



Response to public submissions on draft default guideline values for iron in marine water

September 2025

Draft default guideline values (DGVs) for iron in marine water were published on the Water Quality Guidelines website for a 3-month public consultation period. During this period, comments for the draft DGVs for iron in marine water were received via public submission.

Responses to comments and any associated edits to the draft DGV technical brief are outlined in Attachment A, de-identified for public record. The responses and revisions have been approved by the original peer reviewers and the jurisdictional technical and policy oversight groups, and noted by the National Water Reform Committee.

The default guideline values for iron in marine water are now published as final. For additional information on the publication process, please refer to the [pathway for toxicant default guideline value publication](#).

The Water Quality Guidelines Improvement Program thanks all submissions for their valuable contribution to the development of default guideline values for the protection of aquatic ecosystems.

Attachment A

Response to public submissions on draft default guideline values

Toxicant: Iron in marine water

Submitter	Technical comment	Response	Action taken
1.	<p>1. See comments below:</p> <p>a) All studies listed in the Tech Brief were retained (even though I would remove the Kadar et al (2010) paper on technical grounds) – its inclusion does not change the GV (so retained it).</p> <p>b) For <i>Saccostrea glomerata</i>, the 48 h NOEC of 122 ug/L (from Wilson & Hyne, 1997) was added to a 48 h NEC = 738 ug/L (my data) & a geometric mean of 300 ug/L was calculated and used (while I have my doubts on the former data, I have retained under Ockham's Razor).</p> <p>c) The 96 h acute LC50 value for <i>Litopenaeus vannamei</i> from my reading of the paper is 44,200ug/L (taken from Table 2) & when divided by 10 = 4420 ug/L (5000 ug/L quoted, based on an acute LC50 value of 50,000)</p> <p>d) I added a data point for <i>Heliocidaris tuberculata</i> (72 h chronic NOEC = 2000 ug/L) from the Doyle (1999) thesis – as cited in the metals database by Markich et al. (2002) published in AJE</p> <p>e) I have added 3 new datapoints from my study (marine bivalves – being written up) - all 48 chronic NECs (<i>Crassostrea gigas</i> = 724 ug/L, <i>Xenostrobus securis</i> = 896 ug/L & <i>Irus Crenata</i> = 1020 ug/L) - so as to not over-represent the 10 data points obtained</p> <p>f) See my attached csv file for Fe – Recalculated 95% GV of 400 ug/L (rounded) (using both Burrlioz 2.0 & SSD tools) – the statistical fit looks balanced.</p> <p>Hope this adds something constructive to the final marine Iron GVs</p>	<p>a) Kadar et al. (2010) was further reviewed. The results showed no effects on the 48-h larval development of the mussel <i>Mytilus galloprovincialis</i> at three concentrations of total iron of 8, 80 and 800 µg/L. Given the limited test concentrations, the NOEC of >800 µg/L was excluded from the dataset.</p> <p>b) Wilson & Hyne (1997) was further reviewed. The toxicity value for <i>S. glomerata</i> was excluded because the solution pH was 6.5 (i.e. not representative of normal seawater) because the data were from tests where acid leachates were mixed with seawater.</p> <p>c) We note that the submitter's comment is correct. The value has been corrected.</p> <p>d) The Doyle (1999) value for <i>H. tuberculata</i> (72 h chronic NOEC = 2000 ug/L) was included in the derivation. It is noted that values already in the Australasian Ecotox Database can be used if their quality score is acceptable, even if the source reference is not readily accessible (Warne et al. 2018).</p> <p>e) On consideration/analysis of the data for the 10 bivalve species, toxicity values for all 10 species were included.</p> <p>f) Thank you. As there were several other changes to the final dataset, the DGVs were re-derived using the final dataset.</p>	<p>a) Kadar et al. (2010) toxicity value for <i>M. galloprovincialis</i> was excluded.</p> <p>b) Wilson & Hyne (1997) toxicity value for <i>S. glomerata</i> was excluded.</p> <p>c) Correction was made for <i>L. vannamei</i> toxicity value.</p> <p>d) Doyle (1999) toxicity value for <i>H. tuberculata</i> was included.</p> <p>e) Recently, published data from Markich (2021) for 10 bivalve species were included. An assessment of the effect of the bivalve data on the DGVs was added in Appendix B.</p> <p>f) Revised DGVs were derived using the updated final dataset.</p>

Attachment A

Submitter	Technical comment	Response	Action taken
2.	<p>2. See comments below:</p> <p>a) Methodology for deriving the revised Fe DGVs: Very few toxicity tests used in deriving the proposed Fe DGVs identify the form of Fe present in test solutions. Moreover, it is unclear what forms of Fe in marine waters are responsible for toxicity to biota. The revised DGVs therefore are based on total Fe as in includes all forms (dissolved, colloidal and precipitated). This will pose significant issues, also potentially compliance related, within Port Curtis where total Fe levels are naturally very high. Considering this aspect, the proposed Fe DGVs appear premature and rushed as more toxicity tests should be conducted rather than just define DGVs based on total Fe because it encompasses all other forms.</p> <p>b) Similarly dataset size was small and conducted on species not necessarily endemic of Queensland or Port Curtis which again could significantly change test results. Temperature and pH ranges of ecotoxicological tests are also in some instances not applicable to Port Curtis (e.g. temperature 15 °C) or to seawater in general (e.g. pH 7.3).</p>	<p>a) The forms of iron present in iron toxicity tests are all very likely to be bioavailable (i.e. dissolved, colloidal and freshly precipitated iron, with no mineralised forms of iron in the toxicity test solutions). The USEPA (1991) marine extraction method has recently been refined and validated for iron in freshwater and marine water (Balsamo-Crespo et al. 2023, ANZG 2025). It measures potentially bioavailable iron (i.e. dissolved, colloidal and precipitated iron). These fractions should be relatively consistent with those that are present in typical iron toxicity tests.</p> <p>Moreover, it is worth noting that Aust/NZ now has DGVs for iron in marine water that have a <i>Moderate</i> reliability classification, compared to ANZECC/ARMCANZ (2000), in which there was no marine guideline value and the 1987 Canadian guideline value for freshwater was recommended as an interim indicative working level. The decision to proceed with the DGVs based on the current knowledge is consistent with the precautionary principle.</p> <p>b) It is noted that the dataset was small and, given the time that has elapsed since the DGVs were derived, a new literature search was undertaken. This included assessing potentially acceptable studies by Pereira et al. (2020), Markich (2021) and Han et al. (2022). The results of this is that the dataset now comprises toxicity values for 16 species from 6 taxonomic groups. This dataset is sufficient for deriving ANZG DGVs.</p> <p>It is not possible to derive DGVs that include data for species endemic to all regions or that are representative of all physico-chemical conditions. If there are local concerns over</p>	<p>a) The DGV technical brief (particularly Appendix C) has been updated to reflect the refined and validated pH 2 method and how this should be used in conjunction with the iron freshwater DGVs. The refined and validated pH 2 method (ANZG 2025) has been published on the ANZG website.</p> <p>b) The DGVs were updated with all recent data of acceptable quality.</p>

Attachment A

Submitter	Technical comment	Response	Action taken
		the applicability of a DGV, the ANZG (2018) Guidelines recommend the derivation of site-specific GVs.	
	3. Fe background levels within Port Curtis: The above mentioned monitoring programs that GPC undertakes or participates in, show that total concentrations of Fe are consistently high throughout Port Curtis. In fact, average total Fe concentration as sampled at a subset of five (5) sites spanning from the Narrows to Rodds Bay from March 2017 to June 2020 at quarterly frequency is 247.7 µg/L which is well above the 95% species protection and more than five (5) times higher than then 99% species protection of the proposed Fe DGVs which would be applicable for some of the sites where the samples were collected from.	Use of the refined pH 2 extraction method (ANZG 2025) should resolve this issue. However, if background concentrations are still above the DGVs, site-specific GVs may need to be developed.	Refer to action taken for comment 2(a) in relation to the recommended use of a refined pH 2 extraction method for measuring iron in water samples. Moreover, it has been emphasised in the technical brief that ANZG provides guidance in the event that measured background concentrations exceed the DGVs.
	4. In conclusion the proposed Fe DGVs seem to be premature and rushed and will pose significant challenges. More ecotoxicology testing with more representative species and physical-chemical conditions and investigation on Fe species toxicity should be conducted. Consideration should be given to the analysis methodology, in this case pH 2 extraction method and the rationale behind using a certain method and practicalities around it, firstly related to commercial NATA accredited laboratories which industry must use to meet regulatory conditions. Moreover on this point, threshold are being progressively lowered with already several metals (depending on protection level) below the limit of reporting (LOR) of some commercial laboratories.	Refer to responses to comments 2 and 3.	Refer to action taken for comments 2 and 3.
3.	5. See submitter 2 comments in the public comments for the iron in freshwater DGVs technical brief.	Refer to the responses to submitter 2 comments in the response to public comments for the iron freshwater DGVs.	Refer to actions taken for submitter 2 comments in the response to public comments for the iron freshwater DGVs.
4.	6. While the brief acknowledges that the mechanism of toxicity of iron is unclear; it proposes that toxic effects are clearly due to dissolved, colloidal and precipitated iron (operationally defined by size fractionation). Based on this proposition an analytical method (cold pH2 acid extraction) is proposed to measure this “total” iron fraction. In relation to the operationally defined size	Noted. The text in question has been edited to clarify how the different size fractions were defined by Worsfold et al. (2014), and includes recognition that dissolved iron can be considered	Relevant text edited accordingly.

Attachment A

Submitter	Technical comment	Response	Action taken
	fractionation, this statement is noted in para 2 of the Introduction: “However, what may be operationally defined as ‘dissolved’ iron (formerly defined as <0.45 µm and more recently defined as <0.2 µm) has been found to be 30–91% colloidal (inorganic or organic) iron in estuarine and coastal waters.” We are unaware of where this recent definition of dissolved was changed from <0.45 µm to <0.2 µm?	as both the 0.2 µm fraction or the 0.45 µm fraction.	
	<p>7. Poor size and quality of the toxicity data set</p> <p>a) The toxicity dataset used by ANZG (2020) in the derivation of the draft DGVs is limited with toxicity endpoints from nine (9) species from five (5) taxonomic groups, with only seven (7) of the studies reporting chronic endpoints (five (5) NOEC and two (2) EC₁₀) and two (2) acute endpoints. The acute endpoints were converted using the Warne et al (2018) acute to chronic conversion ratio.</p> <p>Warne et (2018) guidelines recommend that acute data should only be used if there are insufficient chronic data (i.e. < 15 chronic datapoints). If there are 8 – 15 chronic datapoints, acute data probably should not be used. If there are limited chronic data (5 – 8 chronic datapoints), a case can be made for including acute data if that improves the reliability of the DGV as per table 7 in Warne et al (2018). This is the approach adopted by ANZG (2020). However, there are now numerous relevant (Australian marine species) chronic tests that would provide a far more robust data set for derivation of DGVs (e.g. see van Dam et al 2018).</p> <p>b) One of the quality guidelines from Warne et al (2018) is a requirement for measured concentrations of toxicants. In the ANZG (2020) brief five (5) of the studies used total nominal concentrations. Only one, Leigh-Smith et al (2018), considered potentially bioavailable forms of Fe in the test solution. None of the other studies attempted any correlations between iron speciation (bioavailability) and toxicity.</p>	<p>a) Regarding the size of the dataset, refer to response to comment 2(b). While there are specific recommendations for the use of (converted) acute data in Warne et al. (2018), professional judgment is also often required to determine the most appropriate and defensible composition of final datasets. However, following the collation of additional, recent data, the chronic toxicity dataset was of a sufficient size (n = 16) to no longer warrant the inclusion of the two (converted) acute toxicity values.</p> <p>The comment also suggested that additional toxicity testing be carried out using new test methods that have been developed in Australia in the recent past. While this may be a valuable exercise, it is unclear who should fund this work. At this stage, and given the now larger dataset used for the final derivation, the generation of additional toxicity data would seem more desirable rather than essential. The generation of additional data would be welcomed and the DGVs could be updated accordingly in the future.</p> <p>b) Regarding the inclusion of studies based on nominal iron concentrations, such studies are not necessarily automatically rejected from the derivation. In the case of iron in toxicity tests, it would typically be in the form of</p>	<p>a) Refer to action taken for comment 2(b). Also, the two acceptable (converted) acute values were removed from the final dataset. Following the inclusion of additional data, the final toxicity dataset was considered to be of a sufficient size to derive DGVs for iron in marine water.</p> <p>b) Some toxicity values based on nominal concentrations were accepted. The benefits of this were deemed to outweigh any limitations. Moreover, text was added to the technical brief clarifying that iron in toxicity tests will typically comprise dissolved, colloidal and precipitated iron.</p>

Attachment A

Submitter	Technical comment	Response	Action taken
		dissolved, colloidal and precipitated iron, all of which would be potentially bioavailable. Overall, and given the limited size of the toxicity dataset, it was considered acceptable to accept some data based on nominal concentrations.	
	<p>8. The lack of studies that characterised the bioavailability of Fe in the toxicity tests or in any other studies.</p> <p>a) Only one of the studies used by ANZG (2020) reported characterisation of the iron in the toxicity study. No other studies are reported in ANZG (2020) that characterise (size fractionation and/or speciation) the iron in relation to potential bioavailability in the test solutions.</p> <p>b) In addition, there are no studies presented with natural marine coastal waters. The studies all used filtered seawater spiked with iron salts (ferric chloride or ferrous sulfate) which are not representative of natural coastal marine waters, which will generally be dominated by aged, mineralised forms of iron. The bioavailability of these natural particulate forms of iron is not understood and requires further study in relation to toxicity.</p>	<p>a) Refer to responses to comments 2(a) and 7(b)</p> <p>b) The aged, mineralised forms of iron mentioned in the comment will not be captured by the refined pH 2 extraction method and, hence, should not pose a problem when comparing environmental measurements with the DGVs. Notably, additional research to correlate iron toxicity with the pH 2 extraction measurement was being prepared for publication at the time of revisions of these DGVs as part of a PhD project at Southern Cross University (by Balsamo-Crespo). Although the research is yet to be published, a short summary of the findings has been included in Appendix C, while explicitly acknowledging that the work is currently unpublished but expected to be published in 2025. The results were positive in that the pH 2 method was a better predictor of toxicity than either a standard 0.45 µm filtered or total recoverable iron method. This further supports the use of the pH 2 method.</p>	<p>a) Refer to actions taken for comments 2(a) and 7(b).</p> <p>b) Refer to action taking for comment 2(a) and 7(b).</p>
	<p>9. The recommended analytical method for “total” iron (pH2 extractable) has not been validated</p> <p>ANZG (2020) has not presented any data that validates the relationship between toxicity and the concentrations of iron measured using the proposed “total” iron method. There are no studies presented that have investigated different extraction methods to assess iron bioavailability.</p>	Refer to response to comment 2(a). The method validation project addressed the issues raised in the comment as well as other aspects of the method. Details can be found in both Balsamo-Crespo et al. (2023) and ANZG (2025).	Refer to action taken for comment 2(a).

Attachment A

Submitter	Technical comment	Response	Action taken
	<p>There has been an extensive research program based in the USA on aluminium toxicity in freshwater which has reported a pH4 buffer extraction as best representing the toxic fraction of aluminium (Rodriguez et al. 2019). While this extract could be applicable for iron, this research project provides a model for the research required to develop more relevant and robust DGVs for iron.</p> <p>Notwithstanding the validity of the method, there are a number of aspects of this type of method that need validation and standardisation, which have also not been considered in ANZG (2020):</p> <ul style="list-style-type: none"> • How long after collection of the unfiltered sample does it need to be acidified to pH2 (holding time); • How long is the pH2 extraction step (1h, 12h, 24h shake at RT and then filter to <0.45µm)? Unpublished data shows substantial increase in iron concentration with time, which is probably site dependent. • What acid is to be used for the acidification? <p>This will all need to be resolved in order for commercial (NATA) laboratories to develop a method that can be accredited.</p>		
	<p>10. Conclusion</p> <p>PCIMP Inc. considers the release of the ANZG (2020) DGVs for iron in marine waters is premature. There are numerous limitations in the development of the DGVs, as identified above, which requires further research. In summary the research needs to address:</p> <ul style="list-style-type: none"> • Range and quality of toxicity tests, using relevant species; • Incorporation of iron bioavailability studies with toxicity testing; and • Identification and validation the most appropriate analytical method(s) for bioavailable iron. <p>PCIMP Inc. would consider collaborating with ANZG in the development of the DGVs for iron in marine waters.</p>	<p>Refer to responses to comments 6 to 9.</p>	<p>Refer to actions taken for comments 6 to 9.</p>

Attachment A

Submitter	Technical comment	Response	Action taken
5.	11. Reliance on poor quality toxicity studies - The toxicity dataset used by ANZG (2020) in the derivation of the DGVs is limited and insufficient justification is provided by ANZG (2020) to justify the derivation of ‘moderate-reliability’ DGVs within the ANZG (2018) framework, given the quality and quantity of the available toxicity studies.	Refer to response to comment 2(b).	Refer to action taken for comment 2(b).
	12. Inadequate characterisation of iron bioavailability in toxicity studies – The ecotoxicity studies used by ANZG (2020) typically did not adequately characterise the physical form or bioavailability of the iron in the test solutions and the bioavailability of the particulate forms of iron that are predominant in coastal environments is not well understood. In the absence of toxicity studies distinguishing between bioavailable and non-bioavailable forms of iron, the relevance of the DGVs to the aged iron oxide particulates that are typically present in the coastal environments of northern WA is currently uncertain.	Refer to responses to comments 2(a) and 7(b). Also, note that the issue of aged iron oxides has been addressed in the PhD project by SCU (Balsamo-Crespo et al. 2023).	Refer to actions taken for comments 2(a) and 7(b).
	13. Recommended analytical methods that have not been validated - The analytical methods recommended in association with the DGVs have not been demonstrated to define the bioavailable fraction of the total iron concentrations of marine water. It should also be noted that at present there are no robust and widely commercially available analytical techniques for the direct determination of iron bioavailability in marine water. This would appear to place the burden of validating the analytical methodology for determining bioavailable iron concentrations on the industry that will be required to use the DGV and may lead to an increased requirement for industry to undertake costly site-specific toxicity testing and geochemical studies.	Refer to response to comment 2(a). Details of the validated method can be found in both Balsamo-Crespo et al. (2023) and ANZG (2025). Note that numerous commercial and research analytical laboratories were consulted in the early stages of scoping the work to validate/optimize the USEPA (1991) method for iron.	Refer to action taken for comment 2(a).
	14. Analytical method and background concentrations a) PPA considers that due to the limitations identified in the key findings (noted above) and those expressed in the attached report (Attachment 1), further research and analysis is required to test analytical methods to characterise bioavailable iron (Fe) in marine waters, and develop	a) Refer to responses to comments 2(a), 7(b) and 8(b). b) Refer to responses to comments 3 and 8(b).	a) Refer to actions taken for comments 2(a), 7(b) and 8(b). b) Refer to actions taken for comments 3 and 8(b).

Attachment A

Submitter	Technical comment	Response	Action taken
	<p>appropriate models (from a robust data set) to test species to determine acute and chronic toxicity to bioavailable iron.</p> <p>b) The limited data presented by PPA for marine water samples collected in the in Pilbara has identified iron concentration in excess of the 99% and 95% species protection levels (DGVs), including samples from some reference locations that are considered as undisturbed areas representing natural conditions. This limited environmental sampling and analysis program also suggested that the cold dilute pH 2 extraction method recommended by ANZG (2020) dissolves substantial portions of the particulate forms of iron that can be suspended in the marine waters of the Pilbara. These results emphasize the fact that it has not yet been established whether the results of the cold dilute pH 2 extraction method recommended in association with the DGVs align with the bioavailable iron concentrations in unfiltered marine water samples.</p> <p>In summary, based on the critical review of the Technical Brief and the results of the targeted marine water sampling and analysis, PPA consider that the proposed DVGs for iron in marine waters have the potential to impact on industry throughout the northern region of Western Australia due to the lack of knowledge on current and natural marine water quality and the absence of a clear link between the DGVs and the protection of aquatic ecosystems. Accordingly, PPA recommend deferring adopting of the proposed toxicant DVGs for iron until such research has been completed</p>		
6.	<p>15. Southern Ports welcomes the application of quantitative risk-based approaches using empirical observations and statistical techniques to define criteria for protecting humans, animals and plants from toxic exposures of contaminants. This includes defining water quality criteria (Default Guidelines Values (DGVs)) for iron in marine waters to protect aquatic biota. However, Southern Ports does not support risk-based approaches that repeatedly use worst case assumptions within the same assessment. This approach leads to an unrealistic outcome and in this case places unjustifiable and unreasonable burdens on industry. The attached review by MBS draws attention to three</p>	See responses to bullet points, below.	

Attachment A

Submitter	Technical comment	Response	Action taken
	key areas in the assessment of the draft iron DGV that introduce bias including the:		
	16. Inclusion of toxicity data in the statistical analysis of questionable quality, reliability and quantity (e.g. data for <i>Saccostrea glomerata</i> published by Wilson & Hyne 1997);	All data were quality assessed and only those that passed the quality assessment were considered for use in the toxicity tests. Any data limitations are discussed in the technical brief. However, data quality was re-considered as part of the update to the DGVs. As a result of this, the data for <i>S. glomerata</i> published by Wilson & Hyne (1997) were excluded from the dataset.	The dataset was re-evaluated for quality/reliability. Data selection decisions are clearly described in the text (Section 4.1) of the technical brief.
	17. Poorly characterised physical and chemical forms of iron in the testing media that are not representative of the natural forms of iron found in the marine environment;	Refer to responses to comments 2(a) and 7(b).	Refer to actions taken for comments 2(a) and 7(b).
	18. No reliable quantification of total iron concentrations in marine waters for comparison against the proposed DGV that makes application of the DGV impractical and places an unjustified burden on industry to develop site specific criteria for iron DGV's (based on baselines from any suitable reference locations);	Refer to response to comment 2(a). Also, it is noted that the ANZG (2018) Guidelines clearly state that DGVs cannot account for all site-specific conditions and that, in many cases, site-specific GVs will need to be derived.	Refer to action taken for comment 2(a).
	19. Before the iron DGV in marine waters becomes a statutory requirement, we respectfully suggest that the major shortcomings that have been detailed in the Attachment 1 are addressed towards definition of a more realistic DGV.	<p>Refer to responses to comments 16 to 18.</p> <p>In relation to the more detailed review that was undertaken, responses to key comments are provided below:</p> <ul style="list-style-type: none"> • All of the data used in the SSD passed the data assessment criteria. • Where NOEC values are the only available values for a species, these are acceptable. • On re-evaluation, the oyster data of Wilson & Hyne (1997) were excluded from the DGV derivation. • Both particulate and dissolved iron contribute to toxicity. Iron added as soluble salts will stabilise at a mixture of colloidal/precipitated and dissolved iron. Ageing can lead to non-bioavailable 	<p>Refer to actions taken for comments 16-18.</p> <p>The technical brief addresses the issues identified in the more detailed review.</p>

Attachment A

Submitter	Technical comment	Response	Action taken
		<p>forms. These issues were examined by Balsamo Crespo et al. (2023).</p> <ul style="list-style-type: none"> The pH 2 method has been rigorously examined and details are included in Balsamo Crespo et al. (2023) and ANZG (2025), and referred to in the updated technical brief. 	
7.	<p>20. We are a desalination facility based on the Gold Coast and discharge reverse osmosis concentrate into the Tugun embayment. As a part of our marine water monitoring program, we conduct a monthly sampling event within the receiving environment and have done so since commissioning in 2009.</p> <p>I have attached a copy of the Marine Monitoring Report from June 2020 for your information. Temporal iron concentration information can be found from page 18. Historically, the control and impact sites do not differ in any significant way and the plant has never been identified to be contributing to the concentrations of total iron within the area.</p> <p>However, both control and impact site concentrations for total iron can be close to the proposed 95% protection value of 180µg/L; in some cases individual sites (including controls) can test at a higher level than this, indicating broader regional scale processes at play. These may include increased upwelling of cooler nutrient rich waters and impacts of coastal runoff.</p> <p>The draft guidelines proposed do not make mention of consideration given to natural areas with a total iron level which exists at a higher concentration than the 180µg/L.</p> <p>We have a decade of data from our impact and control locations for total and dissolved iron around the discharge diffuser and are happy to provide this information to the committee however require some time to collate the data.</p> <p>Can you please provide me with a date that I can provide this data submission to you?</p>	<p>The refined pH 2 extraction method for iron should address this to a large extent. Also refer to response to comment 2(a).</p> <p>With regards to dealing with naturally elevated concentrations of metals, the ANZG (2018) Guidelines provide advice on this. Also refer to response to comment 3.</p>	Refer to actions taken for comments 2(a) and 3.

Attachment A

Additional improvements made while addressing public comments

Issue	Response	Action taken
The original draft iron marine DGVs technical brief, which was drafted in 2020, was not as detailed as more recently drafted DGV technical briefs.	<p>Additional information was added to the technical brief to make the level of detail more consistent with that in more recently drafted DGV technical briefs. This included, but was not limited to:</p> <ul style="list-style-type: none">• The content of the Summary was improved.• Improved alignment of Section 1 (Introduction) with that for the iron freshwater DGVs technical brief.• Section 2.3 on general toxicity was expanded.• Section 4.1 was expanded, including addition of a modality assessment.	As detailed in the “Response”.

Attachment A

References

- ANZG (2025) [*Optimisation of the USEPA \(1991\) pH 2 extraction method for measuring potentially bioavailable iron \(iron III\)*](#), Australian and New Zealand guidelines for fresh and marine water quality. CC BY 4.0. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.
- Balsamo Crespo E, Reichelt-Brushett A, Smith RE, Rose AL & Batley GE 2023. Improving the measurement of iron (III) bioavailability in freshwater samples: Methods and performance. *Environmental Toxicology and Chemistry*, 42, 303-316.
- Doyle C 1999. Toxicity characterisation of contaminated sediment pore water using the sea urchin *Heliocidaris tuberculata*. BSc (Hons) Thesis, University of Technology, Sydney, NSW, Australia.
- Han C, Kim HJ, Lee JS, Sakakura Y & Hagiwara A 2022. Iron reproductive toxicity of marine rotifer sibling species: adaptation to temperate and tropical habitats. *Aquatic Toxicology*, 246, 106135.
- Hernández-Flores S, Santos-Medrano GE, Rubio-Franchini I & Rico-Martínez R 2020. Evaluation of bioconcentration and toxicity of five metals in the fresh- water rotifer *Euchlanis dilatata* Ehrenberg, 1832. *Environmental Science and Pollution Research* 27, 14058-14069.
- Kadar E, Simmance F, Martin O, Voulvoulis N, Widdicombe S, Mitov S, Lead JR & Readman JW 2010. The influence of engineered Fe₂O₃ nanoparticles and soluble (FeCl₃) iron on the developmental toxicity caused by CO₂-induced seawater acidification. *Environmental Pollution*, 158, 3490–3497.
- Leigh-Smith J, Reichelt-Brushett A & Rose AL 2018. The characterization of iron (III) in seawater and related toxicity to early life stages of scleractinian corals. *Environmental Toxicology and Chemistry*, 37, 1104–1114.
- Markich SJ, Warne M StJ, Westbury A-M & Roberts CJ 2002. A compilation of data on the toxicity of chemicals to species in Australasia. Part 3: Metals. *Australasian Journal of Ecotoxicology* 8, 1–72.
- Markich SJ 2021. Comparative embryo/larval sensitivity of Australian marine bivalves to ten metals: A disjunct between physiology and phylogeny. *Science of the Total Environment*, 789, 147988.
- Pereira AC, Gonçalves BB, Brito RS, Vieira LG, Lima ECO & Rocha TL 2020. Comparative developmental toxicity of iron oxide nanoparticles and ferric chloride to zebrafish (*Danio rerio*) after static and semi-static exposure. *Chemosphere* 254, 126792.
- Warne MStJ, Batley GE, van Dam RA, Chapman JC, Fox DR, Hickey CW & Stauber JL 2018. Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants – update of 2015 version. Prepared for the revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, 48 pp.
- Wilson SP & Hyne RV 1997. Toxicity of acid-sulfate soil leachate and aluminium to embryos of the Sydney Rock oyster. *Ecotoxicology and Environmental Safety*, 37, 30–36.
- Worsfold PJ, Lohan MC, Ussher SJ & Bowie AR 2014. Determination of dissolved iron in seawater: A historical review. *Marine Chemistry*, 166, 25–35.