

REGION 1 BOSTON, MA 02109

August 28, 2024

Sue Kiernan Deputy Administrator Rhode Island Department of Environmental Management Office of Water Resources 235 Promenade Street Providence, RI 02908-5767

Dear Ms. Kiernan:

Thank you for your submission of the State of Rhode Island's 2024 Clean Water Act (CWA) Section 303(d) list of impaired waters. In accordance with Section 303(d) and 40 CFR §130.7, the U.S. Environmental Protection Agency, Region 1 (EPA) conducted a complete review of Rhode Island's 2024 Section 303(d) list and supporting documentation. Based on this review, EPA has determined that Rhode Island's 2024 Section 303(d) list meets the requirements of Section 303(d) of the CWA and EPA's implementing regulations. Therefore, by this letter, EPA hereby approves the State's Section 303(d) list, submitted to EPA on July 26, 2024.

Rhode Island's submission includes a list of water bodies for which technology-based and other required controls for point and nonpoint sources are not stringent enough to attain or maintain compliance with the State's Water Quality Standards. As required, this list includes a priority ranking for each listed water body and specifically identifies waters targeted for total maximum daily load (TMDL) development in the next two years. A long-term schedule for developing TMDLs for all waters on the State's list was also provided. The statutory and regulatory requirements, and EPA's review of the State's compliance with these requirements, are described in detail in the enclosed approval document.

Assessments of state waters conducted under Sections 305(b) and 303(d) of the CWA should be prepared in a manner to support their submission to EPA by April 1, of even numbered years in accordance with those sections of the CWA and 40 CFR §130.7. In addition, waters should be assessed using Water Quality Standards that are approved and in effect at the time of the assessment.

The Rhode Island Department of Environmental Management (RI DEM) has successfully completed a public participation process that provided the public an opportunity to review and comment on the State's 2024 Section 303(d) list. We understand that RI DEM received one emailed set of comments

from individuals and organizations. EPA reviewed the RI DEM's responses to the public comments it received and determined that the State satisfactorily responded to them.

EPA appreciates the advance coordination between the two agencies and the opportunity to review pre-submittal drafts, which allowed us to expedite the formal approval. My staff and I look forward to continued cooperation with RI DEM in implementing the requirements of Section 303(d) of the CWA. If you have any questions regarding EPA's review or this approval, please contact Thelma Murphy at (617) 918-1549 or have your staff contact Steven Winnett at (617) 918-1687.

Sincerely,

/s/

Ken Moraff Director, Water Division

Enclosure

cc: Jane Sawyers, RI DEM Ivy Mlsna, EPA Thelma Murphy, EPA Eric Magnan, EPA Alison Newman, EPA Greg Dain, EPA Steven Winnett, EPA

EPA NEW ENGLAND'S REVIEW OF RHODE ISLAND'S 2024 CWA SECTION 303(d) LIST

1. Introduction

This document sets forth the U.S. Environmental Protection Agency's (EPA) reasoning for approving Rhode Island's 2024 Clean Water Act (CWA) Section 303(d) list. The EPA received Rhode Island's 2024 303(d) list on July 26, 2024, by email from Rhode Island's Department of Environmental Management.

The EPA has conducted a complete review of the state's 2024 303(d) list and supporting documentation and information, including changes from the previous 303(d) list. Based on this review, the EPA has determined that the state's 303(d) list of water quality-limited segments (WQLSs) still requiring TMDLs (i.e., Category 5 of the state's Integrated Report (IR)) satisfies the requirements of Section 303(d) of the CWA and the EPA's implementing regulations. Therefore, the EPA hereby approves Rhode Island's 2024 303(d) list.

EPA's action regarding Rhode Island's 303(d) list does not extend to any waterbodies, or portions of waterbodies, that are within Indian country, as defined in 18 USC Section 1151. The EPA is taking no action to approve or disapprove the state's 303(d) list with respect to those waters. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters.

2. The EPA's Analysis of Rhode Island's Submission

Section 303(d)(1) of the CWA and the EPA's implementing regulations at 40 CFR 130.7 require states, territories, and authorized Tribes (herein referred to as "states") to identify waters for which effluent limitations required by CWA Section 301(b)(1)(A) and (B) are not stringent enough to implement any applicable water quality standard. States need not identify on their lists waters where the following controls are adequate to implement applicable standards: 1) technology-based effluent limitations required by the Act, 2) more stringent effluent limitations required by state or local authority, and 3) other pollution control requirements required by state, local, or federal authority. 40 CFR 130.7(b)(1) and (2). CWA Section 303(d) lists must identify WQLSs still requiring TMDLs. 40 CFR 130.7(b). The definition of "water quality limited segment" (WQLS) in 40 CFR 130.2(j) includes any segment where it is known that water quality does not meet applicable water quality standards (referred to as "impaired waters") and any segment that is not expected to meet applicable water quality standards (referred to as "threatened waters").¹ The term "applicable water quality standards" refers to those water quality standards established under Section 303 of the Act. 40 CFR 130.7(b)(3). A WQLS must be on the 303(d) list and requires a TMDL unless the state can demonstrate that no pollutant(s) causes or contributes to the impairment.² In addition, in developing their CWA 303(d) lists, states must meet several procedural, submission, and content requirements as described in this decision document.

¹ EPA uses this term to reflect the combination of a water segment and an applicable WQS that is not attained or is threatened. For example, if a segment is not meeting three applicable WQS then there are three WQLS for that segment. ²See CWA Sections 303(d)(1)(A) and 303(d)(1)(C); 40 CFR § 130.7(b)(4); 2006 Integrated Reporting Memorandum, page 60; 2024 Integrated Reporting Memorandum, pages 18-19. EPA Integrated Reporting Memoranda may be found at https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314.

States must submit their 303(d) lists to the EPA on April 1 of every even-numbered year. 40 CFR 130.7(d)(1). The EPA must approve or disapprove the 303(d) list not later than 30 days after submission. The EPA approves a list only if it meets the requirements of 40 CFR 130.7(b). 40 CFR 130.7(d)(2). If the EPA approves the listing(s), the state must incorporate the listing(s) into its current Water Quality Management (WQM) plan. If the EPA disapproves a listing decision(s), the EPA must, not later than 30 days after the date of such disapproval, identify waters for inclusion on the 303(d) list (i.e., add the waters to the list). The EPA then must promptly issue a public notice seeking comment on the listing(s). After considering public comment and making any revisions the EPA deems appropriate, the EPA must transmit the listing(s) to the state, which must incorporate the listing(s) into its WQM plan. 40 CFR 130.7(d)(2).

The statutory and regulatory requirements, and the EPA's review of the state's compliance with the requirements, are described in detail in this document. To the extent that any EPA-approved listing decisions are unchanged from prior approved Section 303(d) list actions, EPA incorporates the reasoning of those previous list actions unless otherwise noted.

A. Supporting documentation for making listing determinations

The EPA regulations at 40 CFR 130.7(b)(6) require states to include, as part of their submissions to the EPA, documentation to support the state's determination to list or not to list its waters. Such documentation must include, at a minimum, the information discussed in subsections i through iii, below.

i. Description of the methodology used to develop the 303(d) list. 40 CFR 130.7(b)(6)(i).

The EPA regulations at 40 CFR 130.7(b)(6) require states to include a description of the methodology used to develop the 303(d) list.³ EPA does not approve or disapprove assessment methodologies. Instead, in acting on CWA 303(d) lists, EPA evaluates whether the state, territory, or authorized tribe met listing requirements in determining whether applicable WQS are met and included waters requiring TMDLs on its 303(d) list. 2024 Integrated Reporting Memorandum (IR Memo) at 15.

The EPA finds that Rhode Island has provided a description of its methodologies used for determining whether its waters are achieving the state's WQS (2024 CALM pp. 17-40), satisfying the regulatory requirement to provide a "description of the methodology used to develop the list." 40 CFR 130.7(b)(6)(i). Rhode Island included their 2024 Consolidated Assessment and Listing Methodology in their submission. The EPA has considered the state's methodology as part of its review of the state's 303(d) list.

ii. Description of the data and information used to identify waters. 40 CFR 130.7(b)(6)(ii). The EPA regulations at 40 CFR 130.7(b)(6)(ii) require states to provide a description of the data and information used to identify waters, including a description of the data and information used by the state as required by 40 CFR 130.7(b)(5). The EPA finds that Rhode Island provided a description of the data and information that it assembled and evaluated (Impaired Waters Report pp. 9-11). 40 CFR 130.7(b)(6)(ii). EPA has considered the state's description as part of its review of the state's 303(d) list.

³EPA's Integrated Reporting Memoranda provide more information on assessment methods. See 2006 Integrated Reporting Memorandum at 29.

iii. A rationale for any decision to not use any existing and readily available data and information for any one of the categories of waters as described in 40 CFR 130.7(b)(5). 40 CFR 130.7(b)(6)(iii).

The EPA regulations at 40 CFR 130.7(b)(6)(iii) require states to provide a rationale for any decision to not use any existing and readily available data and information for any one of the categories of waters as described in 40 CFR 130.7(b)(5). 40 CFR 130.7(b)(6)(iii). The EPA evaluates whether a state provides a technical, science-based rationale for decisions not to use data or information in developing the list.⁴ The EPA finds Rhode Island did not exclude any data from assembly and evaluation to develop its list, therefore no rationale for data exclusion was included. 40 CFR 130.7(b)(6)(iii).

B. Public participation

The EPA regulations require states to provide for public participation in the development of their 303(d) lists, including describing their process for involving the public and other stakeholders in their Continuing Planning Processes (CPPs). 40 CFR 130.7(a). States are expected to demonstrate how they considered public comments in their final decisions. The EPA considers the public comments and state responses as appropriate in its actions on 303(d) lists in determining whether a state has provided reasoned support for its submission. See 2006 IR Memo at 25-26.

The state's 2024 303(d) list submission to the EPA included a summary of public comments and the state's responses to comments. RI DEM released the draft 2024 Section 303(d) list to the public on May 9, 2024, via emails to its list of more than 300 interested individuals and organizations. On May 22, 2024, the State held a virtual workshop via Microsoft Teams to introduce the draft list to the public, which was attended by 19 people. RI DEM closed the comment period on June 10, 2024. RI DEM provided EPA with a pre-public notice draft on April 12, 2024, which RI DEM and EPA discussed in a succession of emails between June 26 -28, 2024. In addition to EPA's comments, RI DEM received comments from one other individual/organization, Save the Bay.

The EPA concludes Rhode Island provided an opportunity for public comment on its 303(d) list consistent with 40 CFR 130.7(a). In addition, the state demonstrated how it considered public comments in its final decision, and sufficiently responded to the comments it received.

⁴ 2024 IR Memo at FN 15 (citing court cases); 2006 IR Memo at 37 (EPA evaluates whether there is a "reasonable technical rationale").

C. Assembling, evaluating, and using data and information

i. Assemble and evaluate data and information

States must assemble and evaluate all existing and readily available water quality-related data and information to develop the CWA 303(d) list. 40 CFR 130.7(b)(5). In reviewing a state's 303(d) list submission, the EPA considers whether the state has satisfied the requirements under 40 CFR 130.7(b)(5) to assemble and evaluate all existing and readily available water quality-related data and information when developing their CWA 303(d) lists. This includes, at a minimum, all existing and readily available data and information about the following categories of waters: (1) waters identified as partially meeting or not meeting designated uses, or as threatened, in the state's most recent CWA Section 305(b) report; (2) waters for which dilution calculations or predictive modeling indicate non-attainment of applicable water quality standards; (3) waters for which water quality problems have been reported by local, state, and federal agencies; members of the public; academic institutions (these organizations and groups should be actively solicited for research they may be conducting or reporting); and (4) waters identified as impaired or threatened in any CWA Section 319 nonpoint source assessment submitted to the EPA. In addition to these minimum categories, states are required to assemble and evaluate any other water quality-related data and information that is existing and readily available. 40 CFR 130.7(b)(5).

As noted in the CALM (pp. 12-13), RI DEM strives to consider all readily available water quality data and related information in developing the Integrated Report. In determining if data are appropriate, RI DEM considers quality assurance/quality control, data quality objectives, monitoring design, age of data, accuracy of sampling location information, data documentation, and data format (hard copy versus electronic).

The primary source of data generated for assessments is developed from programs consistent with the Water Monitoring Strategy

(https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/benviron/water/quality/surfwq/pdfs/riwater-monitoring-strategy-19.pdf), which includes the RI Department of Health (RIDOH), RI Coastal Resources Management Council (CRMC), RI Water Resources Board (WRB), University of Rhode Island (URI), and Narragansett Bay Commission (NBC), and other members of the Rhode Island Environmental Monitoring Collaborative. There are a variety of data generated by programs outside of the Water Monitoring Strategy framework. This includes data generated by special projects, research, volunteer efforts, and the federal government. RI DEM reports that it is interested in and considers all such data, but the applicability to the assessment process may be limited by the sampling design and data quality objectives of those projects. Because such data generally have not been collected for assessment purposes, they may be of limited utility for application in assessments due to the frequency of sampling, indicators used, number of samples, etc. The data quality objectives outlined in the CALM (pp. 13-16) are used to allow RI DEM to determine, in a consistent manner, whether these data can be used to make determinations about the water quality attainment status.

RI DEM also uses predictive models and dilution calculations in concert with ambient and discharge data to identify water quality limited segments. RI DEM discusses its monitoring approach and its partnerships with other data gathering organizations in its submission.

RI DEM solicited submittal of such data and information for consideration in developing the 2024 Integrated Report. It posted a notice to its website and sent out emails to over 300 individuals and organizations on March 13, 2024, publicly requesting data for the preparation of the combined list. It closed the data request period on April 1, 2023. In addition, RI DEM used more recent data that was readily available in its assessment and listing decisions.

The EPA has reviewed the state's submission, including the state's description of the data and information that it assembled and evaluated and finds that the state satisfied the requirement to assemble and evaluate all existing and readily available water quality-related data and information to develop its list under 40 CFR 130.7(b)(5).

ii. Use of data and information

States must use existing and readily available water quality-related data and information in developing the CWA 303(d) list, 40 CFR 130.7(b)(5), unless they provide a rationale not to use them, 40 CFR 130.7(b)(6)(iii). The EPA evaluates whether a state provides a technical, science-based rationale for decisions not to use data or information in developing the list.⁵

The EPA evaluated whether Rhode Island provided a technical, science-based rationale for any decisions not to use existing and readily available water quality-related data or information to make a WQS attainment status determination and concluded that the state satisfied the requirement to use existing and readily available water quality-related data and information to develop its list for the purposes of 40 CFR 130.7(b)(6)(iii).

D. Identification of waters for inclusion on the Section 303(d) list

As noted above, the EPA regulations at 40 CFR 130.7(b)(6) require states to provide documentation to support the state's determination to list or not to list its waters. EPA has reviewed the state's submission, including its assessment methodology and additional supporting documentation for its listing determinations.

i. Approval of Identification of waters for inclusion on the 303(d) list

The EPA determined that Rhode Island's 2024 303(d) list encompasses waters consistent with the CWA 303(d) and 40 CFR 130.7 requirements, and the EPA is approving all waters the state included on the 303(d) list. The EPA's approval of the waters on the 303(d) list is based on the EPA's review of the state's submission including the description of the data and information concerning individual waters, documentation to support decisions to rely or not rely on particular data and information, and a description of how data and information were applied to make WQS attainment status determinations. The EPA also considered applicable public comments and responses. The state included the list of WQLSs, along with its list of newly-listed impairments in its submission. The following 17 water body segments-impairment combinations identified in Table 1 are newly listed in the 2024 cycle.

⁵ See FN 4.

Table 1 - Waters newly listed as impaired on the 2024 303(d) List, Category 5				
Water Body Name	Water Segment ID #	Cause of Impairment Added		
Melville Ponds	RI0007029L-01	Dissolved Oxygen		
Annawomscott Brook	RI0007020R-02	Enterococcus		
Mosskettuash Brook & Tribs	RI0007020R-05	Enterococcus		
Cedar Brook & Tribs	RI0007025R-02	Enterococcus		
Nichols River	RI0007025R-17	Enterococcus		
Annaquatucket River & Tribs	RI0007027R-01	Enterococcus		
Cocumcussoc Brook & Tribs	RI0007027R-03	Enterococcus		
Mill Creek & Tribs	RI0007027R-06	Enterococcus		
Wannuchecomecut Brook & Tribs	RI0007027R-09	Enterococcus		
Chipuxet River	RI0008039R-06C	Enterococcus		
Wood River & Tribs	RI0008040R-16C	Enterococcus		
Saugatucket River & Tribs	RI0010045R-05A	Enterococcus		
Potowomut River	RI0007028E-01B	Fecal Coliform		
Moscow Pond	RI0008040L-09	Mercury in Fish Tissue		
Asa Pond	RI0010045L-02	Mercury in Fish Tissue		
Meshanticut Pond	RI0006017L-01	Phosphorus, Total		
Melville Pond Tribs	RI0007029R-04	Phosphorus, Total		

ii. Approval of exclusion of waters identified on previous 303(d) lists

Rhode Island's 2024 303(d) list submission delists six (6) water quality limited water body segments. In reviewing the state's 2024 303(d) list, the EPA carefully considered the state's decision to remove certain WQLSs from the 303(d) list submission, its justification for those removals, any applicable comments and responses, and the methodology used in making those decisions. The EPA concludes that the decisions to remove WQLS identified as part of the 303(d) list are reasonable, based on all existing and readily available water quality-related data and information, applicable WQS, and sound science, and the removal decisions are properly justified.

• Consistent with the EPA's regulations at 40 CFR 130.7(b), the state appropriately moved the following previously-listed waters to Category 4a of the IR where an EPA-approved TMDL is now in place.

Table 7 - Waters fully or partially moved to Category 4A – TMDL comple ted					
<u>Water Body Name</u>	Water Body Segment ID	Water Body Towns	<u>EPA</u> Approved	TMDL Parameter(s)	
Trib to Nonquit Pond	RI0010031R-20	Little Compton, Tiverton	9/20/2023	Enterococcus	
Quaker Creek	RI0010031R-04	Little Compton, Tiverton	9/20/2023	Enterococcus	
Borden Brook	RI0010031R-01	Little Compton, Tiverton	9/20/2023	Enterococcus	

• The State has demonstrated that the water body segments moved into Category 4C are not attaining water quality standards as the result of pollution rather than the presence of a pollutant. The CWA defines pollution as "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." The text of the 2024 list, and the data that RI DEM enters into EPA's ATTAINS database present good cause for the

State to include these waters in Category 4C of its 2024 Integrated Report. The EPA accepts the exclusion of the following waters from the 303(d) list:

Table 8 – Waterbody-impairment combinations newly placed into Category 4C – not impaired by a					
pollutant loading					
Water Body Name	Water Segment ID #	Cause of impairment			
Browning Mill Pond (Arcadia Pond)	RI0008040L-13	Non-native aquatic plants			
Pawtuxet River (North Branch Seg A)	RI0006016R-06A	Non-native aquatic plants			
Pawtuxet River (North Branch Seg B)	RI0006016R-06B	Non-native aquatic plants			

E. Identification of pollutants causing or expected to cause a violation of applicable WQS (130.7(b)(4))

As part of their CWA 303(d) lists, states are required to identify the pollutants causing or expected to cause violations of the applicable WQS. 40 CFR 130.7(b)(4). This includes a pollutant that by itself or in combination with other pollutants causes or is expected to cause violations of applicable WQS. States must identify in their 303(d) lists all pollutants that are known to be causing or are expected to cause violations of the applicable WQS. 40 CFR 130.7(b)(4), see also, 2024 IR memo at 17-19. For listed waters, if the available data and information do not support identification of pollutants causing or expected to cause the exceedance, list submissions would identify the pollutant as "unknown."

Consistent with 40 CFR 130.7(b)(4), Rhode Island appropriately identified the pollutants that were causing or expected to cause a violation of the applicable WQS.

F. Priority ranking and two-year TMDL development (130.7(b)(4))

The CWA and the EPA's regulations, require states to establish a priority ranking for the waters on their CWA 303(d) list "taking into account the severity of the pollution and the uses to be made of such waters." CWA Section 303(d)(1)(A); 40 CFR 130.7(b)(4). The regulations at 40 CFR 130.7(b)(4) provide that this priority ranking must include "all listed water quality limited segments still requiring TMDLs" and further require that states submit their priority rankings to the EPA as a component of their biennial CWA 303(d) lists. Additionally, the regulations require that the priority ranking identify the waters targeted for TMDL development in the next two years. 40 CFR 130.7(b)(4).

Rhode Island's description of how all listed WQLSs are prioritized for TMDL development, including identification of waters targeted for TMDL development in the next two years, is included within the State's 303(d) list submission. In addition, Rhode Island described how its priority ranking took into account the severity of pollution and the uses to be made of such waters.

EPA reviewed the State's priority ranking of listed waters for TMDL development. RI DEM has prioritized its list through its establishment of a schedule from 2025 to 2050 for completing TMDLs for waters on the list. According to the State's 2024 CALM and Vision 2 Prioritization Framework, this schedule reflects the high consideration the State has given to nutrient impairments in ponds, bacteria impairments in tributaries upstream of shellfishing waters, drinking water supplies, and other areas identified by the public as high priority areas, with special attention to the nutrient conditions in the

Tidal Pawcatuck River and Little Narragansett Bay, in cooperation with Connecticut's Department of Energy and Environmental Protection. In addition, EPA reviewed the State's identification of WQLSs targeted for TMDL development in the next two years and concludes that the targeted waters are appropriate for TMDL development in this time frame.

Combinations of water body segments and impairments are given a priority for TMDL development based on their place in RI DEM's schedule. There are 208 water body segments in Category 5 with 314 (water body segment × impairment cause) combinations. RI DEM's TMDL development schedule is as follows, with the number of water body segment-impairment combinations due for development of TMDLs by the date shown:

2025: 13 2026: 1 2028: 22 2029: 3 2030: 17 2031: 8 2032: 11 2033: 10 2034: 18 2035: 63 2036: 78 2039: 11 2040: 7 2042: 13 2044: 8 2045: 24 2050: 3

EPA's review of Rhode Island's submission finds that the state established a priority ranking for all waters on the CWA 303(d) list, taking into account the severity of the pollution and the uses to be made of such waters.⁶ In addition, the state identified the waters targeted for TMDL development in the next two years.

G. Tribal Consultation by EPA

EPA's policy is to consult on a government-to-government basis with federally recognized tribal governments when EPA actions and decisions may affect Tribes. To promote coordination and consultation, all Tribes that may be affected by EPA's upcoming action on the state's CWA 303(d) list were identified, notified of the upcoming state's list submission for EPA action, and offered the opportunity to engage in consultation with EPA. On February 14, 2024, Region 1 held a Regional Tribal Operations Committee meeting with the tribes in Region 1 at which the 303(d) program discussed consultation on 303(d) lists, TMDLs, (and water quality standards). EPA proposed the tribes examine their state's list when it was released for public notice so that there was ample time for them to submit

⁶ In addition to these two statutory factors, states may also consider other factors when prioritizing TMDLs. See 57 Fed. Reg. 33040, 33,044-45 (July 24, 1992).

comments and for the state, and potentially the region, to respond, beyond the 30-day period corresponding to the period between final submission and EPA's approval when formal consultation usually takes place. Consequently, EPA expects that the tribes will be examining the draft public comment version of each state's list and submitting comments at that point if they have them. EPA also offered the tribes the opportunity to engage in consultation with EPA, either before or during the 30-day approval period.

The Narragansett tribe, the only tribe in Rhode Island, was informed directly by RI DEM as to the opportunity to comment on its draft 2024 303(d) list after it was released to the public but did not submit any comments. EPA was not contacted directly by the tribe with reference to Rhode Island's draft 303(d) list.

Formal consultation and coordination with the Narragansett Tribe were concluded after EPA received Rhode Island's final 2024 303(d) list and were conducted consistent with EPA's policy on consultation and coordination with Indian Tribes.⁷ Additionally, EPA staff visited with the Narragansett Indian Tribe on August 21, 2024, and communicated the opportunity to meet. EPA did not receive a request from the Narragansett tribe for consultation.

3. Summary of EPA's decision on the 2024 CWA 303(d) list

After careful review of Rhode Island's final CWA 303(d) list submission package, EPA has determined that Rhode Island's 2024 303(d) list meets the requirements of Section 303(d) of the CWA and EPA's implementing regulations. Therefore, EPA approves Rhode Island's 2024 303(d) list.

⁷ www.epa.gov/system/files/documents/2023-12/epa-policy-on-consultation-with-indian-tribes-2023.pdf