ORANGE COUNTY
OC Community Resources
Our Community. Our Commitment.

J. Cofrancesco SW

SAN DIEGO REGIONAL
WATER QUALITY
CONTROL BOARD

2012 FEB -7 A 7:22

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DIRECTOR
OC COMMUNITY RESOURCES

RYAN DRABEK
DIRECTOR
OC ANIMAL CARE

KAREN ROPER
DIRECTOR
OC COMMUNITY SERVICES

MARK DENNY
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OC PARKS

HELEN FRIED
COUNTY LIBRARIAN
OC PUBLIC LIBRARIES

February 6, 2012

San Diego Regional Water Quality Control Board
9174 Sky Park Court Suite 100
San Diego CA 92123-4353

Attention: Mr. Bob Morris

Subject: Submittal of the Report of Waste Discharge (ROWD) for the County of Orange, OC Parks Laguna Niguel Lake

Dear Mr. Morris,

Attached for your review is the completed ROWD Application requesting approval for OC Parks to contract with Aquatechnex, LLC for the application of Phoslock within Laguna Niguel Lake. The primary objective of the Phoslock application is to improve water quality within the lake. Also with this submittal is the CEQA determination and reference material for the Phoslock technology.

If you have any questions regarding this submittal or require additional information please contact the undersigned at (949) 585-6441.

Sincerely,

Robin M. LaMont

Robin M. LaMont
NPDES Coordinator
OC Parks/Design Division

OCparks
13042 OLD MYFORD ROAD
IRVINE, CA 92602
PHONE: 866.OCPARKS
FAX: 714-667-6511

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. Facility:

Name: Laguna Niguel Regional Lake			
Address: 28241 La Paz Road			
City: Laguna Niguel	County: Orange	State: CA	Zip Code: 92677
Contact Person: Robin LaMont,NPDES Coordinator		Telephone Number: 949-585-6441	

B. Facility Owner:

Name: OC Parks			Owner Type (Check One) 1. ☐ Individual 2. ☐ Corporation
Address: 13042 Old Myford Road			3. ☑ Governmental Agency 4. ☐ Partnership
City: Irvine	State: CA	Zip Code: 92602	5. ☐ Other:
Contact Person: Steve Bonhall, Park Division Manager	Telephone Number: 714-973-6632	Federal Tax ID: 95-60000928	

C. Facility Operator (The agency or business, not the person):

Name: OC Parks			Operator Type (Check One) 1. ☐ Individual 2. ☐ Corporation
Address: 13042 Old Myford Road			3. ☑ Governmental Agency 4. ☐ Partnership
City: Irvine	State: CA	Zip Code: 92602	5. ☐ Other:
Contact Person: John Gannaway, Park Division Manager	Telephone Number: 714-973-6864		

D. Owner of the Land:

Name: County of Orange/OC Parks			Owner Type (Check One) 1. ☐ Individual 2. ☐ Corporation
Address: 13042 Old Myford Road			3. ☑ Governmental Agency 4. ☐ Partnership
City: Irvine	State: CA	Zip Code: 92602	5. ☐ Other:
Contact Person: Steve Bonhall, Park Division Manager	Telephone Number: 714-973-6632		

E. Address Where Legal Notice May Be Served:

Address: 13042 Old Myford Road		
City: Irvine	State: CA	Zip Code: 92602
Contact Person: Steve Bonhall, Park Division Manager	Telephone Number: 714-973-6632	

F. Billing Address:

Address: 13042 Old Myford Road		
City: Irvine	State: CA	Zip Code: 92602
Contact Person: Steve Bonhall, Park Division Manager	Telephone Number: 714-973-6632	

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☐ **A. WASTE DISCHARGE TO LAND** ☑ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

- ☐ Domestic/Municipal Wastewater Treatment and Disposal
- ☐ Cooling Water
- ☐ Mining
- ☐ Waste Pile
- ☐ Wastewater Reclamation
- ☐ Animal Waste Solids
- ☐ Land Treatment Unit
- ☐ Dredge Material Disposal
- ☐ Surface Impoundment
- ☐ Industrial Process Wastewater
- ☐ Animal or Aquacultural Wastewater
- ☐ Biosolids/Residual
- ☐ Hazardous Waste (see instructions)
- ☐ Landfill (see instructions)
- ☐ Storm Water
- ☑ Other, please describe: Phoslock-phosphorous binding compound, bentonite clay affixed with Lanthanum

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)	2. Latitude	3. Longitude
Facility: 65406129	**Facility:** 33°32'50.10N	**Facility:** 117°42'31.33W
Discharge Point: 65406129	**Discharge Point:** 33°32'49.72"W	**Discharge Point:** 117°42"19.35"W

IV. REASON FOR FILING

- ☑ New Discharge or Facility
- ☐ Changes in Ownership/Operator (see instructions)
- ☐ Change in Design or Operation
- ☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
- ☐ Change in Quantity/Type of Discharge
- ☐ Other: _____

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: State Water Resource Control Board

Has a public agency determined that the proposed project is exempt from CEQA? ☑ **Yes** ☐ **No**

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: Categorial Exemption. CEQA document is attached.

Has a "Notice of Determination" been filed under CEQA? ☑ **Yes** ☐ **No**

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☐ **Negative Declaration** **Expected CEQA Completion Date:** Completed 01/2012

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

Discharge parameters at Laguna Niguel Lake: 31.3acres, mean depth 12'; Phoslock application at 98mg/L=45 Metric Tons; 5%Lanthanum=4.9mg La/L; Peak level of Lanthanum in the water column=.25mg Lanthanum per liter

*****See attached Phoslock Documentation for additional characteristics of discharge*****

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: Michael Brandt Title: Deputy Director of Operations

Signature: [signature] Date: 1-5-2012

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

Form 200 (6/97)

OC PLANNING
300 N. FLOWER STREET, P. O. BOX 4048
SANTA ANA, CALIFORNIA 92702-4048
NOTICE OF EXEMPTION

TO: County Clerk, County of Orange
FROM: COUNTY OF ORANGE PLANNING
Initial Study Number: IP12-006

Project Title: Project - IP12-006

Description, Nature, Purpose and Beneficiaries of Project: A Phoslock Application to Laguna Lake for Phosphorous Removal - The project is designed to limit the available phosphorous for excess algae growth, and improve the water quality. The phosporous binding material Phoslock will be applied to Laguna Niguel Lake for this purpose. Application will be performed by mixing the Phoslock granule into slurry and spreading evenly over the lake surface. The slurry slips phosphorous from the water column as it sinks and caps the sediment on the lake bottom to prevent additional internal phosphorous loading. Application rates will be calculated by lab analysis of total and free reactive phosphorous from the water, sediment and water source.

PROJECT LOCATION: The project site is Laguna Niguel Regional Park located on 28241 La Paz Road, around the intersection of La Paz Road and Crown Valley Parkway in the City of Laguna Niguel.

Name of Public Agency Approving Project: County of Orange Board of Supervisors
Applicant or Agency Carrying Out Project: County of Orange Park Services - Park Designs

Address: 13042 Old Myford Road Irvine CA. 92602.
Exempt Status: (Check One)
☐ Ministerial (Sec. 15268)
☐ Declared Emergency (Sec. 15269) **Date of Decision:** _____
☐ Emergency Project (Sec. 15269)
☐ General Rule (Sec. 15061)
☐ Statutory Exemption: State Code number:
☒ Categorical Exemption: State class and section number: Classes 1 & 8; Sections 15301 & 15308
Reasons why project is exempt: Classes 1 & 8 (Existing Facilities) and (Actions by Regulatory Agencies for protection of the Environment),

Project Contact Person: Mark Estoque Phone: (949) 585-6412
CEQA Contact Person: Chris Uzo-Diribe Phone: (714) 667-8845

Signature: Mark Estoque
Title: ENVIRONMENTAL ENGINEERING SPECIALIST

Fish & Game Fees: Pursuant to Section 711.4 (c) (2)(A) of the California Fish and Game Code, this project is exempt from the required fees, as it is exempt from CEQA.

FILED
JAN 11 2012
TOM DALY, CLERK-RECORDER
By _____ DEPUTY

POSTED
JAN 11 2012
TOM DALY, CLERK-RECORDER
By _____ DEPUTY

Recorded in Official Records, Orange County
Tom Daly, County Recorder
NO FEE
201285000030 2:00 pm 01/11/12
281 OR03 Z01
0.00 50.00 0.00 0.00 0.00 0.00 0.00 0.00

OC PLANNING
300 N. FLOWER STREET, P. O. BOX 4048
SANTA ANA, CALIFORNIA 92702-4048
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Reasons why project is exempt: Classes 1 & 8 (Existing Facilities) and (Actions by Regulatory Agencies for protection of the Environment),

Project Contact Person: Mark Estoque Phone: (949) 585-6412
CEQA Contact Person: Chris Uzo-Diribe Phone: (714) 667-8845

Signature: _____

Title: _____

Fish & Game Fees: Pursuant to Section 711.4 (c) (2)(A) of the California Fish and Game Code, this project is exempt from the required fees, as it is exempt from CEQA.

ATTACHMENT 2

RECOMMENDED CEQA STATEMENT/ACTIONS AND FINDINGS FOR STAFF REPORTS/ASRs

A. CEQA COMPLIANCE STATEMENT (FOR TEXT OF STAFF REPORT/ASR):

The CEQA compliance statement, located in the text of the staff report or body of the ASR under "Additional Data", shall include the following statement unless advised otherwise by County Counsel or the Manager, OC Community Development.

In accordance with CEQA Guidelines, Sections 15301 and 15308, Classes 1 & 8 (Existing Facilities) and (Actions by Regulatory Agencies for protection of the Environment), proposed project is exempt from the provisions of CEQA, which reflects the independent judgment of the lead agency, Orange County, and satisfies the requirements of CEQA. The project is exempt because it involves improvement of an existing facility for protection of the environment.

B. RECOMMENDED ACTION STATEMENT FOR APPROVING PROJECT:

State law requires that the decision-maker, prior to approval of the project for which it has been prepared, take action on a CEQA document. The following action must be taken before action on the project, unless directed otherwise by County Counsel or the Manager, OC Community Development.

Find that the proposed project is Categorically Exempt from CEQA per **Sections 15301 and 15308, Classes 1 & 8 (Existing Facilities) and (Actions by Regulatory Agencies for protection of the Environment),** of the CEQA Guidelines.

Note that the following finding is an administrative finding and it is not necessary to include in the findings for the decision-maker:

FISH AND GAME CODE FINDING FOR APPROVAL OF PROJECT:

Find that pursuant to Section 711.4 of the California Fish and Game Code, this project is exempt from the required fees as it has been determined that the project is Categorically Exempt under CEQA.

ATTACHMENT 1

FILING CEQA DOCUMENTS WITH THE COUNTY CLERK

Your division will be responsible for filing the Notice of Exemption (NOE) with the County Clerk for your project. **County projects are exempt per Government Code 6103 from the $50.00 filing fee normally charged by the County Clerk**. You must, however, obtain a fee receipt from the County Clerk, which must then be turned in immediately to OCPW/OC Planning.

Within 5 days of project approval by the decision-maker, (Board, Planning Commission, Zoning Administrator, Subdivision Committee, etc.) on a project, an NOE must be filed with the County Clerk.

Note: According to Section 711.4 (c)(2)(A) CEQA exempt projects are automatically exempt from Fish and Game Fees and do not require a finding. You will need to fill in the information on the NOE form and get an original authorizing signature from your division after the approval action on your project. You will need to take the original set and at least one set of copies to the EIR Clerk located in the *Recorders/Clerks Office, Building 12, Civic Center Plaza. The Clerk will stamp the NOE and keep the* original set. The Clerk will issue a receipt for the environmental document, which must be returned to OC Planning by the end of the day.

Please note the following:

The filing of a Notice of Exemption (NOE) is not required by law. However, it dramatically reduces the statute of limitations on lawsuits regarding the CEQA finding. Therefore, it is strongly recommended that an NOE be filed.

County of Orange **MEMO**

DATE: January 10, 2012

TO: Mark Estoque, OC Parks

FROM: Chris Uzo-Diribe, OC Planning - Environmental Services

SUBJECT: Phoslock Application to Laguna Lake Project - IP12-006

PROJECT DESCRIPTION: A Phoslock Application to Laguna Lake for Phosphorous Removal - The project is designed to limit the available phosphorous for excess algae growth, and improve the water quality. The phosporous binding material Phoslock will be applied to Laguna Niguel Lake for this purpose. Application will be performed by mixing the Phoslock granule into slurry and spreading evenly over the lake surface. The slurry slips phosphorous from the water column as it sinks and caps the sediment on the lake bottom to prevent additional internal phosphorous loading. Application rates will be calculated by lab analysis of total and free reactive phosphorous from the water, sediment and water source.

PROJECT LOCATION: The project site is Laguna Niguel Regional Park located on 28241 La Paz Road, around the intersection of La Paz Road and Crown Valley Parkway in the City of Laguna Niguel.

CEQA DETERMINATION: The CEQA review for the subject project has been completed by OC Planning, which has determined that the proposed project is exempt from the provisions of CEQA. The following is attached to this memo for your consideration:

I. Instructions for Filing CEQA Documents with the County Clerk.
II. CEQA Statements, Actions and Findings, which should be used for Project Staff Reports, including:
   A. CEQA Compliance Statement for Staff Reports; and
   B. Recommended Finding for an Exempt Project; and
III. Notice of Exemption

If clarification is needed regarding this Memo or if there are questions, please contact the following staff person from OC Planning/Current & Environmental Services:
Staff Contact: Chris Uzo-Diribe Telephone Number: 714 667-8845
Rick Lefeuvre, Director, OC Planning

By: _____ Date: 1/10/12
Title: Manager, OC Community Development

Attachments:
Attachment 1: Filing Instructions for County Clerk
Attachment 2: Recommended CEQA Statements, Actions, Findings
Attachment 3: NOE

PLANNING & DEVELOPMENT SERVICES DEPARTMENT
Environmental Planning Services Division

ENVIRONMENTAL INFORMATION

1. PROJECT TITLE:
Phoslock Application to Laguna Niguel Lake for Phosphorous removal

2. PROJECT LOCATION:
Laguna Niguel Regional Park 28241 La Paz Rd. Laguna Niguel, CA 92677

3. PROJECT DESCRIPTION:
This project is designed to limit the available phosphorous for excess algae growth, and improve the water quality. The phosphorous binding material Phoslock will be applied to Laguna Niguel Lake for this purpose

Application will be performed by mixing the Phoslock granule into slurry and spreading evenly over the lake surface. The slurry strips phosphorous from the water column as it sinks, and caps the sediment on the lake bottom to prevent additional internal phosphorous loading. Application rates will be calculated by lab analysis of total and free reactive phosphorous from the water, sediment, and water source.

4. EXISTING ENVIRONMENTAL CONDITIONS:
Laguna Niguel Lake (*Sulfur Creek Reservoir*) is a 31 acre reservoir, containing approximately 379acre feet of water volume. The lake is a storm catchment basin for sulfur creek, and has a dam and spillway at the northeast end to maintain constant lake level and water exchange. Laguna Niguel Lake suffers from poor water quality due to excessive phosphorous levels (average 127parts per billion in the water, 1,165ppb in the sediment). These levels create a hypereutrophic (nutrient polluted) condition that results in excess algae growth. Algae have established a monoculture in the lake and created an imbalance in the lake ecology. These nutrient levels present a threat to the health of all other aquatic life in the lake.

5. ITEMIZATION OF ATTACHED SUPPORT DATA:
- Area location map
- Phoslock characterization and toxicity data

6. PREVIOUS COUNTY ACTION(S) AND/OR ENVIRONMENTAL DOCUMENTATION:
Previous Phoslock applications performed on Mason and Mile Square Regional Parks in 11/10,5/11,and 11/11.

7. GOVERNMENT APPROVALS REQUIRED:
Orange County Board of Supervisors (CEQA determination)
San Diego Regional Water Quality Control Board (NPDES)

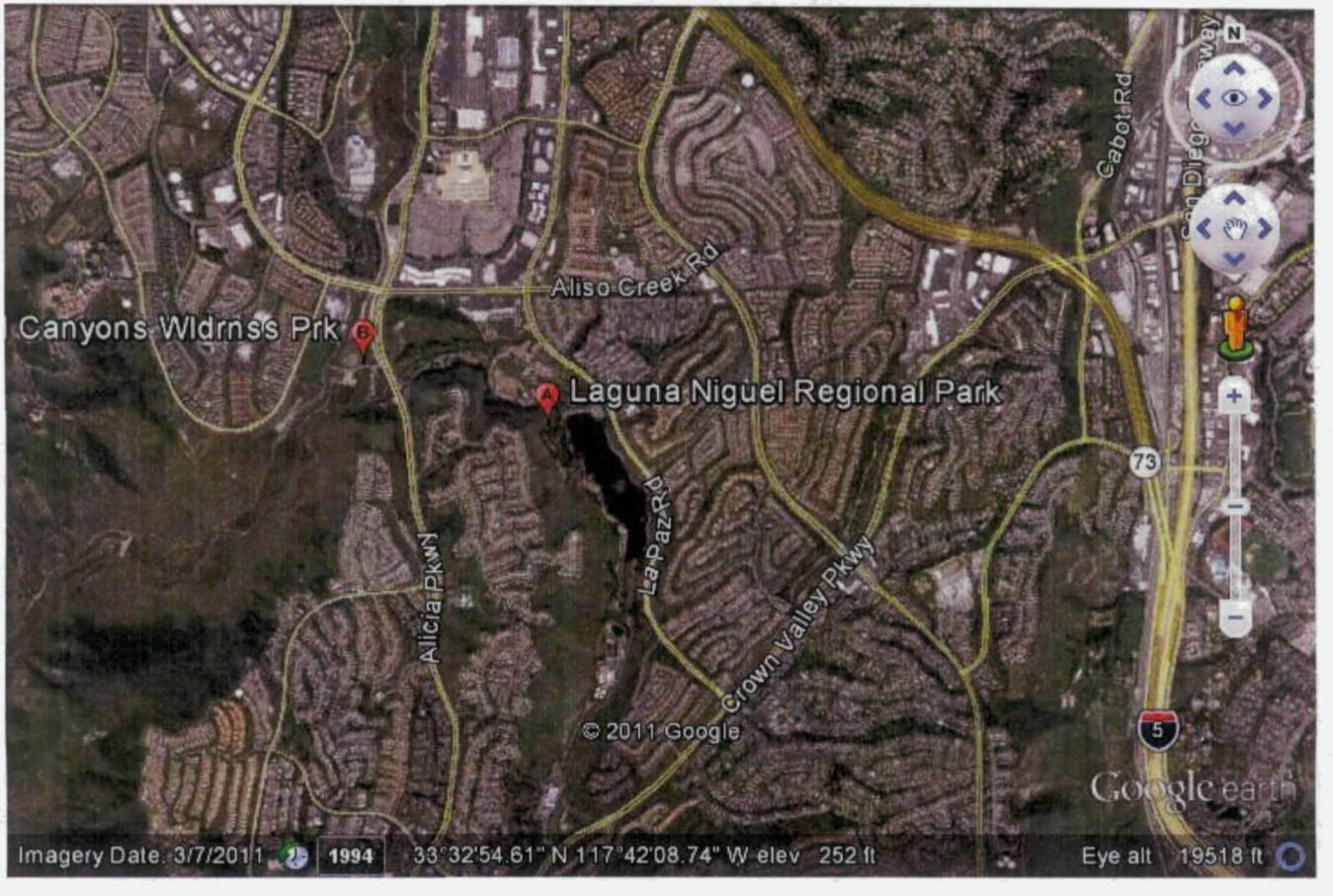
8. APPLICANT OR AGENCY CARRYING OUT THE PROJECT:
Aquatechnex, LLC for OCParks under lake management contract

9. CONTACT PERSON(S) Please include phone number:
Ian Cormican, Aquatechnex, LLC (760)272-5842 ian@aquatechnex.com

10. DECLARATION:
I hereby declare that the statements furnished above, including any attached hereto, represent all information required for this initial evaluation. Said statements, together with any exhibits attached hereto, are true and correct. I hereby agree to pay all required fees for work performed by the County in processing, reviewing, and analyzing the necessary environmental documentation in accordance with adopted County Procedures.

DATE 1-4-12 SIGNATURE

Map of Laguna Niguel Lake—Proposed Discharge Site



PHOSLOCK®
Phosphorus Locking Technology

An Overview of Phoslock and Use in Aquatic Environments

What is Phoslock?

Phoslock is a patented phosphorus locking technology containing lanthanum (5%), a naturally occurring earth element, embedded inside a clay matrix (~95%). Phoslock was developed by the Australian national science agency, Commonwealth Scientific and Industrial Research Organization (CSIRO), to remove phosphorus from water bodies and restore water quality. Phoslock is produced through a patented ion exchange process whereby lanthanum ions displace sodium ions within the clay matrix. The formulation process of Phoslock absorbs lanthanum into a non-toxic carrier such that the lanthanum retains its capacity to bind phosphate when applied to aquatic environments and results in a non-toxic mineral that becomes an inert component of the sediments.

For over ten years, Phoslock has been successfully used in water resource restoration programs around the world to remove free reactive phosphorus and restore water quality. Although Phoslock is a new technology to the United States (2010), it is rapidly emerging as the most effective phosphorus inactivation and water quality restoration solution for ponds, lakes and reservoirs.

How does Phoslock work?

Following an application of Phoslock, the lanthanum ions sorbed to the clay matrix react preferentially with free phosphate compounds in water (removing free reactive phosphorus) and rapidly form a highly stable insoluble mineral. The resulting mineral complex becomes integrated as an inert component into the natural sediments of the waterbody and is not bio-available. Due to the specificity of Phoslock to phosphate, as long as binding sites are available, it will continually bind new incoming phosphorus from internal and external sources.

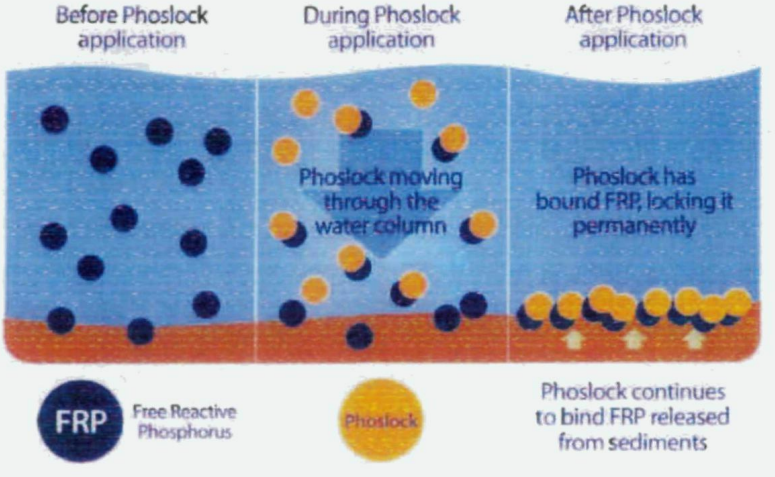


Figure 1. *Illustration of the binding of Phoslock with Free Reactive Phosphorus (via phosphate bond) in water and as it is released from sediments.*

[1]Throughout this document, we use the phrase negligible risk. Risk is the probability of occurrence of an adverse effect from a given exposure to a substance. All substances have an inherent hazard (capacity to cause adverse effects). However, the risk of a potential adverse effect is managed by the product formulation, use directions, application rates and exposure. Phoslock at appropriate uses and dosing will result in negligible or insignificant risk.

Ecological Assessment

To assess and manage possible environmental impacts of a product, it is important to understand the potential risks associated with its use. The objective of the following information is to describe existing toxicity data on the product and assess any potential risks to the aquatic environment. Typical Phoslock application rates are < 100 mg/L. Phoslock applications may occur as a single event or over several days and also may be split over a season or multiple seasons depending on the site and management objective.

Evaluation of Lanthanum Toxicity

Lanthanum is a naturally occurring earth element. Lanthanum can occur in many forms. One such form, lanthanum chloride ($LaCl_3$) can be potentially toxic to aquatic organisms due to the dissolution of high levels of free lanthanum into water after application. This prohibits the use of $LaCl_3$ as an environmentally compatible phosphorus mitigation solution. However, when lanthanum is applied to surface waters in the form of Phoslock, the risk of potential lanthanum toxicity to aquatic organisms is negligible due to the unique formulation of Phoslock (absorbed to the clay matrix) and a limited potential for exposure to free lanthanum. When Phoslock is applied to water, lanthanum associated with the clay in Phoslock preferentially and rapidly binds with phosphate (PO_4), forming a highly stable mineral called rhabdophane ($LaPO_4$). This resulting rhabdophane complex has a very low solubility ($K_{sp} < 10^{-27}$) and is not influenced by changes in pH and redox reactions in waterbody sediments, thus is not bio-available. Lanthanum can only be extracted from rhabdophane in the laboratory using strong acid extraction methods.

Laboratory studies with Phoslock demonstrated that no lanthanum released within 24 hours when granular Phoslock (10 mg/L) was dissolved in de-ionized water; and only a small concentration of lanthanum (~0.016 mg/L or 3% of the total lanthanum in Phoslock) was released from the 10 mg/L concentration of Phoslock when dissolved in low alkalinity natural water or synthetic soft water (*Yasseri and Nowak 2008*).

Even if the total amount of lanthanum applied to a system following a Phoslock application became readily available in water (which it does not due to the Phoslock formulation and the fact that lanthanum binds to phosphates in water), the margin of safety associated with lanthanum toxicity is very high. For example, free lanthanum levels following an application dose of 75 mg/L Phoslock in Barensee Lake, Germany resulted in a peak level of 0.130 mg La^{+3}/L shortly after application and <0.02 mg/L one month later. Toxicity tests from this Barensee Lake project revealed an EC_{50} of 103 mg La^{+3}/L zooplankton (*Daphnia magna*) and EC_{50} of 150 mg La^{+3}/L for fish eggs (*Danio rerio*). The peak level of La^{+3} detected in the lake following application was approximately 800 and 1,150 times lower than the EC_{50} concentrations for zooplankton and fish eggs respectively.

The main potential for free lanthanum in water following a Phoslock application is in waters that have a very low alkalinity (< 20 mg/L) and/or low phosphate concentration (<0.005 mg/L). Typical Phoslock applications are not conducted in waters with low alkalinity and phosphate levels. Even in these low alkalinity aquatic environments, the concentration of dissolved lanthanum associated with the product is very low and below predicted toxicity thresholds. In these systems, risks can be further mitigated by several other assessment and management strategies such as conducting pre-application laboratory "jar tests" using lake water and lowering and/or splitting the Phoslock dose over time through a series of applications. Due to the ability of organisms to readily process lanthanum (through the liver) and the low level of free lanthanum that potentially becomes available for a short period of time following Phoslock applications, the aquatic toxicity risk and hazard to

aquatic organisms is negligible.[1] While free lanthanum can be used in tests to assess the toxicity to organisms, lanthanum in Phoslock, or bound as rhabdophane, is not free and unlikely to become available or achieve concentrations of toxicological concern in the natural aquatic environment.

Exposure to water column biota

The phosphorus removal capacity of Phoslock does not change drastically under different chemical or environmental conditions. From a water chemistry standpoint, the binding and removal of Phoslock is a straight forward process. Phoslock binds to phosphates over a pH range of 4 to 11, and binds to phosphates under aerobic and anaerobic conditions. Water analysis during and after application reveals no significant change in pH and no need to buffer treated waters during or after a Phoslock application. A pH change in the water column, sediment water interface and bottom sediments will not result in a release of lanthanum from Phoslock and phosphorus bound as rhabdophane. Since Phoslock rapidly settles to the sediments, the potential exposure duration to organisms in the water column is relatively short. Also, due to the unique formulation of Phoslock, the lanthanum remains sorbed to the clay until it is displaced by phosphates, and subsequently only disassociates a minimal amount of free lanthanum to the water.

Invertebrates

Data were compiled from numerous different testing agencies on a range of sentinel water column invertebrates. Responses of these zooplankton species, including both mortality and reproduction, were evaluated throughout Phoslock exposures. The data show a wide margin of safety associated with Phoslock (*Table 1*) applications at predicted use rates and environmentally relevant concentrations.

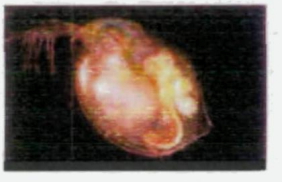


Table 1. Description of Phoslock toxicity experiments with sentinel zooplankton species.

Species	Endpoint	Test Duration	Lowest Observed Effect Concentration (LOEC)*	Water	Reference
Ceriodaphnia dubia	Mortality	48 hours	> 50mg/L Phoslock	Field water	Ecotox 2008
Ceriodaphnia dubia	Reproduction	7 days	> 1mg/L Phoslock	Field water	Ecotox 2008
Ceriodaphnia dubia	Mortality	7 days	> 1mg/L Phoslock	Field water	Ecotox 2008
Ceriodaphnia dubia	Mortality	48 hours	> 12,500 mg/L Phoslock	Synthetic soft	Stauber, 2000
Daphnia magna	Mortality	48 hours	> 50,000 mg/L Phoslock	Synthetic soft	Martin & Hickey, 2004

** Due to the amount of Phoslock needed to result in impacts to biota, many studies did not test concentrations high enough to result in significant impacts, thus toxicity endpoints are reported as greater than the highest concentration tested and does not indicate the actual lowest observed effect levels.*

Fish

The responses of numerous fish species to Phoslock exposures has been evaluated to determine potential risks following application. No mortality or adverse impacts to fish have been observed in field applications in the United States or internationally. Based on data generated for several different fish species (*Table 2*), there is minimal risks to fish expected with applications of Phoslock at standard dose rates in aquatic environments.

Table 2. Description of Phoslock toxicity experiments with sentinel fish species.

Species	Endpoint	Test Duration	Lowest Observed Effect Concentration (LOEC)*	Water	Reference
Melanotaenia duboulayi	Mortality	96 hours	> 50,000 mg/L Phoslock	Synthetic soft	Ecotox 2006a
Oncorhynchus mykiss	Mortality	96 hours	> 3,125 mg/L Phoslock	Synthetic soft	Martin & Hickey, 2004
Oncorhynchus mykiss	Mortality	48 hours	> 13,000 mg/L Phoslock	Natural pond-field	Watson-Leung 2008

** Due to the amount of Phoslock needed to see impacts to biota, many studies did not test concentrations high enough to result in significant results, thus toxicity endpoints are reported as greater than the highest concentration tested and does not indicate the actual lowest observed effect levels.*

Exposure to benthic organisms

When Phoslock settles at the sediment-water interface it forms a thin (1-2 mm) permeable layer that continues to actively bind phosphate released from the sediments or that from inflow. Due to the fine particulate nature of Phoslock, it does not produce a thick flocculent layer at the sediment-water interface. When the lanthanum in Phoslock binds to phosphate, the resulting mineral complex $LaPO_4$ is formed. This stable mineral has a very low water solubility and is not bio-available to benthic organisms. Lanthanum is a naturally occurring earth element and there is a high background concentration in the earth's crust of about 18.3 mg/kg (*Haghseresht 2006*). Concentrations in lake sediments, prior to any Phoslock application, have been measured from 8 to 37 mg/kg dry weight on average and many European river sediments have up to 44 mg/kg dry weight (*Yasseri and Nowak, 2008*). Phoslock applications result in a negligible addition of lanthanum to waterbody sediments.

A variety of different benthic invertebrates have been evaluated in toxicity experiments to determine potential risks associated with Phoslock applications. Responses variables in these studies included survival, emergence time, growth and sex ratio at emergence. Even with long exposure durations and high Phoslock concentrations, no significant impacts were observed with benthic organisms at and above predicted use rates. The predicted risk is negligible and no field toxicity has been observed.

Table 3. Description of Phoslock toxicity experiments with benthic invertebrates.

Species	Endpoint	Test Duration	Lowest Observed Effect Concentration (LOEC)*	Water	Reference
Chironomus zealandicus	Mortality & emergence & sex ratio	38 days	All > 400mg/L Phoslock	Lake water	Clearwater 2004
Chironomus *dilutus*	Mortality	10 days	> 3,400mg/L Phoslock	Pond water	Watson-Leung, 2009
Polypedilum parvidum	Mortality	10 days	> 400mg/L Phoslock	Field water	Clearwater & Hickey 2004
Hyalella azteca	Survival and growth	14 days	> 450mg/L Phoslock	Pond water	Watson-Leung, 2009
Hexagenia sp.	Survival and growth	21 days	> 450mg/L Phoslock	Pond water	Watson-Leung, 2009
Macrobrachium sp. (shrimp)	Mortality	96 hours	> 50,000 mg/L Phoslock	Synthetic soft water	Ecotox, 2006b
Macrobrachium sp.	Mortality	7 days	> 800 mg/L Phoslock	Synthetic soft water	Ecotox, 2006b
Macrobrachium sp.	Mortality	14 days	> 800 mg/L Phoslock	Synthetic soft water	Ecotox, 2006b

** Due to the amount of Phoslock needed to result in impact biota, many studies did not test concentrations high enough to significant impacts, thus toxicity endpoints are reported in the greater than the highest concentration tested and does not indicate the actual lowest observed effect levels.*

Phoslock and Human Health

There is a very low potential exposure to lanthanum in Phoslock after being applied due to the minimal bio-availability. Even if an exposure occurs, lanthanum is readily processed by the liver and excreted with no negative impacts observed. Lanthanum is used in a prescription drug called Fosrenol® to decrease blood phosphate levels in humans. The Food and Drug Administration approved human dose rate for Fosrenol is 750 to 3,000 mg/day.

Exposure via Ingestion of Treated Water

In case of lanthanum ingestion via drinking even a large volume of Phoslock treated reservoir water, there is negligible risk to human health. Applying Phoslock on a reservoir at the dose rate of 50 ppm (a typical dose rate of Phoslock in a waterbody with an average concentration of phosphorus and alkalinity) and assuming that 100% of La (5% La in Phoslock) was released out of the product (which does not happen because alkalinity and PO4 will bind the "free" La in surface waters), the person would need to drink 80 gallons of reservoir water per day to ingest the minimum dose that corresponds to the lowest Fosrenol daily intake. Drinking 2 gallons of water daily under these artificial conditions would result in consuming La levels 40 times lower than the minimum daily dose of Fosrenol. The maximum dose of Fosrenol is 3,000 mg/day; the average person would need to drink 317 gallons of reservoir water per day to receive the maximum dose of La that is the Fosrenol daily

intake. These large volumes of water could not be consumed by a person per day. Drinking Phoslock treated water directly after an application would pose negligible risk to human health.

Exposure via Fish Consumption

The risk via consuming Phoslock/lanthanum in fish harvested from Phoslock treated water after application was negligible as shown in a fish health investigation, after three successive applications of Phoslock in Lake Okareka, New Zealand. The Lake Okareka fish health monitoring report (*Landman et al., 2007*) demonstrated that trout and koura accumulated lanthanum only in the liver and hepatopancreas tissues, not in the flesh/muscle following the application of Phoslock. It was also demonstrated that lanthanum was removed from the fish liver and hepatopancreas tissues within a few months and the concentrations of lanthanum returned to baseline before another Phoslock application one year later, suggesting a biological capacity to depurate lanthanum (*Landman et al., 2007*). This is also consistent with the findings that the main excretion route for absorbed lanthanum in humans or animals is via the liver into bile (*Damment & Pennick, 2007*). The highest concentration of lanthanum measured in the liver of male and female trout in Lake Okareka after one and two months of Phoslock application was 1.2 and 0.8 mg/kg. Similarly, the highest concentration of lanthanum in the hepatopancreas tissues of male and female trout was 0.8 and 1.0 mg/kg respectively (*Landman et al., 2007*). Therefore, in total the highest concentration of lanthanum in one trout was 2.0 mg/kg. Thus, a person would need to consume 826 pounds of fish per day to ingest the minimum dose of La that corresponds to the lowest Fosrenol daily intake. The average person would need to consume 3,306 pounds of fish per day to consume the maximum daily dose of La from Fosrenol. These large quantities of fish would not be consumed by a person per day. If a person consumed 2 pounds of fish this would result in consuming La levels 400 times lower than the minimum daily dose of Fosrenol. Moreover, fish liver and hepatopancreas tissues are not generally consumed by humans. Even consumption of large quantities of fish liver and hepatopancreas tissues harvested from Phoslock treated waterbody would pose negligible risk to human health.

Lanthanum is not a Hazardous Substance

Phoslock is not considered hazardous by the Occupational Health and Safety Administration (OSHA) Hazard Communication Standard (*29 CFF 12910.1200*). Lanthanum and the clay used in the formulation are not listed on the USEPA Toxic Substances Control Act inventory list. Lanthanum is not on the Australian National Occupational Health and Safety Commission (OHSC) List of Designated Hazardous Substances (*NOHSC, 1999a*).

No risk has been associated with contact of Phoslock. The main potential for human exposure to Phoslock is during the application process. Due to some small particulates in the formulation, there could be some potential eye irritation and inhalation for applicators and handlers associated with an application. Applicators and handlers should follow suggested personal protective equipment guidelines found on the package label and material safety data sheet.

Summary

Phoslock is patented phosphorus locking technology that has been specifically formulated to decrease potential exposure to aquatic biota. Phoslock poses a negligible to very low risk to the aquatic environment while providing a high affinity to bind and remove phosphorus that results in improvements to water quality. A review of toxicity data has shown a large margin of safety to aquatic organisms and humans that may be exposed to Phoslock treated water during and following application.

Phoslock phosphorus locking technology is NSF/ANSI Standard 60 certified for use in drinking water. This certification ensures that Phoslock applications, at the maximum use rate specified on the product label, does not contribute contaminants that could cause adverse human health effects. NSF/ANSI Standard 60 is the nationally recognized health effects standard for products which are used to treat drinking water. In addition, this certification requires annual product testing, facility inspections, quality assurance, good manufacturing practices, and product stock inspections. The United States Environmental Protection Agency and all states rely on and accept ANSI accreditations by authorized independent third party accreditation agencies, such as Water Quality Association (WQA).

References

Clearwater SJ. 2004. Chronic exposure of midge larvae to Phoslock. NIWA (National Institute of Water & Atmospheric Research). Prepared for Ecowise Environmental Pty Ltd. NIWA Client Report No. AUS2004-005, August 2004.

Clearwater SJ and CW Hickey. 2004. Ecotoxicity testing of Phoslock on sediment-dwelling aquatic biota and rainbow trout. NIWA (National Institute of Water & Atmospheric Research). Prepared for Ecowise Environmental Pty Ltd. NIWA Client Report No. AUS2004-004, June 2004.

ECOTOX. 2008. Toxicity assessment of Granulated Phoslock to the *Cladoceran Ceriodaphniadubia*. Report prepared for Phoslock Water Solutions Ltd. ECOTOX Services Australasia. July 2008.

Haghseresht, F. 2006. The Availability of Lanthanum Ions from Phoslock: Residual Concentrations following Phoslock Applications & Implications for Consumption. Phoslock Water Solutions Limited. August 2006. Internal report; PLT-06-2.

HSDB. 2000. Hazardous Substances Database, Australia. http://www.health.gov.au/pbs. Australian Government Department of Health and Aging website.

Institute Dr Nowak, 2008. Report on the application of Bentophos on the Silbersee. Internal application report.

Damment S.J.P. and M. Pennick. 2007. Systemic lanthanum is excreted in the bile of rats. Toxicol Lett 171: 69 – 77.

Landman M., Brijs J., Glover C. and N. Ling 2007. Lake Okareka and Tikitapu Fish Health Monitoring 2007. Scion Report. October 2007.

Lurling M., Tolman Y. 2010. Effects of lanthanum and lanthanum-modified clay on growth, survival and reproduction of *Daphnia magna*. Water Research. 44(1):309-19

Martin M.L., and C.W. Hickey. 2004. Determination of HSNO ecotoxic thresholds for granular PhoslockTM(Eureka 1 formulation) phase 1: Acute toxicity. NIWA (National Institute of Water & Atmospheric Research) Client Report No. HAM2004-137, October 2004.

Stauber J.L. 2000. Toxicity testing of modified clay leachates using freshwater organisms. CSIRO Centre for Advanced Analytical Chemistry Energy Technology. Report no. ET/IR267R. Prepared for CSIRO Land and Water. March 2000.

Persey et al. 2006. Lanthanum: A Safe Phosphate Binder, Seminars in Dialysis 19 (3), 195-9.

Stauber J.L. and M.T. Binet. 2000.Canning River Phoslock field trials – Ecotoxicity testing final report.CSIRO Centre for Advanced Analytical Chemistry Energy Techniology. Report no. ET317R. Prepared for CSIRO Land and Water and the WA Water and Rivers Commission. August 2000.

Watson-Leung T. 2009. Phoslock Toxicity Testing with three Sediment Dwelling Organisms (*Hyalella azteca, Hexagenia* spp. and *Chrinonomus dilutes*) and Two Water Dwelling Organisms (Rainbow Trout and *Daphnia magna*). Aquatic Toxicology Unit, Ontario Ministry of the Environment, Ontario, Canada.

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Laguna Niguel Lake Proposed Treatment Process

Phoslock is applied to the water as a slurry mix. The material is a water soluble clay granule that dissolves rapidly when mixed with water, creating the slurry mix which is then evenly spread by boat across the surface of the lake. It settles to the lake bottom over a 48 hour time period, binding any free reactive phosphorous in the water column as it sinks. It forms a 2-3mm layer on the lake bottom, creating a barrier between the hydro-soil and the water column, in order to cap the sediment and prevent internal phosphorous reload from the sediment. The application rate is determined by laboratory analysis of the free reactive phosphorous in the sediment, the water column, and the water source of the lake in order to determine the volume needed for removal of currently available phosphorous, as well as to adjust for phosphorous reload from the water source. Phoslock will continue to uptake free reactive phosphorous until all receptor sites are full. The result is a biological "reset" of the lake.

BMP

Phoslock is not a pesticide, and does not require the use of protective equipment by label. Water chemistry analysis is performed prior to Phoslock application in order to determine alkalinity and buffering capacity. Phoslock is not dependent upon pH, nor does it alter pH post application, but high acidity levels within the water can cause a separation of the Lanthanum and clay particle, decreasing efficacy. Phoslock application rates and timing are adjusted if needed to accommodate for low pH. Laguna Niguel has a good buffering capacity, and pH ranges from 7.8-8.9. In regard to overall water quality, Phoslock is considered to be the most suitable BMP, as it is a proactive and preventative approach to phosphorous pollution. Algaecide application releases bound phosphorous into the water making it available for continued algal growth and thus is not a sustainable approach to water quality enhancement. The most widely used nutrient binding technology to date has been aluminum sulfate, which has a higher toxicity rating and is much less stable than Phoslock. Short of more effective watershed management in regard to nutrient loading, Phoslock is the best management technology available for removing excess phosphorous and returning balance to an aquatic ecosystem.