Attachment M.1 - Local Hydrogeology and Mixing Zone Information

Depth to shallowest ground water - **8.51-feet**

Groundwater was monitored from March of 2003 until August of 2006 as detailed in the **Attachment M.1** *Table 2. Groundwater Elevation Data, Louisiana Pacific, Deer Lodge, MT.* The shallowest depth to groundwater, 8.51-feet, was encountered in MW-2 on July 3, 2003.

Attachment M.2 - Local Hydrogeology and Mixing Zone Information

Depth to shallowest bedrock - **not-applicable**

The Montana Bureau of Mines and Geology (MBMG) - Ground Water Information Center (GWIC) site was used to identify the eight wells (Wells A through Well H) located within a one-mile radius of the Sun Mountain Lumber property as shown on **Attachment M.2.** The layers encountered are alluvial material (i.e., clay and gravel, sand and gravel, gravels silt, sandy clay); bedrock was not encountered. The Clark Fork River meanders 350-feet to 1000-feet east of the site.

The MBMG-GWIC well log reports for Wells A through H are included in **Attachment M.2.**

Attachment M.3 - Local Hydrogeology and Mixing Zone Information

Depth to shallowest impermeable geologic strata (if known)

The wells within a one-mile radius are shown on the map included in **Attachment M.2.** The deepest well (236 feet, Well E, GWIC-ID # 181290) and the on-site well (90 feet total depth, Well I, GWIC-ID# 55847) do not show a continuous clay lens. The clay layer recorded at the on-site well starts at 75 feet. This was a conservative value and was used in the Aqtesolv model and the GW2 permit renewal application.

The MBMG-GWIC well log reports for Well E and Well I are included in **Attachment M.3.**

Attachment M.4 - Local Hydrogeology and Mixing Zone Information

Direction of ground water flow - **East 6-degree North direction**

As per the Permit Fact Sheet MGWPCS for Sun Mountain Lumber, Permit MTX000125, ground water flow is in the East 6-degree North direction. Page 7 of 21 is included in **Attachment M.4.**

The groundwater elevation data from *Table 2. Groundwater Elevation Data, Louisiana Pacific, Deer Lodge, MT* included in **Attachment M.1** was plotted. The direction of groundwater flow is in the northeasterly direction.

Attachment M.5 – Local Hydrogeology and Mixing Zone Information

Standard Mixing Zone

Hydraulic Gradient (I) - **0.008-feet/feet**

The groundwater elevation data from *Table 2. Groundwater Elevation Data, Louisiana Pacific, Deer Lodge, MT* was plotted and the hydraulic gradient is approximately 0.008-feet/feet. A copy of *Table 2* is included in **Attachment M.1**.

Attachment M.6 – Local Hydrogeology and Mixing Zone Information

Hydraulic Conductivity (K) - **26.18-feet/day**

The hydraulic conductivity was determined by performing multiple slug tests on the MW-4 well. Both slug-in and slug-out tests were measured with a transducer; data was input into the Aqtesolv model. Results for all tests resulted in the same hydraulic conductivity and are included in **Attachment M.6**.

Data Set: C:\Users\kdraper\Desktop\sun mountain aqt\sml2 MW-4 line 4141slug in.aqt
Date: 09/30/14
Time: 13:11:52

PROJECT INFORMATION

Company: WET
Client: SML
Project: SMLM01
Location: Deer Lodge
Test Date: 9/22/2014
Test Well: MW-4

AQUIFER DATA

Saturated Thickness: 55. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-4

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.5 ft
Static Water Column Height: 10.88 ft
Casing Radius: 0.1667 ft
Well Radius: 0.1667 ft
Well Skin Radius: 0.5 ft
Screen Length: 11. ft
Total Well Penetration Depth: 11. ft

No. of Observations: 42

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.01667	11.13	0.3667	9.94
0.03333	12.08	0.3833	9.932
0.05	10.79	0.4	9.936
0.06667	9.735	0.4167	9.935
0.08333	9.896	0.4333	9.935
0.1	9.985	0.45	9.931
0.1167	10.01	0.4667	9.934
0.1333	10.01	0.4833	9.929
0.15	10.	0.5	9.929
0.1667	9.981	0.5167	9.935
0.1833	9.97	0.5333	9.933
0.2	9.962	0.55	9.929
0.2167	9.958	0.5667	9.926
0.2333	9.949	0.5833	9.932
0.25	9.95	0.6	9.927
0.2667	9.947	0.6167	9.926
0.2833	9.942	0.6333	9.93
0.3	9.941	0.65	9.929
0.3167	9.945	0.6667	9.927
0.3333	9.943	0.6833	9.928
0.35	9.937	0.7	9.925

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2387

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	26.18	ft/day
y0	1.	ft

K = 0.009236 cm/sec
T = K*b = 1440. ft²/day (15.48 sq. cm/sec)

Attachment M.7 – Local Hydrogeology and Mixing Zone Information

Maximum width of source perpendicular to the direction of ground water flow - **13.7-feet (Drainfield 1) and 38.8-feet (Drainfield 2)**

Drainfield 1 (near Outfall 1), consist of two 16-foot laterals; 13.7-feet is perpendicular to groundwater flow as shown in **Attachment M.7.**

Drainfield 2 (near Outfall 2), consist of two 40-foot laterals; 38.8-feet is perpendicular to groundwater flow as shown in **Attachment M.7.**