Guidance for future Total Maximum Daily Load (TMDL) municipal stormwater cost estimation

Intended Audiences:

- Regional Water Board staff engaged in total maximum daily load (TMDL) development,[1] primarily for TMDLs with allocations or implementation actions that are assigned to urban stormwater, municipal stormwater and/or NPDES Municipal Separate Storm Sewer Systems (MS4s) permittees.
- National Pollutant Discharge Elimination System (NPDES) permit writers who are including information regarding costs of compliance with TMDL wasteload allocations in the fact sheet of an NPDES MS4 permit.
- Staff working on statewide and region-wide regulations, policies, water quality control plans, basin plan amendments, and standards actions.

See the Appendix 3 for relevant legal requirements. This general guidance is not binding and does not change or otherwise affect the legal obligations of the Water Boards related to the adoption of waste discharge requirements. Rather, this guidance provides best practices for staff to conduct a thorough estimation of MS4 permit compliance costs to the extent that sufficient staffing resources exist.

This guidance does not relate to the estimation of the *benefits* of TMDLs. We developed this guidance in part to respond to recommendations of the State Auditor.

Owner of this guidance. The Office of Research, Planning, and Performance (ORPP) is currently responsible for updates to this guidance. Please tell ORPP staff (ORPP@waterboards.ca.gov) about your experience using this guidance, including the time and resources required. ORPP staff are not experts in TMDL issues and are happy to work with you to revisit and revise this guidance as more information becomes available and as the guidance is applied. If needed, ORPP staff will lead efforts for make this guidance more formal.

Introduction. Water Board staff developing draft TMDLs generally approximate the anticipated costs for local jurisdictions to implement reasonably foreseeable means of compliance and document that approximation in the corresponding staff report. Staff are responsible for providing good quality information for their Board to make good policy decisions. This cost analysis becomes an initial reference regarding costs the dischargers affected by the TMDLs may bear and can help to inform subsequent cost considerations when the Water Boards adopt waste discharge requirements and other permits and orders to implement the TMDLs.

[1] TMDLs can be developed for a wide range of pollutants. Most municipality TMDL costs are associated with municipal storm water discharges, but there are also costs associated with municipalities' Publicly Owned Treatment Works and industrial storm water facilities. TMDLs are typically adopted through the quasi-legislative process of amending Regional Water Quality Control Plans (Basin Plans).

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How the approximation of costs at the TMDL stage can help to inform the subsequent cost consideration at the TMDL implementation stage

If the development of a TMDL includes a robust and detailed cost analysis of the methods of compliance to implement the TMDL, then the Water Boards will be able to substantially rely on that analysis when issuing MS4 permits to implement the TMDL. The NPDES permit writer should summarize the analysis performed for the TMDL in the MS4 Permit fact sheet, and supplement it as appropriate.

Municipal storm water permittees have some discretion in deciding how to comply with permit requirements, which may include TMDL-related requirements that implement TMDL wasteload allocations. Permittees, therefore, may be in a better position to estimate costs of reasonably foreseeable methods of compliance than Water Board staff. As such, and in addition to conducting independent analyses, Regional Water Board staff should generally solicit information on compliance approaches and associated costs from the local jurisdictions that will be assigned wasteload allocations in a TMDL. Staff's role includes rigorously assessing estimates so that the Water Boards are able to assess whether they are reasonable. Note, however, that some permittees may overestimate their costs and use those numbers as justification for objecting to perform adequate implementation of pollution control measures.

This guidance describes methods for obtaining information on compliance approaches and associated costs and for completing an independent analysis. Staff may seek information from stakeholders, including permittees, via existing public processes (for example, the administrative process for public participation that the Regional Boards are required to undertake per the California Administrative Procedures Act or the project scoping that the Regional Boards are required to undertake per the California Environmental Quality Act). This guidance strives to promote greater consistency and transparency related to estimation of costs to implement TMDLs. We recognize that precise cost estimation is challenging and that the level of precision possible may be low in many cases. For example, industry-wide, there is no uniform database of projects' components and costs.[2] Despite the limitations, good cost information collection efforts are invaluable for fully informed decision-making

[2] CASQA usually has a list of different types of best management practices and costs for implementing those and the TMDL report cards often include information on projects and costs incurred by stakeholders in implementing pollutant reduction projects.

National efforts to collect cost information have typically focused on surveys of implementers because information is not collected across implementers in a regularized and consistent way. A recent example is Clary and Piza's *Cost of Maintaining Green Infrastructure* (2017). Currently, a number of cities, including cities under combined sewer overflows consent decrees (e.g., Washington, DC and Philadelphia), and San Francisco, are undertaking asset management projects intended to lead to a better understanding of both O&M and full life cycle costs of green and gray infrastructure. There's consideration of adding cost information to the International BMP database, but it's not there now. Those efforts, and smaller efforts such as in Lancaster, Pennsylvania, are likely to lead to a more regularized framework for considering costs associated with this part of the permit program. Estimated costs have also been developed as part of crediting programs, for example in Washington, DC (and suburban Washington) and San Francisco, and to support stormwater utility fees in various jurisdictions.

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and for the evaluation and improvement of policies and practices. The Water Boards' staff will revisit this guidance periodically as it is applied and as more information becomes available.

Guidance on data the Boards have

Before seeking new data, staff should first consider information in existing public Water Board records:

- Annual reports or permit reapplication packages (such as for existing elements of the jurisdiction's stormwater management program) by MS4 permittees on costs to implement their local stormwater program, in compliance with fiscal analysis requirements in permits. To the extent measures anticipated to support attainment of waste load allocations are similar to those already in place (e.g., street sweeping, MS4 maintenance, etc.), these reported costs should be considered.
- Grant funding applications, proposals, and reports submitted to the Division of Financial Assistance (e.g., Prop. 1, Prop 50, Prop. 84). These may include contractors' itemized bids for recently-built projects, which can, with scaling, be used to help estimate TMDL implementation costs.
- Local funding measures.
- Caltrans cooperative interagency agreements.
- Cost estimates in Stormwater Resource Plans, Integrated Regional Water Management Plans, or other types of Watershed Management Program plans.
- Agency budgets.
- Past responses to Regional Water Board staff requests.

The TMDL Roundtable, in conjunction with MS4 permitting staff, should compile all gathered cost information for access and use by State and Regional Water Board planning and permitting staff statewide.

In the meantime, please send data sources that should be included here to ORPP. Links are appreciated.

Guidance on how to get estimates of costs from Permittees and other stakeholders via the TMDL development process

After staff has a good sense of the proposed allocation and implementation requirements, staff should incorporate an explicit process to request estimates of costs from Permittees and other stakeholders into the TMDL development process.[3] Developing estimates in such a process, or vetting estimates through a public process, may be the best way to address possible biases or shortcomings and ensure realistic cost information is provided to the Boards. Also, having a variety of perspectives on cost estimates can help put an estimate in context. Here are possible approaches. These vary in how they fit into the TMDL development process. Any one approach can be used or several could be implemented together in a complementary fashion:

[3] The Water Boards consider input from local jurisdictions during TMDL development and assume that jurisdictions take into consideration their existing expenditures on stormwater management and their ability to obtain funding when the jurisdictions provide their input on proposed TMDLs, including implementation schedules.

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1) ***Add on to the CEQA scoping meeting.*** Request, from Permittees and other stakeholders, information on a range of economic factors, including costs of reasonably foreseeable means of compliance to achieve TMDL wasteload allocations or other alternative requirements, during project CEQA scoping.[4] Notices of CEQA scoping meetings should begin this solicitation process and Permittees and other stakeholders should be given an opportunity to submit information following the scoping meeting. Note that this option is likely to most successful if sufficient details regarding the proposed TMDL are provided prior to the scoping meeting.
2) ***Host a stand-alone scoping meeting just on economics and costs.***
3) ***Issue an 13383 order.*** Require, from existing Permittees or named jurisdictions, information on a range of economic factors, including costs of reasonably foreseeable means of compliance to achieve TMDL wasteload allocations or other alternative TMDL requirements. This could be done through Water Code section 13383 orders.
4) ***Voluntary approaches.*** For example, staff could send out an email request to relevant parties and through the project's Lyris list for the voluntary submittal of cost information.

These steps can add time to the process of TMDL development. As staff apply this guidance, the Boards will be able to determine what amount of time is typical. Additional time should be incorporated into project planning to allow for data collection and independent analysis.

TMDL Example from Region 2

For TMDLs, where needed, staff develop cost analyses for TMDL implementation actions. A good example is the economic analysis in the San Pedro Creek and Pacifica State Beach Bacteria TMDL's Substitute Environmental Documentation. See the Staff Report starting at page 105 here. References supporting that analysis are listed a few pages later. Note that (page 50), "on May 11, 2011, the Water Board issued Cease and Desist Order No. R2-2011-0031(CDO) to Pacifica, ordering the City to comply with the following requirements" and then goes on to itemize specific structural BMP measures to control SSOs. This is a completely different situation than a Phase I MS4 permit, which is typically the implementation mechanism for a TMDL waste load allocation.

Note that while staff makes their best effort to collect and use available cost information, to the extent full information is not available, they make their best estimate and then rely on the public review process to identify additional available information and analysis.

[4] Project scoping is required by the Water Boards' CEQA Certified Regulatory Program regulations. California Code of Regulations, title 23, section 3777.5.

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TMDL Example from Region 3

> **MS4 Implementation Costs.** To implement the TMDL the City of Salinas and the County of Monterey would incur additional costs. The current MS4 and watershed monitoring programs are adequate, however the MS4 are required to implement TMDLs through their permits and will incur addition costs for implementation, analysis and reporting.

MS4 Permit writers now need to conduct more analysis in order to incorporate the TMDL into the MS4 Permit. This example would no longer be considered adequate.

Guidance on cost estimation approaches

Please feel free to contact the Water Board's Training and Technical Services Unit, in ORPP, with questions. ORPP may be able to help you engage consultants, if needed to develop economic analyses.

The Division of Water Quality (DWQ) also has access to professional economists with experience working on standards actions and TMDLs through US EPA's in-kind support using 205(j) grant funds and DWQ may have some ability to support Regional Board projects. Regional Board staff should discuss their needs with DWQ's TMDL Program Coordinator, Rebecca.Fitzgerald@WaterBoards.CA.Gov. The best time to contact her about this is in February and March of each year when fiscal year workplans are developed.

Below are steps Permittees should take in cost estimation.[5] Note, staff need to critically evaluate how all these steps were done and may want to give stronger direction to Permittees.

1. Characterize costs of the TMDL.
    a. Permittees should not include costs that would have been incurred regardless of a TMDL, permit, or renewal. In other words, costs should be based on a comparison of "with permit policy change" versus "without permit policy change."
    b. Many kinds of costs must be considered. For example, Permittees should include, as applicable:
        i. Costs in the planning, design, construction (including land acquisition, if necessary), and operations/maintenance phases.
        ii. Financial costs.
        iii. Data collection costs.
        iv. Monitoring costs (see box).
        v. Costs of hiring QISPs or QSDs.
    c. Costs of TMDL implementation are not always additive. The same practices can be implemented to address multiple pollutants, so care must be taken to avoid double-counting. Note some Permittees may try to get credit for pollutant reductions a project is not likely to provide, for which there is no justification, or where the purpose of the project is flood control or something else other than addressing a TMDL (e.g., purpose was to increase flood control capacity).

[5] Adapted from Boarding, Greenberg, Vining, and Weimer, 1996.

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   d. Costs should be apportioned among permittees and other parties, as appropriate, so that the Permittee does not claim costs that others should or will bear.
   e. See Appendix 1 for a list costs that do generally *not* count.
2. Monetize all costs.
   a. Costs should be broken down into discrete units (permitting, operation and maintenance over the expected time to meet the TMDLs, etc.) rather than treated in aggregate.
3. Discount costs to find their present values. See the Appendix 2 for directions.
4. Sum the discounted costs. This is your estimate.
5. Perform sensitivity analysis or develop a range of possible costs. In other words, produce and present estimates using different assumptions and values of key parameters. This will help account for the uncertainty of cost estimation.

Comments on monitoring costs

When a TMDL requires sampling and analysis of multiple media (e.g., fish, bird eggs, water, sediment, algae) in multiple water bodies to determine whether progress in attaining the TMDL is being made can be substantial.

Costs for analysis of constituents can be obtained from labs. For special analyses, where few labs have the specific capacity, costs are dictated by those select labs. Also, field time needs to be accouned for.

Some types of monitoring can take two people an entire day.

Often with TMDLs, we see new types of monitoring, new analyses not routinely done and low detection limits.

Options to create or participate in regional monitoring efforts could be considered. This can reduce costs for each entity. There have to be checks and balances to make sure that each entity is fully participating and costs are balanced.

If different consitutents need method quality objectives (for example, to meet Surface Water Ambient Monitoring Program (SWAMP) requirements), then those objectives might have to be developed. The SWAMP unit has limited resources for this purpose, however.

Some types of monitoring don't yet have approved standard operating procedures. If those SOPs are to be adopted statewide, there is a cost for review of those SOPs.

The development of Quality Assurance Project Plans and the costs of data management too often have gone undocumented.

For each potential compliance option, staff should consider asking these questions of the Permittee before the Board adopts the TMDL:

1. What will your costs be?
2. What are the ranges for your costs?

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3. When will costs be incurred?
4. Why should each cost be included?
5. How were costs developed? (Is the information provided scientifically, technically, and legally defensible?) Can the real-world cases on which costs were based be shared?
6. Were common industry practices for cost estimation followed?[6]
7. How do your costs compare to the costs of other projects? (The emphasis should be on more recent and more similar projects.)
8. What costs are *not* included in your estimates? (All costs need to be identified whether or not they are quantified.)
9. What have you done to keep costs low?
10. How will you mitigate costs?
11. How is the work going to be financed? (This affects costs and matters for public awareness and oversight.)

Staff should be aware that the Permittee point of contact may not know to consult with his or her colleagues. For example, sometimes the municipal staff contact may not be in contact with the municipality's budget staff.

If information on the costs of implementing best management practices (including structural treatment controls) is limited for the subject TMDL pollutant, the permit fact sheet should explain what information is and is not available. For example, cost information may not be available for management of bioaccumulative TMDL pollutants such as selenium and mercury.

There is a risk of cost overestimation. To help mitigate this, staff should consider:

1. Getting comparable information from diverse sources.
2. Doing your own estimation, to the degree possible.
3. Ensuring a range of alternatives were considered. There may be a number of reasonably foreseeable means of compliance for a Permittee to consider. Each compliance approach will have its own cost. Consider the information in stormwater resource plans and project feasibility studies that compare costs of different project options.
4. Rejecting cost estimates presented with insufficient detail and explanation for verification or auditing. (Keep in mind that in some cases the ideal level of detail may be impossible or unreasonable to expect.) Assumptions should be documented. Appropriate methods must be used to develop cost estimates and such methods should be clearly described and documented, including any assumptions used. Assumptions may relate to scaling of costs, calculating life-cycle costs, etc. The TMDL staff report must include a description of the methods used and assumptions. Any additional method documentation must be included in the administrative record.
5. Requiring multiple estimates to account for costs that are highly uncertain. Highly uncertain costs should not just be represented as a single value, such as an average. The range of reasonable cost should be disclosed to avoid overstating the certainty of the cost estimate.

[6] One option: *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, United States Government Accountability Office, GAO-09-3SP, 2009.

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6. Asking for unit costs (cost per acre treated, per ton avoided, per volume treated, etc.), when applicable, as well as total costs. This can help you understand economies of scale and can help in comparison of different projects. (We can look at unit costs in any rational method, as long as it results in a total cost estimate.)

Guidance on obtaining data for use in cost estimation

The best data tend to be from recent, well-documented, open-access, easy-to-use sources. There are many efforts underway to improve data availability and usefulness. Staff should consider:

1. Developing and using a data collection and quality management plan. (See box.) For all data sought, staff should specify desired types of data, the standards for data reporting, and ways to ensure (1) data quality is high and (2) the quality of the data is documented.
2. Efforts to get better data or more data. For example, consider the costs and benefits of getting more information about the water quality of water bodies relevant to each proposed permit—that could affect the level of effort the Permittee must undertake.
3. What cost data is relevant and reliable given that proven stormwater best management practices and technologies continue to evolve. Often more cost-effective technologies are developed over time so older cost analyses may be less relevant or useful than newer analyses. Similarly, cost estimation may be less precise for new or less common approaches.
4. How to document the sources used to develop cost estimates in the administrative record for the TMDL.
5. Giving priority to these valued data sources:
    a. Published literature.
    b. Open-access databases (e.g., International Stormwater BMP database).
    c. Grant proposals and reports submitted to the Water Boards (e.g., Prop. 1, Prop 50, Prop. 84).
    d. Caltrans Interagency Agreements.
    e. Conference proceedings (e.g. CASQA annual conference).
    f. Estimates in Stormwater Resource Plans, Integrated Regional Water Management Plans, or other types of Watershed Management Program plans.
    g. Estimates provided by MS4 Permittees or other stakeholders in required annual reporting, in published agency budgets, and in response to specific requests by Regional Board staff.
    h. Estimates provided by other stakeholders (e.g., environmental and industry NGOs like ASCE, CASQA, WEF).

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Plans for data collection and quality management

The quality of data used for cost estimates is important and it may be important enough to develop a program plan to help those collecting and submitting data do a good job on data quality assurance and other tasks. The Board has a Quality Management Plan which applies to all our business areas. Any new data collection efforts should consider developing a data management plan to help develop good strategies for the whole data lifecycle and associated interests (e.g., data quality, data accessibility, data resilience, etc.)

The Board's Quality Management Plan is here: https://www.waterboards.ca.gov/water_issues/programs/quality_assurance/.

Our standard template for Data Management Plans is here: https://forms.office.com/Pages/ResponsePage.aspx?id=JWoY_kl95kGZQQXSKB02wTYzSZ1vHHxFnLiGlpSp-6ZUNDVDTDYwQ1FRUUNaUURCSDY0NDlUODRONy4u.

The Surface Water Ambient Monitoring Program (SWAMP) is the most evolved and current QA Program plan the Boards have. That program has a QA Program Plan they use to drive better QA Project Plans, here: https://www.waterboards.ca.gov/water_issues/programs/swamp/qapp/swamp_QAPrP_2017_Final.pdf.

Guidance on consideration of *overall* related costs Permittees have paid and expect to pay

Each TMDL is distinct with the common goal to attainment of water quality standards; it is important however to publicly consider the cumulative effect of policies (e.g., multiple TMDLs) that require reductions in pollutants from municipal stormwater and non-stormwater discharges. At a minimum, Regional Boards should identify whether local jurisdictions are already subject to other TMDLs, identify those TMDLs, and consider additional TMDLs they will likely be subject to in the future. (Water quality impairments listed on the 303(d) list would be useful for this.) Staff should also consider whether the reasonably foreseeable means of compliance are the same as, or different from, those to comply with the other existing TMDLs to which the local jurisdiction(s) is subject—this could also be performed as part of the CEQA analysis of cumulative effects.

Further, existing elements of a jurisdiction's stormwater management program, for which it is already making expenditures, may address, wholly or in part, compliance with a pollutant limit. Regional Boards should consider whether existing elements of the jurisdiction's stormwater management program are reasonably foreseeable means of compliance with the TMDL. If so, this should be stated in the substitute environmental documentation and the costs that were going to be incurred regardless should not be counted as TMDL compliance costs. Costs associated with these program elements can be taken from Permittee-reported costs in permit annual reports or permit reapplication packages.

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Appendix 1: Costs that generally should *not* be counted

Costs should be based on a comparison of "with permit policy change" versus "without permit policy change." Costs that would have been incurred regardless of a TMDL or permit should not be counted.

These activities should not be included as part of TMDL compliance:

1. Street cleaning to the degree that it would otherwise occur.
2. MS4 operation and maintenance activity that would otherwise occur.
3. Enforcement of ordinances prohibiting non-stormwater discharges to MS4.
4. Best management practices already in place for other water quality issues.
5. Best management practices for water conservation, drought management, or stormwater collection for beneficial reuse that would otherwise occur.
6. Any other costs that would be incurred regardless of the TMDL.

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Appendix 2: Discounting

The when one-time or recurring costs occur is important. A dollar spent today is valued more than a dollar spent years later due to the time value of money. Costs incurred over time should be discounted and brought into net present value (or some other common time period). This allows for a fair comparison of costs that occur in different time periods.

Index the years of costs by t so C_t is the cost in year t.

The net present value of these costs is the sum of the costs from each year discounted using the discount rate r:

$$\sum_{for\ all\ years\ t} \frac{C_t}{(1+r)^t}$$

Analogous formulas can used if you have costs by month or if you are using a year other than the current year as your reference.

A real discount rate of 7 percent should be used as a base-case for regulatory analysis, according to the United States Office of Management and Budget Circular A-94.

For long-lived projects, staff are encouraged to use these declining rates so as not to over-discount costs in the more distant future (from Arrow et al., 2014):

Period	Suggested name	Marginal discount rate
Within years 1 to 5 from now	"Immediate future"	4%
Within years 6 to 25 from now	"Near future"	3%
Within years 26 to 75 from now	"Medium future"	2%
Within years 76 to 300 from now	"Distant future"	1%
More than 300 years from now	"Far-distant future"	0%

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Appendix 3: Legal considerations

Please note: this general guidance is not binding and does not change or otherwise affect the legal obligations of the Water Boards related to the adoption of TMDLs or waste discharge requirements that implement TMDLS.

- The State Water Board's California Environmental Quality Act (CEQA) Certified Regulatory Program regulations apply to TMDLs that are adopted as water quality control plan amendments. California Code of Regulations, title 23, section 3777, subdivisions (b) and (c), are modeled on CEQA's Public Resources Code section 21159. Section 3777 requires that the Water Board's Supplemental Environmental Documentation shall include an environmental analysis, including a reasonable range of economic factors, for the reasonably foreseeable methods of compliance with the TMDL. California Code of Regulations § 3720 et seq.; Public Resources Code § 21159.
- Water Code section 13241 requires the Water Boards to consider certain factors in establishing water quality objectives, including economic considerations. The Water Boards must comply with Water Code section 13241 for any water quality control plan amendment that establishes a water quality objective. Almost all TMDLs implement existing water quality objectives, however, rather than establishing new water quality objectives.
- In addition, Water Code section 13241 applies to the adoption of waste discharge requirements that establish site-specific water quality objectives or include more stringent requirements than what would be required under the federal Clean Water Act.[7] Therefore, to the extent that an MS4 permit includes requirements that are more stringent than what would be required under federal law, the permit writer should include a discussion of the permittee's costs to comply with those more stringent requirements.[8] In some cases, those more stringent requirements may be related to permit requirements to implement one or more TMDLs.

[7] In accordance with Water Code section 13263(a), in prescribing permit requirements, a Regional Board must implement any relevant water quality control plan and take into consideration the provisions of Water Code section 13241 among other things. In *City of Burbank v. State Water Resources Control Board* (2005) 35 Cal.4th 613, the California Supreme Court considered whether Regional Boards must comply with section 13241 when issuing waste discharge requirements under section 13263(a) by taking into account the costs a Permittee will incur in complying with the permit requirements. The Court concluded that whether it is necessary to consider such cost information "depends on whether those restrictions meet or exceed the requirements of the federal Clean Water Act" (*Id.* at p. 627). The Court also held that Regional Boards may not consider the factors in section 13241, including economics, to justify imposing pollutant restriction that are less stringent than federal law requires.

[8] The Water Boards' obligation under Water Code section 13241 is to "consider" economic factors. This has been interpreted to include a consideration of cost; however, the Water Boards have broad discretion in the nature and scope of this consideration.

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