Regional Water Quality Control Board
North Coast Region

Executive Officer's Summary Report
February 4, 2021

ITEM: 5

SUBJECT: Updates on the Technical Development of the Laguna de Santa Rosa Total Maximum Daily Loads and the Restoration Vision for the Laguna de Santa Rosa *(Dr. Kelsey Cody, Dr. Jon Butcher, Dr. Neil Lassettre)*

BOARD ACTION: This is an information item only; no action will be taken by the Board.

BACKGROUND: The Laguna de Santa Rosa watershed is the urban center of the North Coast Region. It encompasses Santa Rosa, Rohnert Park, Cotati, Sebastopol, and Windsor, as well as many unincorporated areas. In addition to substantial urban land use, the watershed supports a vigorous agricultural economy including, but not limited to, vineyards and dairies. The Laguna de Santa Rosa (LSR) is a Ramsar wetland of international importance and the largest tributary of the Russian River, draining 254 square miles in Sonoma County. Major streams entering the LSR include Windsor Creek, Mark West Creek, Santa Rosa Creek, Blucher Creek, and Copeland Creek. The 2016 Integrated Report indicated that the Cold Freshwater Habitat (COLD); Fish Spawning (SPWN); Fish Migration (MIGR); Rare, Threatened, or Endangered Species (RARE); Wildlife Habitat (WILD); and Warm Freshwater Habitat (WARM) beneficial uses (BUs) are impaired throughout the LSR Watershed.

The Clean Water Act (CWA) requires Total Maximum Daily Loads (TMDLs) in order to restore supporting conditions for BUs. Beneficial uses in the LSR watershed are impaired by a complex set of interlocking problems derived from widespread hydrologic and land use modifications. These changes have led to the listing of the LSR for four impairments on the federal Clean Water Act 303(d) List, which are the focus of this TMDL project: sediment, Phosphorus, Dissolved Oxygen (DO), and temperature. These impairments are all related through a process called biostimulation.

A TMDL is typically developed for waterbody pollutant pairs and is intended to express the maximum amount of the pollutant that a waterbody can assimilate while still supporting BUs. However, due to land use changes and modifications to the hydrology, the LSR watershed also needs a comprehensive reconciliation strategy that will result in the recovery of the LSR ecosystem functions that support BUs, such as nutrient and sediment assimilation and riparian shade. Therefore, the TMDL will provide the scientific basis for a comprehensive plan that includes not only pollutant load allocations and source control, but also supports a watershed restoration and reconciliation plan. Reconciliation in this context borrows from the framework of reconciliation ecology, and means accepting some of anthropogenic changes to the landscape as permanent and designing projects to recover BUs where restoration to historic conditions is not possible. The purpose of this information item is to provide an update on the status of the TMDL development work to date, to preview draft considerations for certain components of the TMDL, to identify next steps and schedule, and to receive feedback from Board members and interested stakeholders.

DISCUSSION: This board item will present the context needed to understand the development of the technical components of the LSR TMDL, detailed descriptions of that technical work from our contractor, TetraTech, an update from Sonoma Water on the Laguna de Santa Rosa Restoration Vision and Plan, and a description of next steps for both the technical TMDL and the ongoing restoration planning by Regional Board staff (Staff).

For context, a typical TMDL is expressed in terms of the maximum daily load (or "other appropriate measure") of a pollutant that a water body can receive and still support its BUs. Additionally, the Porter-Cologne Water Quality Control Act (Porter-Cologne) requires an implementation plan to be developed to implement the TMDL and achieve BU support. Mathematically, traditional TMDLs are represented by the following equation:

TMDL = Assimilative Capacity = ΣWLA + ΣLA + ΣBackground + MOS

Where **ΣWLA** is the sum of wasteload allocations (point sources), **ΣLA** is the sum of load allocations (nonpoint sources), **ΣBackground** is the sum of all non-anthropogenic loads, and **MOS** is a margin of safety. In the LSR watershed, the direct application of this traditional TMDL framework would be insufficient for BU recovery due to substantial modifications of the landscape, both of land cover and of hydrology. The approach for addressing the substantial land cover and hydrologic modifications in the LSR is still under development. However, the traditional TMDL framework provides a basis from which to develop an approach to address the impacts of these land cover and hydrologic modifications.

Regardless of whether this TMDL project becomes a traditional TMDL or a TMDL alternative, Staff and the contractor have endeavored to determine the key pollutants to control, to estimate what if any assimilative capacity the LSR has for those pollutants, and to determine the loading sources, and needed reduction of those pollutants. Staff will assemble a comprehensive technical support document (staff report) for scientific peer review that relies on the technical work of our contractor and considerable outreach to local partners with the ultimate goal of developing an implementation plan that assures progress towards BU attainment in the LSR. The staff report and implementation plan will meet regulatory requirements under the CWA and Porter-Cologne and provide a mechanism to promote both regulatory and voluntary efforts to restore ecological functions and the LSR watershed's assimilative capacity.

This last point in particular deserves special focus because it is beyond the traditional scope of a TMDL but is necessary for the BU recovery in the LSR watershed. Accordingly, this Board item contains not only a presentation by our contractor on the technical analyses conducted in support of the TMDL project, but also a presentation from Sonoma Water describing an ongoing multi-stakeholder project that supports a watershed recovery plan, the Restoration Vision for the Laguna de Santa Rosa. Staff's involvement in this restoration planning process highlights that the Regional Water

Board is equally focused on development of both the technical aspects of the TMDL as well as building the community partnerships that will be necessary to successfully implement recovery of BUs within the LSR watershed.

The next sections of this summary report discuss the technical analyses conducted to date. This work is by design compatible with a traditional TMDL framework but also has the larger vision of supporting ecological reconciliation. The subsequent sections also describe Staff's thinking on the relationship between pollutant source control and ecological reconciliation. Finally, this report summarizes progress and describes major next steps.

<u>Key Pollutant Relationships:</u> Significant landscape development and hydromodification have fundamentally altered the assimilative capacity of the LSR for contemporary sources of sediment and Phosphorus, in particular, and led to the 303(d) impairments described above. However, these impairments cannot be addressed separately; they are linked through biostimulation. In the LSR watershed, this is due in part to the mainstem's low gradient. The mainstem has captured historic loads of Phosphorus that are now stored within many feet of sediment. These pollutants have accumulated due to sediment being rapidly shunted downstream via flood control conduits. This sedimentation and resulting shallowing have also caused in increases in water temperature, which has only further increased due to the removal of riparian canopy. The increase in temperature, shallowing, and nutrient enrichment promote the growth of aquatic plants, especially the invasive weed *Ludwigia*. *Ludwigia* further encourages sediment deposition and reduces oxygenation while alive and after its death its decomposition consumes oxygen and releases the Phosphorus it drew into its tissues from its roots into the water column. This exacerbates the problem, since the shallowing and Phosphorus loading induced by *Ludwigia* encourage more *Ludwigia* growth. Contemporary sediment and Phosphorus loading continue to worsen these biostimulatory conditions and are key pollutants in need of control.

<u>Estimation of Assimilative Capacity:</u> The assimilative capacity analyses are used to determine the maximum levels of sediment and nutrient loading that can occur while still supporting all BUs. These analyses used the best available science to compare three analytical approaches to establishing assimilative capacity for both sediment and nutrients: an empirical stressor-response approach, a reference watershed approach, and a cause-effect approach. With respect to nutrients, the empirical stressor-response approach has the most scientific support, resulting in an estimate of LSR assimilative capacity that is 20% of current Phosphorus loads and 27% of current Nitrogen loads. With respect to sediment, the reference watershed approach has the most scientific support, resulting in an estimate of LSR assimilative capacity that is 10% of current sediment loads.

<u>Estimation of Pollutant Loading, Sources, and Needed Reduction:</u> The sediment and nutrient budgets and linkage analyses also synthesize the best available science in the LSR watershed with respect to sediment and nutrients. This work determines, on a mass basis, the total sediment and nutrient loads entering and exiting the LSR every year and the sources of those loads. These sources include those to which waste load and load allocations can be assigned. In brief, the sediment budget identifies channel

incision and widening as the largest contributor of sediment at 55% of the total load, while the nutrient budget identifies net exchange with in-channel sediment as the single largest contributor of Phosphorus and Nitrogen at 37% and 38% of the total load, respectively. The remaining sediment and nutrient loads derive largely from non-point agricultural sources, municipal stormwater and wastewater, roads, and natural background.

Based on the budgets, linkage analyses, and assimilative capacity calculations, the needed reductions in sediment and Phosphorus are 90% and 80%, respectively. Because of the substantial contribution of channel-derived sediment and mobilization of stored Phosphorus, the above analyses imply that meeting the sediment and nutrient assimilative capacities will require the TMDL and the implementation plan to assign and address not only controllable pollutant loading due to landscape runoff, but also the ongoing and controllable channel-derived sediment and nutrient loads. That is, the TMDL and implementation plan will need to induce substantial restoration and reconciliation actions to address these controllable channel-derived sediment and nutrient loads.

Surrogate Parameter Consideration: One way of linking the need for restoration and reconciliation with source control is through the use of a surrogate parameter. Assigning channel-derived loads is exceptionally complex, so a surrogate parameter is particularly helpful in assigning proportional responsibility for these loads and simplifying compliance tracking.

Sediment is appealing as an initial starting point for pollutant control and establishing a surrogate parameter because: (1) it is a primary causal agent in the chain of events that lead to biostimulation, (2) Phosphorus is nearly always bound to sediment, (3) controlling sediment leads to a focus on reconciling the modified land use and channel configurations in the LSR watershed, and (4) the channel-derived sediment loading is a contemporary discharge, not strictly linked to historical sources. One US EPA approved mechanism through which proportional responsibility for channel-derived loads can be calculated is based on an estimate of sediment transport capacity. Sediment transport capacity, i.e. runoff's ability to mobilize sediment, can itself be estimated based on a given land cover's runoff coefficient. Proportional responsibility for channel-derived sediment loads could therefore be assigned based on the additional contribution to runoff caused by land cover change above the background runoff coefficient.

Surrogate parameters are also often incorporated into TMDL implementation plans to simplify the tracking and accounting of water quality benefits due to land management improvements. The use of a surrogate parameter could reduce the complexity of monitoring and compliance tracking for sediment and Phosphorus loads, both key factors in biostimulatory conditions within the LSR.

Watershed Restoration and Reconciliation Planning: Whatever form the implementation plan for this TMDL project takes, it will encourage restoration and reconciliation actions. To ensure that these actions are well designed, prioritized, and sequenced, Staff has encouraged and participated in watershed-level restoration planning efforts. One such effort is the development of the Laguna de Santa Rosa Restoration Vision and Plan.

The Vision and Plan are two separate documents produced by the San Francisco Estuary Institute under contract by Sonoma Water and the Laguna de Santa Rosa Foundation. Funded by a single California Department of Fish and Wildlife Proposition 1 grant with support from Sonoma Water, the goal is to generate an integrated approach to restoring the LSR mainstem's 100-year floodplain. The Vision and Plan were developed in collaboration with private landowners, academics, tribes, non-profits, and government agencies, including Staff. The Vision has been through public review and published, while the Plan is nearly ready for public review. The Vision provides an opportunity map that describes broad, landscape-level projects that could be developed and managed to restore ecological function and assimilative capacity, including the construction of freshwater marshes, riparian forest planting, lake restorations, and channel realignments and improvements. The Plan will provide more detailed descriptions and design alternatives of potential project sites.

As a compliment to these efforts, Staff are working with TetraTech to develop an opportunities map that encompasses the remainder of the LSR watershed outside the 100-year floodplain of the LSR mainstem. This contract also includes a review of options for crediting assimilative capacity that would allow restoration and reconciliation projects to count towards TMDL compliance. This crediting could potentially occur though an expansion of the Water Quality Trading Framework that is currently implemented in the Town of Windsor and City of Santa Rosa wastewater permits. This work is funded by a US EPA grant and is scheduled to be completed in early 2022. Additional work to link these documents and other LSR watershed planning initiatives will be necessary in order to generate a comprehensive plan for watershed reconciliation and BU recovery.

<u>Summary of TMDL Development and Restoration Planning:</u> Ongoing sediment and nutrient discharges exceed the assimilative capacities of the LSR. Controllable sources associated with contemporary land uses in the watershed include non-point agricultural sources, municipal stormwater and wastewater, and roads. However, the largest ongoing controllable sources of sediment and nutrients are channel processes and net exchange with sediment, respectively. Because no sediment or Phosphorus assimilative capacity remains and because the largest sources are channel-based, substantial hydrologic and wetland restoration and reconciliation actions are necessary in the LSR watershed, beyond typical actions to address land use and erosion-based controllable sources. A surrogate parameter, such as increases above the background runoff coefficient for a given land area, may be used to assign proportional responsibility for ongoing channel-derived discharges of sediment and thereby induce reconciliation and restoration actions. A surrogate parameter can also be used to simplify implementation of a future TMDL implementation plan by creating a single currency for designing, monitoring, and crediting implementation actions such as restoration and reconciliation projects like those described in the Laguna de Santa Rosa Restoration Vision and Plan. The Vision and Plan will be enhanced by ongoing restoration and reconciliation planning as well as additional planning work that is in early stages.

NEXT STEPS: Future work includes preparation of a staff report for peer review based on the completed technical analyses. Comments received from peer review will then be addressed. This work is scheduled for completion in 2021. Staff will then conduct California Environmental Quality Act scoping and present a public review draft of the staff report and implementation plan in 2022 in preparation for Board consideration. Throughout these activities, Staff will continue cultivating partnerships with LSR stakeholders to support the development of the implementation plan and its eventual execution.

Following the presentations by Regional Water Board staff and the invited speakers at the February Board meeting, staff welcome comments from the public and Board members and will be available to answer questions.

RECOMMENDATIONS: N/A This is an informational item only.

SUPPORTING DOCUMENTS: None

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