



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

April 9, 2018

Mr. Ken Wiegardt, President
Willapa-Grays Harbor Oyster Growers Association
PO Box 3
Ocean Park, WA 98640

Re: Public Notice of Intent to Deny National Pollutant Discharge Elimination System Permit

Dear Mr. Wiegardt:

The Washington State Department of Ecology (Ecology) has reviewed the Willapa-Grays Harbor Oyster Growers Association (WGHOGA) January 8, 2016 application for an aquatic pesticide discharge National Pollutant Discharge Elimination System (NPDES) permit and applications for Sediment Impact Zones. Ecology has also reviewed supporting information submitted by WGHOGA, studies and data relevant to the proposed discharge, and comments and analyses received during the State Environmental Policy Act (SEPA) environmental review. As required by Washington Administrative Code (WAC) WAC 173-220-110, Ecology has made a "tentative staff determination" to deny the permit. Our detailed basis for this decision is contained in the April 4, 2018 memo recommending denial of the Sediment Impact Zone applications and the April 5, 2018 memo recommending denial of the NPDES permit application (see enclosed memos).

As described in RCW 90.48.180, Ecology cannot issue a permit if the agency finds the discharge "as proposed in the application will pollute the waters of the state in violation of the public policy declared in RCW 90.48.010." It is the policy of the state of Washington, as set out in RCW 90.48.010, to maintain the highest possible standards to insure the purity of waters of the state consistent with protections such as "protection of wild life, birds, game, fish and other aquatic life . . ." Additionally, as stated in RCW 90.48.520, in issued state or federal wastewater discharge permits, "[i]n no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria."

Any permit Ecology issues must comply with surface water quality standards of the state of Washington, including WAC 173-201A, Water quality standards for surface waters of the state of Washington, WAC 173-204, Sediment management standards, and applicable federal rules. Under the Sediment management standards, a discharge that will violate or has a substantial potential to violate the sediment quality standards is required to obtain an authorized sediment impact zone. Authorization of a sediment impact zone requires compliance with several requirements as set out in WAC 173-204-415(1)(a)-(j). The two requirements which the WGHOGA's proposed discharge cannot meet are: (1) that the discharge shall not have an adverse effect to biological resources within the sediment impact zone above a minor adverse effects level; and (2) that the discharge shall not result in a violation of the sediment quality standards outside of the sediment impact zone. *See* WAC 173-204-415(1)(f) and (i). We have tentatively determined the proposed discharge cannot meet water quality standards and therefore the NPDES and sediment impact zone applications will be denied.



WGHOGA's letter of January 2, 2018 discussed addressing the proposed discharge as an "experimental" discharge in contrast with the current application in which the discharge is for commercial purposes. WGHOGA subsequently confirmed that the January 2, 2018 letter was not a new permit application and not intended to modify the pending permit application. Although such an experimental permit application is not before Ecology, the issues related to an imidacloprid discharge would remain whether the purpose of the discharge is "experimental" or for commercial purposes. An "experimental" discharge application that is substantially similar to the current application request would likely not meet the requirements of the sediment management standards unless it addresses the harmful impact of imidacloprid on the biological resources of Washington, and the movement of imidacloprid beyond the boundaries of a sediment impact zone.

In accordance with WAC 173-220-050, we are publishing notice of our "tentative determination" to deny the permit and conducting a public comment period of not less than thirty days during which time interested persons may submit their written views on the draft permit determination. Enclosed is a copy of the public notice that will appear in *The Chinook Observer* and *The Daily World*. WGHOGA and other interested parties are invited to submit comments regarding this determination. Following the thirty day comment period, Ecology will consider and respond to all comments received and prepare a final determination on the applications for a NPDES permit and sediment impact zone authorizations. Ecology will then notify you, as the applicant, and any persons who have submitted written comments or requested notice of the final permit decision. This notification will include both Ecology's response to public comments and the procedures to contest the agency's decision.

This tentative determination to deny the permit and sediment zone applications is not a final permit decision subject to appeal. Ecology's final permit decision may be appealed as specified in RCW 43.21B.

Please feel free to contact me at (360) 407-6271 if you have questions regarding this letter, the enclosed technical memos, or the public process.

Sincerely,

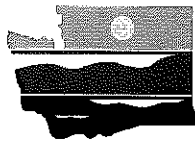


Rich Doenges
Southwest Region Manager
Water Quality Program

Enclosures: Toxics Control Program memo
Water Quality Program memo
Public notice

By CERTIFIED MAIL: 91 7199 9991 7030 1775 7775

cc: Heather Bartlett, Ecology
Jim Pendowski, Ecology
Barry Rogowski, Ecology



DEPARTMENT OF
ECOLOGY
State of Washington

Date: April 4, 2018

To: Rich Doenges, Section Manager, Water Quality Program

From: Barry Rogowski, Manager
HQ Cleanup Section
Toxics Cleanup Program *Barry Rogowski*

Subject: Recommendation to deny Sediment Impact Zone applications as impacts of the discharge prohibit Sediment Impact Zone authorization and cannot be addressed via permit conditions

Background and Scope

This memorandum has been prepared by the Washington State Department of Ecology Toxics Cleanup Program (Ecology) and is a review of the proposed discharge under the application for a National Pollutant Discharge Elimination System (NPDES) permit and Sediment Impact Zone (SIZ) applications submitted by the Willapa-Grays Harbor Oyster Growers Association (WGHOGA) to discharge imidacloprid in Willapa Bay and Grays Harbor for the control of burrowing shrimp. This memorandum focuses solely on the SIZ applications.

1. Introduction

In 2016, the WGHOGA on behalf of a group of growers requested an Individual NPDES permit to authorize chemical applications of imidacloprid on up to 485 acres per year of commercial clam and oyster beds within Willapa Bay, and up to 15 acres per year within Grays Harbor. WGHOGA completed and submitted an application for the required NPDES permit, and applications for two SIZ authorizations for areas in Willapa Bay and Grays Harbor in April 2017.

The WGHOGA's application proposes a discharge of imidacloprid to kill native burrowing shrimp. Burrowing shrimp mortality would occur through immediate direct mortality or indirectly through paralysis and eventual suffocation after the shrimp can no longer maintain their burrows (Final Supplemental Environmental Impact Statement 2018 (FSEIS)). Imidacloprid is a neonicotinoid pesticide. It is a broad spectrum pesticide that targets a wide-range of invertebrates, with a lesser toxicity to vertebrates (FSEIS). As such, in an open water environment, it will affect non-target invertebrates concurrently with the target invertebrate (i.e., burrowing shrimp).

The toxicity of imidacloprid is based on interference of the neurotransmission in the nicotinic cholinergic nervous system. Imidacloprid binds to the nicotinic acetylcholine receptor (nAChR) at the neuronal and neuromuscular junctions in insects and vertebrates. The nAChR is an ion channel, which endogenous agonist is the excitatory neurotransmitter acetylcholine (ACh). The receptor normally exists in a closed state, however, upon ACh binding, the complex opens a pore and becomes permeable for cations. The channel openings occur in short bursts, which represent the lifetime of the receptor-ligand complex. ACh is then rapidly degraded by the enzyme acetylcholinesterase (AChE). In contrast, imidacloprid bound to the nAChR is inactivated very slowly. Prolonged activation of the nAChR by imidacloprid causes desensitization and blocking of the receptor and leads to paralysis and death of biological organisms (CEPA-DPR, 2006).

The proposed chemical application under the WGHOGA application is described in detail within the 2018 Final Supplemental Environmental Impact Statement (FSEIS). The Literature Review (section 1.6.1) of the FSEIS includes a discussion of the new science and research that was evaluated during this process. This review included more than 100 research papers and the federal Environmental Protection Agency (EPA) Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid. The EPA document established proposed acute and chronic chemical concentration risk endpoints for saltwater invertebrates which are important in evaluating the environmental impacts of the pesticide application proposal submitted by WGHOGA. The FSEIS is available through Ecology at the website: <https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Aquatic-pesticide-permits/Burrowing-shrimp-control-Imidacloprid>.

2. Regulatory Background on the Sediment Management Standards

The Sediment Management Standards rules (Chapter 173-204 WAC) were developed to reduce and ultimately eliminate adverse effects on biological resources, including those that make up the base of the benthic food web, and reduce significant threats to human health from surface sediment contamination.¹ Part III of the rule establishes sediment quality standards (SQS) – numeric and narrative criteria for marine and freshwater sediment. The SQS correspond to the long-term goals for sediment quality in Washington State. Chemical concentrations in sediments at, or below, the SQS criteria for that chemical are presumed to have no adverse effects on biological resources. Part IV of the rule includes a process for managing sources of sediment contamination, including conditioning an NPDES permit where the discharge has the potential to impact sediment and requiring use of a SIZ.

¹ The SMS rule Parts I-VI and Part VI were adopted under the Water Pollution Control Act, RCW 90.48, as well as the Model Toxics Control Act, RCW 70.105D and other authorities. The U.S. Environmental Protection Agency has approved the SMS Rule Parts I-VI and Part VI as federally-approved water quality standards for the State of Washington. In 1991, the EPA approved the initial version of the Sediment Management Standards in its entirety under the CWA. EPA also approved revisions to the Sediment Management Standards on September 18, 2008 and again on December 18, 2015. See Water Quality Standards Regulations: Washington, available at <https://www.epa.gov/wqs-tech/water-quality-standards-regulations-washington> (last visited on March 2, 2018).

The NPDES permit applicant is required to apply for a SIZ authorization when Ecology determines that, as a result of a proposed discharge, the permit applicant will violate or create a substantial potential to violate the Sediment Management Standards of WAC 173-204-320 through WAC 173-204-420. A SIZ is an area where the applicable SQS may be temporarily exceeded due to a permitted or otherwise authorized discharge because it is not possible in the near term to reduce contamination resulting from the discharge sufficiently to meet the SQS. However, an upper limit has been placed on the allowable level of sediment contamination and impact to biological resources within a SIZ.

The discharge within a SIZ may not exceed a maximum chemical concentration or level of biological effects (often referred to as a SIZ max criteria). Ecology shall only authorize a SIZ if the discharge limitations, requirements, and compliance time periods can be conditioned sufficient to meet the Sediment Management Standards in Chapter 173-204 WAC. It is the policy of Ecology – as set out in the Sediment Management Standards rule – to only authorize a sediment impact zone in such a way as to “minimize the number, size, and adverse effects of all zones . . . with the intent to eliminate the existence of all such zones whenever practicable.” WAC 173-204-410(1)(b).

3. Regulatory Compliance for Sediment Impact Zone Authorization

Ecology has determined that the WGHOGA’s NPDES permit application to discharge imidacloprid² into Willapa Bay and Grays Harbor would require Ecology to authorize a Sediment Impact Zone for each bay. WGHOGA submitted two SIZ applications, one each for Willapa Bay and Grays Harbor. The SIZ authorization can only be approved if a demonstration can be made that the proposed discharge can meet the requirements detailed in WAC 173-204 or if the permit can be conditioned sufficient to meet the requirements of the Sediment Management Standards.

Ecology’s review indicates that the proposed discharge cannot meet two requirements for a sediment impact zone, and that a NPDES permit cannot be sufficiently conditioned to meet those requirements. Authorization of a SIZ requires compliance with several requirements as set out in WAC 173-204-415(1)(a)-(j). The two requirements which the proposed discharge cannot meet are: (1) that the discharge shall not have an adverse effect to biological resources within the sediment impact zone above a minor adverse effects level; and (2) that the discharge shall not result in a violation of the SQS outside of the SIZ. *See* WAC 173-204-415(1)(f) and (i).

- A) Requirement: Adverse effects to biological resources within a sediment impact zone shall not exceed a minor adverse effects level as a result of the discharge. WAC 173-204-415(1)(f).**

The impact of the proposed discharge inside the SIZ³ cannot exceed a minor adverse effects level to biological resources.

² The NPDES application and SIZ applications propose a discharge of imidacloprid to be applied directly to the sediment at a rate of up to 0.5 pounds of active ingredient per acre for all treatment scenarios.

³ The Sediment Impact Zones for the proposed discharge would include the site of the pesticide application (i.e., the plot) and a 25 foot buffer surrounding the plot.

The Sediment Management Standards establishes that “minor adverse effects” are the maximum chemical contaminant concentration, maximum health risk to humans, maximum biological effects level, maximum other toxic, radioactive, biological, or deleterious substance level, and maximum nonanthropogenically affected sediment quality level allowed within a SIZ. The process to establish those criteria are set out in WAC 173-204-420⁴.

The criteria at issue with this proposed discharge is the maximum biological effects level and the maximum other toxic, radioactive, biological, or deleterious substance level.

i) Maximum Biological Effects Level

The Sediment Management Standards in WAC 173-204-420(3) establishes that the maximum biological effects level allowed within a sediment impact zone is at or below a “minor adverse biological effects level” (in other words, there cannot be more than a minor adverse effect to biological resources within the SIZ).

The minor adverse biological effects level may be set using the acute and chronic effects biological tests of WAC 173-204-315(1) as set out in WAC 173-204-420(3). Ecology reviewed the potential for the proposed discharge to exceed the biological test determination using benthic abundance as detailed in WAC 173-204-420(3)(c)(iii). Using a benthic abundance test, the proposed discharge will be determined to be at the minor adverse biological effect so long as there is no exceedance of the biological test determination. The proposed discharge will have more than a minor adverse biological effect (and thus be in exceedance of the maximum biological effects criteria⁵) if the biological test determination demonstrates the following result: the test sediment (i.e., sediment where the discharge has occurred) has less than 50% of the reference sediment mean abundance of any two of the major taxa (i.e., Class Crustacea, Phylum Mollusca, or Class Polychaeta) and the test sediment abundances must be statistically different from the reference sediment abundances (*t* test, $p \leq 0.05$).

a) Benthic Abundance Test Determination

Ecology’s review of the benthic abundance monitoring data indicates that a benthic abundance test within the SIZ would fail, given the significant decline in abundance of crustacean and polychaete invertebrates compared to the control site during the 2011 field trial in Willapa Bay in Cedar River. (Cedar River site 2011; FSEIS 2018). During the 2011 field trial, mean crustacean abundance in the treatment plot showed an 86% decline after 14 days, while there was little change in the control plot. After 28 days, there was more than a 40% increase in crustaceans at the control plot, while there was a 60% decrease in crustaceans on the treatment plot. After 28 days, six out of nine subgroups showed a more than 60% decrease compared to before treatment numbers. For polychaetes, after 14 days there was a 72% decrease on the treatment plot while there was a 44% increase at the control plot. At 28 days, there was a 55% decrease in polychaetes at the control plot compared to a 75% increase in the control plot.

⁴ WAC 173-204-420(1)(b) has reserved criteria for Non-Puget Sound marine sediment (“The department shall determine on a case-by-case basis the criteria, methods, and procedures necessary to meet the intent of this chapter.”) Ecology has determined that for Willapa Bay and Grays Harbor, use of the marine criteria is appropriate.

⁵ An exceedance of the maximum biological effects level can also be shown if two tests exceed the SQS criteria in WAC 173-204-320(3). See WAC 173-204-420(3)(c).

Benthic abundance monitoring was conducted during 2011, 2012, and 2014, as part of experimental imidacloprid applications.

Finding adequate matching reference sites was difficult and did not occur in all cases. During all three years, statistical power was low given high variability exhibited at sites. Pre- and post-spray monitoring could not be compared with enough rigor to meet Sediment Management Standard benthic abundance test criteria. Ecology has determined that results of benthic abundance monitoring as proposed cannot be used to show that the proposed discharge would pass a benthic abundance test. (TerraStat, January 2, 2018; FSEIS 2018).

ii) Maximum Other Toxic, Radioactive, Biological or Deleterious Substances Level

The Sediment Management Standards in WAC 173-204-420(5) indicates that a discharge of toxic, radioactive, biological or deleterious substances in or on sediments shall be below levels which cause minor adverse effects in marine biological resources. As defined in WAC 173-204-200(15), “minor adverse effects” means a level of effects that has been determined by rule, that does not result in significant human health risk; and that meets the following criteria: (1) an acute⁶ or chronic⁷ adverse effect to biological resources; or (2) a statistically and biologically significant response that is significantly elevated relative to reference or control; or (3) biological effects as predicated by exceedance of an appropriate chemical or other deleterious substance standard.

a) Sediment Porewater and Surface Water is above the EPA Acute/Chronic Levels

Ecology has compared the 2014 sediment porewater results against the EPA (2017) acute and chronic marine endpoints for surface water. (FSEIS 2018). EPA recommended an acute marine invertebrates endpoint for imidacloprid of 16.5 ppb and a chronic marine endpoint of 0.16 ppb. All of the on-plot surface water samples immediately after treatment significantly exceed the EPA acute toxicity endpoint of 16.5 ppb, with averages of 796 ppb (Taylor and Coast plots 2014) and 290 ppb (Nisbet plot 2014), and 800 ppb (Cedar River 2014). Maximum concentrations on-plot were measured up to 1,600 ppb.

One day post treatment, concentrations in porewater ranged from 4.7 ppb to 100 ppb, and three of eight samples exceeded the acute marine endpoint of 16.5 ppb, and all samples exceeded the chronic marine endpoint. Although concentrations (range 0.09 to 3.1 ppb) declined over 14 days, 6 of 8 (75%) samples exceeded the EPA chronic marine endpoint of 0.16 ppb. At 28 days post treatment, concentrations (range 0.11 to 1.2 ppb) continued to exceed the EPA chronic marine endpoint in 5 of 8 (63%) samples. No data were collected after 28 days so it is uncertain as to when sediment porewater declined to below the EPA chronic marine endpoint.

⁶ “Acute” effects may include mortality, larval abnormality, or other endpoints as determined by Ecology. WAC 173-204-200(1).

⁷ “Chronic” effects may include mortality, reduced growth, impaired reproduction, histopathological abnormalities, adverse effects to birds and mammals, or other endpoints as determined by Ecology. WAC 173-204-200(7).

b) Effect to Marine Biological Resources

Ecology's review of data leads to the conclusion that the proposed discharge of imidacloprid will cause more than a minor adverse effect to marine biological resources within the sediment impact zone. The toxicity of imidacloprid is not limited to burrowing shrimp, and other biota will be present and impacted by the proposed discharge.

Burrowing shrimp live with other species, as described by Chapman et al. (2012) when detailing that "[f]unctional and absolute losses of *Upogebia* species reduce their ecosystem services and dependent symbionts" For example, soft shell clams can be expected to be co-located in an area that has burrowing shrimp. Griffen et al. (2004) found up to eight soft shell clams (*Cryptomya californica*) per burrowing shrimp burrow in Yaquina Bay, Oregon – this is comparable to what Ecology expects to find in Willapa Bay and Grays Harbor.

Ecology expects that if 60-80% of burrowing shrimp are killed during spraying due to burrow collapse, then a significant portion of commensal species such as the soft shell clams would also be killed by either the impact of the imidacloprid or burrow collapse. That imidacloprid results in mortality for soft shell clams was documented in the 2012 monitoring report submitted by WGHOGA (Hart-Crowser 2014) in which during post spray monitoring the off-plot impacts were documented by using dead *Cryptomya* shells to estimate the areal, "extent of off-target effects...by the presence or absence of these surface shells following imidacloprid treatment."

Studies also indicate that the proposed discharge of imidacloprid will cause death or paralysis to more than 50% of Dungeness crab (a species found in Willapa Bay and Grays Harbor) within a SIZ. Crab studies by Patten and Norelius (2017) and Osterberg et al. (2012), reviewed in the FSEIS 2018, confirm that Dungeness crab juveniles and planktonic forms will be affected on- and off-plot and outside of the SIZ by the proposed discharge of imidacloprid on shellfish beds. In 2014, commercial scale application of imidacloprid to a 90 acre plot in central Willapa Bay showed high Dungeness crab mortality. After imidacloprid application, 137 affected crabs and 4 live crabs were counted. (FSEIS 2018). The rate of affected juvenile Dungeness crabs was 97%. It was shown in the study that paralysis was effectively a measure of mortality since those crabs were preyed upon resulting in death.

The 2014 monitoring data confirms EPA's (2013) conclusions that "direct effects on the individual organisms, including crab species, can also be expected" from spraying imidacloprid in the environment. (FSEIS Section 3.3.5 Animals, Affected Environment, pg. 3-34)

B) Requirement: The permitted discharge shall not result in a violation of the applicable SQS outside the area limits of the established Sediment Impact Zone. WAC 173-204-415(1)(i).

The impact of the proposed discharge outside the SIZ cannot exceed the SQS, which corresponds to a sediment quality that will result in no adverse effects, including no acute or chronic adverse effects on biological resources and no significant health risk to humans. WAC 173-204-320(1)(a). Ecology's review indicates that the proposed discharge will result in concentrations of imidacloprid, at a level which will result in acute or chronic impact to marine invertebrates, being carried by surface water up to ¼ mile outside the SIZ.

In several trials (2012) where imidacloprid was applied to sediment in Willapa Bay, high surface water concentrations of imidacloprid were measured up to ¼ mile off-plot in a location which would be considered outside of a SIZ. The concentration of the off-plot imidacloprid was at levels 4 to 250 times that of the EPA acute (mortality) endpoint. This indicates that the proposed discharge of imidacloprid will result in concentrations in surface water (and subsequently in the sediments) that will exceed the EPA acute and chronic marine endpoint in areas outside the SIZ. These levels of imidacloprid will result in mortality, and/or reduced survival, reproduction or growth to invertebrates that come into contact with imidacloprid concentrations in these waters.

During the imidacloprid application trials, imidacloprid was frequently detected in surface water samples in the leading edge of the incoming tide in off-plot areas and would be further concentrated in drainage channels and adjacent areas covered by the rising tide.

These measured surface water concentrations would result in acute or chronic adverse effects to marine benthic invertebrates. The EPA Risk Assessment⁸ (2017) recommended for marine aquatic invertebrates an acute toxicity endpoint of 16.5 ppb. The EPA marine aquatic invertebrate chronic toxicity endpoint is 0.16 ppb⁹. Of the 60 total surface water samples collected off-plot (i.e., outside the proposed SIZ boundary) in Willapa Bay (2012), imidacloprid was detected in 50 samples (83%) with the concentration ranging from 0.043 ppb to 4,200 ppb. The proposed SIZ would cover the treatment plot and a 25 foot buffer zone. These trials documented detectable concentrations of imidacloprid up to 1,575 feet from the border of the sprayed plots. The same trial in 2012 showed off-plot concentrations reached as high as 1300 ppb and included nine detections above 100 ppb, with concentrations as high as 200 ppb at a distance of 480 meters or 1,575 feet from the treated area. Two others trials showed concentrations reached 130 ppb at a distance of 60 meters (or 196 feet) and 260 ppb at 100 meters (or 328 feet) from the treated plot.

Results from the 2012 imidacloprid application trials monitoring illustrate that nearly half (29/60 samples) of off-plot surface water samples showed exceedances of the EPA Risk Assessment acute toxicity endpoint. More than half of these (16) exceeded the EPA acute criteria by more than 10 times. While it is expected that dilution would be the dominant fate mechanism, a number of plots, such as the 2012 monitoring trials indicated, showed a broad spatial extent above the EPA acute marine endpoint. (FSEIS Section 3.3.3 Surface Water, Affected Environment, pg. 3-12 to 3-16).

⁸ The EPA Risk Assessment (2017) evaluated available toxicity data for marine species and recommended acute and chronic marine biologic endpoints. Ecology views the EPA's recommended endpoints as the current best available science.

⁹ Exposure to chronic or sub lethal levels of imidacloprid may be compounded by repeated exposures because imidacloprid has irreversible binding to neurological receptors so that each subsequent exposure reduces the organism's neurological capacity. Rondeau et al. (2014) showed that terrestrial insects exposed to imidacloprid have delayed mortality which may not be detected in studies with less than 10 days duration. It is not known what duration of exposure is needed to create an additive acute effect and whether a short "pulse" of high concentrations is less likely to create an effect than a sustained exposure of hours.

The 2012 imidacloprid application trials monitoring results also indicate that of the 60 total samples, 47 showed exceedances of the EPA Risk Assessment chronic toxicity endpoint. Using EPA Risk Assessment (2017) acute toxicity endpoint of 16.5 ppb, Ecology modeled potential impacts of imidacloprid on marine invertebrates as it is carried off-plot by rising tidal waters¹⁰. Ecology calculated the off-plot area that could be exposed to acutely toxic levels of imidacloprid as it was carried by the rising tide.

Based upon modeling of the 2012 surface water monitoring results, an area approximately double the size of the modeled treated plot would experience imidacloprid levels at least five times above the acute toxicity criterion of 16.5 ppb (FSEIS 2018). In addition, the area exposed to levels exceeding the EPA acute marine biological endpoint for imidacloprid off plot is greater than five times the size of the spray plot location. For example, for every one acre treated approximately five acres will be affected above 16.5 ppb.

Monitoring trials conducted in 2012¹¹ confirm that imidacloprid dissolves in surface water and persists in the water column during the first tidal cycle at a minimum off-plot through surface water conveyance. The highest concentrations of imidacloprid would occur during the first rising tide after application, and would dilute and flow off-plot during consecutive tidal cycles (Hart Crowser 2016). Modelling provides more clarity of the areal extent and magnitude of toxicity that surface water levels of imidacloprid pose off-plot to biological resources. *See* FSEIS Surface Water Chapter, pages 3-15 and 3-16, for a discussion of Ecology surface water modelling conducted using WGHOGA supplied data and comparing to the EPA Risk Assessment endpoints.

4. Sediment Impact Zone Conditions and NPDES Permit Terms and/or Conditions Evaluated to Meet Compliance Standards

Ecology has determined that the proposed discharge would exceed SQS standards and requires a SIZ. As detailed above, the proposed discharge would not meet some of the general requirements which must be complied with for authorization of a SIZ. The two requirements which the proposed discharge cannot meet are: (1) that the discharge shall not have an adverse effect to biological resources within the SIZ above a minor adverse effects level; and (2) that the discharge shall not result in a violation of the SQS outside of the SIZ. *See* WAC 173-204-415(1)(f) and (i). Ecology then reviewed whether the NPDES permit's effluent limitations, requirements, or compliance time period could be conditioned sufficient to meet the standards for authorization of a SIZ and concluded that it was not possible to condition the permit in a manner sufficient to address the issues without compromising the purpose for the discharge.

¹⁰ While Ecology's modeling indicates that imidacloprid will travel off-plot, the travel has been documented during the 2012 imidacloprid application trials. Imidacloprid was detected at the Leadbetter control plot (0.97 ppb) on the day imidacloprid was applied on treatment plots in the 2012 monitoring trials. While it is problematic that a control plot would test positive for imidacloprid when monitoring protocol dictates no measurable quantity should be present, it is important to note that the control site is over 600 meters (approximately 0.4 miles) away from the closest treated trial plot. This is a further indication of the areal extent imidacloprid can be transported off a treated plot.

¹¹ Off-plot impacts were also seen in 2014 but spatial extent could not be determined based on lack of monitoring.

The primary options reviewed by Ecology for conditioning were to:

- Decrease size of treatment plot and subsequently the SIZ;
- Decrease amount of imidacloprid applied to a treatment plot; or
- Limiting application of imidacloprid to low total organic carbon areas.

Ecology found that each potential condition (either by itself or bundled with other conditions) either (1) did not address the issues enough to bring the proposed discharge into compliance; or (2) compromised the purpose for the discharge.

A) Addressing the issue that the proposed discharge will exceed a minor adverse effects level

Reductions in treatment plot size will not address the issue that application of imidacloprid has a more than minor adverse impact. The area being addressed may be smaller, but the impact of imidacloprid within that space will remain just as lethal.

The rate of 0.5 pounds of active ingredient per acre of imidacloprid was used to treat shellfish beds throughout the 2012 and 2014 imidacloprid application trials. Any reductions in the amount of imidacloprid applied would have a corresponding negative affect on the efficiency of that pesticide in completing its purpose (i.e., to kill burrowing shrimp).

Another potential condition is to limit the application of imidacloprid to only areas of low total organic carbon. However, this would not eliminate all of the adverse biological effects, since negative adverse biological effects have been documented in a range of sediment containing low total organic carbon in the central bay, and high total organic carbon in the north of Willapa Bay. Further, Ecology does not have any data indicating the total organic carbon throughout Willapa Bay and Grays Harbor, and would be unable to make such a condition without this information.

B) Addressing the issue that the proposed discharge will result in an exceedance of the applicable SQS outside the area limits of the Sediment Impact Zone

Imidacloprid is highly soluble with the surface water of the incoming tide and the proposed discharge will result in acute and chronic impacts outside the SIZ. It is not physically possible to prevent imidacloprid from entering the water column or, once it dissolves in the water column, being transported throughout the estuary at acute and chronic toxicity levels.

Decreasing the size of a treatment plot would result in a corresponding decrease in the size of the sediment impact zone. The area boundaries of the SIZ must include the minimal practicable surface area. WAC 173-204-415(1)(e). Therefore, this would not address the issue of a toxic concentration of imidacloprid being transported outside of the SIZ through the water column.

Decreasing the amount of imidacloprid applied may result in transportation at a level below the chronic endpoint because there will be less of the imidacloprid to dissolve into water column. However, to decrease the amount of imidacloprid applied per acre will decrease the effectiveness of the pesticide at its intended purpose of killing burrowing shrimp.

Additionally, Ecology has received no data to assist it in determining the maximum amount of imidacloprid that could be applied before it results in the water column moving an amount outside of the SIZ that will result in chronic adverse effects on biological resources.

Another potential condition is to limit the application of imidacloprid to only areas of low total organic carbon. However, no data indicates that this approach would eliminate the movement of imidacloprid outside of the SIZ.

C) Additional Conditions Reviewed

Ecology looked at the addition of harrowing as a condition of the permit. This is a promising non-chemical method of controlling burrowing shrimp, however harrowing can be done by the WGHOA without gaining approval from Ecology. There is no indication that harrowing could address the issues noted above.

Another suggested condition was additional monitoring or different types of monitoring of the proposed discharge. Monitoring would not address the issues noted above but will only give greater documentation of the impacts of use of imidacloprid in a marine environment.

5. Conclusions

It is my determination that the proposed discharge is required to obtain a SIZ. Also that the requirements necessary to authorize a SIZ cannot be met by the proposed discharge. Finally, it is not possible to condition a permit to meet the requirements of the SIZ. Therefore, I recommend that Ecology deny the SIZ authorization applications.

Ecology's review indicates that the proposed discharge cannot meet two requirements for a SIZ, and that a NPDES permit cannot be sufficiently conditioned to meet those requirements.

Authorization of a SIZ requires compliance with several requirements as set out in WAC 173-204-415(1)(a)-(j). The two requirements which the proposed discharge cannot meet are: (1) that the discharge shall not have an adverse effect to biological resources within the SIZ above a minor adverse effects level; and (2) that the discharge shall not result in a violation of the SQS outside of the SIZ. *See* WAC 173-204-415(1)(f) and (i).

6. References and Additional Information Sources

- 1) Agatz, A., R. Ashauer, and C. Brown. 2014. Imidacloprid Perturbs Feeding of *Gammarus pulex* at Environmentally Relevant Concentrations. *Environmental and Toxicology and Chemistry* 33: 648 – 653.
- 2) Alexander, A. C., J. M. Culp, K. Liber, A. J. Cessna. 2007. Effects of Insecticide Exposure on Feeding Inhibition in Mayflies and Oligochaetes. *Environmental Toxicology and Chemistry* 26 (8): 1726 – 1732.
- 3) Alexander, A. C., E. Luiker, M. Finley, J. M. Culp. 2016. Mesocosm and Field Toxicity Testing in the Marine Context in *Marine Ecotoxicology* (eds. J. Blasco, P. M. Chapman, O. Campana, and M. Hampel). Academic Press, London, UK. 321 pp.
- 4) Asson, D., J. W. Chapman, and B. R. Dumbauld. 2017. No evidence that the introduced parasite *Orthonia griffenis* Markham, 2004 causes sex change or differential mortality in the native mud shrimp, *Upogebia pugettensis* (Dana, 1852). *Aquatic Invasions* 12 (2): 213 – 224.
- 5) Bass, C., I. Denholm, M. S. Williamson, Ralf Nauen. 2015. The global status of insect resistance to neonicotinoid insecticides. *Pesticide Biochemistry and Physiology*. 121: 78-87.
- 6) Beketov, M. A., and M. Liess. 2008. Acute and Delayed Effects of the Neonicotinoid Insecticide Thiacloprid on Seven Freshwater Arthropods. *Environmental Toxicology and Chemistry*. 27(2): 461 – 470.
- 7) Beketov, M. A., and M. Liess. 2008. Potential of 11 Pesticides to Initiate Downstream Drift of Stream Macroinvertebrates. *Archives of Environmental Contaminant Toxicology*. 55: 247 – 253.
- 8) Beketov, M. A., R. B. Schafer, A. Marwitz, A. Paschke, and M. Liess. 2008. Long-term stream invertebrate community alterations induced by the insecticide thiacloprid: Effect concentrations and recovery dynamics. *Science of the Total Environment* 405: 96 – 108.
- 9) Böttger, R., J. Schaller, and S. Mohr. 2012. Closer to reality—the influence of toxicity test modifications on the sensitivity of *Gammarus roeseli* to the insecticide imidacloprid. *Ecotoxicology and Environmental Safety*, 81, pp.49-54.
- 10) Brandt, A., A. Gorenflo, R. Siede, M. Meixner, R. Buchler. 2016. The neonicotinoids thiacloprid, imidacloprid, and clothianidin affect the immunocompetence of honey bees (*Apis mellifera* L.). *Journal of Insect Physiology*. 86: 40-47.
- 11) Camp, A.A. and D.B. Buchwalter. 2016. Can't take the heat: Temperature-enhanced toxicity in the mayfly *Isonychia bicolor* exposed to the neonicotinoid insecticide imidacloprid. *Aquatic Toxicology*, 178, pp.49-57.
- 12) Carpenter, K. D., K. M. Kuivila, M. L. Hladik, T. Haluska, and M. B. Cole. 2016. Storm-event-transport of urban-use pesticides to streams likely impairs invertebrate assemblages. *Environmental Monitoring and Assessment*. 188: 345 – 363.
- 13) Cavallaro, M. C. C. A. Morrissey, J. V. Headley, K. M. Peru, and K. Liber. 2016. Comparative Chronic Toxicity of Imidacloprid, Clothianidin, and Thiamethoxam to

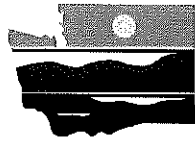
- Chironomous dilutes* and Estimation of Toxic Equivalency Factors. Environmental Toxicology and Chemistry. 36(2): 372 – 382.
- 14) Chagnon, M., D. Kreutzweiser, E.A. Mitchell, C.A. Morrissey, D.A. Noome, and J.P. Van der Sluijs. 2015. Risks of large-scale use of systemic insecticides to ecosystem functioning and services. Environmental Science and Pollution Research, 22(1), pp.119-134.
 - 15) Chapman, J. W., B. R. Dumbauld, G. Itani, and J. C. Markham. An introduced Asian parasite threatens northeastern Pacific estuarine ecosystems. Biological Invasions 14(6): 1221 – 1236.
 - 16) Chapman, J. W., and C. S. Carter. 2014. A Rapid Intertidal Megafauna Survey Method Applied to *Upogebia Pugettensis*, and its Introduced Parasite, *Orthione griffensis*. Journal of Crustacean Biology 34(3): 349 – 356.
 - 17) Chen, X. D., E. Culbert, V. Herbert, and J. D. Stark. 2009. Mixture effects of the nonylphenyl polyethoxylate, R-11 and the insecticide, imidacloprid on population growth rate and other parameters of the crustacean, *Ceriodaphnia dubia*. Ecotoxicology and Environmental Safety 73: 132 – 137.
 - 18) Colombo, V., S. Mohr, R. Berghahn, and V. J. Pettigrove. 2013. Structural Changes in a Macrozoobenthos Assemblage After Imidacloprid Pulses in Aquatic Field-Based Microcosms. Archives of Environmental Contaminant Toxicology 65: 683 – 692.
 - 19) Dumbauld, B. R., G. R. Hosack, and K. M. Bosley. 2015. Association of Juvenile Salmon and Estuarine Fish with Intertidal Seagrass and Oyster Aquaculture Habitats in a Northeastern Pacific Estuary. Transactions of the American Fisheries Society 144: 1091 – 1110.
 - 20) Dumbauld, B. R. J. W. Chapman, M. E. Torchin, A. M. Kuris. 2011. Is the Collapse of Mud Shrimp (*Upogebia pugettensis*) Populations Along the Pacific Coast of North America Caused by Outbreaks of a Previously Unknown Bopyrid Isopod Parasite (*Orthione griffenis*)? Estuaries and Coasts 34:336 – 350.
 - 21) EFSA (European Food Safety Authority). 2014. Conclusion on the Peer Review of the Pesticide Risk Assessment for Aquatic Organisms for the Active Substance Imidacloprid. EFSA Journal 2014; 12(10):3835, 49 pp. doi:10.2903/j.efsa.2014.3835.
 - 22) Feldman, K.L., B.R. Dumbauld, T.H. DeWitt, and D.C. Doty. 2000. Oysters, crabs, and burrowing shrimp: Review of an environmental conflict over aquatic resources and pesticide use in Washington State's (USA) coastal estuaries. Estuaries 23:141–176.
 - 23) Gibbons, D., C. Morrissey, and P. Mineau. 2015. A review of direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. Environmental Science and Pollution Research 22: 103-118.
 - 24) Goulson, D. 2013. An overview of the environmental risks posed by neonicotinoid insecticides. Journal of Applied Ecology, 50(4), pp.977-987.
 - 25) Griffen, B. D., T. H. Dewitt, C. Langdon. 2004. Particle removal rates by the mud shrimp *Upogebia pugettensis*, its burrow, and a commensal clam: effects on estuarine phytoplankton abundance. Marine Ecology Progress Series 269: 223 – 236.

- 26) Hallmann, C.A., R.P. Foppen, C.A. van Turnhout, H. de Kroon, and E. Jongejans. 2014. Declines in insectivorous birds are associated with high neonicotinoid concentrations. *Nature*, 511(7509), pp.341-343.
- 27) Hallman, C. A., M. Sorg, E. Jongejans, H. Siepel, N. Hofland, H. Schwan, W. Stenmans, A. Muller, H. Sumser, T. Horren, D. Goulson, H. de Kroon. 2017. More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLOS One* 12(10); <https://doi.org/10.1371/journal.pone.0185809>
- 28) Hayasaka, D., T. Korenaga, K. Suzuki, F. Saito, F. Sánchez-Bayo, and K. Goka, K. 2012. Cumulative ecological impacts of two successive annual treatments of imidacloprid and fipronil on aquatic communities of paddy mesocosms. *Ecotoxicology and environmental safety*, 80, pp.355-362.
- 29) Health Canada. 2016. Proposed re-evaluation decision, imidacloprid. Document PRVD2016-20. Health Canada Pest Management Regulatory Agency. Ottawa, ON. Canada.
- 30) Hesketh, H., E. Lahive, A.A. Horton, A.G. Robinson, C. Svendsen, A. Rortais, J.L. Dorne, J. Baas, D.J. Spurgeon, and M.S. Heard. 2016. Extending standard testing period in honeybees to predict lifespan impacts of pesticides and heavy metals using dynamic energy budget modelling. *Scientific reports*, 6.
- 31) Hiebert, T.C. 2015. *Cryptomya californica*. In: *Oregon Estuarine Invertebrates: Rudys' Illustrated Guide to Common Species*, 3rd ed. T.C. Hiebert, B.A. Butler and A.L. Shanks (eds.). University of Oregon Libraries and Oregon Institute of Marine Biology, Charleston, OR.
- 32) Holsman, K. H., P. S. McDonald, D. A. Armstrong. 2006. Intertidal migration and habitat use by subadult Dungeness crab *Cancer magister* in a NE Pacific estuary. *Marine Ecology Progress Series* 308: 183 – 195.
- 33) Hook, S. E., H. Doan, D. Gonzago, D. Musson, J. Du, Rai Kookana, M. Sellars, and A. Kumar. 2018. The impacts of modern-use pesticides on shrimp aquaculture: An assessment for north eastern Australia. *Ecotoxicology and Environmental Safety* 148: 770 – 780.
- 34) Hornig, S., A. Sterling, and S. D. Smith. 1989. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Northwest)*. USFWS Biological Report 82(11.93). 14 pp.
- 35) Key, P., K. Chung, T. Siewicki, and M. Fulton. 2007. Toxicity of three pesticides individually and in mixture to larval grass shrimp (*Palaemonetes pugio*). *Ecotoxicology and Environmental Safety* 68: 272 – 277.
- 36) Kuechle, K., E. B. Webb, D. Mengel, A Main. 2017. Do neonicotinoid insecticides cause trophic cascades between aquatic and terrestrial systems? A test using emerging aquatic invertebrates and tree swallows. SETAC North America, 38th Annual Meeting, Minneapolis, MN.
- 37) Lamberson, J.O., M.R. Frazier, W.G. Nelson, and P.J. Clinton. 2011. *Utilization Patterns of Intertidal Habitats by Birds in Yaquina Estuary, Oregon*. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Western Ecology Division, Newport OR; EPA/600/R- 11/118.

- 38) Liess, M., K. Foit, A. Becker, E. Hassold, I. Dolciotti, M. Kattwinkel, and S. Duquesne. 2013. Culmination of Low-Dose Pesticide Effects. *Environmental Science and Technology* 47: 8862 – 8868.
- 39) Main, A. R., J. V. Headley, K. M. Peru, N. L. Michel, A. J. Cessna, C. A. Morrissey. 2014. Widespread Use and Frequent Detection of Neonicotinoid Insecticides in Wetlands of Canada's Prairie Pothole Region. *PLOS One* 9 (3): 1 – 12.
- 40) Mason, R., H. Tennekes, F. Sanchez-Bayo, P. U. Jepsen. 2013. Immune Suppression by Neonicotinoid Insecticides at the Root of Global Wildlife Declines. *Journal of Environmental Immunology and Toxicology* 1: 3 – 12.
- 41) Mitchell, E. A. D., B. Mulhauser, M. Mulot, A. Mutabazi, G. Glauser, and A. Aebi. 2017. A Worldwide Survey of Neonicotinoids in Honey. *Science* 358: 109 – 111.
- 42) Morrissey, C.A., P. Mineau, J. H. Devries, F. Sanchez-Bayo, M. Liess, M.C. Cavallaro, and K. Liber. 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: a review. *Environment International* 74:291-303. Osterberg, J.S., K.M. Darnell, T.M. Blickley, J.A. Romano, and D. Rittschof. 2012. Acute toxicity and sub-lethal effects of common pesticides in post-larval and juvenile blue crabs, *Callinectes sapidus*. *Journal of Experimental Marine Biology and Ecology* 424-425: 5-14.
- 43) Parkinson, R.H., J.M. Little, and J.R. Gray. 2017. A sublethal dose of a neonicotinoid insecticide disrupts visual processing and collision avoidance behaviour in *Locusta migratoria*. *Scientific Reports*, 7(1), p.936.
- 44) Pestana, J. L. T., A.C. Alexander, J.M. Culp, D.J. Baird, A.J. Cessna, A.M.V.M. Soares. 2009. Structural and functional responses of benthic invertebrates to imidacloprid in outdoor stream mesocosms. *Environmental Pollution* 157: 2328 – 2334.
- 45) Pisa, L. W., V. Amaral-Rogers, L. P. Belzunces, J. M. Bonmatin, C. A. Downs, D. Goulson, D. P. Kreutzweiser, C. Krupke, M. Liess, M. McField, C. A. Morrissey, D. A. Noome, J. Settele, N. Simon-Delso, J. D. Stark, J. P. Van der Sluijs, H. Van Dyck, M. Wiemers. 2015. Effects of neonicotinoids and fipronil on non-target invertebrates. *Environmental Science and Pollution Research* 22: 68 – 102.
- 46) Rondeau, G., F. Sánchez-Bayo, H.A. Tennekes, A. Decourtye, R. Ramírez-Romero, and N. Desneux. 2014. Delayed and time-cumulative toxicity of imidacloprid in bees, ants and termites. *Scientific reports*, 4.
- 47) Sánchez-Bayo, F., and K. Goka. 2006. Ecological Effects of the Insecticide Imidacloprid and a Pollutant from Antidandruff Shampoo in Experimental Rice Fields. *Environmental Toxicology and Chemistry* 25 (6): 1677 – 1687.
- 48) Sánchez-Bayo, F. 2014. The trouble with neonicotinoids. *Science*. 346. 806-807. 10.1126/science.1259159.
- 49) Sánchez-Bayo, F., K. Goka, and D. Hayasaka. 2016. Contamination of the aquatic environment with neonicotinoids and its implication for ecosystems. *Frontiers in Environmental Science*, 4, p.71.

- 50) Sanford, E. 2012. An Analysis of the Commercial Pacific Oyster (*Crassostrea gigas*) Industry in Willapa Bay, WA: Environmental History, Threatened Species, Pesticide Use, and Economics. Masters Thesis, Evergreen State College.
- 51) Sardo, A. M., and A. M. V. M. Soares. 2010. Assessment of the Effects of the Pesticide Imidacloprid on the Behaviour of the Aquatic Oligochaete *Lumbriculus variegatus*. Archives of Environmental Contaminant Toxicology 58: 648 – 656.
- 52) Simmons, W. R., and D. R. Angelini. 2017. Chronic Exposure to a Neonicotinoid Increases Expression of Antimicrobial Peptide Genes in the Bumblebee *Bombus impatiens*. Scientific Reports 7, 44773; doi: 10.1038/srep44773 (2017)
- 53) Simon-Delso, N., V. Amaral-Rogers, L. P. Belzunces, J. M. Bonmatin, M. Chagnon, C. Downs, L. Furlan, D. W. Gibbons, C. Giorio, V. Girolami, D. Goulson, D. P. Kreutzweiser, C. H. Krupke, M. Liess, E. Long, M. McField, P. Mineau, E. A. D. Mitchell, C. A. Morrissey, D. A. Noome, L. Pisa, J. Settele, J. D. Stark, A. Tapparo, H. Van Dyck, J. Van Praagh, J. P. Van der Sluijs, P. R. Whitehorn, M. Wiemers. 2015. Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites. Environmental Science and Pollution Research 22: 5 – 34.
- 54) Smit, C. E. 2014. Water Quality Standards for Imidacloprid: Proposal for an update according to the Water Framework Directive. RIVM Letter Report 270006001/2014.
- 55) Suter, G. W., and S. M. Cormier. 2015. Why Care About Aquatic Insects: Uses, Benefits, and Services. Integrated Environmental Assessment and Management 11 (2): 188 – 194.
- 56) Tappert, L, T. Pokorný, J. Hofferberth, and J. Ruther. 2017. Sublethal doses of imidacloprid disrupt sexual communication and host finding in a parasitoid wasp. Sci. Rep. 7, 42756; doi: 10.1038/srep42756 (2017)
- 57) Tennekes, H. A. 2010. The significance of the Druckrey–Küpfmüller equation for risk assessment—The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time. Toxicology 280: 173-175.
- 58) Tennekes, H. A., and F. Sánchez-Bayo. 2013. The molecular basis of simple relationships between exposure concentration and toxic effects with time. Toxicology 309: 39 – 51.
- 59) The Task Force on Systemic Pesticides (TFSP). 2015. Worldwide Integrated Assessment of the Impacts of Systemic Pesticides on Biodiversity and Ecosystems. Published in Environmental Science and Pollution Research 22: 1-154.
- 60) Thorbek, P., P. J. Campbell, H. M. Thompson. 2017. Colony Impact of Pesticide-induced Sublethal Effects on Honeybee Workers: a Simulation Study Using BEEHAVE. Environmental Toxicology and Chemistry 36(3): 831 – 840.
- 61) Tsvetkov, N., O. Samson-Robert, K. Sood, H. S. Patel, D. A. Malena, P. H. Gajiwala, P. Mackiukiewicz, V. Fournier, and A. Zayed. 2017. Chronic exposure to neonicotinoids reduces honey bee health near corn crops. Science 356: 1395 – 1397.

- 62) U.S. Environmental Protection Agency (USEPA). 2017. Preliminary aquatic risk assessment to support the registration review of imidacloprid. PC Code 129099. DP Barcode 429937. USEPA, Office of Chemical Safety and Pollution Prevention, Washington D.C. Prepared by USEPA Office of Pesticide Programs, Environmental Fate and Effects Division, Washington D.C.
- 63) Van den Brink, P.J., J.M. Van Smeden, R.S. Bekele, W. Dierick, D.M. De Gelder, M. Noteboom, and I. Roessink. 2016. Acute and chronic toxicity of neonicotinoids to nymphs of a mayfly species and some notes on seasonal differences. *Environmental toxicology and chemistry*, 35(1), pp.128-133.
- 64) Van der Sluijs, J.P., V.Amaral-Rogers, L.P. Belzunces, M.B. van Lexmond, J.M. Bonmatin, M. Chagnon, C.A. Downs, L. Furlan, D.W. Gibbons, C. Giorio, and V. Girolami. 2015. Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning.
- 65) Van Dijk, T. C., M. A. Van Staalduinen, and J. P. Van der Sluijs. 2013. Macro-Invertebrate Decline in Surface Water Polluted with Imidacloprid. *PLoS ONE* 8(5): e62374. doi:10.1371/journal.pone.0062374
- 66) Wang, L., L. Zeng, and J. Chen. 2015. Sublethal effect of imidacloprid on *Solenopsis invicta* (Hymenoptera: Formicidae) feeding, digging, and foraging behavior. *Environmental Entomology*, 44(6), pp.1544-1552.
- 67) Woodcock, B.A., N.J. Isaac, J.M. Bullock, D.B. Roy, D.G. Garthwaite, A. Crowe, and R.F. Pywell. 2016. Impacts of neonicotinoid use on long-term population changes in wild bees in England. *Nature Communications*, 7, p.12459.
- 68) Woodcock, B. A., J. M. Bullock, R. F. Shore, M. S. Heard, M. G. Pereira, J. Redhead, L. Ridding, H. Dean, D. Sleep, P. Henrys, J. Peyton, S. Hulmes, L. Hulmes, M. Sárospataki, C. Saure, M. Edwards, E. Genersch, S. Knäbe, R. F. Pywell. 2017. Country-specific effects of neonicotinoid pesticides on honey bees and wild bees. *Science* 356: 1393 – 1395.
- 69) Wright, S. L. 2015. D. Rowe, M. J. Reid, K. V. Thomas & T. S. Galloway. Bioaccumulation and biological effects of cigarette litter in marine worms. *Scientific Reports* 5, 14119; doi: 10.1038/srep14119 (2015).
- 70) Wu-Smart, J. and M. Spivak. 2016. Sub-lethal effects of dietary neonicotinoid insecticide exposure on honey bee queen fecundity and colony development. *Scientific Reports*, 6; doi: 10.1038/srep32108



DEPARTMENT OF
ECOLOGY
State of Washington

MEMORANDUM
WATER QUALITY PROGRAM

April 5, 2018

To: Rich Doenges, Section Manager

From: Chris Montague-Breakwell, Watershed Resources Unit Supervisor *CM-B*

Subject: Tentative staff determination, and recommendation, to deny WGHOGA NPDES permit application as impacts of the discharge prohibit Sediment Impact Zone authorization and cannot be addressed via permit conditions

As required by WAC 173-220-110, this memorandum provides the "tentative staff determination" with respect to the Willapa-Grays Harbor Oyster Growers Association (WGHOGA) application for a National Pollutant Discharge Elimination System (NPDES) permit. It is my recommendation that the Department of Ecology (Ecology) deny the WGHOGA application for an NPDES permit because the proposed discharge will not be consistent with the requirements of the Sediment Management Standards and the NPDES permit cannot be conditioned such to meet the standards of this regulation.

The WGHOGA applied to Ecology for an individual NPDES permit and sediment impact zone authorizations for Willapa Bay and Grays Harbor to use the pesticide imidacloprid to control burrowing shrimp on commercial clam and oyster beds. Ecology reviewed the applications and completed a Supplemental Environmental Impact Statement (SEIS) pursuant to the Washington State Environmental Policy Act (SEPA). The review of information by Ecology, as detailed in the SEPA documents and attached memorandum from Ecology's Toxics Cleanup Program (TCP), has led to the determination that the proposed discharge would create a sediment impact with an adverse effect on biological organisms above a minor adverse biological effects level within the sediment impact zone. Additionally, the proposed discharge would result in adverse effects outside of the sediment impact zone due to the movement of the pesticide in surface water. The impact of the proposed discharge does not meet the regulatory requirements set out in the Sediment Management Standards necessary for an authorization of the sediment impact zones in Willapa Bay and Grays Harbor. Ecology must issue permits that comply with surface water quality standards of the state of Washington, including Washington Administrative Code (WAC) 173-201A, Water quality standards for surface waters of the state of Washington, WAC 173-204, Sediment management standards, and applicable federal rules. The WGHOGA proposed discharge cannot meet water quality standards and therefore the NPDES and sediment impact zone applications should be denied and no permit issued.

SEPA Environmental Review

In 2014, the WGHOGA applied to Ecology for an NPDES Individual Permit to authorize use of the neonicotinoid pesticide imidacloprid combined with Integrated Pest Management practices to suppress burrowing shrimp populations on up to 1,500 acres per year of commercial shellfish beds in Willapa Bay and up to 500 acres per year of commercial shellfish beds in Grays Harbor (up to 2,000 acres per year, total). Ecology reviewed the potential impacts of the proposed action in a Draft and Final Environmental Impact Statement (EIS) in 2014 and 2015, respectively. The *Final EIS for Proposed Use of Imidacloprid for Burrowing Shrimp Control on Commercial Oyster and Clam Beds in Willapa Bay and Grays Harbor, Washington* (Ecology 2015; hereafter referred to as the 2015 FEIS) was prepared based on scientific studies and information available at that time. Ecology issued a 5-year NPDES individual Permit (WA0039781) on April 16, 2015, with an effective date of May 16, 2015. On May 3, 2015, WGHOGA asked Ecology to withdraw the permit in response to strong public concerns. Ecology cancelled the permit on May 4, 2015. The 2015 permit was cancelled prior to the close of the appeal period and before the permit was active.

On January 8, 2016, WGHOGA, on behalf of a group of about a dozen growers, applied to Ecology for a new permit for the use of imidacloprid to control burrowing shrimp on commercial clam and oyster beds in Willapa Bay and Grays Harbor. The 2016 proposal requested authorization to treat a reduced amount of acreage (up to 500 acres per year, total, in the two estuaries), and the application detailed the use of boats and/or ground equipment to apply liquid and granular pesticide rather than aerial applications from helicopters. The 2016 permit application for the use of imidacloprid, including the revised scope, was evaluated in a supplemental EIS in the context of additional research performed, and additional literature published on the environmental effects of imidacloprid since the 2015 FEIS was issued.

The proposed pesticide application and impacts are described in the 2018 Final Supplemental Environmental Impact Statement (FSEIS). The Literature Review (section 1.6.1) of the FSEIS includes a discussion of the new science that was evaluated during the supplemental EIS process. The review included more than 100 research papers and the federal Environmental Protection Agency (EPA) Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid. The EPA Risk Assessment proposed acute and chronic chemical concentration risk endpoints for saltwater invertebrates. The FSEIS is available through Ecology at the website: <https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Aquatic-pesticide-permits/Burrowing-shrimp-control-Imidacloprid>.

Regulatory Information

a) National Pollutant Discharge Elimination System Permit

The Federal Clean Water Act (1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act (CWA) is the NPDES, administered by the federal Environmental Protection Agency (EPA). The EPA delegated authority to the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the

wastewater discharge NPDES permit program in Chapter 90.48 Revised Code of Washington (RCW 90.48). Ecology may also issue State Waste Discharge permits under its state Water Pollution Control Act (RCW 90.48) authority for state waters, which includes both surface waters and groundwater. Where appropriate, Ecology issues a combined NPDES/State Waste Discharge permit under both authorities.

The Sediment Management Standards, Parts I-IV, in WAC 173-204, are federally approved water quality standards for the State of Washington¹.

The discharge of chemicals to waters of the state requires coverage under an NPDES permit. Ecology has issued general and individual NPDES permits for discharges of aquatic pesticides and other chemicals since 2002.

An NPDES permit must include conditions that ensure the discharge will meet established water quality standards. WAC 173-201A-510. The following regulations apply to Individual NPDES permits:

- Procedures Ecology follows for issuing NPDES permits [chapter 173-220 Washington Administrative Code (WAC)]
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for ground waters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

As described in RCW 90.48.180, Ecology cannot issue a permit if the agency finds the discharge “as proposed in the application will pollute the waters of the state in violation of the public policy declared in RCW 90.48.010.” It is the policy of the state of Washington, as set out in RCW 90.48.010, to maintain the highest possible standards to insure the purity of waters of the state consistent with protections such as “protection of wild life, birds, game, fish and other aquatic life . . .” Also, as stated in RCW 90.48.520, “[i]n no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria.” Therefore, if a federal wastewater discharge permit cannot be conditioned to have the discharge meet water quality standards, Ecology cannot issue the permit.

b) Sediment Impact Zones Authorization Determination

If the applicable sediment quality standards of WAC 173-204-320 through 173-204-420 (Marine Sediment Quality Standards) will be exceeded due to a proposed discharge, Ecology is required to issue a sediment impact zone consistent with the Sediment Management Standards. A sediment impact zone is an area where the permitted discharge can have a temporary impact that

¹ In 1991, the EPA approved the initial version of the Sediment Management Standards in its entirety under the CWA. EPA also approved revisions to the Sediment Management Standards on September 18, 2008 and again on December 18, 2015. See Letter from Daniel D. Opalski, Director, EPA Office of Water and Watersheds to Maia Bellon, Director Department of Ecology (December 18, 2015) (available at <https://www.epa.gov/sites/production/files/2017-10/documents/wawqs-letter-12182015.pdf>).

exceeds the applicable sediment quality standards, but only up to the minor adverse effects criteria. There are several other requirements that must be met for Ecology to be authorized to establish a sediment impact zone. Requirements for a sediment impact zone (including establishment, maintenance, and closure) must be set out either through a discharge permit or other formal administrative action. Ecology shall only authorize a sediment impact zone if the permit discharge effluent limitations, requirements, and compliance time periods can be conditioned sufficiently to meet the standards of WAC 173-204-400 through 173-204-420. Because Parts III-IV of the Sediment Management Standards are federally recognized water quality standards, any discharge permit issued by Ecology must meet those standards and criteria set out in the Sediment Management Standards.

Recommendation

Ecology's Water Quality Program is the department expert for issuance of NPDES permits, and worked in concert with the Toxic Cleanup Program for guidance related to Sediment Management Standards and sediment impact zone authorization. The memorandum authored by Ecology's Toxics Cleanup Program (dated April 4, 2018) addressed to Southwest Regional Office Water Quality Section Manager, Rich Doenges, explains how a sediment impact zone cannot be authorized for Willapa Bay or Grays Harbor as the proposed discharge will exceed the applicable sediment quality standards, and the requirements for authorization of a sediment impact zone cannot be met. Ecology has reviewed the requirements for a sediment impact zone authorization and determined that it is not possible to condition the individual permit effluent limitations, requirements, or compliance time periods to meet the standards of the Sediment Management Standards. Because Ecology cannot allow the discharge of toxicants that would violate any water quality standard, including sediment criteria and dilution zone criteria, the NPDES permit should not be issued.

For the foregoing reasons, it is my "tentative determination" that the WGHOGA permit application be denied.

WASHINGTON DEPARTMENT OF ECOLOGY

PUBLIC NOTICE TO DENY PERMIT

Ecology invites you to submit written comments on Ecology's tentative decision to deny an aquatic pesticide permit.

The Willapa-Grays Harbor Oyster Growers Association Willapa Bay (WGHOGA) applied for a National Pollutant Discharge Elimination System (NPDES) permit in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW), Chapter 173-220 Washington Administrative Code (WAC), and the Federal Clean Water Act. WGHOGA proposes to apply the pesticide imidacloprid to control burrowing shrimp on 500 acres of commercial shellfish beds in Willapa Bay and in Grays Harbor, Washington.

The Department of Ecology has tentatively determined to deny the permit for the proposed new discharge of imidacloprid and is hereby issuing public notice of its intent. Interested persons are invited to submit written comments regarding this tentative determination via our website or by letter as detailed below.

Comments must be received by May 14, 2018. Prior to a final determination to either deny or proceed with the development of this permit, the Department will consider and respond to all comments received during the comment period.

Copies of the permit application, sediment impact zone applications, and recommendations to deny the permit are available through our website at: www.ecology.wa.gov/burrowingshrimp

To submit comments:

Online through our website: www.ecology.wa.gov/burrowingshrimp

By Mail: Rich Doenges, Department of Ecology, Southwest Regional Office, P.O. Box 47775, Olympia, WA 98504-7775.

For questions please contact: Rich Doenges at 360-407-6271.

To request ADA accommodation or materials in another language, visit <https://ecology.wa.gov/accessibility>, call Ecology at 360-407-7170, Relay Service 711, or TTY 877-833-6341.

Para solicitar información en español acerca de la decisión tentativa para denegar este permiso, por favor comuníquese con Rich Doenges a burrowing.shrimp@ecy.wa.gov ó 360-407-6271.