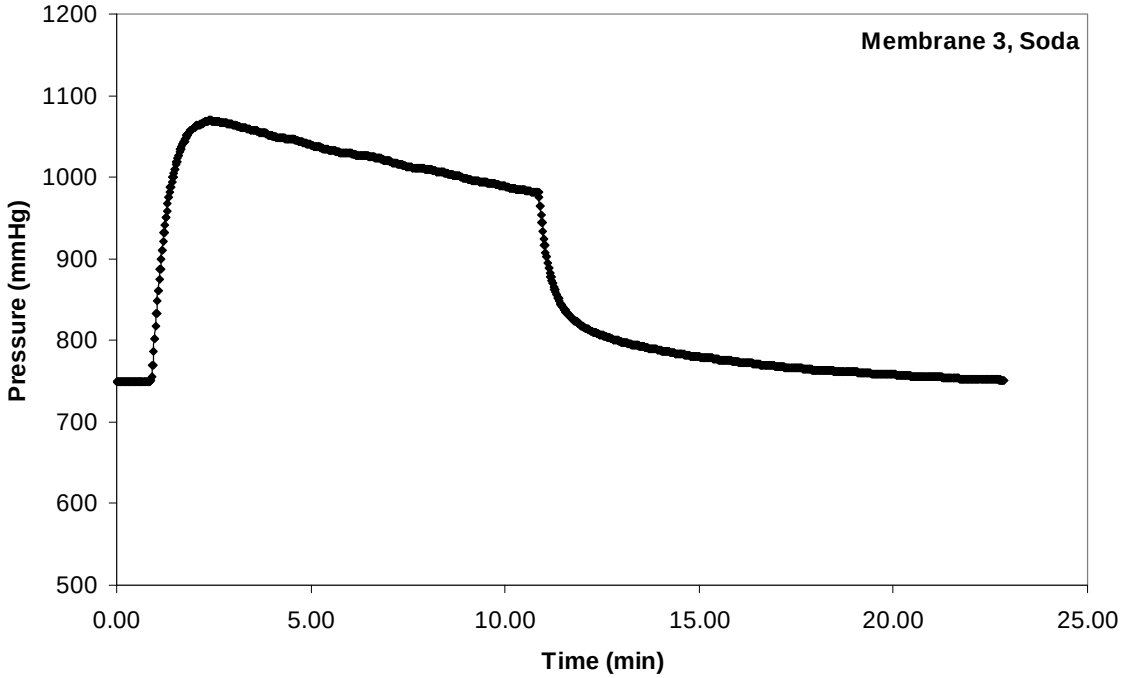


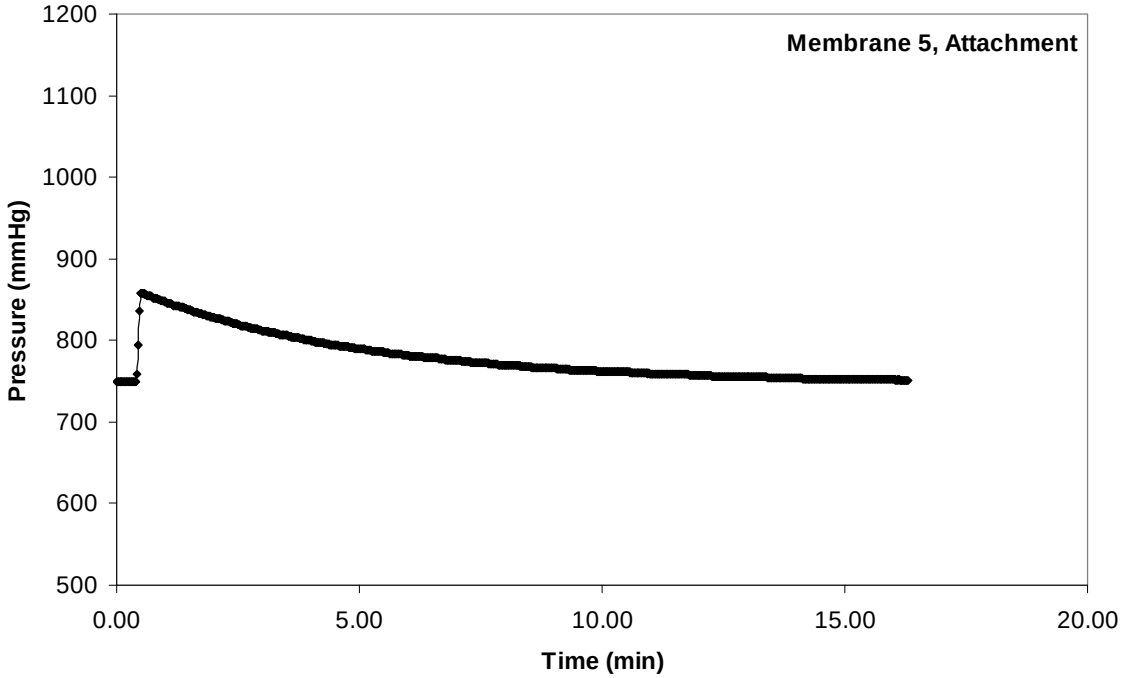
Membrane 2 was used at Ives 1 river from 3/22/2007 to 4/10/2007 with MiniSonde 44946.



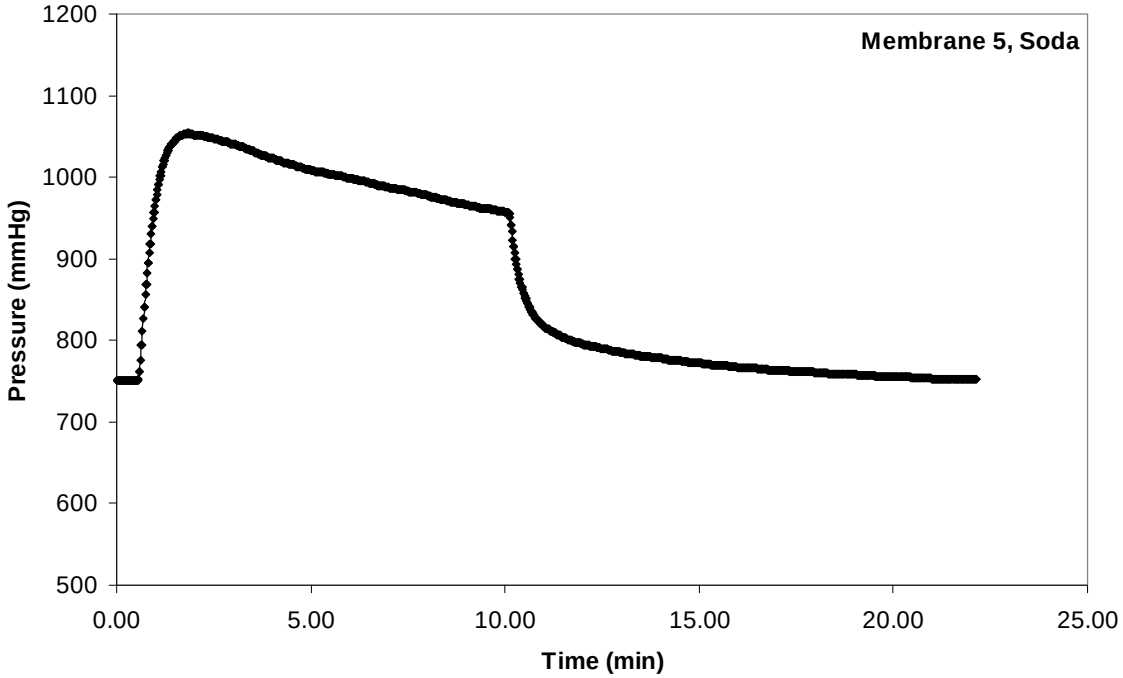


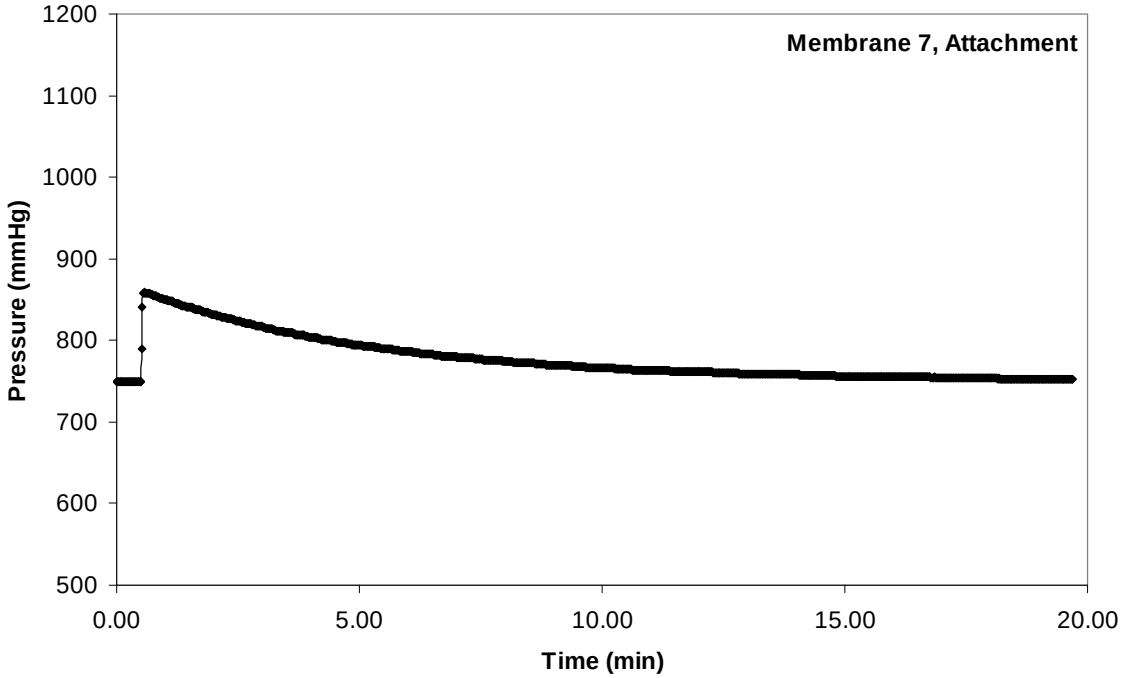
Membrane 3 was used at Ives 5 hyporheic from 3/22/2007 to 4/12/2007 with MiniSonde 43654.



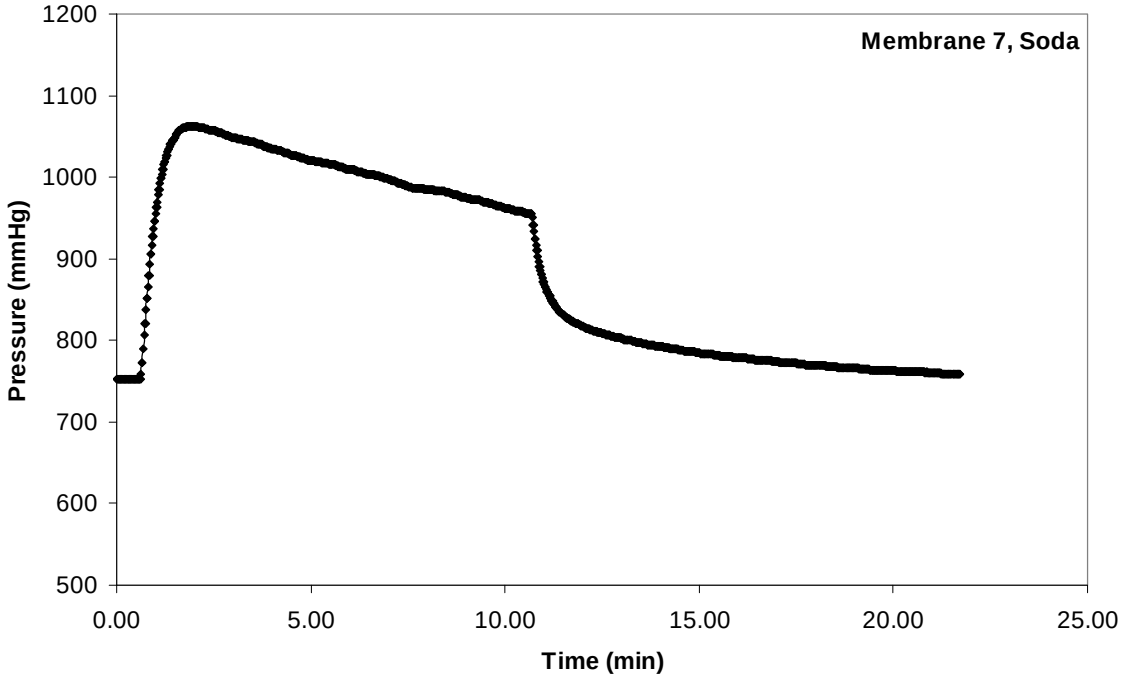


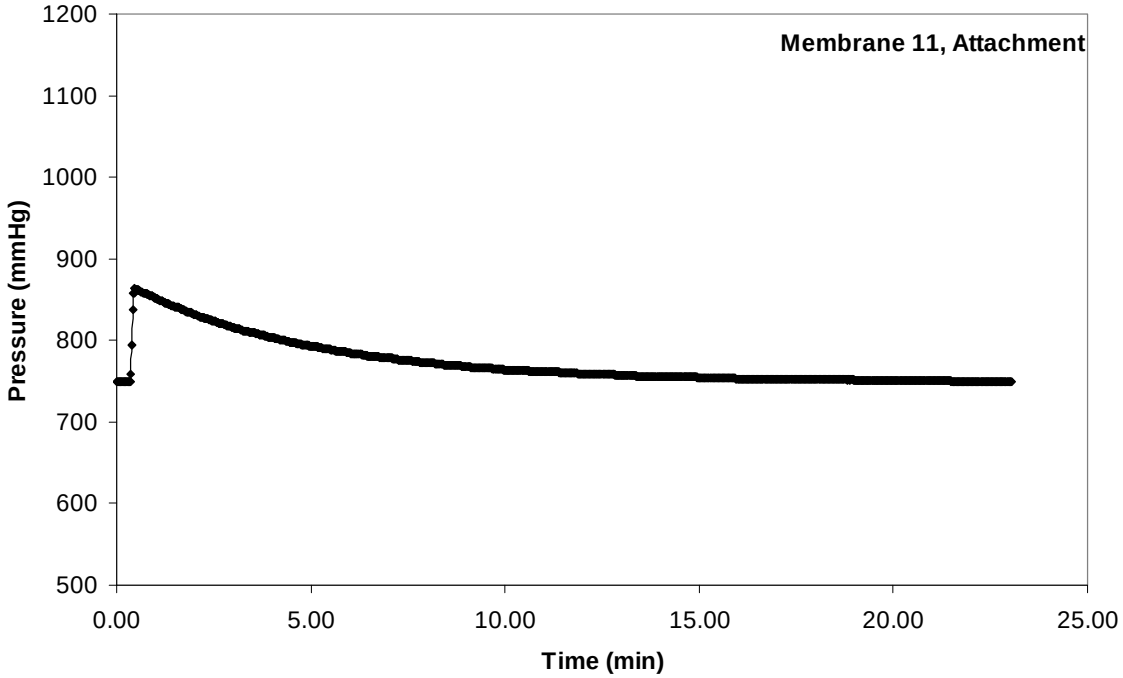
Membrane 5 was used at Ives 2 river from 3/23/2007 to 4/12/2007 with MiniSonde 44927.



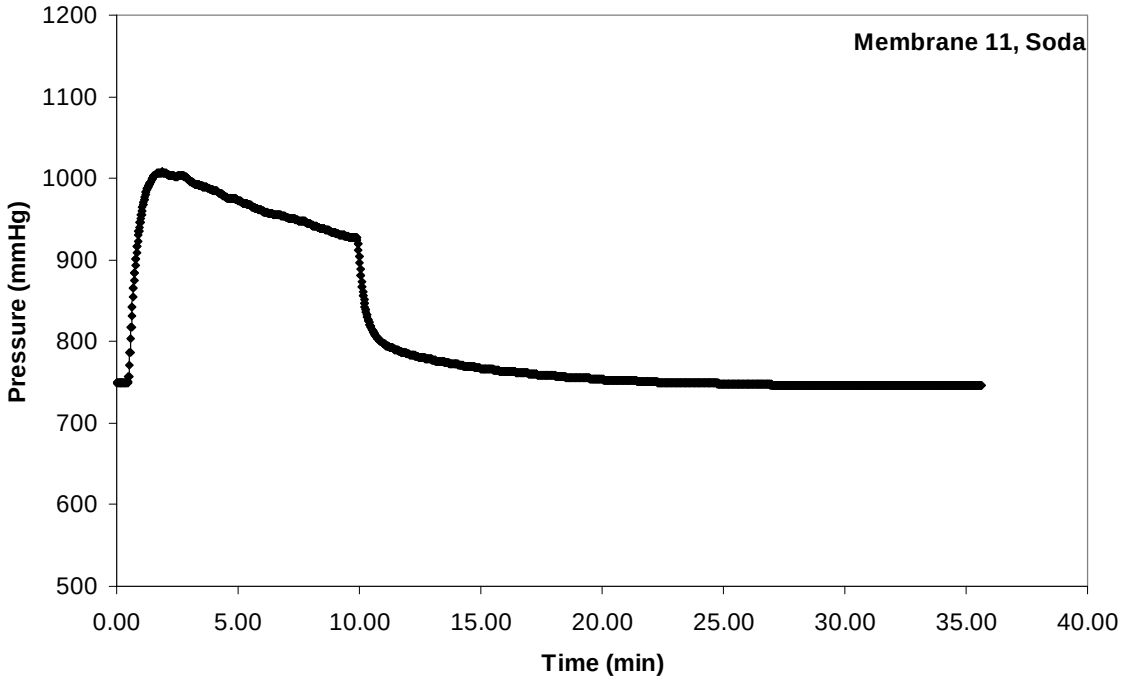


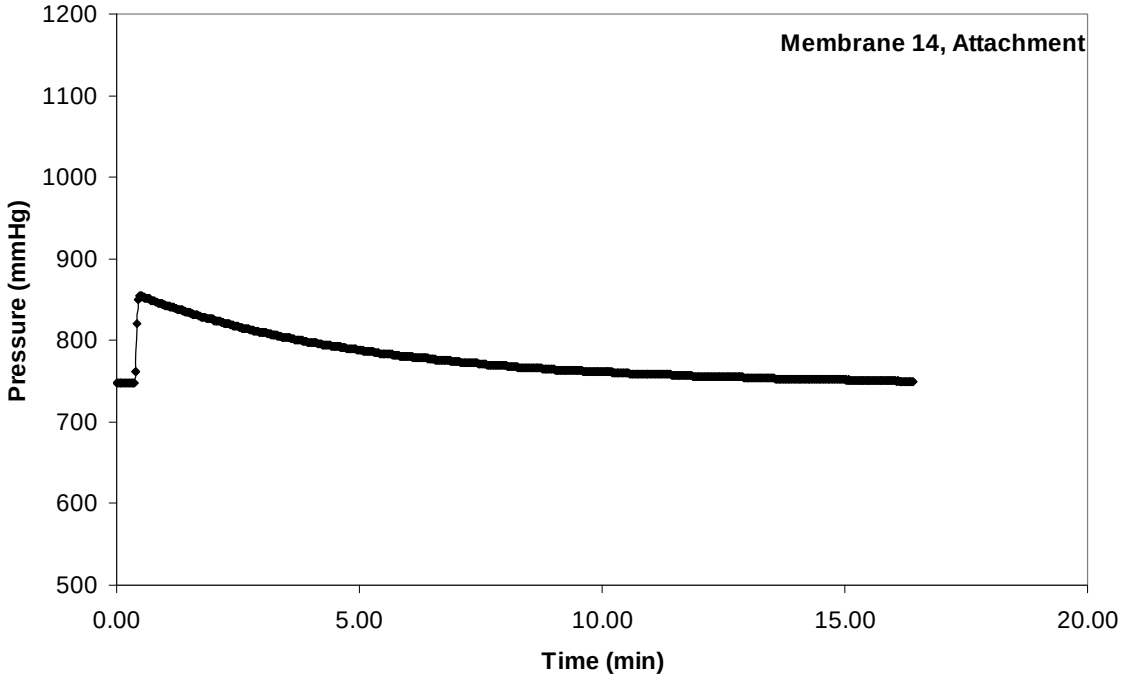
Membrane 7 was used at Ives 5 river from 3/22/2007 to 4/11/2007 with MiniSonde 44945.



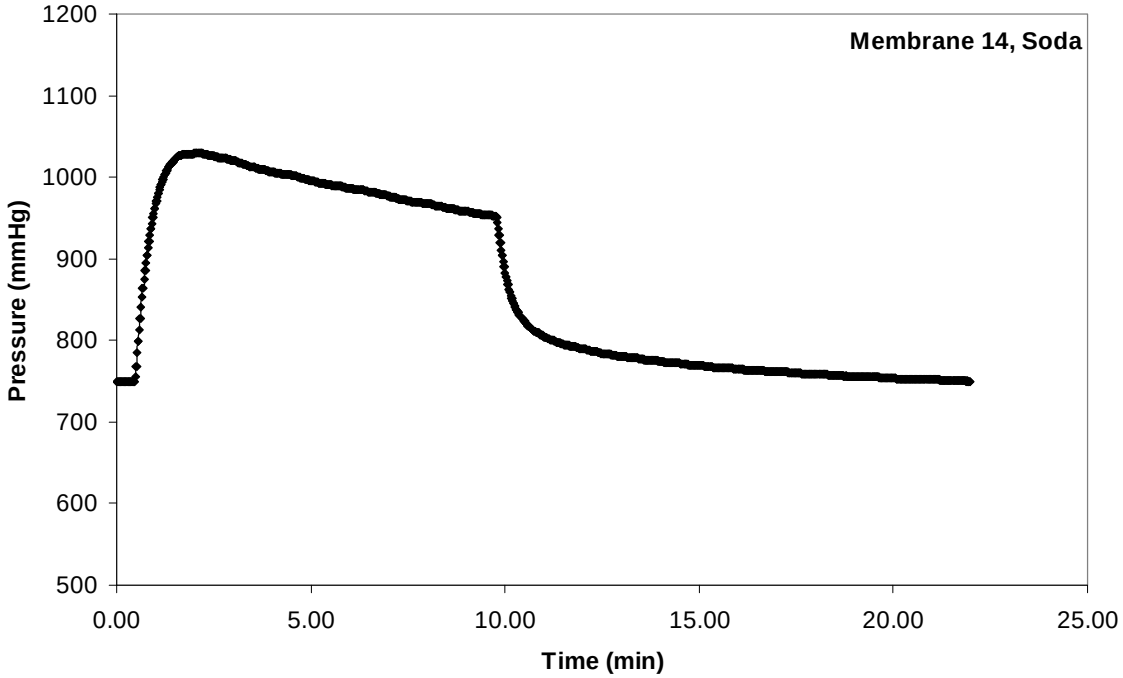


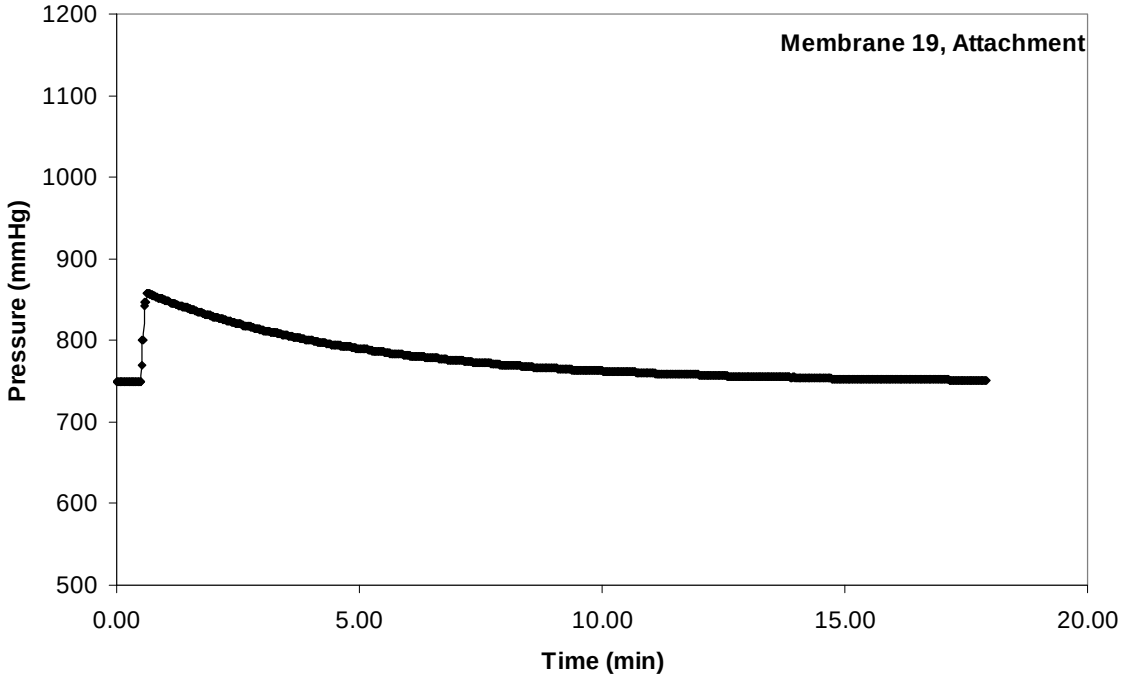
Membrane 11 was used at Multnomah Falls 1 hyporheic from 3/21/2007 to 4/9/2007 with MiniSonde 44947.



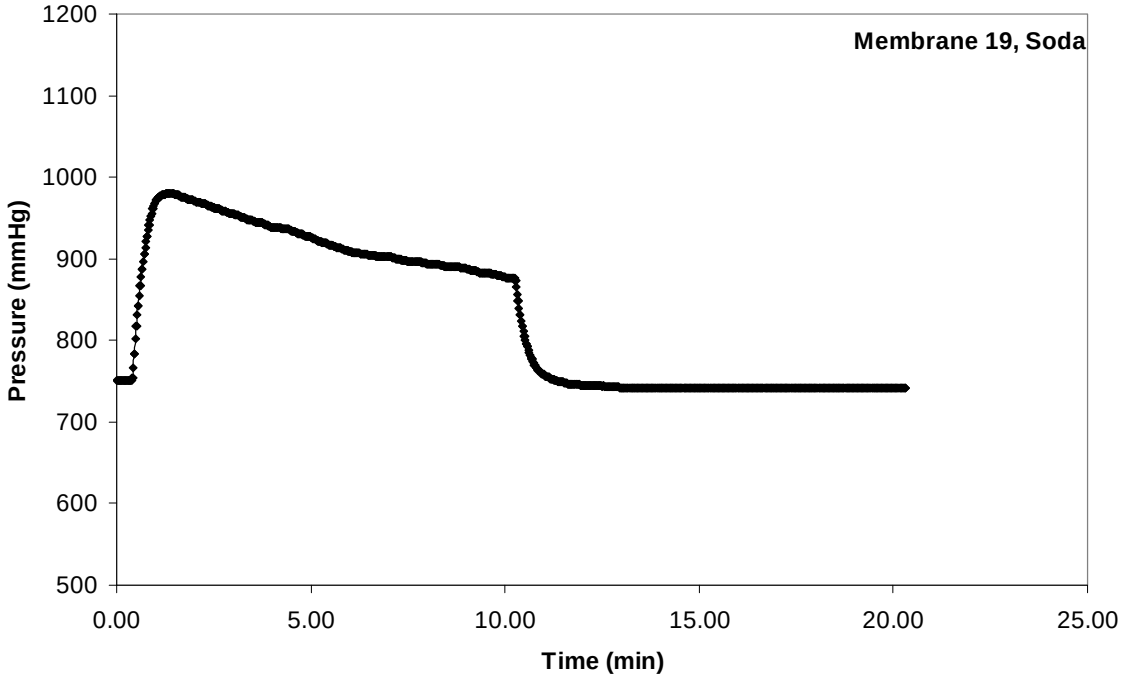


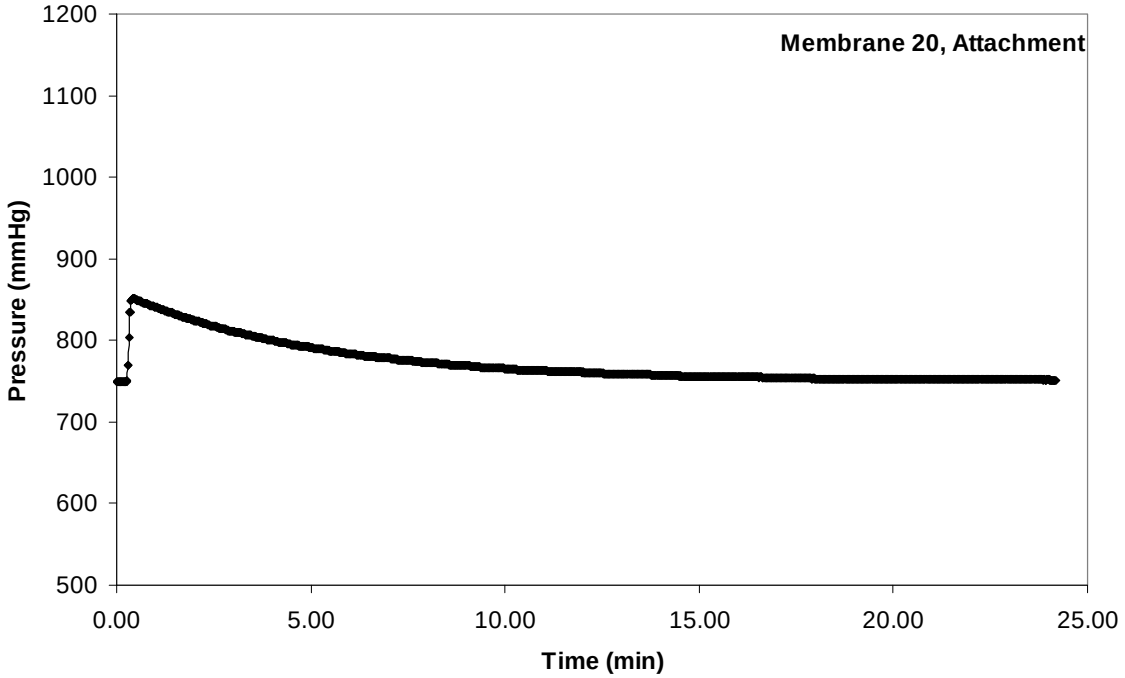
Membrane 14 was used at Ives 2 hyporheic from 3/23/2007 to 4/12/2007 with MiniSonde 42970.



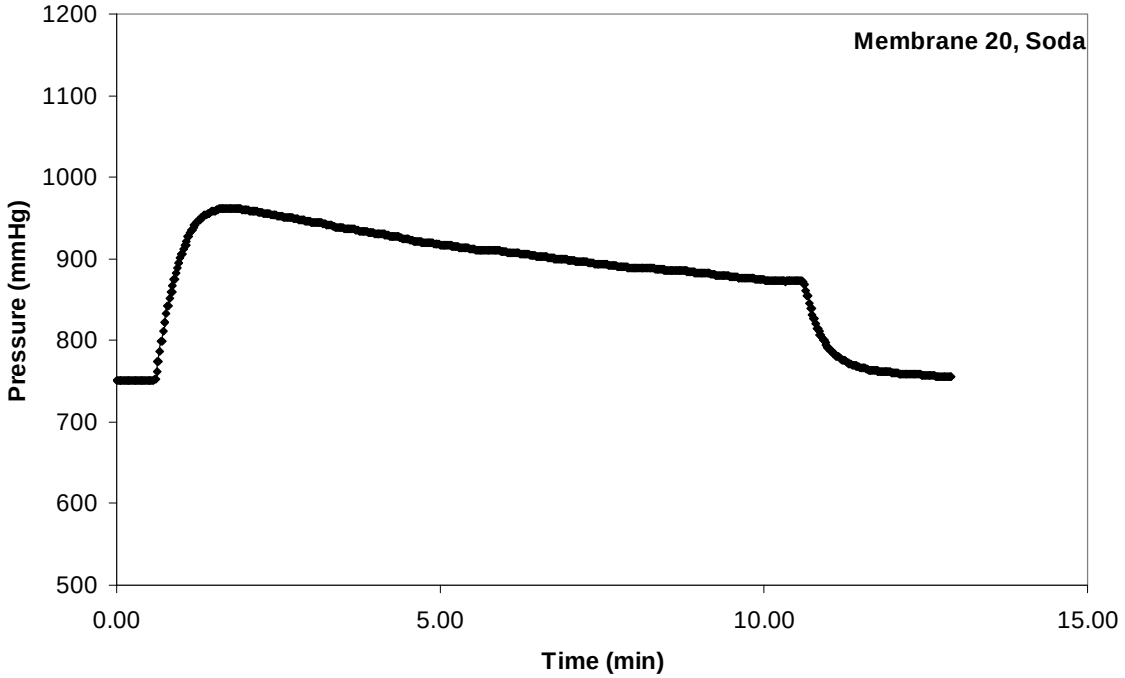


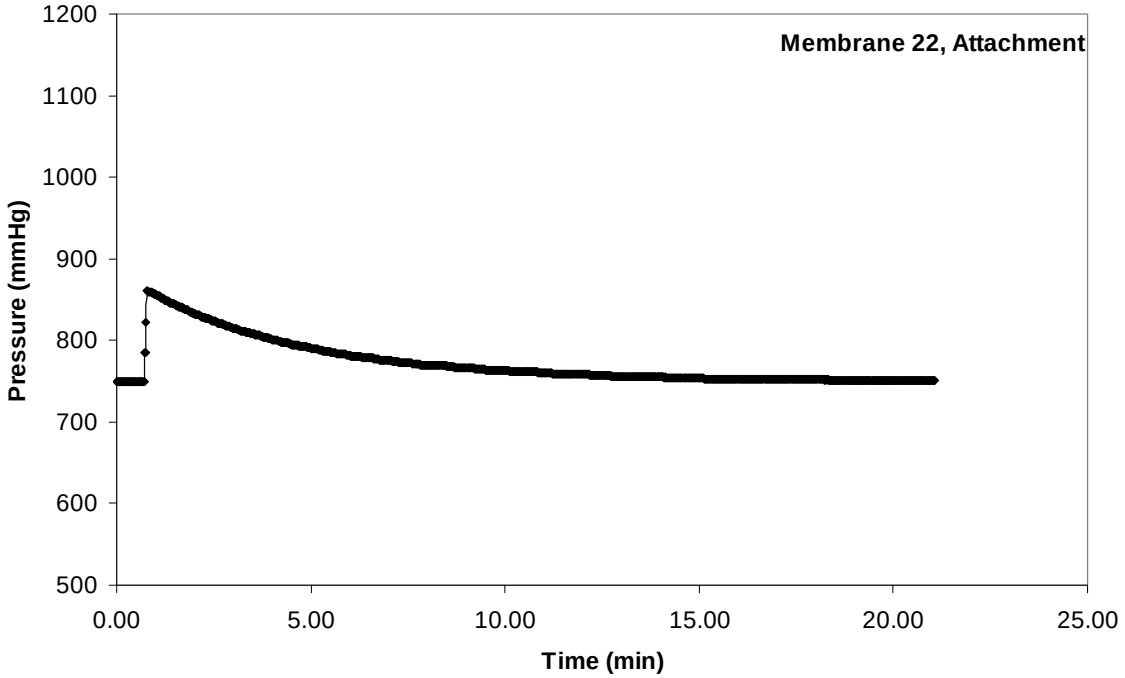
Membrane 19 was used at Multnomah Falls 1 river from 3/21/2007 to 3/31/2007 with MiniSonde 43659.



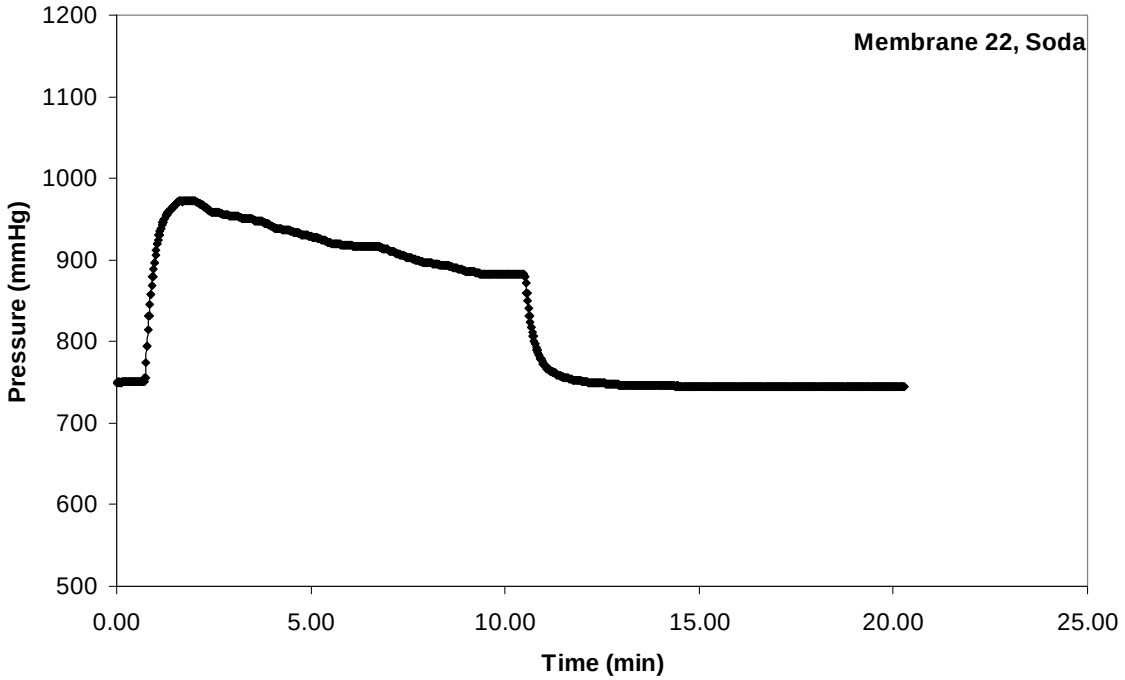


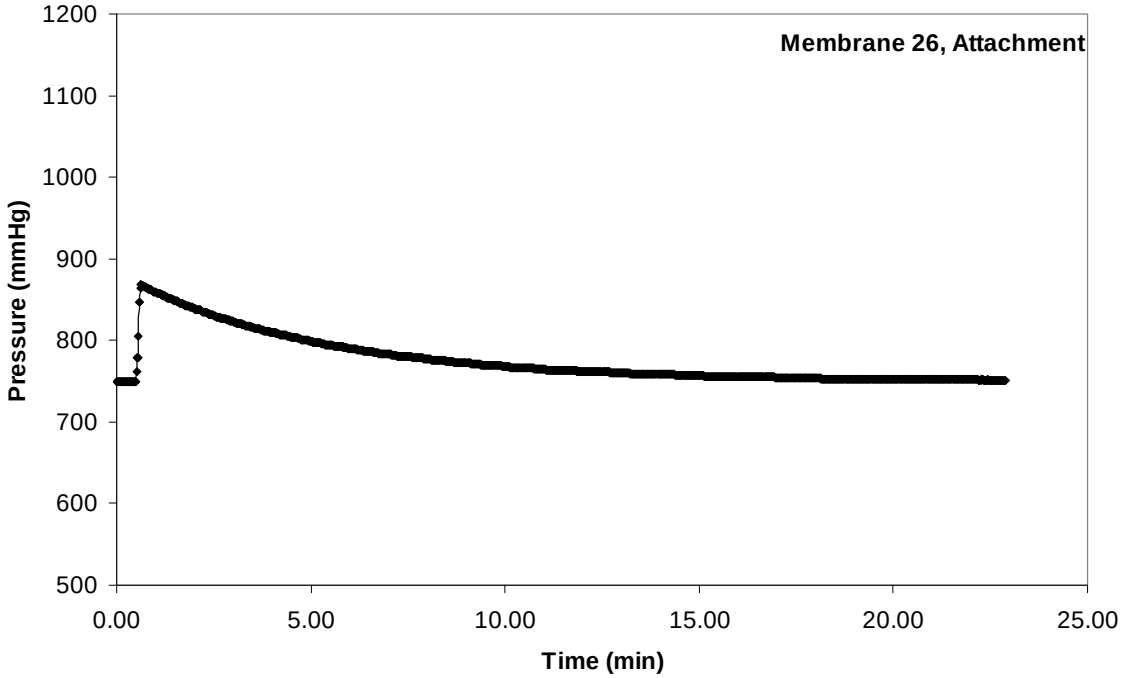
Membrane 20 was used at Multnomah Falls 3 river from 3/21/2007 to 4/2/2007 with MiniSonde 44948.



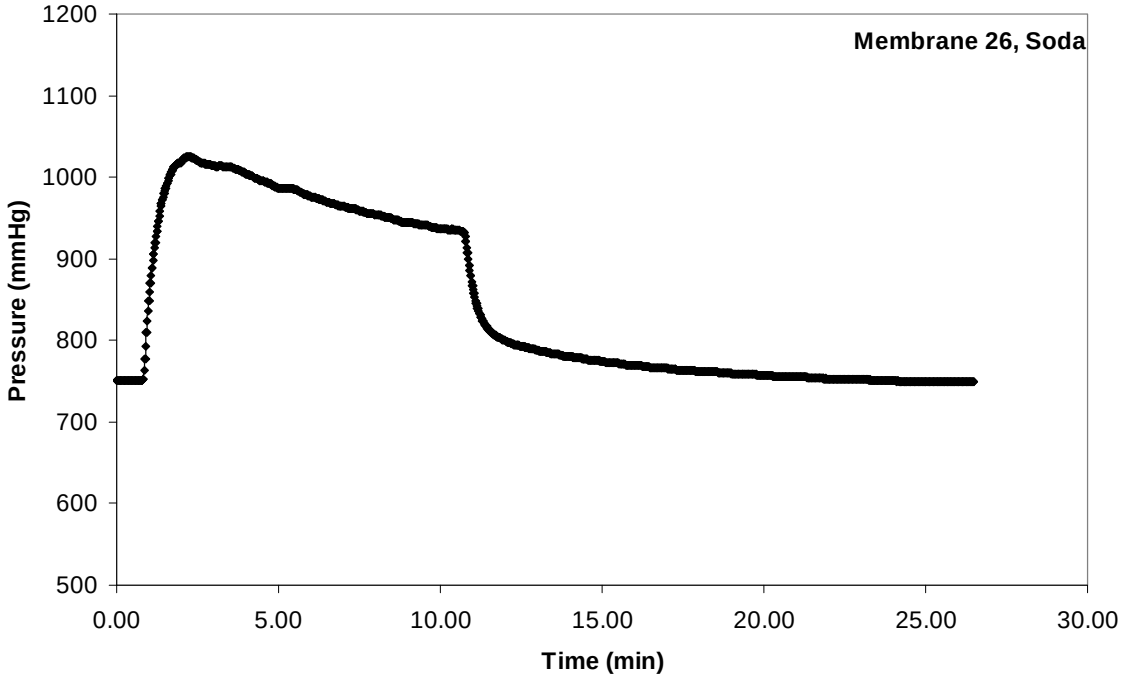


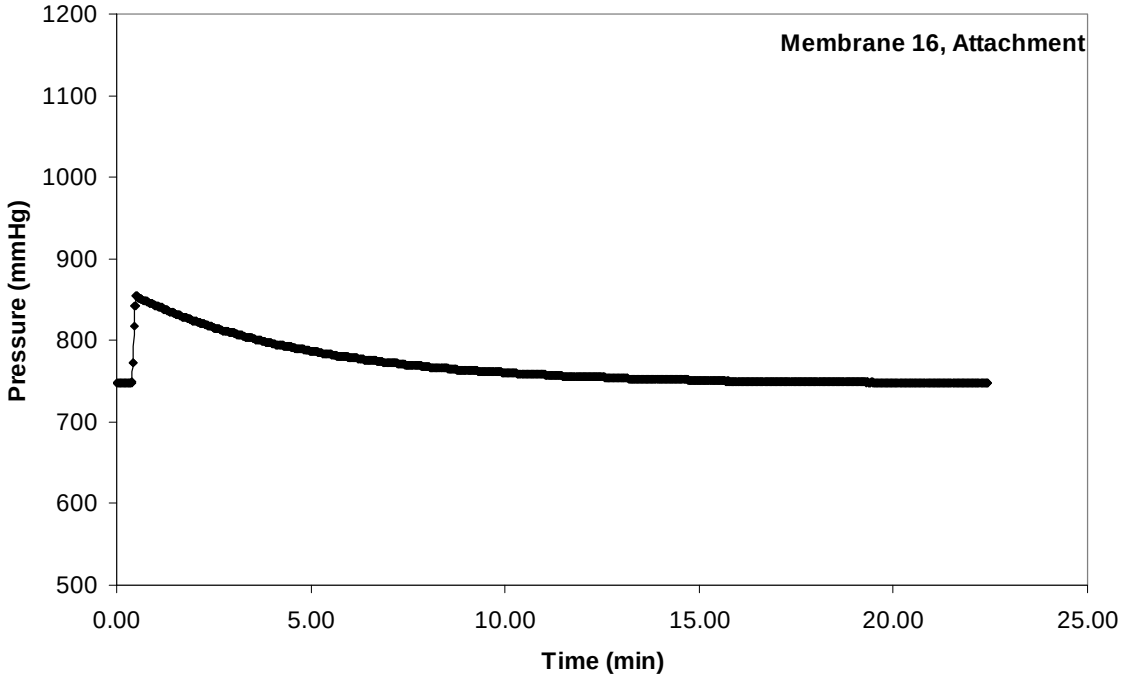
Membrane 22 was used at Multnomah Falls 3 hyporheic from 3/21/2007 to 4/6/2007 with MiniSonde 43656.



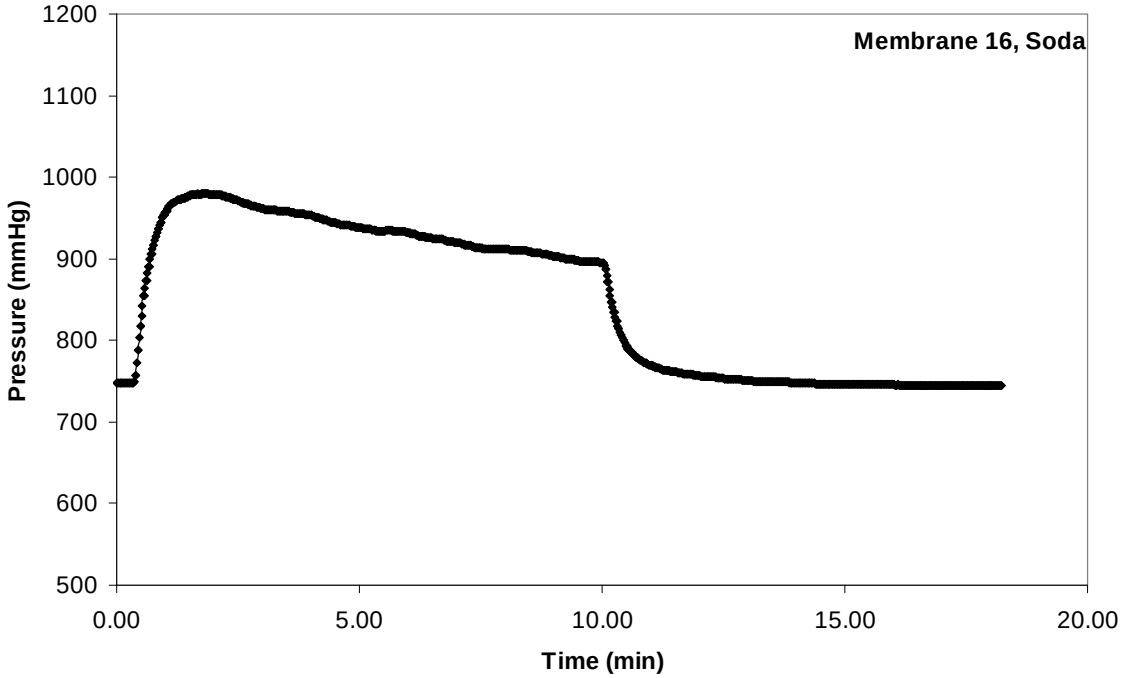


Membrane 26 was used at Ives 1 hyporheic from 03/22/2007 to 4/11/2007 with MiniSonde 43639.

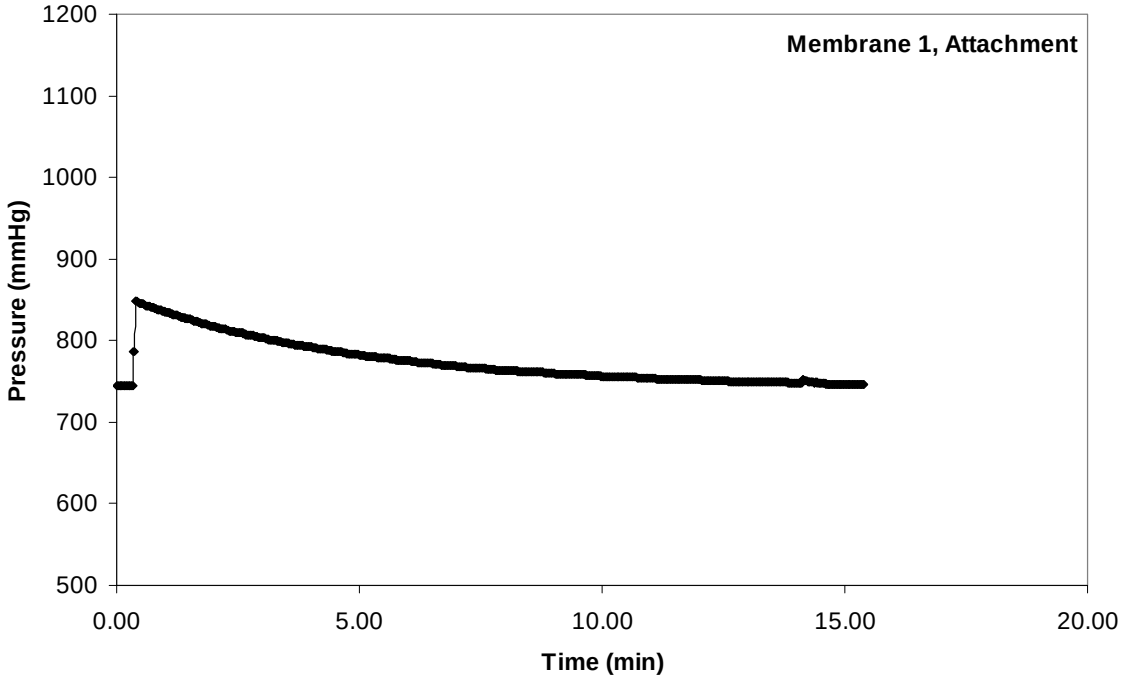




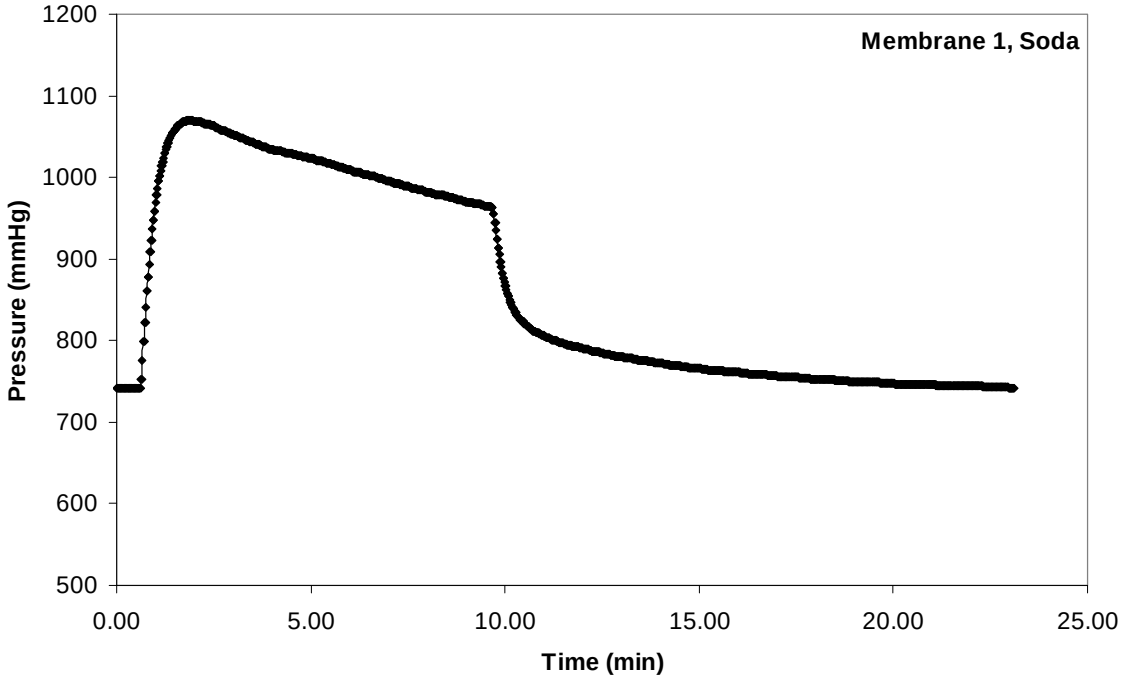
Membrane 16 was used as the control for the side-by-side after deployment 2 with MiniSonde 43655.

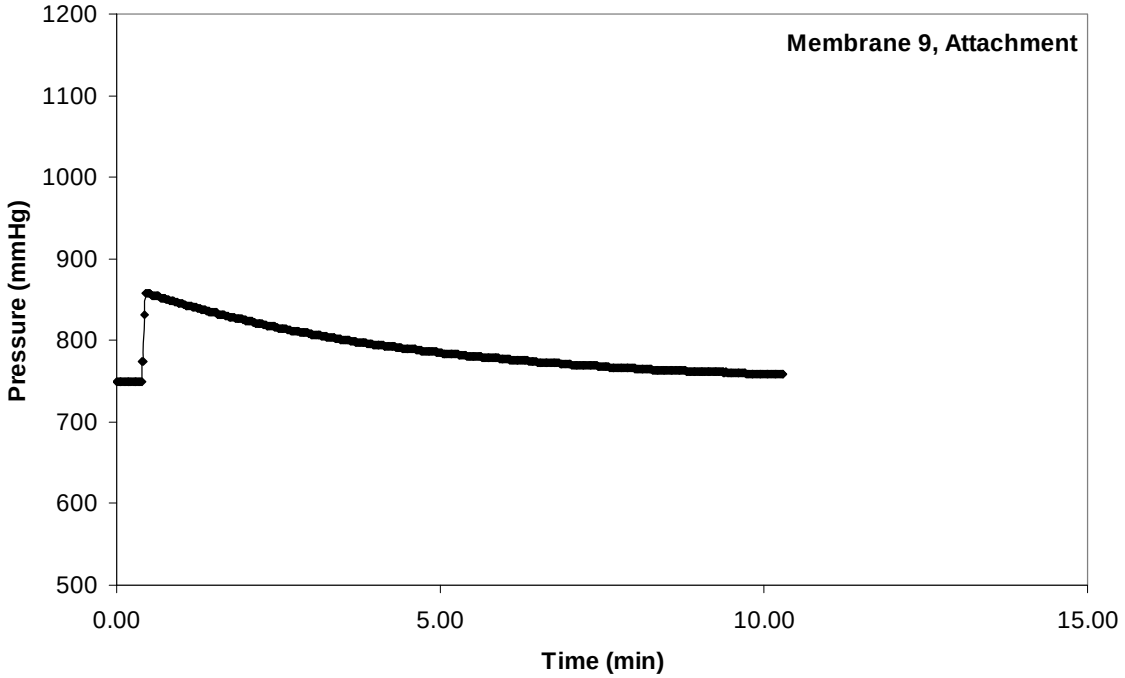


Post-Deployment 3

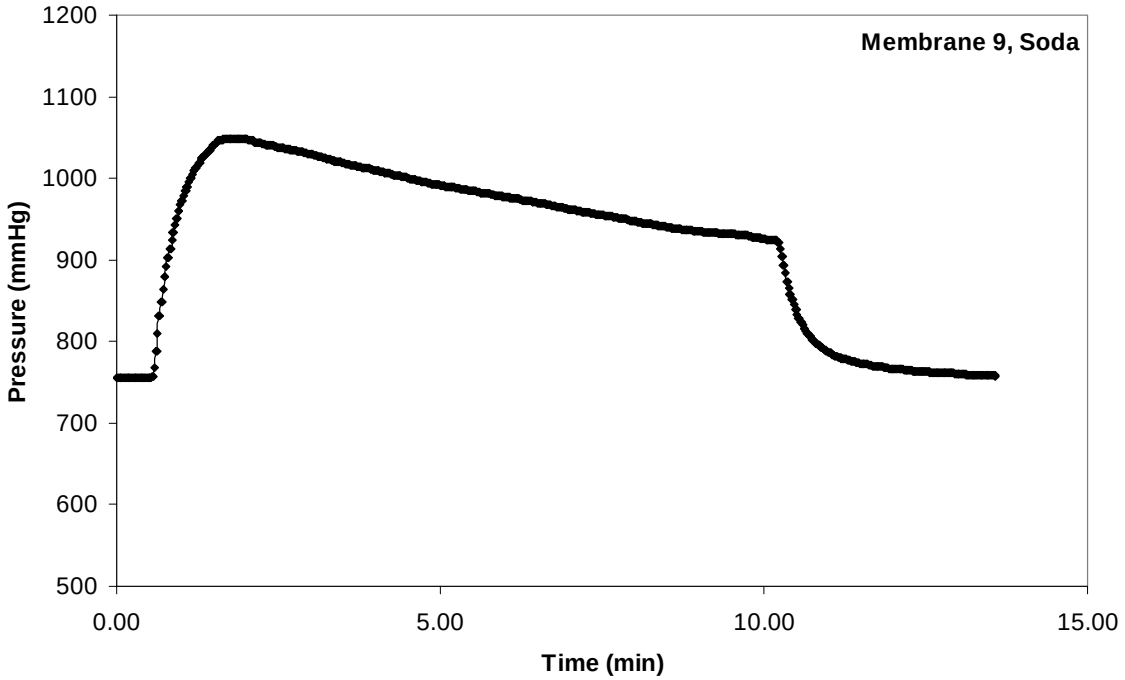


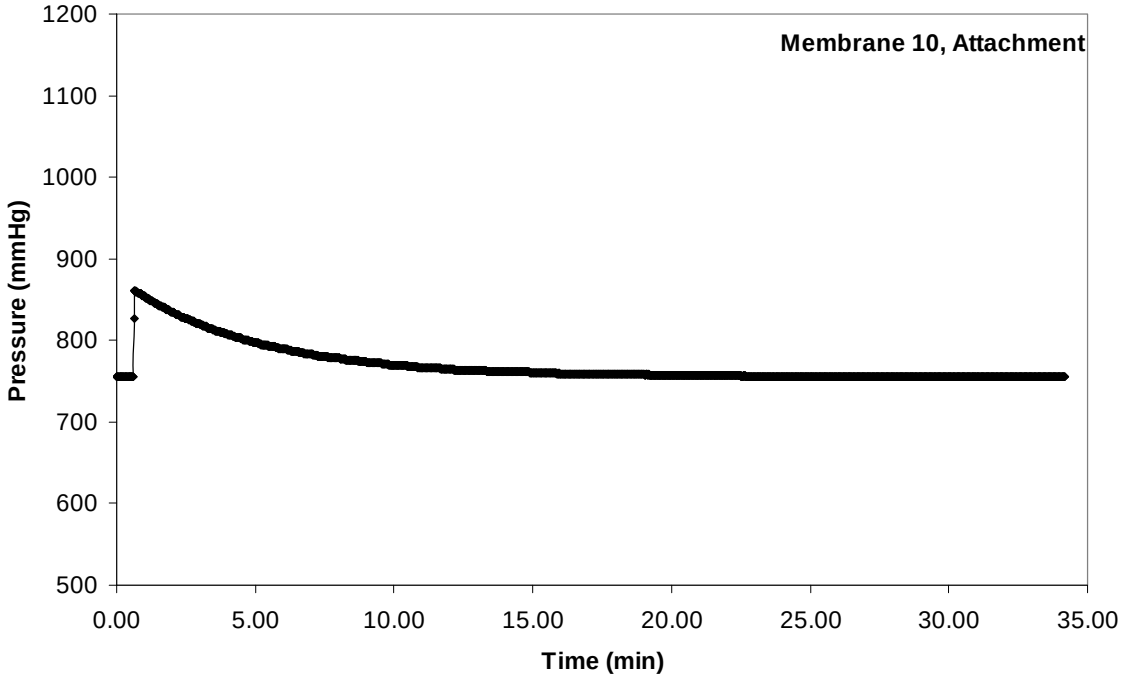
Membrane 1 was used at Multnomah Falls 1 river from 4/13/2007 to 4/27/2007 with MiniSonde 43659.



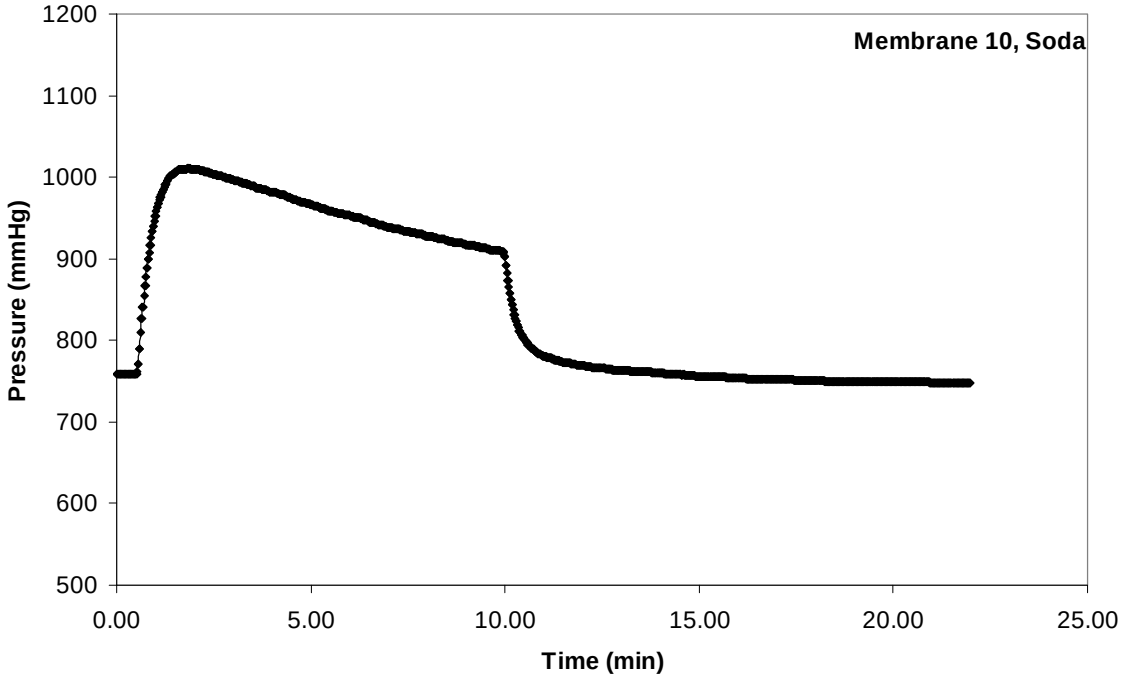


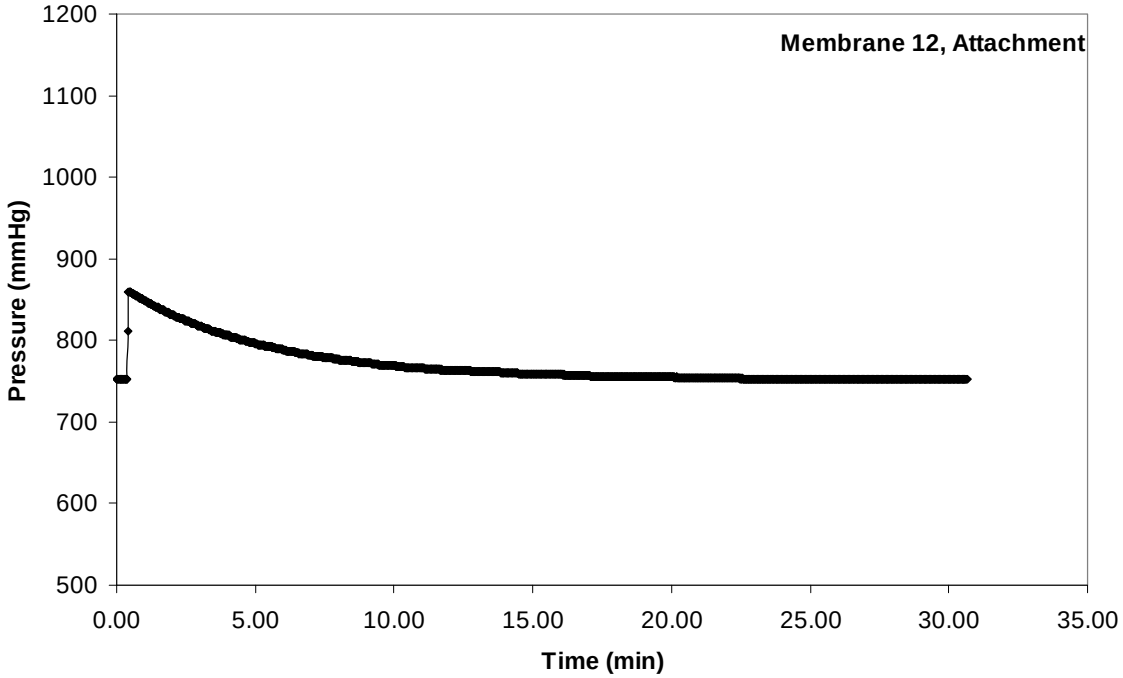
Membrane 9 was used at Multnomah Falls 3 hyporheic from 4/13/2007 to 4/27/2007 with MiniSonde 44948.



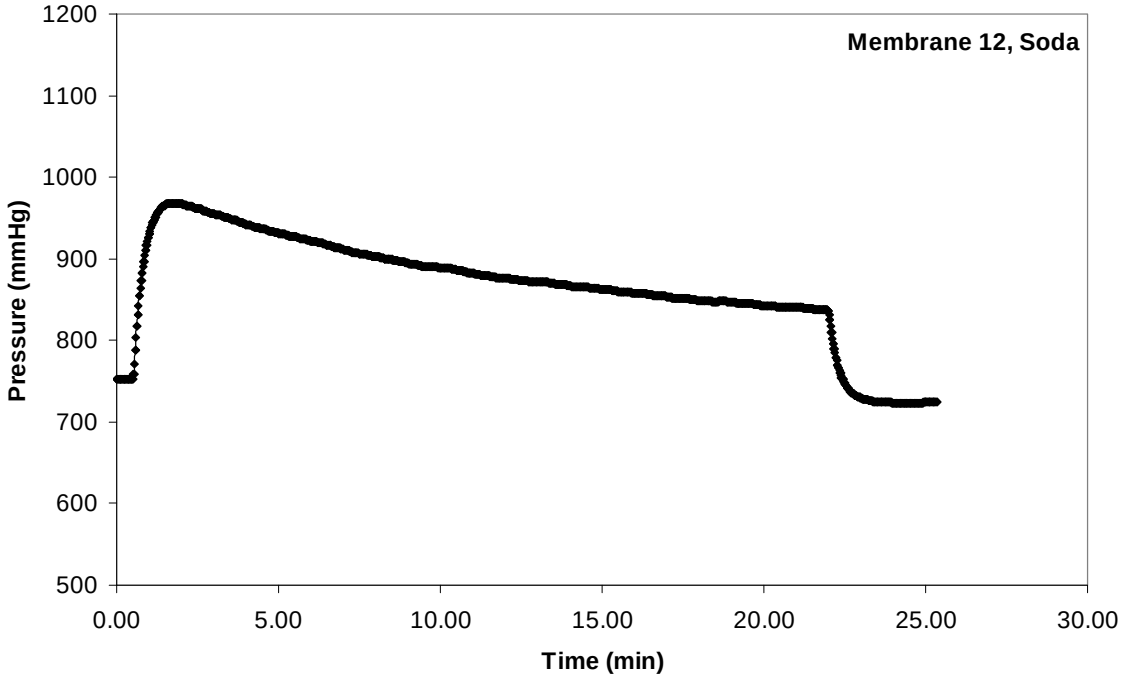


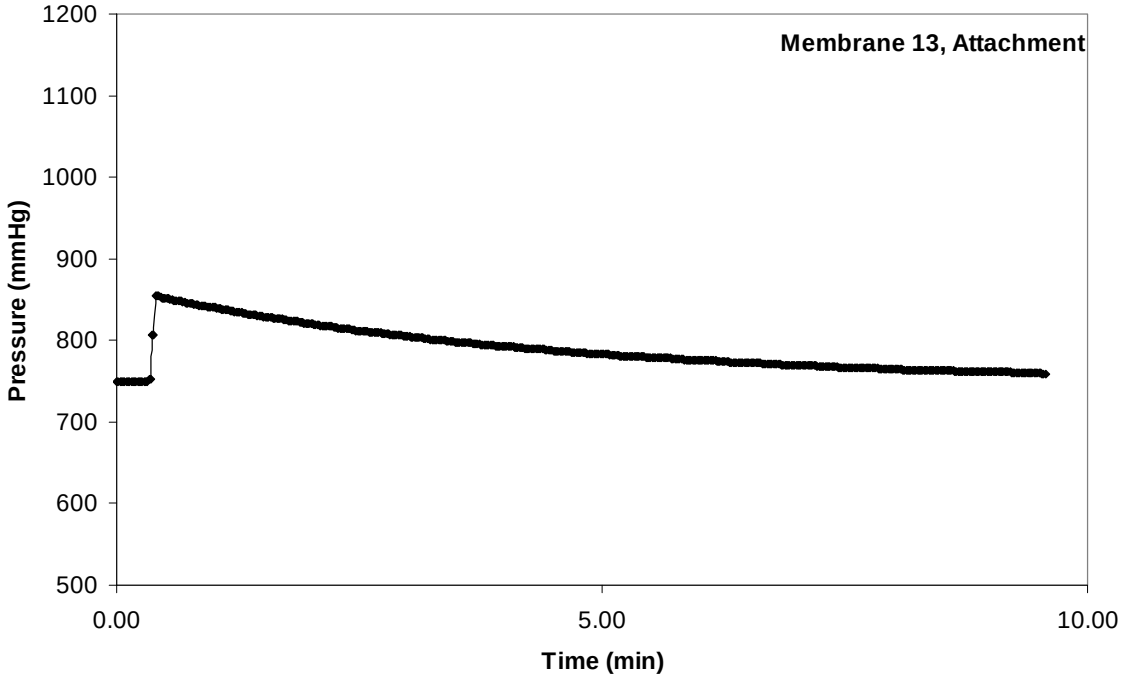
Membrane 10 was used at Ives 1 hyporheic from 4/12/2007 to 4/26/2007 with MiniSonde 43639.



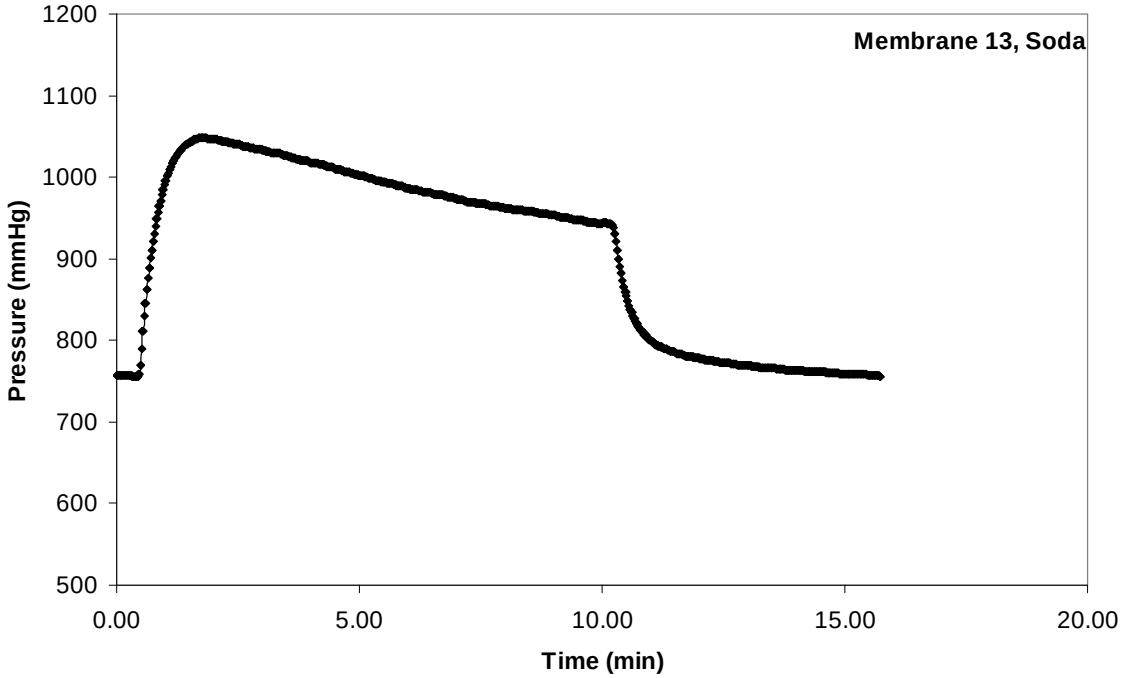


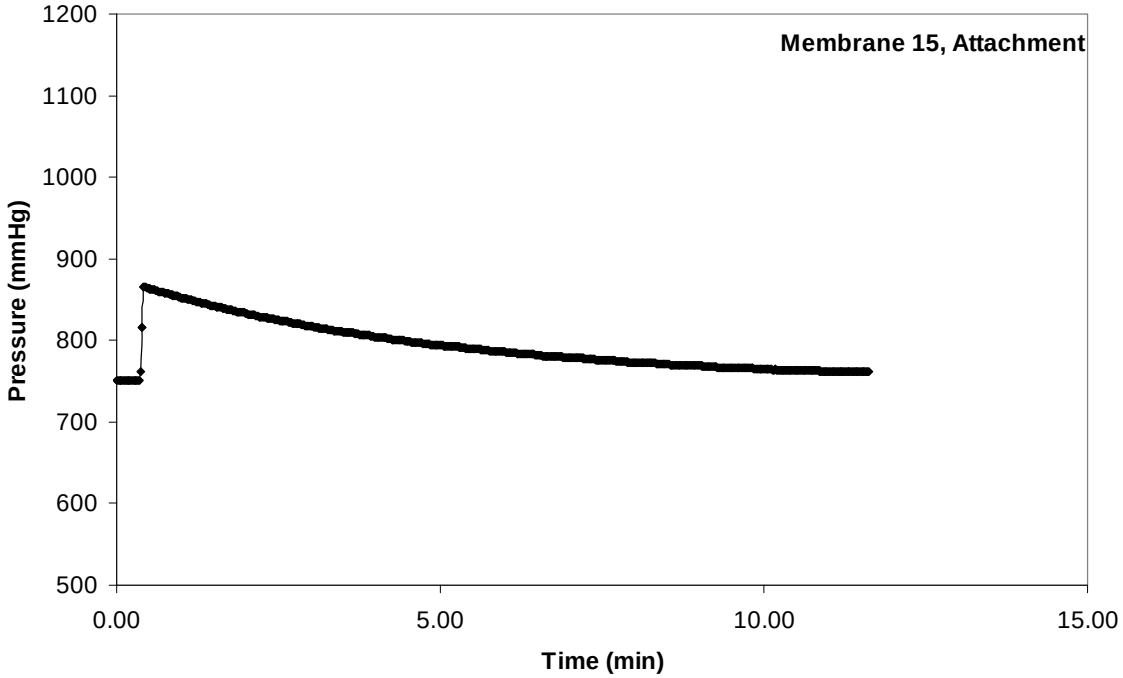
Membrane 12 was used at Ives 2 river from 4/12/2007 to 4/26/2007 with MiniSonde 44927.



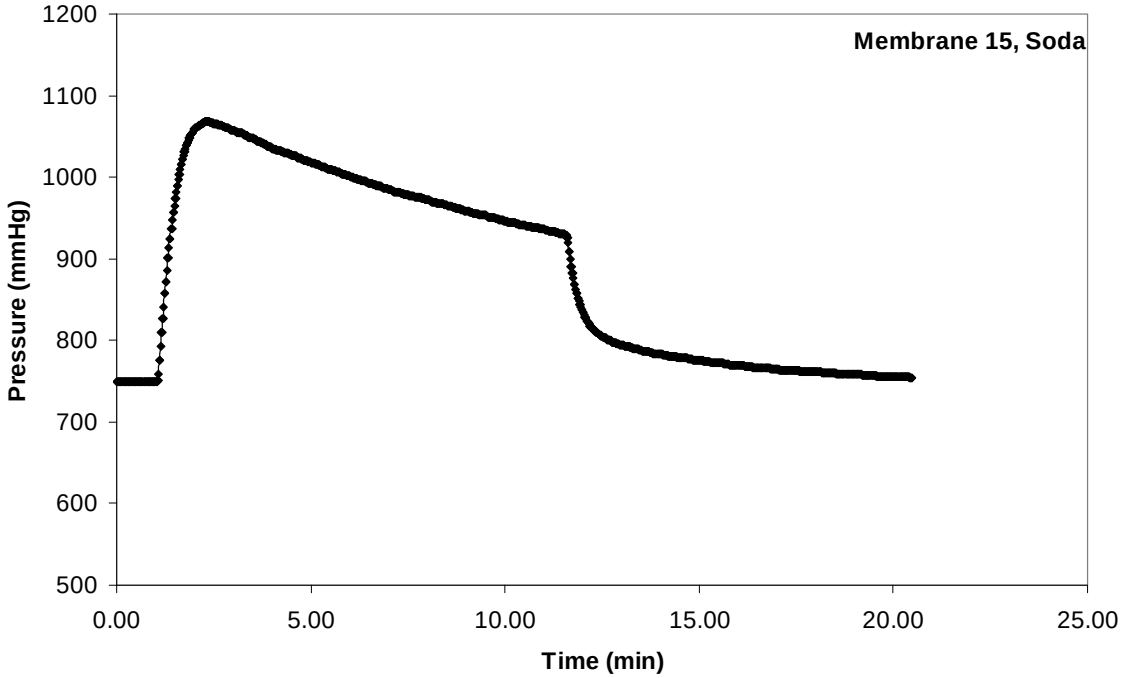


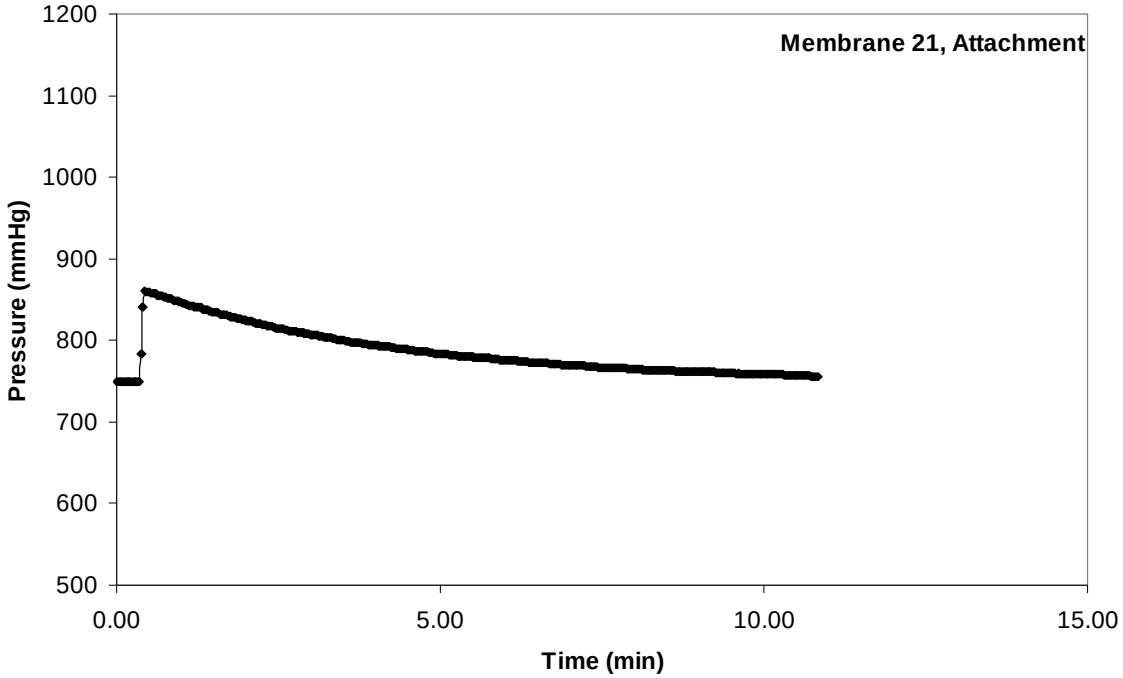
Membrane 13 was used at Multnomah Falls 3 river from 4/13/2007 to 4/27/2007 with MiniSonde 43656.



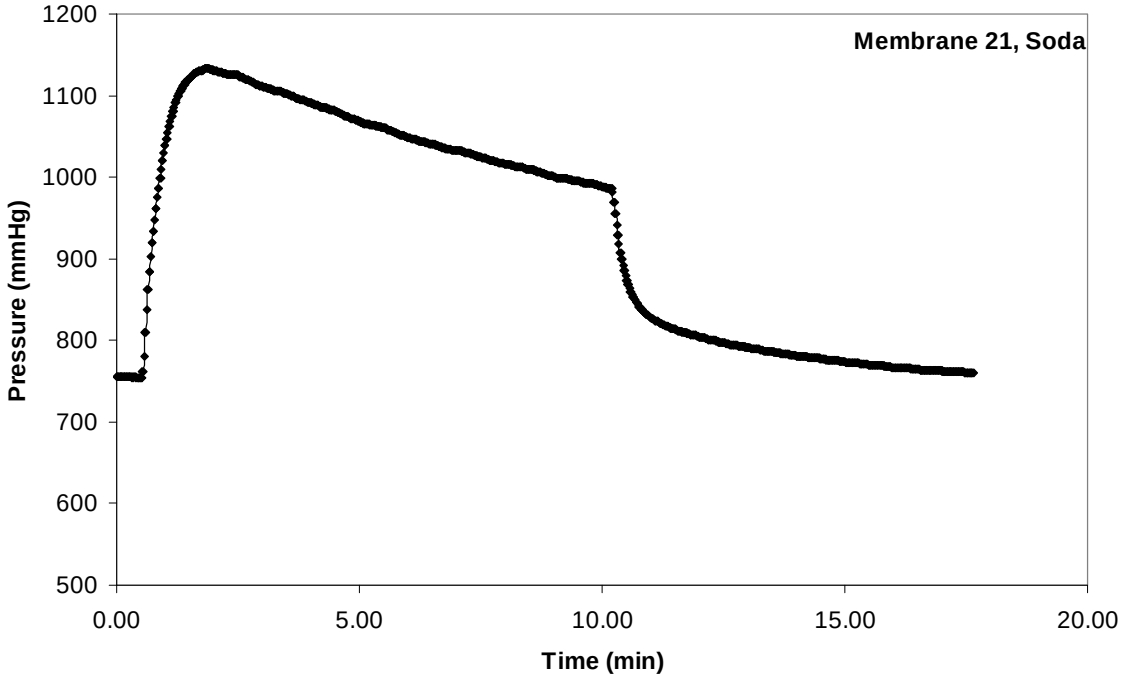


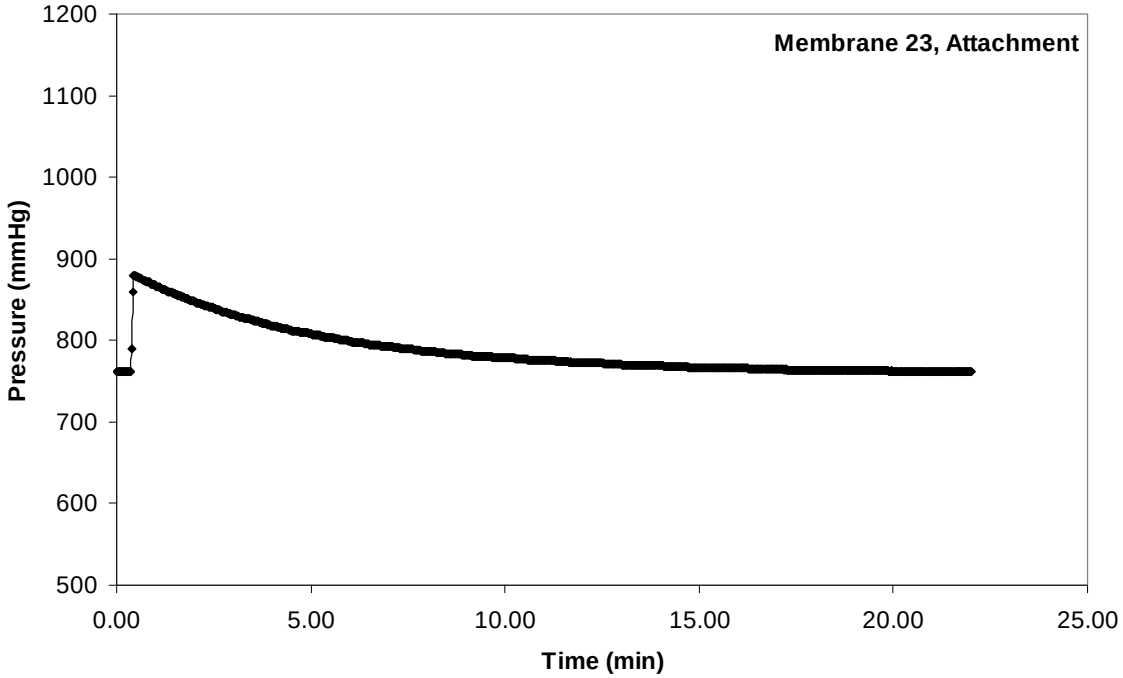
Membrane 15 was used at Ives 1 river from 4/12/2007 to 4/26/2007 with MiniSonde 44946.



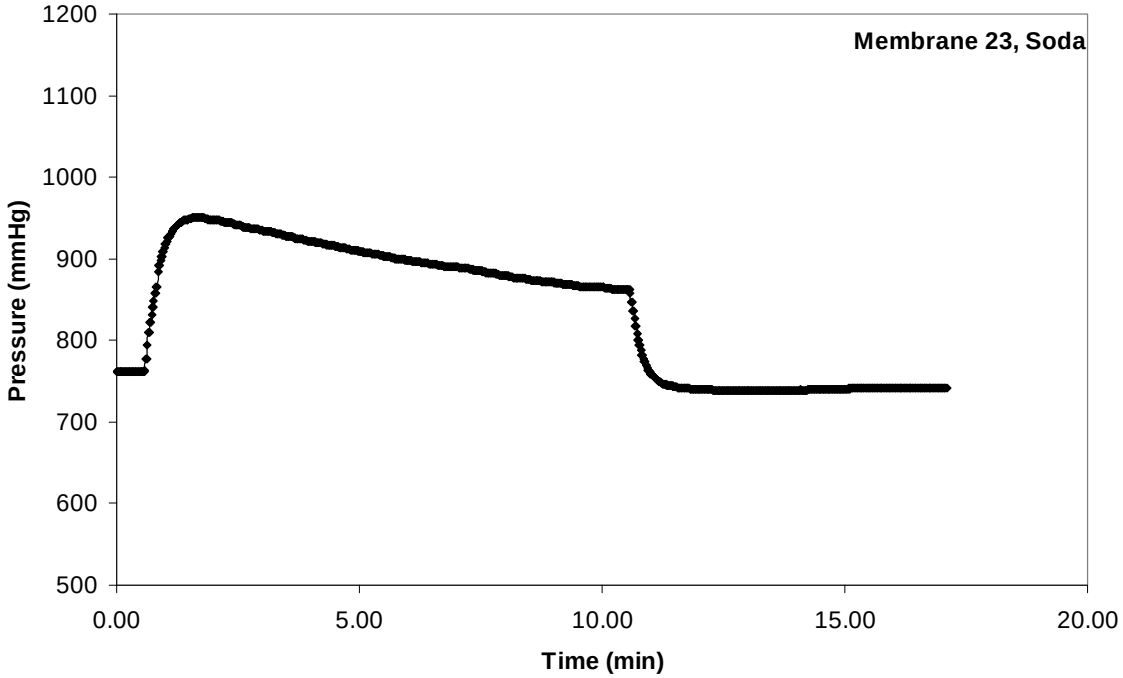


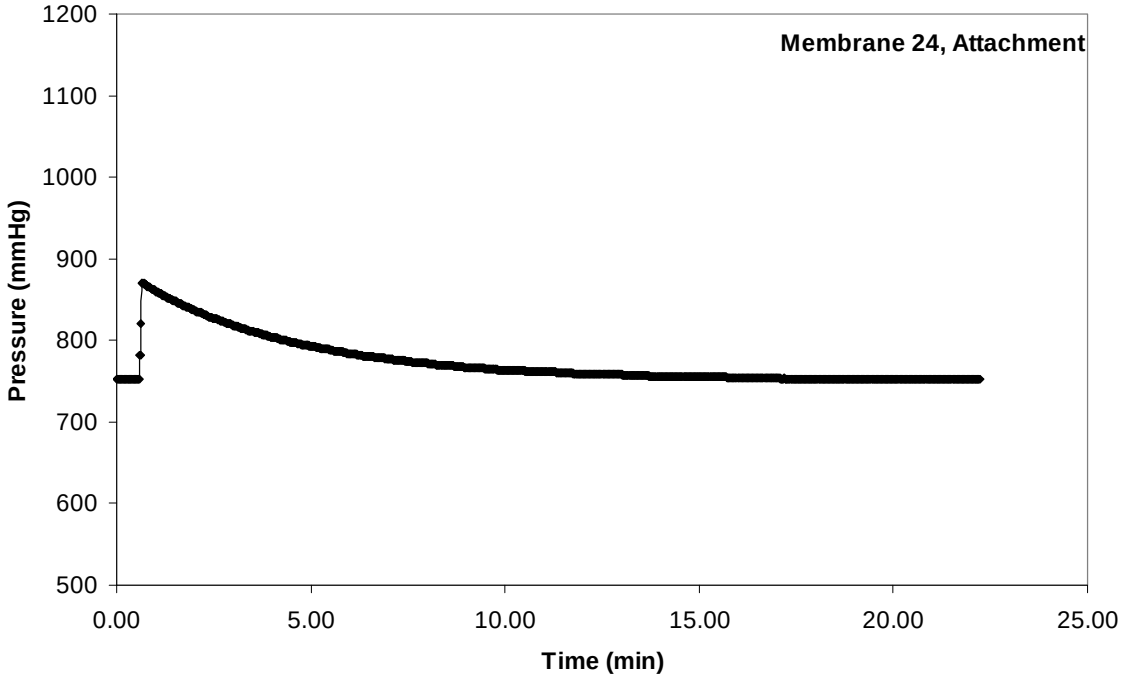
Membrane 21 was used at Ives 5 hyporheic from 4/12/2007 to 4/26/2007 with MiniSonde 43654.



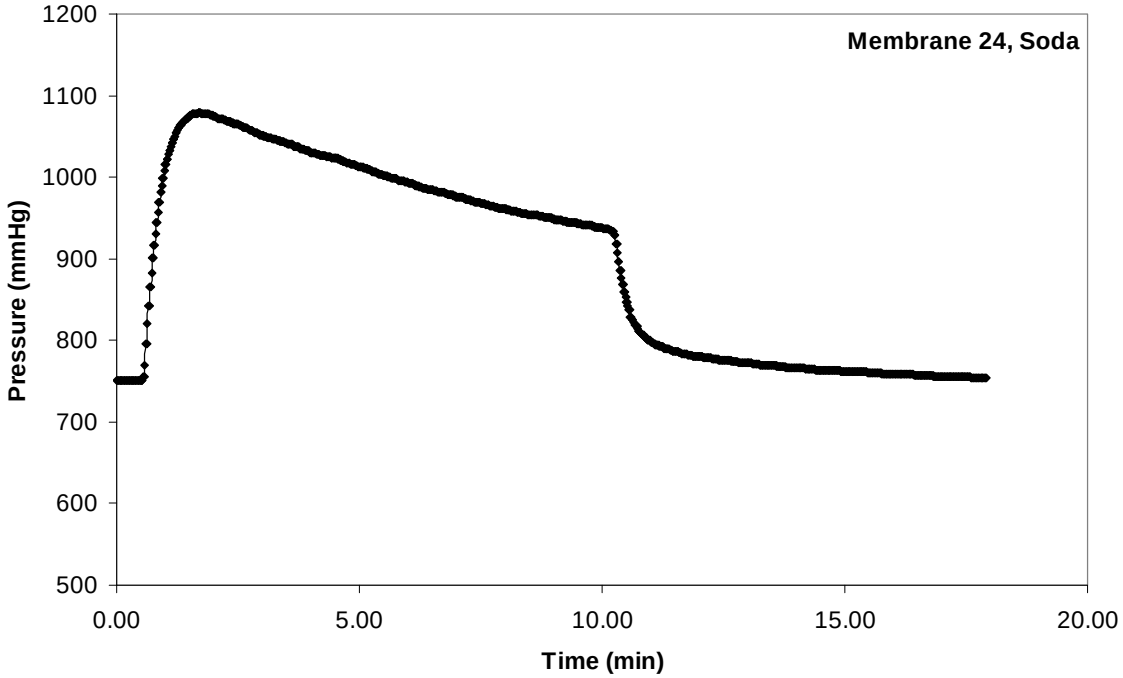


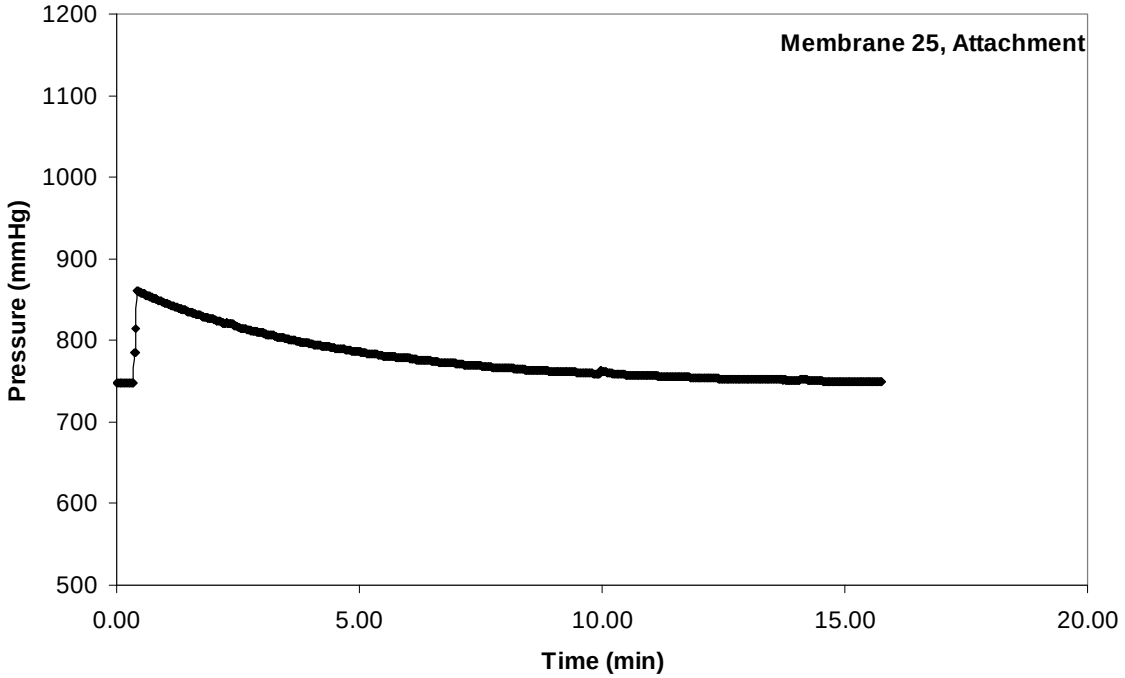
Membrane 23 was used at Ives 2 hyporheic from 4/12/2007 to 4/26/2007 with MiniSonde 42970.



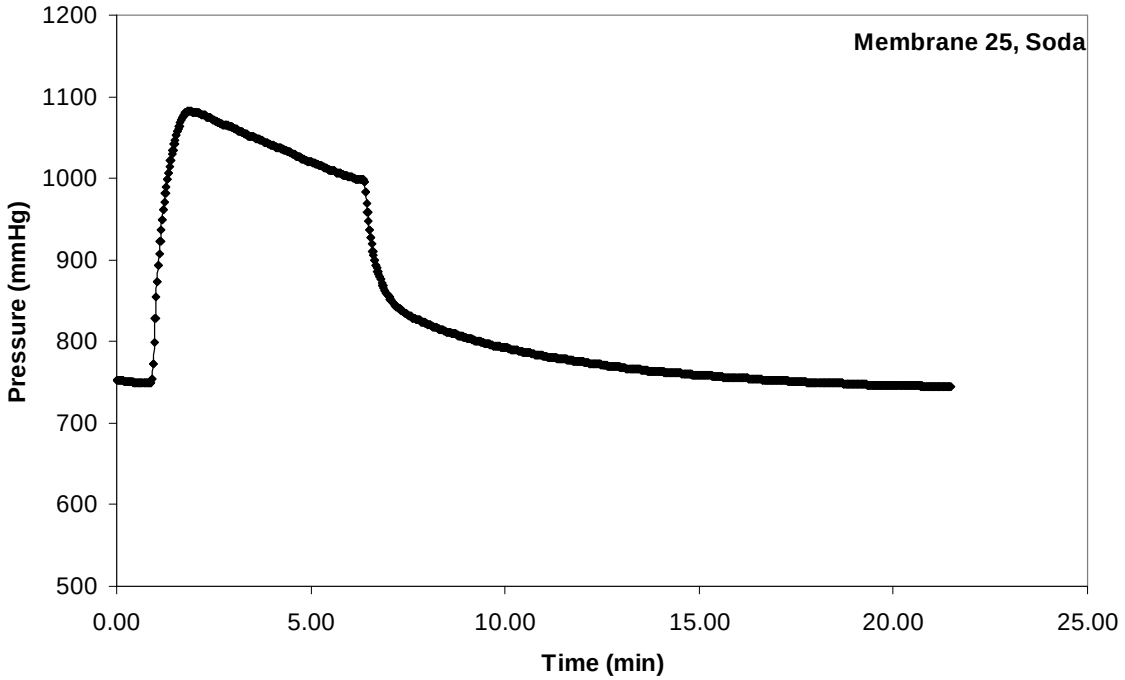


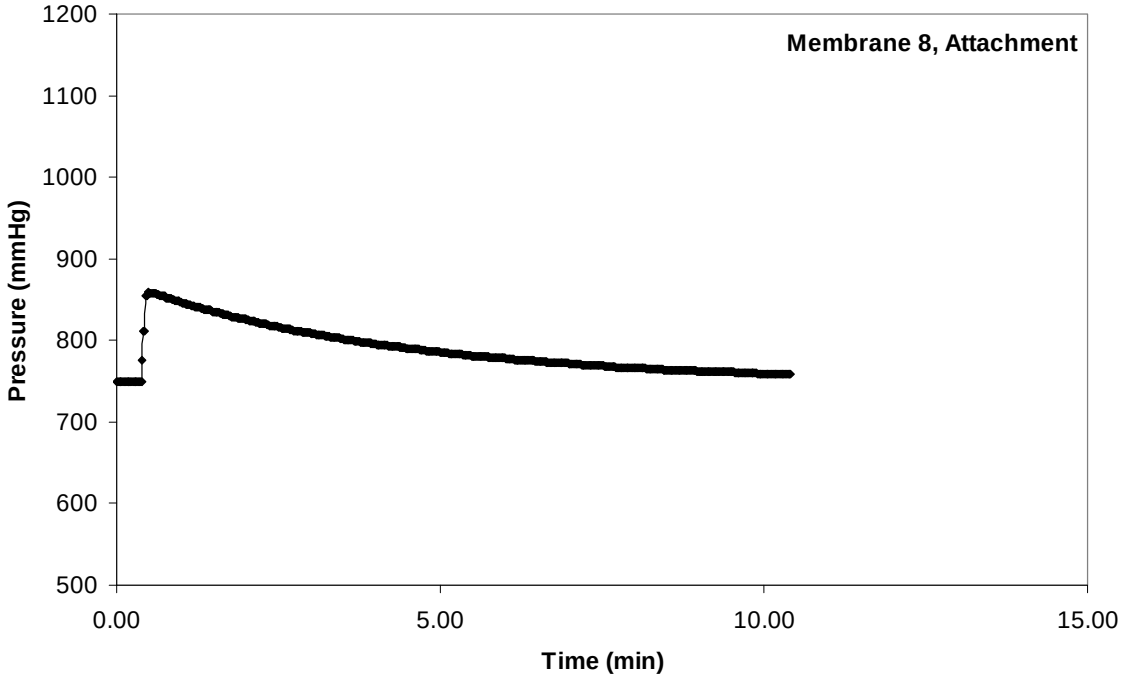
Membrane 24 was used at Ives 5 river from 4/12/2007 to 4/26/2007 with MiniSonde 44945.



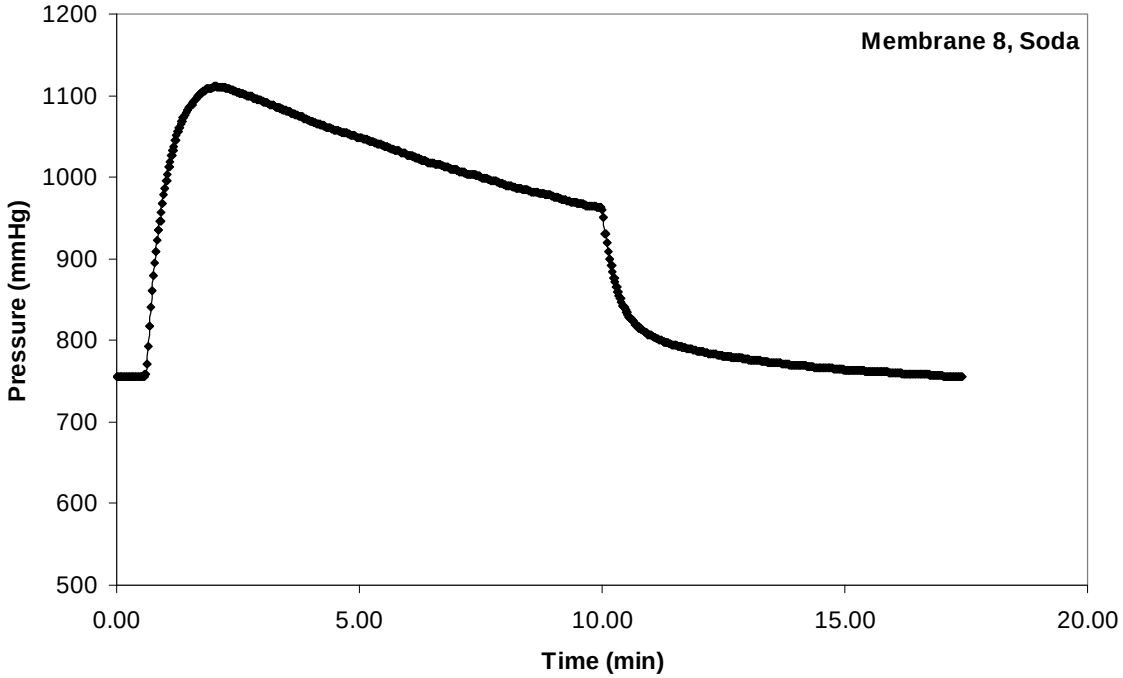


Membrane 25 was used at Multnomah Falls 1 hyporheic from 4/13/2007 to 4/27/2007 with MiniSonde 44947.

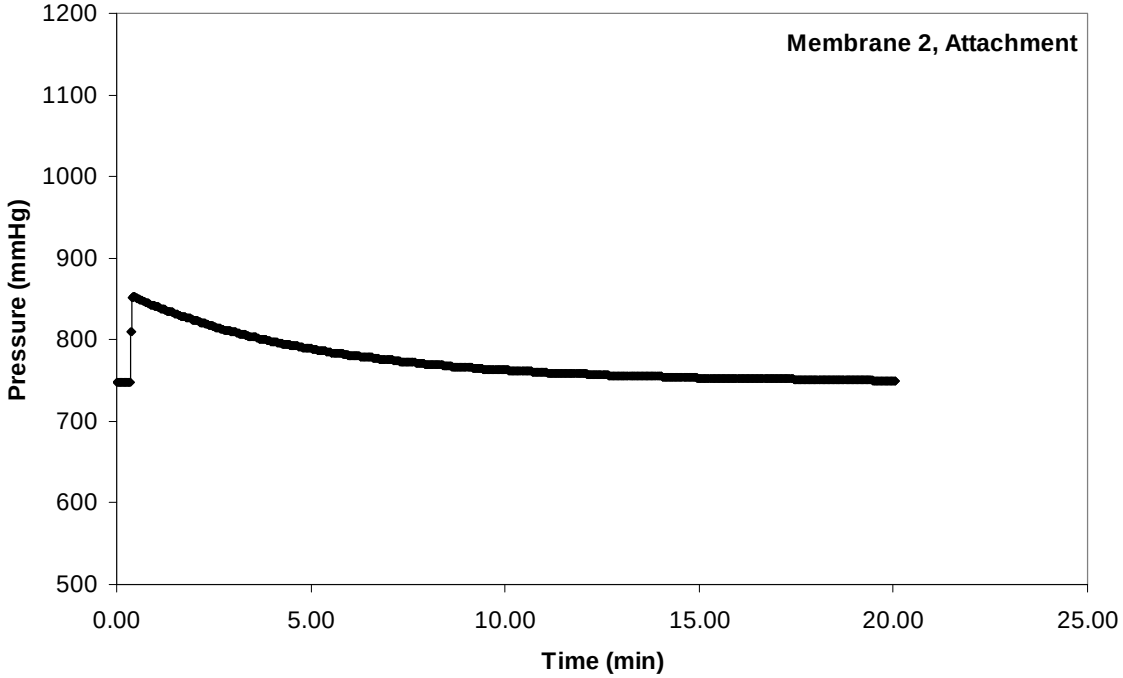




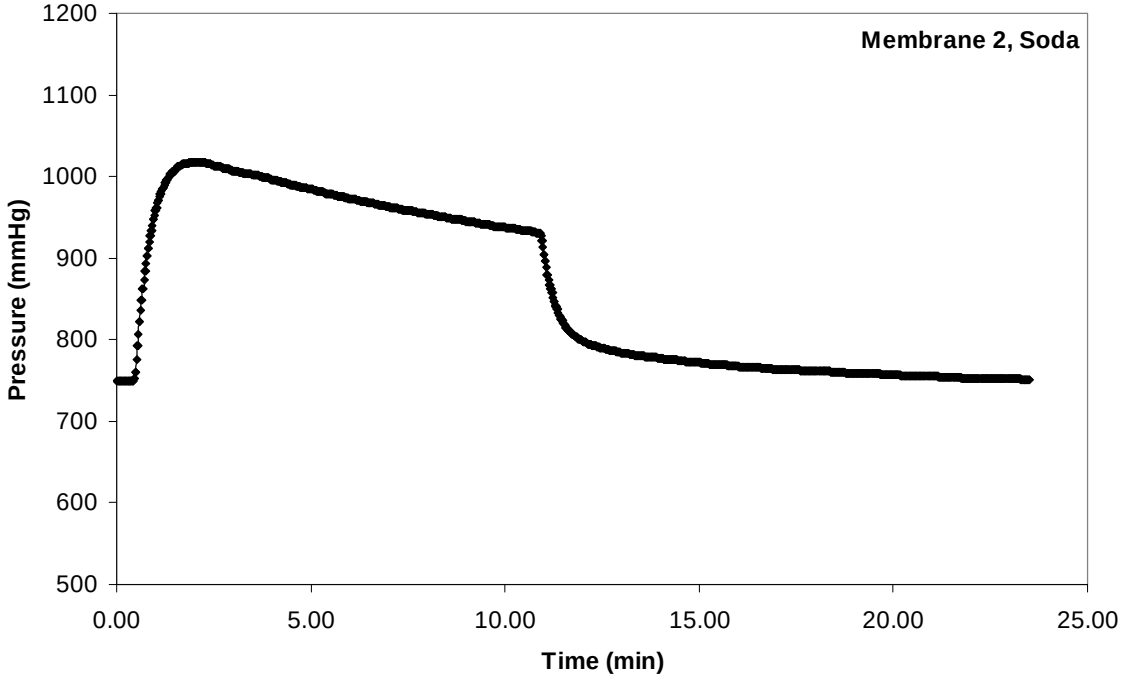
Membrane 8 was used as the control for the side-by-side after deployment 3 with MiniSonde 43655.

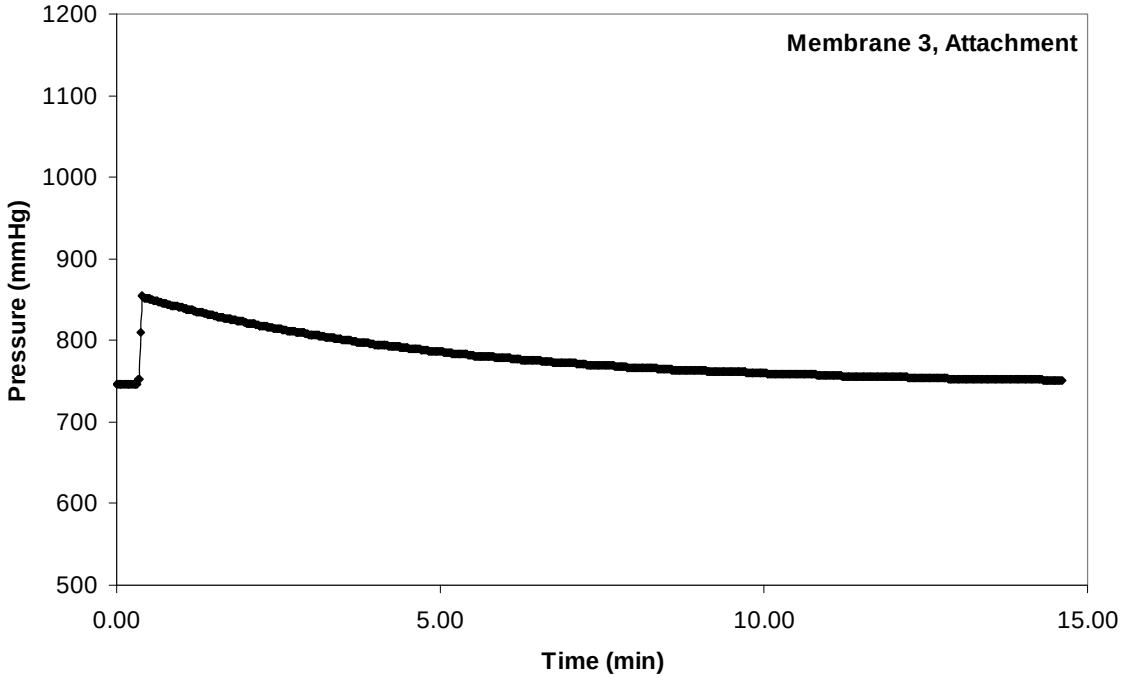


Post-Deployment 4

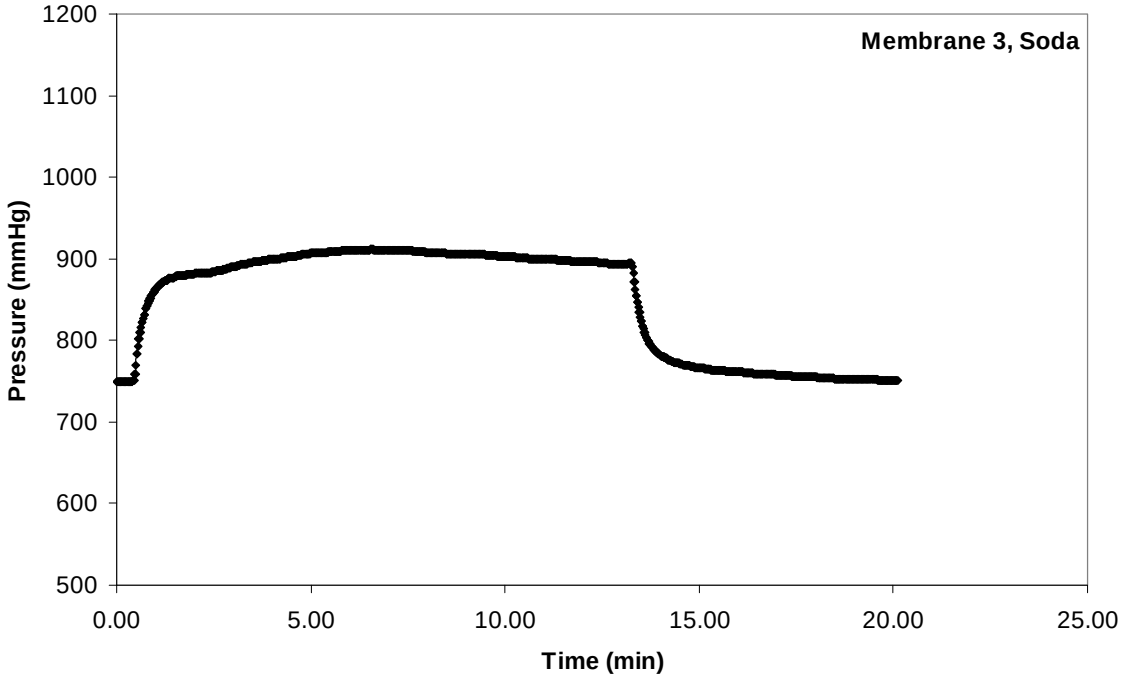


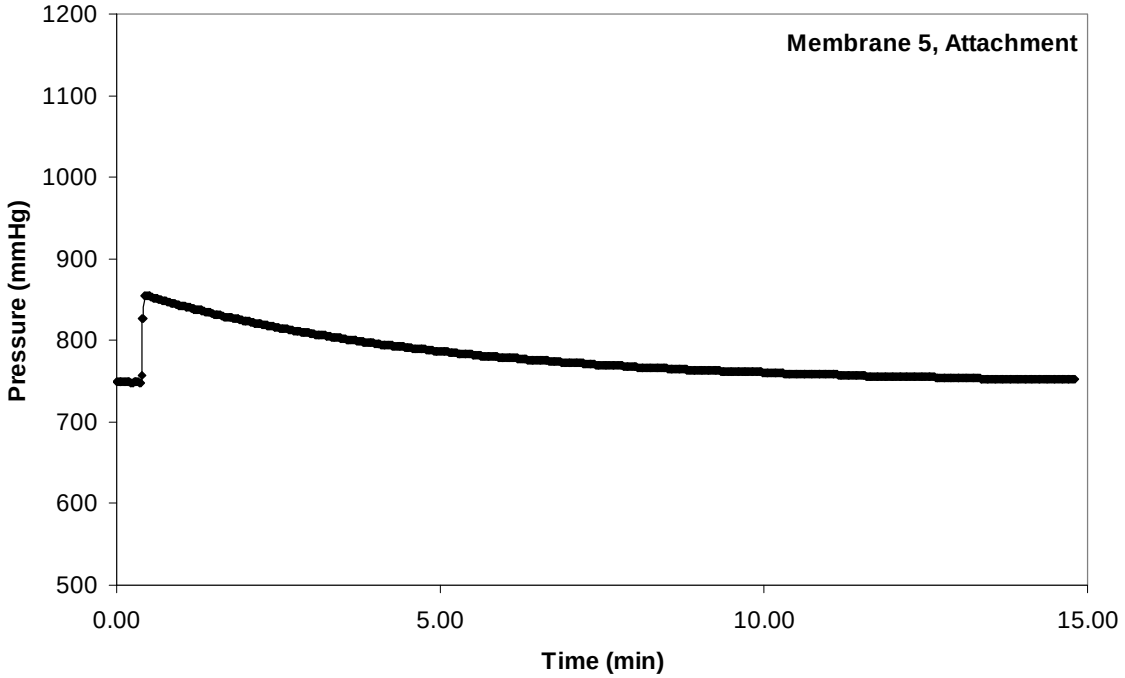
Membrane 2 was used at Ives 2 river from 4/26/2007 to 5/10/2007 with MiniSonde 44927.



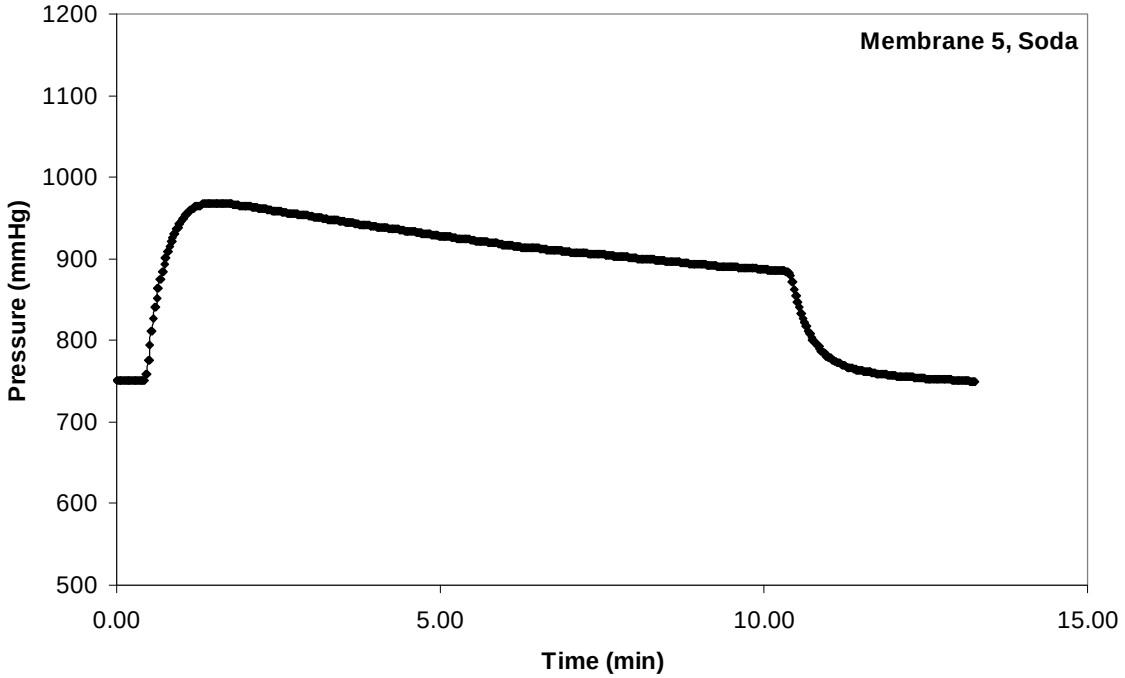


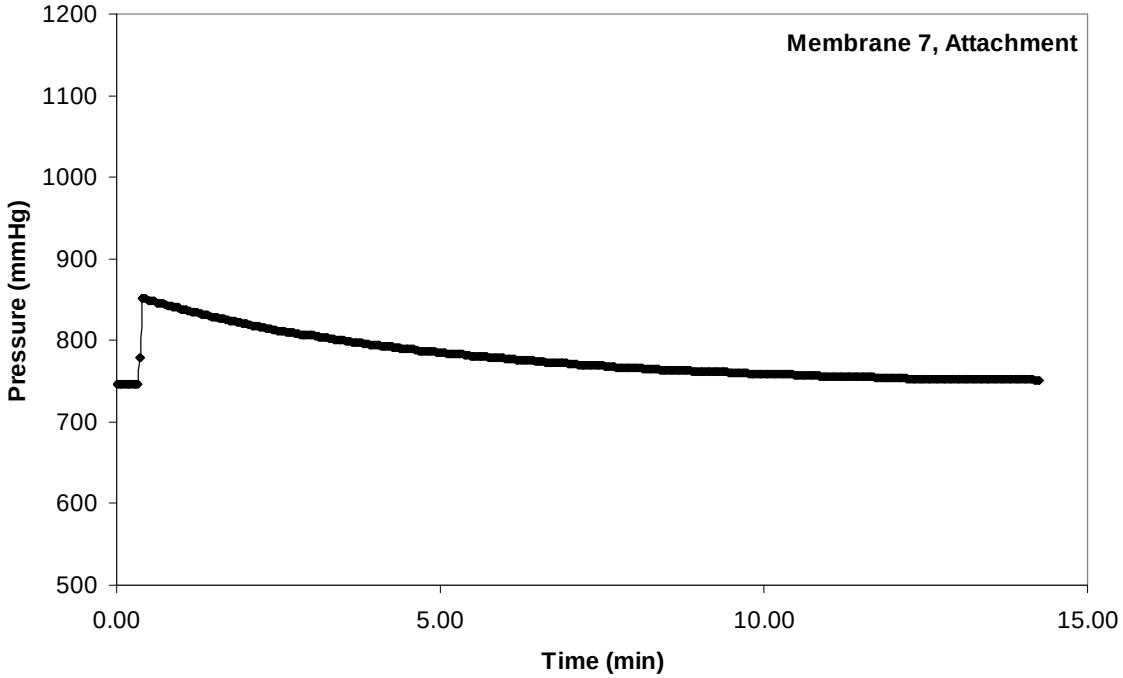
Membrane 3 was used at Multnomah Falls 1 river from 4/27/2007 to 5/11/2007 with MiniSonde 43659.



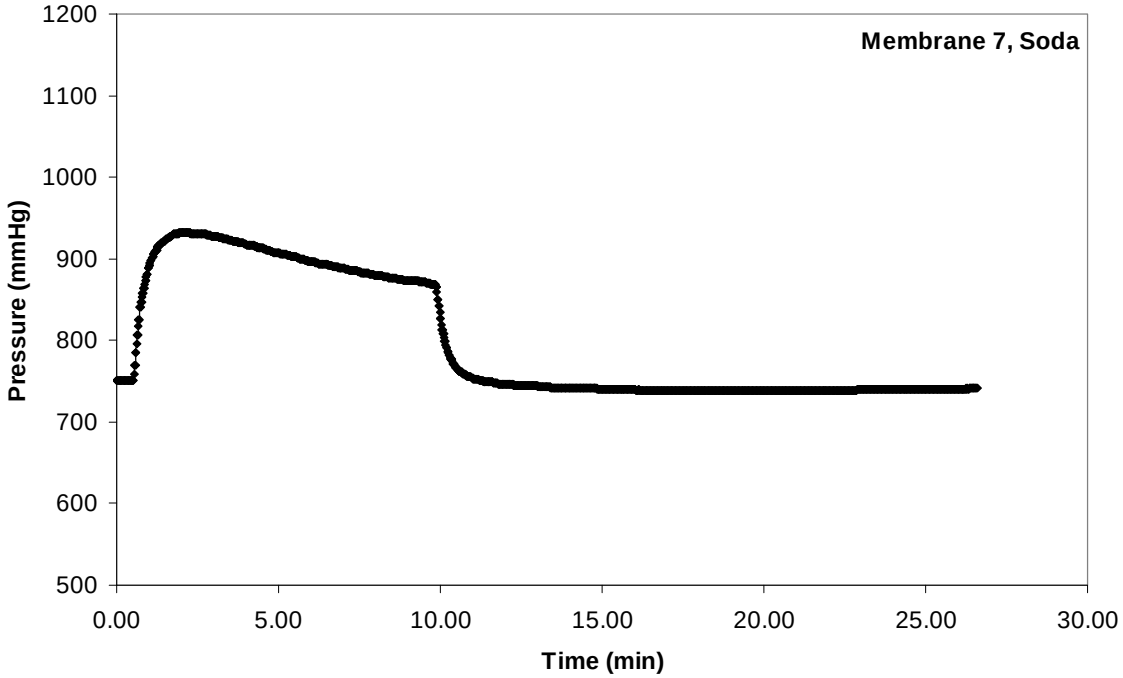


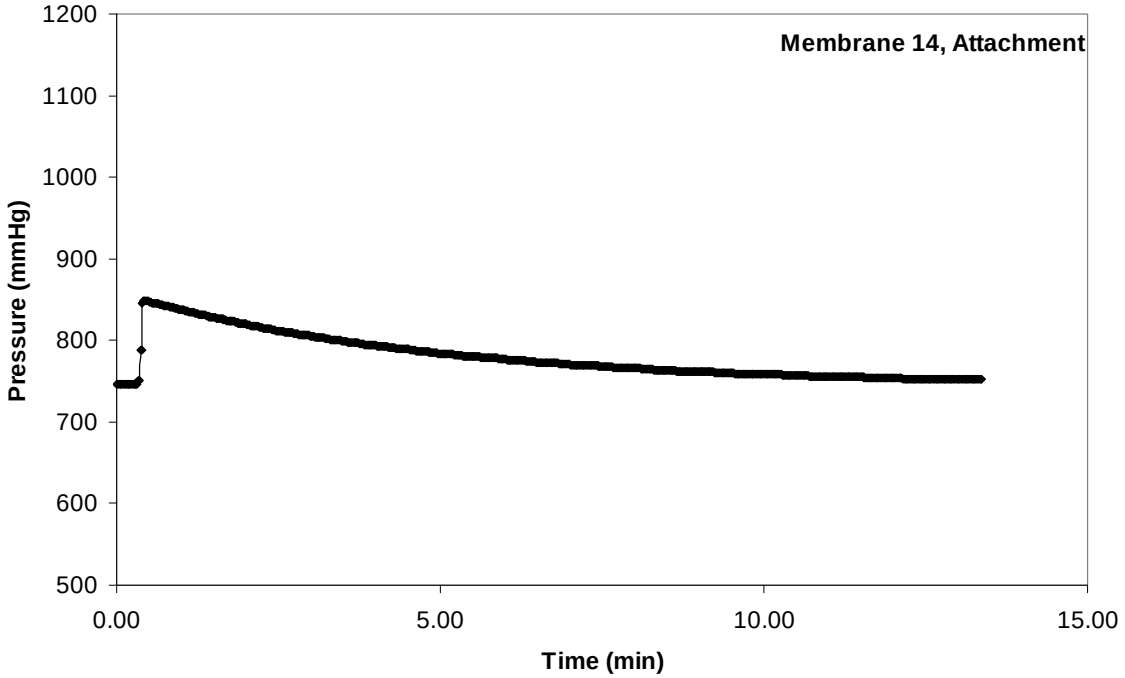
Membrane 5 was used at Multnomah Falls 3 river from 4/27/2007 to 5/11/2007 with MiniSonde 43656.



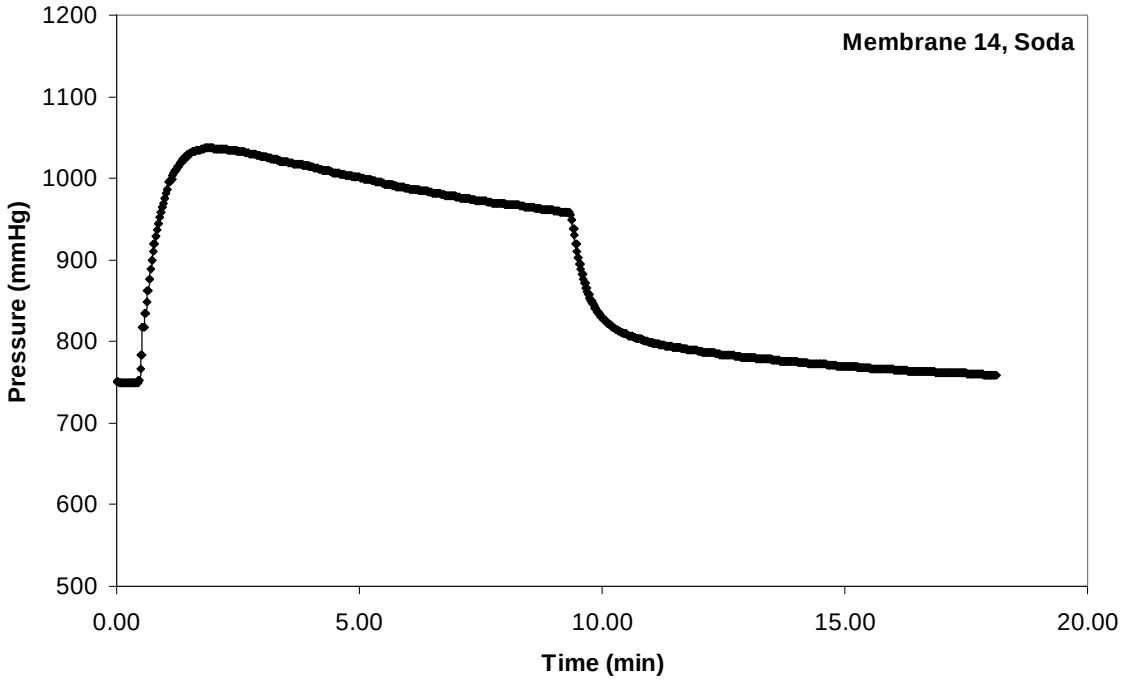


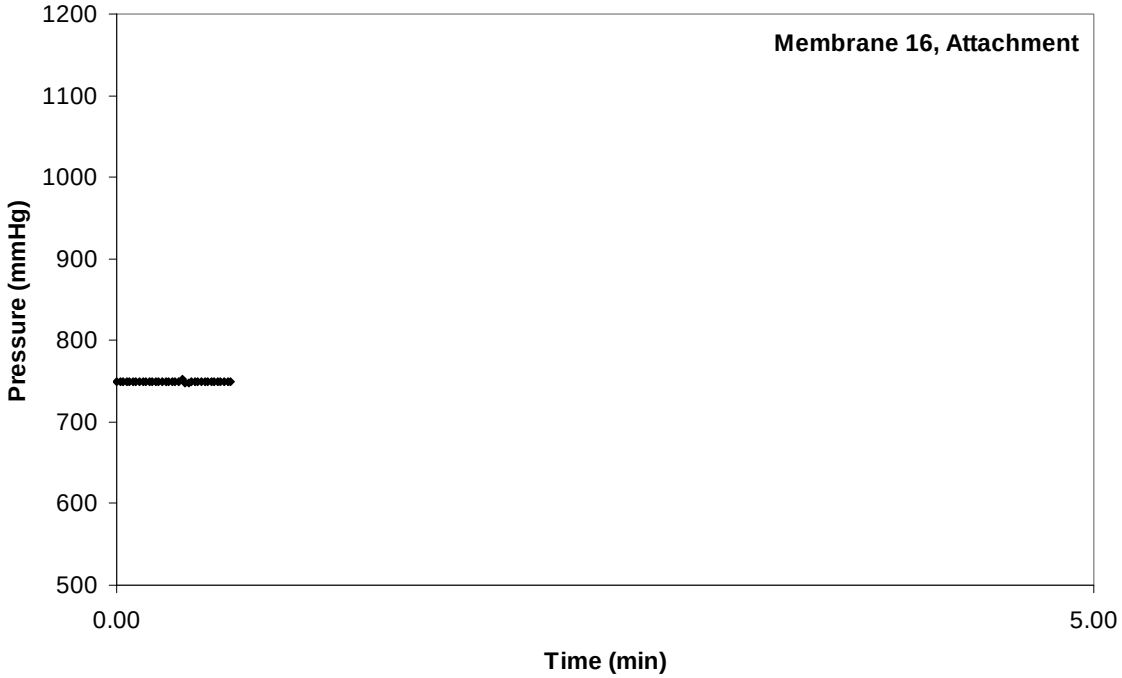
Membrane 7 was used at Ives 1 river from 4/26/2007 to 5/10/2007 with MiniSonde 44946.



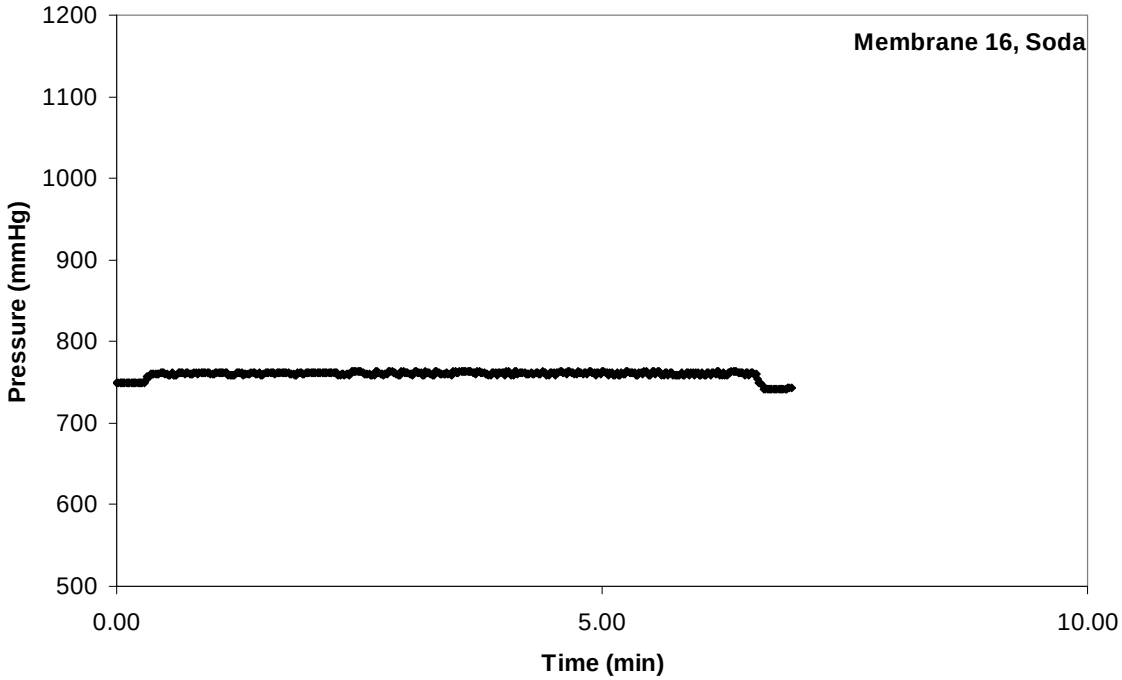


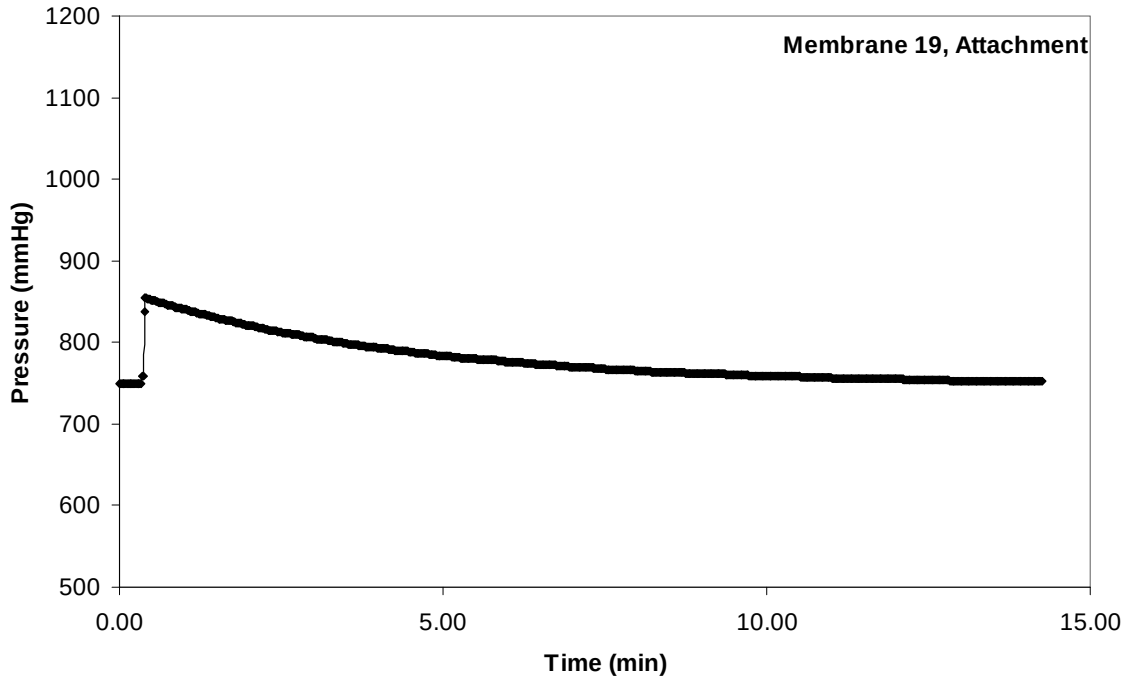
Membrane 14 was used at Multnomah Falls 1 hyporheic from 4/27/2007 to 5/11/2007 with MiniSonde 44947.



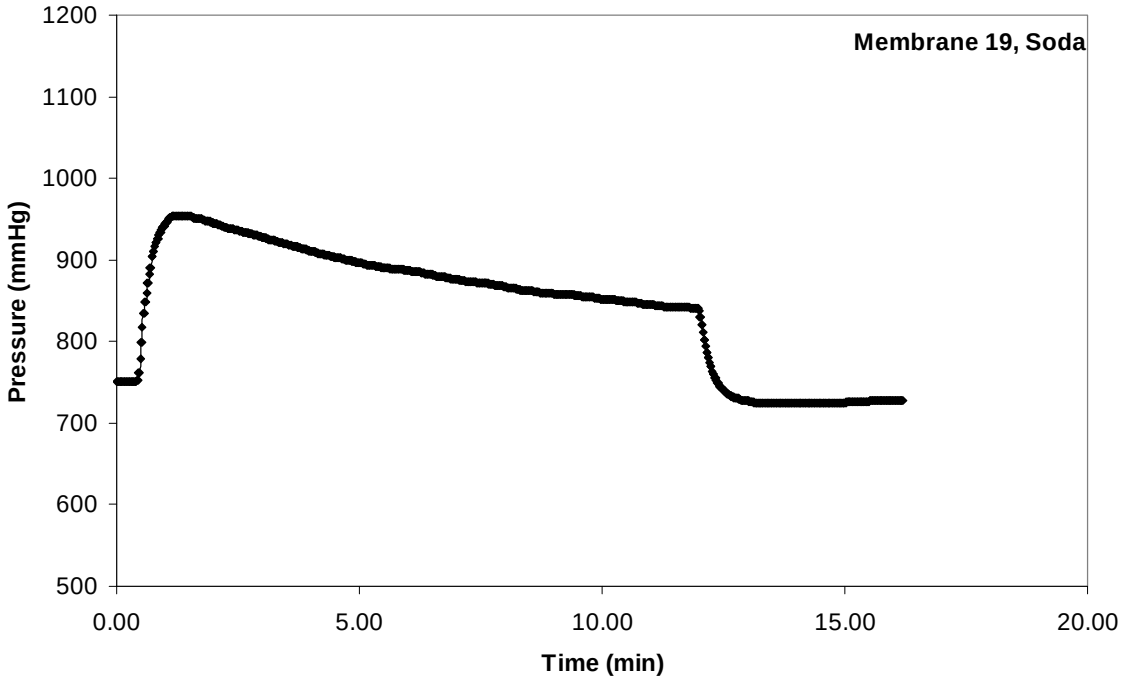


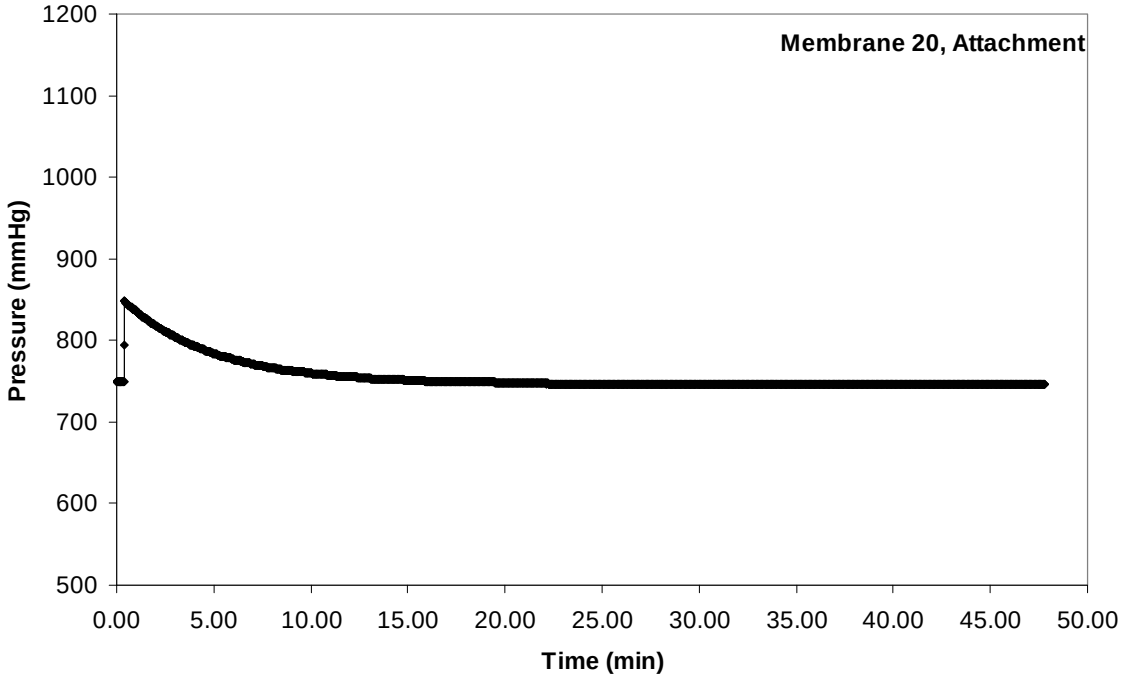
Membrane 16 was used at Ives 3 river from 4/26/2007 to 5/10/2007 with MiniSonde 44945. This membrane was found to be bad, and the data from this deployment were excluded from our analysis.



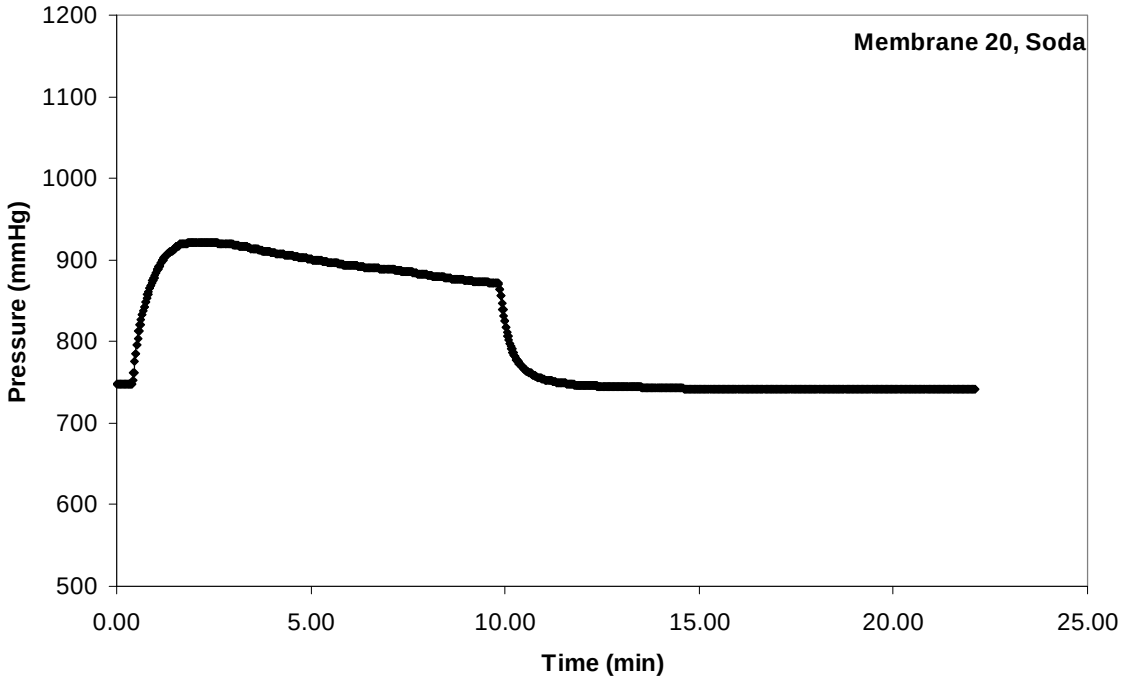


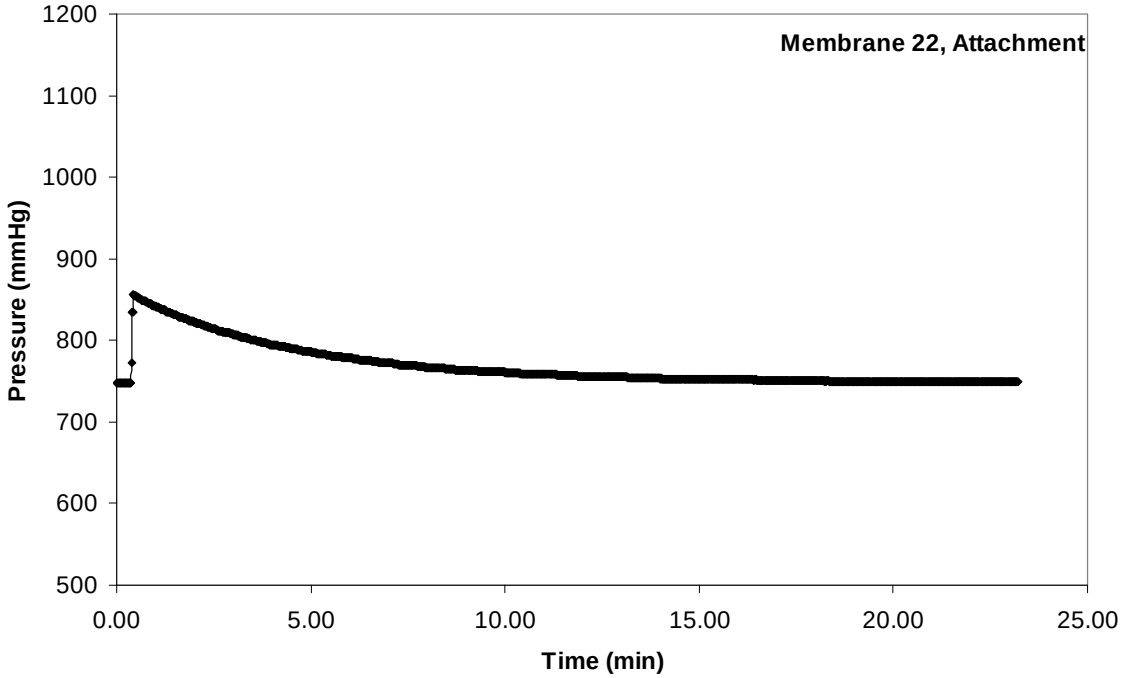
Membrane 19 was used at Multnomah Falls 3 hyporheic from 4/27/2007 to 5/11/2007 with MiniSonde 44948.



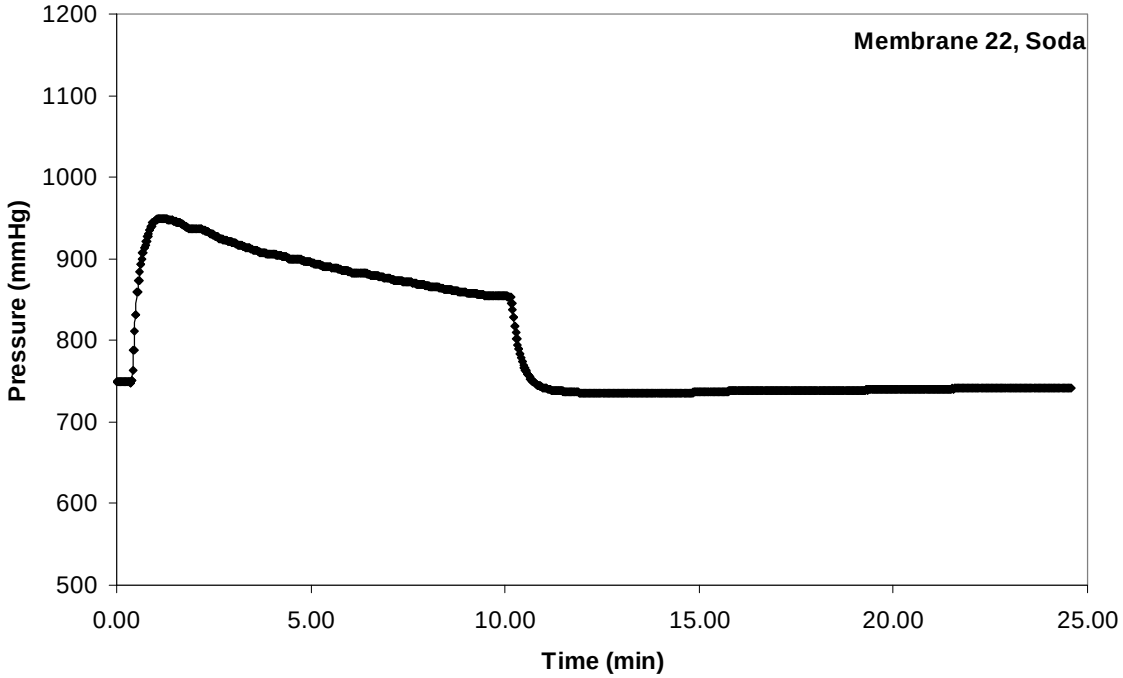


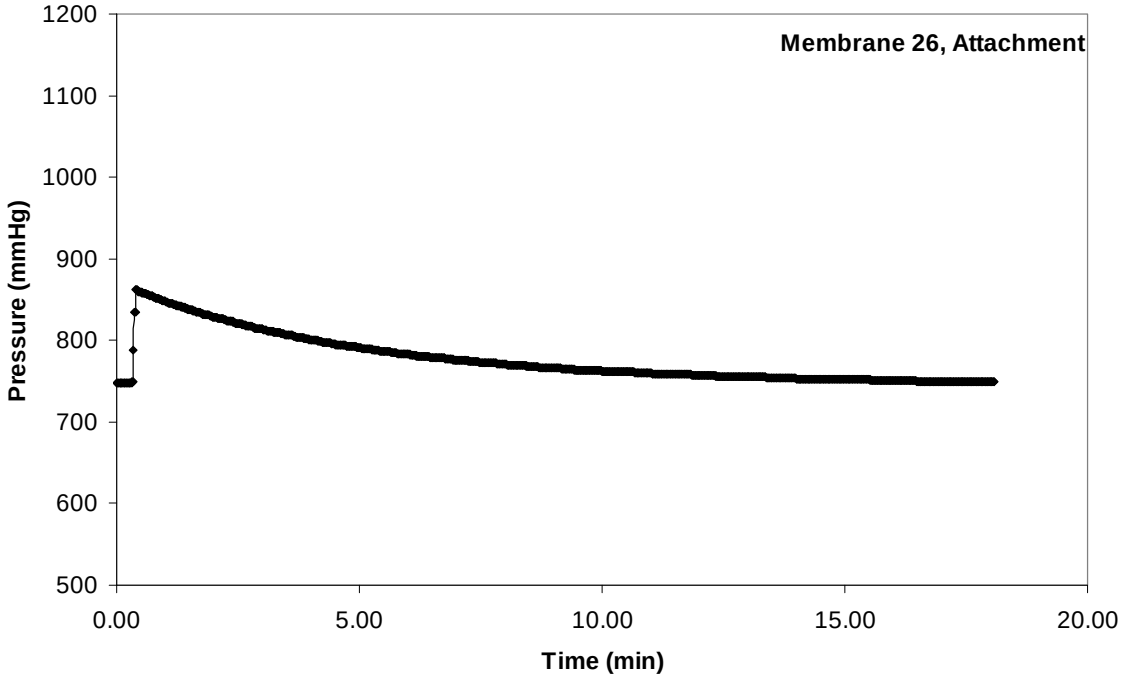
Membrane 20 was used at Ives 2 hyporheic from 4/26/2007 to 5/10/2007 with MiniSonde 42970. This membrane tested fine, but the side-by-side data were questionable so were excluded from our analysis.



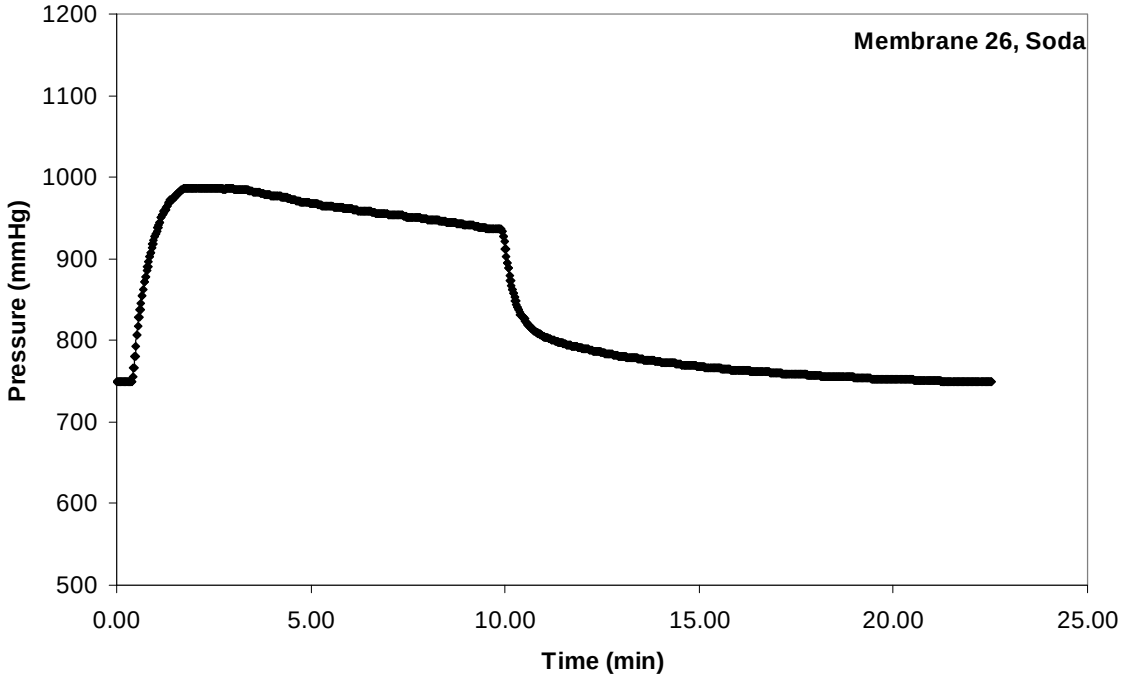


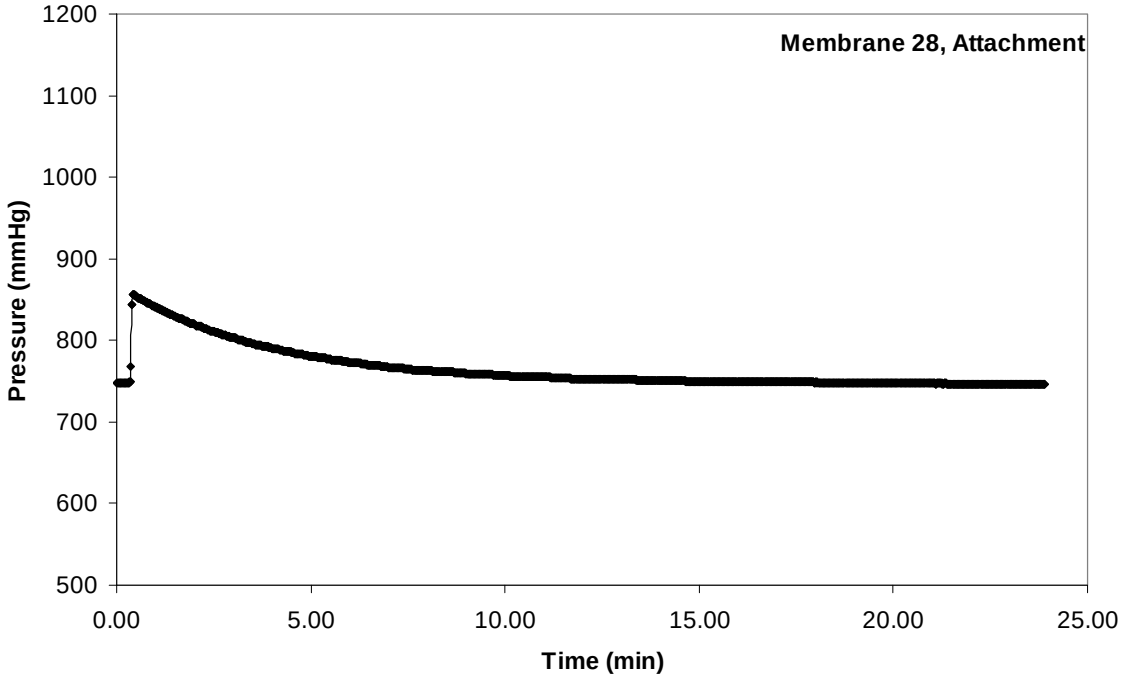
Membrane 22 was used at Ives 5 hyporheic from 4/26/2007 to 5/10/2007 with MiniSonde 43654.



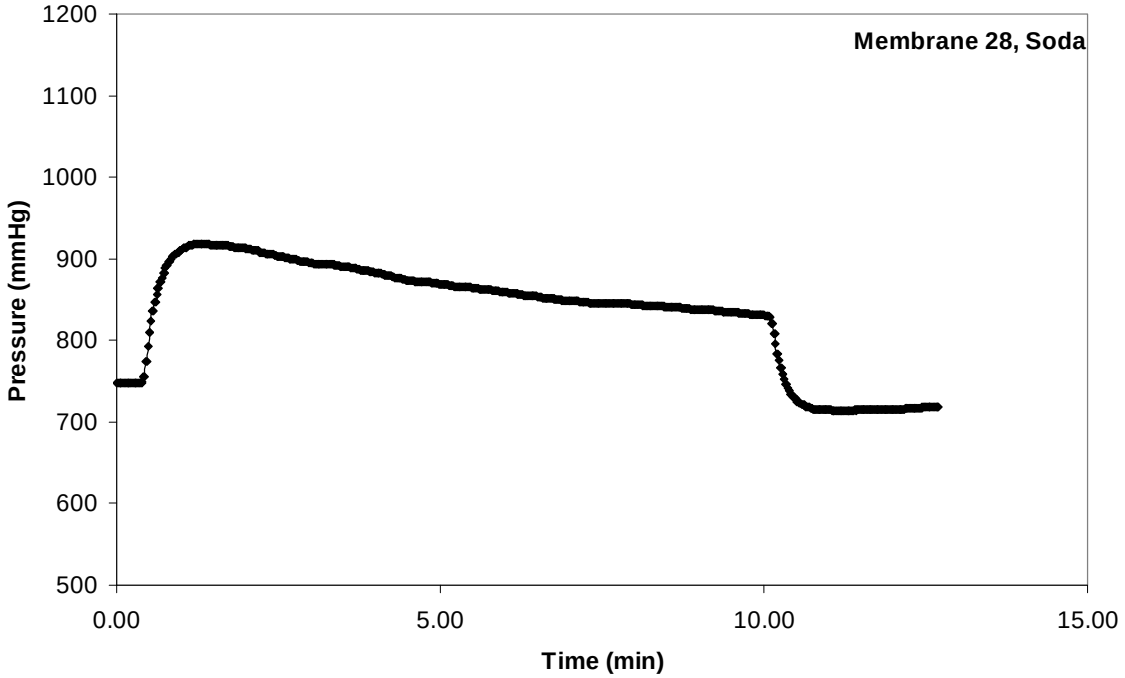


Membrane 26 was used at Ives 1 hyporheic from 4/26/2007 to 5/10/2007 with MiniSonde 43639.

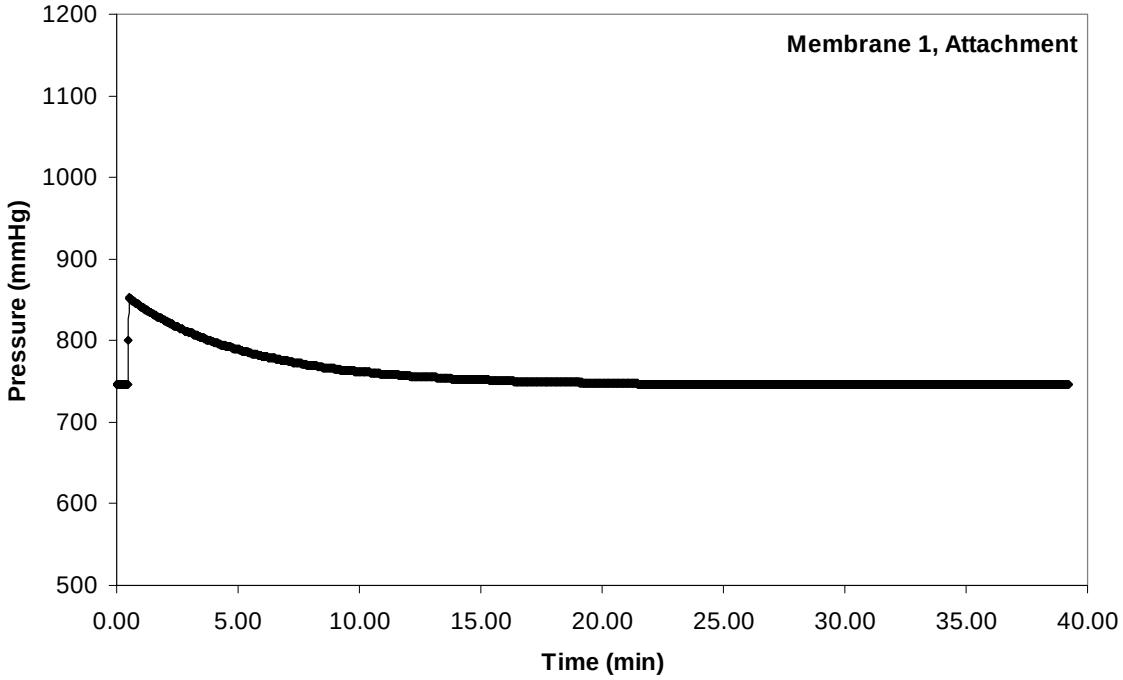




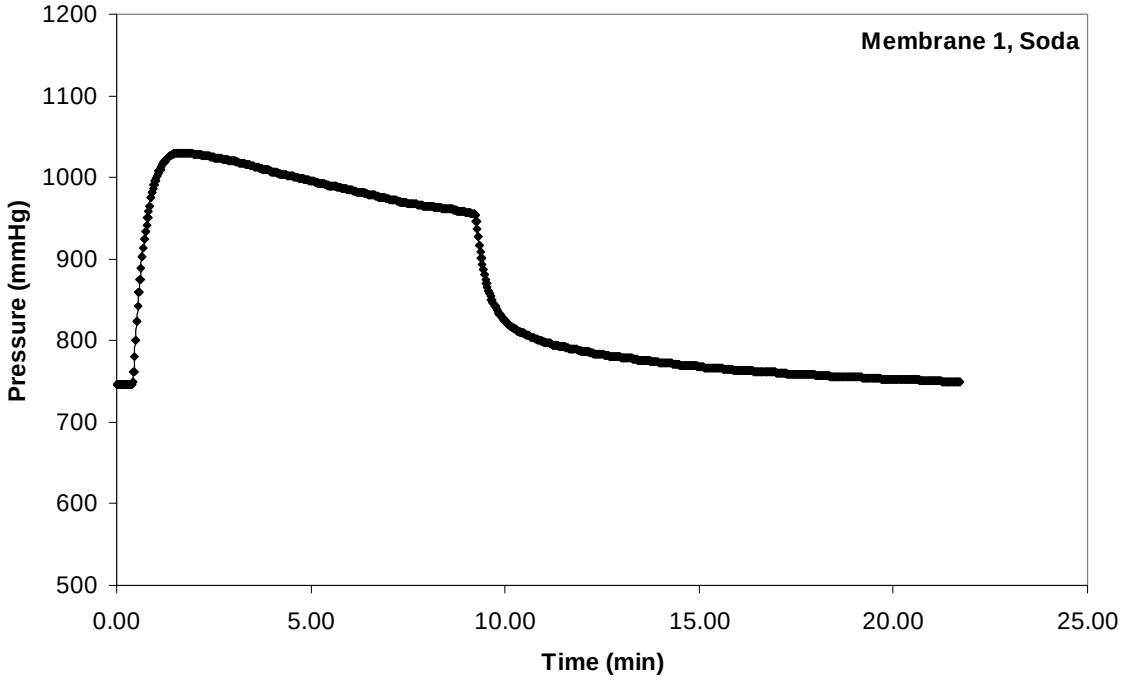
Membrane 28 was used as the control for the side-by-side after deployment 4 with MiniSonde 44283.

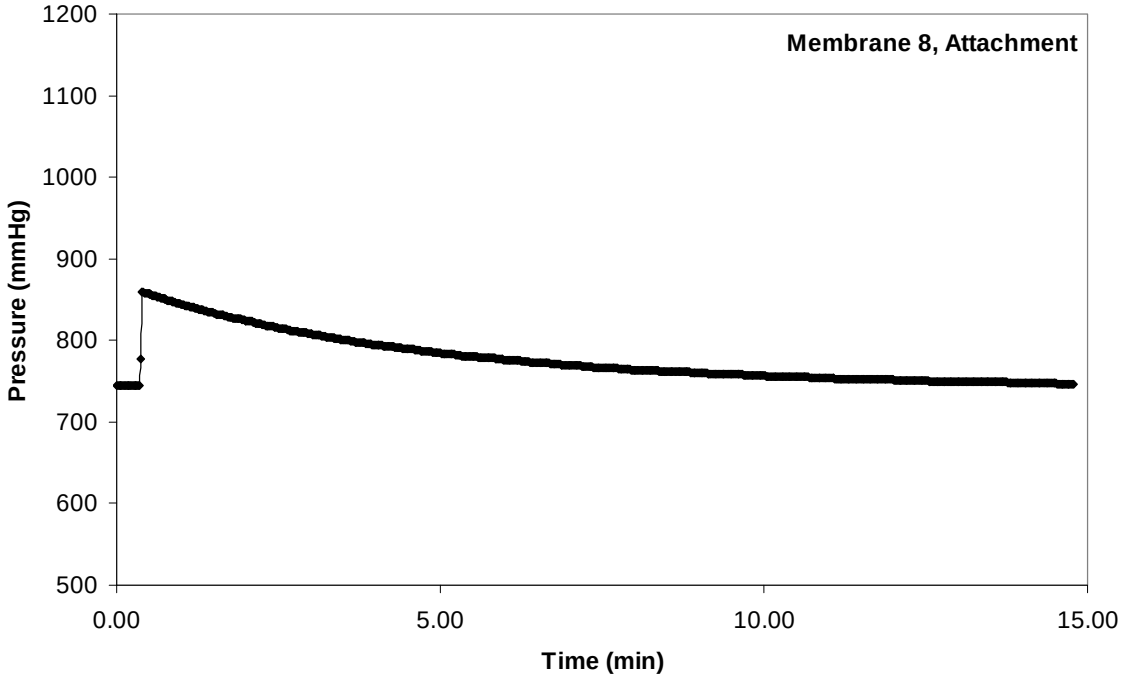


Post-Deployment 5

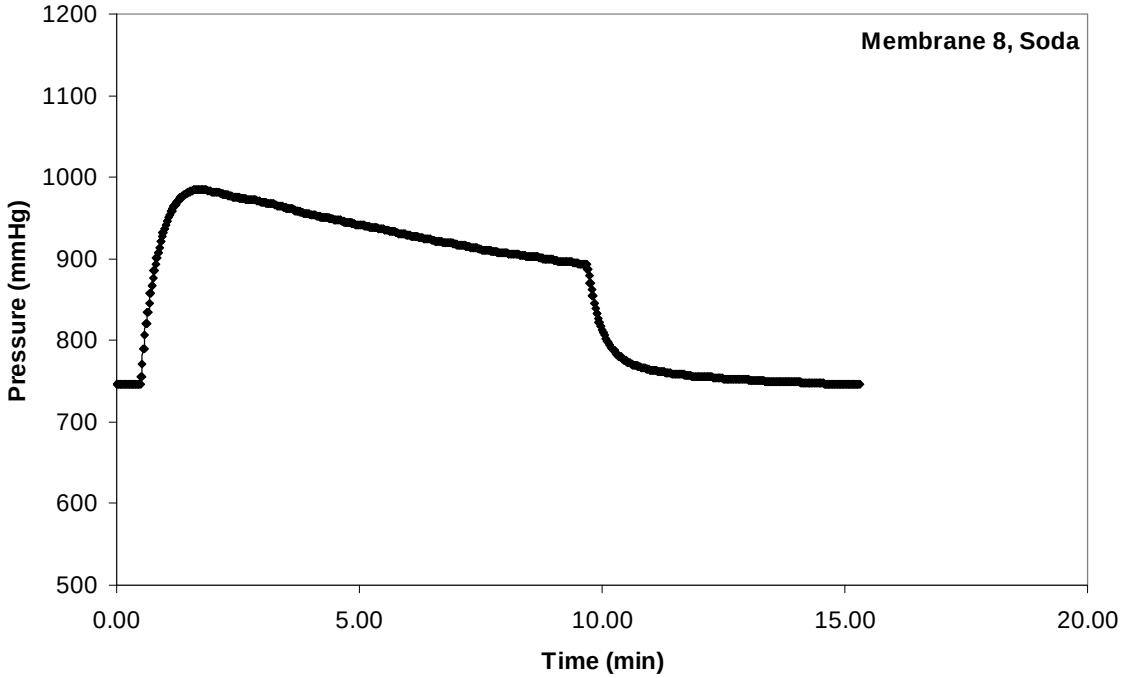


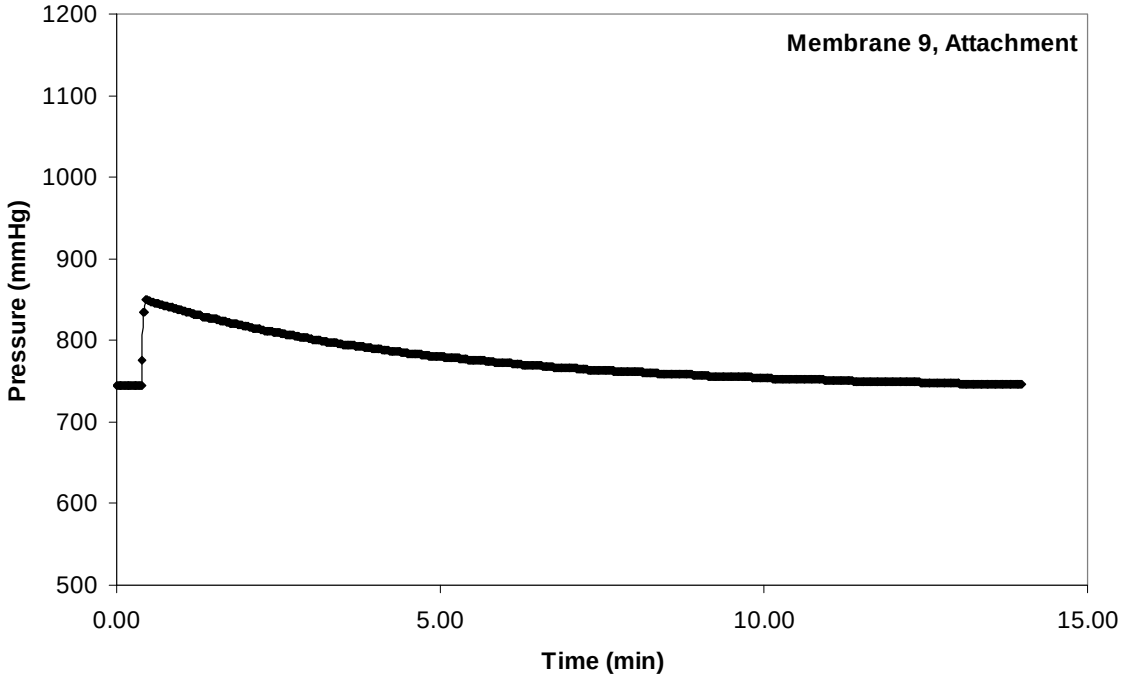
Membrane 1 was used at Multnomah Falls 3 river from 5/11/2007 to 5/25/2007 with MiniSonde 43656.



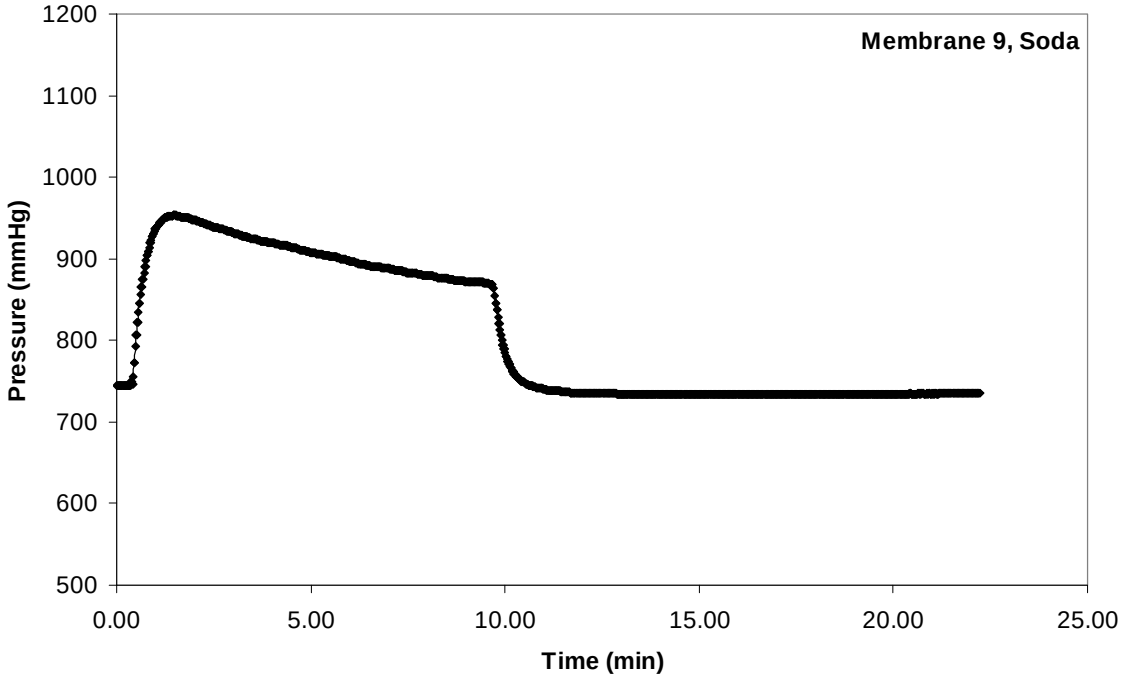


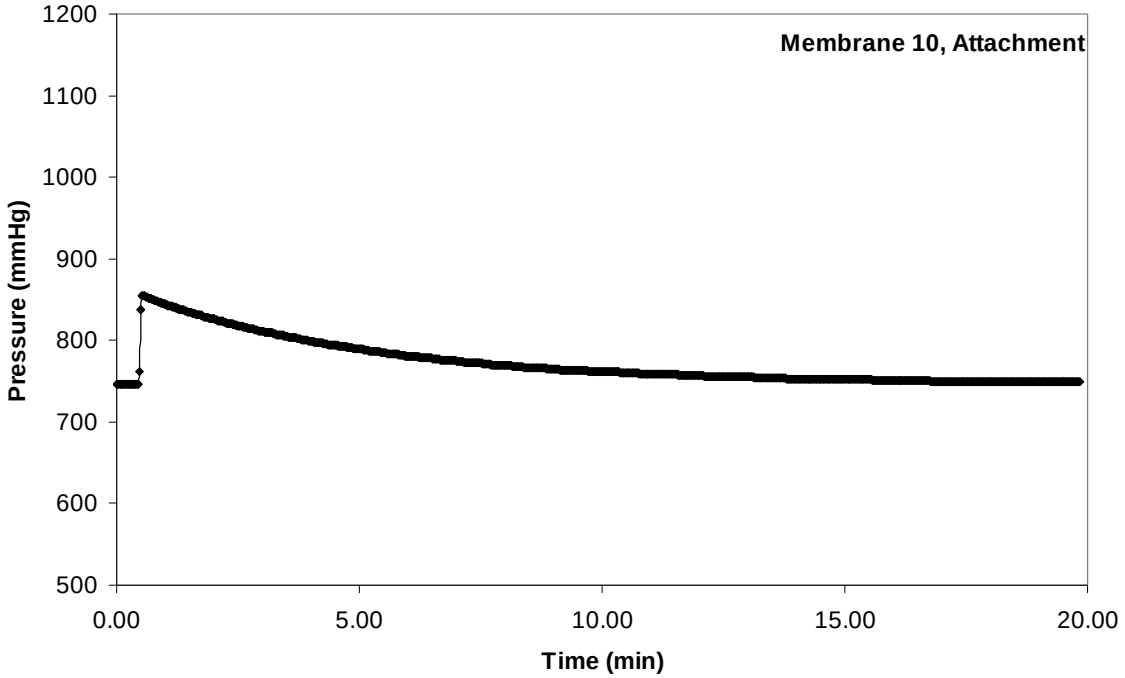
Membrane 8 was used at Ives 1 hyporheic from 5/10/2007 to 5/24/2007 with MiniSonde 43639.



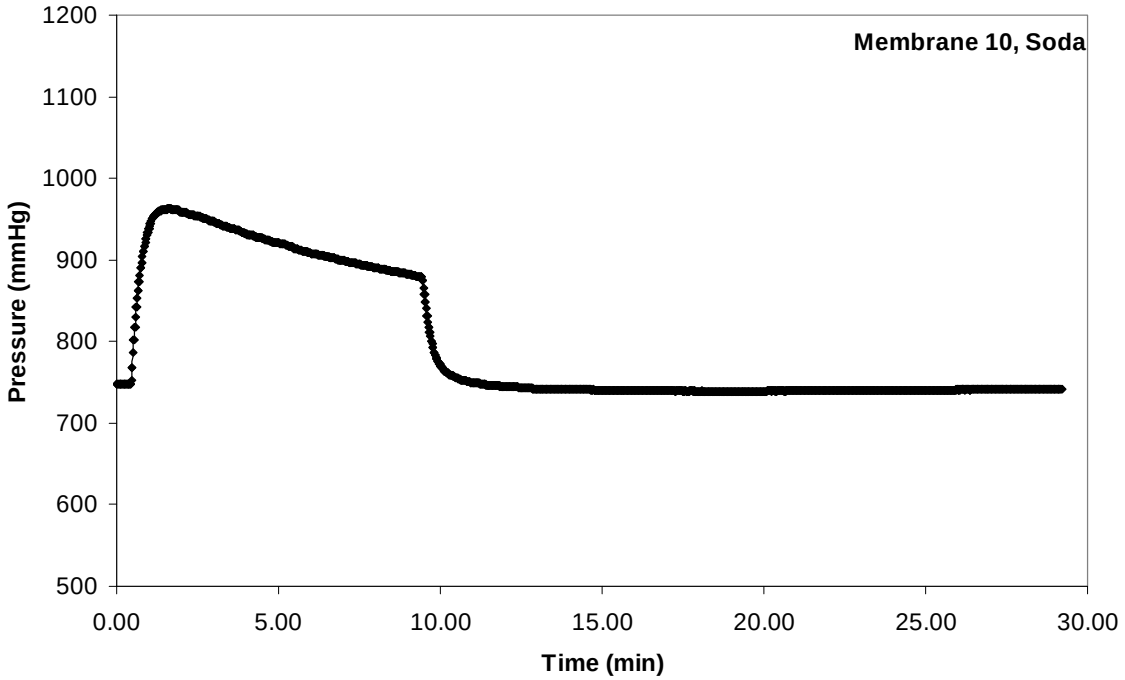


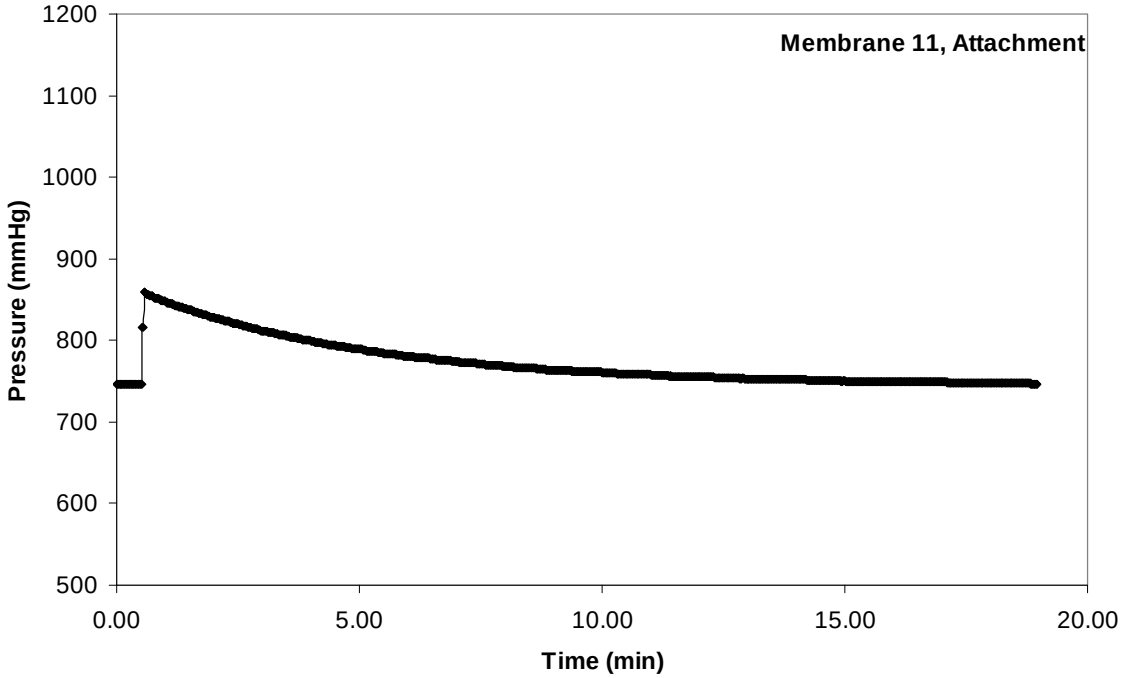
Membrane 9 was used at Ives 3 river from 5/10/2007 to 5/24/2007 with MiniSonde 44945.



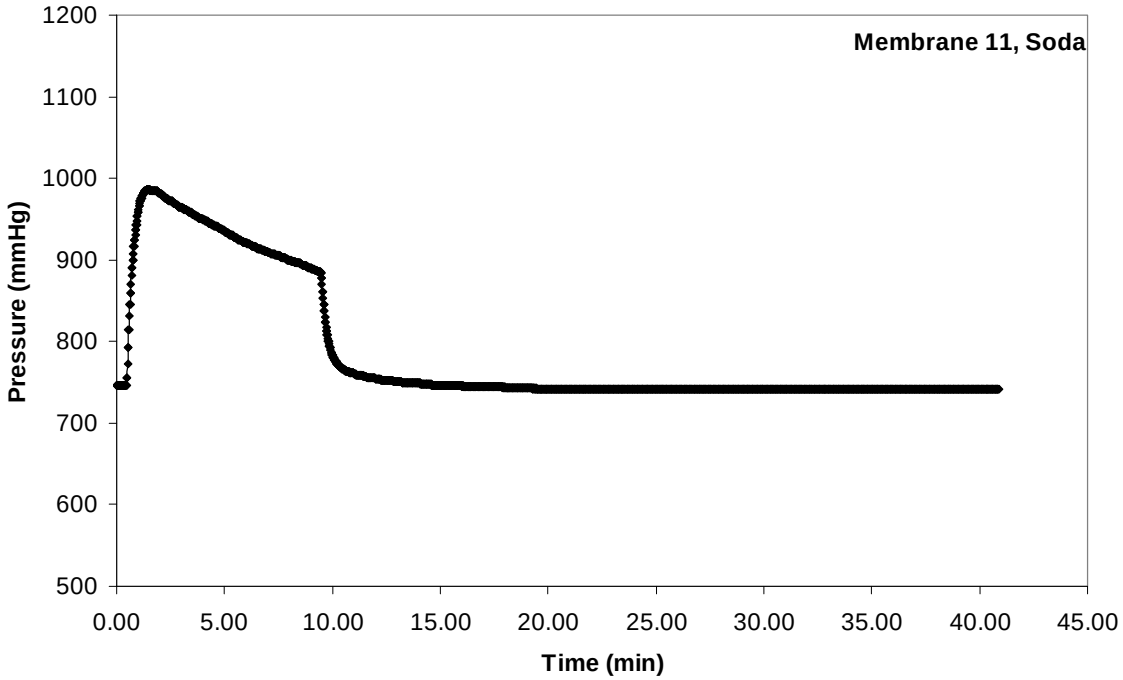


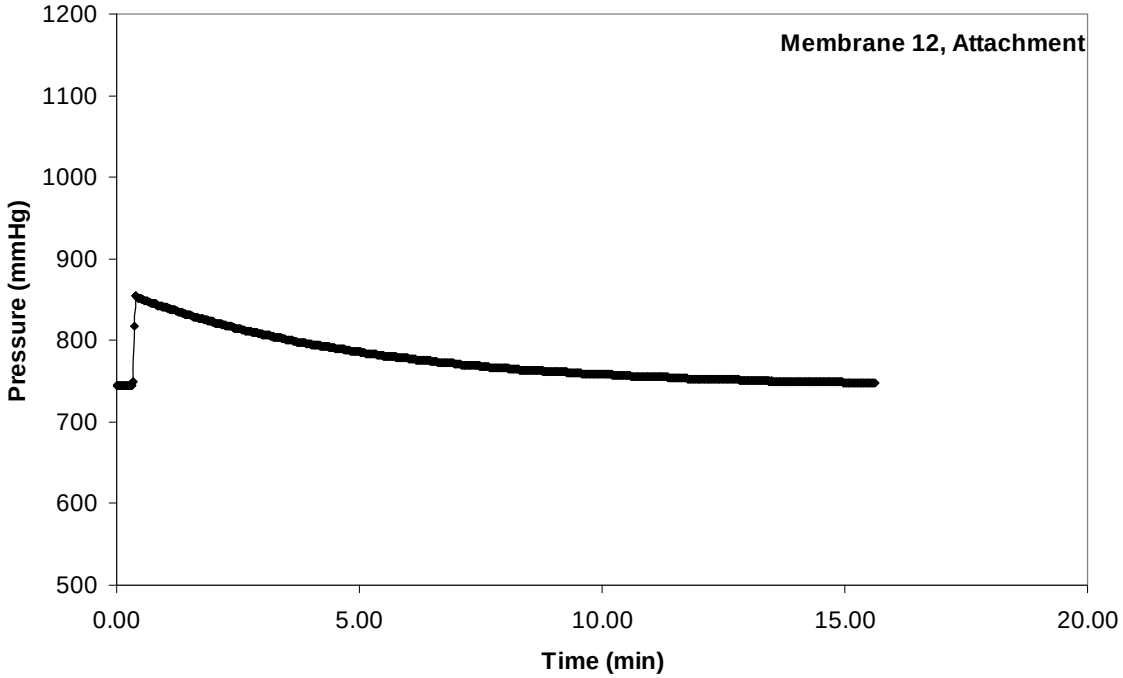
Membrane 10 was used at Multnomah Falls 1 hyporheic from 5/11/2007 to 5/25/2007 with MiniSonde 44947.



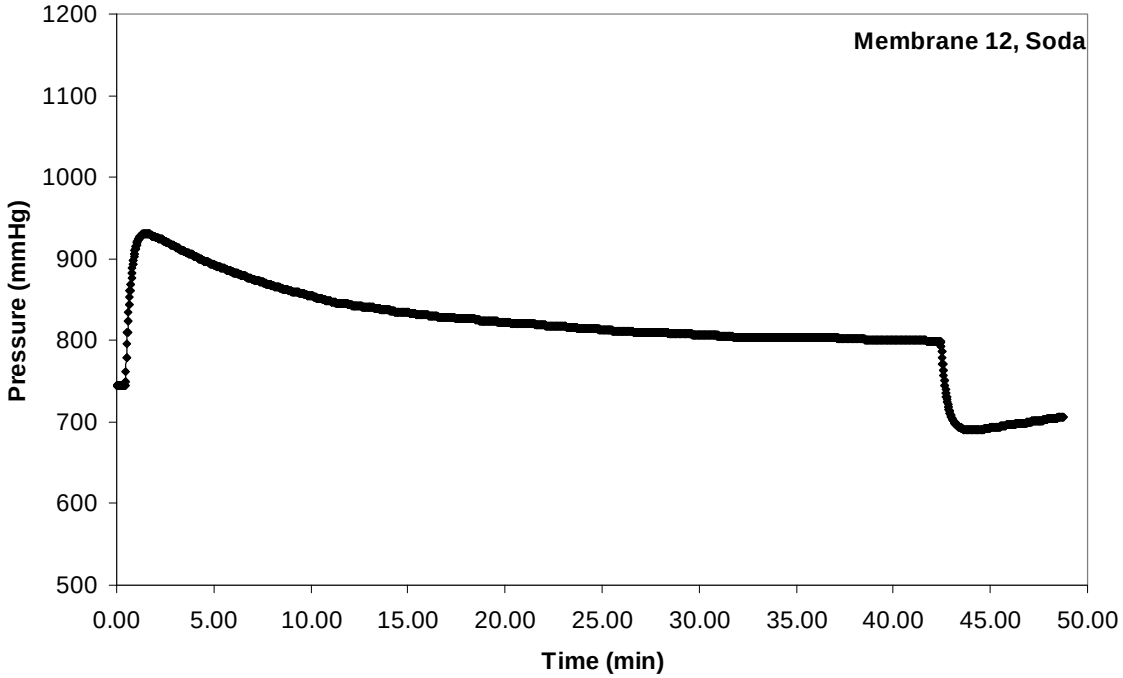


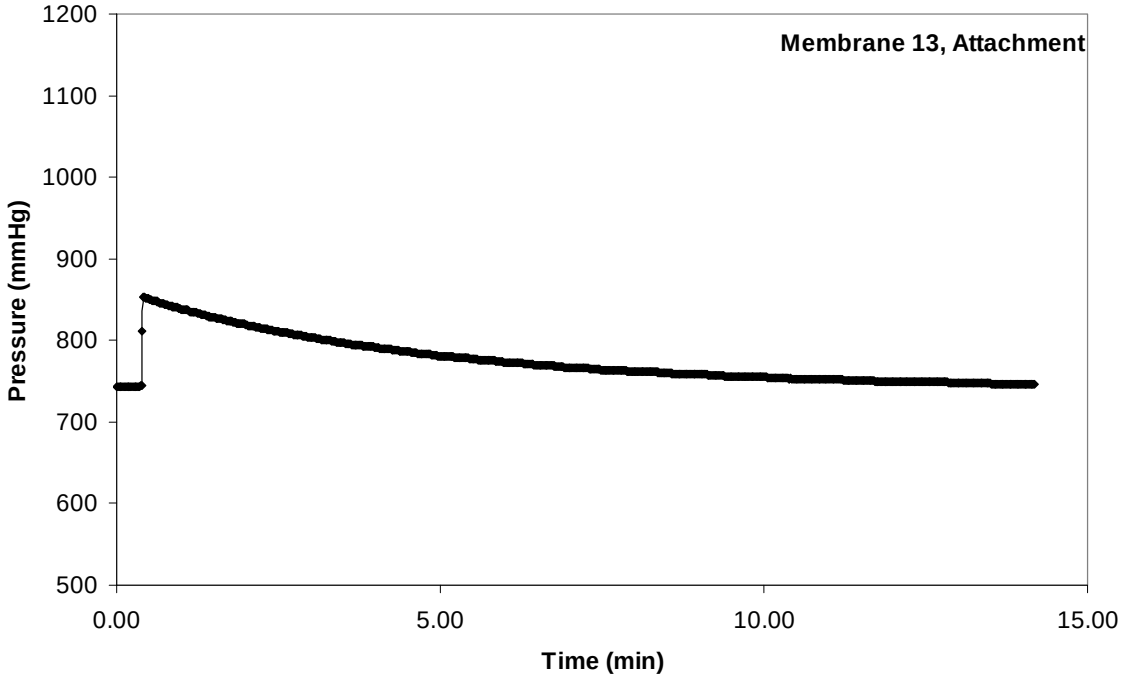
Membrane 11 was used at Multnomah Falls 3 hyporheic from 5/11/2007 to 5/25/2007 with MiniSonde 44948.



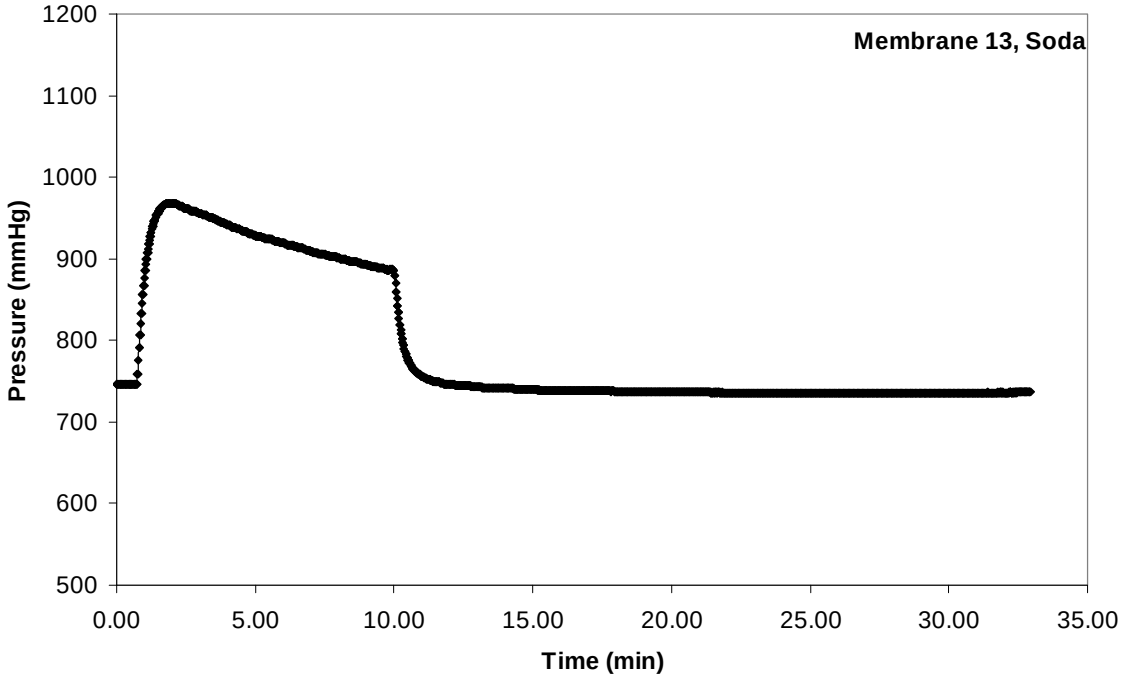


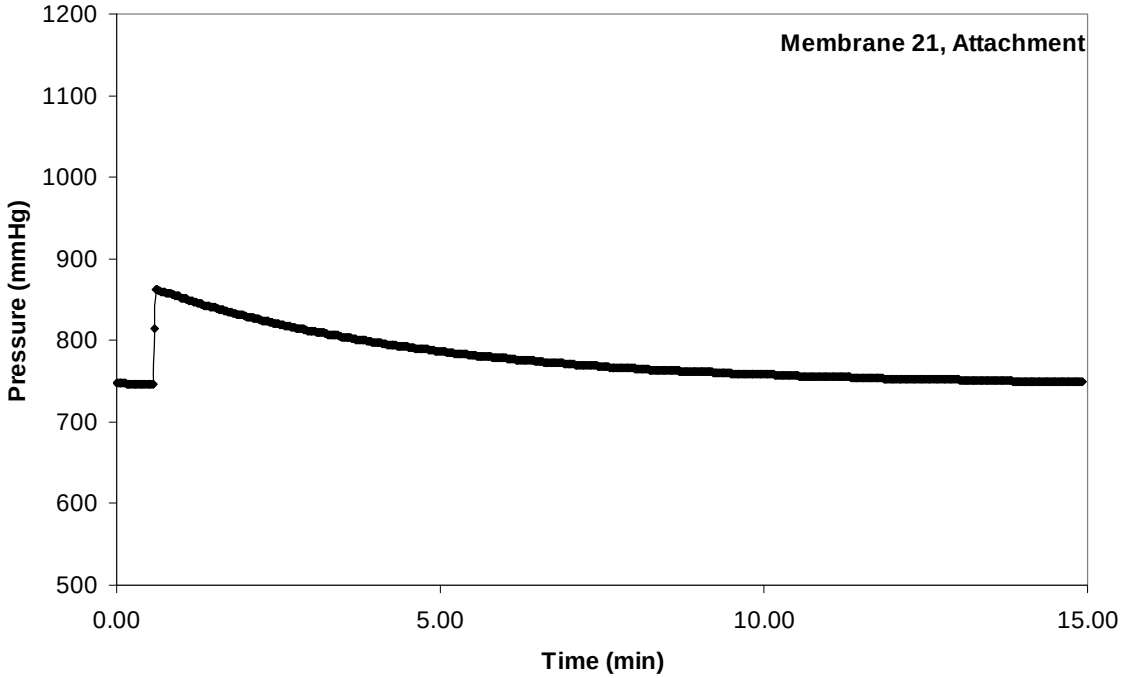
Membrane 12 was used at Ives 3 hyporheic from 5/10/2007 to 5/24/2007 with MiniSonde 43654.



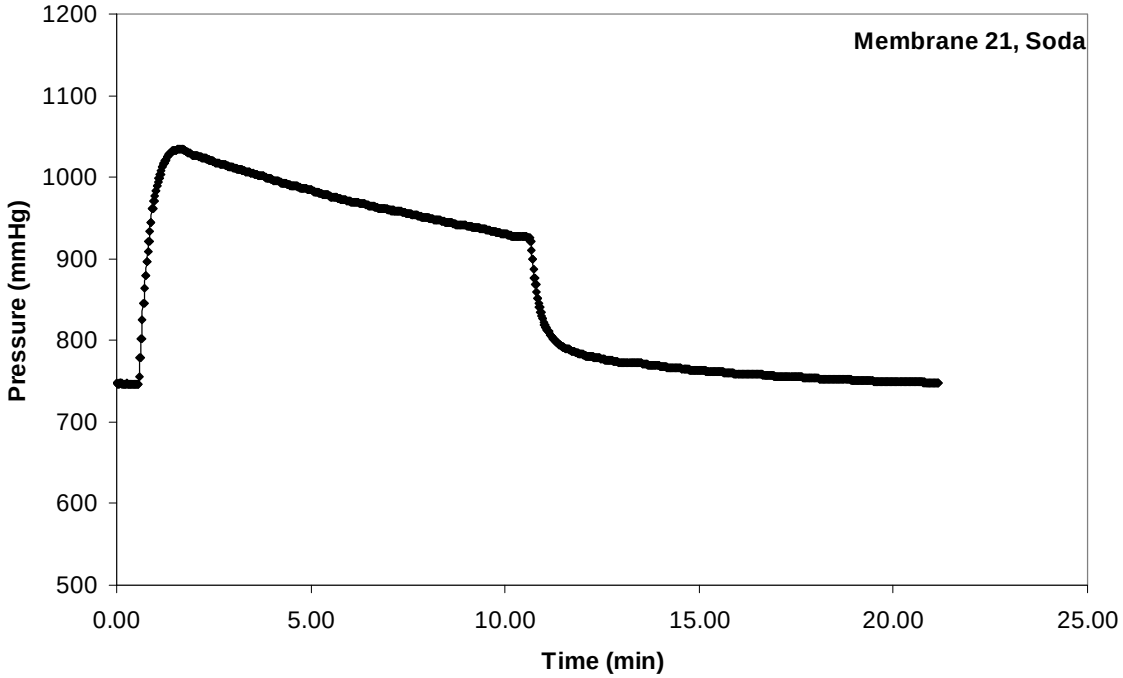


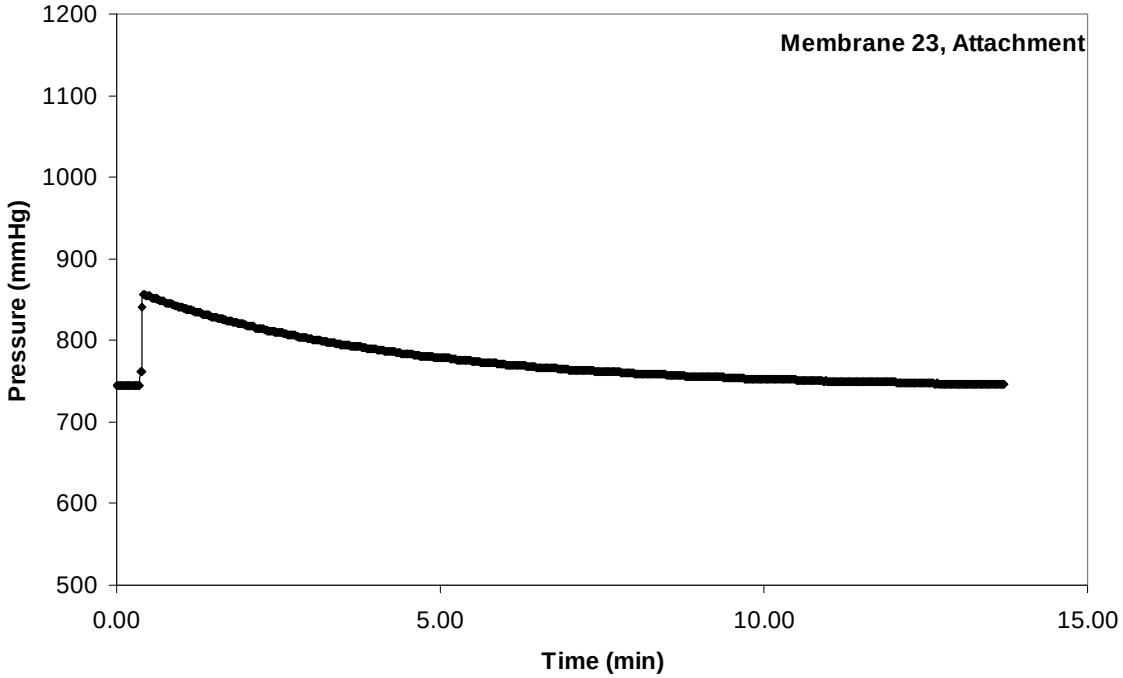
Membrane 13 was used at Ives 1 river from 5/10/2007 to 5/24/2007 with MiniSonde 44946.



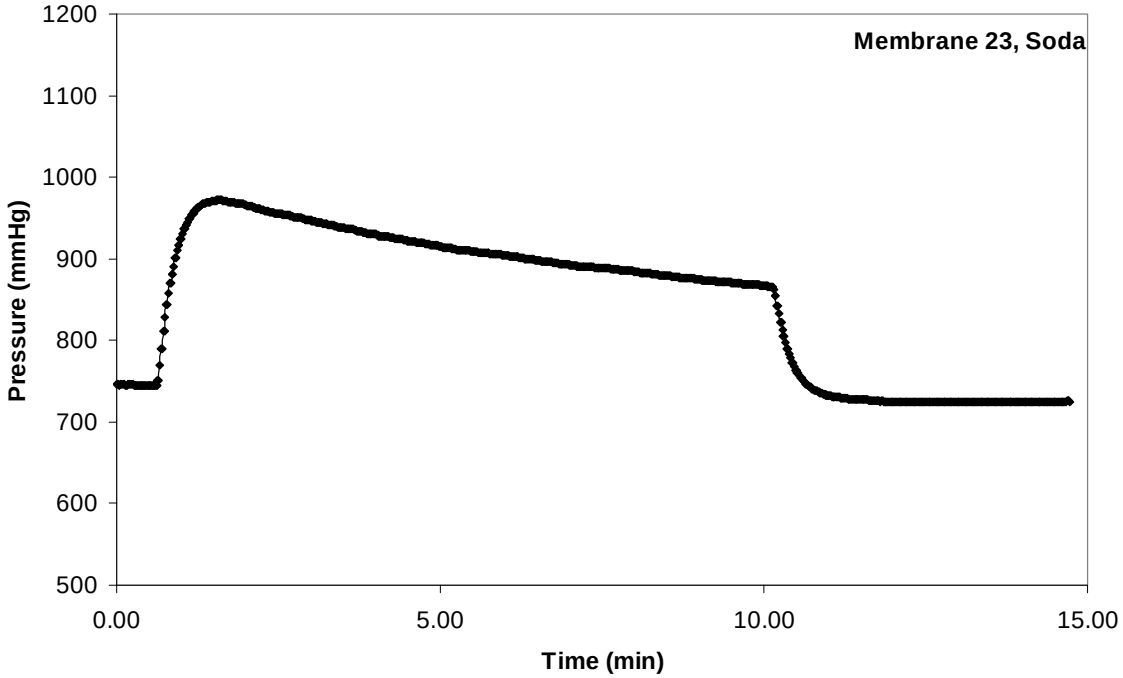


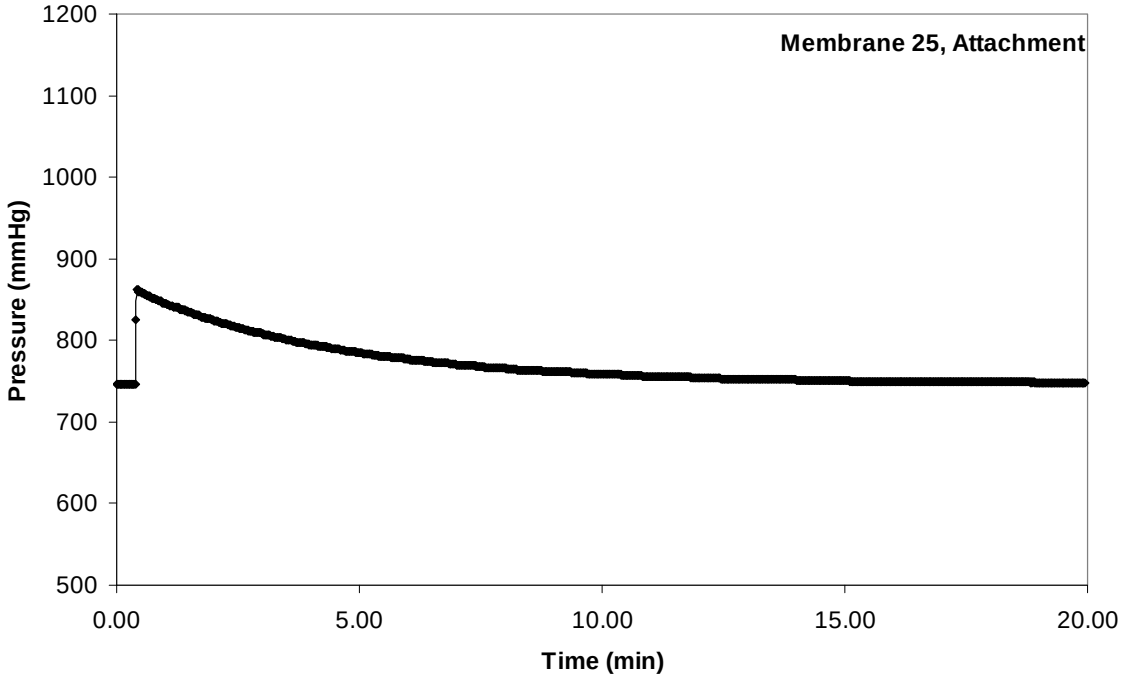
Membrane 21 was used at Multnomah Falls 1 river from 5/11/2007 to 5/25/2007 with MiniSonde 43659.



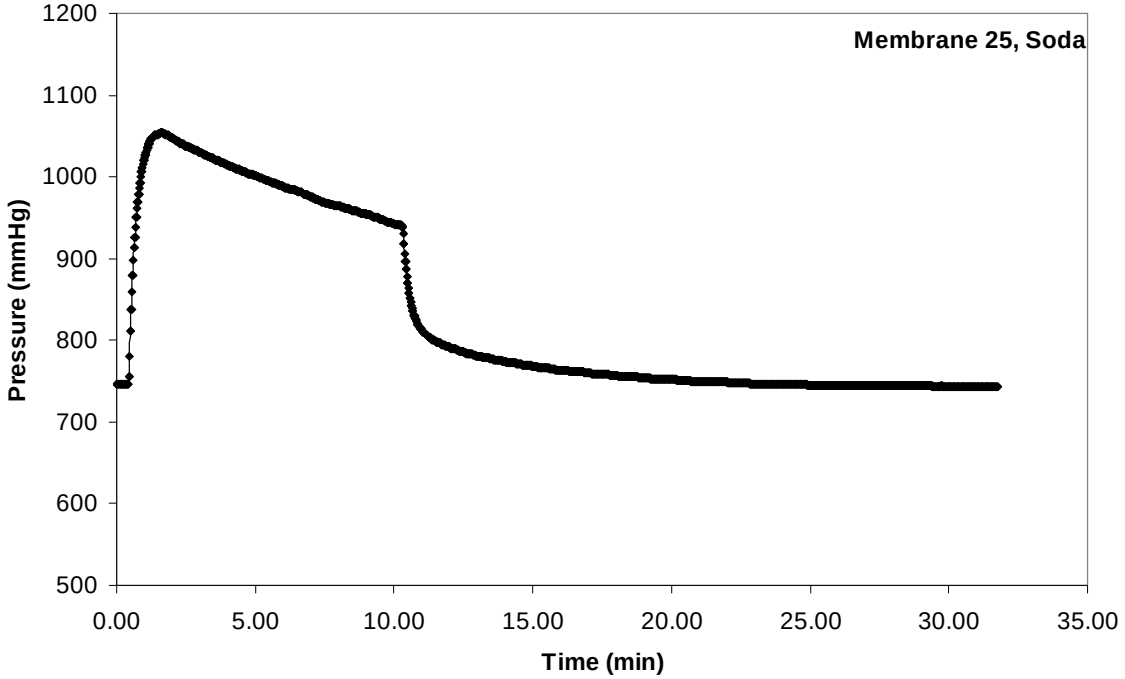


Membrane 23 was used at Ives 2 river from 5/10/2007 to 5/24/2007 with MiniSonde 44927.



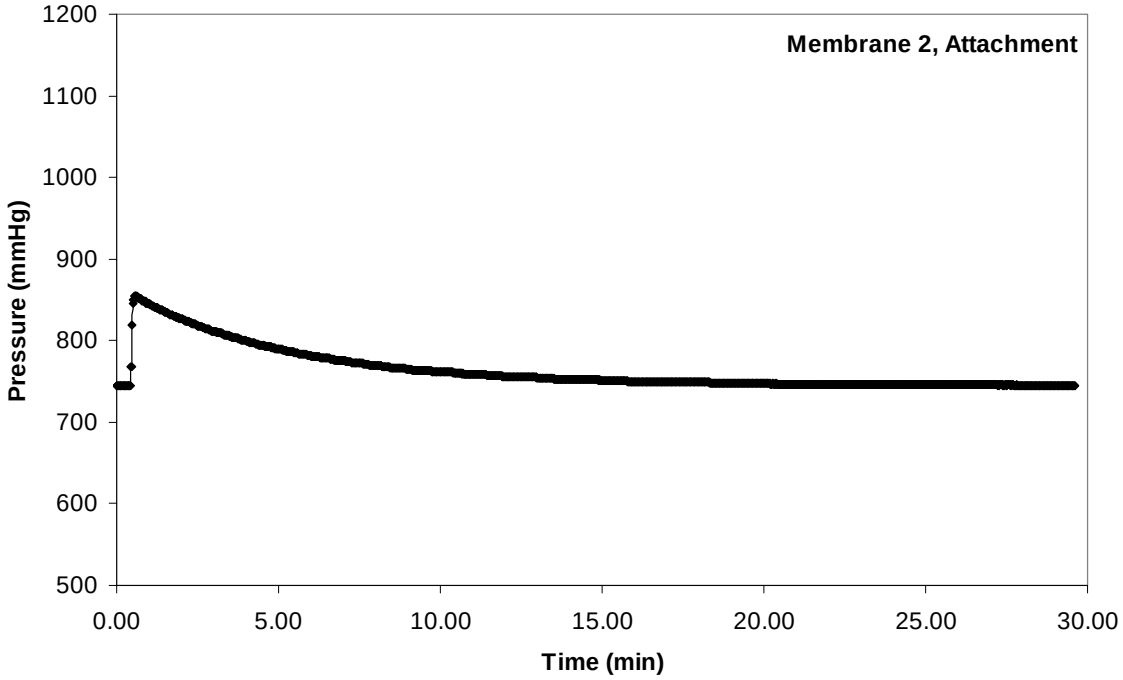


Membrane 25 was used as the control for the side-by-side after deployment 5 with MiniSonde 44283.

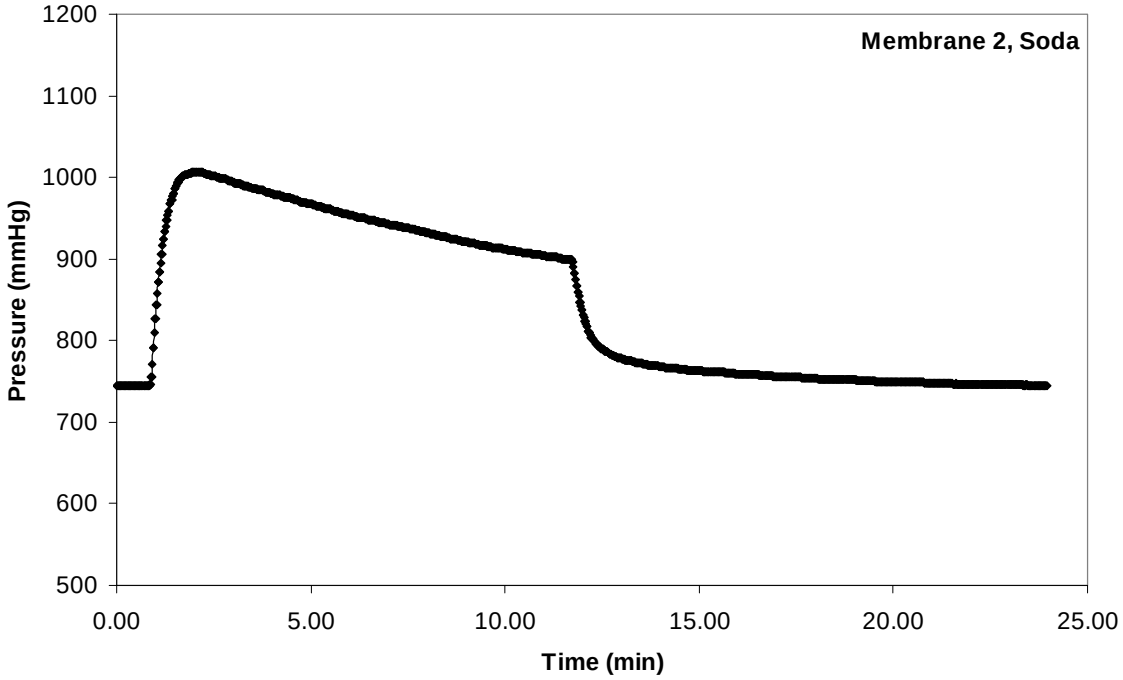


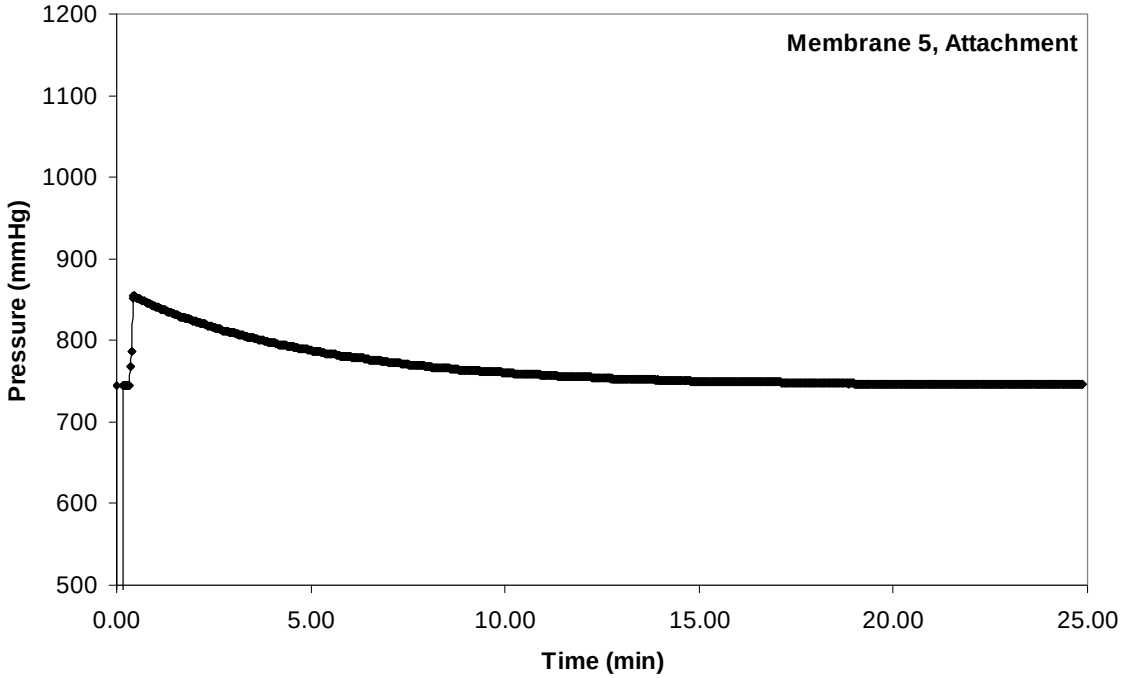
Membrane 27 was used at Ives 2 hyporheic from 5/10/2007 to 5/24/2007 with MiniSonde 42970. We lost this MiniSonde during the side-by-side and were not able to retrieve the side-by-side data or the membrane for quality assurance testing. For this reason, these data were excluded from the analysis.

Post-Deployment 6

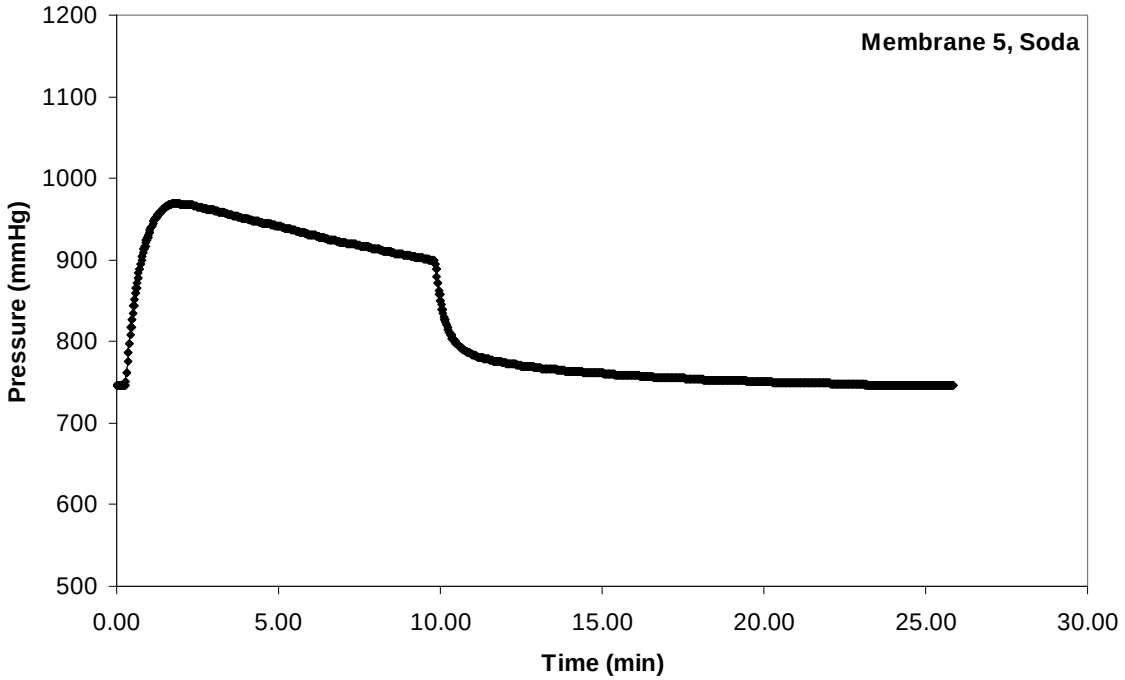


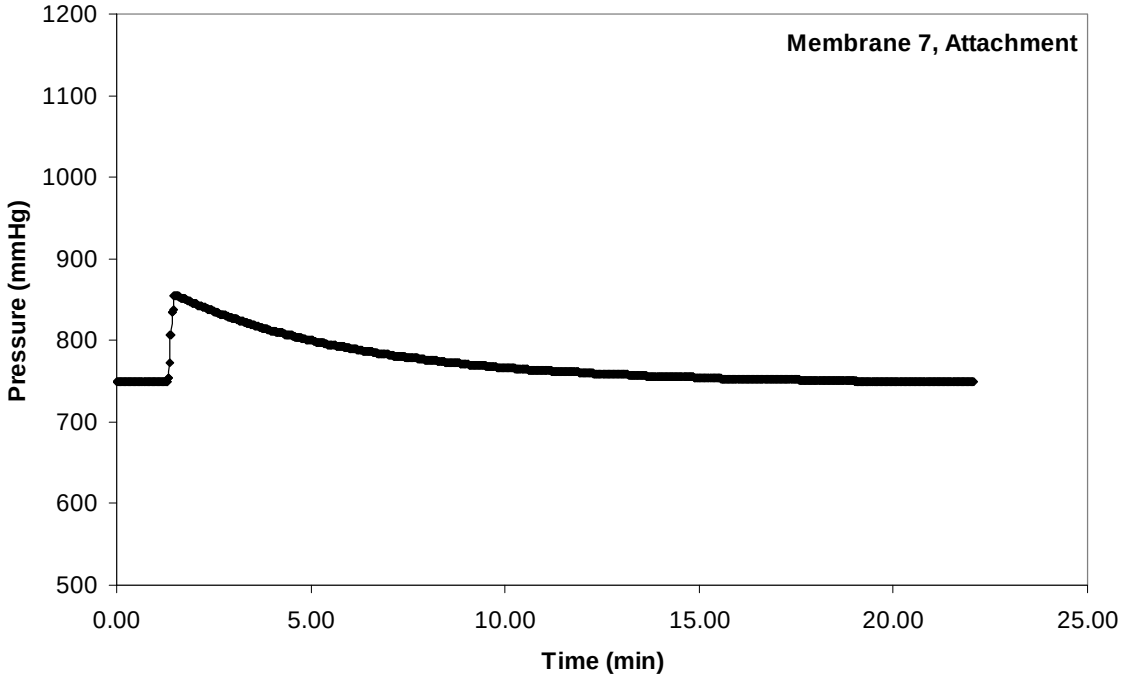
Membrane 2 was used at Multnomah Falls 3 river from 5/25/2007 to 6/14/2007 with MiniSonde 43656.



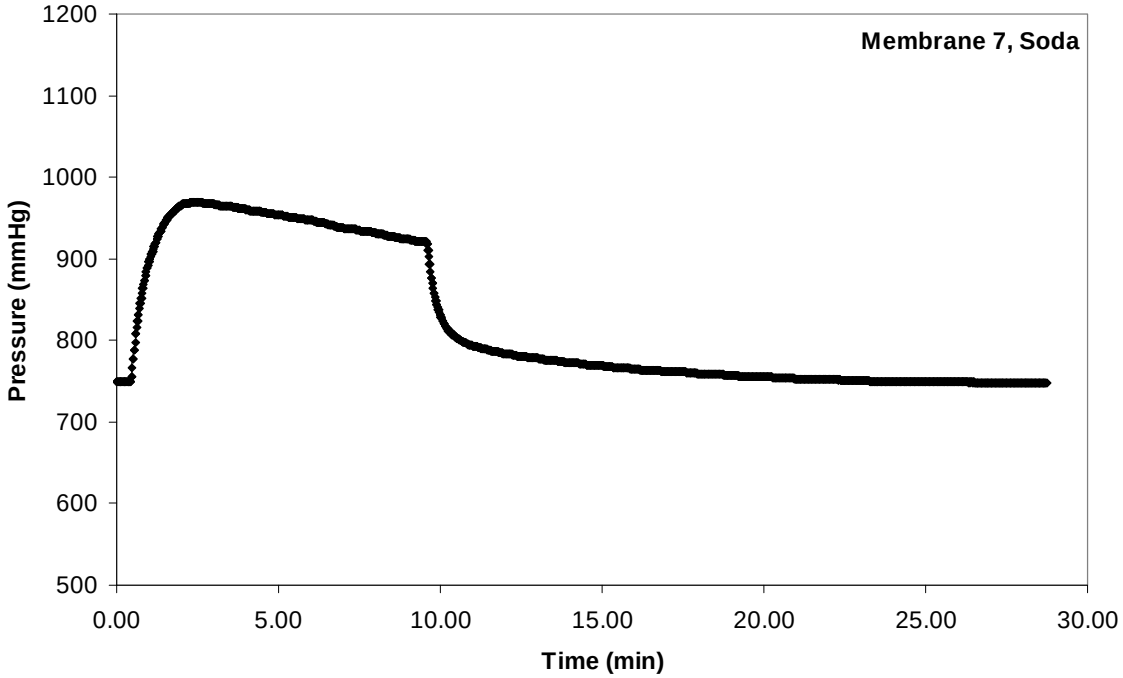


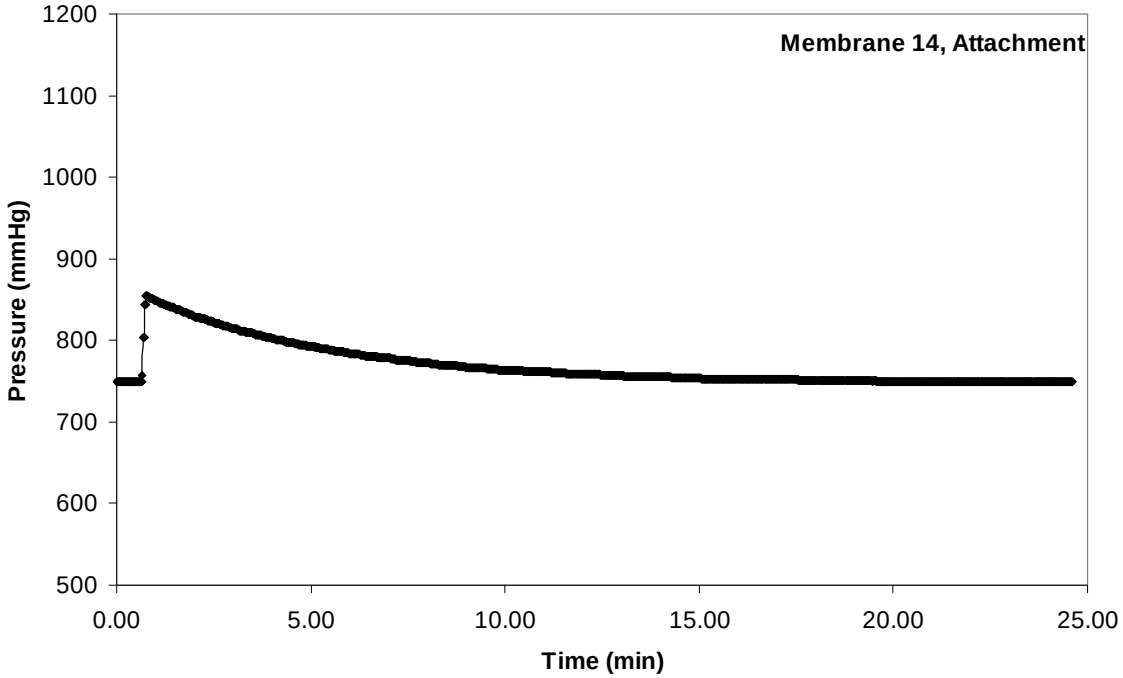
Membrane 5 was used at Multnomah Falls 3 hyporheic from 5/25/2007 to 6/13/2007 with MiniSonde 44948.



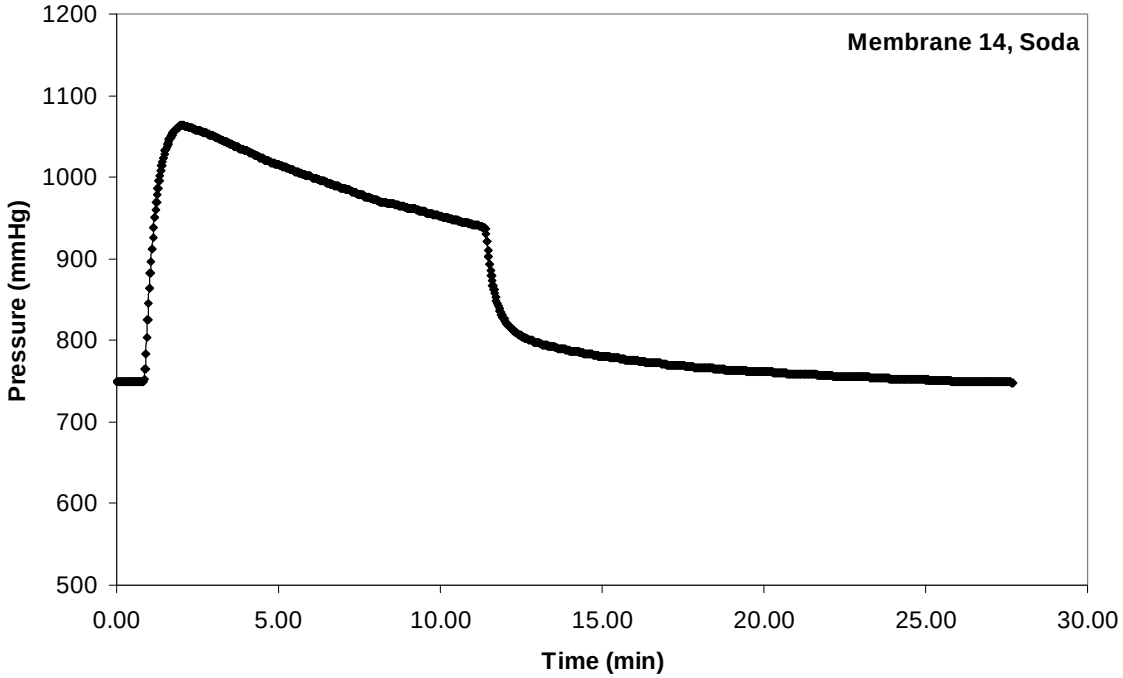


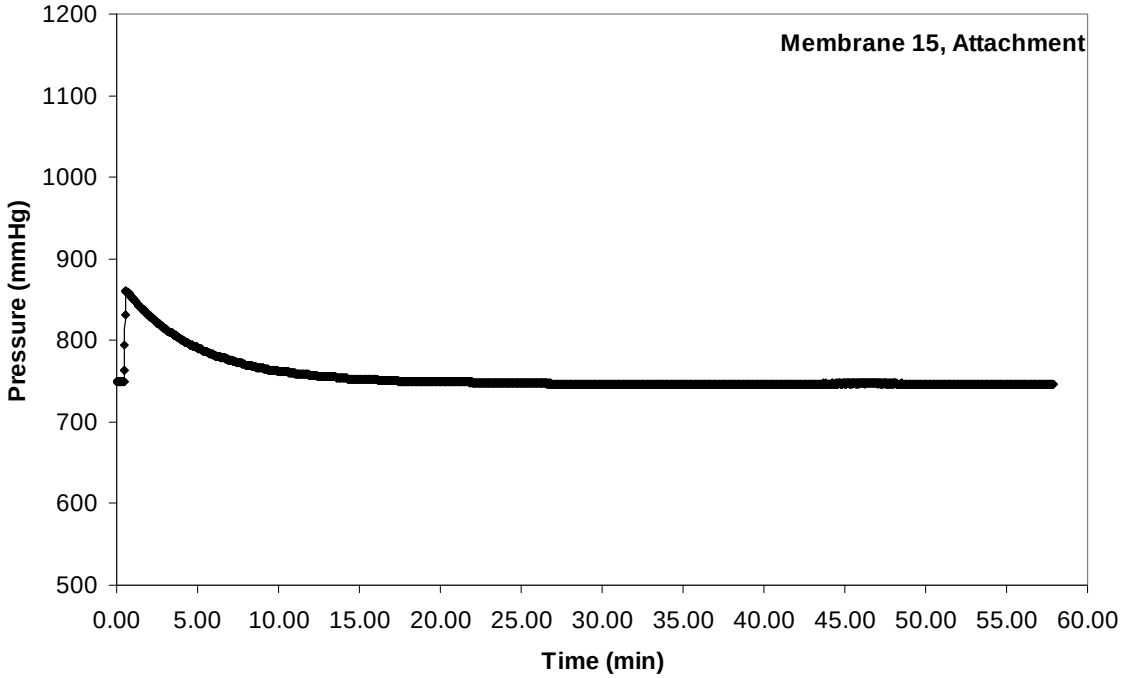
Membrane 7 was used at Ives 1 hyporheic from 5/24/2007 to 6/13/2007 with MiniSonde 43639.



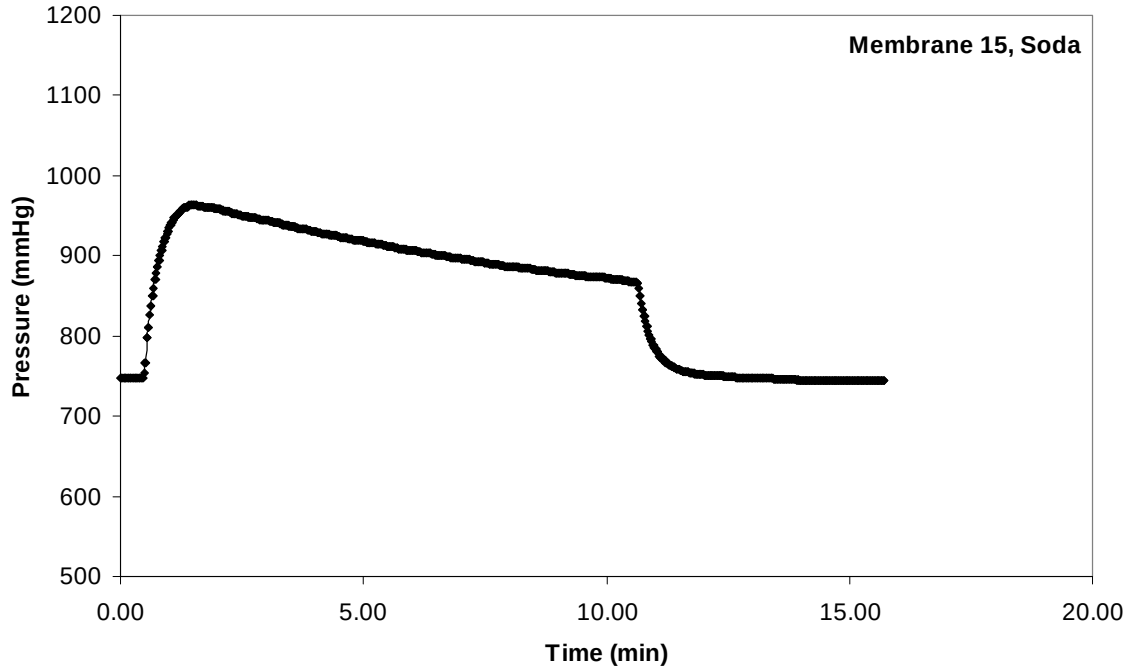


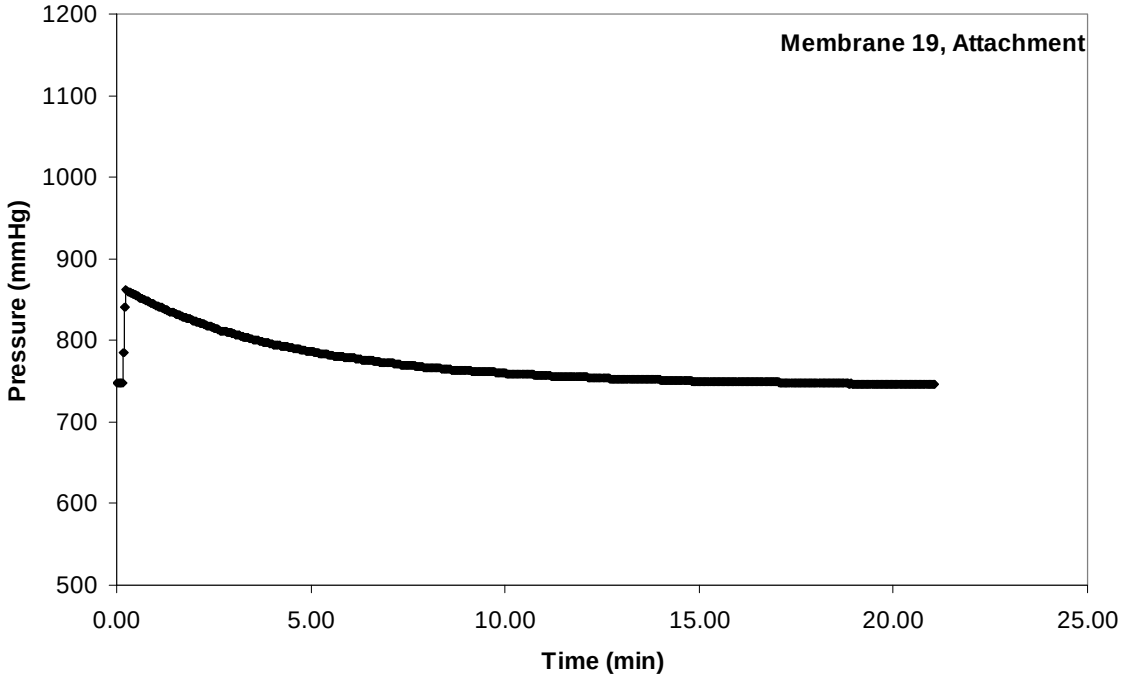
Membrane 14 was used at Ives 3 river from 5/24/2007 to 6/12/2007 with MiniSonde 44945.



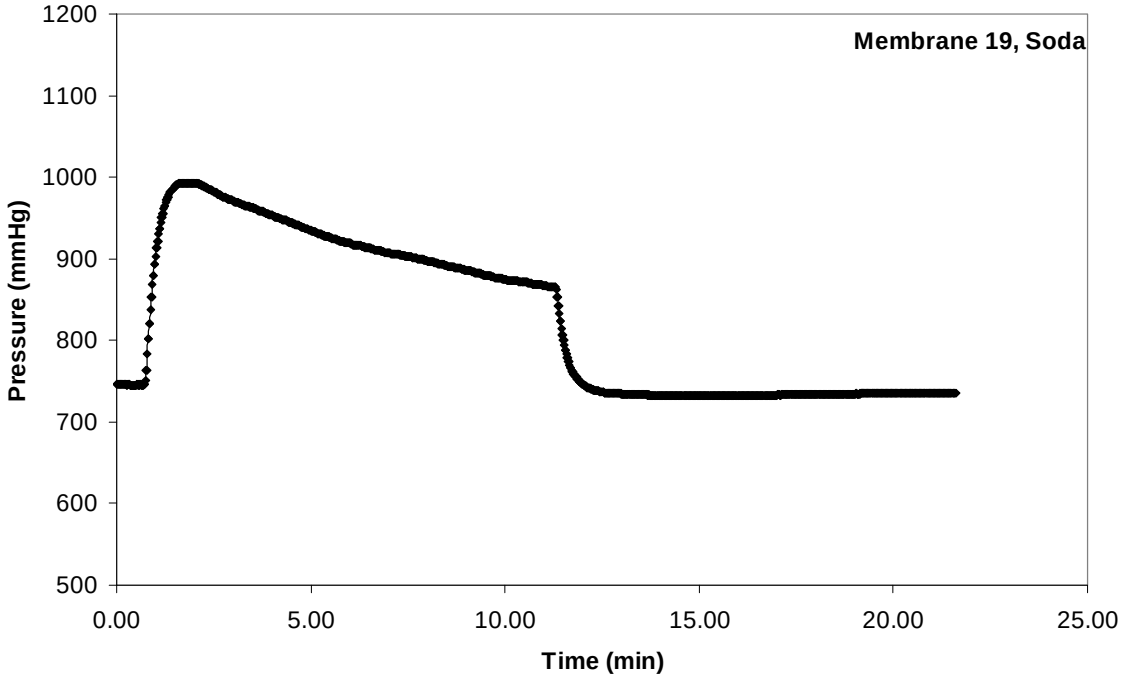


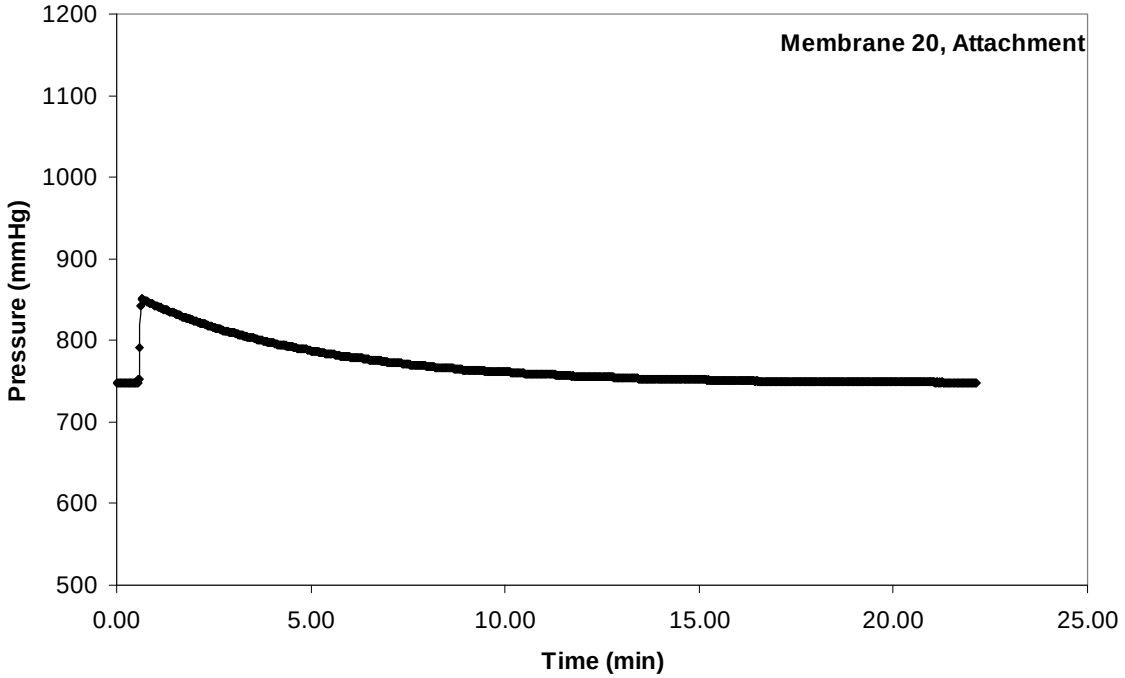
Membrane 15 was used at Ives 3 hyporheic from 5/24/2007 to 6/13/2007 with MiniSonde 43654.



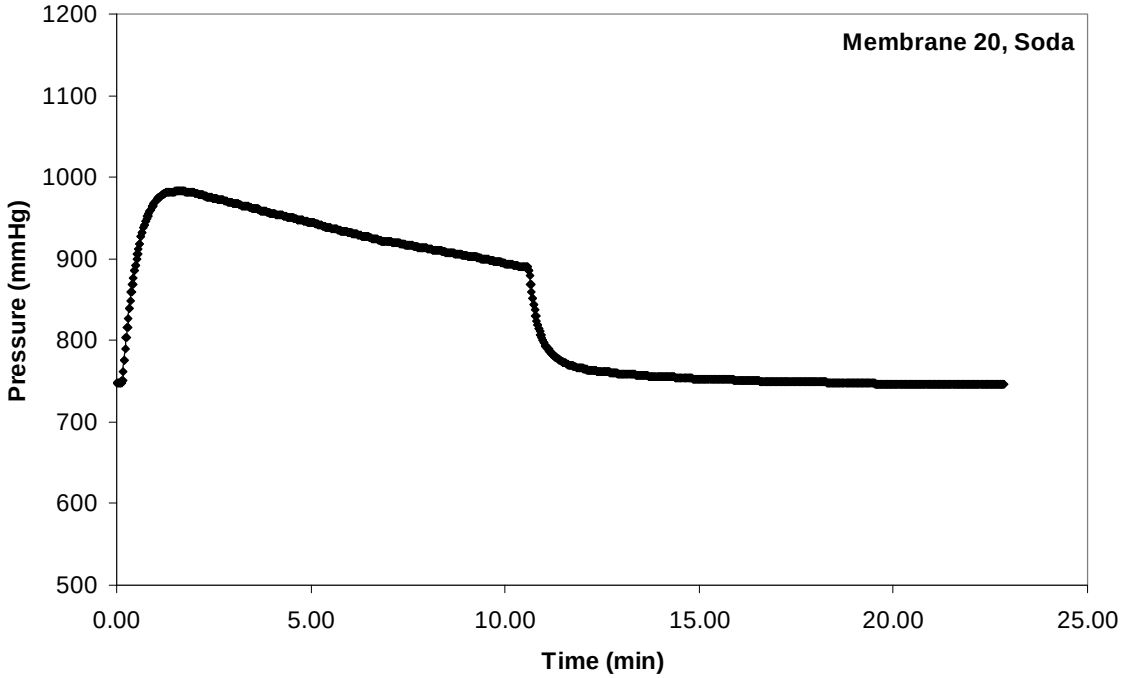


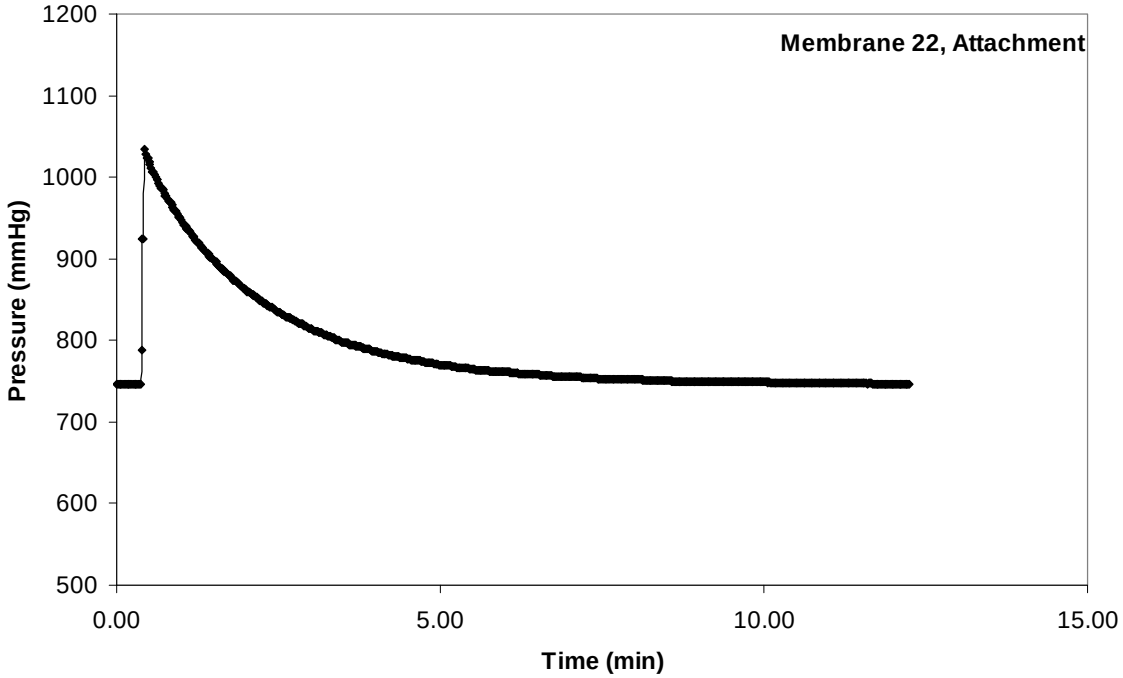
Membrane 19 was used at Ives 2 hyporheic from 5/24/2007 to 6/13/2007 with MiniSonde 40347.



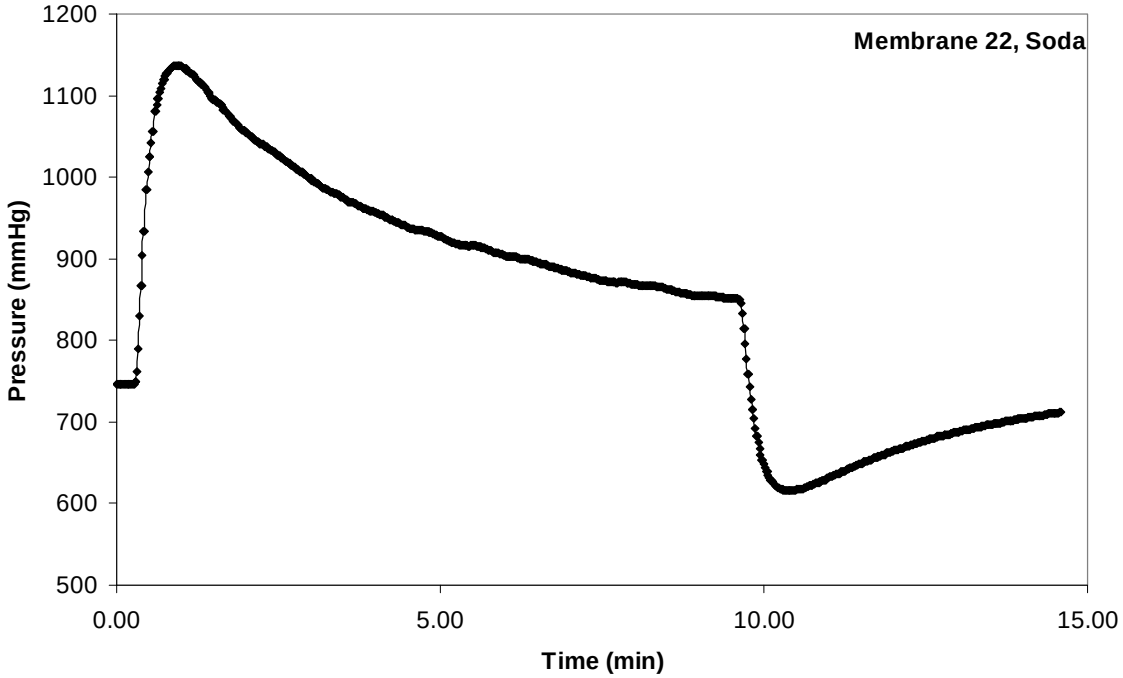


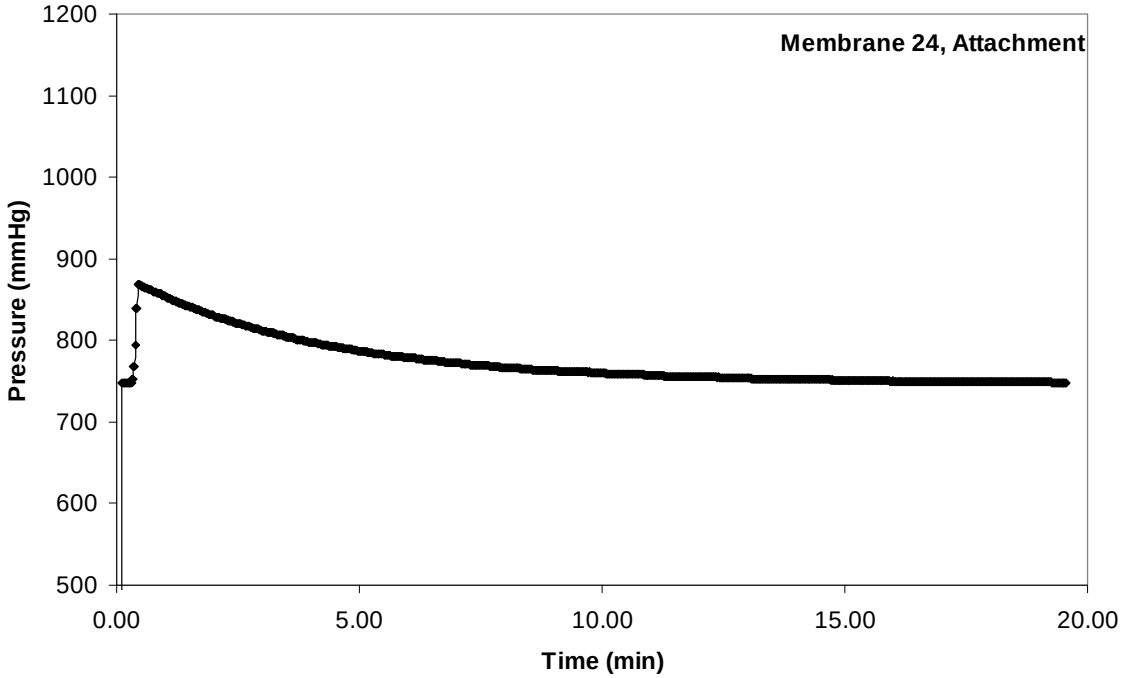
Membrane 20 was used at Multnomah Falls 1 river from 5/25/2007 to 6/14/2007 with MiniSonde 43659.



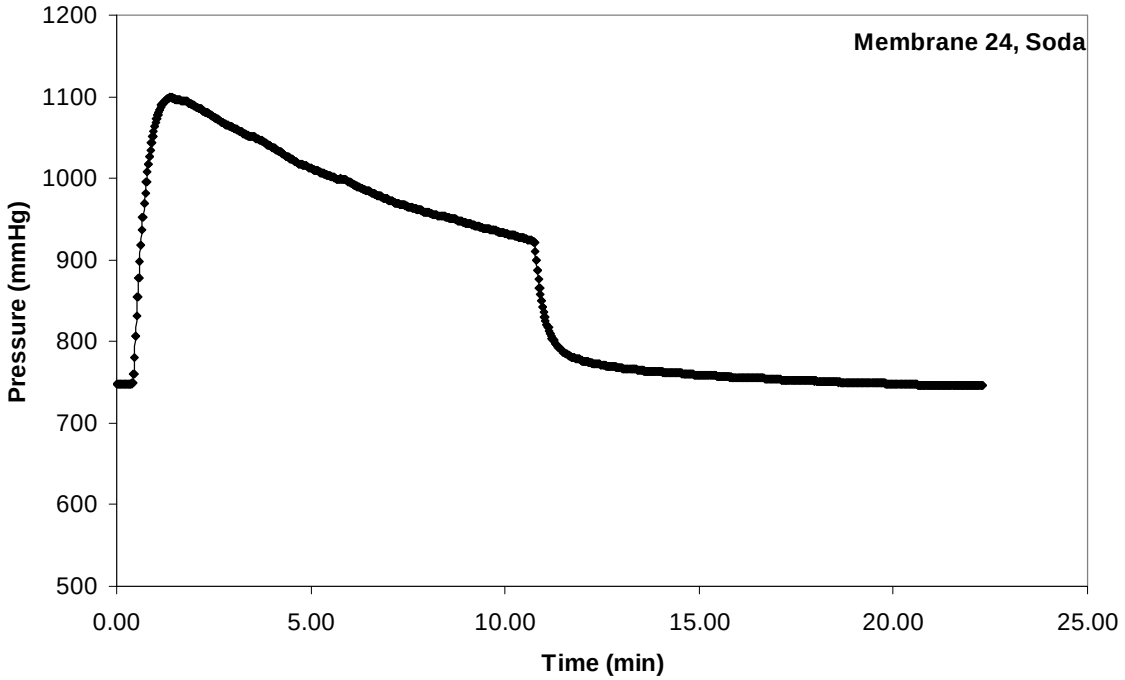


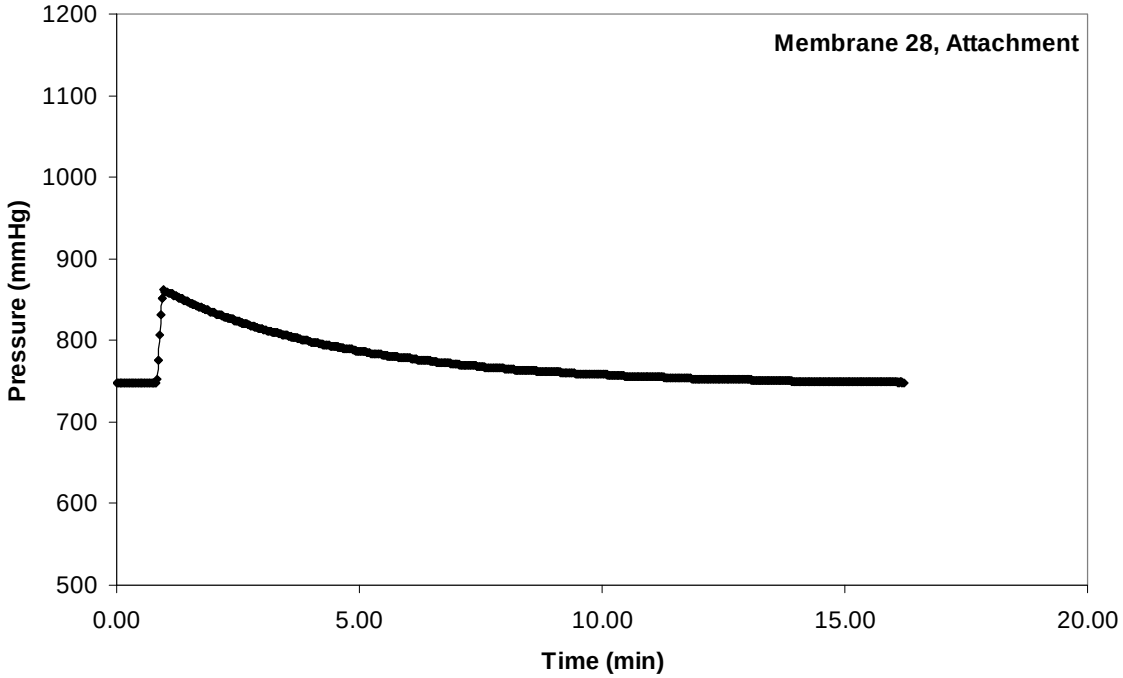
Membrane 22 was used at Ives 1 river from 5/24/2007 to 6/12/2007 with MiniSonde 44946.



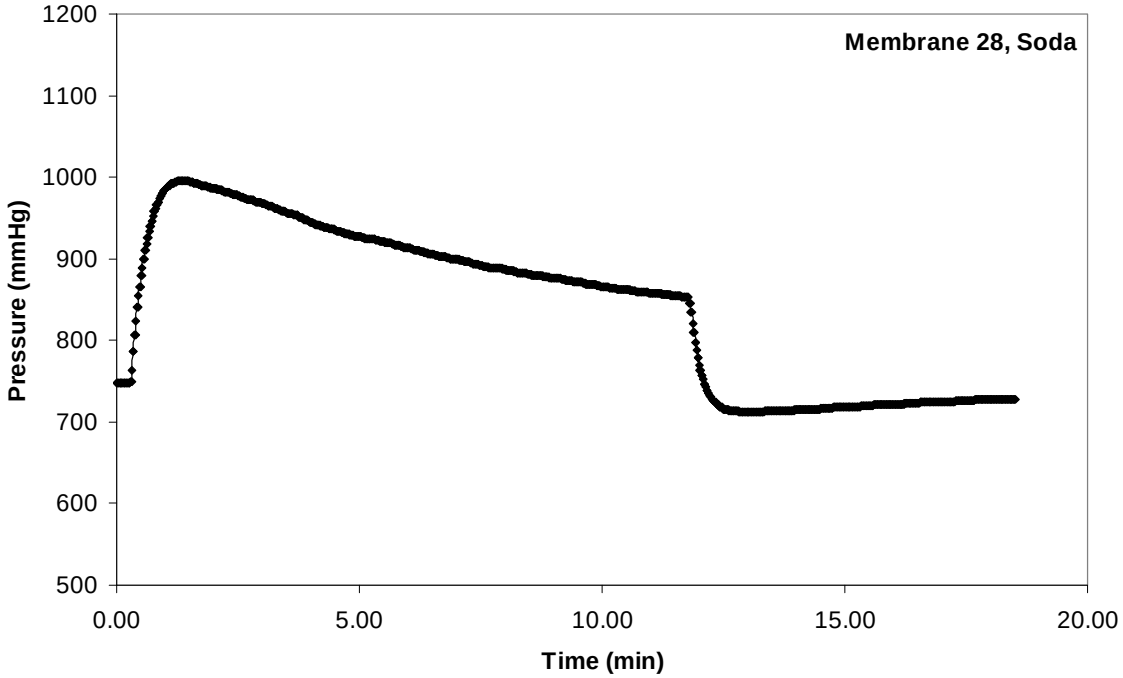


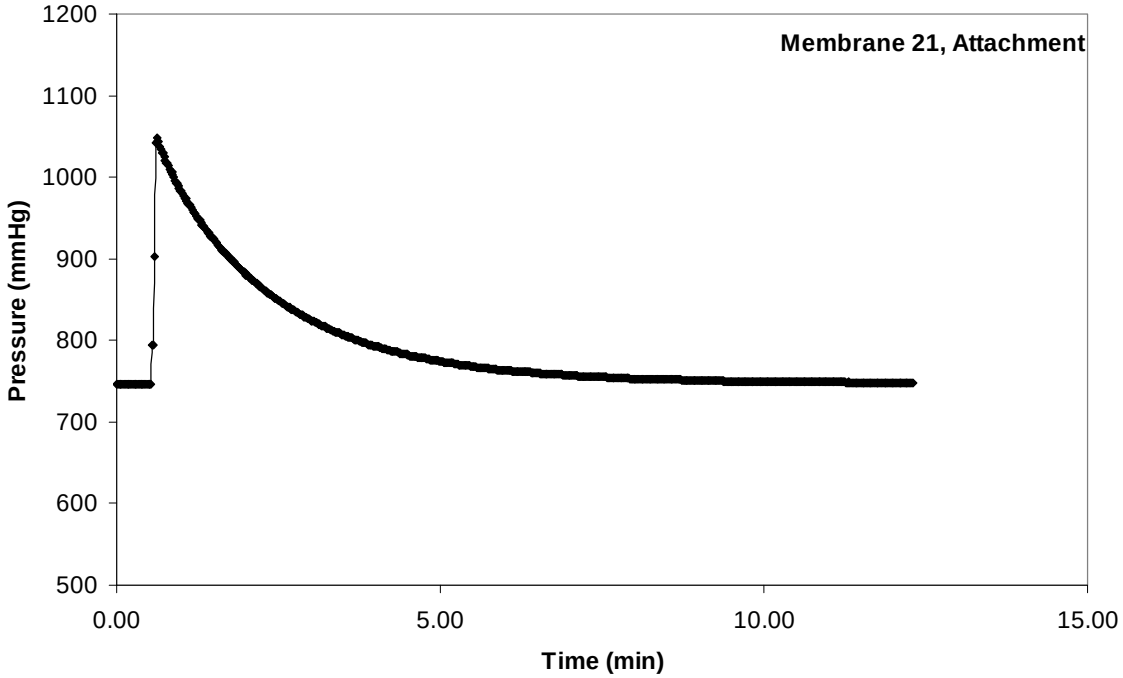
Membrane 24 was used at Multnomah Falls 1 hyporheic from 5/25/2007 to 6/13/2007 with MiniSonde 44947.



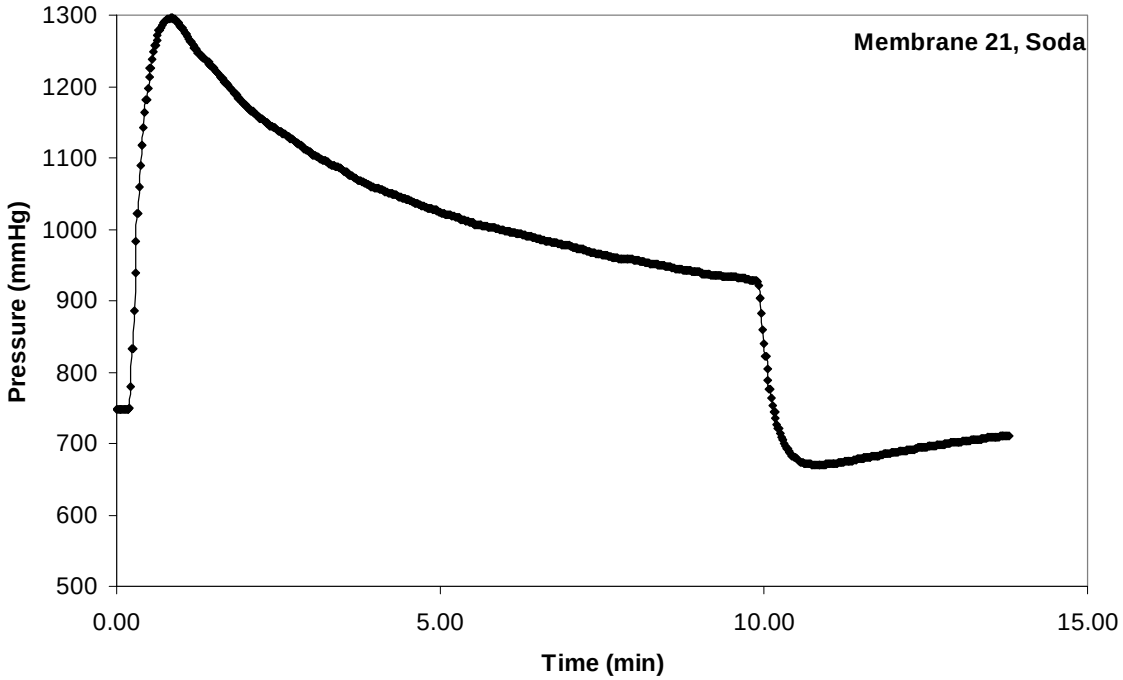


Membrane 28 was used at Ives 2 river from 5/24/2007 to 6/13/2007 with MiniSonde 44927.

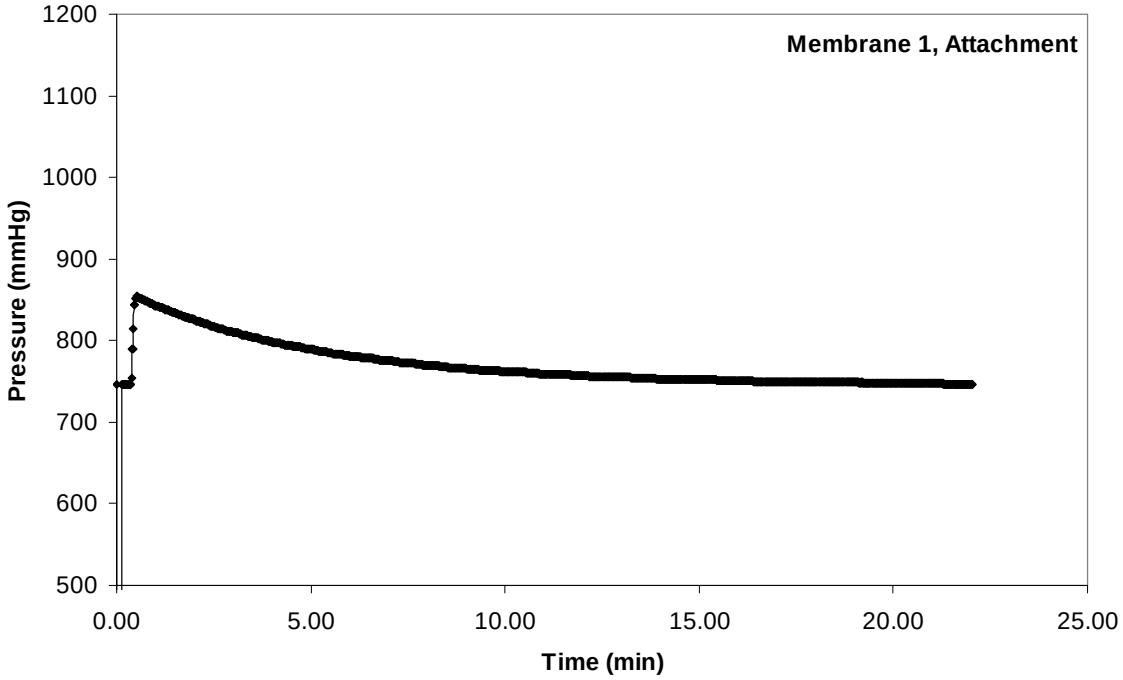




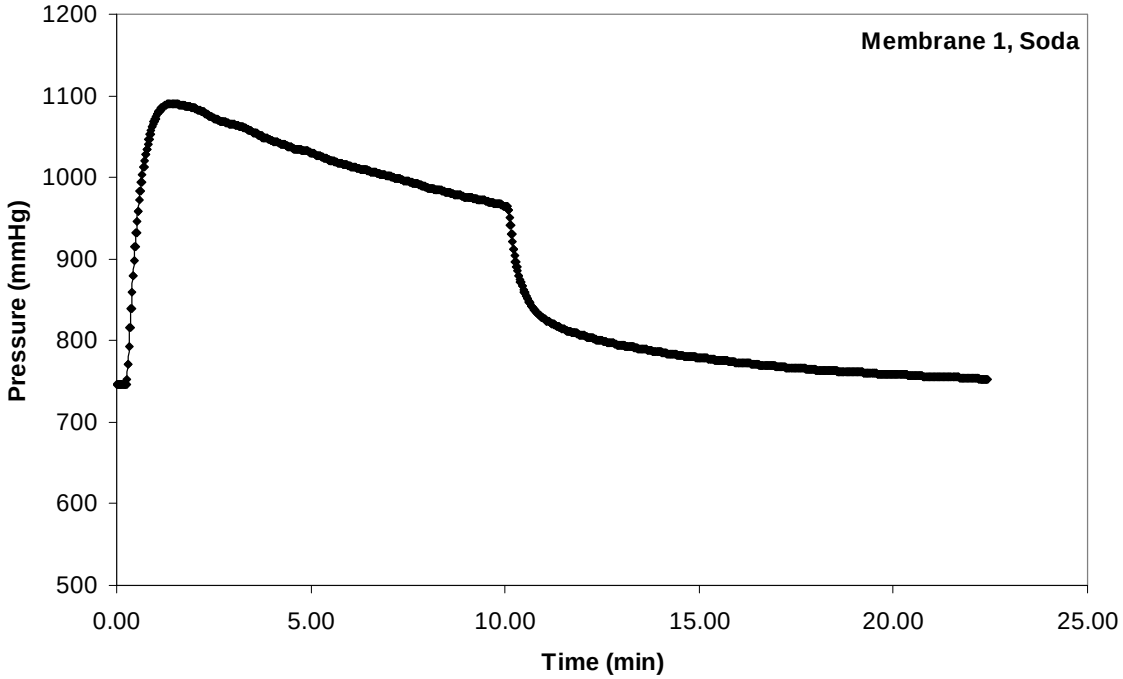
Membrane 21 was used as the control for the side-by-side after deployment 6. It was used with MiniSonde 43655 at the Ives Island site and with MiniSonde 40347 at Multnomah Falls.

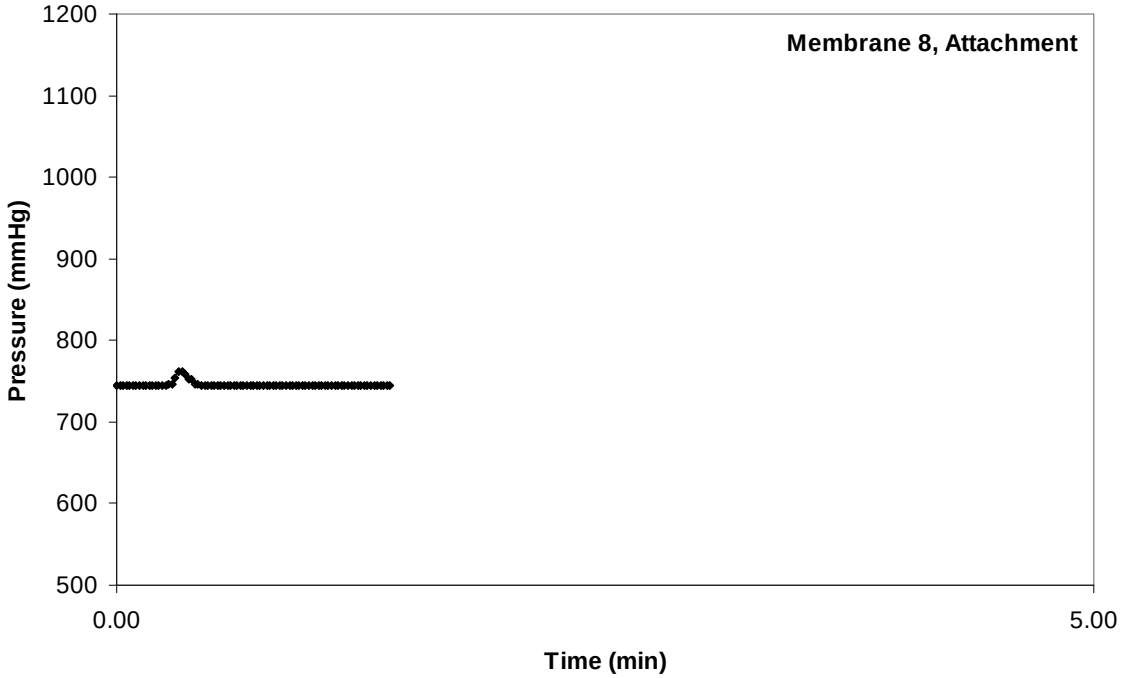


Post-Deployment 7

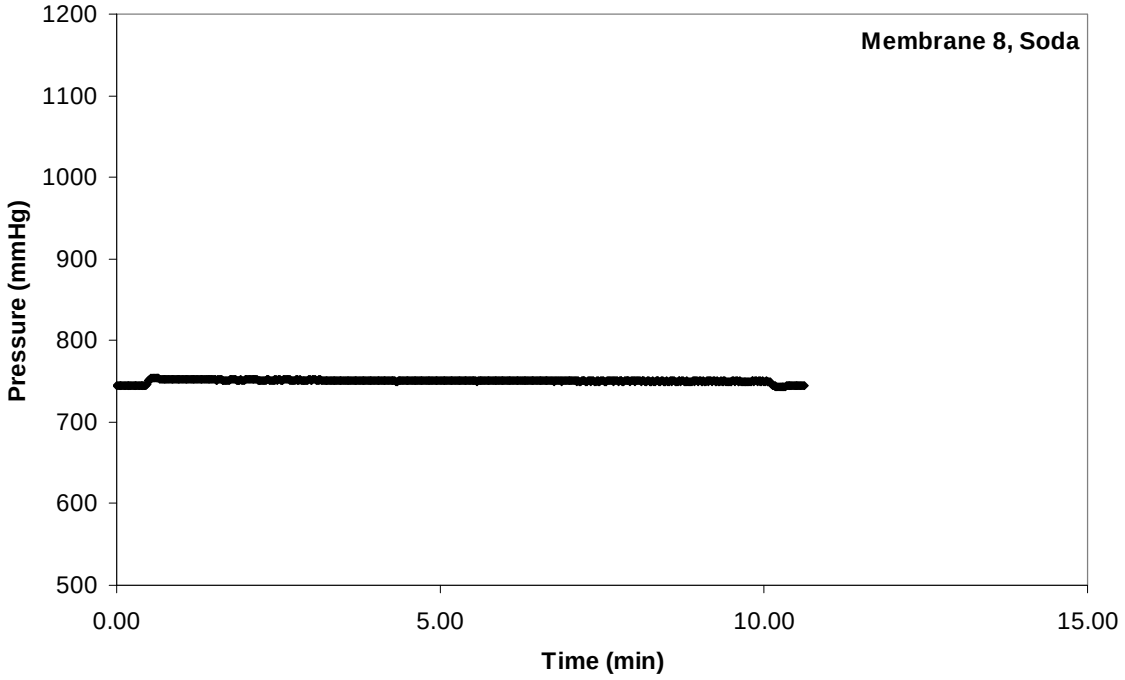


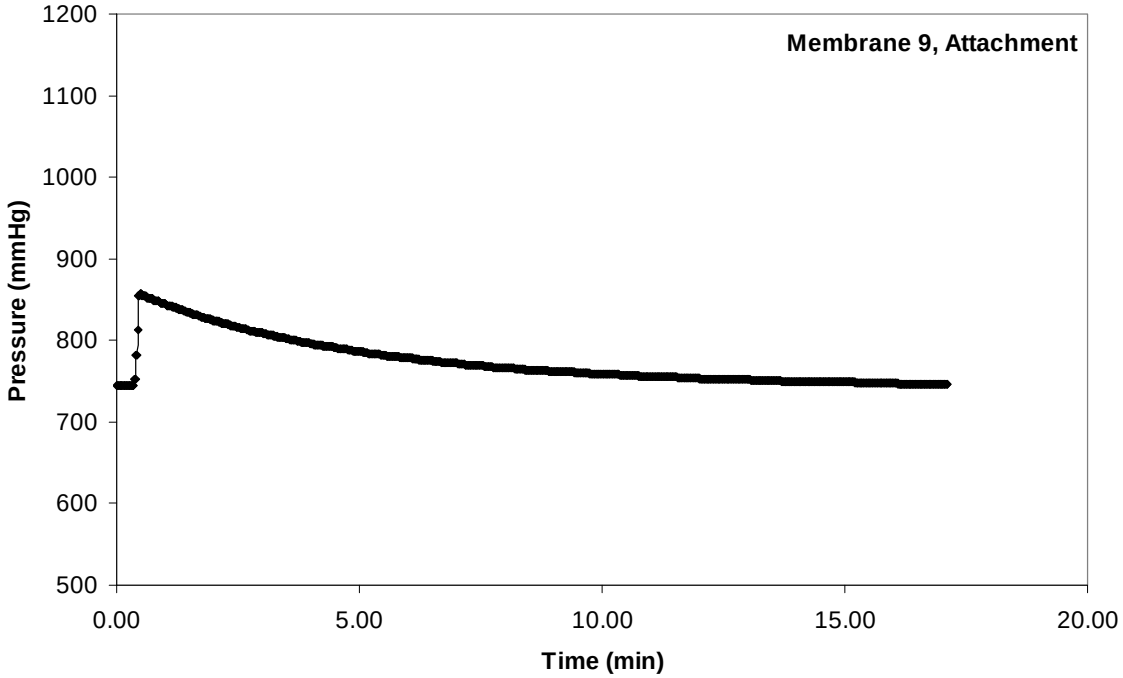
Membrane 1 was used at Ives 3 river from 6/13/2007 to 7/2/2007 with MiniSonde 44945.



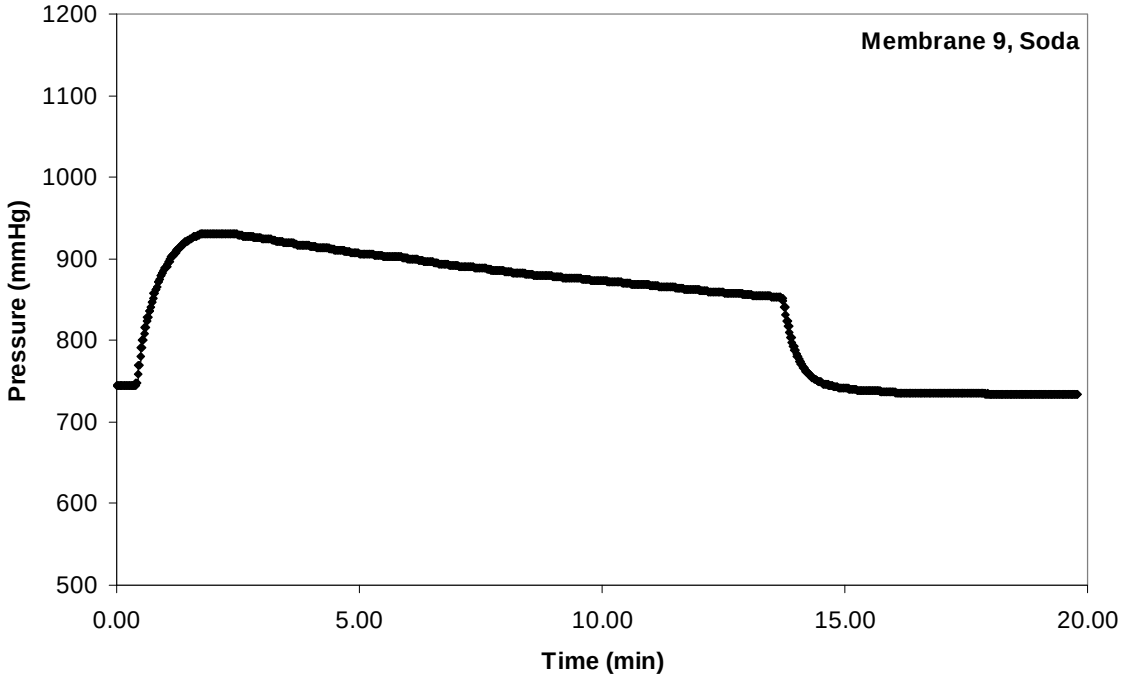


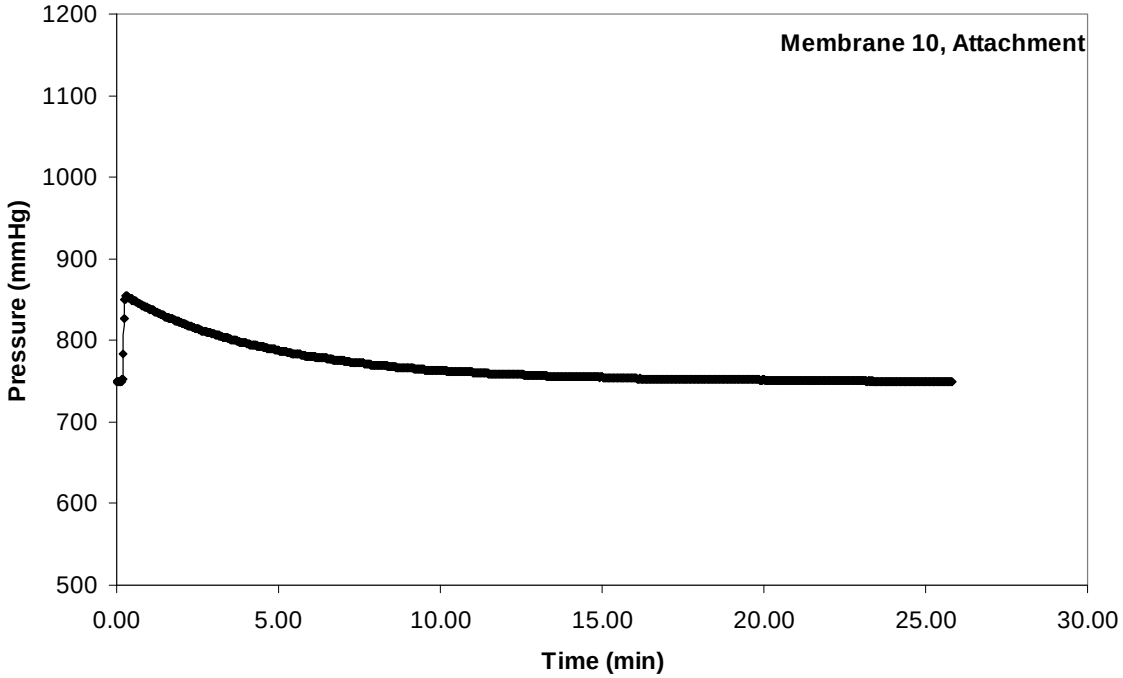
Membrane 8 was used at Ives 1 river from 6/13/2007 to 7/2/2007 with MiniSonde 44946. This membrane tested bad. Although the side-by-side data appeared reliable, we still excluded them from our analysis.



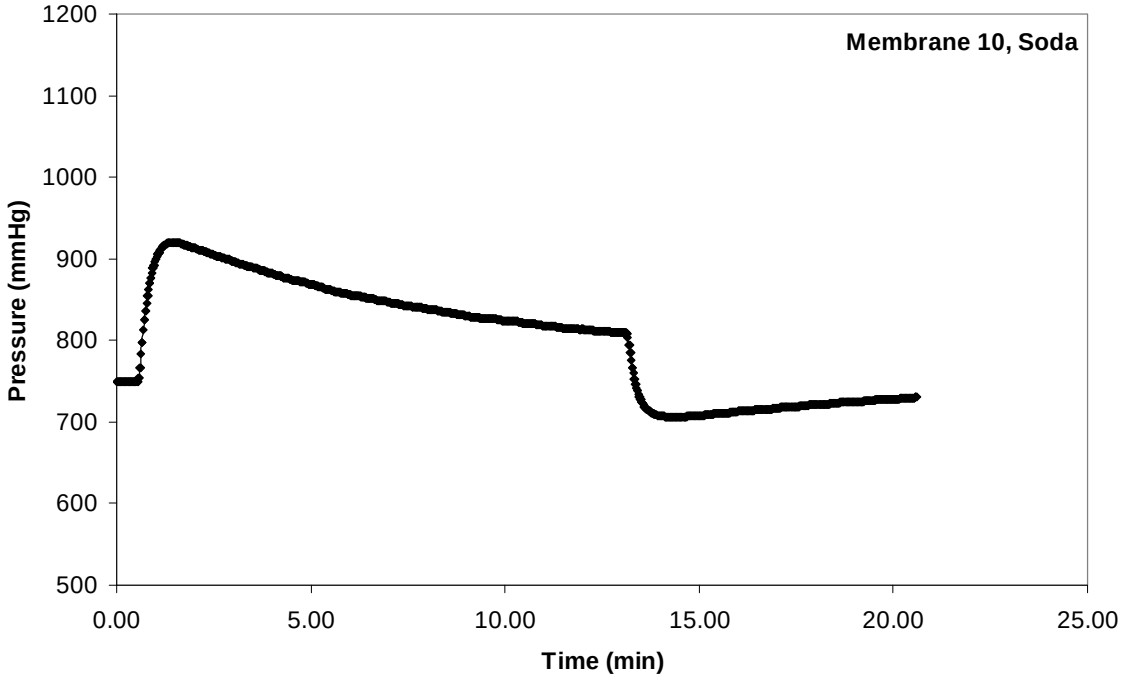


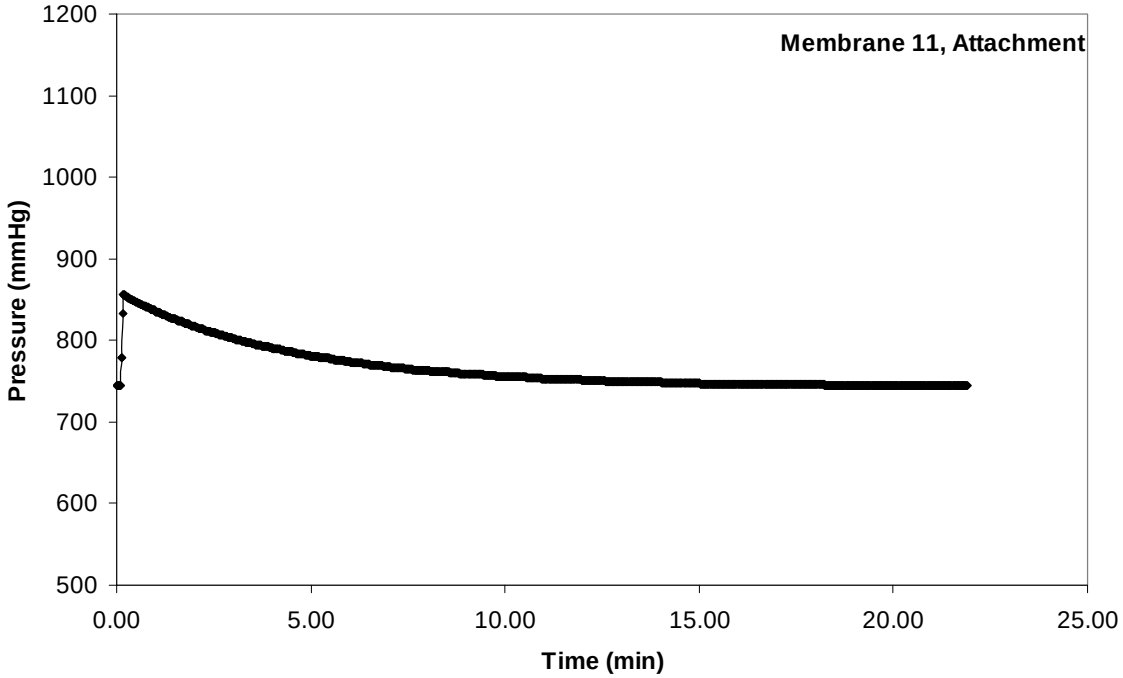
Membrane 9 was used at Ives 2 hyporheic from 6/13/2007 to 7/2/2007 with MiniSonde 43655.



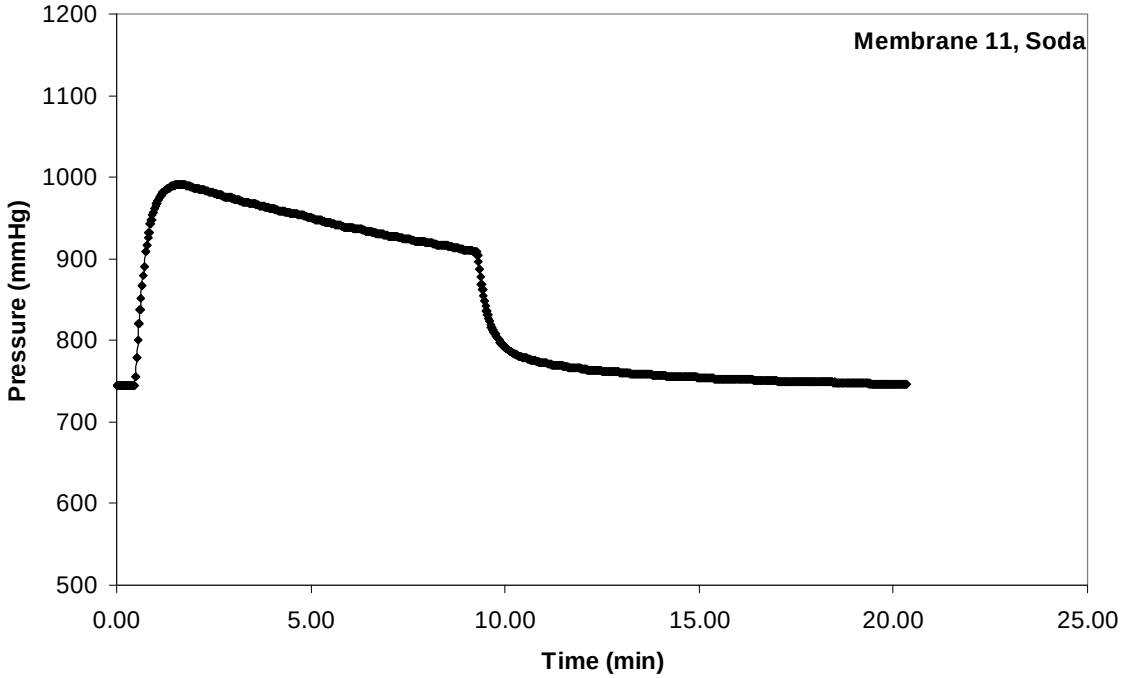


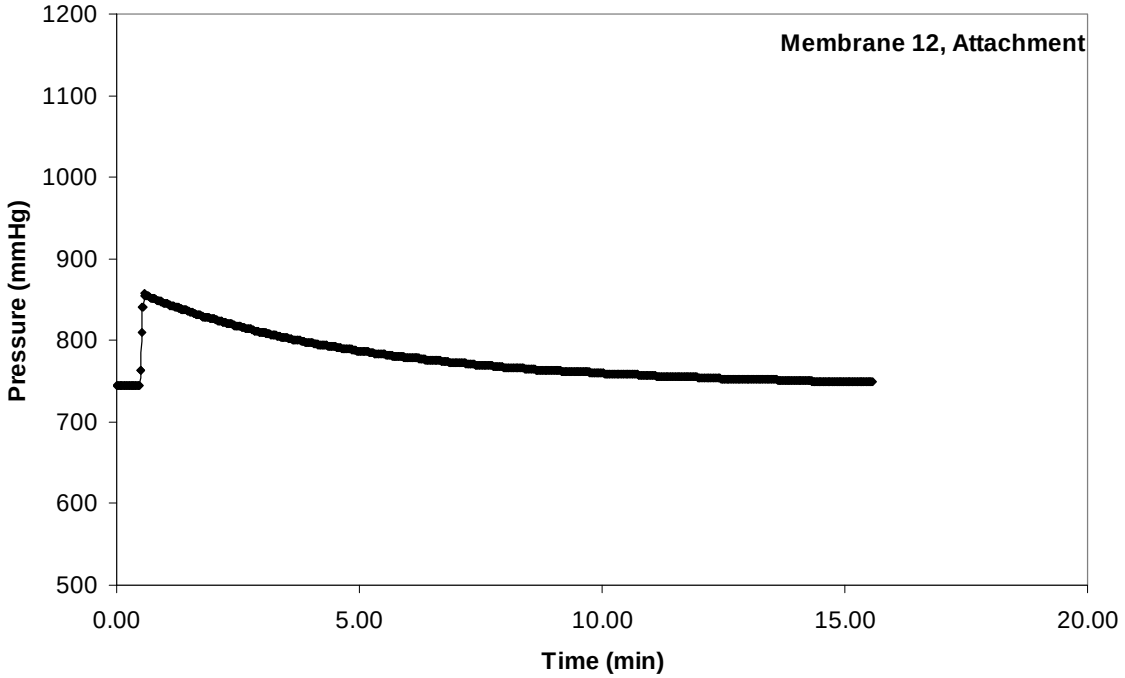
Membrane 10 was used at Ives 3 hyporheic from 6/13/2007 to 7/2/2007 with MiniSonde 43654.



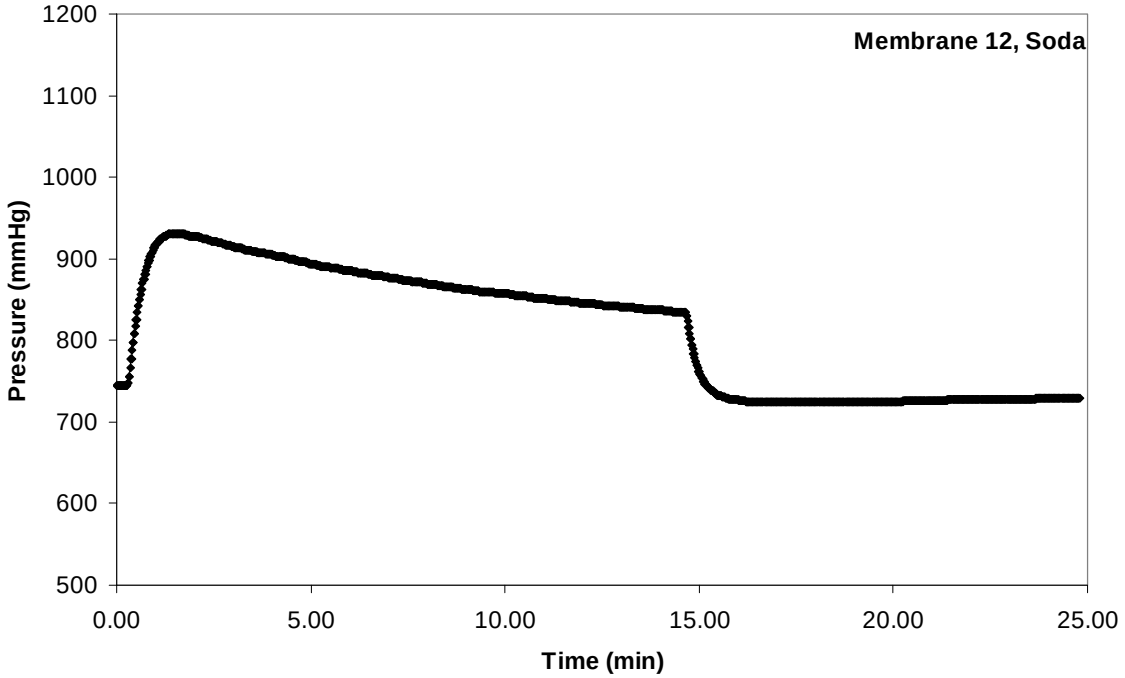


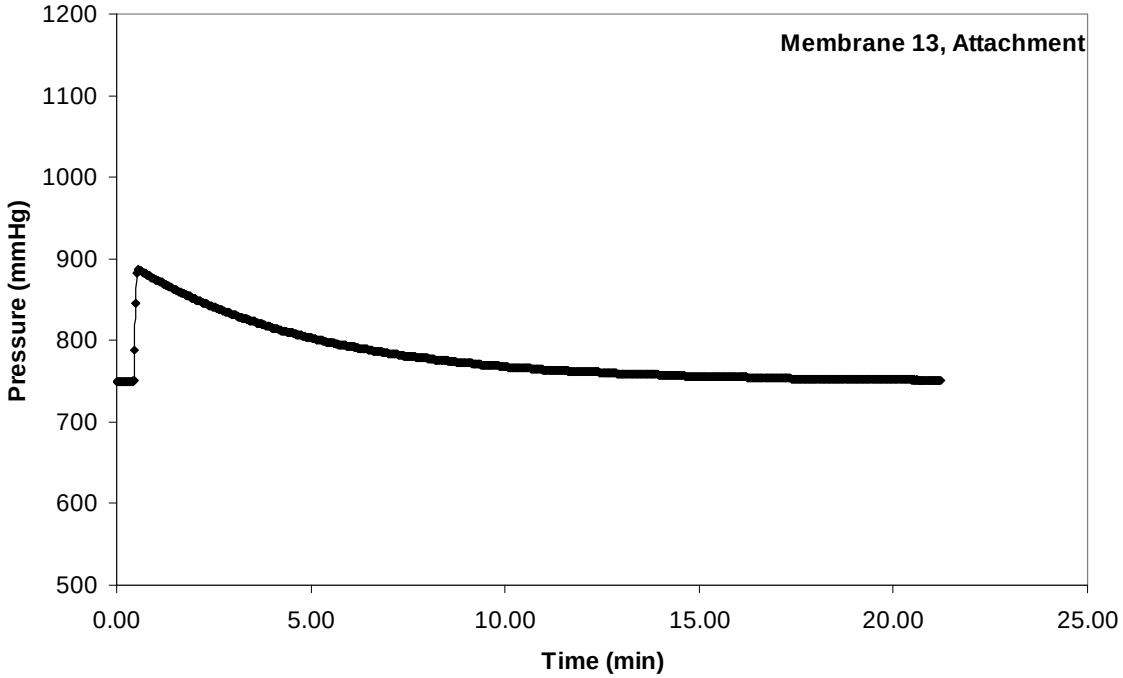
Membrane 11 was used at Ives 2 river from 6/13/2007 to 7/2/2007 with MiniSonde 44927.



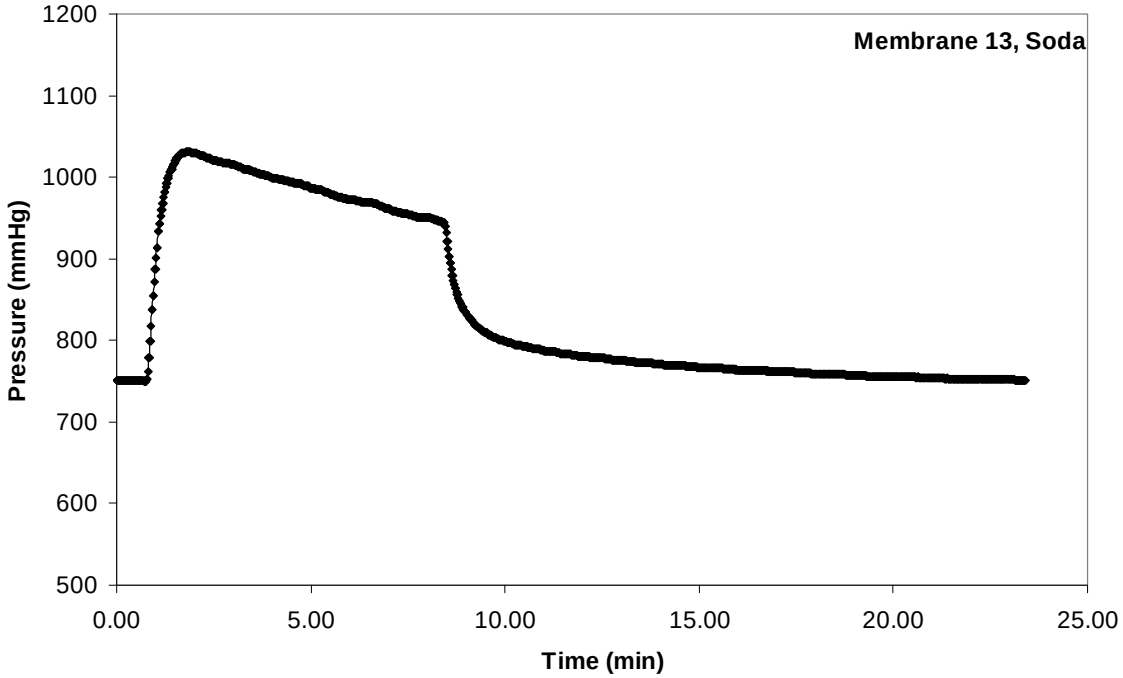


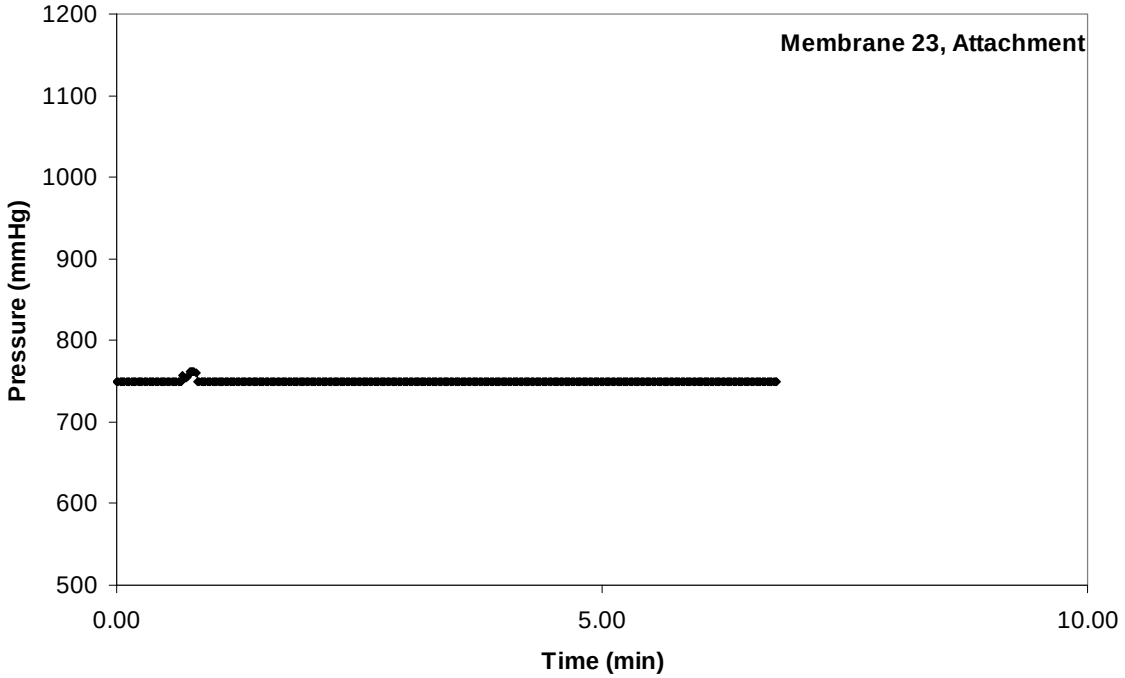
Membrane 12 was used at Multnomah Falls 3 river from 6/14/2007 to 7/2/2007 with MiniSonde 43656.



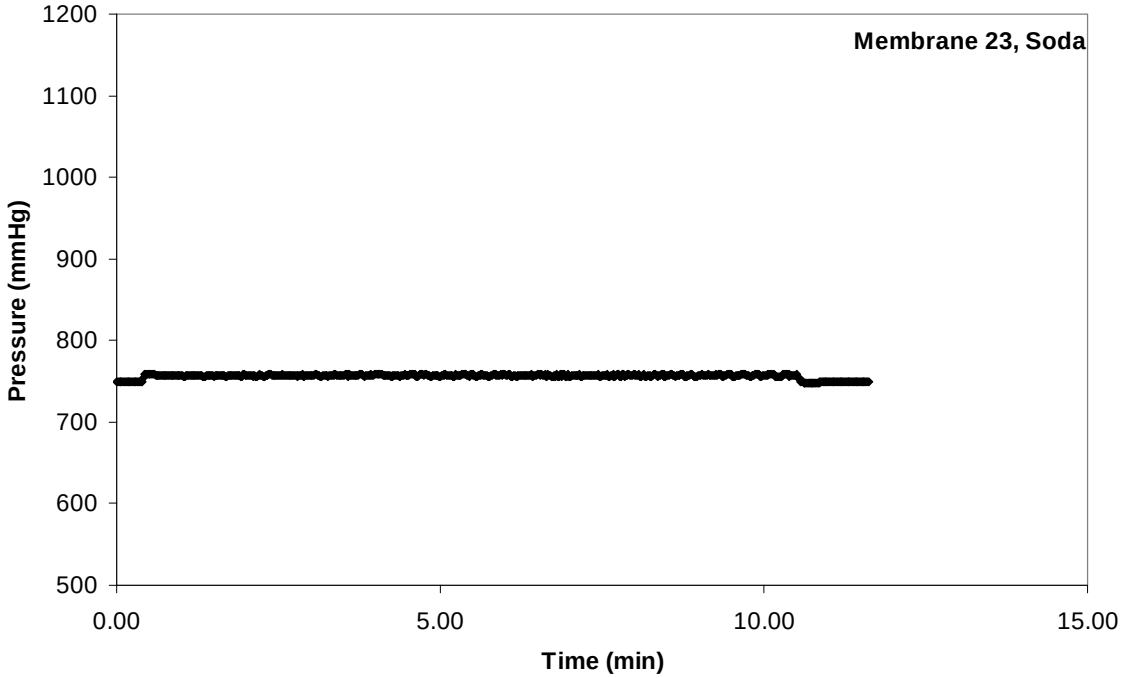


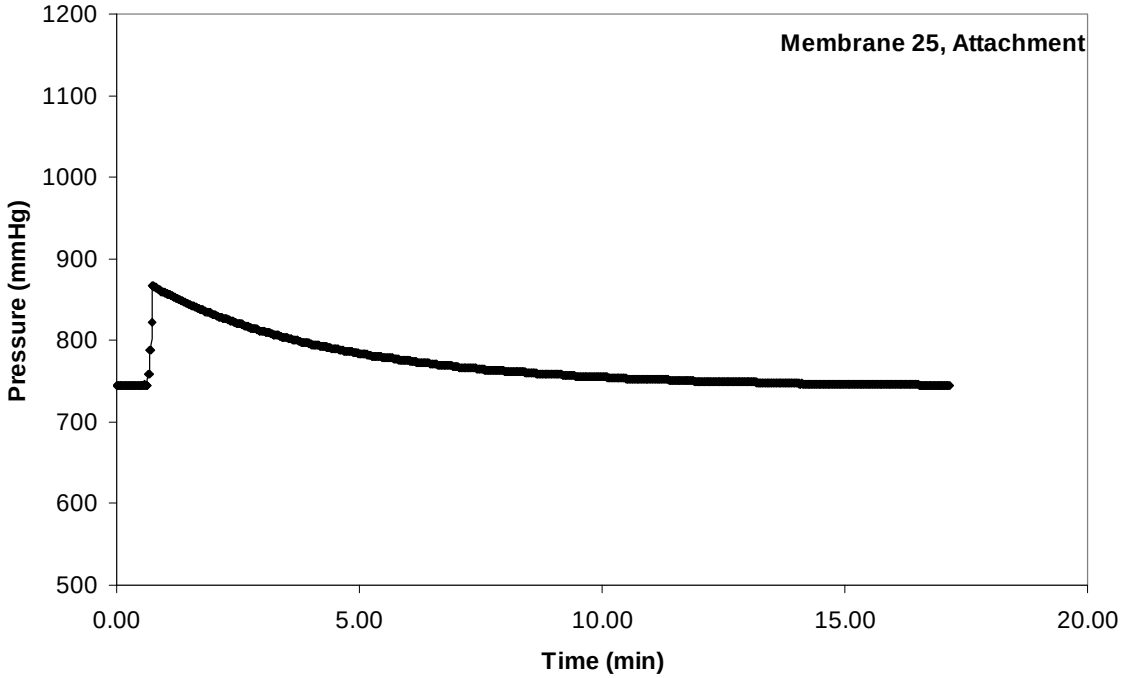
Membrane 13 was used at Ives 1 hyporheic from 6/13/2007 to 7/2/2007 with MiniSonde 43639.



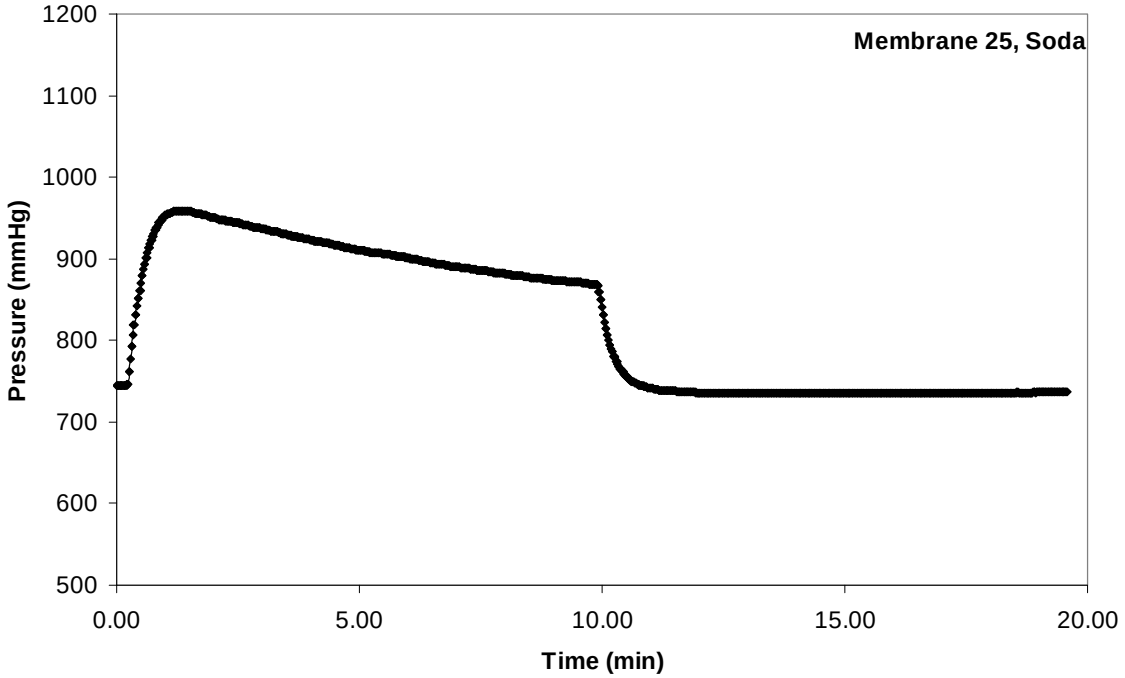


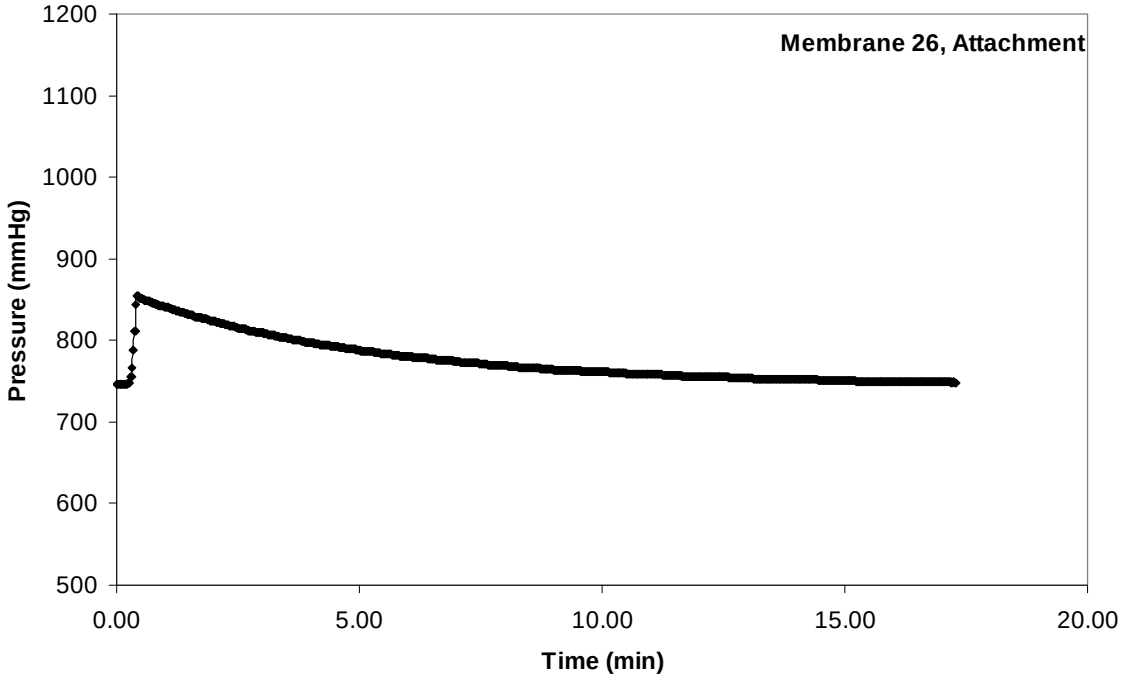
Membrane 23 was used at Multnomah Falls 3 hyporheic from 6/14/2007 to 7/2/2007 with MiniSonde 44948. This membrane tested bad. Although the side-by-side data appeared reliable, we excluded them from our analysis.



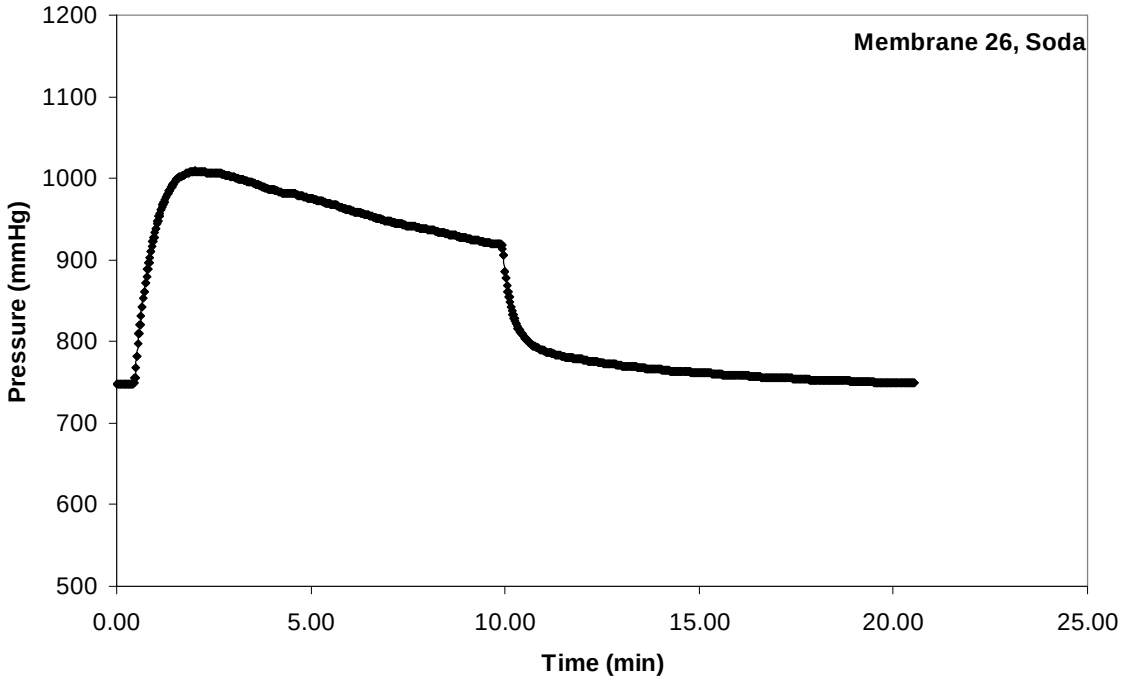


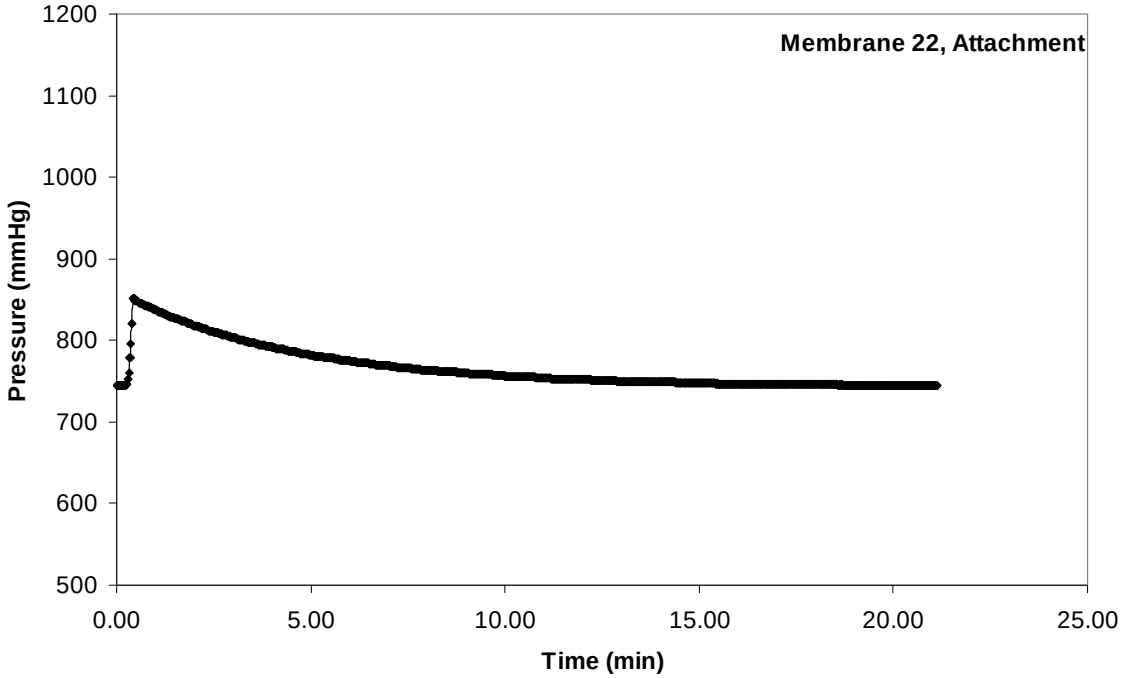
Membrane 25 was used at Multnomah Falls 1 river from 6/14/2007 to 7/2/2007 with MiniSonde 43659.





Membrane 26 was used at Multnomah Falls 1 hyporheic from 6/14/2007 to 7/2/2007 with MiniSonde 44947.





Membrane 22 was used as the control for the side-by-side after deployment 7. It was used with MiniSonde 40347.