

Wastewater Dispersion Modeling using US EPA VP UM3

Efficient wastewater dispersion can be achieved by the InvisiHead diffuser discharging wastewater. The 5m IH diffuses, disperses, spreads, mixes and dilutes wastewater as shown in the US EPA VP UM3 model below.

Bacteria decays from 17000 col/dl to 17 at 10m from the diffuser and reaches 16 at the edge of the ZID or acute zone 30m away from the diffuser; it reaches 4 col/dl at 200m away from the diffuser . At the edge of the Allocated Impact Zone (AIZ) 300m away it is 3 col/dl and 1.3 at 1500m away.



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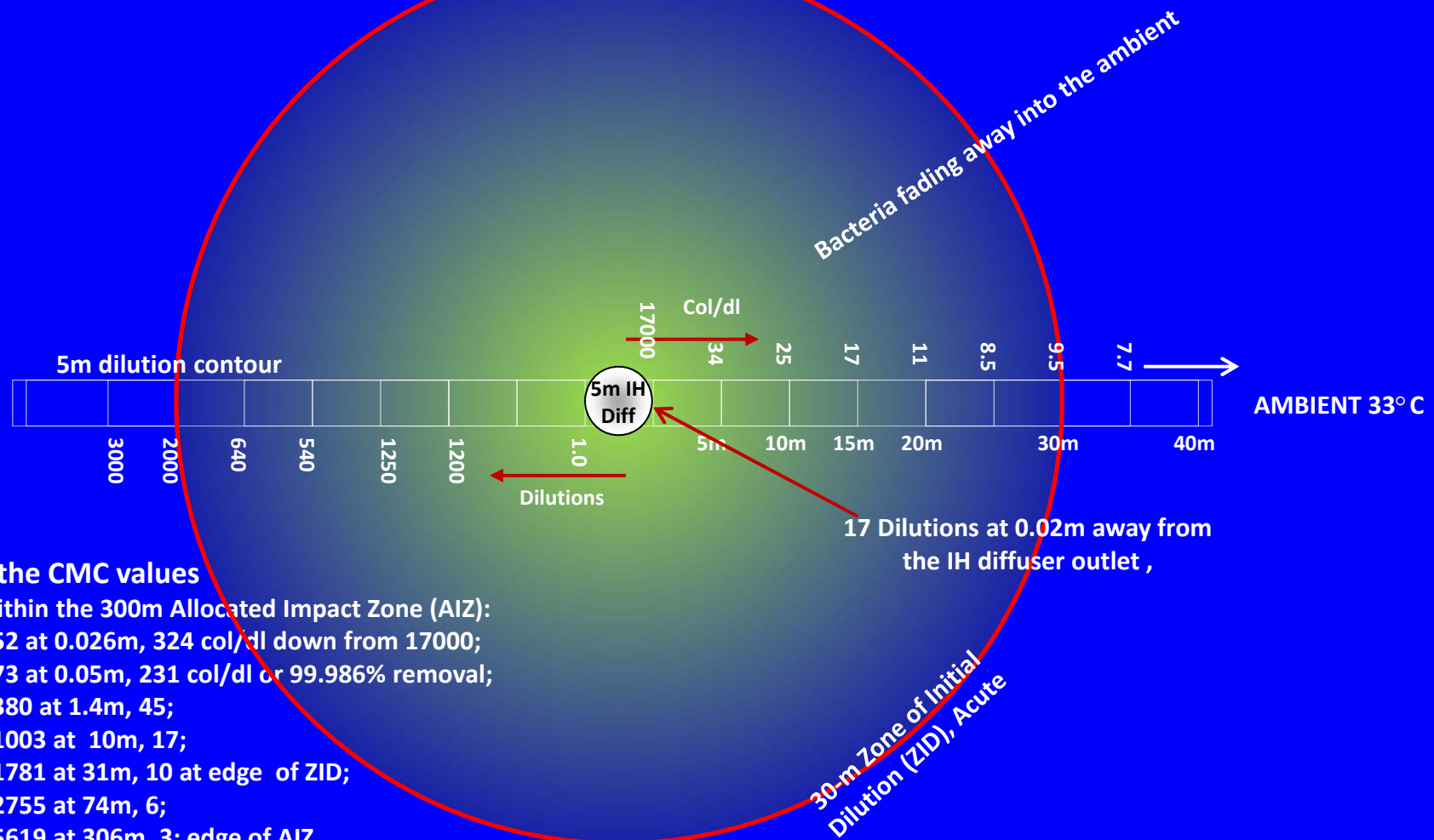
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THE INVISIHEAD DIFFUSER

By nature of the design, the InvisiHead diffuser releases effluent in spatial and temporal fashion or in a 4-D space + time domain that makes the flow to funnel out in a 360° round surround, 180° up, sideways, straight, and down. *It discharges, funnels out and disperses, spreads, mixes and dilutes effluents to reach the required dilution within the vicinity of the diffuser early in the mixing zones; radial diffusion of effluents with multi directionality is what the InvisiHead exactly made to do.*



Meeting the CMC values

Dilution within the 300m Allocated Impact Zone (AIZ):

- 52 at 0.026m, 324 col/dl down from 17000;
- 73 at 0.05m, 231 col/dl or 99.986% removal;
- 380 at 1.4m, 45;
- 1003 at 10m, 17;
- 1781 at 31m, 10 at edge of ZID;
- 2755 at 74m, 6;
- 5619 at 306m, 3; edge of AIZ
- 12407 at 1491m, 1

Meeting the Regulatory Mixing Zone (RMZ) distance from outfall diffuser

- Acute criteria met (CMC values) at the edge of ZID, acute mixing zone is 10% of chronic zone;
- Chronic criteria met (CCC values) at the AIZ or CMZ.

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Case 1; ambient file C:\Plumes\Bacteria.001.db; Diffuser table record 1:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	0.05	90.0	38.0	25.0	0.0	0.000632	0.01	0.0	0.0003
30.0	0.05	90.0	38.0	25.0	0.0	0.000632	0.01	0.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChronicMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(m)	(m)	(deg)	(deg)	()	(m)	(m)	(m)	(m)	(m3/s)	(psu)	(C)	(col/dl)
6.00E-7	3.5	-10.0	90.0	1.68E+7	6.97E-8	30.0	300.0	26.5	2.045	38.0	25.0	17000.0

Froude number: pure jet

Step	Amb-cur	P-dia	Polutnt	Dilutn	x-posn	y-posn
	(m/s)	(m)	(col/dl)	()	(m)	(m)
0	0.05	6.000E-7	17000.0	1.0	0.0	0.0
100	0.05	0.000201	2346.6	7.245	0.0	0.000499
200	0.05	0.0105	323.9	52.48	0.0	0.0267
217	0.05	0.0207	231.3	73.49	0.0	0.0524
300	0.05	0.553	44.71	380.2	0.0	1.402
349	0.05	3.849	16.94	1003.4	0.0	9.762
378	0.05	12.14	9.54	1781.8	0.0	30.78
400	0.05	29.01	6.17	2754.7	0.0	73.57
436	0.05	120.7	3.02	5619.2	0.0	306.0
476	0.05	587.8	1.345	12407.4	0.0	1491.1

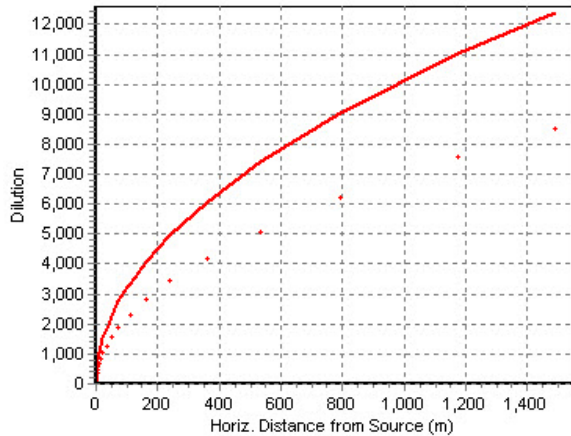
max dilution reached / **99.986% removal**

bottom hit,
acute zone, / **99.999% removal**

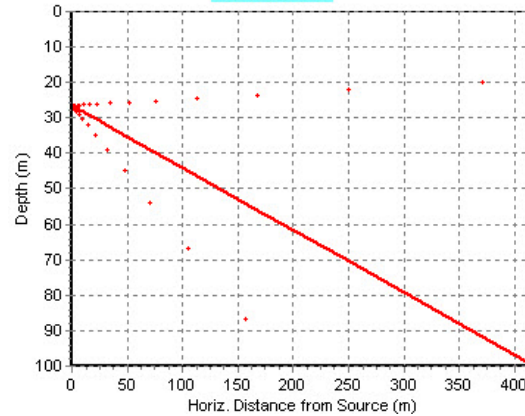
chronic zone, / **99.9999% removal**
surface,

The InvisiHead diffuser

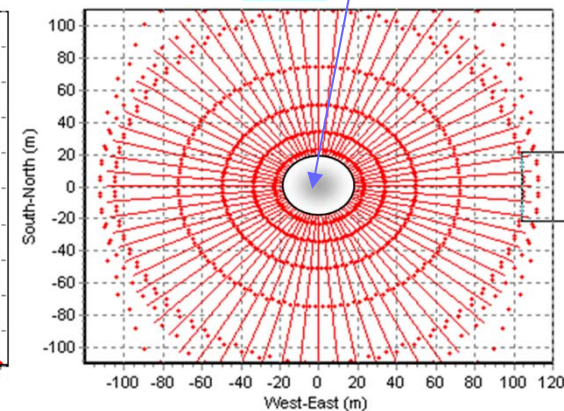
Plumes Dilution Prediction



Plume Elevation



Plan View



The InvisiHead diffuser discharges effluent in a round surround, side ways, up, straight, and down funneling out flow and efficiently manages effluent diffusion and dispersion.