No Elevated Fluoride Levels Reported

Columbia River Toxic Discharges Assessment and Mixing Zone Mapping

COLUMBIA RIVERKEEPER®

--DRAFT—Pending Peer Review

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Project funding supported by:

The Mountaineers Foundation

Brief Background on Toxic Pollution in the Columbia River

The Columbia River has long been polluted by a broad range of toxics contaminants. These toxics are concentrating in Columbia River fish and the people that depend on them as a food source, such as Native Americans and others who consume large quantities of fish. As such, the issue of toxic pollution into the Columbia River is not merely an environmental issue, but one that raises issues of public health generally, children's health, and Native American treaty rights. The large scale pollution of the Columbia River also raises numerous environmental justice issues.

50 years after the flooding of Celilo Falls Columbia Basin tribes continue to fish the Columbia as they have for over 10,000 years.

This was most clearly shown in the 2002 Columbia River Basin Fish Contaminant Survey risk evaluation prepared by the U.S. Environmental Protection Agency (EPA) in cooperation with the Columbia River Intertribal Fish Commission (CRITFC).[1]

This study evaluated the concentrations of 92 toxics in fish tissue samples from multiple species of resident and migratory fish and evaluated the resulting health threats on Native Americans. The report painted a dramatic picture about the risks that toxics are currently having on the Columbia River and tribal members.

As EPA explains, the study concluded that as a result of the levels of toxics in Columbia Basin fish, tribal members may have a life-time cancer risk that is "up to 50 times higher than those for the general public who consume fish about once a month."[2] For some sites along the Columbia River, fish toxics were so high that they created a 2 in 100 cancer risk for Native Americans.[3]

The study evaluated the effects of toxics that are generally associated with non-point sources of pollution, such as agricultural and stormwater runoff, legacy contamination from toxics such as DDT and PCBs (which are generally banned today), as well as, toxics that the State of Oregon through the Oregon Department of Environmental Quality (DEQ) and the State of Washington through the Washington Department of Ecology (Ecology) continue to permit to be discharged into the Columbia River today such as arsenic, mercury and lead.

Sources of Pollution

The sources of pollution on the Columbia are many and the effects can be seen in all but the highest reaches of the 1,243 mile River known to many as the "Great River of the West." While this report looks only at major industrial and

Columbia Riverkeeper's Executive Director Brent Foster on a black sand beach of heavy metal slag with Citizens for a Clean Columbia members near the U.S./ Canadian border.

municipal pollution in the United States, the toxic threats to the Columbia River are much broader and begin in Canada. In fact, where the Columbia River first flows into the United States, toxic metal slag from Teck Cominco's zinc and lead smelting operations 10 miles north of the Canadian / U.S. border form black sand beaches along the shoreline and have led to high fish toxicity levels in area fish. While the dumping of metal slag has now been stopped, it is estimated that as much as 20 million tons of heavy metal slag was dumped by Teck Cominco into the Columbia over the last 100 years and this slag is still present in the river.

Moving down River, the Hanford Nuclear Reservation is considered the most contaminated site in North America and multiple contaminated groundwater plumes of radioactive and non-radioactive contaminants such as uranium, chromium, and strontium are currently leaching into the Columbia River. While some talk about "potential" future concerns over Hanford contamination reaching the Columbia, even the U.S. Department of Energy admits that contamination is currently leaching into the Columbia at Hanford.[4]

In light of this, it should probably not be surprising that 84% of the Chinook salmon returning to the Hanford Reach that appear to be female were in fact initially male salmon that in the words of the study's authors have been "sex-reversed."[5]

Scientific studies highlighting the serious toxic threats facing the Columbia River have stretched back over almost two decades.

In 1990, widespread concern about toxics in the Columbia River culminated in the creation of the Bi-State Program which over the next six years produced more than 50 technical reports related to toxics and the lower Columbia River. The Bi-State Program involved a broad diversity of interests including the states of Washington and Oregon, conservationists, Native American tribes, the pulp and paper industry, the federal government and many others.

The study plainly reported that, "There is strong evidence that fish and wildlife in the lower Columbia River basin are being exposed, via water, sediments, and prey, to a range of pollutants known to cause adverse effects. These include heavy metals, dioxins, furans, PCBs, DDT and its metabolites, and other pesticides."[6]

A number of other recent studies on the Columbia have similarly reported on the significant effects that toxics are having on the River.

Though highly contaminated, the Hanford Reach is one of the last free-flowing sections of the Columbia and home to the largest population of salmon that spawn in the Columbia River mainstem.

A 2005 monitoring study by the Washington Department of Ecology found that "human health criteria were commonly exceeded for dieldrin (a pesticide) and PCBs," and "less frequently exceeded for DDT compounds."[7]

In 2006, a study of mercury levels in the sex organs of white sturgeon in the Columbia River showed that mercury levels in the Columbia may be related to poor sturgeon reproduction behind the Bonneville Dam.[8]

A similar 2005 study looking at concentrations of chlorinated pesticides in Columbia sturgeon reported that "exposure to environmental contaminants may be affecting both growth and reproductive physiology of sturgeon in some areas of the Columbia River."[9]

This is only a small portion of the numerous studies that have highlighted the toxic effects that are facing everything from osprey and river otters to freshwater clams and resident fish. Considering the large body of scientific information that has already clearly highlighted the serious impacts that toxics are having on the Columbia, it is hard not to contemplate whether there will ever be sufficient science to overcome the powerful inertia of protecting the status quo while avoiding meaningful steps towards toxics reductions. Even after the six year Bi-State Program prepared more scientific evaluations, monitoring and testing than had ever been conducted on the Lower Columbia, one of the chief recommendations of the final report was for even more studies.

> *"There is strong evidence that fish and wildlife in the lower Columbia River basin are being exposed, via water, sediments, and prey, to a range of pollutants known to cause adverse effects. These include heavy metals, dioxins, furans, PCBs, DDT and its metabolites, and other pesticides."*
>
> - Columbia River Bi-State Study Final Rpt. (1996)

While dramatic sources of pollution, such as Hanford and Teck Cominco may generate the most public attention, the toxic threat facing the Columbia River is truly a result of the cumulative impacts of not just these larger historic sources, but thousands of sources that affect every tributary and virtually every mile of the Columbia.

The sources certainly include stormwater runoff from agriculture, cities, and forestry operations, which have historically received minimal regulation under both state law and federal statutes such as the Clean Water Act. The impacts from these discharges are very significant. One stormwater study conducted by the Oregon Association of Clean Water Agencies, which represents most of the large municipalities in Oregon, found that stormwater pollution from Industrial zoned areas in the City of Portland exceeded the state acute toxicity standard for zinc 100% of the time and exceeded the acute toxicity standard for copper 75% of the time.[10]

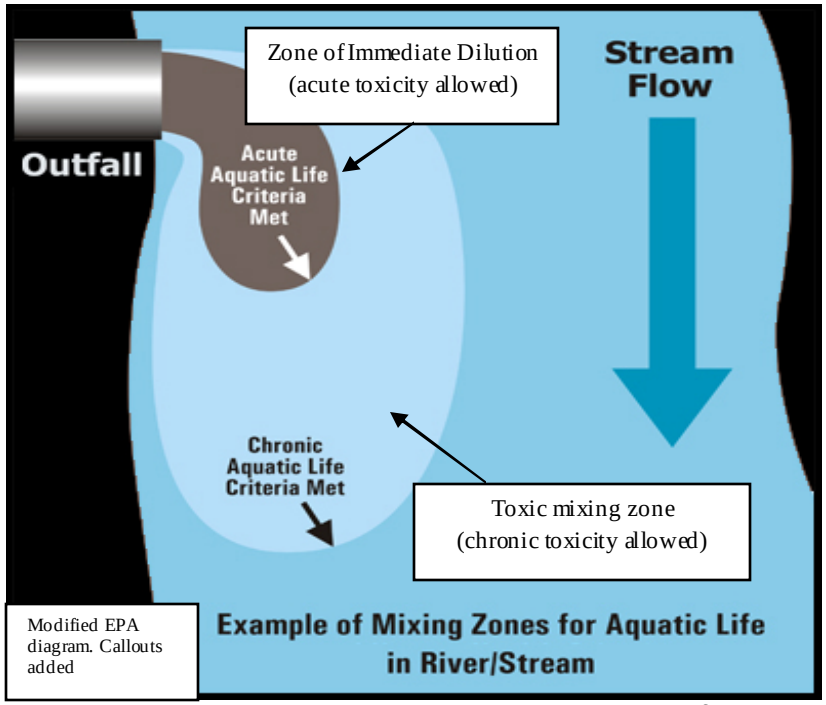
Pollution discharges from small, medium and large industrial facilities and municipal sewage plants are also significant sources of pollution on the Columbia River. While these facilities have been the focus of much more state and federal regulation, the discharges from these facilities continue to be a major source of pollution in the Columbia River Basin.

To date, however, there has been little effort to cumulatively evaluate the total quantity of pollutants being discharged from these sources or to evaluate the impacts of these discharges. While some facilities are required to report estimated toxics discharges pursuant to the federal Toxics Reporting Inventory (TRI), many question the accuracy and usefulness of this data, and neither Oregon DEQ nor Washington Ecology regularly use this data as a part of the process of regulating pollution discharges.

What is a Toxic Mixing Zone

Toxic mixing zones are designated portions of a river, stream, or coastal water where industrial or municipal dischargers are legally allowed to exceed state toxicity standards. DEQ and Ecology permit mixing zones for many different pollutants include pollutants like heat and turbidity which are not "toxics." Under both Oregon and Washington administrative regulations, Oregon DEQ and Washington Dept. of Ecology are allowed to designate portions of a river or a stream downstream of an industrial or municipal outfall as a "mixing zone." When mixing zones allow the discharge of toxics at concentrations that exceed state toxicity standards many river conservation groups refer to them as "Toxic Mixing Zones."

DEQ's administrative regulations, explain that within a mixing zone, "the Department may suspend all or part of the water quality standards, or set less restrictive standards …" OAR 340-041-0053(2). Water quality standards are the foundation of both federal and state water quality law and are specifically adopted to ensure the protection of beneficial uses of rivers, streams and coastal waters, ranging from swimming and fishing, to salmon spawning and use for domestic water supply.



The idea is that by ensuring the protection of water quality standards, state agencies will be able to guarantee that people will be able to safely use rivers and streams and that these waters will be able to support fish and wildlife.

Generally, both the federal Clean Water Act and state statute in Oregon and Washington prohibit pollution discharges that would cause a violation of water quality standards. The federal and state regulations which are intended to guide implementation of the state and federal

statute, however, have created a major loophole to this general requirement in allowing Toxic Mixing Zones.

Toxic Mixing Zones have been called "legalized zones of pollution," since within these zones toxicity levels can exceed the state's toxicity standards by 1,000% or more. As a hypothetical example, if the water quality toxicity standard for arsenic was 10 parts per billion (ppb), a discharger would not be allowed to discharge pollutants at higher than that concentration unless DEQ or Ecology allowed the discharger to have a mixing zone. If DEQ and Ecology do allow a discharger to have a mixing zone (as is almost always the case), then the discharger would only need to meet the water quality standard for mercury at the *outside* of the mixing zone and the area within the Toxic Mixing Zone could significantly exceed the 10 ppb standard.

Mixing zones can exceed 100,000 square feet in size and virtually every industrial or municipal facility that has an individual NPDES pollution permit has been given a mixing zone. It is important to recognize, however, that the size of many mixing zones is often established based on the discharge of heat or turbid water from a given point source.

Impacts of Toxic Mixing Zones

There are two types of impacts caused by Toxic Mixing Zones. The first is the localized effect that results from toxic concentrations that exceed state toxicity standards. The practical effects are likely greatest on resident fish or shellfish species that spend all or a significant part of their life cycle within a Toxic Mixing Zone. Second, Toxic Mixing Zones allow a greater total mass of pollutants to be discharged in a given waterbody than if no mixing zone was allowed. This has broader ecosystem level effects far beyond the localized mixing zones especially for bioaccumulative toxics that concentrate in fish and shellfish and are then passed on to humans if they are consumed. For example, a facility that had to meet a 10 ppb arsenic standard at the end of its outfall pipe may discharge 5 pounds of arsenic a day, whereas if the same facility was allowed to discharge into a Toxic Mixing Zone at 500 ppb it would release 250 pounds a day.

To be clear, the data from this report shows that a number of facilities are discharging a large amount of toxic contaminants even when such facilities are not discharging above the applicable toxicity standard. In the attached aerial photos, this report labels facilities that are exceeding state toxicity standards as having "Toxic Mixing Zones." For facilities that are discharging toxics, but not exceeding state toxicity standards, we simply use the term "Mixing Zones."

While decreasing toxic concentrations in the Columbia will require significant attention to many different

Fishermen try their luck in the middle of the City of Portland's mixing zone.

pollution sources, phasing out the use of Toxic Mixing Zones is a necessary first step since toxicity levels allowed in these zones by definition exceeds state toxicity standards.

How are Toxic Mixing Zones Established

Under state and federal law, anyone discharging a pollutant into a waterbody needs to obtain a permit to allow that discharge called a National Pollution Discharge Elimination System (NPDES) permit or "Pollution Permit."

Oregon DEQ and Washington Ecology establish the size of Toxic Mixing Zones when a pollutant discharger goes to apply for or to renew their Pollution Permit. The Pollution Permit will make clear that within the given Toxic Mixing Zone the discharger is allowed to exceed state toxicity standards, but must meet these standards at the outside of the mixing zone. Under Oregon and Washington regulations, dischargers are allowed to exceed the chronic toxicity standards within the mixing zone. These chronic toxicity standards represent the toxicity levels that will affect growth or reproduction of sensitive aquatic species after long-term exposure.

But within most Toxic Mixing Zones there is also a mixing zone within a mixing zone called a "Zone of Immediate Dilution." Within this smaller zone, pollution discharges are allowed to exceed a state's *acute* toxicity standards. The acute toxicity standards, which are generally significantly higher than the chronic standards, reflect the toxic concentrations at which sensitive aquatic species will be adversely affected after even short-term exposure. Within the Zone of Immediate Dilution, toxicity concentrations can legally be so high that they could kill or injure an aquatic species.

There are regulations under Oregon and Washington law that are supposed to ensure some level of protection when agencies are establishing mixing zones, but these regulations are weakly applied and do not change the central fact that mixing zones are areas in rivers, streams and coastal waters where dischargers are legally allowed to exceed state toxicity standards.

Purpose of this Report

The purpose of this report is to begin to evaluate and better understand the magnitude of effects that industrial and municipal point sources of toxic pollution are having on the Columbia River and to provide the public and policy makers with information about the general location and extent of Toxic Mixing Zones.

This report is only intended to be the beginning of a more comprehensive evaluation and is inherently limited by the fiscal resources that were available to prepare it. For example, this report only evaluates the point source pollution discharges from the largest industrial

and municipal dischargers on the Columbia defined by EPA as "majors," but there are literally hundreds of smaller dischargers whose total discharges likely exceed the cumulative total from the 26 largest dischargers considered here.

Similarly, this report does not consider stormwater pollution from agriculture, forestry or cities that also have a significant effect on toxicity levels in the Columbia River.

While it is our belief that this type of report should have been prepared long ago by Oregon DEQ and Washington Ecology, these agencies face significantly limited budgets and powerful political interests that do not necessarily benefit from a close scrutiny of toxic discharges.

This report was prepared in full knowledge that any report attempting to characterize the magnitude and extend of toxic pollution into the Columbia will be closely reviewed and criticized by some who are identified in it. In anticipation of this, the report is intended to be overly conservative.

In many cases, for example, the size of mixing zones are described in NPDES Pollution Permits as extending a certain distance from the diffusers on the end of a given outfall pipe. Diffusers can be over 100 feet in length and as a result, a mixing zone that is described as including "the section of the river that is within 200 feet of the diffuser" would create a mixing zone that is 160,000 square feet. However, in many cases the size of the diffuser was not specified in agency permit files and so this report assumed there was no diffuser. For the mixing zone described above, this would reduce the 160,000 square foot mixing zone to 125,663 square feet.

What this Evaluation Does

This report does several key things including:

1. Identifying Mixing Zone Locations and Size

First, this report identifies for the public and agency decision makers the approximate location and size of Mixing Zones for the 26 largest dischargers on the Columbia River. Neither Oregon DEQ, Washington Ecology nor EPA currently have maps that they can provide to the public with information about the location and size of Toxic Mixing Zones on the Columbia River. Because there are currently no signs, buoys or other identifying markers around any of the permitted mixing zones to alert the public to their presence, many people fish, swim and recreate in these areas without any awareness that they are doing so. Since most major pollution discharge pipes are underwater and cannot be seen from the surface, the lack of any warning signs is particularly significant.

Even for pollutants that are not being discharged above state toxicity standards, the ability of the public and decision makers to have a better understanding about the size and location of mixing zones where toxics are being discharged at any concentration is beneficial.

While there is an unfortunate lack of any studies that have actually evaluated the toxicity levels of resident (non-migratory) fish or shellfish that spend a significant amount of their life within a Toxic Mixing Zone, it is not unreasonable to assume that such species would have a higher level of bioaccumulative toxics. For those wishing to minimize their contact with waters that contain elevated

concentrations of toxics, this report provides general information about the location and size of Toxic Mixing Zones.

The locations of Toxic Mixing Zones that are mapped within this report, however, are approximate and general. The mixing zone locations identified are based only on data from Oregon DEQ and Washington Ecology permit files which in many cases are incomplete or non-specific. For some dischargers, the state permit files do not have a map showing the location of the discharger's pollution outfall pipe and in those cases the report uses the best evidence available to estimate the location of the permitted mixing zone.

The mapped mixing zones depict the areas which DEQ or Ecology *has permitted* as mixing zones, but since neither DEQ nor Ecology require dischargers to monitor toxics concentrations within or at the edge of mixing zones, there is not monitoring information about actual toxics concentrations inside or outside these mixing zones. As a result, it is not possible to determine how the actual portions of the river with increased toxicity levels downstream from major dischargers match the permitted mixing zones.

Georgia Pacific's Camas paper mill discharges an estimated 18.6 billion gallons of wastewater a year into the Columbia that contains an estimated 1,161,469 pounds of toxics including heavy metals, ammonia and nitrates.

This report is important, however, since it can be used to provide general information about areas of the Columbia that the public may want to avoid while fishing or recreating if they are concerned with decreasing their exposure to toxics and other pollutants. However, since it only shows a limited number of pollution sources, it is not intended as a comprehensive guide to areas with higher pollution concentrations.

2. Estimating Toxic Loads and Discharge Volumes

The second important piece of information this report provides is data about the types of toxics which individual dischargers are releasing and how much of these toxics individual facilities are discharging. Currently, neither Oregon DEQ nor Washington Ecology have any cumulative assessment of how many pounds of toxics they permit to be discharged into the Columbia River each year nor any specific assessment of how these toxics are concentrating in the fish, wildlife or sediment. Neither agency can tell the public how many gallons of effluent are released into the Columbia nor how many pounds of toxics are discharged each year.[11]

The estimates used in this report were calculated using water quality toxicity data contained in the NPDES pollution permit files maintained by Oregon DEQ and Washington Ecology for each facility. In almost all cases information about the concentrations of toxics being discharged were provided to these state

agencies by the dischargers themselves from data they or their contractors collected at a time of their own choosing. As a result, there is the potential that discharger-provided toxicity data may underestimate the actual toxicity concentrations of the wastewater being released.

This report used the pollutant concentrations data from DEQ and Ecology permit files and then calculated an estimated annual toxic load for each toxic based on the average volume of discharges each facility was releasing. To make this calculation, the report used the average toxicity values that were reported and the average daily flows from the given facility. Together this data was used to calculate an estimated annual toxic load or mass (in pounds) for the toxic pollutants being discharged.

A significant limitation of this report is that it can only be as accurate as the toxicity data that it is based on. No new or independent toxicity samples were obtained to use in this report and in a number of cases, there were a very small number of toxicity samples actually submitted for a given facility. No toxicity data was readily available for three of the facilities and two facilities reported that they did not detect any toxics in their discharges.

Most of the toxicity data the report is based on was contained in U.S. EPA toxicity reporting forms which dischargers must submit to Washington Ecology and Oregon DEQ at the time they renew their NPDES Pollution Permits.[12] Pollution Permits are supposed to be renewed once every five years so most of the toxic concentrations data relied on is not over five years old. Where data that was more current than the data contained in a dischargers permit renewal application was readily available, this data was used for this report. When EPA toxics reporting forms (EPA form 2 c or 2 a) were not available, the most current toxics data that was in DEQ's files and readily available was used.

This report also estimates the size of each mixing zone based on the description of the legally permitted mixing zone in the facility's NPDES Pollution Permit. Mixing zones vary in size and description, but typically a Pollution Permit will define a mixing zone as a certain distance from the pollution outfall pipe. As explained previously, the size of these mixing zones was conservatively estimated.

Many toxics released throughout the Columbia and Willamette Basins ultimately end up in the Columbia Estuary.

On the aerial mapping of the mixing zones for the 26 facilities that were evaluated there is a listing of the estimated total number of pounds of toxics that each facility is discharging each year, as well as, an estimated total volume of discharges. This listing also includes an estimate of the Biological Oxygen Demand (BOD) that each facility

is discharging because the Columbia River is water quality limited for oxygen. BOD, however, is not a toxic.

3. Comparing Discharges with Applicable Toxicity Standards

Finally, this report also compares the concentrations of toxics being discharged with applicable state toxicity standards for Oregon and Washington. Because each state has different toxicity standards, the appropriate standard for each state was used. A number of toxicity standards depend on the hardness of the water. To provide a uniform evaluation, this report uses a hardness value of 50 mg/l CaCO3 but actual hardness may vary slightly in different sections of the Columbia.

For a number of pollutants that have significant toxic effects, such as aluminum and nitrates, it is important to note that Oregon does not even have a water quality standard that applies to the Columbia River despite evidence that these toxics can have significant effects on aquatic species and humans.[13]

Finally, it is important to note, that although a discharger maybe exceeding state toxicity standards, this is not illegal under DEQ and Ecology's current regulations and this report is not indented to identify any illegal discharges. To the contrary, it is intended to highlight the significant quantity of toxics that are being legally discharged each day.

Summary of Key Findings

1. The 26 major industrial and municipal facilities together discharged an estimated 176 billion gallons of industrial and municipal waste into the Columbia River each year;

2. These discharges contain an estimated 7.4 million pounds of toxics ranging from Arsenic to Zinc;

3. The estimated quantities of toxics discharged from these facilities includes:

Arsenic	1,452 pounds
Aluminum	518,527 pounds
Ammonia	1,600,420 pounds
Chromium	3,473 pounds
Cyanide	6,926 pounds
Fluoride	72,424 pounds
Lead	851 pounds
Mercury	110 pounds
Nitrates	1,591,302 pounds
Titanium	7,657 pounds
Zinc	102,403 pounds

The discharge quantities of numerous other toxics are disclosed in Appendix 1 this report.

Recommended Next Steps

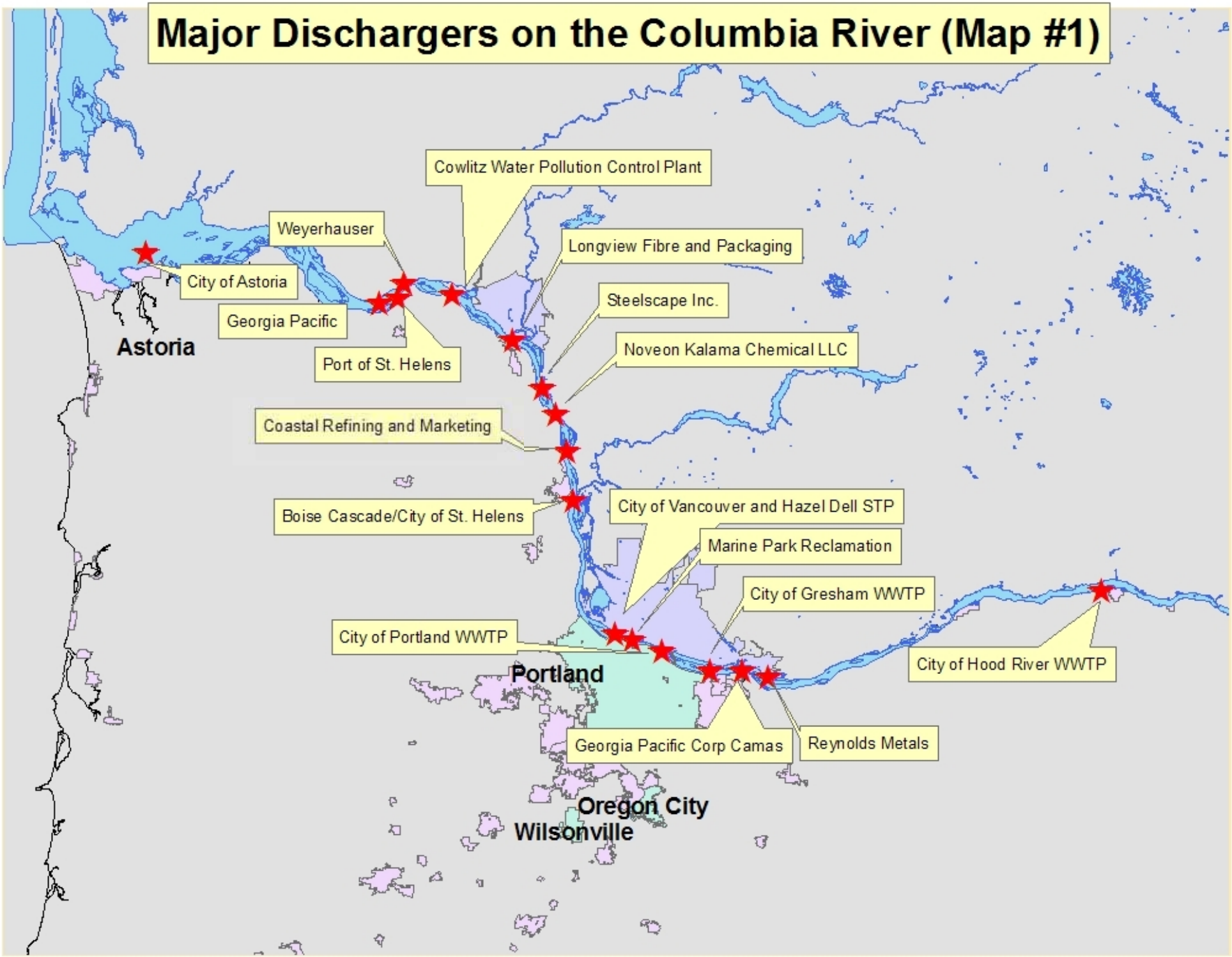
The findings of this report are intended to be a step towards better identifying and reducing the sources of toxic discharges that are impacting the Columbia River, its fish and wildlife, and the people who rely on the Columbia to put food on their dinner table. While there is a real need to better understand the sources of pollution into the Columbia and specific effects that such pollution is having, it is critical to recognize that there is already more than ample evidence to support that a large scale effort to reduce toxic discharges into the Columbia River is necessary.

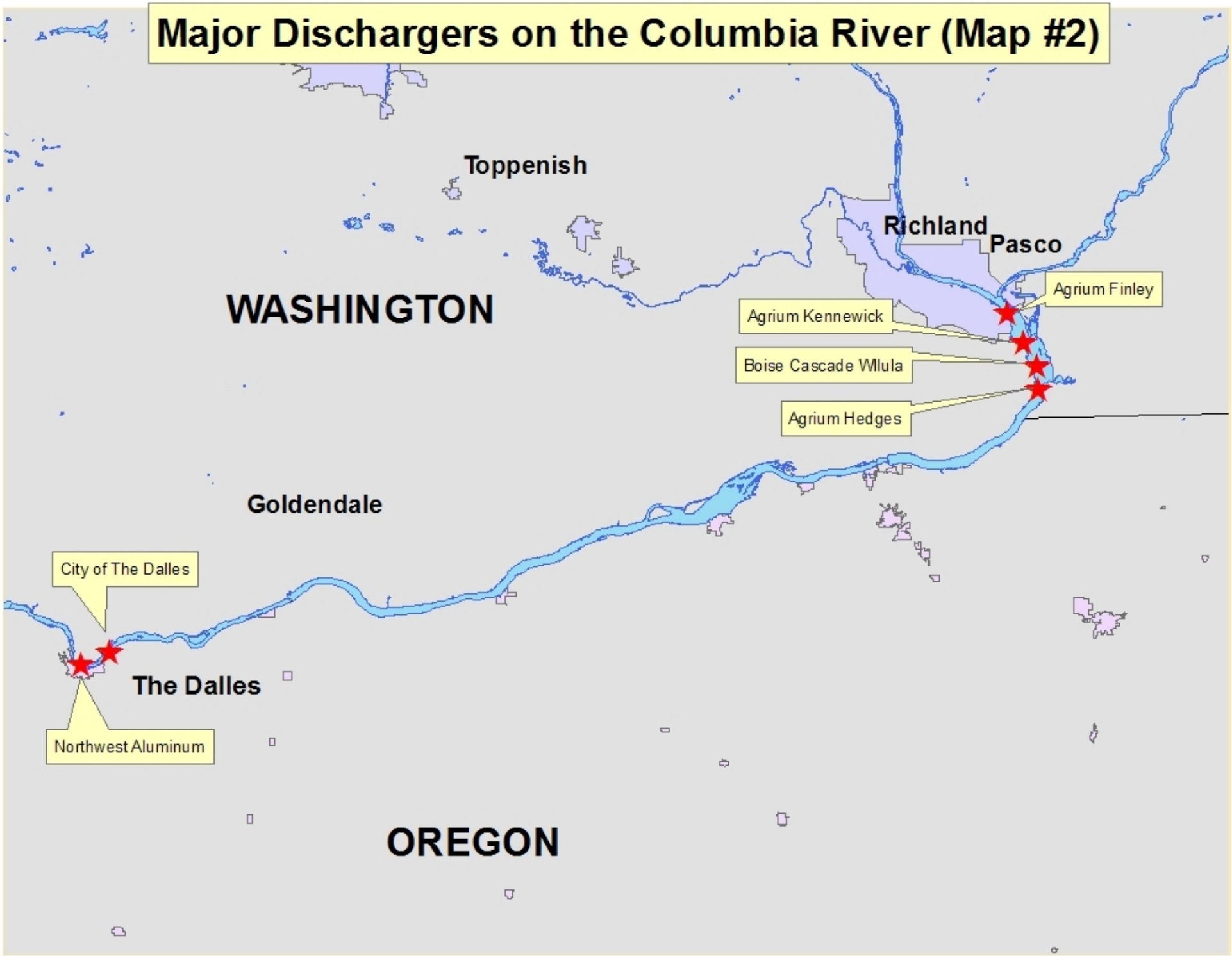
While there is little question that additional information and scientific evaluation can help clarify important issues and questions, it is difficult to avoid the conclusion that the preparation of studies has become a surrogate for actions that will actually create meaningful toxics reductions in the Columbia River.

It is with this in mind that this report comes with a plain recommendation that state and federal mixing zone laws that openly permit toxic discharges that exceed state toxicity standards must be reformed if there is any real chance of reducing toxics in the Columbia River. Similarly, by failing to take basic steps, such as signs or buoys to alert the public to the location of Toxic Mixing Zones, both the dischargers who enjoy the benefits of releasing their waste into the public waters of the Columbia and the state and federal agencies that permit such discharges, are failing to provide the public with basic information they have a right to know.

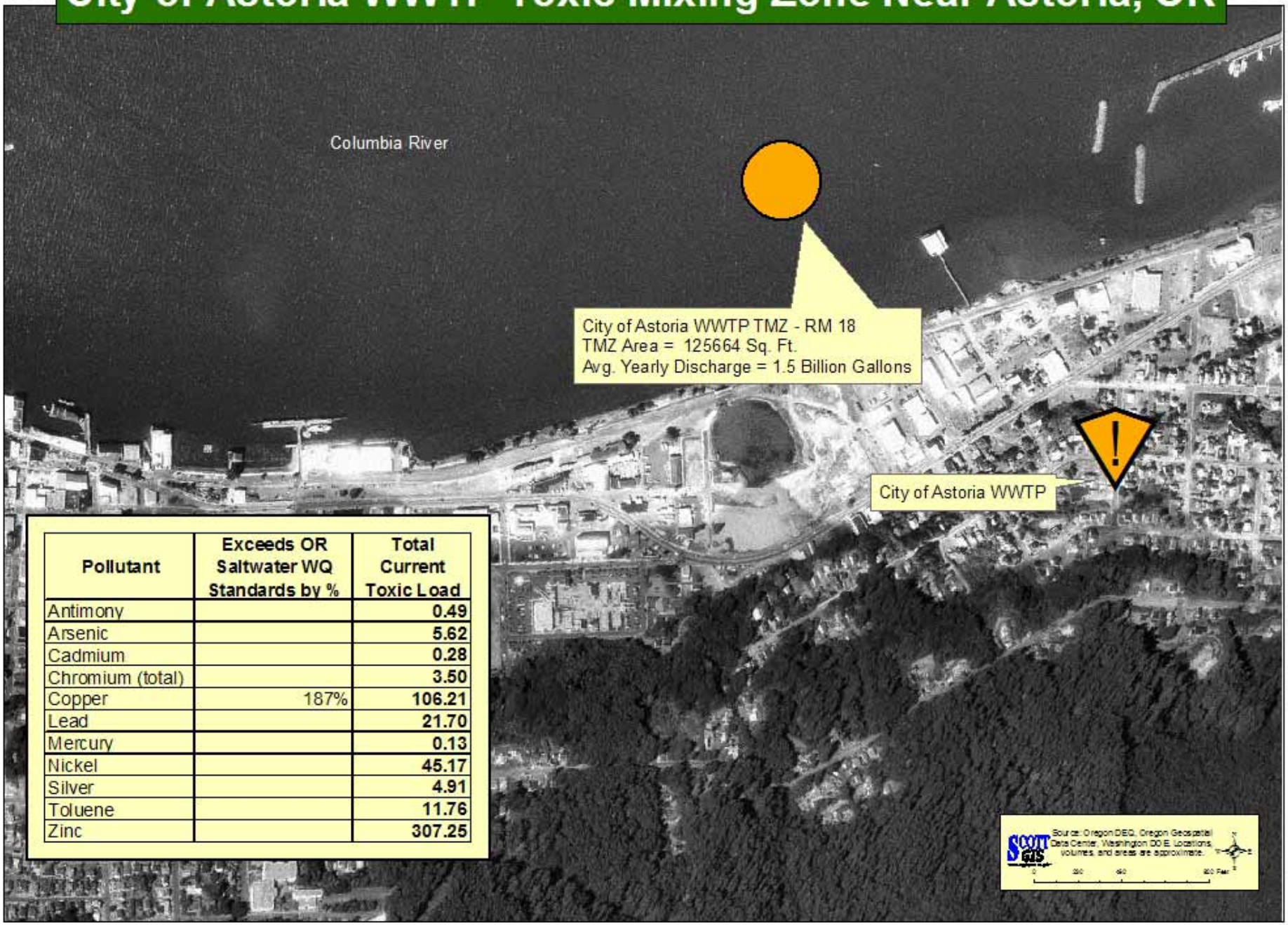
Toxic Mixing Zones are not the only, nor even the most significant, cause of toxic pollution in the Columbia River, but they are likely the most egregious example of an outdated public policy that stems from the misguided assumption that "dilution is the solution to pollution."

As a result, if there is to be any meaningful progress on reducing toxics in the Columbia River and other Oregon rivers such as the Willamette, then closing what has aptly been described as the "Toxic Mixing Zone Loophole" is an important first step.


Major Dischargers on the Columbia River (Map #1)
Cowlitz Water Pollution Control Plant
Weyerhauser
Longview Fibre and Packaging
City of Astoria
Steelscape Inc.
Georgia Pacific
Noveon Kalama Chemical LLC
Astoria
Port of St. Helens
Coastal Refining and Marketing
Boise Cascade/City of St. Helens
City of Vancouver and Hazel Dell STP
Marine Park Reclamation
City of Gresham WWTP
City of Portland WWTP
City of Hood River WWTP
Portland
Georgia Pacific Corp Camas
Reynolds Metals
Oregon City
Wilsonville

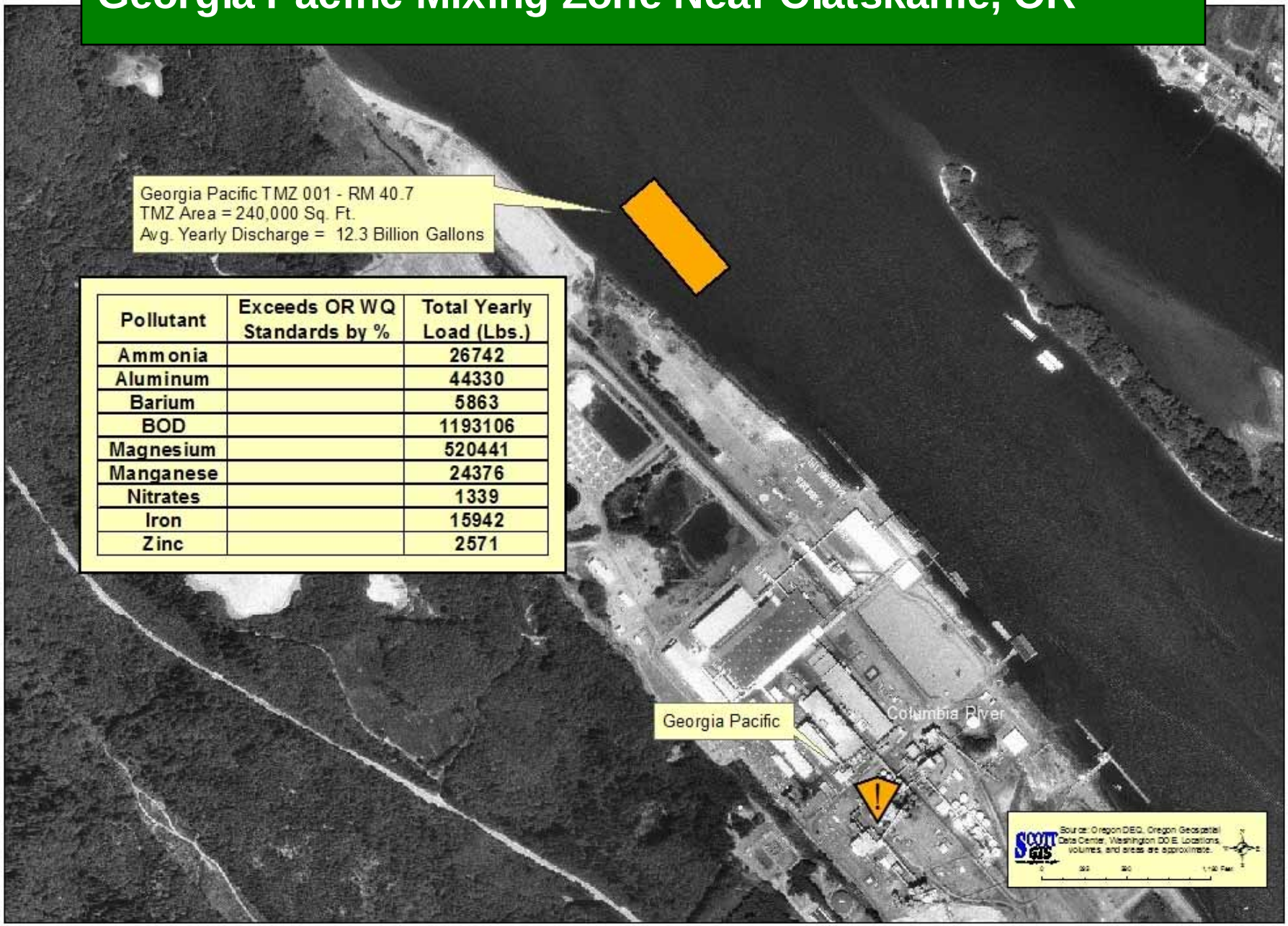

Major Dischargers on the Columbia River (Map #2)
Toppenish
Richland
Pasco
WASHINGTON
Agrium Finley
Agrium Kennewick
Boise Cascade Wllula
Agrium Hedges
Goldendale
City of The Dalles
The Dalles
Northwest Aluminum
OREGON

City of Astoria WWTP Toxic Mixing Zone Near Astoria, OR



Pollutant	Exceeds OR Saltwater WQ Standards by %	Total Current Toxic Load
Antimony		0.49
Arsenic		5.62
Cadmium		0.28
Chromium (total)		3.50
Copper	187%	106.21
Lead		21.70
Mercury		0.13
Nickel		45.17
Silver		4.91
Toluene		11.76
Zinc		307.25

Georgia Pacific Mixing Zone Near Clatskanie, OR



Pollutant	Exceeds OR WQ Standards by %	Total Yearly Load (Lbs.)
Ammonia		26742
Aluminum		44330
Barium		5863
BOD		1193106
Magnesium		520441
Manganese		24376
Nitrates		1339
Iron		15942
Zinc		2571

Port of St. Helens - Port Westward Facility
Toxic Mixing Zone Near Clatskanie, OR.

Proposed discharge from facilities still in development

Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
BOD		16158
Cadmium	667	46
Copper	4	62
Lead	284	46
Mercury	2150	3
Zinc		108

Weyerhauser Paper Mill Toxic Mixing Zones Near Longview, WA

Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Arsenic		438
Cadmium	356	438
Chromium (total)		1022
Copper	38	1315
Lead		146
Nickel		876
Zinc	75	15045

Cowlitz Water Pollution Control Plant Mixing Zone Near Kelso, WA

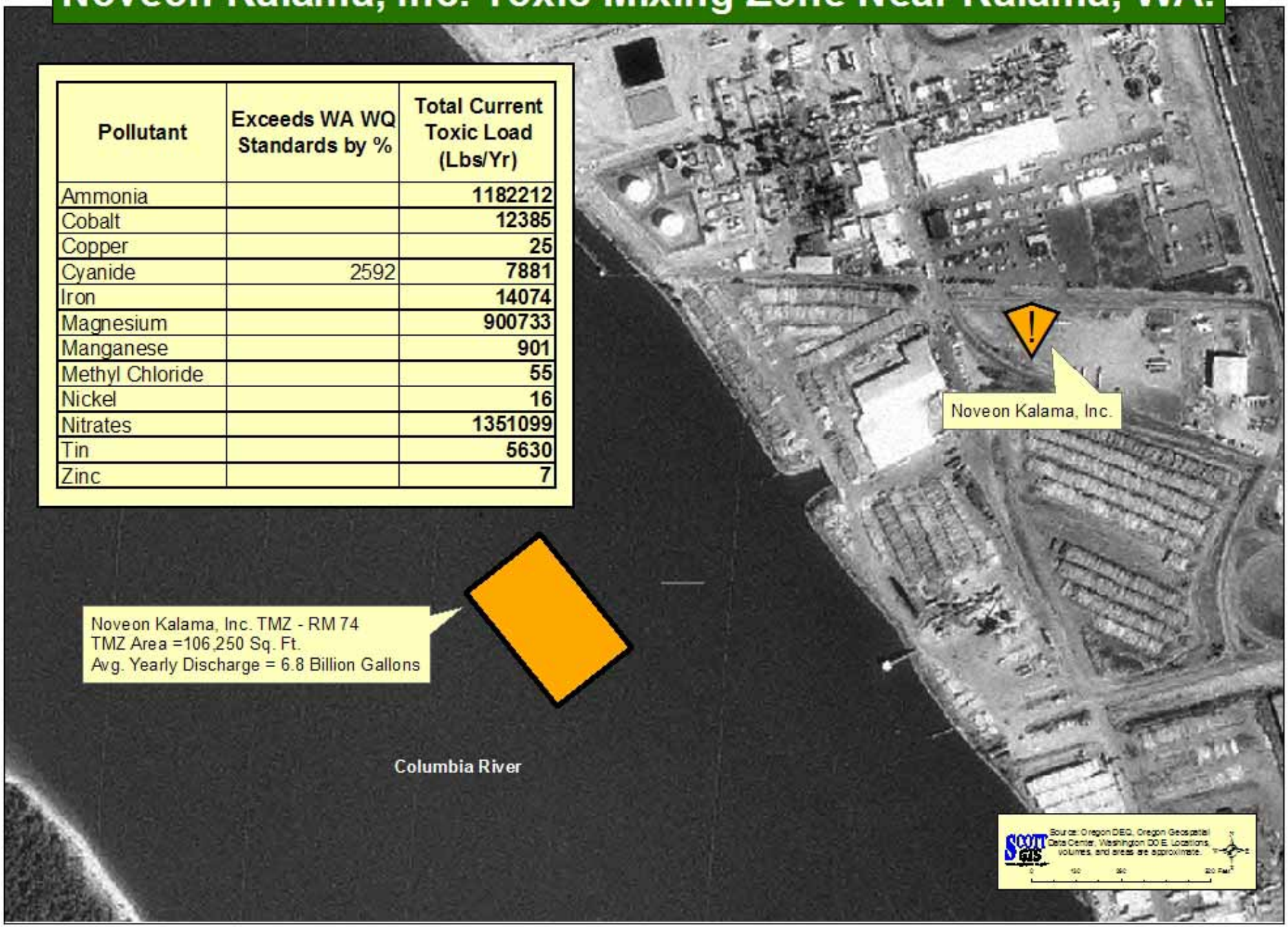
Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
BOD		12172
Iron		10662
Zinc		584

Steelscape, Inc. Toxic Mixing Zone Near Kalama, WA.

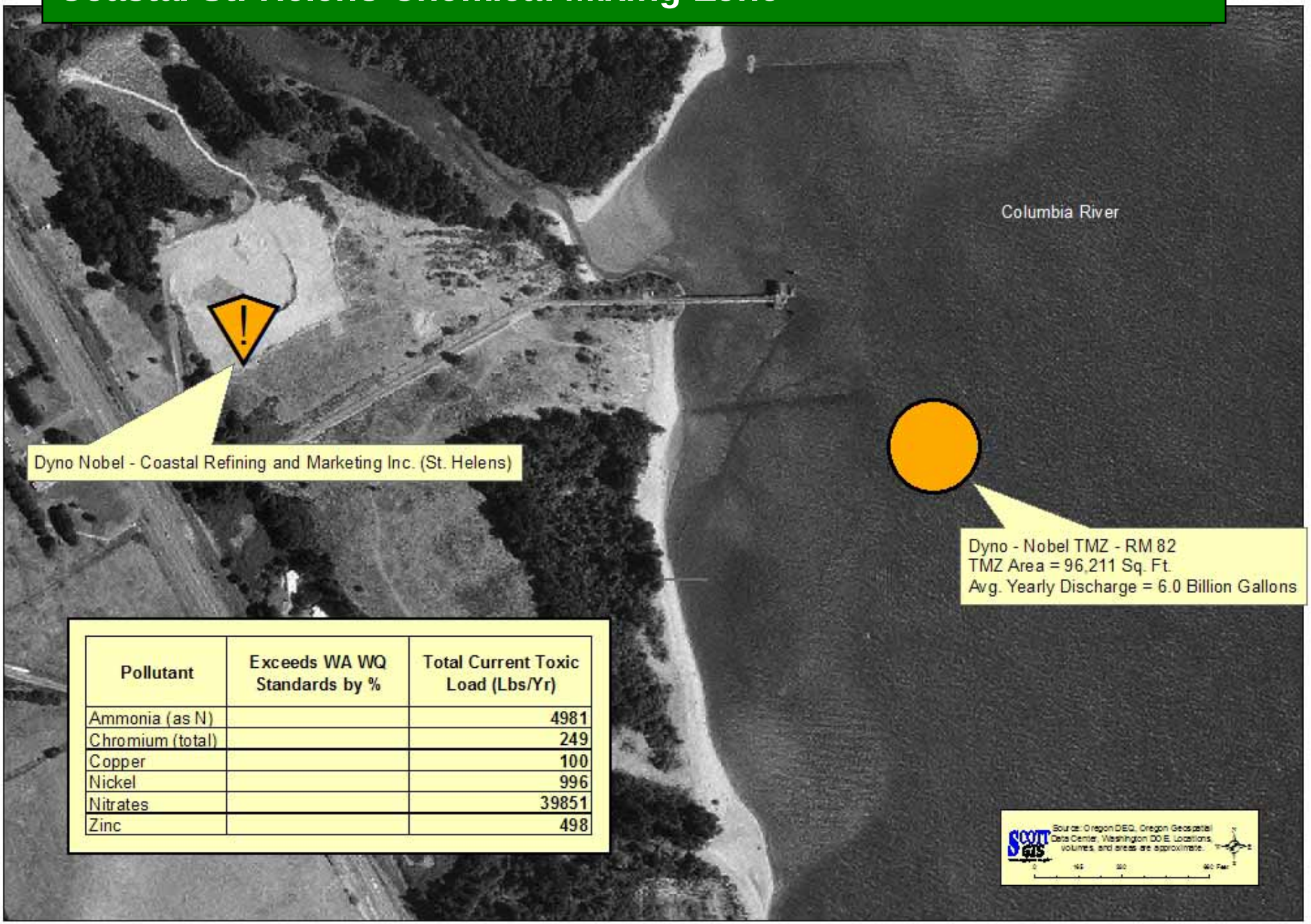
Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		110
Chromium (total)		9
Copper	235	12
Iron		67
Lead		1
Zinc	23	40

Noveon Kalama, Inc. Toxic Mixing Zone Near Kalama, WA.

Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia		1182212
Cobalt		12385
Copper		25
Cyanide	2592	7881
Iron		14074
Magnesium		900733
Manganese		901
Methyl Chloride		55
Nickel		16
Nitrates		1351099
Tin		5630
Zinc		7

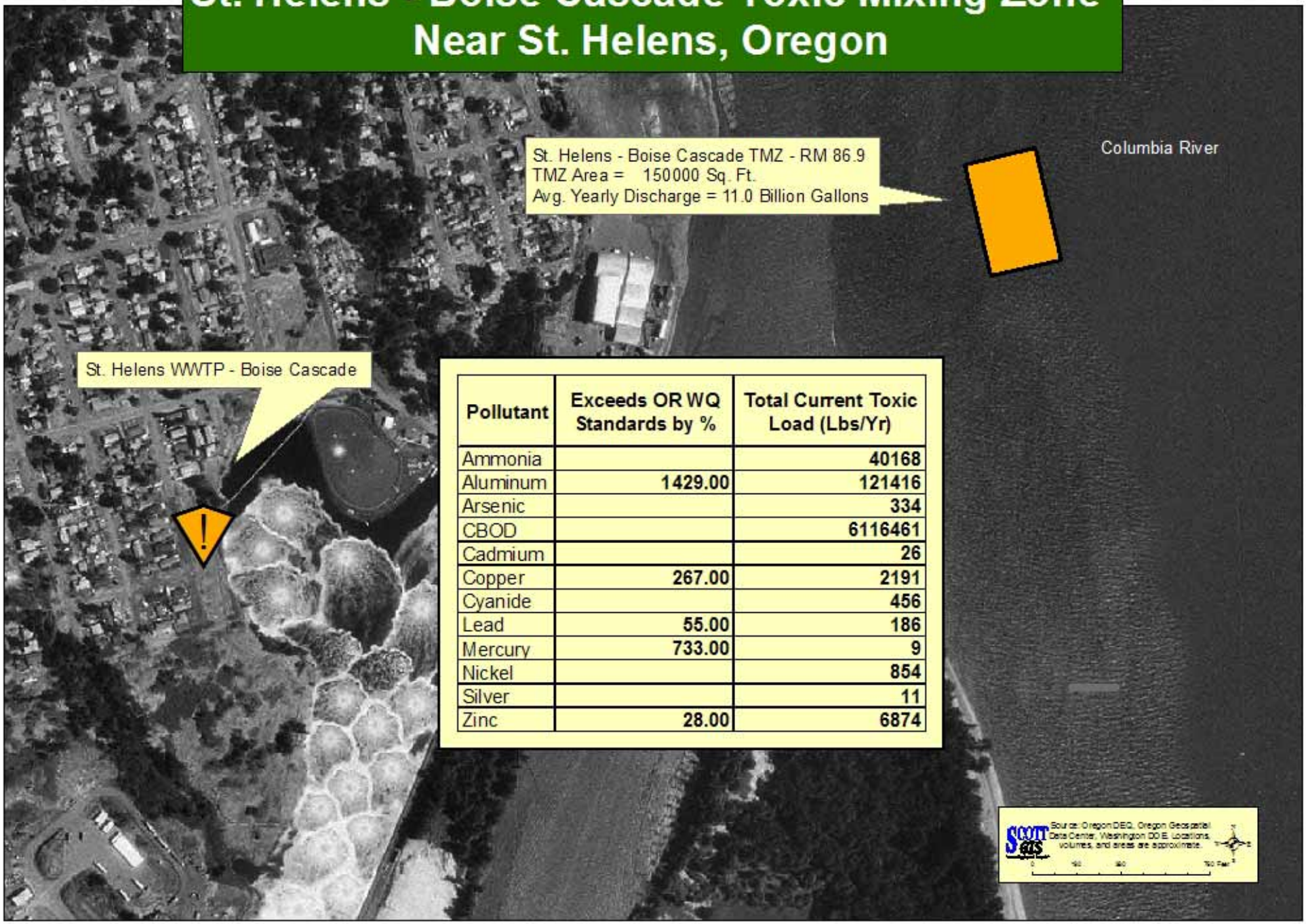


Coastal St. Helens Chemical Mixing Zone



Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia (as N)		4981
Chromium (total)		249
Copper		100
Nickel		996
Nitrates		39851
Zinc		498

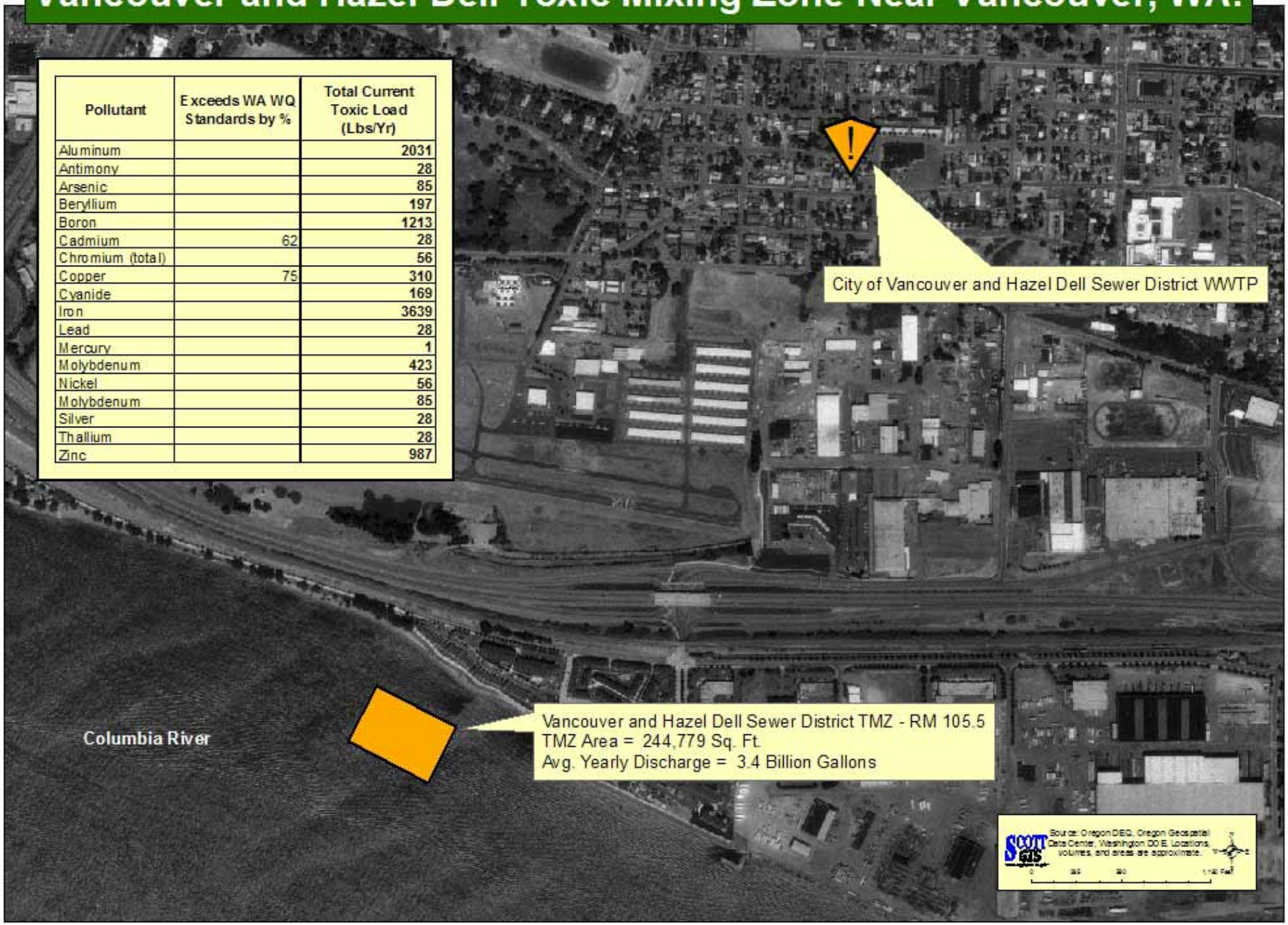
St. Helens - Boise Cascade Toxic Mixing Zone Near St. Helens, Oregon



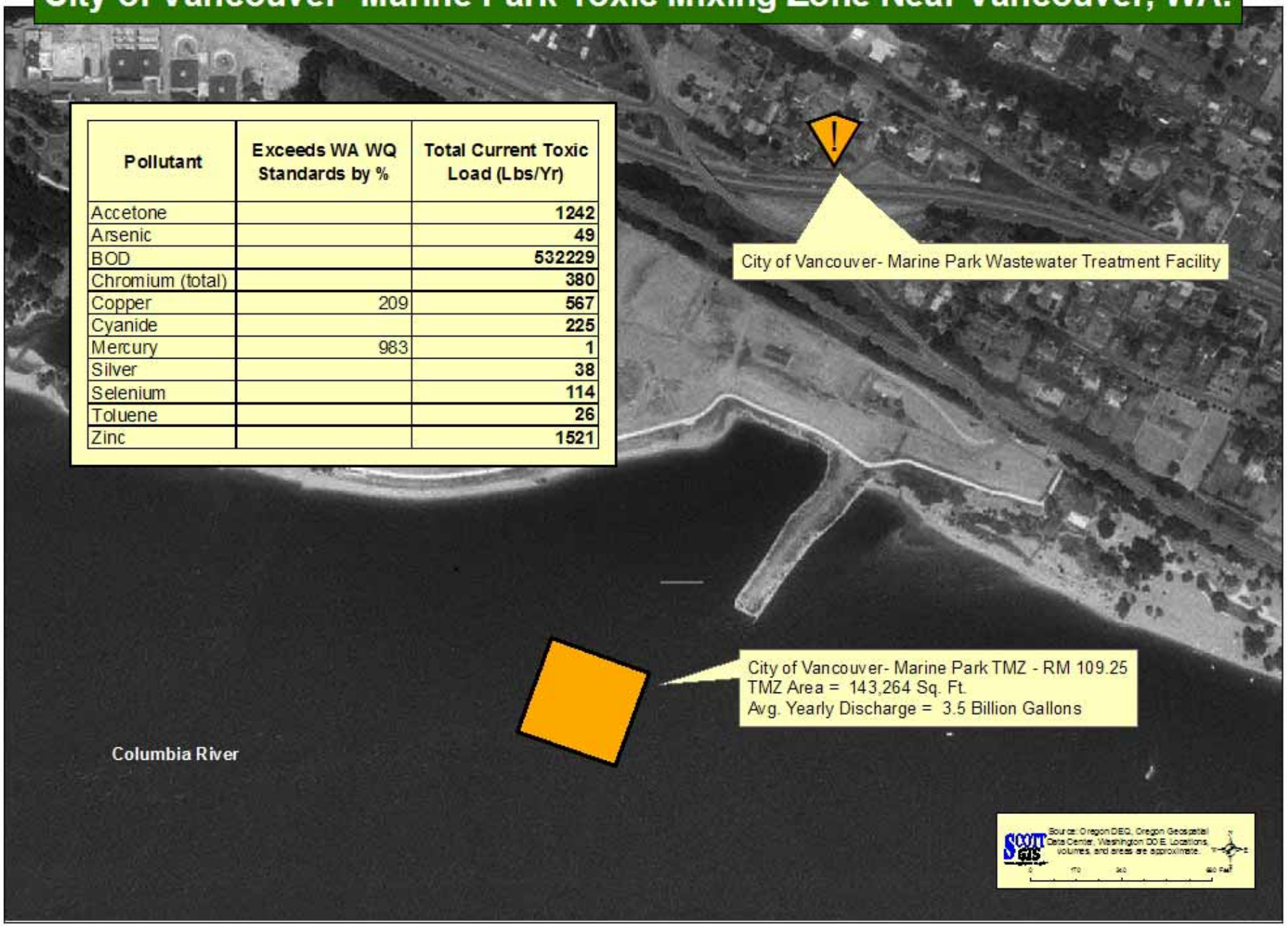
Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia		40168
Aluminum	1429.00	121416
Arsenic		334
CBOD		6116461
Cadmium		26
Copper	267.00	2191
Cyanide		456
Lead	55.00	186
Mercury	733.00	9
Nickel		854
Silver		11
Zinc	28.00	6874

Vancouver and Hazel Dell Toxic Mixing Zone Near Vancouver, WA.

Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		2031
Antimony		28
Arsenic		85
Beryllium		197
Boron		1213
Cadmium	62	28
Chromium (total)		56
Copper	75	310
Cyanide		169
Iron		3639
Lead		28
Mercury		1
Molybdenum		423
Nickel		56
Molybdenum		85
Silver		28
Thallium		28
Zinc		987



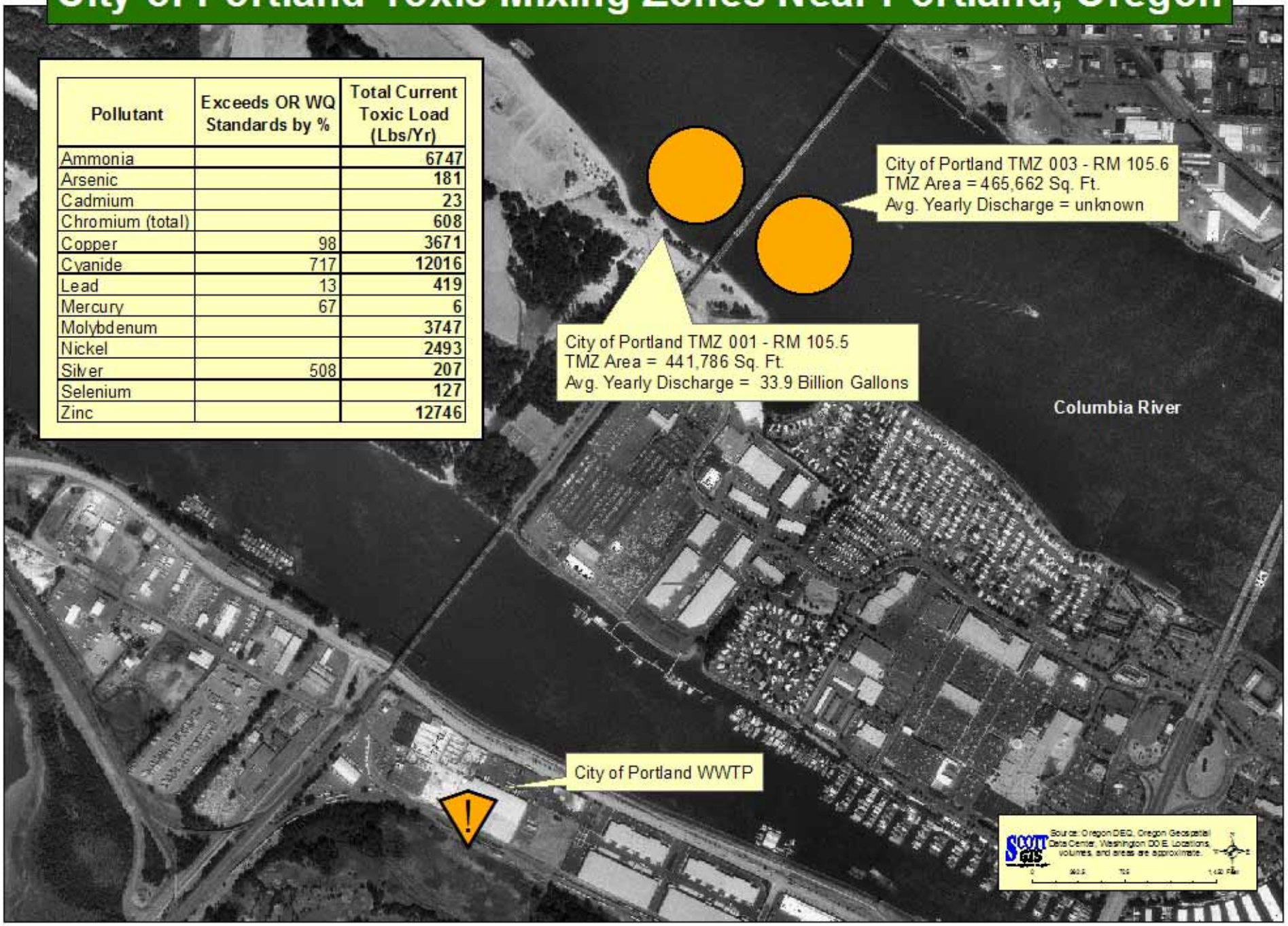
City of Vancouver- Marine Park Toxic Mixing Zone Near Vancouver, WA.



Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Accetone		1242
Arsenic		49
BOD		532229
Chromium (total)		380
Copper	209	567
Cyanide		225
Mercury	983	1
Silver		38
Selenium		114
Toluene		26
Zinc		1521

City of Portland Toxic Mixing Zones Near Portland, Oregon

Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia		6747
Arsenic		181
Cadmium		23
Chromium (total)		608
Copper	98	3671
Cyanide	717	12016
Lead	13	419
Mercury	67	6
Molybdenum		3747
Nickel		2493
Silver	508	207
Selenium		127
Zinc		12746



City of Gresham Mixing Zone

Georgia Pacific Toxic Mixing Zone Near Camas, WA.

Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia		**319699**
Aluminum		**125707**
Barium		**20175**
BOD		**7449303**
Boron		**9312**
Chromium (total)		**1242**
Copper	75	**1707**
Iron		**128811**
Magnesium		**398848**
Manganese		**89547**
Nitrates		**62078**
Titanium		**4345**

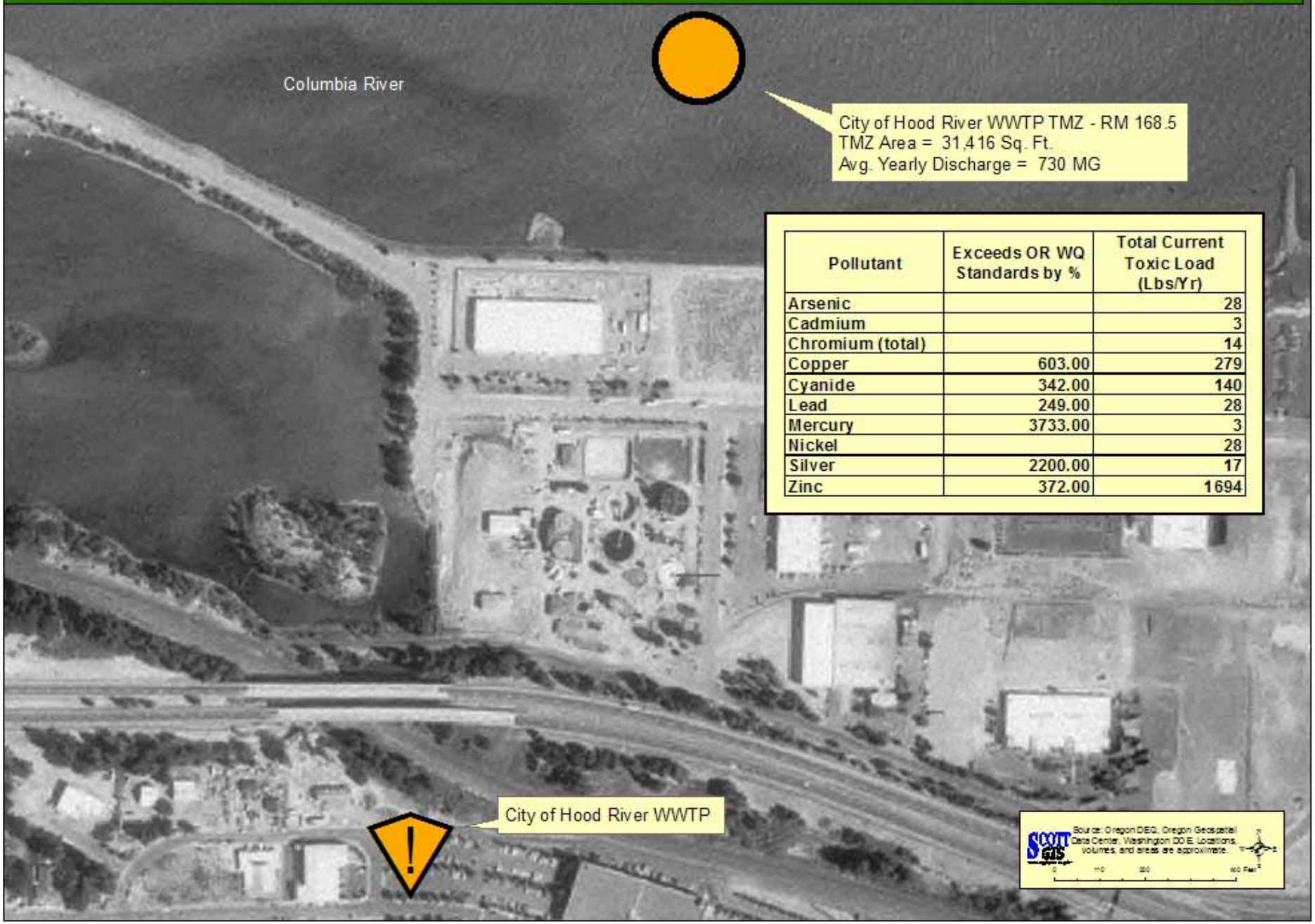
Reynolds Metals Company Mixing Zone Near Troutdale, OR

Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		874
Antimony		3
Arsenic		3
Copper		5
Cyanide		5
Lead		2
Nickel		42
Zinc		20

City of Troutdale Mixing Zone Near Troutdale, OR

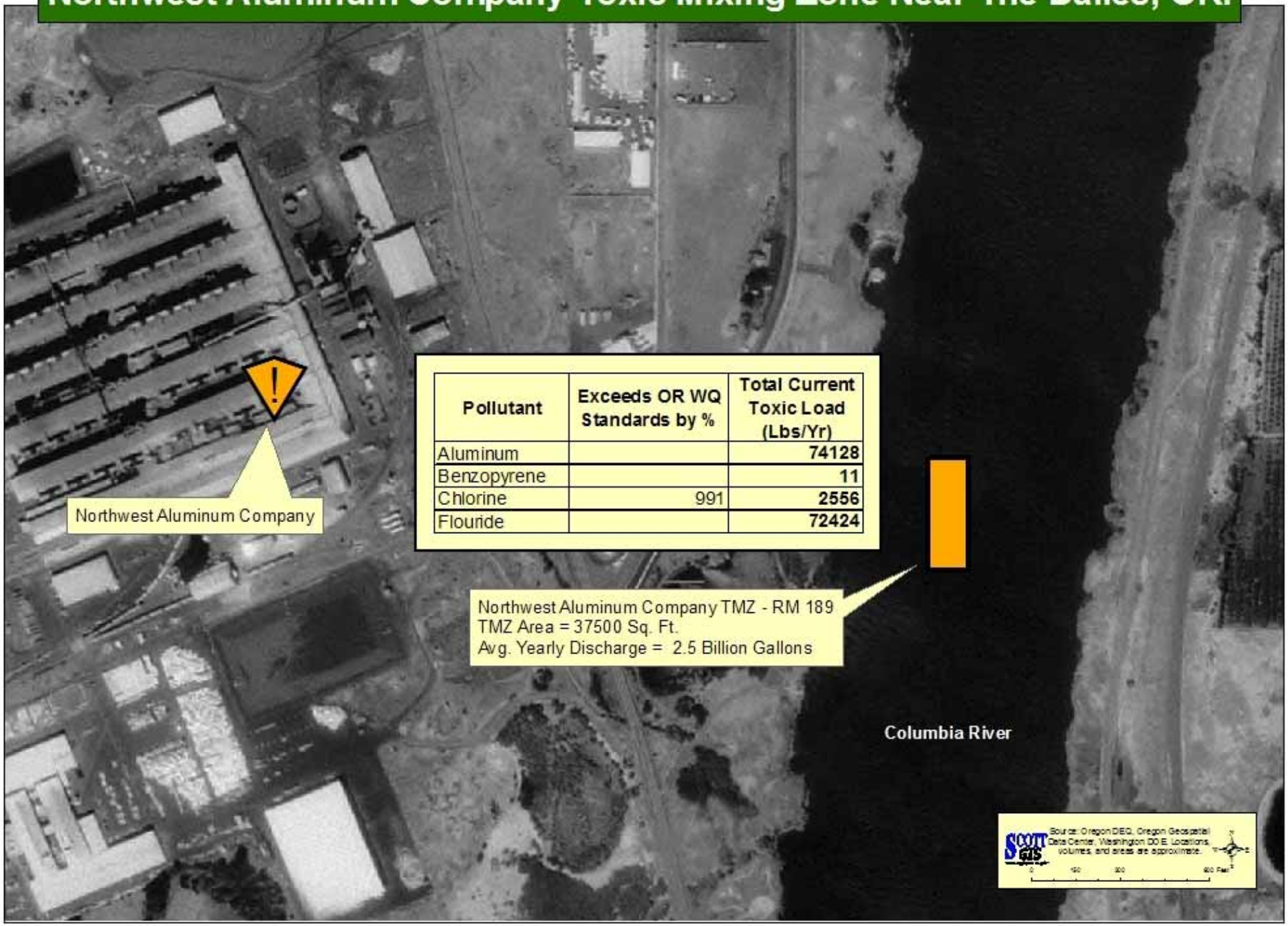
Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Ammonia		22019
Arsenic		6
BOD		273871
Cadmium		1
Chromium (total)		3
Copper		18
Lead		1
Molybdenum		8
Nickel		288
Nitrates		136935
Selenium		4
Silver		1
Zinc		155

Hood River WWTP Toxic Mixing Zone Near Hood River, Oregon



Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Arsenic		28
Cadmium		3
Chromium (total)		14
Copper	603.00	279
Cyanide	342.00	140
Lead	249.00	28
Mercury	3733.00	3
Nickel		28
Silver	2200.00	17
Zinc	372.00	1694

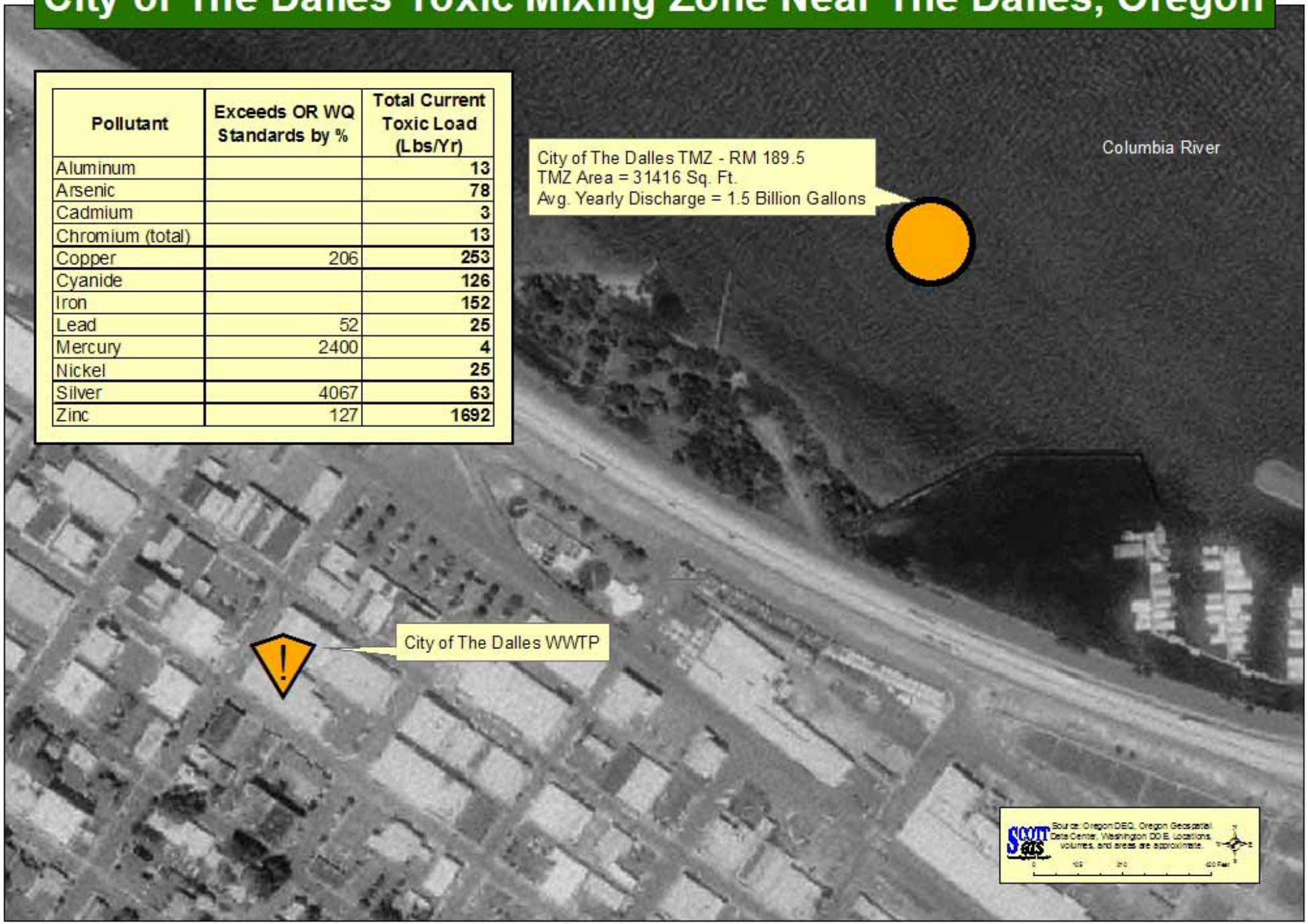
Northwest Aluminum Company Toxic Mixing Zone Near The Dalles, OR.



Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		**74128**
Benzopyrene		**11**
Chlorine	991	**2556**
Flouride		**72424**

City of The Dalles Toxic Mixing Zone Near The Dalles, Oregon

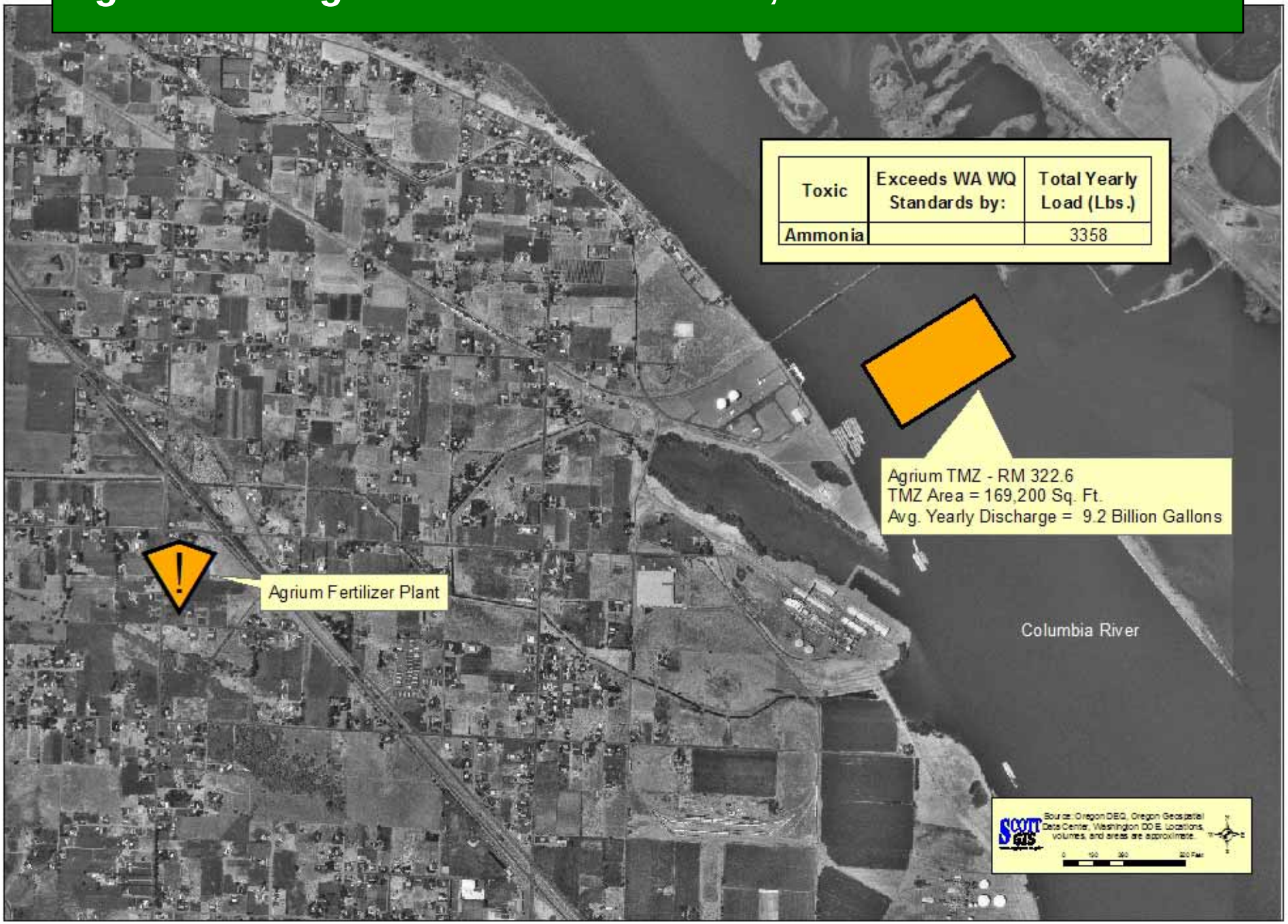
Pollutant	Exceeds OR WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		**13**
Arsenic		**78**
Cadmium		**3**
Chromium (total)		**13**
Copper	206	**253**
Cyanide		**126**
Iron		**152**
Lead	52	**25**
Mercury	2400	**4**
Nickel		**25**
Silver	4067	**63**
Zinc	127	**1692**



Boise Cascade Toxic Mixing Zone Near Wallula, Washington

Pollutant	Exceeds WA WQ Standards by %	Total Current Toxic Load (Lbs/Yr)
Aluminum		60790
Antimony		1193
Barium		12214
BOD		3647401
Boron		5062
Cadmium	143	85
Chloroform		284
Chromium (total)		1136
Copper	219	1136
Iron		51188
Magnesium		426098
Manganese		24657
Mercury	733	6
Methyl Chloride		852
Nickel		51
Nitrates		173848
Silver	2233	159
Titanium		1886
Zinc	52	5113

Agrium Mixing Zone Near Kennewick, WA



Literature cited

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[2] *Id.*

[3] *Id* at E-6.

[4] The Second CERCLA Five-Year Review Report for the Hanford Site, U.S. Dept. of Energy, DOE/RL-2006-20 Revision-1(2006).

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[6] Final Report Lower Columbia River Bi-State Program, The Health of the River 1990 to 1996, Integrated Technical Report. 1990-1996. Tetra Tech (1996).

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[8] Webb MA, Feist GW, Fitzpatric MS, Foster EP, Schreck CB, Plumlee M., Gundersen DT. Mercury concentrations in gonad, liver, and muscle of white sturgeon Acipenser transmontanus in the Lower Columbia River. Arch. Ennviron. Contam . Toxicol. 50, 443-451 (2006).

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[10] Analysis of Oregon Urban Runoff Water Quality Monitoring Data Collected from 1990 to 1996. Oregon Assoc. of Clean Water Agencies, prepared by Eric Strecker, Binhong Wu, Michael Iannelli, Woodward-Clyde (1997).

[11] As explained, while federal Toxics Reporting Inventory data does provide estimated toxic releases information from some facilities it is not broadly considered accurate or relied on by agencies as a part of their NPDES pollution permitting efforts.

[12] Specifically, data was generally obtained from EPA Form 2C (for industrial dischargers) and EPA Form 2A (for municipal dischargers).

[13] Oregon does have an aluminum standard but it is only applicable to low ph soft waters.