RETAIL GASOLINE OUTLETS: NEW DEVELOPMENT DESIGN STANDARDS FOR MITIGATION OF STORM WATER IMPACTS

SUPPLEMENT

(To June 2001 Technical Report)

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Introduction

On March 23, 2001, the Western States Petroleum Association (WSPA), a trade association for the petroleum industry in the Western U.S., submitted a petition to the State Water Resources Control Board (State Board) which challenged the inclusion of numerical design standards for Retail Gasoline Outlets (RGOs) in the Municipal Separate Storm Sewer (MS4) permit for San Diego County.[1]

In June 2001, the California Water Quality Control Board, Los Angeles Region (LA Regional Board) and the California Water Quality Control Board, San Diego Region (SD Regional Board) issued a Technical Report, 'Retail Gasoline Outlets: New Development Design Standards for Mitigation of Storm Water Impacts' (RGO Technical Report). The Technical Report was prepared in response to the direction provided by the State Board in its decision in, *In Re*: City of Bellflower et al. (Order No. WQ 200-11, hereafter the LA SUSMP Decision) for the inclusion of numerical design standards for RGOs in future MS4 permits. The RGO Technical Report addressed presumptive concerns expressed by the State Water Resources Control Board (State Board) in the LA SUSMP Decision such as, (i) heavily regulated; (ii) limitations of space; (iii) feasibility and safety of treatment; (iv) absence of a threshold relative to RGO size. It also recommends a threshold relative to RGO size as directed by the State Board. WSPA claims that the Regional Board's evidence and findings are not "proper justification" as

[1] The State Board upheld WSPA's petition on procedural grounds. See *In Re*: Building Industry Association of San Diego and Western States Petroleum Association (Order No. WQ 2001-15)

required by the State Board. In contrast, Regional Board Counsel has determined that the criteria established are lawful and proper.[2]

On August 6, 200, WSPA submitted a critique of the RGO Technical Report in its comment on the second draft of the Los Angeles County MS4 permit. WSPA, in large part, contended that the justification was not proper. The LA Regional Board staff has prepared this Supplement to the RGO Technical Report to clarify issues raised by WSPA in its critique of the RGO Technical Report, and WSPA's comments on applicability of numerical design standards to RGOs in reference to the October 11 tentative draft of the Los Angeles County MS4 permit.[3]

Lack of Specific Analyses by WSPA

We are concerned as to the lack of substantive documentation by WSPA of its assertions that the treatment of storm water to remove pollutants of concern in California is technically not feasible, not safe, and prohibitively costly. WSPA has not technically documented the bases of such claims or conducted any analyses of such conditions at RGOs. ~~Rather~~ Regional Board staff and WSPA and its consultants differ in opinion on ~~appear to misinterpret~~ data from other studies; ~~misstate~~ facts; ~~draw questionable~~ inferences, and ~~gloss over~~ important differences. Regional Board staff ~~on the hand have~~ conducted independent analyses of these factors and facts to ensure "proper justification" for the inclusion of RGOs.

For example contrary to WSPA's claims, (i) WSPA member RGOs in Western Washington and Northern Oregon have been required by their municipalities to utilize tiered treatment since 1992 to remove petroleum hydrocarbons in storm water runoff from the fueling areas and other pollutants such as heavy metals from adjacent areas, and not after "August 2001" (Figure 1);[4] (ii) treatment control BMP pollutant concentrations were higher in the effluent at a Washington State RGO study site only because the parameters were either a component of the treatment media (phosphorous and nitrates) or the influent concentration was low (oil and grease), not because the BMP was ineffective;[5] (iii) treatment control BMPs tested by Caltrans performed as expected but needed more maintenance because of undersizing and no pre-treatment, not because they were ineffective;[6] (iv) space at RGOs for installation of treatment

[2] Regional Board Staff Counsel's Brief (November 9, 2001) at p.7.

[3] See, WSPA Comment Letter on October Draft dated November 13, 2001.

[4] See p 9 where is reproduced the e-mail communication between Mr. Ciuba at Washington Department of Ecology and Dr. Swamikannu (dated Sept. 20, 2001). Mr. Ciuba explains that the criteria applied to RGOs in the State of Washington is "virtually the same as in 1992".

[5] See, Stormwater Sampling – Stormfilter, Performance Results; Burwell/ Straley's Union 76 Station, Bremerton, WA (2000) 7 pp.

[6] *See Performance Evaluation of Structural BMPs: Drain Inlet Inserts and Oil Water Separator,* Othmer, E.F. *et al*. (2001) at p 1 (cited by WSPA)

control BMPs is not constrained to render it infeasible (Table 1)[7], (iv) subsurface treatment control BMPs are safe, as demonstrated by WSPA member RGOs in Washington and Oregon who have installed these systems for some years; and (v) cost of installation of treatment control BMPs (actually a retrofit of existing facilities) tested by Caltrans was well within estimated costs; the larger expense was for monitoring and analysis…not installation.[8]

RGOs are Storm Water Pollutant Hotspots

RGOs are incontrovertible hot spots for pollutants of concern in storm water and have been widely documented as such. The most common pollutants of concern in storm water runoff from RGOs are heavy metals, petroleum hydrocarbons (such as Polycyclic Aromatic Hydrocarbons (PAHs)), and oil and grease.[9] These pollutants have been identified through analyses of: (i) trapped sediments in on-line oil water separators; (ii) particulates removed by treatment control BMPs such as media filters; (iii) simulated runoff; or (iv) storm water runoff leaving RGOs. In studies conducted, since 1970, in relation to automotive related activities and their impact on the quality of storm water runoff, a strong correlation has emerged between the volume and duration of automotive exposure and its impact on water quality and sediment quality criteria. As a result, several areawide storm water management programs already identify RGOs as pollutant hotspots and require the implementation of treatment control BMPs.[10,11,12]

An 18-month study was performed in the Washington Metropolitan area ("Washington Study"), to compare storm water quality with the National Urban Runoff Program (NURP) monitoring results.[13] One of the monitoring locations was situated at a

[7] Table 1 illustrates that more than two-thirds of the surface area (at a sampling of RGOs in the Los Angeles area) is available for installation for WQF treatment control BMPs (some which are as compact as 50 sq. ft in dimension).

[8] *Ibid*. Footnote 6, ref. at p. 12.

[9] *A Review of Semivolatile and Volatile Organic Compounds in Highway Runoff and Urban Stormwater,* Open-File Report 98-409, U.S. Department of the Interior, U.S. Geological Survey (1998)

[10] *New York Stormwater Design Manual-Draft*, (2001) New York State Dept. of Environmental Conservation.

[11] *Virginia Stormwater Management Handbook*, Volumes 1 and 2, First Edition, (1999).

[12] *Stormwater Management Manual for Western Washington* (2001), Washington State Dept. of Ecology.

[13] *Concentrations of Selected Constituents in Runoff from Impervious Surfaces in Four Urban Catchments of Different Land Use* – F.I. Rabanal and T.J. Grizzard (1995), Proceedings of the 4th Biennial Conference on Stormwater, FL. Note that NURP catchments generally contained both pervious and impervious surfaces, while the study surfaces here were completely impervious, which may account for comparability in some pollutant concentrations.

gasoline station. The Washington Study confirmed NURP findings, i.e., water quality criteria for metals and Chemical Oxygen Demand (COD) are exceeded for storm water runoff from sites exposed to vehicular traffic (such as gasoline stations, parking lots and streets).[14] In the Washington Study the high COD values were attributed to the presence of high concentrations of petroleum hydrocarbons in the runoff from the gasoline station site. In addition, the U.S. General Accounting Office, in its report to Congressional requesters on urban runoff water quality (Report No. GAO-01-679) cites research in Texas that shows PAH concentrations are related to the volume of vehicular traffic.[15] Nationwide studies confirm the increased concentrations of PAHs in sediments deposited by storm water from urban watersheds.[16] A similar link between the duration and volume of automotive exposure at automotive-intensive land uses, including RGOs, demonstrated that, even at moderate duration and volume of automotive exposure, the observed hydrocarbon concentrations in storm water runoff were high.[17] For the Los Angeles area, a number of studies have identified PAHs and heavy metals as pollutants of concern in storm water runoff discharging to Santa Monica Bay.[18,19]

Implementation of Storm Water Quality Task Force (Source Control) BMPs Alone is Inadequate to Control Pollutants in Storm Water

WSPA's total reliance on the Storm Water Quality Task Force RGO BMP Guide (RGO BMP Guide) is misplaced. We have reviewed the RGO BMP Guide[20] and found it to be obsolete.[21] The recommendations of the Task Force were for the implementation of a default set of source control BMPs ~~were not an "end all" and ultimate method~~ to control storm water pollution at RGOs. The Task Force itself suggested that these source

[14] WSPA has never disputed the fact that pollutants in storm water discharges from RGOs often exceed water quality criteria. Their claim has been that it is no worse than the quality of storm water from urban land-uses characterized in the NURP study from the 1970s.

[15] *Urban Sprawl Leaves Its PAH Signature* - P. Van Metre *et al*. (2000), Env. Science Technol., 34 (19).

[16] *Selected Findings and Current Perspective on Urban and Agricultural Water Quality by the National Water-Quality Assessment Program* -–USGS FS-047-01 April 2001.

[17] *Petroleum Hydrocarbon Concentrations Observed in Runoff from Discrete, Urbanized Automotive-Intensive Land Uses* – D.L. Shepp, In Watershed ' 96 Conference Proceedings, June 1996, Baltimore, MD.

[18] *The Santa Monica Bay Restoration Plan – Actions for Bay Restoration* – Santa Monica Bay Restoration Project 1994.

[19] *Study of the Impact of Stormwater Discharge on Santa Monica Bay* – Executive Summary – Southern California Coastal Water Research Project – 1999.

[20] *Best Management Practice Guide Retail Gasoline Outlets* - California Stormwater Quality Task Force (1996).

[21] *Storm Water Quality Task Force BMP Guide for Retail Gasoline Outlets: Review and Comment*, D. Radulescu (Nov. 2001), California Regional Water Quality Control Board, 5 pp.

control BMPs were not the one and only method to address the discharge of pollutants in storm water runoff from RGOs. In fact, the Task Force contemplated the addition of treatment control BMPs in the future to the recommended BMPs menu. The RGO BMP Guide was intended to provide a default menu of source control BMPs as a pre-treatment step, until treatment BMPs were added to the Guide. The RGO BMP Guide has not been updated, and as a result is woefully inadequate for guidance to reduce the discharge of pollutants in storm water to protect the beneficial uses of receiving waters in the Los Angeles Region.[22]

WSPA's contention that the RGO Guide is the 'end all' originates from two unsupported assumptions – that source control BMPs: (i) alone are sufficient to control the discharge of pollutants in storm water runoff from RGOs so that no exceedances of water quality standards will occur, and (ii) are consistently and diligently implemented. A study conducted recently in the Los Angeles Region deflates both assumptions.[23] The results from the study demonstrate that the implementation of source control BMPs alone (similar to those recommended in the RGO BMP Guide) are insufficient to reduce the concentration of pollutants discharged in storm water to meet water quality standards. Treatment control BMPs must be employed to adequately reduce pollutants in storm water to meet water quality standards. Secondly, source control BMPs by their nature are difficult to verify and often are at the operator's discretion. While pollution prevention practices recommended in the RGO BMP Guide are desirable, neither WSPA nor others have demonstrated that the implementation of such practices reduces pollutants successfully to where water quality impacts are eliminated.[24] In fact the opposite evidence now exists.[25]

Implementation of Properly Designed Treatment Control BMPs is Necessary

Treatment control BMPs in order to be effective have to be properly designed based on either the Water Quality Flow (WQF) or Water Quality Volume (WQV) criteria or both. The WQF and WQV criteria developed by the Los Angeles Regional Board are based on characteristics of precipitation in the region. The most common precipitation events are small size storms and extreme events are rare. Consequently, for water quality purposes, the design standards ensure proper design for the treatment of the small more frequent precipitation events.

More than likely a multi-chamber treatment train or a set of treatment control BMPs will be necessary to remove the full suite of pollutants of concern in storm water

[22] *Ibid.*

[23] *Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report* – 2000. Part of the critical sources study was conducted at automotive service facilities which have similar traffic volume and duration exposure as RGOs.

[24] See Letter from Professor L.D. Duke at UCLA to Mr. Radulescu dated Nov. 15, 2001, explaining the meaning of his statement on pollution prevention in a report cited by WSPA as proof that source control BMPs are all that are needed.

[25] *Supra*. See Footnote 23

discharges from RGOs, and regular maintenance of the treatment systems will be necessary to keep it performing optimally. Current approaches to treating runoff from RGOs include isolation of the fuel servicing area to treat VOCs, petroleum hydrocarbons, and oil and grease. The area should not be connected to an infiltration type of BMP because of the potential for soil and groundwater contamination from gasoline. These areas should be connected to the sanitary sewer system with the permission of the sewer agency or to an oil water separator and a basic treatment control BMP (such as a media filter or a biofilter). VOC concentrations in storm water because of their volatility are seldom detectable. Storm water from the general area is separately treated to remove pollutants of concern adhering to particulates. Basic treatment control BMPs being implemented elsewhere in the U.S. include sand filters, vegetated buffers, biofilters, flow-through filter cartridges, and multi-chamber treatment train.[26]

The percent removal efficiencies of treatment control BMPs are highly dependent on the influent concentration of pollutants. The higher the influent concentration the higher the percent removal. For filter media based treatment control BMPs the characteristics of the medium also matter and removal efficiencies vary according to the type of filter material.[27]

Implementation of BMPs is Safe

WSPA contends that the installation of subsurface treatment control BMPs raises safety concerns because gasoline spills would purposely be routed below grade thus presenting a potentially explosive environment. We agree that the fueling area, vehicle maintenance areas, and vehicle traffic areas represent different problems. They require different solutions. To control spills, the fuel-island may be designed with a dead-end sump or spill control separator in compliance with the Uniform Fire Code (UFC); and as a spill containment pad (UFC § 790.18). The canopy should be designed to prevent the entry of rain into the fuel pad area. Storm water collected in the fuel island area may be conveyed to the sanitary sewer system after pre-treatment (if the sewer authority approves) or discharged after passing through a treatment train that includes an oil-water separator and basic treatment BMPs (media filters, biofilters, etc.). Storm water from the vehicle traffic areas may be treated using biofilters, linear sand filters, media filters or similar BMPs.[28] Contrary to WSPA's assertions, it is feasible to minimize safety concerns by designing the fueling area at RGOs consistent with UFC standards to

[26] (i) *Storm Water Management Manual for Western Washington* (2001) Vol. 1, 4-6 to 4-11; Vol. IV 2-19 – 2-21 and Vol. V; (ii) *Rouge River National Wet Weather Demonstration Project, Task Product Memorandum – Evaluation of On-line Media Filters RPO-NPS-TPM59.00*, (1999) Wayne County, MI, (iii) *Multi-Chamber Treatment Train Developed for Storm Water Hotspots*, Technical Note #87, Watershed Protection Techniques 2: 11-13 (1999).

[27] For filter medium performance see, *Catch Basin Inserts to Reduce Pollution from Stormwater*. S.L. Lau *et al* (2001), Water Science and Technol. 44: 23-34.

[28] See Table 4.1, which lists treatment control BMP options, *Storm Water Management Manual for Western Washington* (2001) Vol. 1, at p. 4-11.

control spills, while also incorporating treatment control BMPs to reduce the discharge of storm waters pollutants.

Treatment Control BMPs are Reasonable in Cost

We have previously reviewed the literature on the cost of treatment control BMPs for RGOs and determined them to be reasonable.[29] Biofilters are expected to cost about $6,500 per 5,000 square feet.[30] The multi-chamber treatment train has been estimated to cost between $5,000 and $10,000 per 5,000 square feet of drainage area.[31] Based on the estimated project cost to build a RGO (Table 2), the cost of installation of treatment control BMPs appears to be between 1.75 – 2.3 percent of the project cost. These estimates are consistent with the Regional Board's empirical basis of reasonable cost to meet the mitigation criteria (1-2 percent of the project development cost).[32]

Conclusion

Water quality protection should be no less important for RGO operators in California than they are for their counterparts in other Western states. The RGO BMP Guide which emphasizes pollution prevention practices may be considered as the pre-treatment step that optimizes the cost-effectiveness of treatment control BMPs. Both source control and treatment control BMPs are essential to reduce the discharge the pollutants in storm water effectively and to minimize treatment costs. A suite of treatment control BMPs or a treatment train of BMPs most likely will be needed to remove the range of pollutants of concern in storm water runoff from RGOs. The thresholds established by the Regional Board for the numerical mitigation criteria to apply to RGOs are reasonable and fair, have been properly justified, and have fully met all evidentiary requirements set forth in the LA SUSMP Decision by the State Board for the inclusion of RGOs.

[29] *Retail Gasoline Outlets: New Development Design Standards for Mitigation of Storm Water Impacts*), Radulescu *et al.*, (June 2001) at p 7.

[30] See, "Cost and Benefits of Storm Water BMPs" in, *Preliminary Data Summary of Urban Storm Water Best Management Practices*, USEPA, No. EPA-821-R-99-012 (1999) pp. 6-1 – 6-44.

[31] *Multi-Chamber Treatment Train Developed for Storm Water Hotspots*, Technical Note #87, Watershed Protection Techniques 2: 11-13 (1999), at p 29.

[32] See State Board Order No. WQ 2000-11 (LA SUSMP Decision) at p. 21, where the State Board finds that this cost basis is reasonable.

-----Original Message-----
From: Xavier Swamikannu [mailto:XSWAMI@rb4.swrcb.ca.gov]
Sent: Monday, September 10, 2001 5:36 PM
To: Lynch, Donna
Subject: RE: Manual and Questions

Would you kindly respond to the following two questions:

1. Does a new gas station development that creates 5,000 square feet or more of impervious surface be subject to storm water treatment for post-construction use?
2. Does an existing gas station that replaces 5,000 square feet or more of impervious surface be subject to storm water treatment for post-construction use?

Thanks for your assistance.

Sincerely
Xavier
Storm Water Program
CalEPA- RWQCB Los Angeles"

-----Original Message-----
From: Lynch, Donna
Sent: Wednesday, September 12, 2001 9:42 AM
To: Ciuba, Stan
Subject: FW: Manual and Questions

Stan,
Please answer these gas station questions. Thanks.

>>> "Ciuba, Stan" <sciu461@ECY.WA.GOV> 09/12/01 01:37PM >>>
Xavier, the new manual, which should be published in the next couple of weeks, applies to new and redevelopments. Local governments can also use it for retrofits as they judge necessary. The impervious containment area of the fuel island is considered a pollutant generating source requiring treatment for hydrocarbon pollutants. The 5000 square foot threshold pollutant generating surface applies to the parking area adjacent to the fuel island and includes any convenience store parking area. Hope this helps.
Stan

-----Original Message-----
From: Xavier Swamikannu [mailto:XSWAMI@rb4.swrcb.ca.gov]
Sent: Thursday, September 13, 2001 2:38 PM
To: Ciuba, Stan
Cc: Dan Radulescu
Subject: Re: FW: Manual and Questions

Hello Stan:

Some follow-up questions.
Have these requirements for gas-stations been in effect for certain parts of Western Washington State for some time....for e.g. the Puget Sound Area?
What were the requirements for gas stations in the Stormwater Management Manual for the Puget Sound Basin (1992)?
Xavier

"*The answer to your question is that the gas station BMPs in the new Manual (published last week), is virtually the same as in the 1992 Manual. The language has been changed and several items are expressed more directly. The new 2001 Manual applies to Western WA and is offered as technical guidance to local governments and others. However, the BMPs in the new Manual may be incorporated into the various municipal and industrial general NPDES Stormwater Permits. Exactly how and when that will happen has not been determined.*
Best regards, Stan

Figure 1. Text of e-mail communications between staff from the Regional Board and Washington Department of Ecology on treatment control BMPs at RGOs (Sept 10 to Sept. 20, 2001).

Table 1. Summary of surface and underground spatial areas of typical structures at a sample of RGOs in the Los Angeles area.

	Mobil Station #18-EDP (Gardena)	United Oil Station #51 (Harbor City)	United Oil Station #4 (Lawndale)	Thrifty Station #1 (Maywood)	Mobil Station #18-L81 (Torrance)
Total Surface Area (sq. ft.)	11,000	12,000	12,000	16,000	24,000
Area of fuel canopy (%)	6	10	14	15	10
Area of building (%)	10	3	4	2	11
Area of subsurface UST* (%)	4	6	14	9	6
Remaining area (sq. ft.)	8,800	9,720	9,360	11,840	17,520
Remaining area (%)	80	81	78	74	73

* UST = Underground Storage Tanks

Table 2. Summary of estimated costs associated with the construction of a new gas station. Costs slightly vary from location to location, and auxiliary activities such as mini-mart, car wash, and vehicle service involve additional facility construction costs (Cost Estimates provided by a commercial land developer in the Los Angeles region).

Gas Station Development Characteristics	
Area (sq. ft.)	40,000
Land Cost ($)	800,000
Buildings and Site Improvement Costs($)	1,000,000
Entitlements (design, permits, etc.) Cost ($)	200,000
Off site Connections (signals, water lines, etc.) Cost ($)	300,000
Total Cost ($M)	2.3
Total Cost/ 5,000 sq. ft	287,500