

Outfall 001 Mixing Performance Study Addendum

Date:	December 15, 2023	1100 112th Avenue NE
Project name:	Salmon Creek Treatment Plant - Outfall 001	Suite 500
Project no:	D3487800	Bellevue, WA 98004-5118
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Reviewed by:	David Wilson, Brad Paulson	
Copies to:	Scott Crook, Jacobs	

Introduction

The *Salmon Creek Treatment Plant Outfall 001 Mixing Performance Study Report* (Jacobs, 2023), hereinafter referred to as the *Outfall 001 Mixing Performance Study*, was submitted to the Washington Department of Ecology (Ecology) in March 2023. The Salmon Creek Treatment Plant (SCTP) is owned and operated by the Clark Regional Wastewater District (CRWD). The *2023 Outfall 001 Mixing Performance Study Report* documents the dilution performance of the replacement SCTP Outfall 001 diffuser in the Columbia River at River Mile 96. The *Outfall Mixing Performance Study* was conducted in 2022 following construction, and it included site-specific field measurements and tracer dye measurements of dilutions that were used to select and validate the dilution model used to generate dilution factors under critical effluent and receiving water conditions. These dilution factors under critical conditions were developed for the Washington State Department of Ecology (Ecology) to apply in the renewal of the SCTP National Pollutant Discharge Elimination System (NPDES) permit.

Following submittal of the *Outfall 001 Mixing Performance Study Report* to Ecology in March 2023, the project team determined that the diffuser was installed on a slightly sloped river bed which resulted in six of ten diffuser ports at elevations deeper than the design port elevations. The as-built port elevations were field-measured in July 2023, confirming that six offshore diffuser ports were installed approximately 1.5 to 4.5 feet deeper in the river than the design port elevations. The reason that the diffuser ports were deeper than the design port elevation was due to the diffuser pipe invert being placed on an approximately 5 percent sloped trench in the river bed. The CRWD immediately engaged the design engineers to design solutions and the marine construction contractor to prepare for diffuser riser extension during the fall in-water work period. In November 2023, the marine contractor completed modifications to the offshore outfall diffuser risers. The outfall diffuser 20-inch diameter risers #5 through #10 (farthest offshore) were modified with addition of steel riser extensions to achieve the average design port elevation of -40 ft (NGVD29) for all ten diffuser ports. The design port elevation was developed in design to provide adequate port heights above the riverbed to address potential risk of diffuser ports burial by Columbia River bedform transport of sand waves.

The design team has prepared this evaluation to address the potential for the port depth discrepancy to affect the dilution performance and this document is submitted as an Addendum to the March 2023 *Outfall 001 Mixing Performance Study* for the SCTP Outfall 001. This evaluation supports the conclusion that the port depth discrepancy does not affect the dilution factors at the points of compliance in the

receiving water, and that NPDES permit renewal development should proceed with the results of the March 2023 *Outfall 001 Mixing Performance Study*.

Approach

The model selection and validation process completed in the 2023 *Outfall 001 Mixing Performance Study* resulted in the selection of the UM3 model from EPA's Visual Plumes platform. Of the three models evaluated (UM3, DKHW, and CORMIX), the UM3 model agreed most closely with the field-measured dilutions from the September 2022 field tracer study.

Dilution models including UM3 simulate discharge from a multi-port diffuser by assuming that all ports discharge at the same water depth. Thus, it is an accepted and reasonable approach to simulate the diffuser using an average port depth. The *Outfall 001 Mixing Performance Study* applied the design port elevation of -40.0 feet (NGVD29) under 7Q10 low river flow stage at RM 96, which yields an average port depth of -42.6 feet. The as-built port elevations were surveyed in July 2023 and the port elevations (adjusted for river stage) were determined to range from -44.4 feet (offshore port no. 1) to -39.5 feet (inshore port no. 10), with an average as-built port elevation of -41.7 feet (NGVD29) across all 10 ports (compared to the design port elevation of -40.0 feet, NGVD29). This indicates that the diffuser was installed on an approximately 5-percent slope in the pipe trench, with the offshore diffuser end lower than the design elevation. Therefore, for the purposes of this evaluation, an additional 2.0 feet was added to the design port elevation plus the 7Q10 river stage to represent the temporary as-built average port depth of -44.6 feet at 7Q10 low river stage. As described above, the outfall diffuser was modified in November 2023 with the addition of 20-inch diameter riser extensions of varied lengths on ports #5 through #10 to achieve the average design port elevation of -40 ft across all ten ports.

The as-built port elevations determined from the July 2023 field inspection survey, and the modified port elevations after the addition of riser extensions on six of the 10 risers, are annotated on the final design drawing provided in Figure 1. This information documents that for a period of time after the completion of construction in 2022, the ports were discharging at an average port elevation of -41.7 feet NGVD29, approximately 2 feet deeper than the design port elevation. As of early November 2023, the SCTP outfall diffuser ports have been discharging at an average elevation of -40 ft NGVD29, which was the design elevation and the condition represented in the *Outfall 001 Mixing Performance Study* (Jacobs, 2023).

To evaluate the potential for the increased port depth to affect the dilutions at the points of regulatory compliance, the *Outfall 001 Mixing Performance Study* authors re-ran a selection of the model cases and compared the results to those presented in the 2023 study report.

Results

The following model cases were re-run with the deeper port depth of -44.6 ft at the 7Q10 river stage, and these model cases show that the model predicted dilution were not affected by the deeper port depths.

Existing Effluent Flow Rates:

- Model case SCTP-7, representing critical dry season conditions for compliance with chronic aquatic life water quality standards (flood tide conditions with the 10th-percentile current speed)

Phase 5 Effluent Flow Rates:

- Model case SCTP-17, representing Phase 5 critical dry season conditions for compliance with chronic aquatic life water quality standards (ebb tide conditions with the 50th-percentile current speed)

Buildout Effluent Flow Rates:

- Model case SCTP-51, representing critical dry season conditions for compliance with chronic aquatic life water quality standards (flood tide conditions with the 10th-percentile current speed)

Figures 2 and 3 plot the model-predicted dilutions along the plume's travel distance from the SCTP diffuser for model case no. SCTP-14 and SCTP-17, respectively. Each plot illustrates model predicted results for: a) the average design port depth of **42.6 feet**, as presented in the *Outfall 001 Mixing Performance Study*, and for b) an assumed average as-built port depth of **44.6 feet**. These results show that the model-predicted dilutions at the Acute Zone Boundary (AZB, a distance of 24 feet) and the Mixing Zone Boundary (MZB, a distance of 242 feet) are identical for both diffuser depths. The deeper as-built port depths result in slightly higher dilutions once the plume has reached the river surface. Therefore, the deeper port depth is only potentially meaningful to the predicted critical dilutions for cases where the plume reaches the water surface before reaching the AZB or MZB.

In all cases evaluated, the discharge plume reaches the water surface well after the AZB, and the acute dilutions in the *Outfall 001 Mixing Performance Study* are thus still representative for the conditions with the deeper ports. In addition, for all human health critical conditions, the plume reaches the water surface well after reaching the MZB. The plume reaches the water surface before reaching the MZB only for the following model cases:

Chronic aquatic life, flood tide conditions:

- Existing Effluent Flows: SCTP-7, SCTP-9
- Phase 5 Effluent Flows: SCTP-18, SCTP-20
- Phase 6 Effluent Flows: SCTP-29, SCTP-31
- Phase 7 Effluent Flows: SCTP-40, SCTP-42
- Buildout Effluent Flows: SCTP-51, SCTP-53

Model case no. SCTP-7 represents existing effluent flow conditions and dry season chronic aquatic life conditions under flood tide. The model results with an additional two feet of port depth results in a slightly *higher* predicted dilution at the mixing zone boundary than with the design port depth:

- Original SCTP-7 with port depth of **42.6 feet**: dilution factor at the MZB of **131**
- SCTP-7 with port depth of **44.6 feet**: dilution factor at the MZB of **136**

This model-predicted dilution at flood tide makes only a very small difference in the tidally-averaged dilution factor, increasing it by 1, such that the dilution factor applicable to chronic aquatic life critical conditions (existing effluent flows) would be 170 instead of 169 (refer to Table 3-2 in the *Outfall 001 Mixing Performance Study*). Refer to Figure 4 for a plot of these results for model case no. SCTP-7. The updated model cases for all effluent flows (existing through buildout) under ebb tide conditions (with a time-weighted proportion of 76%), would be identical because the plume reaches the MZB before the water surface.

Under buildout effluent flow conditions, the plume reaches the MZB after it surfaces (model case no. SCTP-51) for chronic aquatic life conditions under flood tide conditions. The two feet of additional average port depth results in a slightly higher predicted dilution at the mixing zone boundary than under the design port depth:

- Original SCTP-51 with port depth of **42.6 feet**: dilution factor at the MZB of **52**
- SCTP-51 with port depth of **44.6 feet**: dilution factor at the MZB of **54**

Refer to Figure 5 for a plot of these two model results for SCTP-51. Ultimately, this makes no real difference in the tidally-averaged chronic dilution factor, which equals 113 under both port depth conditions.

Model input/output files for the model cases listed above are provided as an attachment to this technical memorandum. All model cases submitted for NPDES permit development are presented in detail in Section 3.3 of the *Outfall 001 Mixing Performance Study* and supporting appendices.

Conclusion

The results of this evaluation demonstrate the following: 1) the difference in port depth between the (temporary) as-built and the design conditions shows virtually no reduction in the Outfall 001 discharge's dilution in the Columbia River at the authorized mixing zone boundaries. For a short time in 2022 and 2023, the discharge achieved very slightly higher dilutions at the MZB than was presented in the 2023 *Outfall 001 Mixing Performance Study* for a limited number of critical conditions. As the diffuser port elevations were remedied to the design elevations in November 2023, the diffuser ports are discharging at the average design port elevation of -40 feet NGVD29, and the model-predicted dilutions presented in the *Outfall 001 Mixing Performance Study* are valid for use in the NPDES permit renewal.

Figures

Attachment 1 – UM3 Model Input and Output

Figures

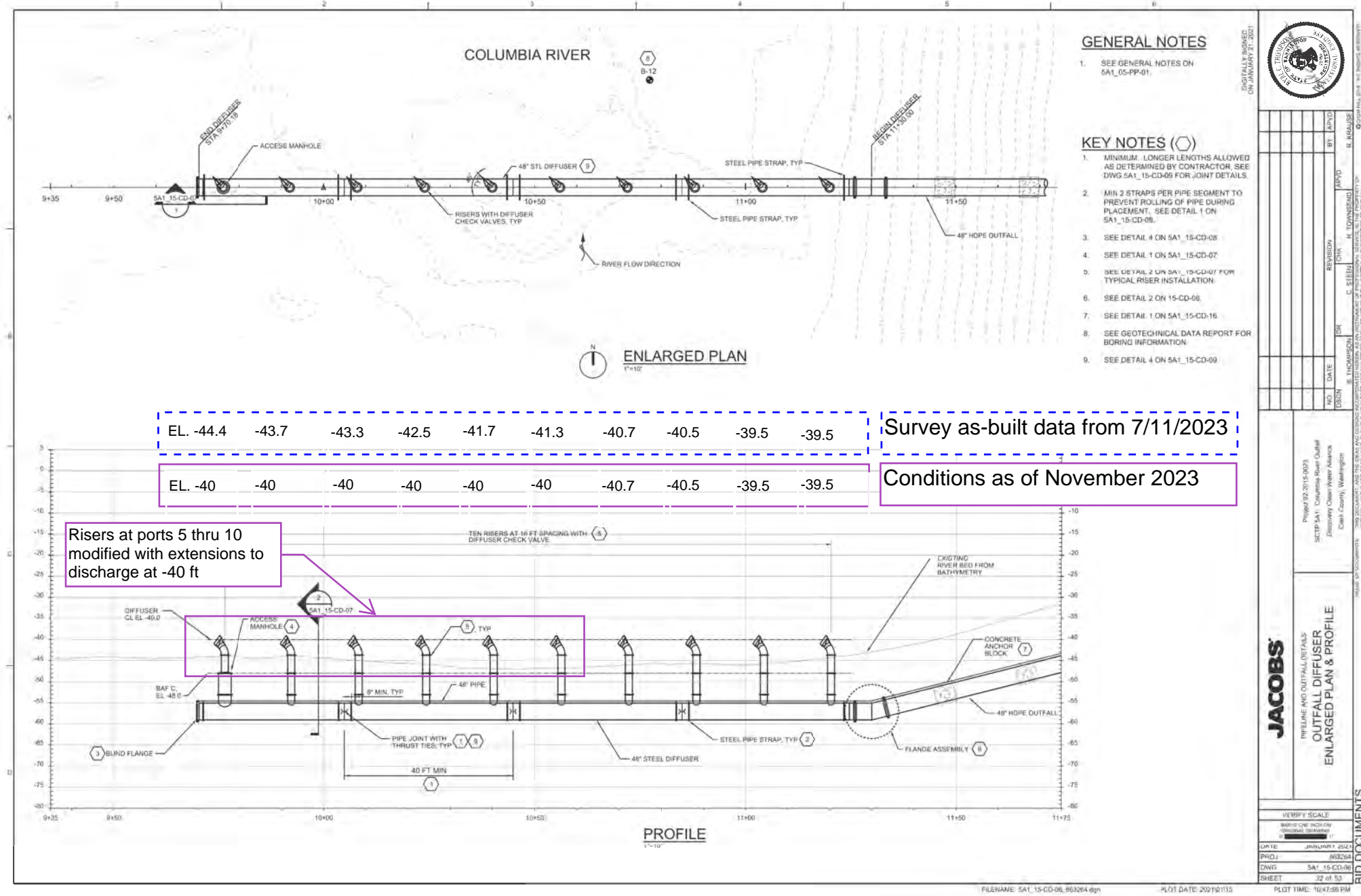


Figure 1. Annotated As-Built Drawing SCTP Outfall 001 Mixing Performance Study Addendum

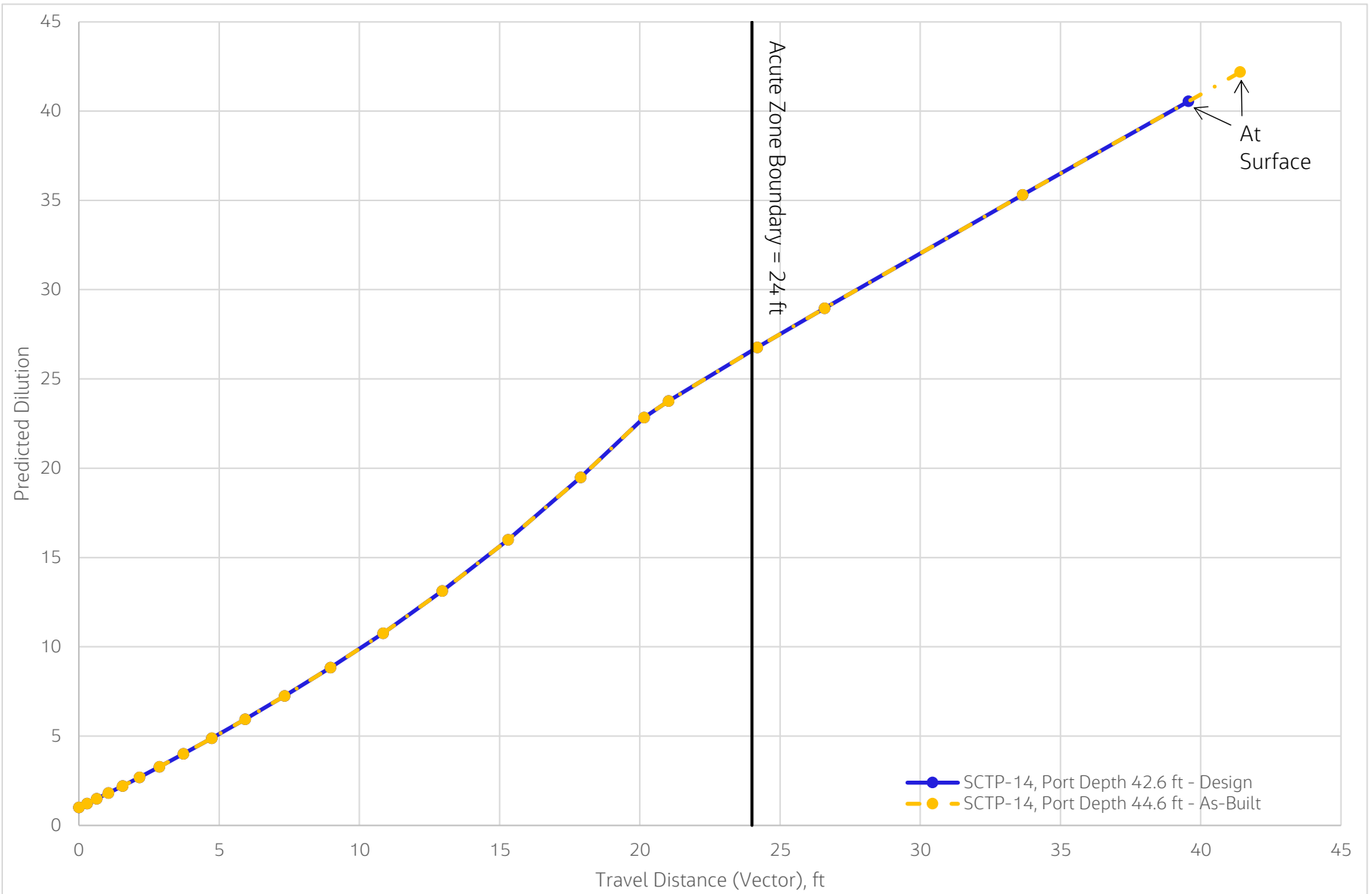


Figure 2. Model-Predicted Dilutions for Model Case No. SCTP-14 at Design and As-Built Average Port Depths Salmon Creek Treatment Plant Outfall 001 - Mixing Performance Study Addendum

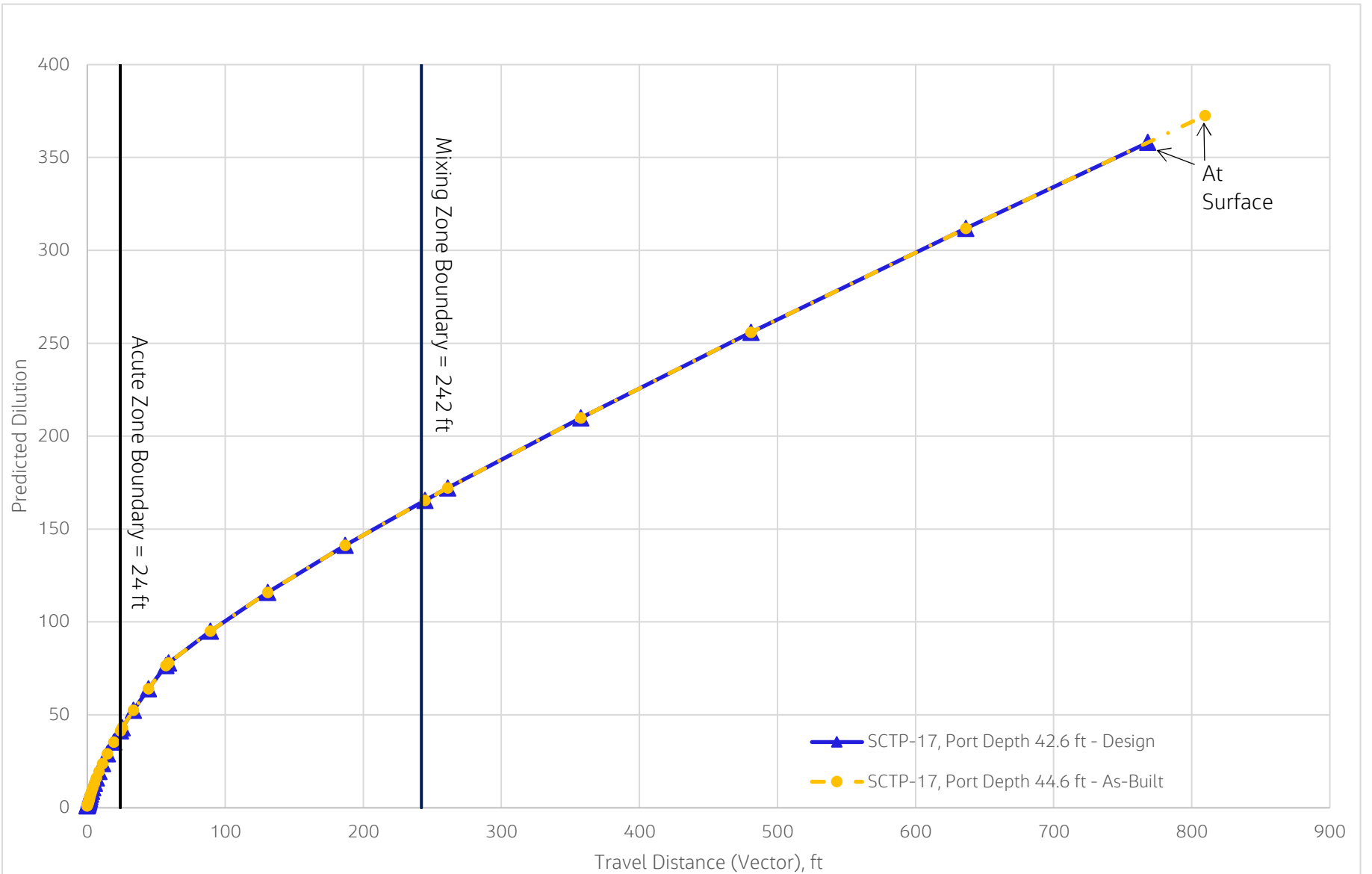


Figure 3. Model-Predicted Dilutions for Model Case No. SCTP-17 at Design and As-Built Average Port Depths
 Salmon Creek Treatment Plant Outfall 001 - Mixing Performance Study Addendum

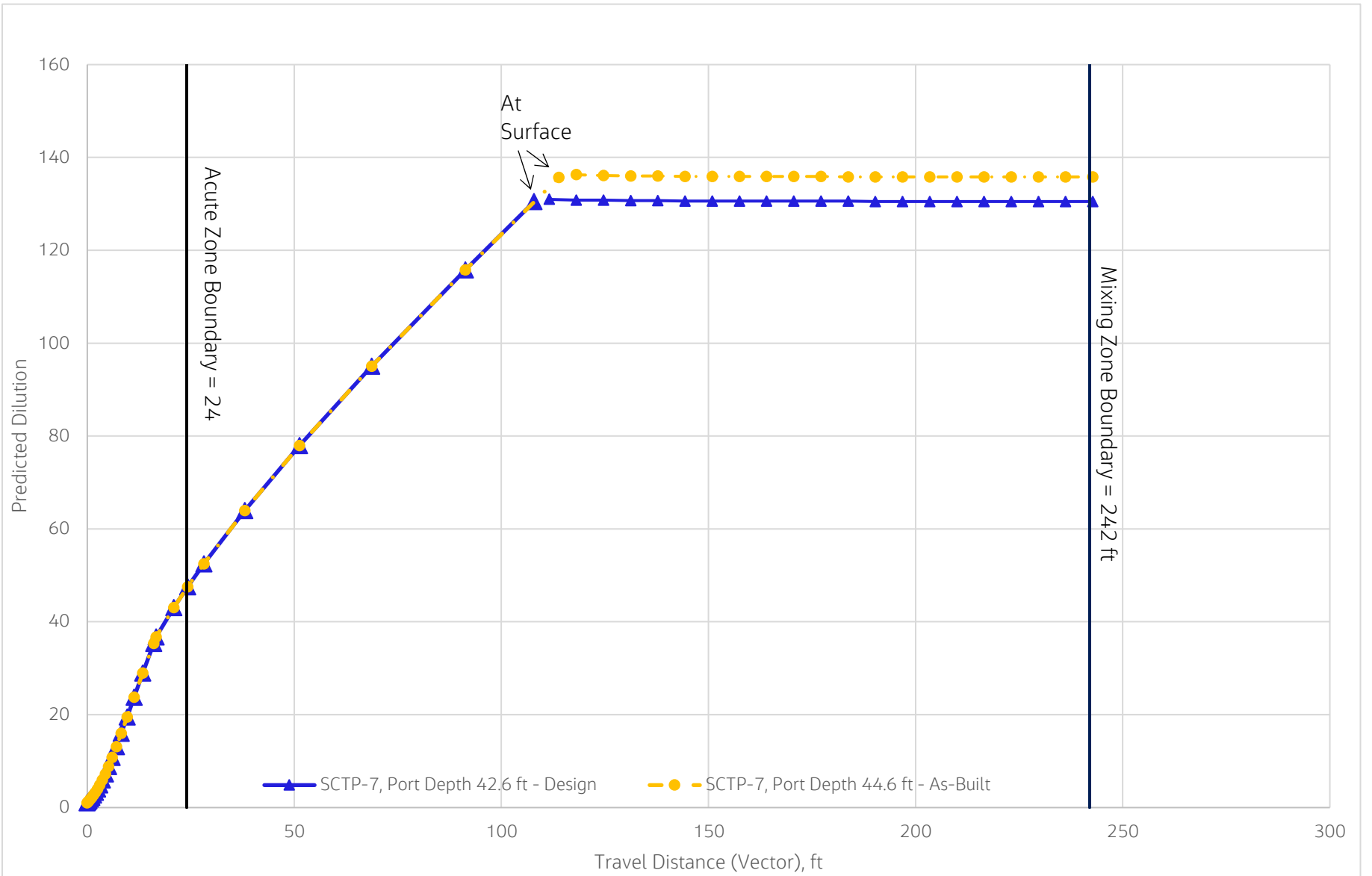


Figure 4. Model-Predicted Dilutions for Model Case No. SCTP-7 at Design and As-Built Average Port Depths
 Salmon Creek Treatment Plant Outfall 001 - Mixing Performance Study Addendum

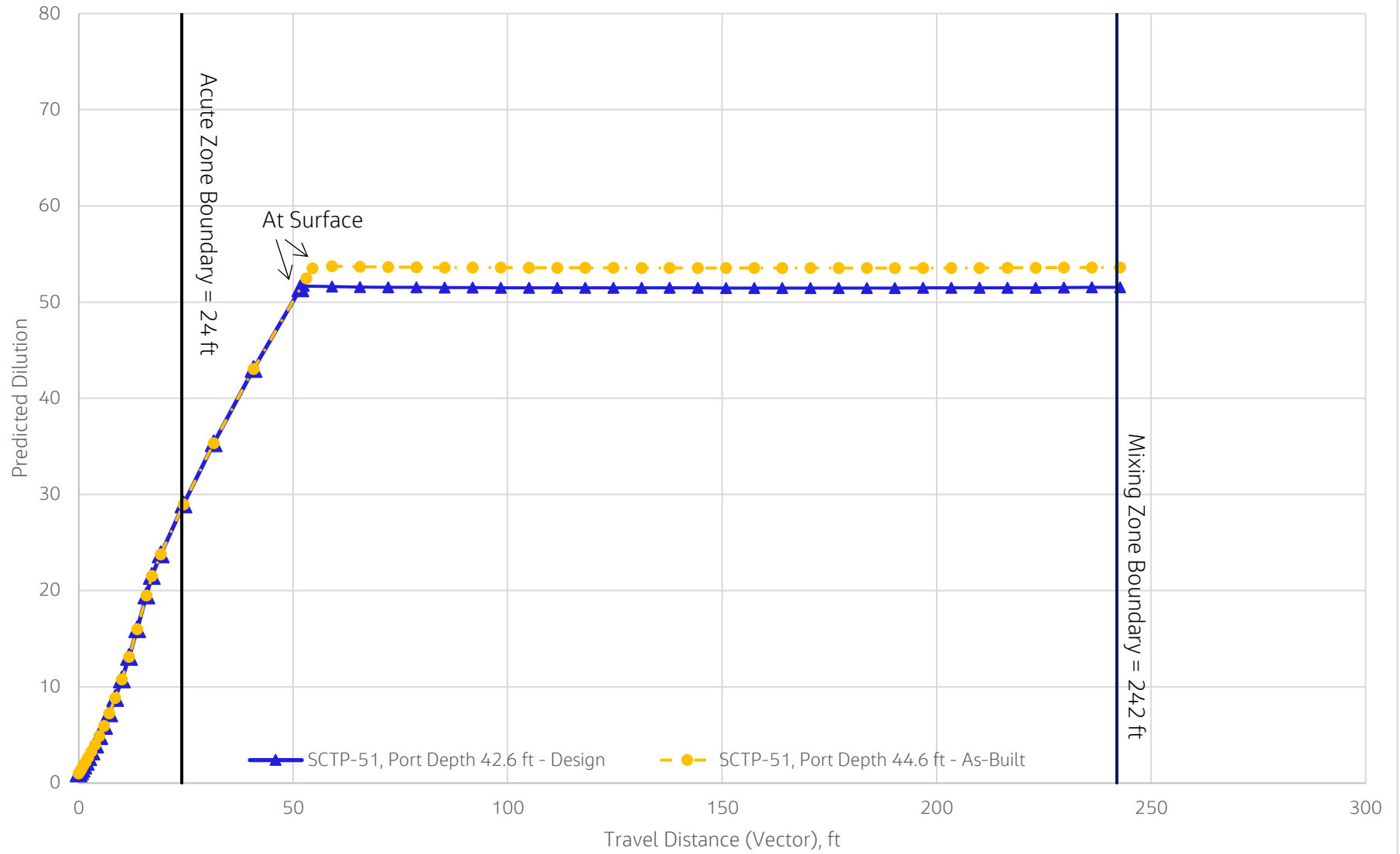


Figure 5. Model-Predicted Dilutions for Model Case No. SCTP-51 at Design and As-Built Average Port Depths
 Salmon Creek Treatment Plant Outfall 001 - Mixing Performance Study Addendum

Attachment 1 – UM3 Model Input and Output

/ Case UM3. 11/3/2023 1:16:03 PM SCTP-14 ambient file c:\plumes\plume 23.001.db; Diffuser table record 1:00 -----

Ambient

Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-sp	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.04	90	0	21.1	0	0	0.04	90	0.0003	-1.966
15	0.04	90	0	21.1	0	0	0.04	90	0.0003	-1.966

Diffuser

table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.7972	4.3	45	135	10	16	24	242	42.6	17.33	1.00E-03	23.2	100

Simulation:

Froude number: 48.38; effluent density (sigma-T) -2.446; effluent velocity 1.637(m/s);

Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector Dist
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)
0	42.6	0.04	0.797	100	1	0	0	0.0;	0
10	42.31	0.04	0.961	82.03	1.219	-0.203	0.205	0.0848;	0.29
20	41.97	0.04	1.169	67.3	1.486	-0.447	0.452	0.209;	0.64
30	41.56	0.04	1.422	55.21	1.811	-0.738	0.753	0.389;	1.1
40	41.07	0.04	1.729	45.29	2.207	-1.084	1.116	0.65;	1.6
50	40.48	0.04	2.101	37.15	2.691	-1.494	1.556	1.028;	2.2
60	39.8	0.04	2.55	30.48	3.28	-1.977	2.087	1.57;	2.9
70	38.99	0.04	3.092	25	3.998	-2.543	2.726	2.344;	3.7
80	38.05	0.04	3.745	20.51	4.874	-3.2	3.495	3.44;	4.7
90	36.96	0.04	4.528	16.83	5.941	-3.958	4.418	4.98;	5.9
100	35.7	0.04	5.464	13.8	7.242	-4.825	5.525	7.127;	7.3
110	34.27	0.04	6.577	11.32	8.827	-5.804	6.844	10.08;	9.0
120	32.68	0.04	7.892	9.289	10.76	-6.881	8.387	14.04;	10.8
130	30.94	0.04	9.438	7.62	13.12	-8.035	10.16	19.21;	13.0
140	29.07	0.04	11.24	6.251	15.99	-9.25	12.19	25.84;	15.3
150	27.08	0.04	13.33	5.128	19.49	-10.51	14.48	34.21;	17.9
158	25.41	0.04	15.22	4.377	22.84	-11.53	16.53	42.37;	20.2
160	24.78	0.04	15.76	4.207	23.76	-11.91	17.33	45.69;	21.0
166	22.52	0.04	17.85	3.736	26.76	-13.24	20.24	58.29;	24.2
170	20.82	0.04	19.6	3.451	28.96	-14.2	22.48	68.36;	26.6
180	15.87	0.04	25.32	2.831	35.3	-16.83	29.14	100.1;	33.7
187	11.75	0.04	30.58	2.465	40.55	-18.83	34.79	128.6;	39.6

merging;

acute zone;

surface;

Const

Eddy Diffusivity. Farfield dispersion based on wastefield width of 40.36 m

concentration (%)	dilutn	width (m)	distnce (m)	time (hrs)	(kg/kg)	(s-1)	/s)(m0.67/s2)
2.45926	40.64	40.95	14	0.0135	0	0	3.00E-04
2.46124	40.61	41.56	16	0.0274	0	0	3.00E-04
2.46222	40.59	42.15	18	0.0413	0	0	3.00E-04
2.46284	40.58	42.74	20	0.0552	0	0	3.00E-04
2.46325	40.58	43.32	22	0.069	0	0	3.00E-04
2.46349	40.57	43.89	24	0.0829	0	0	3.00E-04
2.46346	40.57	44.45	26	0.0968	0	0	3.00E-04
2.46302	40.58	45.01	28	0.111	0	0	3.00E-04
2.46201	40.6	45.56	30	0.125	0	0	3.00E-04
2.46028	40.63	46.1	32	0.138	0	0	3.00E-04
2.45773	40.67	46.64	34	0.152	0	0	3.00E-04
2.45429	40.73	47.17	36	0.166	0	0	3.00E-04
2.44977	40.8	47.7	38	0.18	0	0	3.00E-04
2.44461	40.89	48.22	40	0.194	0	0	3.00E-04
2.43865	40.99	48.73	42	0.208	0	0	3.00E-04
2.4319	41.1	49.24	44	0.222	0	0	3.00E-04
2.4245	41.23	49.74	46	0.236	0	0	3.00E-04
2.41642	41.36	50.24	48	0.25	0	0	3.00E-04
2.40793	41.51	50.74	50	0.263	0	0	3.00E-04
2.39878	41.67	51.22	52	0.277	0	0	3.00E-04
2.38931	41.83	51.71	54	0.291	0	0	3.00E-04
2.37935	42.01	52.19	56	0.305	0	0	3.00E-04
2.36901	42.19	52.66	58	0.319	0	0	3.00E-04
2.35823	42.39	53.13	60	0.333	0	0	3.00E-04
2.34741	42.58	53.6	62	0.347	0	0	3.00E-04
2.33634	42.78	54.06	64	0.361	0	0	3.00E-04
2.32526	42.99	54.52	66	0.375	0	0	3.00E-04
2.31397	43.2	54.98	68	0.388	0	0	3.00E-04
2.30254	43.41	55.43	70	0.402	0	0	3.00E-04
2.291	43.63	55.88	72	0.416	0	0	3.00E-04
2.27938	43.85	56.32	74	0.43	0	0	3.00E-04

count: 31

1:16:03 PM. amb fills: 2

Ambient Table:

Depth m	Amb-cur m/s	Amb-dir deg	Amb-sal psu	Amb-tem C	Amb-pol kg/kg	Decay s-1	Far-spd m/s	Far-dir deg	Disprsn m0.67/s2	Density sigma-T
0	0.04	90	0	21.1	0	0	0.04	90	0.0003	-1.966
15	0.04	90	0	21.1	0	0	0.04	90	0.0003	-1.966

Diffuser table:

P-dia (ft)	P-elev (ft)	V-angle (deg)	H-angle (deg)	Ports ()	Spacing (ft)	AcuteMZ (ft)	ChrncMZ (ft)	P-depth (ft)	Ttl-flo (MGD)	Eff-sal (psu)	Temp (C)	Polutnt (%)
0.7972	4.3	45	135	10	16	24	242	44.6	17.33	1.00E-03	23.2	100

Simulation:

Froude number:	48.38;	effluent	density	(sigma-T)	-2.446;	effluent	velocity	1.637(m/s);		
Step	Depth (ft)	Amb-cur (m/s)	P-dia (ft)	Polutnt (%)	Dilutn ()	x-posn (ft)	y-posn (ft)	Time (s)	Vector (ft)	Dist
0	44.6	0.04	0.797	100	1	0	0	0.0;	0	
10	44.31	0.04	0.961	82.03	1.219	-0.203	0.205	0.0848;	0.29	
20	43.97	0.04	1.169	67.3	1.486	-0.447	0.452	0.209;	0.64	
30	43.56	0.04	1.422	55.21	1.811	-0.738	0.753	0.389;	1.1	
40	43.07	0.04	1.729	45.29	2.207	-1.084	1.116	0.65;	1.6	
50	42.48	0.04	2.101	37.15	2.691	-1.494	1.556	1.028;	2.2	
60	41.8	0.04	2.55	30.48	3.28	-1.977	2.087	1.57;	2.9	
70	40.99	0.04	3.092	25	3.998	-2.543	2.726	2.344;	3.7	
80	40.05	0.04	3.745	20.51	4.874	-3.2	3.495	3.44;	4.7	
90	38.96	0.04	4.528	16.83	5.941	-3.958	4.418	4.98;	5.9	
100	37.7	0.04	5.464	13.8	7.242	-4.825	5.525	7.127;	7.3	
110	36.27	0.04	6.577	11.32	8.827	-5.804	6.844	10.08;	9.0	
120	34.68	0.04	7.892	9.289	10.76	-6.881	8.387	14.04;	10.8	
130	32.94	0.04	9.438	7.62	13.12	-8.035	10.16	19.21;	13.0	
140	31.07	0.04	11.24	6.251	15.99	-9.25	12.19	25.84;	15.3	
150	29.08	0.04	13.33	5.128	19.49	-10.51	14.48	34.21;	17.9	
158	27.41	0.04	15.22	4.377	22.84	-11.53	16.53	42.37;	20.2	merging;
160	26.78	0.04	15.76	4.207	23.76	-11.91	17.33	45.69;	21.0	
166	24.52	0.04	17.85	3.736	26.76	-13.24	20.24	58.29;	24.2	acute zone;
170	22.82	0.04	19.6	3.451	28.96	-14.2	22.48	68.36;	26.6	
180	17.87	0.04	25.32	2.831	35.3	-16.83	29.14	100.1;	33.7	
189	12.47	0.04	32.3	2.369	42.19	-19.42	36.57	137.9;	41.4	surface;

x y
 24.0 0
 24.0 45

Const

Eddy conc (%)	Diffusivity dilutn	Farfield width (m)	dispersion distance (m)	based time (hrs)	on (kg/kg)	wastefield (s-1)	width (s)/(m0.67/s2)	of 40.88 m
2.36272	42.3	41.31	14	0.00957	0	0	0.04	3.00E-04
2.36526	42.26	41.91	16	0.0235	0	0	0.04	3.00E-04
2.36637	42.24	42.51	18	0.0374	0	0	0.04	3.00E-04
2.36704	42.23	43.11	20	0.0512	0	0	0.04	3.00E-04
2.36749	42.22	43.69	22	0.0651	0	0	0.04	3.00E-04
2.36778	42.21	44.27	24	0.079	0	0	0.04	3.00E-04
2.36785	42.21	44.84	26	0.0929	0	0	0.04	3.00E-04
2.36758	42.22	45.4	28	0.107	0	0	0.04	3.00E-04
2.36682	42.23	45.95	30	0.121	0	0	0.04	3.00E-04
2.36544	42.26	46.5	32	0.135	0	0	0.04	3.00E-04
2.3633	42.29	47.04	34	0.148	0	0	0.04	3.00E-04
2.36035	42.35	47.58	36	0.162	0	0	0.04	3.00E-04
2.35654	42.42	48.11	38	0.176	0	0	0.04	3.00E-04
2.35177	42.5	48.63	40	0.19	0	0	0.04	3.00E-04
2.34637	42.6	49.15	42	0.204	0	0	0.04	3.00E-04
2.34025	42.71	49.66	44	0.218	0	0	0.04	3.00E-04
2.33345	42.84	50.17	46	0.232	0	0	0.04	3.00E-04
2.32603	42.97	50.67	48	0.246	0	0	0.04	3.00E-04
2.31814	43.12	51.17	50	0.26	0	0	0.04	3.00E-04
2.30965	43.28	51.67	52	0.273	0	0	0.04	3.00E-04
2.30077	43.44	52.15	54	0.287	0	0	0.04	3.00E-04
2.29148	43.62	52.64	56	0.301	0	0	0.04	3.00E-04
2.28179	43.81	53.12	58	0.315	0	0	0.04	3.00E-04
2.27159	44	53.59	60	0.329	0	0	0.04	3.00E-04
2.26141	44.2	54.06	62	0.343	0	0	0.04	3.00E-04
2.25098	44.41	54.53	64	0.357	0	0	0.04	3.00E-04
2.24033	44.62	54.99	66	0.371	0	0	0.04	3.00E-04
2.22976	44.83	55.45	68	0.385	0	0	0.04	3.00E-04
2.21894	45.05	55.91	70	0.398	0	0	0.04	3.00E-04
2.20799	45.27	56.36	72	0.412	0	0	0.04	3.00E-04
2.19695	45.5	56.81	74	0.426	0	0	0.04	3.00E-04

count: 31

/ Case UM3. 11/3/2023 1:27:03 PM SCTP-17
 1; ambient file c:\plumes\plume 23.001.db; Diffuser table record 1:00 -----

Ambient Table:

Depth m	Amb-cur m/s	Amb-dir deg	Amb-sal psu	Amb-tem C	Amb-pol kg/kg	Decay s-1	Far-spd m/s	Far-dir deg	Disprsn m0.67/s2	Density sigma-T
0	0.44	90	0	21.1	0	0	0.44	90	0.0003	-1.966
15	0.44	90	0	21.1	0	0	0.44	90	0.0003	-1.966

Diffuser table:

P-dia (ft)	P-elev (ft)	V-angle (deg)	H-angle (deg)	Ports ()	Spacing (ft)	AcuteMZ (ft)	ChrncMZ (ft)	P-depth (ft)	Ttl-flo (MGD)	Eff-sal (psu)	Temp (C)	Polutnt (%)
0.7423	4.3	45	135	10	16	24	242	42.6	13.15	1.00E-03	23	100

Simulation:

Froude number:	46.24;	effleunt	density	(sigma-T)	-2.398;	effleunt	velocity	1.433(m/s);											
Step	Depth (ft)	Amb-cur (m/s)	P-dia (ft)	Polutnt (%)	Dilutn ()	x-posn (ft)	y-posn (ft)	Time (s)	Vector Dist (ft)										
0	42.6	0.44	0.742	100	1	0	0	0.0;	0										
10	42.46	0.44	0.882	82.03	1.219	-0.0984	0.105	0.0467;	0.14										
20	42.32	0.44	1.052	67.3	1.486	-0.197	0.226	0.104;	0.30										
30	42.18	0.44	1.248	55.21	1.811	-0.296	0.365	0.174;	0.47										
40	42.04	0.44	1.47	45.29	2.208	-0.396	0.527	0.26;	0.66										
50	41.9	0.44	1.718	37.15	2.691	-0.495	0.716	0.364;	0.87										
60	41.76	0.44	1.992	30.48	3.28	-0.595	0.938	0.491;	1.1										
70	41.62	0.44	2.292	25	3.998	-0.695	1.204	0.648;	1.4										
80	41.47	0.44	2.617	20.51	4.874	-0.799	1.527	0.844;	1.7										
90	41.32	0.44	2.969	16.83	5.941	-0.906	1.929	1.094;	2.1										
100	41.15	0.44	3.348	13.8	7.242	-1.02	2.439	1.417;	2.6										
110	40.98	0.44	3.758	11.32	8.828	-1.143	3.094	1.838;	3.3										
120	40.79	0.44	4.203	9.289	10.76	-1.275	3.948	2.394;	4.1										
130	40.59	0.44	4.686	7.62	13.12	-1.419	5.07	3.133;	5.3										
140	40.36	0.44	5.213	6.251	15.99	-1.577	6.551	4.117;	6.7										
150	40.11	0.44	5.789	5.128	19.49	-1.749	8.515	5.431;	8.7										
160	39.84	0.44	6.42	4.207	23.76	-1.939	11.12	7.188;	11.3										
170	39.53	0.44	7.113	3.451	28.96	-2.146	14.6	9.538;	14.8										
180	39.2	0.44	7.875	2.831	35.31	-2.374	19.21	12.68;	19.4										
188	38.9	0.44	8.539	2.416	41.37	-2.572	23.98	15.93;	24.1	acute zone;									
190	38.82	0.44	8.713	2.323	43.04	-2.623	25.35	16.86;	25.5										
200	38.41	0.44	9.636	1.905	52.46	-2.895	33.5	22.43;	33.6										
210	37.94	0.44	10.65	1.563	63.95	-3.191	44.29	29.83;	44.4										
219	37.48	0.44	11.66	1.308	76.43	-3.479	56.92	38.5;	57.0	merging;									
220	37.41	0.44	11.78	1.282	77.96	-3.521	58.96	39.9;	59.1										
230	36.46	0.44	13.37	1.052	95.03	-4.08	89.12	60.65;	89.2										
240	35.29	0.44	15.54	0.863	115.8	-4.714	130.8	89.37;	130.9										
250	33.86	0.44	18.33	0.708	141.2	-5.416	186.9	128.1;	187.0										
258	32.49	0.44	21.09	0.604	165.4	-6.021	244.7	167.9;	244.8	chronic zone;									
260	32.11	0.44	21.86	0.581	172.1	-6.177	261.1	179.2;	261.2										
270	29.97	0.44	26.26	0.476	209.8	-6.99	357.5	245.8;	357.6										
280	27.35	0.44	31.7	0.391	255.8	-7.843	480.8	330.9;	480.9										
290	24.15	0.44	38.4	0.321	311.8	-8.728	636.4	438.6;	636.5										
297	21.5	0.44	43.98	0.279	358.1	-9.361	768.1	529.6;	768.2	surface;									

Outside chronic zone
 ;
 1:27:03 PM. amb fills: 2

/ Case UM3. 11/3/2023 1:27:27 PM SCTP-17
 1; ambient file c:\plumes\plume 23.001.db; Diffuser table record 1:00 -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-sp	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.44	90	0	21.1	0	0	0.44	90	0.0003	-1.966
15	0.44	90	0	21.1	0	0	0.44	90	0.0003	-1.966

Diffuser table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrcMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.7423	4.3	45	135	10	16	24	242	44.6	13.15	1.00E-03	23	100

Simulation:

Froude number:	46.24;	effluent	density	(sigma-T)	-2.398;	effluent	velocity	1.433(m/s);		
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector	Dist
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)	(ft)
0	44.6	0.44	0.742	100	1	0	0	0.0;	0	0
10	44.46	0.44	0.882	82.03	1.219	-0.0984	0.105	0.0467;	0.14	0.14
20	44.32	0.44	1.052	67.3	1.486	-0.197	0.226	0.104;	0.30	0.30
30	44.18	0.44	1.248	55.21	1.811	-0.296	0.365	0.174;	0.47	0.47
40	44.04	0.44	1.47	45.29	2.208	-0.396	0.527	0.26;	0.66	0.66
50	43.9	0.44	1.718	37.15	2.691	-0.495	0.716	0.364;	0.87	0.87
60	43.76	0.44	1.992	30.48	3.28	-0.595	0.938	0.491;	1.1	1.1
70	43.62	0.44	2.292	25	3.998	-0.695	1.204	0.648;	1.4	1.4
80	43.47	0.44	2.617	20.51	4.874	-0.799	1.527	0.844;	1.7	1.7
90	43.32	0.44	2.969	16.83	5.941	-0.906	1.929	1.094;	2.1	2.1
100	43.15	0.44	3.348	13.8	7.242	-1.02	2.439	1.417;	2.6	2.6
110	42.98	0.44	3.758	11.32	8.828	-1.143	3.094	1.838;	3.3	3.3
120	42.79	0.44	4.203	9.289	10.76	-1.275	3.948	2.394;	4.1	4.1
130	42.59	0.44	4.686	7.62	13.12	-1.419	5.07	3.133;	5.3	5.3
140	42.36	0.44	5.213	6.251	15.99	-1.577	6.551	4.117;	6.7	6.7
150	42.11	0.44	5.789	5.128	19.49	-1.749	8.515	5.431;	8.7	8.7
160	41.84	0.44	6.42	4.207	23.76	-1.939	11.12	7.188;	11.3	11.3
170	41.53	0.44	7.113	3.451	28.96	-2.146	14.6	9.538;	14.8	14.8
180	41.2	0.44	7.875	2.831	35.31	-2.374	19.21	12.68;	19.4	19.4
188	40.9	0.44	8.539	2.416	41.37	-2.572	23.98	15.93;	24.1	acute zone;
190	40.82	0.44	8.713	2.323	43.04	-2.623	25.35	16.86;	25.5	
200	40.41	0.44	9.636	1.905	52.46	-2.895	33.5	22.43;	33.6	
210	39.94	0.44	10.65	1.563	63.95	-3.191	44.29	29.83;	44.4	
219	39.48	0.44	11.66	1.308	76.43	-3.479	56.92	38.5;	57.0	merging;
220	39.41	0.44	11.78	1.282	77.96	-3.521	58.96	39.9;	59.1	
230	38.46	0.44	13.37	1.052	95.03	-4.08	89.12	60.65;	89.2	
240	37.29	0.44	15.54	0.863	115.8	-4.714	130.8	89.37;	130.9	
250	35.86	0.44	18.33	0.708	141.2	-5.416	186.9	128.1;	187.0	
258	34.49	0.44	21.09	0.604	165.4	-6.021	244.7	167.9;	244.8	chronic zone;
260	34.11	0.44	21.86	0.581	172.1	-6.177	261.1	179.2;	261.2	
270	31.97	0.44	26.26	0.476	209.8	-6.99	357.5	245.8;	357.6	
280	29.35	0.44	31.7	0.391	255.8	-7.843	480.8	330.9;	480.9	
290	26.15	0.44	38.4	0.321	311.8	-8.728	636.4	438.6;	636.5	
299	22.67	0.44	45.73	0.268	372.6	-9.544	809.6	558.3;	809.7	surface;

Outside chronic zone
 ;
 1:27:27 PM. amb fills: 2

/ UM3. ##### 9:13:18 AM SCTP-7
 Case 1; ambient file C:\Plumes\ Diffuser table record 1:00 -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966
15	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966

Diffuser table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrcMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.6876	4.3	45	135	10	16	24	242	42.6	9.58	1.00E-03	23	100

Simulation:

Froude	number:	40.79;	effluent	density	(sigma-T)	-2.398;	effluent	velocity	1.217(m/s);
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector Dist
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)
0	42.6	0.11	0.688	100	1	0	0	0.0;	0
10	42.39	0.11	0.826	82.03	1.219	-0.151	0.154	0.0848;	0.22
20	42.14	0.11	1.001	67.3	1.486	-0.325	0.34	0.204;	0.47
30	41.86	0.11	1.211	55.21	1.811	-0.525	0.563	0.37;	0.77
40	41.54	0.11	1.461	45.29	2.208	-0.752	0.832	0.601;	1.12
50	41.18	0.11	1.76	37.15	2.691	-1.004	1.151	0.912;	1.53
60	40.79	0.11	2.114	30.48	3.28	-1.276	1.523	1.323;	1.99
70	40.38	0.11	2.529	25	3.998	-1.565	1.95	1.853;	2.50
80	39.95	0.11	3.014	20.51	4.874	-1.865	2.44	2.527;	3.07
90	39.51	0.11	3.573	16.83	5.941	-2.175	2.998	3.371;	3.70
100	39.05	0.11	4.213	13.8	7.242	-2.49	3.635	4.42;	4.41
110	38.59	0.11	4.937	11.32	8.828	-2.809	4.363	5.714;	5.19
120	38.12	0.11	5.746	9.289	10.76	-3.132	5.203	7.308;	6.07
130	37.64	0.11	6.644	7.62	13.12	-3.459	6.182	9.28;	7.08
140	37.14	0.11	7.631	6.251	15.99	-3.793	7.341	11.73;	8.26
150	36.62	0.11	8.71	5.128	19.49	-4.137	8.735	14.81;	9.67
160	36.08	0.11	9.886	4.207	23.76	-4.495	10.44	18.72;	11.37
170	35.49	0.11	11.17	3.451	28.96	-4.87	12.55	23.72;	13.46
180	34.86	0.11	12.56	2.831	35.31	-5.267	15.2	30.16;	16.09
182	34.73	0.11	12.85	2.721	36.73	-5.349	15.81	31.66;	16.69
190	33.85	0.11	14.4	2.323	43.04	-5.878	20.1	42.35;	20.94
195	33.2	0.11	15.65	2.104	47.52	-6.249	23.48	50.87;	24.30
200	32.49	0.11	17.11	1.905	52.46	-6.645	27.41	60.87;	28.20
210	30.84	0.11	20.69	1.563	63.95	-7.51	37.31	86.34;	38.06
220	28.8	0.11	25.27	1.282	77.96	-8.473	50.56	120.9;	51.27
230	26.28	0.11	31.02	1.052	95.03	-9.527	68.04	166.9;	68.70
240	23.18	0.11	38.15	0.863	115.8	-10.66	90.72	227.2;	91.34
246	20.97	0.11	43.2	0.766	130.5	-11.37	107.3	271.5;	107.90

Const	Eddy	Diffusivity	Farfield	dispersion	based	on	wastefield	width	of	44.2
conc	dilutn	width	distnce	time	(%)	(s-1)	/s)(m0.67/s2)			
(%)	(m)	(m)	(hrs)	(%)	(s-1)	/s)(m0.67/s2)				
0.76305	131	44.33	34	0.00282	0	0	0.11	3.00E-04	112	
0.76395	130.8	44.56	36	0.00787	0	0	0.11	3.00E-04	118	
0.76443	130.8	44.79	38	0.0129	0	0	0.11	3.00E-04	125	
0.76474	130.7	45.02	40	0.018	0	0	0.11	3.00E-04	131	
0.76495	130.7	45.25	42	0.023	0	0	0.11	3.00E-04	138	
0.76512	130.6	45.47	44	0.0281	0	0	0.11	3.00E-04	144	
0.76525	130.6	45.7	46	0.0331	0	0	0.11	3.00E-04	151	
0.76535	130.6	45.92	48	0.0382	0	0	0.11	3.00E-04	157	
0.76544	130.6	46.14	50	0.0432	0	0	0.11	3.00E-04	164	
0.76552	130.6	46.36	52	0.0483	0	0	0.11	3.00E-04	171	
0.76558	130.6	46.58	54	0.0533	0	0	0.11	3.00E-04	177	
0.76564	130.6	46.8	56	0.0584	0	0	0.11	3.00E-04	184	
0.76569	130.5	47.02	58	0.0634	0	0	0.11	3.00E-04	190	
0.76573	130.5	47.24	60	0.0685	0	0	0.11	3.00E-04	197	
0.76577	130.5	47.45	62	0.0735	0	0	0.11	3.00E-04	203	
0.7658	130.5	47.67	64	0.0786	0	0	0.11	3.00E-04	210	
0.76583	130.5	47.88	66	0.0836	0	0	0.11	3.00E-04	217	
0.76585	130.5	48.09	68	0.0887	0	0	0.11	3.00E-04	223	
0.76585	130.5	48.31	70	0.0937	0	0	0.11	3.00E-04	230	
0.76585	130.5	48.52	72	0.0988	0	0	0.11	3.00E-04	236	
0.76583	130.5	48.73	74	0.104	0	0	0.11	3.00E-04	243	

/ Case UM3. ##### 9:13:52 AM SCTP-7
 1; ambient file C:\Plumes\ Diffuser table record 1:00 -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966
15	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966

Diffuser table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrcMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.6876	4.3	45	135	10	16	24	242	44.6	9.58	1.00E-03	23	100

Simulation:

Froude number:	40.79;	effluent	density	(sigma-T)	-2.398;	effluent	velocity	1.217(m/s);		
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector Dist	
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)	
0	44.6	0.11	0.688	100	1	0	0	0.0;	0	
10	44.39	0.11	0.826	82.03	1.219	-0.151	0.154	0.0848;	0.22	
20	44.14	0.11	1.001	67.3	1.486	-0.325	0.34	0.204;	0.47	
30	43.86	0.11	1.211	55.21	1.811	-0.525	0.563	0.37;	0.77	
40	43.54	0.11	1.461	45.29	2.208	-0.752	0.832	0.601;	1.12	
50	43.18	0.11	1.76	37.15	2.691	-1.004	1.151	0.912;	1.53	
60	42.79	0.11	2.114	30.48	3.28	-1.276	1.523	1.323;	1.99	
70	42.38	0.11	2.529	25	3.998	-1.565	1.95	1.853;	2.50	
80	41.95	0.11	3.014	20.51	4.874	-1.865	2.44	2.527;	3.07	
90	41.51	0.11	3.573	16.83	5.941	-2.175	2.998	3.371;	3.70	
100	41.05	0.11	4.213	13.8	7.242	-2.49	3.635	4.42;	4.41	
110	40.59	0.11	4.937	11.32	8.828	-2.809	4.363	5.714;	5.19	
120	40.12	0.11	5.746	9.289	10.76	-3.132	5.203	7.308;	6.07	
130	39.64	0.11	6.644	7.62	13.12	-3.459	6.182	9.28;	7.08	
140	39.14	0.11	7.631	6.251	15.99	-3.793	7.341	11.73;	8.26	
150	38.62	0.11	8.71	5.128	19.49	-4.137	8.735	14.81;	9.67	
160	38.08	0.11	9.886	4.207	23.76	-4.495	10.44	18.72;	11.37	
170	37.49	0.11	11.17	3.451	28.96	-4.87	12.55	23.72;	13.46	
180	36.86	0.11	12.56	2.831	35.31	-5.267	15.2	30.16;	16.09	
182	36.73	0.11	12.85	2.721	36.73	-5.349	15.81	31.66;	16.69	merging;
190	35.85	0.11	14.4	2.323	43.04	-5.878	20.1	42.35;	20.94	
195	35.2	0.11	15.65	2.104	47.52	-6.249	23.48	50.87;	24.30	acute zone;
200	34.49	0.11	17.11	1.905	52.46	-6.645	27.41	60.87;	28.20	
210	32.84	0.11	20.69	1.563	63.95	-7.51	37.31	86.34;	38.06	
220	30.8	0.11	25.27	1.282	77.96	-8.473	50.56	120.9;	51.27	
230	28.28	0.11	31.02	1.052	95.03	-9.527	68.04	166.9;	68.70	
240	25.18	0.11	38.15	0.863	115.8	-10.66	90.72	227.2;	91.34	
248	22.17	0.11	45.02	0.736	135.7	-11.61	113.3	287.7;	113.89	surface;
Const	Eddy	Diffusivity	Farfield	dispersion	based	on	wastefield	width	of	44.76 m
	conc	dilutn	width	distnce	time					
	(%)		(m)	(m)	(hrs)	(%)	(s-1)	/s)(m0.67/s2)		
0.7335	136.3	44.91	36	0.00321	0	0	0.11	3.00E-04	118	
0.73432	136.1	45.14	38	0.00826	0	0	0.11	3.00E-04	125	
0.73477	136	45.37	40	0.0133	0	0	0.11	3.00E-04	131	
0.73505	136	45.6	42	0.0184	0	0	0.11	3.00E-04	138	
0.73526	135.9	45.82	44	0.0234	0	0	0.11	3.00E-04	144	
0.73541	135.9	46.05	46	0.0285	0	0	0.11	3.00E-04	151	
0.73553	135.9	46.28	48	0.0335	0	0	0.11	3.00E-04	157	
0.73563	135.9	46.5	50	0.0386	0	0	0.11	3.00E-04	164	
0.73572	135.9	46.72	52	0.0436	0	0	0.11	3.00E-04	171	
0.73579	135.9	46.95	54	0.0487	0	0	0.11	3.00E-04	177	
0.73585	135.8	47.17	56	0.0537	0	0	0.11	3.00E-04	184	
0.73591	135.8	47.39	58	0.0588	0	0	0.11	3.00E-04	190	
0.73596	135.8	47.61	60	0.0638	0	0	0.11	3.00E-04	197	
0.736	135.8	47.82	62	0.0689	0	0	0.11	3.00E-04	203	
0.73603	135.8	48.04	64	0.0739	0	0	0.11	3.00E-04	210	
0.73607	135.8	48.26	66	0.079	0	0	0.11	3.00E-04	217	
0.73609	135.8	48.47	68	0.084	0	0	0.11	3.00E-04	223	
0.73611	135.8	48.69	70	0.0891	0	0	0.11	3.00E-04	230	
0.73611	135.8	48.9	72	0.0941	0	0	0.11	3.00E-04	236	
0.73611	135.8	49.11	74	0.0992	0	0	0.11	3.00E-04	243	chronic zone

/ Case UM3. ##### 1:21:26 PM SCTP-51
 1; ambient file C:\Plumes\Diffuser table record 1:00 -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966
15	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966

Diffuser table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.9056	4.3	45	135	10	16	24	242	42.6	29.21	1.00E-03	23	100

Simulation:

Froude number:	62.48;	effleunt	density	(sigma-T)	-2.398;	effleunt	velocity	2.139(m/s);		
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector Dist	
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)	
0	42.6	0.11	0.906	100	1	0	0	0.0;	0	
10	42.29	0.11	1.09	82.03	1.219	-0.217	0.22	0.0692;	0.31	
20	41.93	0.11	1.324	67.3	1.486	-0.472	0.485	0.169;	0.68	
30	41.51	0.11	1.607	55.21	1.811	-0.772	0.804	0.311;	1.11	
40	41.01	0.11	1.949	45.29	2.208	-1.121	1.19	0.512;	1.63	
50	40.44	0.11	2.36	37.15	2.691	-1.525	1.655	0.797;	2.25	
60	39.78	0.11	2.853	30.48	3.28	-1.988	2.215	1.195;	2.98	
70	39.04	0.11	3.442	25	3.998	-2.514	2.886	1.746;	3.83	
80	38.21	0.11	4.143	20.51	4.874	-3.098	3.678	2.49;	4.81	
90	37.31	0.11	4.972	16.83	5.941	-3.728	4.597	3.469;	5.92	
100	36.35	0.11	5.945	13.8	7.242	-4.396	5.653	4.734;	7.16	
110	35.35	0.11	7.077	11.32	8.828	-5.093	6.858	6.342;	8.54	
120	34.32	0.11	8.385	9.289	10.76	-5.81	8.229	8.359;	10.07	
130	33.26	0.11	9.878	7.62	13.12	-6.541	9.79	10.87;	11.77	
140	32.17	0.11	11.57	6.251	15.99	-7.282	11.57	13.96;	13.67	
150	31.07	0.11	13.46	5.128	19.49	-8.033	13.62	17.78;	15.81	
155	30.47	0.11	14.48	4.645	21.52	-8.433	14.84	20.15;	17.07	merging;
160	29.52	0.11	15.8	4.207	23.76	-9.065	16.89	24.27;	19.17	
170	27.33	0.11	19.56	3.451	28.96	-10.5	22.1	35.15;	24.47	acute zone;
180	24.74	0.11	24.84	2.831	35.31	-12.14	29.05	50.31;	31.48	
190	21.67	0.11	31.84	2.323	43.04	-14	38.29	71.3;	40.77	
199	18.41	0.11	39.84	1.943	51.43	-15.88	49.19	96.82;	51.69	surface;

Const Eddy Diffusivity. Farfield dispersion based on wastefield width of 43.18 m

conc (%)	dilutn	width (m)	distnce (m)	time (hrs)	(%)	(s-1)	/s)(m0.67/s2)			
1.93429	51.68	43.21	16	6.20E-04	0	0	0.11	3.00E-04	52	
1.93687	51.61	43.44	18	0.00567	0	0	0.11	3.00E-04	59	
1.93845	51.57	43.67	20	0.0107	0	0	0.11	3.00E-04	66	
1.93937	51.54	43.89	22	0.0158	0	0	0.11	3.00E-04	72	
1.94	51.52	44.12	24	0.0208	0	0	0.11	3.00E-04	79	
1.94047	51.51	44.34	26	0.0259	0	0	0.11	3.00E-04	85	
1.94082	51.5	44.56	28	0.0309	0	0	0.11	3.00E-04	92	
1.94111	51.49	44.79	30	0.036	0	0	0.11	3.00E-04	98	
1.94135	51.49	45.01	32	0.041	0	0	0.11	3.00E-04	105	
1.94156	51.48	45.23	34	0.0461	0	0	0.11	3.00E-04	112	
1.94173	51.48	45.45	36	0.0511	0	0	0.11	3.00E-04	118	
1.94189	51.47	45.66	38	0.0562	0	0	0.11	3.00E-04	125	
1.94202	51.47	45.88	40	0.0612	0	0	0.11	3.00E-04	131	
1.94214	51.47	46.1	42	0.0663	0	0	0.11	3.00E-04	138	
1.94224	51.47	46.31	44	0.0713	0	0	0.11	3.00E-04	144	
1.94233	51.46	46.52	46	0.0764	0	0	0.11	3.00E-04	151	
1.94239	51.46	46.74	48	0.0814	0	0	0.11	3.00E-04	157	
1.94244	51.46	46.95	50	0.0865	0	0	0.11	3.00E-04	164	
1.94246	51.46	47.16	52	0.0915	0	0	0.11	3.00E-04	171	
1.94246	51.46	47.37	54	0.0966	0	0	0.11	3.00E-04	177	
1.94242	51.46	47.58	56	0.102	0	0	0.11	3.00E-04	184	
1.94234	51.46	47.79	58	0.107	0	0	0.11	3.00E-04	190	
1.94221	51.47	47.99	60	0.112	0	0	0.11	3.00E-04	197	
1.94204	51.47	48.2	62	0.117	0	0	0.11	3.00E-04	203	
1.94181	51.48	48.4	64	0.122	0	0	0.11	3.00E-04	210	
1.94151	51.48	48.61	66	0.127	0	0	0.11	3.00E-04	217	
1.94116	51.49	48.81	68	0.132	0	0	0.11	3.00E-04	223	
1.94073	51.51	49.02	70	0.137	0	0	0.11	3.00E-04	230	
1.94023	51.52	49.22	72	0.142	0	0	0.11	3.00E-04	236	
1.93965	51.53	49.42	74	0.147	0	0	0.11	3.00E-04	243	chronic zone

count: 30

/ Case UM3. ##### 1:21:53 PM SCTP-51
 1; ambient file C:\Plumes\Diffuser table record 1:00 -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966
15	0.11	90	0	21.1	0	0	0.11	90	0.0003	-1.966

Diffuser table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(ft)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(%)
0.9056	4.3	45	135	10	16	24	242	44.6	29.21	1.00E-03	23	100

Simulation:

Froude number:	62.48;	effleunt	density	(sigma-T)	-2.398;	effleunt	velocity	2.139(m/s);	
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn	Time	Vector Dist
	(ft)	(m/s)	(ft)	(%)	()	(ft)	(ft)	(s)	(ft)
0	44.6	0.11	0.906	100	1	0	0	0.0;	0
10	44.29	0.11	1.09	82.03	1.219	-0.217	0.22	0.0692;	0.31
20	43.93	0.11	1.324	67.3	1.486	-0.472	0.485	0.169;	0.68
30	43.51	0.11	1.607	55.21	1.811	-0.772	0.804	0.311;	1.11
40	43.01	0.11	1.949	45.29	2.208	-1.121	1.19	0.512;	1.63
50	42.44	0.11	2.36	37.15	2.691	-1.525	1.655	0.797;	2.25
60	41.78	0.11	2.853	30.48	3.28	-1.988	2.215	1.195;	2.98
70	41.04	0.11	3.442	25	3.998	-2.514	2.886	1.746;	3.83
80	40.21	0.11	4.143	20.51	4.874	-3.098	3.678	2.49;	4.81
90	39.31	0.11	4.972	16.83	5.941	-3.728	4.597	3.469;	5.92
100	38.35	0.11	5.945	13.8	7.242	-4.396	5.653	4.734;	7.16
110	37.35	0.11	7.077	11.32	8.828	-5.093	6.858	6.342;	8.54
120	36.32	0.11	8.385	9.289	10.76	-5.81	8.229	8.359;	10.07
130	35.26	0.11	9.878	7.62	13.12	-6.541	9.79	10.87;	11.77
140	34.17	0.11	11.57	6.251	15.99	-7.282	11.57	13.96;	13.67
150	33.07	0.11	13.46	5.128	19.49	-8.033	13.62	17.78;	15.81
155	32.47	0.11	14.48	4.645	21.52	-8.433	14.84	20.15;	17.07
160	31.52	0.11	15.8	4.207	23.76	-9.065	16.89	24.27;	19.17
170	29.33	0.11	19.56	3.451	28.96	-10.5	22.1	35.15;	24.47
180	26.74	0.11	24.84	2.831	35.31	-12.14	29.05	50.31;	31.48
190	23.67	0.11	31.84	2.323	43.04	-14	38.29	71.3;	40.77
200	20.01	0.11	40.84	1.905	52.46	-16.1	50.58	100.1;	53.08
201	19.6	0.11	41.87	1.868	53.51	-16.32	52.01	103.5;	54.51

merging;

acute zone;

surface;

Const	Eddy	Diffusivity.	Farfield	dispersion	based	on	wastefield	width	of	43.8 m
conc	dilutn	width	distnce	time						
(%)	(%)	(m)	(m)	(hrs)	(%)	(s-1)	/s)(m0.67/s2)			
1.86059	53.72	43.96	18	0.0035	0	0	0.11	3.00E-04	59	
1.86261	53.67	44.19	20	0.00855	0	0	0.11	3.00E-04	66	
1.86371	53.63	44.41	22	0.0136	0	0	0.11	3.00E-04	72	
1.86441	53.61	44.64	24	0.0187	0	0	0.11	3.00E-04	79	
1.86492	53.6	44.87	26	0.0237	0	0	0.11	3.00E-04	85	
1.8653	53.59	45.09	28	0.0288	0	0	0.11	3.00E-04	92	
1.86561	53.58	45.32	30	0.0338	0	0	0.11	3.00E-04	98	
1.86586	53.57	45.54	32	0.0389	0	0	0.11	3.00E-04	105	
1.86607	53.57	45.76	34	0.0439	0	0	0.11	3.00E-04	112	
1.86625	53.56	45.98	36	0.049	0	0	0.11	3.00E-04	118	
1.86641	53.56	46.2	38	0.054	0	0	0.11	3.00E-04	125	
1.86654	53.55	46.42	40	0.0591	0	0	0.11	3.00E-04	131	
1.86666	53.55	46.63	42	0.0641	0	0	0.11	3.00E-04	138	
1.86677	53.55	46.85	44	0.0692	0	0	0.11	3.00E-04	144	
1.86686	53.54	47.07	46	0.0742	0	0	0.11	3.00E-04	151	
1.86693	53.54	47.28	48	0.0793	0	0	0.11	3.00E-04	157	
1.86699	53.54	47.49	50	0.0843	0	0	0.11	3.00E-04	164	
1.86703	53.54	47.71	52	0.0894	0	0	0.11	3.00E-04	171	
1.86704	53.54	47.92	54	0.0944	0	0	0.11	3.00E-04	177	
1.86702	53.54	48.13	56	0.0995	0	0	0.11	3.00E-04	184	
1.86697	53.54	48.34	58	0.105	0	0	0.11	3.00E-04	190	
1.86687	53.54	48.55	60	0.11	0	0	0.11	3.00E-04	197	
1.86674	53.55	48.75	62	0.115	0	0	0.11	3.00E-04	203	
1.86655	53.55	48.96	64	0.12	0	0	0.11	3.00E-04	210	
1.86632	53.56	49.17	66	0.125	0	0	0.11	3.00E-04	217	
1.86602	53.57	49.37	68	0.13	0	0	0.11	3.00E-04	223	
1.86566	53.58	49.58	70	0.135	0	0	0.11	3.00E-04	230	
1.86523	53.59	49.78	72	0.14	0	0	0.11	3.00E-04	236	
1.86473	53.6	49.98	74	0.145	0	0	0.11	3.00E-04	243	chronic zone

count: 29