

Data Warehousing and Business Intelligence

Bay Area Air Quality Management District (BAAQMD) is responsible for a wide range of tasks across a number of counties. Among these responsibilities, the BAAQMD has many facilities, pollutants, and schedules to track and evaluate. Staff needed to be able to conduct reviews and comparisons from various vantage points: from the type of source device, the facility type, or by county. Although data had been collected over many years, it was located in disparate systems and files. Performing a comprehensive review was laborious and time-consuming – there was no collective way to investigate each area without digging into data, which could take months. Trinity Technology Group contracted with ARB to create a sustainable, intuitive, and comprehensive solution that has enhanced the way users assess, use, and comprehend system data.

Background

Run by the California Air Resources Board (ARB), the Bay Area Air Quality Management District (BAAQMD) provides permits to facilities where source devices (such as diesel combustion engines, boilers, dry cleaning machines, auto body paint shops, landfills, and tanks that refine crude oil) emit pollutants emissions.

There are many conditions regarding how devices can be used. Within the BAAQMD there are various departments, including engineering and enforcement, to ensure employee expertise and client compliance.

The BAAQMD also tracks toxic air contaminants (TACs) and their trigger levels. If any project emits TACs at a quantity greater than trigger levels, district staff are responsible for conducting a Health Risk Screening Analysis (HRSa) to assess the risk in regards to public exposure.

When a new facility wishes to construct, it is the BAAQMD that reviews and awards both the *authority to construct* and the *permit to operate*. They also conduct inspections to be sure that facilities are compliant with regulations.

Key Benefits to the Client

- **Innovative and Informative** – The system allows users to examine and interpret data in entirely new ways and with greater depth and ease.
 - **Promotes Organization and Efficiency** – Managers and employees can view employee contribution and progress. This assists to employees better understand their contribution, and those of their peers. It also guides managers while conducting staff reviews and staff training, and helps them to manage their workload and to distribute it evenly.
 - **Enables Staff to Conduct Comparative Analysis** – Users can view, compare, and assess case data in many ways, including by pollutant, county, and facility type. Current and historical data on any project throughout the bay area can be accessed and evaluated.
 - **Helps Staff Meet Compliance Requirements** – Aids staff to track permit renewals, toxic air contaminant (TAC) levels, fees, and to schedule inspections when needed.
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TrinityTG worked closely with Bay Area Air Quality Management District to ascertain their requirements and create a sustainable solution. The database allows users to explore the requirements that different facilities have, and it indicates the level of compliance among facilities.

Annual Emission In Tons	Year						
City	2008	2009	2010	2011	2012	2013	Grand Total
⊕ Coyote		2,694,961.41	2,384,765.59	2,210,876.55	1,401,771.33	2,332,676.74	11,025,051.61
Carbon Monoxide		241.96	33.64	31.21	95.29	68.47	470.56
Greenhouse Gases		1,347,037.77	1,192,248.63	1,105,313.81	700,717.99	1,166,158.37	5,511,476.56
Hazardous Air Pollutants		1.36	1.20	1.12	0.71	1.18	5.56
Nitrogen Oxides		99.70	64.30	59.68	53.25	79.68	356.61
Organics		28.96	8.25	7.65	2.35	7.88	55.10
Particulates		49.33	17.19	15.94	12.71	14.75	109.92
Precursor Organic Compounds		28.96	8.25	7.65	2.35	7.88	55.10
Regulated Air Pollutant		1,347,464.06	1,192,376.75	1,105,432.67	700,883.36	1,166,332.55	5,512,489.39
Sulfur Dioxide		6.60	4.96	4.59	1.91	3.63	21.68
Toxic Carcinogens		1.36	1.20	1.12	0.71	1.18	5.56
Toxic Non-Carcinogens		1.36	1.20	1.12	0.71	1.18	5.57
⊕ Pittsburg	4,197,266.91	8,571,495.45	8,241,326.88	8,150,309.97	6,109,586.81	3,546,871.32	38,816,857.35
Carbon Monoxide	229.21	1,077.63	607.00	449.90	567.54	370.07	3,301.36
Greenhouse Gases	2,097,550.64	4,283,592.47	4,119,077.58	4,073,724.81	3,053,578.02	1,772,824.42	19,400,347.95
Halogen Gases	0.95	0.99	1.00	0.99	0.97	0.01	4.92
Hazardous Air Pollutants	30.27	30.38	33.88	32.58	30.11	3.72	160.94
Inorganic Acid Gases	2.03	3.50	6.90	16.85	3.45		32.73
Nitrogen Oxides	330.77	431.95	386.88	400.08	293.99	121.69	1,965.37
Non-Precursor Organic Compounds	16.16	7.25	6.47	5.99	6.03	0.62	42.53
Organics	143.58	149.22	145.79	131.01	82.29	20.56	672.45
Particulates	86.26	158.39	109.32	112.39	92.16	41.07	599.59
Precursor Organic Compounds	127.42	141.97	139.32	125.01	109.22	30.15	673.09
Regulated Air Pollutant	2,098,517.54	4,285,631.51	4,120,545.98	4,075,043.95	3,054,696.56	1,773,414.24	19,407,849.77
Sulfur Dioxide	121.43	120.01	122.46	116.27	13.85	9.10	503.13
Toxic Carcinogens	20.49	13.59	11.26	12.66	11.76	0.98	70.74
Toxic Non-Carcinogens	90.17	136.58	133.03	137.47	100.85	34.70	632.80
Grand Total	4,197,266.91	11,266,456.87	10,626,092.47	10,361,186.52	7,511,358.14	5,879,548.05	49,841,908.97

Figure A. The BAAQMD solution allows users to view pollutant types and levels released into the air in each bay area location. It also allows users to extract data from two or more distinct locations for comparison or review. In the screenshot above the cities of Coyote and Pittsburgh are shown. Along with the type of pollutant, we are able to view the quantity of emissions in tons. It is possible to populate tables by years, and it is possible elect multiple years at a time for review.

Fee Amount	Year						
City	2008	2009	2010	2011	2012	2013	Grand Total
Coyote	234,268.47	174,538.54	172,715.39	183,071.26	189,734.99	203,362.78	1,157,691.43
Filing Fee	300.00						300.00
Greenhouse Gas Inventory Fee		53,850.00	48,745.00	48,203.00	30,559.00	50,857.00	232,214.00
Initial Fee	276.00						276.00
Late Payment Fee					17,208.00		17,208.00
Major Facility Review Emissions Fee	10,099.00	5,460.00	1,840.00	1,877.00	2,976.00	3,418.00	25,670.00
Major Facility Review Monitoring Fee	21,140.00	13,004.00	14,564.00	16,020.00	18,264.00	19,908.00	102,900.00
Major Facility Review Source Fee	3,174.00	2,275.00	2,548.00	2,800.00	3,192.00	3,479.00	17,468.00
Major Stationary Source Fee	22,778.00	8,736.00	6,480.00	6,314.00	5,634.00	8,431.00	58,373.00
Penalty Settlement			1,500.00	5,000.00			6,500.00
Permit to Operate Fee	174,152.00	90,601.00	96,406.00	100,904.00	111,366.00	116,553.00	689,982.00
Renewal Processing Fee	448.47	243.54	325.39	271.26	374.99	318.78	1,982.43
Risk Screen Fee	576.00						576.00
School Public Notice Fee				1,399.00			1,399.00
Toxic Inventory Fee	1,325.00	369.00	307.00	283.00	161.00	398.00	2,843.00
Pittsburg	956,555.34	1,562,835.72	1,283,292.05	1,267,075.69	1,418,462.56	1,298,244.95	7,786,466.31
Application Late Fee		371.50			459.00	274.00	1,104.50
Asbestos Operation Fee	1,966.00	1,688.00	2,045.00		4,469.00	975.00	11,143.00
Back Fee	1,630.00	945.00			1,051.00	860.00	4,486.00
Delinquent Payment Fee						865.47	865.47
ERC Transfer Fee	300.00						300.00
Filing Fee	6,904.00	8,570.00	7,415.50	7,947.00	14,807.00	14,281.00	59,924.50
Greenhouse Gas Inventory Fee	5,351.00	178,700.96	170,237.00	177,452.00	153,218.00	138,852.00	823,810.96
Initial Fee	629.00	181,988.00	32,691.50	14,010.00	118,361.00	20,832.00	368,511.50
Late Payment Fee	1,368.46	1,611.69	29,809.27	1,556.39	4,255.58	4,440.07	43,041.46
Major Facility Review Administrative Amendment Fee				60,605.00	60,605.00	196.00	121,406.00
Major Facility Review Emissions Fee	10,385.00	20,706.00	17,437.00	13,326.00	17,942.00	17,939.00	97,735.00
Major Facility Review Monitoring Fee	81,700.00	111,602.00	115,055.00	115,506.00	116,616.00	112,182.00	652,661.00
Major Facility Review Permit Shield Fee	1,176.00						1,176.00
Major Facility Review Renewal Fee	63,578.00		3,210.00				66,788.00
Major Facility Review Revision Fee				2,376.00	18,852.00	20,664.00	41,892.00
Major Facility Review Source Fee	81,201.00	92,807.00	96,564.00	101,528.00	110,429.00	120,362.00	602,891.00
Major Stationary Source Fee	36,213.95	49,300.87	33,081.97	36,544.97	24,232.00	24,367.00	203,740.76
N/A	-1,878.67	-496.00	-1,397.64	-1,757.40	0.00	-588.00	-6,117.71
Penalty Settlement	30,750.00	20,000.00	27,750.00	13,000.00		66,375.00	157,875.00
Permit to Operate Fee	610,582.26	709,542.89	704,233.07	695,383.94	728,512.92	701,559.00	4,149,814.08
Registration Renewal Fee						1,023.00	1,023.00
Renewal Processing Fee	6,817.34	7,769.81	8,391.38	8,561.79	10,642.40	10,706.41	52,889.13
Risk Screen Fee	989.00	153,390.00	12,728.00	6,024.00	10,077.00	6,889.00	190,097.00
School Public Notice Fee	1,038.00	2,000.00	3,311.00	346.00	71.66		6,766.66
Toxic Inventory Fee	14,912.00	21,022.00	19,324.00	13,578.00	22,805.00	34,358.00	125,999.00
Toxic Inventory Gas Dispensing Nozzle Fee	855.00	919.00	905.00	865.00	234.00	670.00	4,448.00
Toxics Surcharge Fee	88.00	397.00	501.00	223.00	823.00	163.00	2,195.00
Grand Total	1,190,823.81	1,737,374.26	1,456,007.44	1,450,146.95	1,608,197.55	1,501,607.73	8,944,157.74

Figure B. The table above shows the types of fees, and the amounts associated with those fees, for Coyote and Pittsburgh. Again, it is possible to populate this chart with either multiple years, or with a single year. If we examine the information closely, we can learn a lot about both locations presented. For example, Pittsburgh works with asbestos and requires a toxic gas dispensing nozzle, while Coyote does not. We can also learn about Pittsburgh and Coyotes payment history by viewing their fee charts. Though Coyote has been charged a late payment fee, Pittsburgh's fee list reveals that the area is more consistently late on payments. The ability to view this information comprehensively alters the way that system users understand their role and the role of those they serve, it also allows them to anticipate and better facilitate each district's needs.

Fee Amount	Years				
City	2010	2011	2012	2013	Grand Total
Benicia	1,866,294.61	2,475,693.26	2,357,366.07	2,989,293.54	9,688,647.48
4186 Park Road Group c/o ERM	5,787.00	1,234.00	1,380.00	1,503.00	9,904.00
7-Eleven #26231	849.72	979.96	1,009.96	1,092.00	3,931.64
Acrometrix Corporation			1,505.00	687.00	2,192.00
American Port Services	656.00	689.00	781.00	848.00	2,974.00
Amports		2,490.00		2,900.00	5,390.00
Anand Medical Office		434.00		510.00	944.00
Appiano's Installations Inc	615.00	310.00	354.00	-82.00	1,197.00
APS West Coast, Inc	330.00	346.00	392.00	425.00	1,493.00
APS West Coast, Inc , Valero Refining Co - CA	5,535.39	5,810.26	6,496.99	7,077.78	24,920.42
APS West Const Inc	135.56	141.74	244.16	170.00	691.46
AT&T Mobility / A T & T Services	389.00		449.00		838.00
Barry's Cultural Marble, Inc	825.00	689.00	781.00	848.00	3,143.00
Bay Area Coffee Inc	2,024.39	2,325.26	2,333.99	6,077.78	12,761.42
Benicia Cleaners				371.00	371.00
Benicia Cabinetry	297.00	346.00	392.00	425.00	1,460.00
Benicia Fueling Center	204.12	213.48	358.74	77.00	853.34
Benicia Harbor Corp ATTN: B Berkey	204.12	213.48	239.16	258.00	914.76
Benicia Industries	204.12	567.48	239.16	253.00	1,263.76
Benicia Industries Inc	135.56	141.74	158.08	165.00	600.38
Benicia Industries, Inc	341.24	356.96	401.32	429.00	1,528.52
Benicia Shell (cardlock site)	1,087.86	1,241.08	1,301.32	1,476.00	5,106.26
Benicia Unified School District	135.56	141.74	158.08	165.00	600.38
Bio-Rad Laboratories	389.00		450.00		839.00

Figure C. Users can view fees by location. Here, we can see the fees associated with each facility across multiple years.

Annual Emission In Tons	Year					
City	2008	2009	2010	2011	2012	Grand Total
Benicia	5,372,101.54	5,399,567.68	5,215,687.56	4,852,022.47	4,709,489.00	25,548,868.25
Carbon Monoxide	657.59	656.67	564.38	541.85	464.35	2,884.85
Greenhouse Gases	2,677,565.05	2,690,986.35	2,599,508.24	2,418,612.32	2,352,537.25	12,739,209.22
Hazardous Air Pollutants	6.20	10.96	8.86	6.77	8.84	41.64
Inorganic Acid Gases					0.00	0.00
Nitrogen Oxides	1,877.10	1,785.05	1,736.39	1,783.94	1,048.76	8,231.24
Non-Precursor Organic Compounds	1.94	11.27	6.88	2.66	4.95	27.71
Organics	278.46	360.01	344.20	306.86	206.98	1,496.50
Particulates	297.61	302.49	289.65	247.94	122.47	1,260.16
Precursor Organic Compounds	276.52	348.74	337.31	304.19	220.81	1,487.57
Reduced Sulfur Compounds	3.53	6.00	5.53	5.16	5.76	25.97
Regulated Air Pollutant	2,685,900.54	2,699,631.87	2,607,655.54	2,425,955.68	2,354,716.56	12,773,860.20
Sulfur Dioxide	5,090.01	5,294.46	5,062.22	4,058.91	115.78	19,621.38
Toxic Carcinogens	2.98	4.22	3.42	3.40	3.44	17.47
Toxic Non-Carcinogens	144.01	169.57	164.93	192.79	33.04	704.34
Grand Total	5,372,101.54	5,399,567.68	5,215,687.56	4,852,022.47	4,709,489.00	25,548,868.25

Figure D. Now that we have seen some of the facilities that accrue fees for producing pollutants, we may want to see what pollutants are common in each location. We can see here that Greenhouse Gases and Regulated Air Pollutants are the heaviest contributors to air pollution in Benicia.

Annual Emission In Tons	Year					
City	2008	2009	2010	2011	2012	Grand Total
Benicia	2,677,565.05	2,690,986.35	2,599,508.24	2,418,612.32	2,352,537.25	12,739,209.22
Greenhouse Gases	2,677,565.05	2,690,986.35	2,599,508.24	2,418,612.32	2,352,537.25	12,739,209.22
Amparts		6.47	0.17	3.35	0.17	12.86
Anand Medical Office					1.12	1.12
AT&T Mobility / A T & T Services				4.46	0.00	4.46
Bay Area Coffee Inc	179.92	210.43	210.43	215.43	215.43	1,031.63
Bio-Rad Laboratories		0.25		0.33		0.58
CCL Organics LLC	42.61	33.02	34.13	20.52	41.94	172.23
City of Benicia Water Treatment Facility		4.91			1.65	6.56
Clean Harbors Industrial Services, Inc			0.24	0.03		0.26
Delta Steel Erectors		291.19	302.70	299.10	297.15	1,190.14
Duvall Coffee Roasting		1.40				1.40
GEM Mobile Treatment Services					1.09	1.09
GEM Mobile Treatment Services Inc			284.59			284.59
Northgate Christian Fellowship		0.33		0.31		0.64
Onyx/Veolia ES Industrial Services		99.68				99.68
Pacific Bell		3.47		3.21		6.68
PSC Industrial Outsourcing, LP			3.55			3.55
Rix Industries				0.74	0.37	1.10
Rrags Caffee	9.03	9.04	9.04	9.04	9.04	45.18
Simpkins Auto Care, Inc	9.72	7.96	8.11	7.28	8.29	41.36
Suisun Bay Reserve Fleet				138.54	142.72	281.26
US Dept of Transportation Maritime Administration		80.87	80.87			161.74
Valero Benicia Asphalt Plant		23,895.55	22,400.80	22,263.14	22,986.97	91,546.46
Valero Refining Company - California	2,677,313.70	2,666,339.10	2,576,160.96	2,395,639.76	2,328,827.38	12,644,280.89
Verizon Business		0.56		0.56		1.11
Verizon Wireless	1.39		2.95		1.84	6.19
Verizon Wireless (Hwy 780 Southampton)		1.09		0.74		1.83
Grand Total	2,677,565.05	2,690,986.35	2,599,508.24	2,418,612.32	2,352,537.25	12,739,209.22

Figure E. We can also view the emissions of greenhouse gases, across a number of years, created by each facility. Note that Valero contributes the majority of greenhouse gases in this area.

Fee Amount	Years				
City	2010	2011	2012	2013	Grand Total
Benicia	1,681,658.27	2,102,757.74	2,065,976.94	2,681,459.97	8,531,852.92
Valero Refining Company		24,077.25	18,602.78	14,288.68	56,968.71
Valero Refining Company - California	1,681,658.27	2,078,680.49	2,047,374.16	2,667,171.29	8,474,884.21
Grand Total	1,681,658.27	2,102,757.74	2,065,976.94	2,681,459.97	8,531,852.92

Figure F. Now that we've seen that Valero is the major source of emissions in Benicia, we may want to view the fees associated with that pollutant and facility. We can populate that information across years as well. Though the annual emission of greenhouse gases has decreased over the years (as seen in figure D.), the fees associated with that pollutant and facility have risen.

Fee Amount	Years				
City	2010	2011	2012	2013	Grand Total
Benicia	1,681,658.27	2,102,757.74	2,065,976.94	2,681,459.97	8,531,852.92
Valero Refining Company		24,077.25	18,602.78	14,288.68	56,968.71
C: STATIONARY CONTAINERS FOR THE STORAGE OF ORGANIC LIQUIDS		1,132.50	995.88	1,001.28	3,129.66
D: GASOLINE TRANSFER AT GASOLINE DISPENSING FACILITIES, BULK PLANTS AND TERMINALS		10,739.00	11,203.92	11,767.52	33,710.44
E: SOLVENT EVAPORATING SOURCES		0.00	0.00	0.00	0.00
G1		1,236.75	1,320.98	1,437.88	3,995.61
N: TOXIC INVENTORY FEES		157.00	82.00	82.00	321.00
Unknown		10,812.00	5,000.00		15,812.00
Valero Refining Company - California	1,681,658.27	2,078,680.49	2,047,374.16	2,667,171.29	8,474,884.21
B: COMBUSTION OF FUEL	528,668.82	648,209.52	782,327.46	875,253.70	2,834,459.50
C: STATIONARY CONTAINERS FOR THE STORAGE OF ORGANIC LIQUIDS	15,145.33	14,972.92	142,176.38	286,346.41	458,641.04
D: GASOLINE TRANSFER AT GASOLINE DISPENSING FACILITIES, BULK PLANTS AND TERMINALS	4,092.51	4,490.18	3,629.58	2,208.98	14,421.25
E: SOLVENT EVAPORATING SOURCES	0.00	0.00	315.00	717.00	1,032.00
F: MISCELLANEOUS SOURCES	124,190.58	124,583.17	117,047.52	78,442.60	444,263.87
G1	36,151.99	36,192.33	65,232.80	111,103.90	248,681.02
G2	32.55	1,887.20	15,393.08	32,177.36	49,490.19
G3	4,617.00		30,128.00	115,168.00	149,913.00
G4	1,656.02	1,333.89	112,047.02	209,453.41	324,490.34
G5	87,934.47	89,210.28	140,809.32	184,622.93	502,577.00
N: TOXIC INVENTORY FEES	8,905.00	8,894.00	11,119.00	25,776.00	54,694.00
P: MAJOR FACILITY REVIEW FEES	249,975.00	269,154.00	303,089.00	433,822.00	1,256,040.00
T: GREENHOUSE GAS FEES	114,390.00	117,095.00	108,060.00	218,079.00	557,624.00
Unknown	505,899.00	762,658.00	216,000.00	94,000.00	1,578,557.00
Grand Total	1,681,658.27	2,102,757.74	2,065,976.94	2,681,459.97	8,531,852.92

Figure G. We can see how those fees are broken down in a fee detail screen.

Trinity Technology Group Provides Innovative Solutions

At TrinityTG, we are in the business of solving the problems that arise with shifts in business strategies and operations. **No matter what information technology challenges you face, we can use those challenges as opportunities to find solutions that fit your current and future needs.** We can help to develop business, technical, and enterprise architectures to improve business processes and transactions. **Our Strategic Planning approach focuses on re-use and adaptation vs. re-building from scratch.** We perform process analysis with an eye to best leverage your current system. We design process maps to enable effective communication between business and technical users throughout the project life cycle. **At every phase, we use new technologies and techniques to maximize your investment in business systems.** To establish cohesive and effective interaction through the project life cycle, we produce formal plans for all of the following critical processes for every project: Communication, Risk Management, Change Management, Configuration Management, Implementation Management, and Project Management.

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Our clients are among the largest of state agencies across the public sector and the most progressive and advanced in the private sector. Our clients' success drives our business; 95% of our business comes from referrals from current and past clients. **We distinguish ourselves by our approach, working in connection with our clients to ensure their satisfaction every step of the way.**

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