

# Remediation and Redevelopment Division

## Michigan Department of Environment, Great Lakes, and Energy

Present Worth Analysis.doc

04/21/2020

### FORMULA TO DETERMINE THE PRESENT WORTH OF FINANCIAL ASSURANCE

This document provides guidance and information necessary to determine the amount of a contribution to pay for monitoring, operation and maintenance (O&M), oversight, and other costs determined by the department to be necessary to assure the effectiveness and integrity of the remedial action when financial assurance is required under Section 20114d(4)(b) of Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), MCL 321.20101 *et seq.* In order to utilize the present worth formulas detailed in this document, the financial assurance mechanism (FAM) must be an interest-bearing mechanism (i.e., an escrow, certificate of deposit, or trust fund).

Please contact Mr. Brad Ermisch, Compliance and Enforcement Section, Remediation and Redevelopment Division (RRD), EGLE, at [ermischb@michigan.gov](mailto:ermischb@michigan.gov) or 517-275-1173 for any questions relating to this document; or you may call the RRD main number at 517-284-5087 for assistance.

#### Formula:

$$D = (AP)(PWF)$$

where:

- D** = Required contribution to be deposited in an interest accruing FAM.  
**AP** = Annual payout. The annual payout is the amount of money needed to pay for monitoring, operation and maintenance (O&M), oversight, and other costs determined by the department to be necessary to assure the effectiveness and integrity of the remedial action plan (RAP) or interim response designed to meet criteria (IDRC) on an annual basis. A contingency rate of 15 percent, which represents the percentage of increase attributable to unknown contingencies in relation to O&M estimates, is also applied to the annual payout. The following mathematical calculation is utilized to determine the annual payout:

$$AP = (OM + T)(1 + C)$$

where:

- OM** = Annual O&M estimate.  
**T** = Annual trustee fee.  
**C** = Contingency rate (15% or  $C = 0.15$ ).  
**PWF** = Present worth factor (PWF). The uniform series PWF is a mathematical calculation to determine the discounted amount of the FAM. The calculation follows:

$$PWF = \frac{(1+i)^N - 1}{i(1+i)^N}$$

where:

- i** = Interest rate.

The most recent 30-Year Treasury Constant Maturity Rate may be used for “*i*” in this calculation and can be obtained from the following link: [30-Year Treasury Constant Maturity Rate](#)

**N** = Number of years (normally this will be established at 30-year increments in perpetuity).

The PWF can easily be found without the use of the above equation by locating the intersection of the following coordinates on the table in Attachment A:

- (a) The interest rate *i*, and
- (b) The number of years *N*.

An example of a present worth calculation for a FAM financing long-term response activity costs for a 30-year period is included in Attachment B.

### **DISCLOSURE IN WRITTEN SETTLEMENT AGREEMENTS**

In order to evaluate the contribution required to guarantee the effectiveness and integrity of the remedial action by funding O&M and long-term monitoring activities, an attachment, which states and/or calculates all of the following, should be submitted as part of the FAM submittal:

1. Interest rate utilized in calculation (see above link for 30-Year Treasury Constant Maturity Rate).
2. Number of years utilized in calculation (normally 30 years).
3. Annual cost estimate (documentation must be provided for each element required by Part 201 for monitoring, operation and maintenance, oversight and other costs determined by the department to be necessary).
4. Annual trustee fees (if applicable).
5. Annual payout.
6. Present worth factor.
7. Required contribution calculated from the above data.

### **REVISING THE FAM PRESENT WORTH CONTRIBUTION**

The requirements for updating, revising and terminating the FAM are typically described in the postclosure agreement entered as part of a No Further Action Report under Section 20114d of the NREPA. The annual payout and rates utilized in the present worth calculation must be based on the higher of the following:

- Historic trend analysis of the annual payout and the rates used during the previous agreement period; or
- The average of the payout and rates of the same previous period.

An Excel spreadsheet to calculate present worth factors is available at the following link: [Present Worth Calculator](#)

**ATTACHMENT A  
Present Worth Factor (PWF)**

Number of Years	Interest Rate									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>1</b>	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091
<b>2</b>	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355
<b>3</b>	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869
<b>4</b>	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699
<b>5</b>	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908
<b>6</b>	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553
<b>7</b>	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684
<b>8</b>	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349
<b>9</b>	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590
<b>10</b>	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446
<b>11</b>	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951
<b>12</b>	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137
<b>13</b>	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034
<b>14</b>	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667
<b>15</b>	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061
<b>16</b>	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237
<b>17</b>	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216
<b>18</b>	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014
<b>19</b>	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649
<b>20</b>	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136
<b>21</b>	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922	8.6487
<b>22</b>	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715
<b>23</b>	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802	8.8832
<b>24</b>	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066	8.9847
<b>25</b>	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770
<b>26</b>	22.7952	20.1210	17.8768	15.9828	14.3752	13.0032	11.8258	10.810	9.9290	9.1609
<b>27</b>	23.5596	20.7069	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	10.0266	9.2372
<b>28</b>	24.3164	21.2813	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	10.1161	9.3066
<b>29</b>	25.0658	21.8444	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	10.1983	9.3696
<b>30</b>	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269

## ATTACHMENT B

**Present worth example of thirty years' worth of EGLE payments to a third party contractor with the follow data:**

Interest rate	Number of periods	Annual O&M costs	Annual trustee fee	Annual payout	Present worth factor	Required contribution
5.00%	30	\$2,500.00	\$500.00	\$3,450.00	15.37245103	\$53,034.96

Year	Principal at start of year	Interest rate	Principal + interest	Annual payout	Year end principal
1	\$53,034.96	5.00%	\$55,686.70	\$3,450.00	\$52,236.70
2	\$52,236.7	5.00%	\$54,848.54	\$3,450.00	\$51,398.54
3	\$51,398.54	5.00%	\$53,968.47	\$3,450.00	\$50,518.47
4	\$50,518.47	5.00%	\$53,044.39	\$3,450.00	\$49,594.39
5	\$49,594.39	5.00%	\$52,074.11	\$3,450.00	\$48,624.11
6	\$48,624.11	5.00%	\$51,055.31	\$3,450.00	\$47,605.31
7	\$47,605.31	5.00%	\$49,985.58	\$3,450.00	\$46,535.58
8	\$46,535.58	5.00%	\$48,862.36	\$3,450.00	\$45,412.36
9	\$45,412.36	5.00%	\$47,682.98	\$3,450.00	\$44,232.98
10	\$44,232.98	5.00%	\$46,444.63	\$3,450.00	\$42,994.63
11	\$42,994.63	5.00%	\$45,144.36	\$3,450.00	\$41,694.36
12	\$41,694.36	5.00%	\$43,779.07	\$3,450.00	\$40,329.07
13	\$40,329.07	5.00%	\$42,345.53	\$3,450.00	\$38,895.53
14	\$38,895.53	5.00%	\$40,840.30	\$3,450.00	\$37,390.30
15	\$37,390.3	5.00%	\$39,259.82	\$3,450.00	\$35,809.82
16	\$35,809.82	5.00%	\$37,600.31	\$3,450.00	\$34,150.31
17	\$34,150.31	5.00%	\$35,857.83	\$3,450.00	\$32,407.83
18	\$32,407.83	5.00%	\$34,028.22	\$3,450.00	\$30,578.22
19	\$30,578.22	5.00%	\$32,107.13	\$3,450.00	\$28,657.13
20	\$28,657.13	5.00%	\$30,089.99	\$3,450.00	\$26,639.99
21	\$26,639.99	5.00%	\$27,971.98	\$3,450.00	\$24,521.98
22	\$24,521.98	5.00%	\$25,748.08	\$3,450.00	\$22,298.08
23	\$22,298.08	5.00%	\$23,412.99	\$3,450.00	\$19,962.99
24	\$19,962.99	5.00%	\$20,961.14	\$3,450.00	\$17,511.14
25	\$17,511.14	5.00%	\$18,386.69	\$3,450.00	\$14,936.69
26	\$14,936.69	5.00%	\$15,683.53	\$3,450.00	\$12,233.53
27	\$12,233.53	5.00%	\$12,845.21	\$3,450.00	\$9,395.21
28	\$9,395.21	5.00%	\$9,864.97	\$3,450.00	\$6,414.97
29	\$6,414.97	5.00%	\$6,735.71	\$3,450.00	\$3,285.71
30	\$3,285.71	5.00%	\$3,450.00	\$3,450.00	(\$0.00)