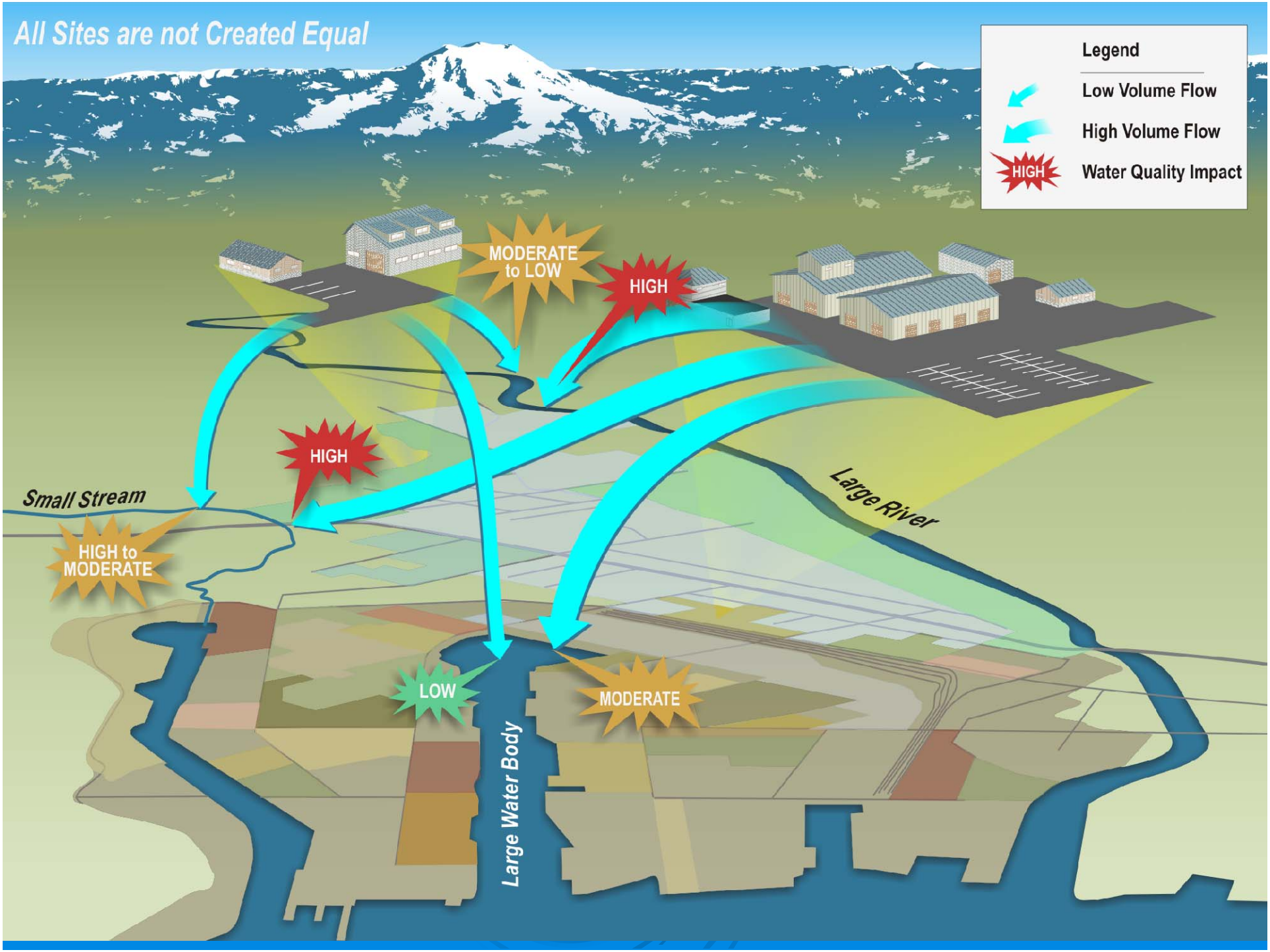
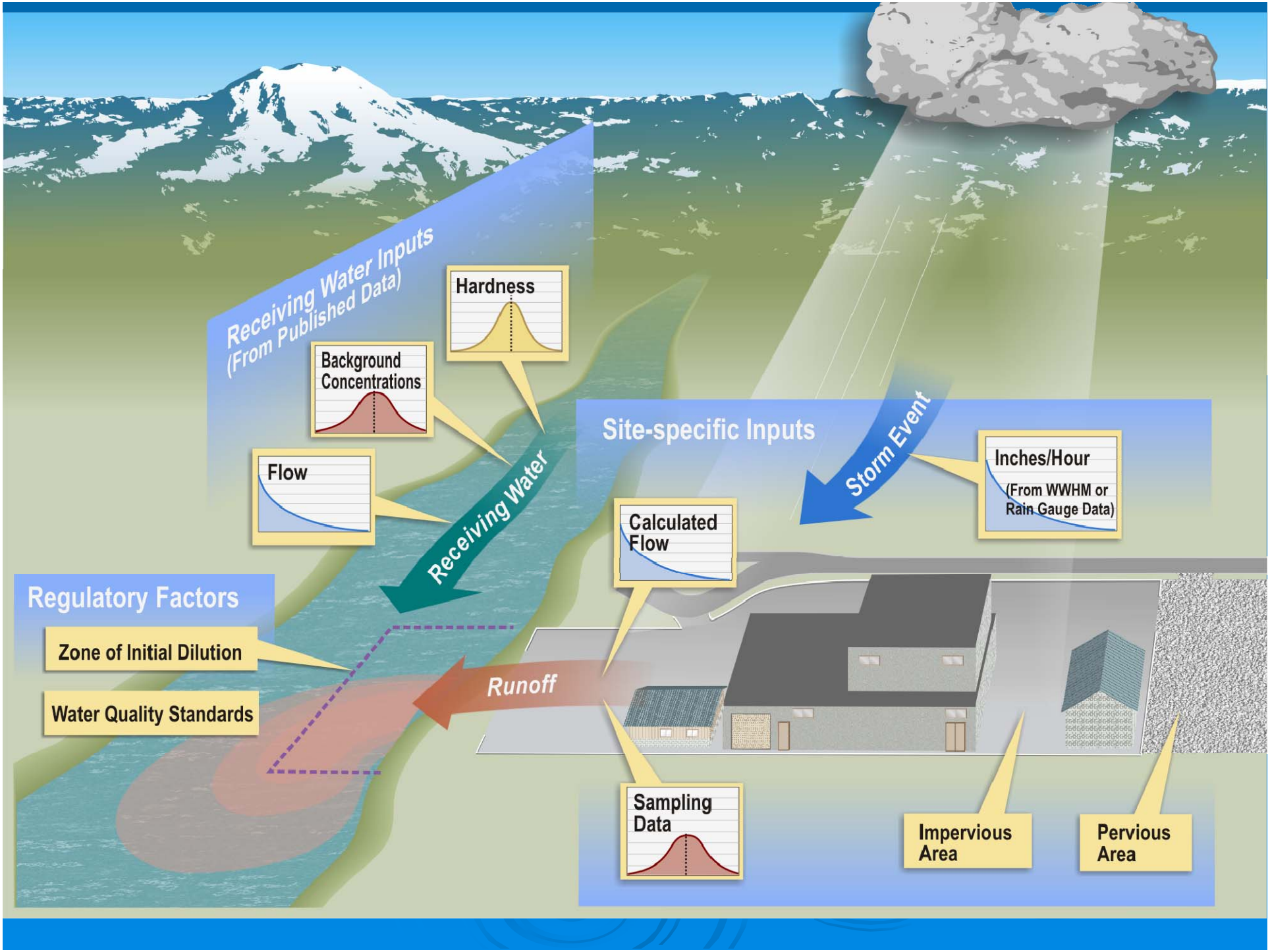
Risk-Based Approach to Evaluating Stormwater Impacts

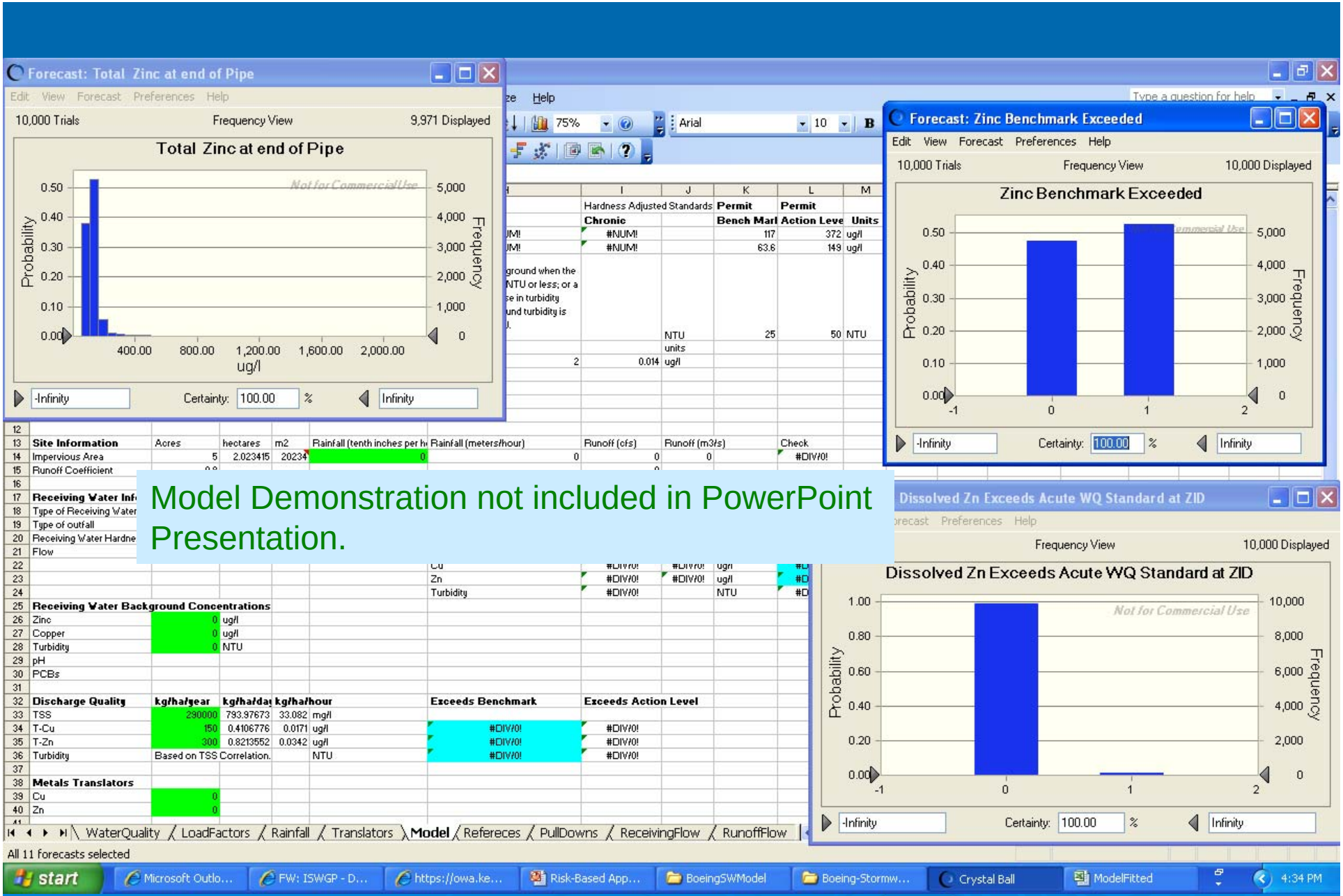
ISGP External Advisory Group Meeting
12 December 2008

One Set Of Benchmarks Do Not Fit All Sites

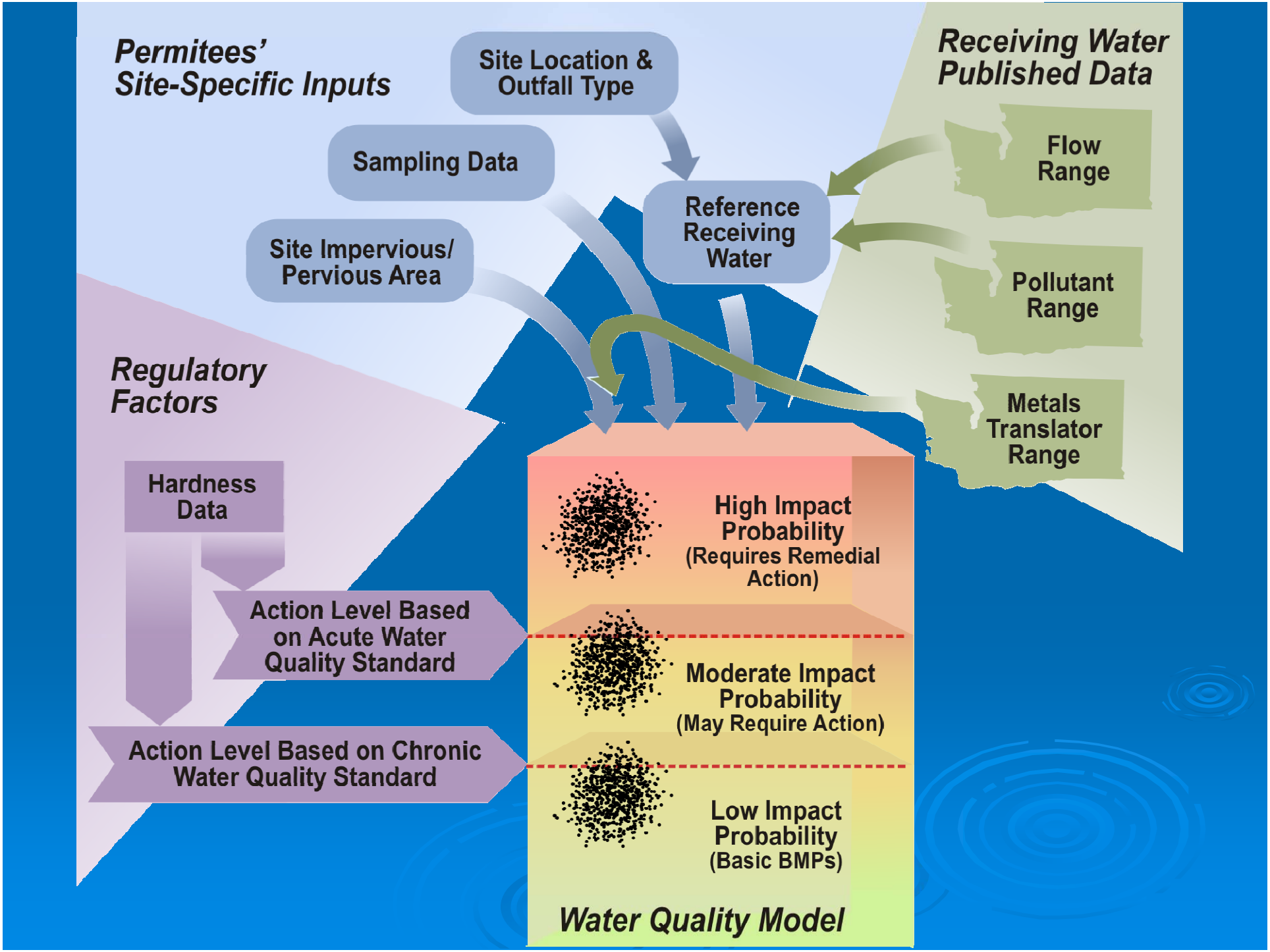
- Size of site and receiving water flow/quality are factors in meeting water quality standards
- Worst-case conditions occur rarely, if ever
- Probabilistic approach allows limited resources to be focused on medium and high risk sites to bring about maximum benefit


All Sites are not Created Equal
Legend
Low Volume Flow
High Volume Flow
HIGH
Water Quality Impact
MODERATE to LOW
HIGH
HIGH
Small Stream
HIGH to MODERATE
Large River
LOW
MODERATE
Large Water Body


Receiving Water Inputs
(From Published Data)
Hardness
Background Concentrations
Flow
Receiving Water
Site-specific Inputs
Storm Event
Inches/Hour
(From WWHM or Rain Gauge Data)
Calculated Flow
Regulatory Factors
Zone of Initial Dilution
Water Quality Standards
Runoff
Sampling Data
Impervious Area
Pervious Area



Model Demonstration not included in PowerPoint Presentation.


Permitees' Site-Specific Inputs
Site Location & Outfall Type
Sampling Data
Site Impervious/ Pervious Area
Reference Receiving Water
Receiving Water Published Data
Flow Range
Pollutant Range
Metals Translator Range
Regulatory Factors
Hardness Data
Action Level Based on Acute Water Quality Standard
Action Level Based on Chronic Water Quality Standard
High Impact Probability (Requires Remedial Action)
Moderate Impact Probability (May Require Action)
Low Impact Probability (Basic BMPs)
Water Quality Model

Benefits of Probabilistic Approach

- Takes into account receiving water and water quality standards
- Identifies high priority sites => reduced overall program costs
- Demonstrates progress
- Tracks risk reduction over time.

Questions

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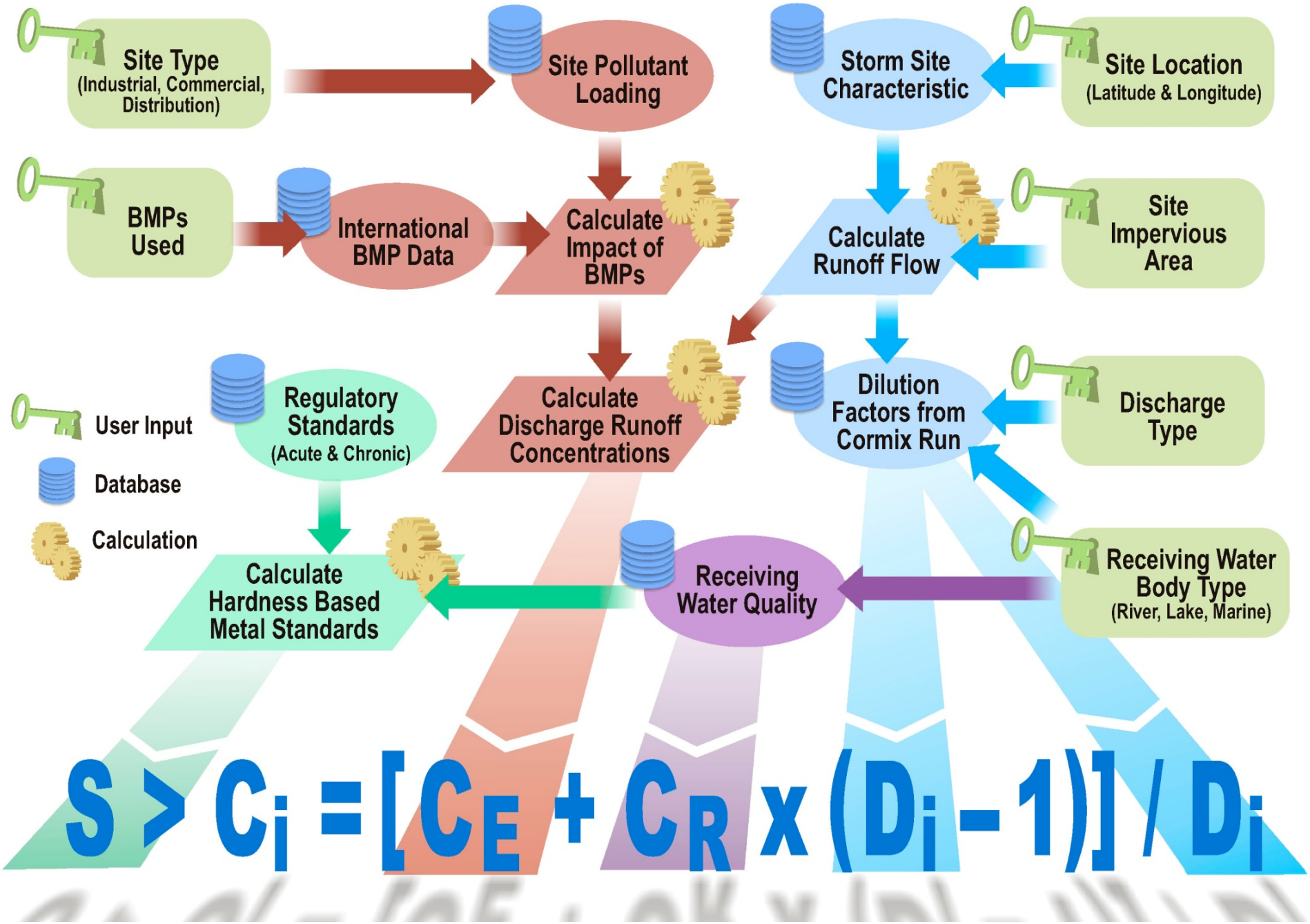

$$S > C_i = [C_E + C_R \times (D_i - 1)] / D_i$$

Table 15. Summary statistics for total zinc concentrations measured in industrial stormwater by industry category.

Industrial Category	n	Mean (µg/L)	Median (µg/L)	Minimum (µg/L)	10th Percentile (µg/L)	90th Percentile (µg/L)	Maximum (µg/L)	Std. Dev. (µg/L)	Coefficient of Variation	Exceedance of Benchmark [a]	Exceedance of Action Level [b]
01 - Facilities with effluent limitations	8	1639	1600	520	520	3110	3,110	779	0.48	100%	100%
02 - Manufacturing	1,233	321	140	0.02	19.0	722	8,110	653	2.03	55%	22%
03 - Mineral, metal, oil, and gas	23	80.2	30.0	2.00	9.00	220	650	147	1.83	17%	4%
05 - Landfills	120	158	35.0	0.002	6.00	347	4,400	457	2.89	18%	8%
06 - Recycling facilities	288	308	119	2.00	24.0	730	6,410	580	1.88	50%	23%
07 - Steam electric plants	3	41.6	34.0	17.8	17.8	73.0	73	28.4	0.68	0%	0%
08 - Transportation facilities	959	318	146	0.136	25.1	604	16,200	810	2.54	57%	20%
09 - Treatment works	76	122	43.6	1.00	12.0	300	1,140	199	1.63	29%	7%
10 - Construction sites > 5 acres	6	796	368	180	180	2600	2,600	931	1.17	100%	50%
11 - Light industrial activity	1,412	774	150	0.00	32.6	750	130,000	5645	7.29	58%	23%
12 - Significant contributor	4	16.3	9.00	0.021	0.021	47.0	47.0	21.2	1.30	0%	0%
No category specified	132	533	149.5	0.255	20.0	881	18,200	1790	3.36	58%	28%
All categories	4,264	469	139	0	20.4	692	130,000	3317	7.06	55%	21%

[a] Benchmark for zinc is 117 µg/L.
[b] Action level for copper is 372 µg/L.
Std. Dev.: Standard Deviation.
µg/L: microgram/liter.

Table 18. Summary statistics for total copper concentrations measured in industrial stormwater by industry category.

Industrial Category	n	Mean (µg/L)	Median (µg/L)	Minimum (µg/L)	10th Percentile (µg/L)	90th Percentile (µg/L)	Maximum (µg/L)	Std. Dev. (µg/L)	Coefficient of Variation	Exceedance of Benchmark [a]	Exceedance of Action Level [b]
01 - Facilities with effluent limitations	4	36	38	6.0	6	63.6	63.6	31.5	0.9	0%	0%
02 - Manufacturing	280	86	22	0.03	5	100	11000	659	7.6	21%	6%
03 - Mineral, metal, oil, and gas	1	158	158	158	--	--	158	--	--	100%	100%
05 - Landfills	22	78	14	2.1	5.9	83	1230	259	3.3	14%	5%
06 - Recycling facilities	196	117	26	2.0	6.7	160	5940	476	4.1	29%	10%
08 - Transportation facilities	196	47	28	0.04	5.9	115	496	72	1.5	28%	6%
09 - Treatment works	18	37	26	5.2	5.7	64	224	49.5	1.4	11%	6%
11 - Light industrial activity	440	48	22	0.01	7	89	1700	111	2.3	16%	5%
No category specified	20	292	10	0.01	2.2	333	4930	1098	3.8	20%	10%
All categories	1177	73.1	22.2	0.01	6	104	11000	410	5.6	21%	6%

[a] Benchmark for copper is 63.6 µg/L.
[b] Action level for copper is 149 µg/L.
Std. Dev.: Standard Deviation.

Table 11. Summary statistics for turbidity levels measured in industrial stormwater by industry category.

Industry Category	n	Mean (NTU)	Median (NTU)	Minimum (NTU)	10th Percentile (NTU)	90th Percentile (NTU)	Maximum (NTU)	Std. Dev. (NTU)	Coefficient of Variation	Exceedance of Benchmark [a]	Exceedance of Action Level [b]
01 - Facilities with effluent limitations	8	6.7	5.0	1.9	1.9	14	14	4.9	0.73	0%	0%
02 - Manufacturing	1,327	93	20	0.16	3.1	180	9,700	356	3.84	45%	27%
03 - Mineral, metal, oil, and gas	24	8.3	3.2	0.43	1.1	22	52	12	1.51	8%	4%
05 - Landfills	135	15	7.9	0.48	1.4	37	165	21	1.44	16%	4%
06 - Recycling facilities	295	58	19	0.0	3.3	156	710	104	1.80	42%	27%
07 - Steam electric plants	3	9	10	3.7	3.7	12	12	4.4	0.50	0%	0%
08 - Transportation facilities	1,010	81	17	0	2.7	142	5,380	319	3.94	40%	24%
09 - Treatment works	77	13	5.7	0.4	1.0	28	100	18	1.39	10%	8%
10 - Construction sites > 5 acres	6	42	19	4.5	4.5	173	173	65	1.55	50%	17%
11 - Light industrial activity	1,450	45	12	0.05	2.1	77	5,490	189	4.17	31%	16%
12 - Significant contributor	7	31	2.5	1.5	1.5	149	149	56	1.80	29%	29%
No category specified	137	38	8.4	0.7	2.7	72	1,190	118	3.13	24%	15%
All categories	4,479	66	15	0	2.4	120	9,700	272	4.10	37%	21%

[a] Benchmark for turbidity is 25 NTU.
[b] Action level for turbidity is 50 NTU.
Std. Dev.: Standard Deviation.