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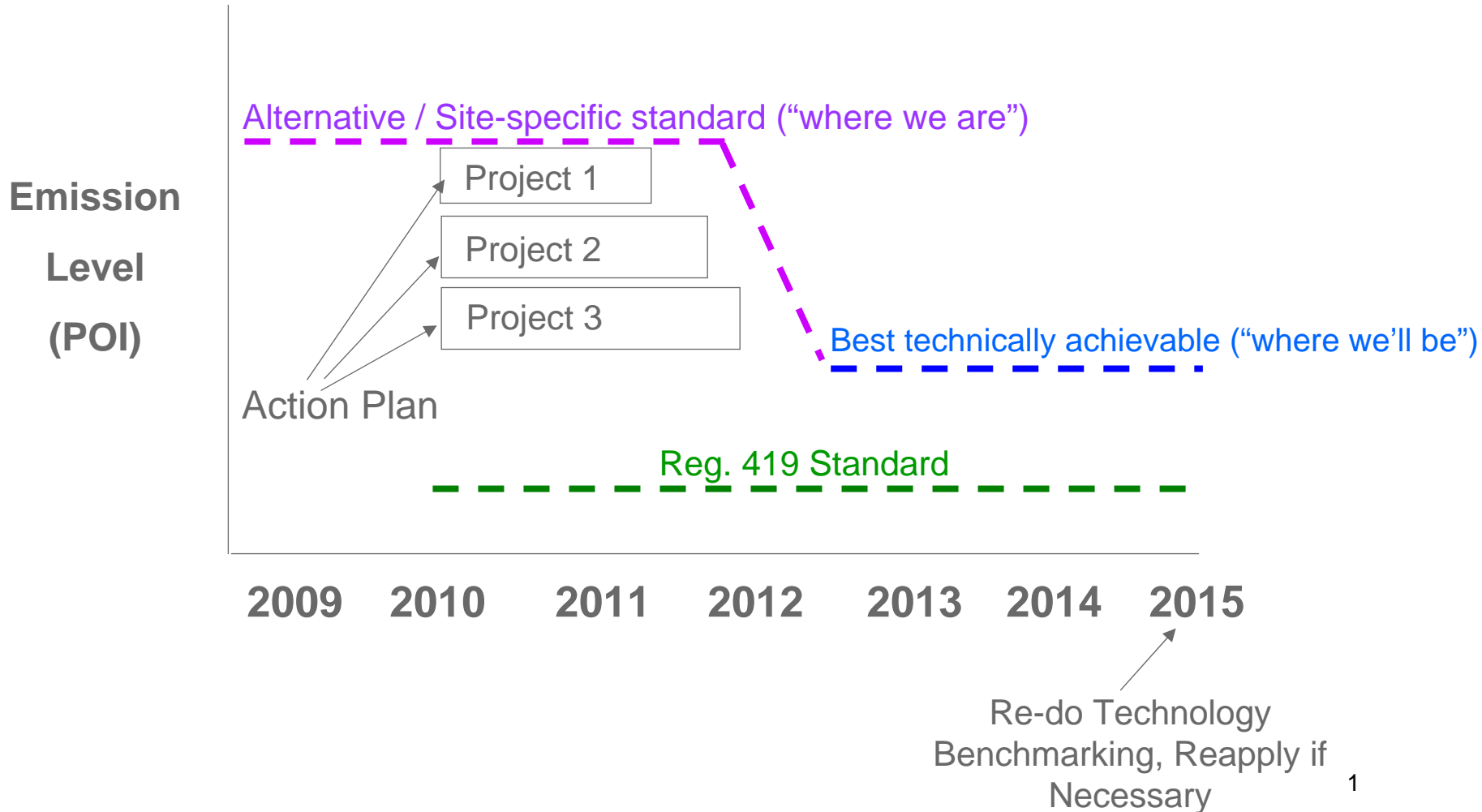
Alternative & Site-Specific Standards

Emission Modeling Results “Blue Skies” Air Quality Action Plan

September 17, 2009



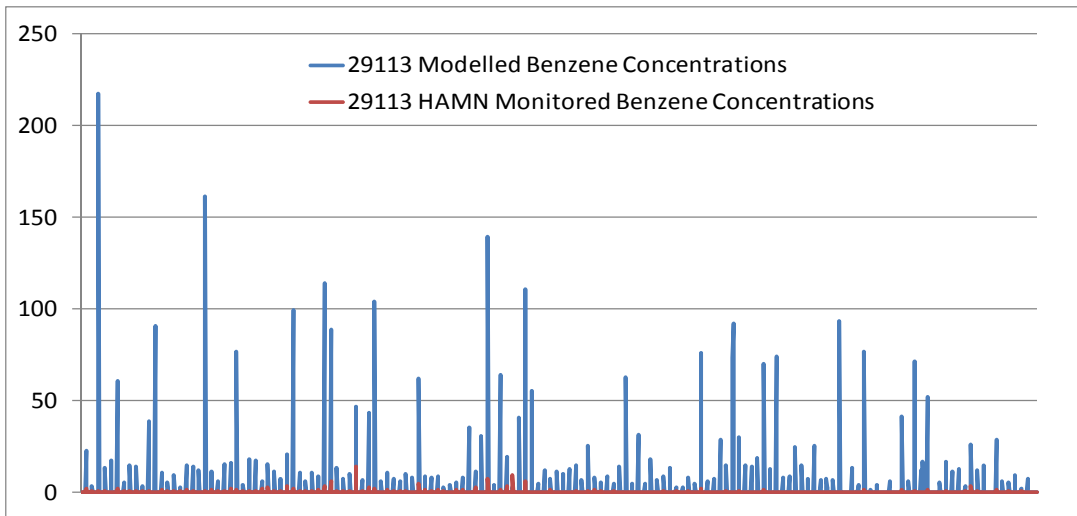
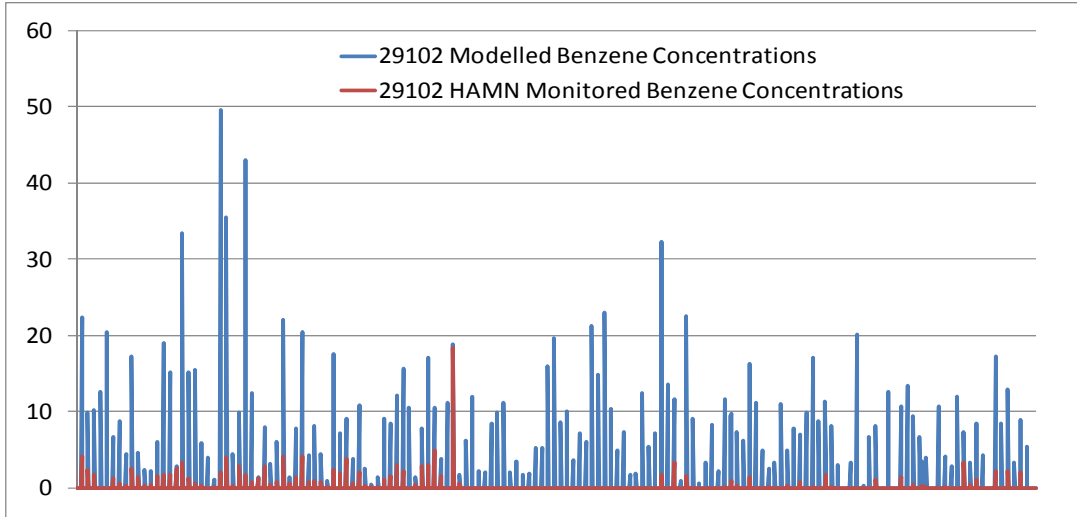
Alternative & Site-Specific Standards: Process



Emission Modeling

- **Benefit: Disciplined approach to continuous improvement**
 - Identify all emission sources
 - Prioritize improvement projects
 - Measure improvement on a consistent basis
 - Predict emission concentrations
- **Challenge: Highly-conservative assumptions**
 - Maximum emission rates (including infrequent upsets)
 - Worst meteorological conditions
- **“Maximum modeled POI” levels are not indicative of day-to-day performance**

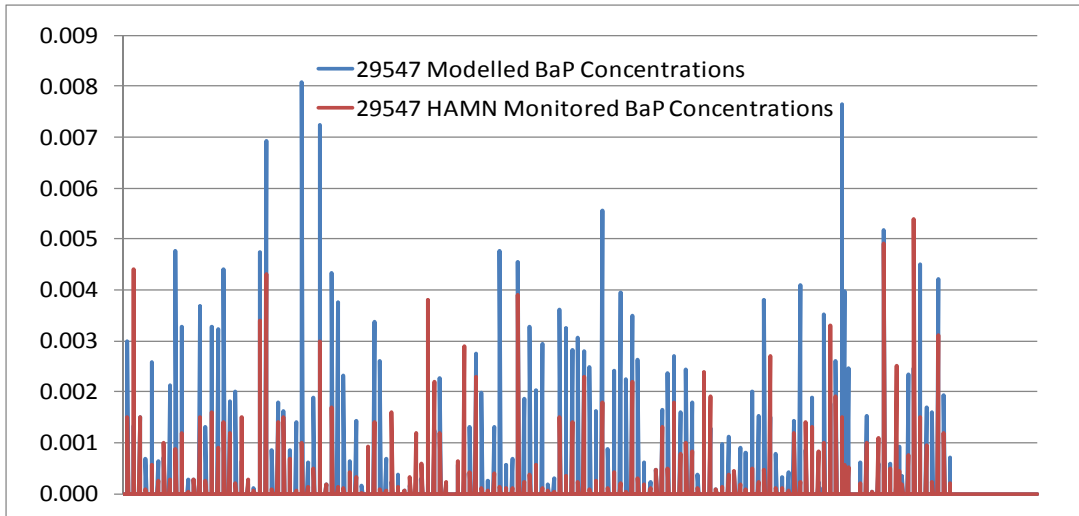
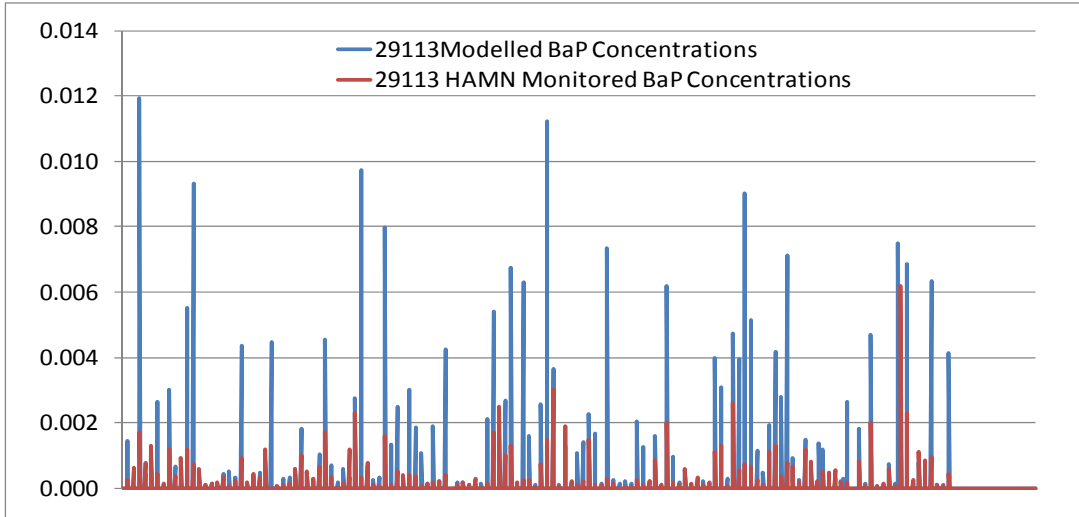
Modelled Results vs HAMN Measurements: Benzene



$\mu\text{g}/\text{m}^3$

	29102 Beach Blvd	29113 Gertrude
Maximum Modeled	49.6	217.2
Maximum Monitored	18.3	14.0

Modelled Results vs HAMN Measurements: Benzo(a)Pyrene



µg/m³

	29113 Gertrude	29547 Pier 25
Maximum Modeled	0.012	0.008
Maximum Monitored	0.006	0.005



Emission Model (ESDM) Results

Contaminant	Sources	Reg 419 POI Standard / Guideline (24-hour)	Maximum Modeled POI (ESDM) (at Fenceline)
Benzene	By-Products Coke Ovens	2.3 $\mu\text{g}/\text{m}^3$ (Proposed Std)	642.2 $\mu\text{g}/\text{m}^3$
Benzo(a)Pyrene	Coke Ovens	0.0011 $\mu\text{g}/\text{m}^3$ (Guideline) 0.00005 $\mu\text{g}/\text{m}^3$ (Proposed Std)	0.0884 $\mu\text{g}/\text{m}^3$
Total Reduced Sulphur (TRS)	BF Slag Pelletizers By-Products	24-hr: 7 $\mu\text{g}/\text{m}^3$ 10-min: 13 $\mu\text{g}/\text{m}^3$	23.3 $\mu\text{g}/\text{m}^3$ 70.5 $\mu\text{g}/\text{m}^3$
Total Suspended Particulate (TSP)	Coffining Various sources	120 $\mu\text{g}/\text{m}^3$	288 $\mu\text{g}/\text{m}^3$

ESDM Results: Benzene

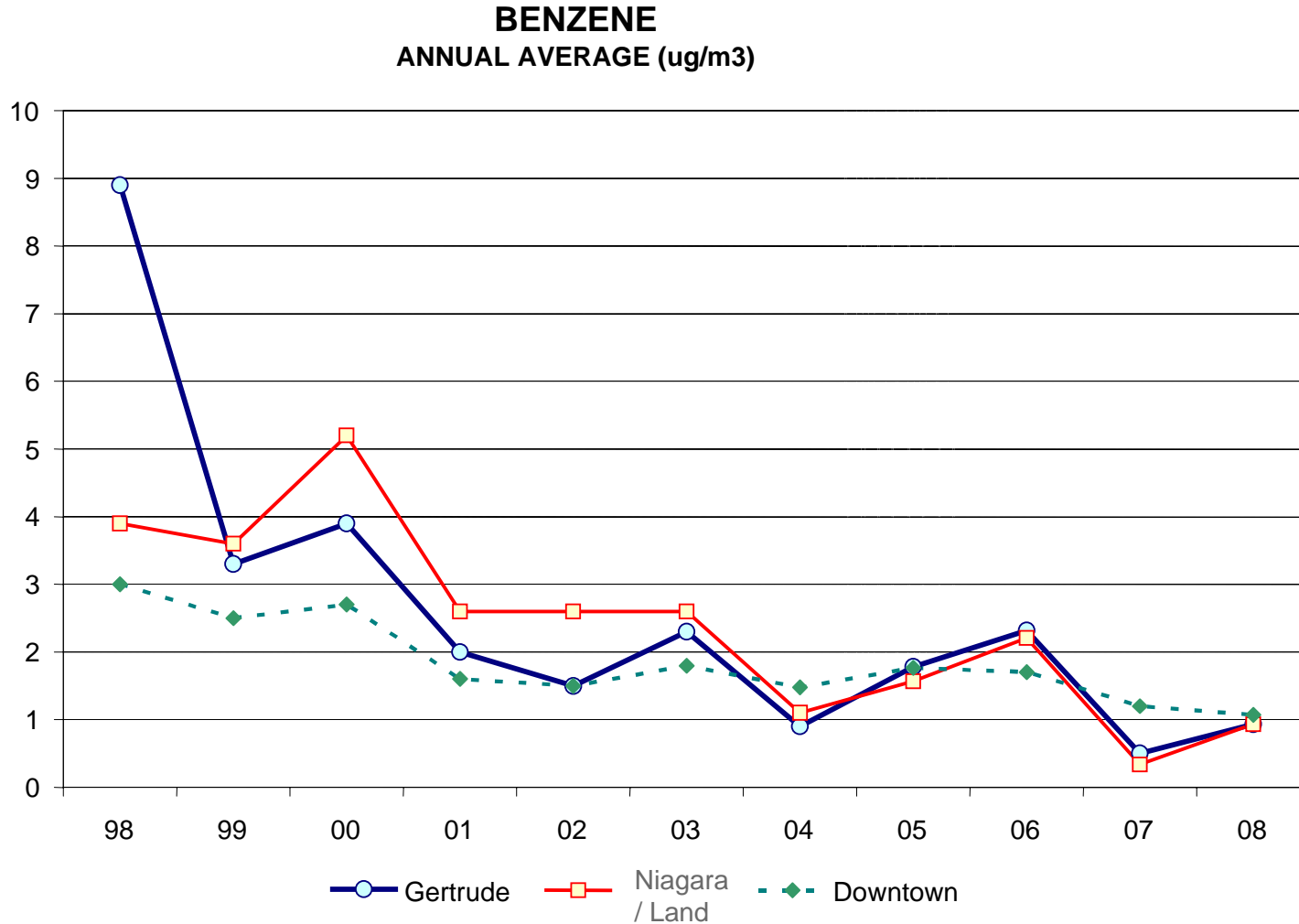
Release Point Description	Contribution to Maximum Modeled POI [ug/m3]	POI Rank
1BP Misc Fugitives	352.233	1
1BP Oxidizer Towers (2)	267.531	2
1BP Fugitive Sources	18.413	3
3BP Misc Fugitives	1.057	4
2BP Misc Fugitives	0.788	5
1CP No.2 Battery – Fugitives	0.502	6
3BP Fugitives	0.484	7
#1 CP No.1 Battery – Fugitives	0.427	8
#1 CP No.3 Battery – Fugitives	0.414	9
2 BP Fugitives	0.158	10
#2 CP No.4 Battery Fugitives	0.040	11
#1 CP Pushing ESP	0.039	12
#3 CP Total Fugitives	0.038	13
#2 CP No.5 Battery Fugitives	0.028	14
Total	642.185	

Sources addressed by proposed Action Plan projects for benzene

Sources addressed by proposed Action Plan projects for other parameters

Benzene: HAMN Data Trend

MOE's Proposed Industry Standard: 2.3 $\mu\text{g}/\text{m}^3$ (24-hour)



ESDM Results: Benzo(a)Pyrene

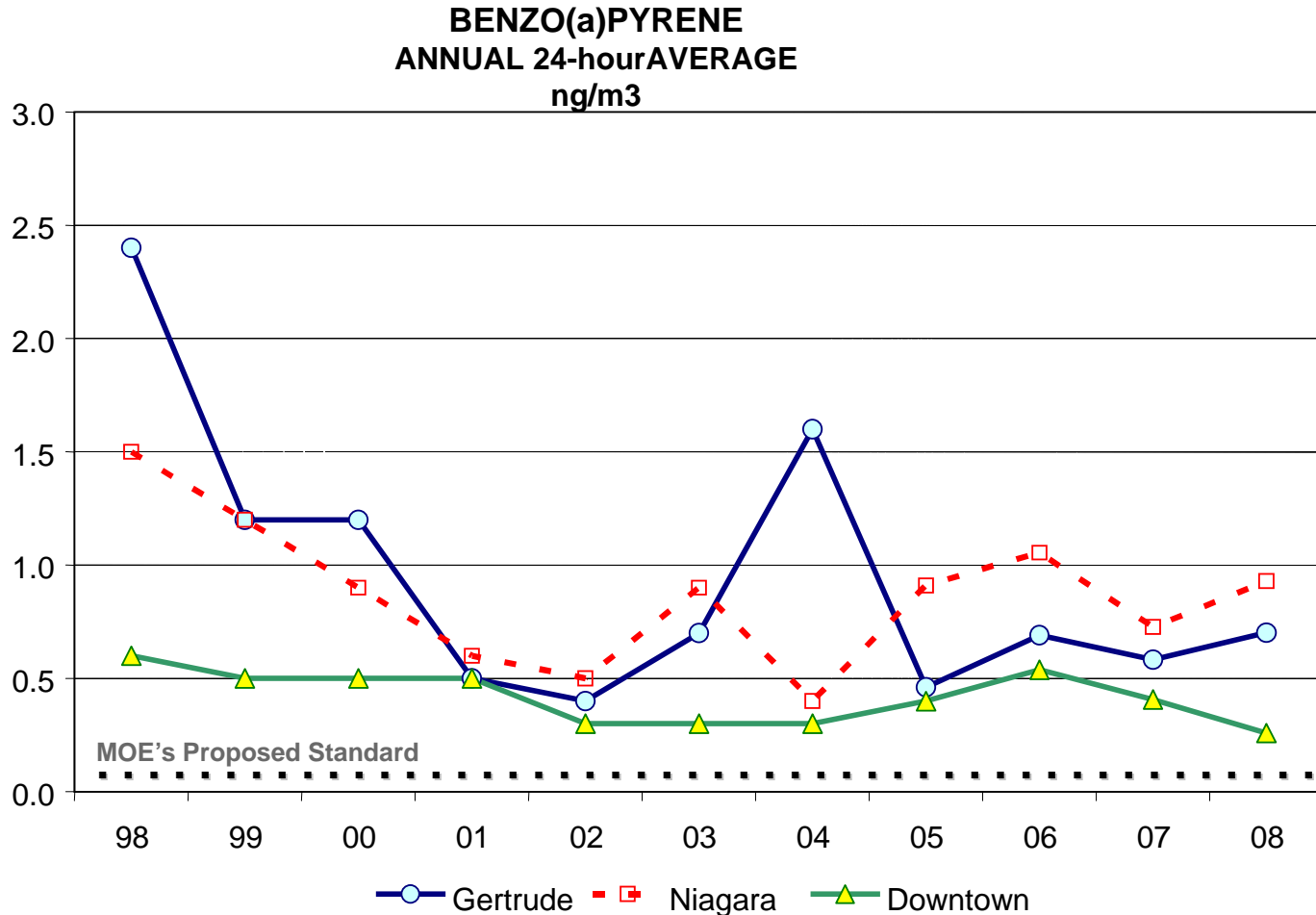
Release Point Description	Contribution to Maximum Modeled POI [ug/m3]	POI Rank
#3 CP No.6 Battery Fugitives	0.068243	1
#2 CP No.5 Battery Fugitives	0.011887	2
#2 CP No.4 Battery Fugitives	0.007827	3
#1 CP No.3 Battery - Fugitives	0.000209	4
#1 CP No.2 Battery - Fugitives	0.000145	5
#1 CP No.1 Battery - Fugitives	0.000094	6
#4 BF Raw BFG Bleeder	0.000011	7
#3 BF Raw BFG Bleeder	0.000005	8
#2 CP Pushing Baghouse	0.000004	9
#2 BF Raw BFG Bleeder	0.000004	10
Total	0.088432	

Sources addressed by proposed Action Plan projects for BaP



Benzo(a)Pyrene: HAMN Data Trend

MOE's Proposed Industry Standard: 0.00005 $\mu\text{g}/\text{m}^3$ (0.05 ng/m^3) (24-hour)



ESDM Results: Total Reduced Sulphur

Release Point Description	Contribution to Maximum Modeled POI [$\mu\text{g}/\text{m}^3$]	POI Rank
#4 BF Pelletizer Fugitives	12.5439	1
#3 BF Pelletizer Fugitives	4.8320	2
2 BP Fugitives	2.7894	3
3 BP Fugitives	0.8723	4
#2 BF Pelletizer Fugitives	0.7838	5
#3 CP No.6 Battery Fugitives	0.7041	6
#2 CP No.4 Battery Fugitives	0.4088	7
#2 CP No.5 Battery Fugitives	0.2391	8
By-Products 1 Fugitive Sources	0.0612	9
#1 BP All Oxidizer Towers (2)	0.0443	10
#1 CP No.3 Battery - Fugitives	0.0058	13
#1 CP No.2 Battery - Fugitives	0.0038	14
#1 CP No.1 Battery - Fugitives	0.0025	19
Total	23.32	

Further study into whether improvements at #4 BF Pelletizer can be moved forward in time.

Sources addressed by proposed Action Plan projects for TRS

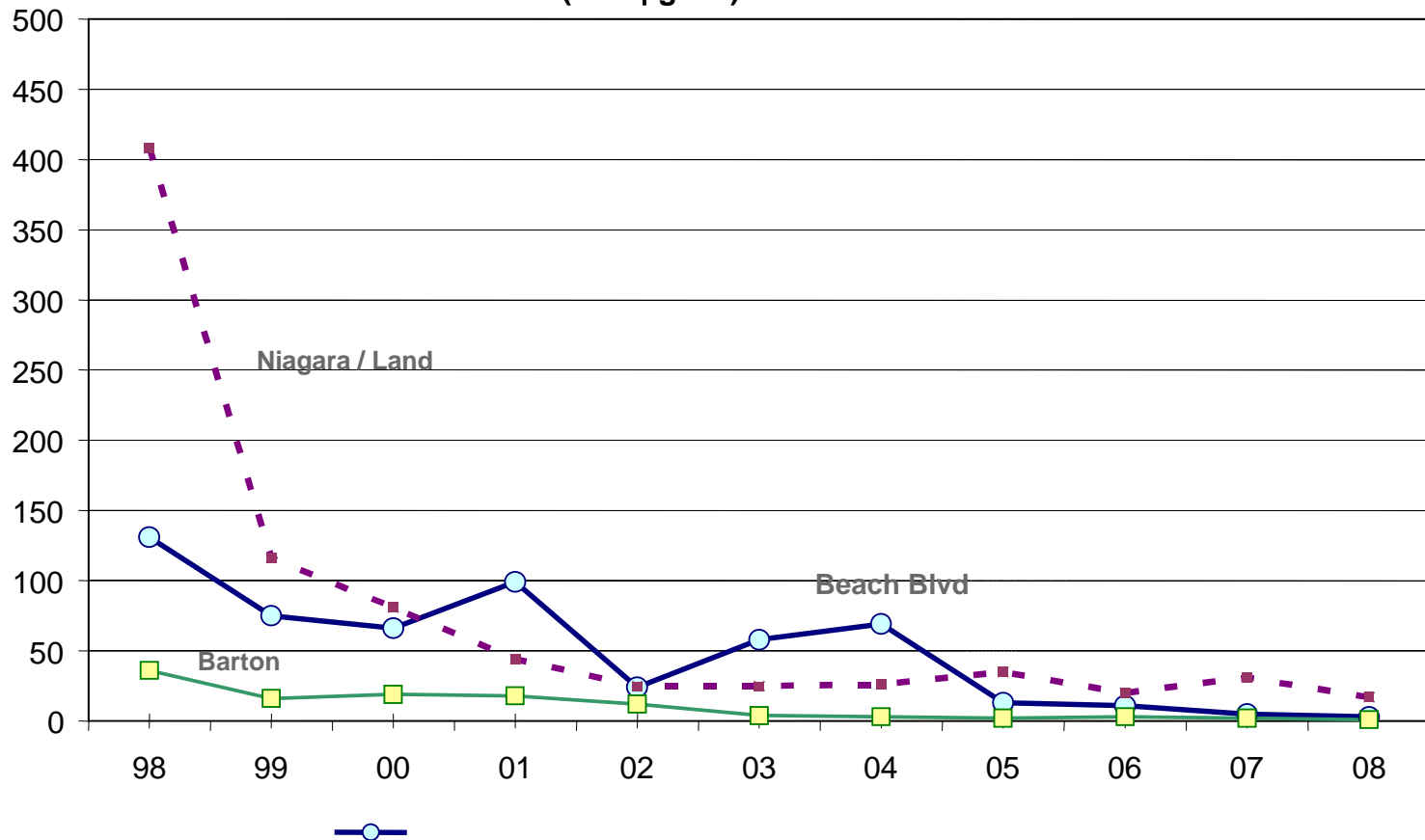
Sources addressed by proposed Action Plan projects for other parameters



Total Reduced Sulphur: HAMN Data

MOE's Proposed Industry Standard: 7 $\mu\text{g}/\text{m}^3$ (24-Hour)

TOTAL REDUCED SULPHUR
NUMBER OF HOURS OVER 10 ppb
(~ 14 $\mu\text{g}/\text{m}^3$)



ESDM Results: Total Suspended Particulate

Increase in sweeping & flushing of plant roads
(60% of total TSP, excluded from MOE's POI model)

Release Point Description	Contribution to Maximum Modeled POI [ug/m3]	POI Rank
Coffin Facility - North	180.45	1
#4 BF Slag Pelletizer	41.17	2
#3 BF Pelletizer Fugitives	16.26	3
Desulph Station Fugitives	11.96	4
Iron Ore Handling	9.80	5
#2 CP No.5 Battery Fugitives	6.25	6
#2 CP No.4 Battery Fugitives	4.91	7
Iron Ore Unloading	2.82	8
Dekish Coffins	2.34	9
Iron Ore Storage	1.06	10
#3 CP Total Fugitives	0.29	25
#1 CP No.3 Battery - Fugitives	0.28	26
#1 CP No.2 Battery - Fugitives	0.20	30
#1 CP No.1 Battery - Fugitives	0.12	34
Total	288.2	

Further study into whether improvements at #4 BF Pelletizer can be moved forward in time.

Further evaluation of mobile baghouse

Hot metal charging at EAF will reduce future frequency of cofining.

Sources addressed by proposed Action Plan for TSP

Sources addressed by proposed Action Plan for other parameters

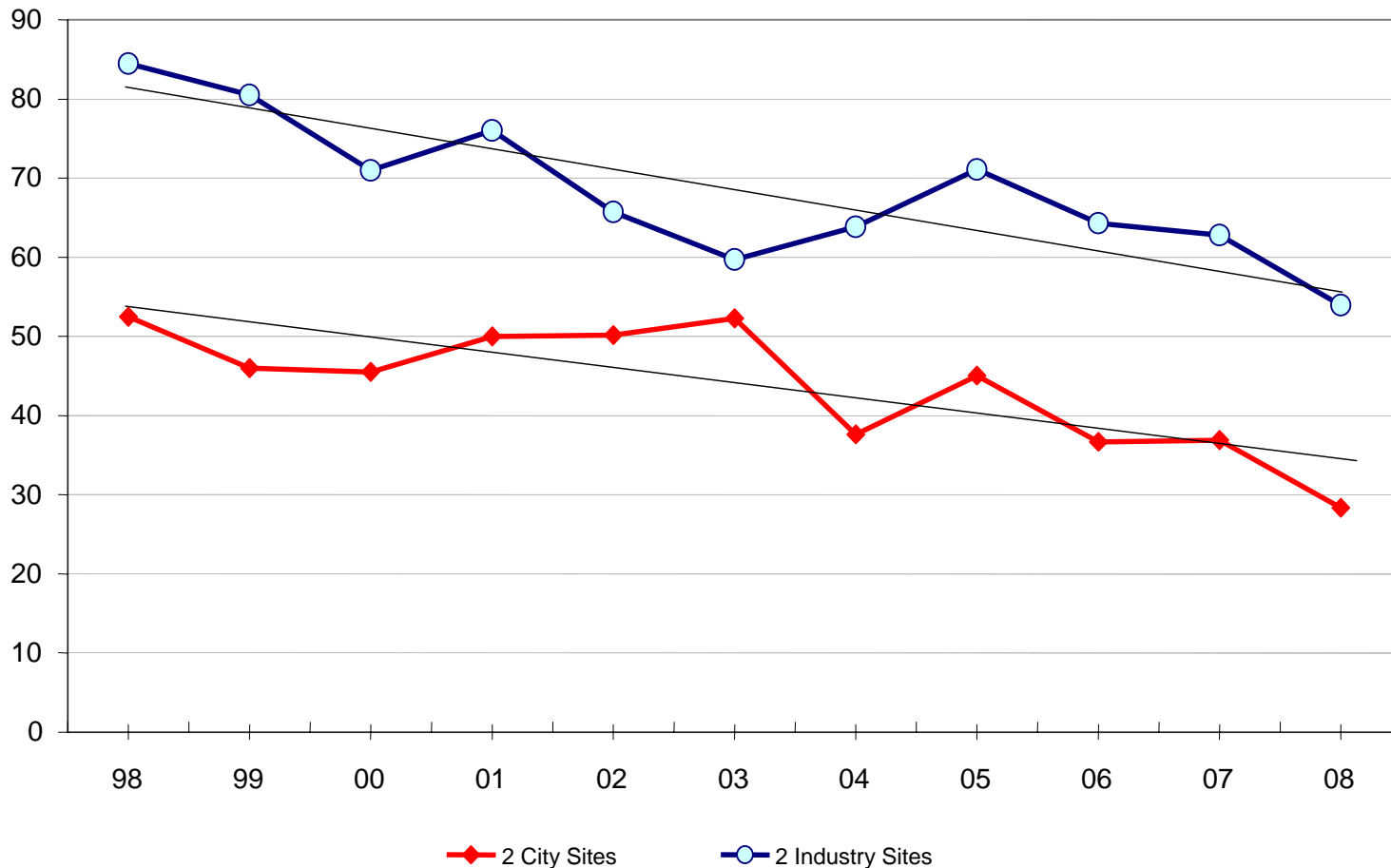
Sources addressed by Best Management Practices



Total Suspended Particulate: HAMN Data

MOE's Proposed Industry Standard: 120 $\mu\text{g}/\text{m}^3$ (24-hour)

Total Suspended Particulate ($\mu\text{g}/\text{m}^3$)



“Blue Skies” Air Quality Action Plan



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Project	Primary Contaminant	Secondary Contaminant	2010	2011	2012	2013	2014
CP1: New Door Machine	BaP	Benzene, TRS, TSP	4,900,000				
CP3: Replace Door Jambs	BaP	Benzene, TRS, TSP	1,500,000				
CP2: Pusher Side Jamb Cleaners	BaP	Benzene, TRS, TSP	750,000		500,000		
CP1,2,3: Coke Guide Pyrometers	BaP	Benzene, TRS, TSP	150,000				
CP2,3: Electronic Off-gas Controllers	BaP	Benzene, TRS, TSP	120,000				
CP1,2,3: Off-Gas Temperature Monitoring	BaP	Benzene, TRS, TSP			500,000		
CP 1,2,3 Benchmarking for Continuous Improvement	BaP	Benzene, TRS, TSP					
BP1: Improved Primary Coolers	Benzene	TRS	1,000,000	1,500,000			
BP1: Thermal Oxidizer	Benzene	TRS		1,500,000			
BP1,2,3: Leak Detection Analysis	Benzene	-	300,000	300,000	300,000	300,000	300,000
#3BF Slag Pelletizer Hood and Stack	TRS	TSP	1,500,000				
#4BF Investigate Slag Pelletizer Improvements	TRS	TSP					
CTS: Increased Road Sweeping/Flushing	TSP	-	300,000	300,000	300,000	300,000	300,000
IRON: Investigate Coffining Mobile Baghouse	TSP	-					
TOTAL:			10,220,000	3,600,000	1,600,000	600,000	600,000

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CP1: New Door Machine	BaP	Benzene, TRS, TSP	4,900,000					
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CP2: Pusher Side Jamb Cleaners	BaP	Benzene, TRS, TSP	750,000		500,000			
CP1,2,3: Coke Guide Pyrometers	BaP	Benzene, TRS, TSP	150,000					
CP2,3: Electronic Off-gas Controllers	BaP	Benzene, TRS, TSP	120,000					
CP1,2,3: Off-Gas Temperature Monitoring	BaP	Benzene, TRS, TSP			500,000			
CP 1,2,3 Benchmarking for Continuous Improvement	BaP	Benzene, TRS, TSP						
BP1: Improved Primary Coolers	Benzene	TRS	1,000,000	1,500,000				
BP1: Thermal Oxidizer	Benzene	TRS		1,500,000				
BP1,2,3: Leak Detection Analysis	Benzene	-	300,000	300,000	300,000	300,000	300,000	
#3BF Slag Pelletizer Hood and Stack	TRS	TSP	1,500,000					
#4BF Investigate Slag Pelletizer Improvements	TRS	TSP						
CTS: Increased Road Sweeping/Flushing	TSP	-	300,000	300,000	300,000	300,000	300,000	
IRON: Investigate Coffining Mobile Baghouse	TSP	-						
		TOTAL:	\$16,620,000	10,220,000	3,600,000	1,600,000	600,000	600,000

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CP3: Replace Door Jamb	BaP	Benzene, TRS, TSP	1,500,000					
CP2: Pusher Side Jamb Cleaners	BaP	Benzene, TRS, TSP	750,000		500,000			
CP1,2,3: Coke Guide Pyrometers	BaP	Benzene, TRS, TSP	150,000					
CP2,3: Electronic Off-gas Controllers	BaP	Benzene, TRS, TSP	120,000					
CP1,2,3: Off-Gas Temperature Monitoring	BaP	Benzene, TRS, TSP			500,000			
CP 1,2,3 Benchmarking for Continuous Improvement	BaP	Benzene, TRS, TSP						
BP1: Improved Primary Coolers	Benzene	TRS	1,000,000	1,500,000				
BP1: Thermal Oxidizer	Benzene	TRS		1,500,000				
BP1,2,3: Leak Detection Analysis	Benzene	-	300,000	300,000	300,000	300,000	300,000	
#3BF Slag Pelletizer Hood and Stack	TRS	TSP	1,500,000					
#4BF Investigate Slag Pelletizer Improvements	TRS	TSP						
CTS: Increased Road Sweeping/Flushing	TSP	-	300,000	300,000	300,000	300,000	300,000	
IRON: Investigate Coffining Mobile Baghouse	TSP	-						
		TOTAL:	\$16,620,000	10,220,000	3,600,000	1,600,000	600,000	600,000

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CP1,2,3: Coke Guide Pyrometers	BaP	Benzene, TRS, TSP	150,000					
CP2,3: Electronic Off-gas Controllers	BaP	Benzene, TRS, TSP	120,000					
CP1,2,3: Off-Gas Temperature Monitoring	BaP	Benzene, TRS, TSP			500,000			
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BP1: Thermal Oxidizer	Benzene	TRS		1,500,000				
BP1,2,3: Leak Detection Analysis	Benzene	-	300,000	300,000	300,000	300,000	300,000	
#3BF Slag Pelletizer Hood and Stack	TRS	TSP	1,500,000					
#4BF Investigate Slag Pelletizer Improvements	TRS	TSP						
CTS: Increased Road Sweeping/Flushing	TSP	-	300,000	300,000	300,000	300,000	300,000	
IRON: Investigate Coffining Mobile Baghouse	TSP	-						
		TOTAL:	\$16,620,000	10,220,000	3,600,000	1,600,000	600,000	600,000

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CP3: Replace Door Jamb	BaP	Benzene, TRS, TSP	1,500,000					
CP2: Pusher Side Jamb Cleaners	BaP	Benzene, TRS, TSP	750,000		500,000			
CP1,2,3: Coke Guide Pyrometers	BaP	Benzene, TRS, TSP	150,000					
CP2,3: Electronic Off-gas Controllers	BaP	Benzene, TRS, TSP	120,000					
CP1,2,3: Off-Gas Temperature Monitoring	BaP	Benzene, TRS, TSP			500,000			
CP 1,2,3 Benchmarking for Continuous Improvement	BaP	Benzene, TRS, TSP						
BP1: Improved Primary Coolers	Benzene	TRS	1,000,000	1,500,000				
BP1: Thermal Oxidizer	Benzene	TRS		1,500,000				
BP1,2,3: Leak Detection Analysis	Benzene	-	300,000	300,000	300,000	300,000	300,000	
#3BF Slag Pelletizer Hood and Stack	TRS	TSP	1,500,000					
#4BF Investigate Slag Pelletizer Improvements	TRS	TSP						
CTS: Increased Road Sweeping/Flushing	TSP	-	300,000	300,000	300,000	300,000	300,000	
IRON: Investigate Coffining Mobile Baghouse	TSP	-						
		TOTAL:	\$16,620,000	10,220,000	3,600,000	1,600,000	600,000	600,000

Emission Reductions from “Blue Skies” Air Quality Action Plan

	Contaminant	Maximum Modeled POI (24-hour)
		Fenceline
Base Case	BaP	0.0884
	Benzene	642.2
	TRS	23.32
	TSP	288.2
After Action Plan	BaP	0.0648
	Benzene	114.9
	TRS	18.73
	TSP	277.5
% Improvement	BaP	27%
	Benzene	82%
	TRS	20%
	TSP *	4%

*** Does not reflect benefit of increased road sweeping and flushing program – not modeled**



Alternative Standards: Comprehensive Certificate of Approval

- **MOE initiative to stream-line Approvals process**
 - Encouraging Comprehensive (site-wide) Certificates of Approval for large facilities
- **“Piggy-back” Comprehensive COA and Alternative Standard applications**
 - Both are site-wide instruments
 - Both require annual update to site-wide emission models
 - Scope of both is “maximum operating scenario” which includes #3 Blast Furnace (currently idle)
- **Facilitate approvals for Action Plan implementation**



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Alternative & Site-Specific Standards

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