

Minnesota Attorney General: Administrative Rules Proceedings

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Version 3
August 20, 2018

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William P. Donohue
Special Assistant Attorney General
Pollution Control Agency

June 11, 1976

- WPC-37

STATE OF MINNESOTA

COUNTY OF RAMSEY

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Proposed Adoption of Agency Regulation WPC 37, Including Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners

ORDER FOR HEARING

Pursuant to Minnesota Statutes Sections 15.0412 and 116.24 (1971), as amended, the Agency deems it necessary to receive and review testimony and evidence bearing upon the proposed adoption of Agency Regulation WPC 37 including standards for limitations of the amount of phosphorus in various cleaning agents and chemical water conditioners.

NOW, THEREFORE, IT IS ORDERED this 6th day of February, 1975, that a public hearing be held on the above-referenced matter.

IT IS FURTHER ORDERED, that notice of said hearing be given to all representatives of associations or other interested groups or persons who have registered their names with the Minnesota Pollution Control Agency for that purpose.

IT IS FURTHER ORDERED, that the authority to appoint a hearing officer in this matter is delegated to the Executive Director.

Dated: February 6, 1975.

MINNESOTA POLLUTION CONTROL AGENCY

GRANT J. MERRITT
Executive Director

HAROLD D. FIELD, JR.
Chairman

CERTIFICATE OF BOARD'S
AUTHORIZING RESOLUTION

I, GRANT J. MERRITT, do hereby certify that I am Executive Director of the Minnesota Pollution Control Agency, an agency duly authorized under the laws of the State of Minnesota, and that at a meeting of the Board of the Minnesota Pollution Control Agency, duly and properly called and held on the 15th day of October, 1974; a quorum was present at said meeting; that a majority of those present voted for a Resolution to call a hearing In the Matter of the Proposed Adoption of Agency Regulation WPC 37, Including Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners.

IN WITNESS WHEREOF, I have hereunto subscribed by name this 7th day of February, 1975.

GRANT J. MERRITT
Executive Director
Minnesota Pollution Control Agency

STATE OF MINNESOTA

COUNTY OF HENNEPIN

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Proposed
Adoption of Agency Regulation
WPC 37, Including Standards
for the Limitation of the
Amount of Phosphorus in
Various Cleaning Agents and
Chemical Water Conditioners

NOTICE OF HEARING

PLEASE TAKE NOTICE, that a public hearing in the above-entitled matter will be held pursuant to Minnesota Statutes Sections 15.0412 and 116.24 (1971) in the Board Room of the Minnesota Pollution Control Agency, 1935 West County Road B2, Roseville, Minnesota 55113, on Tuesday, February 11, 1975, beginning at 9:00 a.m., and continuing until all interested persons, representatives, and organizations have had an opportunity to be heard concerning the adoption of the proposed regulations captioned above by submitting oral or written data, statements, comments, or arguments. All testimony shall be given under oath or affirmation. Statements may be mailed to the Agency at the above address for submission into the record at any time prior to closing of the record. The record shall close at 4:30 p.m., on the twentieth day following adjournment of the hearing.

The Agency proposes in WPC 37(b) various definitions which apply to the phosphorus regulations.

The Agency proposes in WPC 37(c) that phosphorus as elemental phosphorus be a prescribed nutrient.

The Agency proposes in WPC 37(d) nutrient limitations which establish maximum permissible concentrations of the prescribed nutrient. The maximum limitations are prescribed for various household detergents, soaps, other cleaning agents, and chemical water conditioners. Concentrations by weight of the prescribed nutrient shall be determined by the current applicable method prescribed by the American Society for Testing and Materials.

The Agency proposes in WPC 37(g) provisions for variances where the application of the regulations would cause undue hardship or where applicatio of regulations is in contravention of the public health, safety or welfare or where enforcement would be unreasonable, impraticable or not feasible.

The Agency also proposes that all currently existing supplies of cleaning agents and chemical water conditioners be exempted from these regulations

ies of the proposed regulations are available from the Minnesota
n Control Agency, Surface and Groundwaters Section and can be
by writing to the address given above. Copies will also be made
ie at the hearing. These regulations are proposed regulations only
subject to alterations or modifications as the Agency deems
ary and appropriate from its consideration of all the evidence adduced
public hearing and all statements entered into the record.

ted this 9th day of January, 1975.

STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

Grant J. Merritt

GRANT J. MERRITT
Executive Director

STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY
AFFIDAVIT OF SERVICE

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

Ted W. Martin, being duly sworn, deposes and says:

1. That he is an employee of the Pollution Control Agency of the State of Minnesota.

2. That on the 8th day of January, 1975, he went to the Secretary of State's Office for the State of Minnesota and requested a current set of 404 mailing labels and the pollution control list of all representatives of associations or other interested groups of persons who had registered their names with the Secretary of State for the purpose of obtaining notices of public hearings.

3. That on the above date, in response to the above request, the Secretary of State provided him with such lists, copies of which are attached hereto and incorporated by reference.

Ted W. Martin

Subscribed and sworn to
before me this 10th day
of January, 1975 at
Roseville, Minnesota.

Lila Holmdahl

LILA HOLMDAHL
Notary Public, Hennepin County, Minn.
My Commission Expires Oct. 31, 1976

STATE OF MINNESOTA

COUNTY OF HENNEPIN

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Proposed Adoption of Agency Regulation WPC 37, Including Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners

AFFIDAVIT OF MAILING

Gerald T. Blaha, first duly sworn, deposes and says:

That on the 10th day of January, 1975, at the City of Roseville, County of Ramsey, State of Minnesota, he served the attached Notice of Hearing by depositing in the United States mail at said City of Minneapolis, a true and correct copy thereof, properly enveloped, with postage prepaid, to all persons and associations at the addresses listed on the attached list.

Gerald T. Blaha

Subscribed and sworn to before me
this 14th day of January, 1975.

Lila Holmdahl

LILA HOLMDAHL
Notary Public, Hennepin County, Minn.
My Commission Expires Oct. 31, 1976

STATE OF MINNESOTA

COUNTY OF RAMSEY

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Adoption of Agency Regulation WPC 37, Including Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners

STATEMENT OF NEED

The above-captioned regulation is a new regulation and is not an amendment to an existing rule or regulation.

The need to adopt the above-captioned regulation arises for the following reasons:

In 1971 the Minnesota Legislature by adopting Minn. Stat. §§116.20-116.35 encouraged the Minnesota Pollution Control Agency to set standards limiting the amount of nutrients in various cleaning agents and water conditioning agents and specifically authorized the Agency to adopt regulations containing such limitations. The stated reason for these limits in Minn. Stat. §116.21 was the Legislature's awareness of the tendency of nutrients to overstimulate the growth of aquatic life and eventually lead to an acceleration of the natural eutrophication process. However, the Legislature directed MPCA to consider the following factors in setting nutrient limits:

(1) The availability of safe, non-polluting, and effective substitutes.

(2) The difference in the mineral content of water in various parts of the state.

(3) The differing needs of industrial, commercial and household users of cleaning agents and chemical water conditioners.

Through a careful review of the literature on eutrophication and by observing the effects of the banning of phosphorus in detergents and other cleaning agents by other states, the Agency has identified phosphorus as the major nutrient contributing to the overstimulation of the growth of aquatic life. The Agency recognizes that a number of nutrients are necessary for the growth of agal or aquatic life, but phosphorus is in most cases the limiting nutrient for growth of algae because it is the essential nutrient which is found to be in shortest supply relative to the amount needed to support growth. In addition, phosphorus is not available in large quantities from

natural sources but is supplied by man's activities which are to some degree controllable.

One of the major contributions of phosphorus to lakes and streams is from sewage that results from human activities. In turn over half of the phosphorus in sewage is derived from phosphate ingredients in laundry detergents. Thus, to reduce the addition of phosphorus to many of the lakes and streams of Minnesota there is a need to eliminate the use of phosphorus in laundry detergents and other cleaning agents. Studies in other states have shown that after the initiation of a phosphorous ban similar to that proposed in Minnesota, concentrations of phosphorus in sewage effluents are reduced by 50 to 70% and the presence of phosphorus in lakes and streams greatly reduced.

It has been shown through the United States Environmental Protection Agency's National Eutrophication Study and the experience of the Agency, that eutrophication interfers with the use by man of the waters of the state and contributes to the degradation of water quality to an extent detrimental to their use by man. In many cases this eutrophication is controllable through the limitations of the addition of phosphorus from sewage sources.

In evaluating this need the Agency has given consideration to the factors noted by the Legislature in Minn. Stat. §116.21. From the experience of other states and the work of experts in the field of cleaning products, it is clear that there are now effective, safe and non-polluting products to replace phosphate containing cleaners. These products have been extensively marketed in phosphate ban areas and to a limited degree in Minnesota. Consumer acceptance of these products has been shown to be favorable.

The differences in the mineral content of the water in various parts of the state has been accounted for in the regulation. While there appear to be substitutes for phosphate products that perform under all mineral conditions, the regulation allows the use of phosphorus in water conditioners and for a variance from the limitations where necessary.

The differing needs of various users of cleaning products are also recognized within the regulation by limiting only those products shown to contribute substantial amounts of phosphorus and by allowing high phosphate levels where necessary for effective use.

Therefore, to implement the policy of the Legislature as stated in Minn. Stat. §116.21, the Minnesota Pollution Control Agency has determined there is a need to adopt WPC 37.

MINNESOTA POLLUTION CONTROL AGENCY

Marion E. Watson
Chairwoman

Peter L. Gove
Executive Director

Dated: May 14, 1976

STATE OF MINNESOTA

COUNTY OF RAMSEY

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Adoption of Proposed Regulation for the Establishment of Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners, WPC-37.

FINDINGS OF FACT

The subject matter of the proposed regulation was first presented at a hearing before the Minnesota Pollution Control Agency commencing at 9:00 a.m. on Tuesday, February 11, 1975, in the Board Room of the Agency office at 1935 West County Road B-2, Roseville, and continuing at 9:00 a.m. on Wednesday, February 12, 1975 and 9:00 a.m. on Thursday, February 13, 1975. The public hearing was then reconvened at 9:00 a.m. on Monday, April 7, 1975, at the same location and continued at 9:00 a.m. on Tuesday, April 8, 1975, and at 9:00 a.m. on Wednesday, April 9, 1975. Proper notice for all hearings, as required by Minnesota Statutes 15.0412 (1971) was served upon all persons, associations and other interested groups registered with the Secretary of State for that purpose.

After affording interested persons an opportunity to present written and oral data, statements and arguments, having heard all of the testimony, having considered all the evidence adduced and upon the records, files, and proceedings, the Agency finds the following:

I. Introduction

1. In 1971 the Legislature encouraged the Minnesota Pollution Control Agency to "...set standards limiting the amount of nutrients in various cleaning agents and water conditioning agents."
2. In authorizing such regulations the Legislature recognized that the nutrients contained in many of these products "...overstimulate the growth of aquatic life and eventually lead to an acceleration of the natural eutrophication process of our state's waters."
3. These regulations are intended to carry out the legislative purpose of keeping the waters of the state in a pollution free condition by prescribing the use of the nutrient phosphorus above specific concentrations in various cleaning agents and water conditioners.

II. Eutrophication and the Importance of Phosphorus Control

4. Eutrophication is a natural aging process of lakes which is accompanied by a gradual increase in biological productivity. Abnormally high nutrient inputs attributable to human activities greatly accelerate the rate of the eutrophication process. There are many detrimental effects associated with accelerated eutrophication, but it is chiefly characterized by the stimulation of excessive blooms of blue-green algae.
5. Virtually all nutritive elements required by algae, except phosphorus, are readily available from natural sources. Large quantities of phosphorus are usually not available in Minnesota waters under natural conditions; hence phosphorus is the essential nutrient commonly found to be in shortest supply. Phosphorus then becomes a "limiting nutrient" which controls the growth of aquatic plants and algae (ref. PCA Exhibits

1, 3, 4, 5, 9, 10, 64, 67, 110).

6. Major sources of excess phosphorus in eutrophic waters in Minnesota are sewage treatment plant effluents, inadequate soil absorption sewage disposal systems, erosion, and runoff from feedlots and fertilized agricultural lands.

7. Since phosphorus plays a key role in limiting the growth of algae and since its distribution in the environment is largely attributable to man, its input to the environment can and should be controlled to the fullest extent possible (PCA Exhibits 1, 2, 3).

8. Major programs are currently underway in Minnesota to control phosphorus pollution from sewage effluents through the incorporation of advanced wastewater treatment, and from feedlot runoff through the implementation of suitable runoff containment measures. Control of phosphorus originating from complex non-point sources such as on-site sewage disposal systems, erosion, or fertilized farmlands is more difficult and will take time. A meaningful and effective phosphorus control program requires that the attempt be made to limit phosphorus entering the lakes and streams of Minnesota from all controllable sources.

9. Pursuant to the authorization of Minnesota Statutes 116.23, phosphorus has been identified as a prescribed nutrient in Section (c) of WPC 37, for the purpose of limitation.

III. Environmental Benefits of Detergent Phosphorus Control

10. The discharge of phosphorus from sewage treatment plants adds significantly to the nutrient load of Minnesota surface waters. When such discharges occur directly to lakes or reservoirs, or to streams which flow into lakes or reservoirs, the resulting nutrient enrichment

accelerates the eutrophication process, promoting the growth of algae and other undesirable aquatic life.

11. Information from the states of New York and Indiana, and other jurisdictions where phosphate-based detergents are banned indicates that laundry detergents with phosphate builders contribute 50 percent or more of the total amount of phosphorus contained in sewage effluents. Monitoring of sewage effluents in these areas demonstrated that detergent phosphorus control measures rapidly and effectively reduced the amount of phosphorus entering receiving waters (ref. PCA Exhibits 12, 13, 14, 18, 19).

12. Water quality monitoring studies of sewage-impacted streams in New York, Indiana and Dade County, Florida have shown that significant reductions in the concentrations of phosphorus in streams have directly resulted from the lowering of phosphorus levels in sewage treatment plant effluents after the implementation of detergent phosphorus control measures and that these reductions have been permanent (ref. PCA Exhibits 12, 19, 20, 21, 100).

13. While the control of detergent phosphorus alone cannot be expected to eliminate eutrophication, it can reduce the number and magnitude of algal blooms. Scientific evidence based on background information in New York and Indiana provides indications that reductions of algae and aquatic plant growths have occurred (ref. PCA Exhibits 21, 23, 70, 100).

14. Water quality improvements in Minnesota lakes can be expected to occur in proportion to the phosphorus inflow to a lake attributable to sewage-related sources. Lakes which receive all their phosphorus from agricultural or erosional sources will not be benefited. This measure can, however, be expected to help restore or protect lakes which receive

municipal or private sewage effluents or have sewered populations in their watersheds (ref. PCA Exhibits 24, 26, 60; Testimony: Shapiro, Vol. I., p. 59).

15. In 1972, the U.S. Environmental Protection Agency National Eutrophication Survey sampled 74 of the sewage-impacted lakes in Minnesota. Nearly all of these lakes were found to be seriously eutrophic. Many of these lakes are expected to show substantial water quality improvements as a direct result of detergent phosphorus control (ref. PCA Exhibits 24, 25, 26; Testimony: Shapiro, Vol. I., pp. 57-58).

IV. Wastewater Treatment and Detergent Phosphorus Control

16. At the present time, approximately 575 Minnesota municipalities discharge treated sewage into the waters of the state. Existing standards require that roughly 140, or 25 percent of these sources provide phosphorus removal to prevent or reduce the effects of accelerated eutrophication. However, only about 10 percent of the municipalities required to control phosphorus have completed construction of the necessary facilities.

17. Future construction of phosphorus removal facilities will continue to depend on the availability of Federal construction grant funds and cannot be predicted from year to year. The control of detergent phosphorus will provide some interim relief in problem areas prior to the time that necessary facilities can be constructed and placed into operation and will complement the phosphorus removal process after facilities are completed.

18. Over 400 Minnesota municipalities are currently not being required to limit phosphorus in their sewage effluents. Detergent phosphorus

control will of itself decrease the amount of phosphorus entering Minnesota waters from these sources by approximately 3 to 4 million pounds annually (PCA Exhibits 52, 65). This will reduce the phosphorus load of streams receiving these discharges and will be of benefit to the many lakes and reservoirs in Minnesota with significant sewered populations in their watersheds.

19. Approximately 25 percent of the 70,000 permanent and seasonal lake homes in unincorporated areas of Minnesota are equipped with laundry facilities. The elimination of phosphate detergents will help to control phosphorus inputs to lakes and streams originating from these sources which for the most part utilize septic tank/soil absorption sewage disposal systems (ref. PCA Exhibits 41, 42).

20. In situations where stormwater runoff in combined sewers results in bypassing and the discharge of untreated sewage to surface waters, detergent phosphorus control will exert a partial reduction in the amount of phosphorus entering the affected waters.

21. The control of phosphorus in municipal wastewaters can be accomplished by the addition of chemical precipitants, on-land disposal of all effluent by spray irrigation or other means, or by the diversion of treated wastewaters where appropriate (e.g. Lake Minnetonka).

22. Chemical treatment processes at municipal sewage treatment plants utilizing alum or ferric chloride for phosphorus removal can expect to experience significant savings in chemical costs (up to 30 percent) due to a reduction of phosphorus in raw sewage (ref. PCA Exhibits 13, 16, 65, 117). Where lime precipitation processes are used, little or no chemical cost savings can be expected to occur.

23. By reducing the concentration of phosphorus in raw sewage and thereby

the amount of alum needed to precipitate phosphorus, the amount of chemical sludge produced and associated sludge handling or disposal problems and expenses will also be reduced. This would help to lower operating costs for phosphorus removal, particularly for small plants, and could enhance the overall sludge handling capacity of new or upgraded plants which include phosphorus removal (ref. PCA Exhibit 13, 65, 98).

24. Chemical precipitation and phosphorus removal technology represent advanced waste treatment processes requiring a higher degree of maintenance and process control than secondary treatment. In situations where communities are having difficulty providing adequate plant supervision, or are for other reasons (equipment breakdown, repairs, plant upset, etc.) unable to maintain optimum operating conditions, a phosphate detergent ban will provide an extra margin of phosphorus control (ref. PCA Exhibits 65, 98).

V. Availability of Phosphate-Free Detergents

25. A typical laundry detergent (heavy duty detergent) in use today contains surfactant, usually a mixture of ingredients acting as a wetting agent; a phosphate or phosphate-free builder or water softener (phosphate builders have secondary properties which aid in the cleaning process); an anti-corrosive agent to protect washing machine parts; an anti-redeposition agent; a fluorescent whitening agent or optical brightener, color and fragrance; and an inert standardizing diluent, usually sodium sulfate.

26. Section (d)(1) of WPC 37 specifies a level of 0.5 percent elemental phosphorus may be present in heavy duty detergents, additives, and

built soaps for machine laundry, excluding chemical water conditioners. Phosphates are not an indespensible component in laundry detergents in that safe and effective phosphate-free products are readily available. A 0.5 percent level is essentially a trace amount which allows for possible impurities in industrial grade chemicals or contamination during the manufacturing process.

27. Phosphate-free detergents currently available vary considerably with respect to the chemical composition of the builder or water softening system employed. All of the major detergent manufacturers market more than one type of phosphate-free detergent, some of which are available nationwide, others only in phosphate-ban states and cities.

28. There are essentially six categories of commercial phosphate-free detergents:

    a. Silicate-based, granular detergents with synthetic surfactant plus upwards of 20-25 percent sodium silicate as builder. All phosphate-free powdered detergents manufactured by Colgate-Palmolive Company are of this type. Colgate's share of the 1974 St. Paul laundry detergent market has been estimated at 15.3 percent (PCA Exhibit 74).

    b. Low carbonate, granular detergents containing synthetic surfactant with a mixture of about 20 percent sodium carbonate and 20 percent sodium silicate as builder. All phosphate-free powdered detergents manufactured by the Procter and Gamble Company are of this type. Lever Brothers, Inc. generally markets phosphate-free powdered detergent containing 30-45 percent sodium carbonate and 10-15 percent sodium silicate, although some Lever detergents may occasionally contain more than 50 percent carbonate. Procter and

Gamble's share of the 1974 St. Paul detergent market has been estimated at 57.2 percent while Lever's was 21.2 percent (PCA Exhibit 74).

c. High carbonate, granular detergents with synthetic surfactant plus 50-70 percent sodium carbonate as builder. High carbonate detergents are generally not typical of phosphate-free detergents sold in phosphate-ban areas.

d. Liquid citrate-built detergents containing synthetic surfactant with 20-25 percent sodium citrate as builder and sometimes with sodium silicate as supplemental builder. Detergents of this type are manufactured by Lever Brothers, Inc.

e. Unbuilt liquid detergents containing a combination of synthetic anionic and nonionic surfactants at relatively high concentration with no builder. Detergents of this type are made by Colgate-Palmolive Company and the Procter and Gamble Company.

f. Soap with soap as the major surfactant, usually without any substantial quantity of builder but sometimes with sodium carbonate.

VI. Performance of Phosphate-Free Detergents

29. Among commercial laundry detergents, performance can vary considerably with good quality phosphate-free detergents frequently out-performing phosphate detergents depending on the types of soils, fabrics and washing conditions. As such, it is believed that differences in overall cleaning ability that may exist between a standard high quality phosphate detergent and its phosphate-free counterpart are minimal and will not be noticeable to the average user.

30. Advertising claims made by the major detergent manufacturers for their

phosphate-free products variously state that they are effective, powerful, and economical laundry detergents suitable for removing all types of soils, from all types of fabrics and under any normal washing conditions.

31. In many performance tests, phosphate-free detergents are compared to a single, high-phosphate (12% elemental phosphorus) standard detergent. Tests of this nature do not take into consideration the performance variations of detergents within the phosphate group itself, which can be shown to be substantial (PCA Exhibit 94), or that reductions in the phosphorus content of currently-marketed phosphate-based detergents may affect their performance (PCA Exhibits 31, 101).

32. Laundering tests which compare a single, less desirable type of phosphate-free detergent to a standard phosphate detergent cannot be used to evaluate the performance of other types of phosphate-free detergents.

33. Silicate-built phosphate-free detergents have been found to possess effective soil removal properties (PCA Exhibits 27, 30, 114). In one test, a phosphate-free silicate-built version of a commercial laundry detergent gave slightly better performance than its phosphate-based counterpart with the same brand name (PCA Exhibit 114).

34. Phosphate-free detergents with a building system of sodium carbonate in low concentration plus silicate give results comparable to or slightly lower than phosphate detergents under normal laundering conditions but may be less desirable when used in hard or very hard water with hardness greater than 154 mg/l (PCA Exhibits 27, 30, 47, 114).

35. High carbonate detergents of 50 percent or more sodium carbonate give performance generally comparable to phosphate-based detergents under normal laundering conditions but are recommended for use only in softer

water less than 60-80 mg/l hardness. High carbonate detergents have been found to be less effective when washing fabrics made of 100 percent cotton fiber (PCA Exhibits 27, 30, 47, 94, 114; Public exhibit 120; Testimony: A Schwartz, Vol. I, p. 210).

36. Citrate-based phosphate-free laundry detergents have been found to perform effectively under any normal laundry conditions. When compared to phosphate detergents, citrate built detergents are generally less effective on 100 percent cotton fabrics but comparable in performance on cotton/synthetic blend fabrics (PCA Exhibit 28, 29, 47; Public Exhibit 120).

37. Citrate-built detergents are known to possess superior properties for the removal of grease and greasy soils.

38. Suitable formulations of anionic and nonionic surfactants in combination in an unbuilt liquid detergent provide effective cleaning performance under any normal washing conditions. In direct comparison with phosphate detergents, commercial unbuilt liquid formulations displayed good soil removal properties for both 100 percent cotton and cotton/synthetic blend fabrics (PCA Exhibit 27, Public exhibit 120).

39. Unbuilt liquid detergents commercially available at this time also possess superior grease and oily soil removal properties.

40. Soap will continue to be used by some Minnesota consumers and will give good results when used with soft water. However, soap is less desirable for general laundry use because of its tendency to produce organic deposits on fabrics.

VII. Safety and Environmental Acceptability of Phosphate-Free Detergents

41. Present day phosphate-free detergents in general present no greater

health hazard to humans than do phosphate detergents (PCA Exhibits 18, 33, 34, 38).

42. The sanitizing properties of the laundry process are almost entirely dependent on the use of hot water (greater than 130°F) and on the use of a detergent in adequate concentration (0.1 - 0.15 percent). There were no data presented to support speculation that the use of phosphate-free detergents will promote the retention or redeposition of pathogenic bacteria or other organisms on clothing, bedding or other materials (PCA Exhibits 91, 92).

43. Special attention must be given to washing flame retardant childrens sleepwear as certain types of phosphate-free laundry products may be unacceptable.

    a. Soap-containing detergents, phosphate or phosphate-free, are not acceptable for washing flame retardant garments under any conditions.

    b. Carbonate-containing phosphate-free detergents are generally acceptable for washing most types of synthetic flame retardant fabrics. They are definitely not acceptable for washing 100 percent cotton fabrics under any conditions (PCA Exhibit 113, Public exhibit 123). However, 100 percent cotton fiber fabrics presently account for only about 6-8 percent of the children's sleepwear market (PCA Exhibit 96, Testimony: Johnson, Vol. VI, p. 220).

    c. Silicate-based, non-carbonate, phosphate-free detergents may compromise flame retardancy of 100 percent cotton fabrics (Public Exhibit 123).

    d. Citrate and unbuilt phosphate-free liquid detergents do not interfere with the retention of flame retardant properties of children's

sleepwear and may be superior to 8.7 percent phosphorus detergents in this regard (PCA Exhibit 113). Among phosphate-free detergents, therefore, liquid detergents are preferred for washing flame retardant garments.

44. There are no known environmental hazards associated with the phosphate substitutes currently used in detergent formulations sold in the United States (PCA Exhibits 27, 60, 66, 79, 108).

VIII. Water Hardness in Minnesota

45. As a general rule, the performance of laundry detergents and other cleaning agents declines as the hardness of the wash water increases. With the use of carbonate-containing detergents, water hardness takes on added importance because of the formation of inorganic precipitates, primarily calcium carbonate, formed by the softening activity of the sodium carbonate builder.

46. Inorganic precipitate formed in this way can be deposited on clothing or washing machine parts. The amount of deposition which can form is dependent on the hardness of the washwater, the carbonate content of the detergent, the type of fabric and the quality of the formulation in use.

47. Public and private water supplies in Minnesota are generally hard to very hard. It is estimated that 60 percent of the State's population receives water greater than 154 mg/l hardness (PCA Exhibit 105, Public Exhibit 19).

48. Usage of home water softening equipment in Minnesota amounts to an estimated 28-42 percent of the population and is concentrated among consumers whose water supplies are high in hardness. On this basis, it is estimated

that from 66 to 79 percent of Minnesota consumers are using water of less than 154 ppm hardness in their homes (PCA Exhibit 105).

49. The average hardness of finished public water supplies in Minnesota is less than half the hardness of finished public water supplies in Indiana, a state which has had a phosphate detergent ban in effect since January 1, 1973. Groundwater supplies in Indiana are on the average 29 percent higher in hardness than groundwater supplies in Minnesota, 354 mg/l vs. 275 mg/l (PCA Exhibit 54).

50. Adequate phosphate-free alternatives to carbonate-containing detergents do exist for consumers who use only hard water for laundering. These include granular silicate, liquid citrate-based, and unbuilt liquid detergents.

IX. Cost of Laundry and Phosphate-Free Detergents

51. In general, phosphate-free detergents are comparably priced to their phosphate-based counterparts (PCA Exhibits 18, 60; Public exhibit 40).

52. Among those homemakers who notice a reduction in cleaning performance with the use of a phosphate-free detergent, there may be attempts to compensate for loss of cleaning ability through the use of laundry additives such as bleach, fabric softener, etc.

53. Minnesota consumers are already using phosphate-free detergents. In 1974, it was estimated that 18 percent of the homemakers in the St. Paul area were using phosphate-free detergents (PCA Exhibit 74). Hence, they would experience no added costs should phosphate detergents be eliminated.

54. A large share of a cost increase may be expected to be due to the use or overuse of laundry additives, especially bleach, which may do little to improve performance and may actually be harmful to fabrics. Therefore,

an obvious responsibility exists to adequately educate consumers on correct laundry practices, use of detergent, etc. (Public Exhibit 40).

X. Effect of Phosphate-Free Detergents on Clothing and Washing Machines

55. Commercial liquid phosphate-free detergents, citrate or unbuilt, do not have negative effects on clothing or machine parts associated with their use. Silicate built phosphate-free detergents may produce a small but insignificant buildup of insoluble deposits on clothing with prolonged use in very hard water (Testimony: A. Schwartz, Vol. I, p. 191).

56. Carbonate containing detergents can cause troublesome buildup of inorganic deposits on the fiber and machine surfaces. However, deposition extensive enough to cause noticeable deterioration of fabric or finish before 30 or 50 washings is encountered only with high carbonate detergents used without any precaution in hard or very hard water (Testimony: A. Schwartz, Vol. I, p. 191).

57. Experimentally, the buildup of inorganic deposit on clothing of 100 percent cotton has been found to be 7 times more extensive when a high carbonate detergent is used than when a low carbonate detergent is used (PCA Exhibit 47).

58. According to other estimates, the buildup from high carbonate detergents can occur at twice the rate of a low carbonate detergent on 100 percent cotton and at three times the rate on fabrics containing synthetic fibers (Public Exhibit 101).

59. The potential severity of these problems cannot be accurately assessed based on the limited data presented. The potential that problems will develop can be eliminated or substantially reduced through the use of low or non-carbonated detergents, home water softeners, and by observing

manufacturer's recommendations for use of carbonate-containing detergent, i.e. dissolving detergent in the washwater before adding clothes and do not use more detergent than is necessary.

60. It is estimated that 10 percent of the families in the U.S. do not have automatic laundry machines (PCA Exhibit 31). In Minnesota this would further reduce the potential number of families subject to possible added machine costs.

61. Sales of liquid phosphate-free detergents have reportedly increased in areas where phosphate detergents are banned (PCA Exhibit 39, Testimony: A. Schwartz, Vol. II, p. 41). Liquid detergents cause no additional wear on fabrics or machines as a result of the laundry process.

62. Procter and Gamble Company and Colgate-Palmolive, who collectively manufacture 70 percent of all laundry detergents sold in the U.S., do not market phosphate-free detergents of the high carbonate type. The bulk of laundry detergents manufactured by Lever Brothers, Inc. are of the reduced carbonate type (PCA Exhibits 71, 87, 88). Therefore, the usage of potentially problem-causing high-carbonate detergents is reduced to a small percentage.

XI. Economic Impact on Detergent Manufacturing

63. Major detergent manufacturers will be expected to experience costs associated with adjustments in manufacturing and inventorying practices. Major manufacturers would not experience additional costs for product development since they currently market complete lines of non-phosphate products in phosphate ban areas with a total population greater than 32,000,000 people.

64. Raw material suppliers will experience a partial loss of market for

higher-priced phosphate materials (e.g. tripolyphosphate) and only partial replacement by lower-priced commodities (e.g. sodium carbonate).

65. Manufacturers of laundry appliances may experience costs resulting from the possible necessity of redesigning new models to avoid the potential for deposit accumulation and increased costs of meeting service contracts and warranties of machines in service (Public Exhibits 20, 34). However, these costs will not materialize with the use of citrate, unbuilt liquid, silicate or well-formulated low carbonate products in areas with moderately hard water, or in areas where soft water is available.

66. Wholesalers who maintain inventories of laundry products for interstate distribution will experience undetermined operating cost increases associated with the need to stock both phosphate and phosphate-free detergents of the same brand names, or from other modification of distribution practices (Public Exhibit 14).

67. Retail grocery outlets located near state borders may experience a loss of sales of cleaning products to retailers outside the state.

68. Some local manufacturers of detergent products may experience increases in manufacturing costs as a result of a detergent phosphorus ban.

    a. The Tennant Company does not market products affected by the limits imposed.

    b. Grace-Lee Products, Inc. manufactures janitorial maintenance items, institutional cleaners and disinfectants, rest room sanitation products, kitchen and laundry supplies and a number of specialty products for commercial and industrial use. The company employs approximately 48 persons. About 150 of the 180 products currently sold contain phosphate ingredients. However, Grace-Lee apparently does not manufacture household laundry or dishwashing detergents

since in 1974 the company did not report the phosphorus content of its products to the agency. Such reporting is required by law for all household laundry and dishwashing compounds. Thus, it would not appear that Grace-Lee Products would be seriously affected by WPC 37.

c. Lan-O-Sheen, Inc. manufactures some detergents and other cleaning agents which would be affected by the limits set in WPC 37. This company would be expected to experience increased costs associated with adjustments in manufacturing processes, labelling, distribution, etc. Lan-O-Sheen will be expected to experience additional costs for the development of new formulations.

d. National Purity Soap and Chemical Company is involved in the manufacture of industrial, institutional and commercial cleaning products. NPS would experience production cost increases similar to Lan-O-Sheen but may also incur added costs in developing phosphate-free formulations and raw material shortages. Not all products marketed by NPS are affected by the proposed limits, however, NPS currently employs about 25 persons.

e. Economic Laboratories, Inc. does manufacture some products covered by the phosphorus limitations and will be affected by the regulation. In particular, their ability to test market, in Minnesota, products with concentrations of phosphorus higher than those prescribed in the regulation will be eliminated.

69. The cost of continued acceleration of the rate of eutrophication can be expressed in terms of water quality degradation, reduced usefulness of recreational waters, lowered lakeshore property values and reduced income from the tourism and travel industry. These costs, however, are complex and impossible to accurately assess.

XII. Attitudes Concerning Phosphate Detergent Bans

70. Industry representatives have reported that the number of complaints from customers has increased in areas where phosphate detergents have been banned. These complaints generally reflect dissatisfaction at being unable to obtain the same cleaning results with the use of phosphate-free detergents. The actual extent of the complaints among the total number of consumers cannot be determined.

71. Consumers surveys conducted by industry and independent analysts generally agree with respect to consumer satisfaction with the performance of phosphate-free detergents. In general, 3 out of 5 homemakers were very or somewhat satisfied with the cleaning performance of phosphate-free detergents while about 1 person in 3 were somewhat or very dissatisfied with cleaning performance. Others were neutral (PCA Exhibits 37; Public Exhibits 37, 38).

72. Consumer support for detergent phosphate bans was found to be greater than consumer satisfaction with phosphate-free detergent performance. In general, 80 percent of the consumers surveyed supported the phosphate detergent bans in their areas while from 5 to 16 percent were opposed. This support was largely based on the belief that a phosphate detergent ban was beneficial to the environment. An industry survey in Erie County, New York concluded that the homemaker's "primary concern is the polluted lakes and streams."

73. In 1972, a survey of Minnesota residents living in areas adjacent to the Mississippi River drainage was conducted under the auspices of the University of Minnesota Water Resources Research Center. At that time better than 9 out of 10 individuals indicated their willingness to use soap instead of phosphate detergents in order to abate pollution

(Public Exhibit 15).

74. The International Joint Commission of the United States and Canada has concluded that "programs implemented by both countries have resulted in substantial reduction in phosphorus loadings to the lower Great Lakes..." and further concluded that "limiting by regulation the amounts of phosphorus used in the manufacture of detergents contributes substantially to the achievement of the agreed water quality objectives of the Great Lakes," (Testimony: S. Schwartz, Vol. II, p. 37).

XIII. Other Cleaning Agents and Water Conditioners

75. There are currently no acceptable replacements for phosphate-based automatic machine dishwashing detergents. It is felt that existing commercial dishwashing machine detergents containing 8.7 to 11 percent phosphorus will provide effective and economical performance.

76. Household cleaning agents such as floor care products, cleansers, hand laundry soaps, general household cleaners, liquid dish detergents, bleaches, fabric softeners, etc., do not require phosphate components for effective cleaning performance. A variety of commercial phosphate-free products are currently marketed in each category which provide performance comparable to phosphate-containing products. Therefore, a maximum phosphorus level of 0.5 percent should be set (PCA Exhibit 101).

77. Water conditioning agents marketed for household use generally consist almost entirely of sodium tripolyphosphate. These products are used for personal cleansing purposes as well as laundry in areas of extreme water hardness and a maximum level of 20 percent phosphorus should be permitted. However, their use for home laundry should be discouraged in favor of one of the several good quality phosphate-free detergents.

XIV. Consideration of Energy and Resource Conservation

78. The present use of phosphate for detergent builders accounts for about 13 to 14 percent of the world's production. According to industry estimates, the continued use of phosphate builders in cleaning products would not appear to threaten the world's total phosphate reserves, however, there are factors which must be taken into consideration relative to the consumption of phosphate supplies (Public Exhibit 115).

a. Industry estimates of the size of phosphate reserves do not account for the use of phosphate-bearing reserve land for other purposes. For example, the Director of Mining for Monsanto Chemical Company estimates that there are 20 million acres of phosphate reserve land in the State of Florida. However, the full exploitation of this reserve would mean that 60 percent of the land area of the state would be mined.

b. The availability of these reserves may be reduced by environmental restrictions and water use for processing.

c. The retrieval of phosphate from lower grade ore supplies will be increasingly expensive and energy consumptive. The economic costs associated with large-scale utilization of phosphates from sources such as the ocean floor, sewage treatment processes, and lower grade ores could increase greatly.

d. The future environmental costs associated with phosphate utilization include strip mining as a primary production technique and the high cost of new mines and plants which comply with air and water quality standards and waste disposal regulations.

e. According to a 1974 forecast by the U.S. Department of the Interior Bureau of Mines, a gap between the projected U.S. domestic demand and export demand for phosphates and the phosphate rock production capacity of new and existing U.S. mines will begin to widen substantially after 1978. Thus, it would appear likely that this country will become increasingly reliant on foreign supplies to meet its phosphate needs.

79. In general, phosphate-free detergent surfactant levels on a per wash basis are comparable to phosphate detergents. Thus, the increased usage of petrochemicals for surfactant production associated with a switch to phosphate-free detergents does not appear to be an important factor with respect to the overall consumption of oil (PCA Exhibit 66).

80. Generally, the most cost-effective chemical precipitation process for phosphorus removal in a sewage treatment plant uses chemicals containing aluminum. Owing to the cost and energy consumed in their production, any reduction in chemical usage for phosphorus removal is deemed desirable (PCA Exhibit 65).

81. A possible reduction in cleaning efficiency with the use of phosphate-free detergents may cause some homemakers to use more warm or hot water for laundry purposes resulting in added energy consumption. Hot water washing would be of some benefit, however, in enhancing the sanitizing effects of the laundry process. Water consumption may also increase due to rerinsing.

Dated this 14 day of

May, 1976

STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

By Marion E. Watson
Marion E. Watson
Chairwoman

By
Peter L. Gove
Executive Director

CERTIFICATE OF AGENCY'S
ADOPTION OF RULES RESOLUTION

I, Peter L. Gove, do hereby certify that I am the Executive Director of the Minnesota Pollution Control Agency, an Agency duly authorized under the laws of the State of Minnesota, and that the following is a true, complete and correct copy of a resolution adopted at a meeting of the Agency duly and properly called and held on the 27th day of April, 1976; that a quorum was present at said meeting; that the resolution was passed by a majority of the Agency; that said resolution is set forth in the minutes of said meeting and has not been rescinded or modified:

> RESOLVED that WPC 37 relating to the limitation of the amount of phosphorus in various cleaning agents and chemical water conditioners, be and is approved and adopted. This regulation is adopted pursuant to the authority vested in the Minnesota Pollution Control Agency by Minn. Stat. §116.21 et seq. (1974) and §15.0412 (1974).
>
> BE IT FURTHER RESOLVED that Findings of Fact as amended in support of this regulation are approved and adopted by the Agency and Marion Watson, Chairwoman of the Agency, and Peter L. Gove, Director of the Agency, are hereby authorized to sign such Findings of Fact, an order adopting these regulations and any other document necessary for the adoption of this rule.
>
> BE IT FURTHER RESOLVED, that in the implementation of this regulation, careful studies be conducted by the staff to determine the effect of WPC 37 on the waters of the state.

IN WITNESS WHEREOF, I have hereunto subscribed my name this 17 day of May, 1976.

Peter L. Gove
Executive Director

Subscribed and sworn to before me this 17th day of May, 1976:

WILLIAM DONOHUE
NOTARY PUBLIC — MINNESOTA
RAMSEY COUNTY
My Commission Expires April 29, 1982

Notary Public

STATE OF MINNESOTA

COUNTY OF RAMSEY

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of Proposed Regulation for the Establishment of Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners, WPC 37

ORDER ADOPTING RULE

The subject matter of the proposed regulation was first presented at a hearing before the Minnesota Pollution Control Agency commencing at 9:00 a.m. on Tuesday, February 11, 1975, in the Board Room of the Agency offices at 1935 W. County Road B2, Roseville, and continuing at 9:00 a.m. Wednesday, February 12, 1975, and 9:00 a.m. Thursday, February 13, 1975. The public hearing was then reconvened at 9:00 a.m. on Monday, April 7, 1975, at the same location and continuing at 9:00 a.m. on Tuesday, April 8, 1975, and at 9:00 a.m. on Wednesday, April 9, 1975. Proper notice for all hearings, as required by Minn. Stat. §15.0412 (1974), was served upon all persons, associations and other interested groups registered with the Secretary of State for that purpose.

After affording interested persons an opportunity to present written and oral data, statements and arguments, having heard all the testimony, having considered all of the evidence adduced and upon the records, files and proceedings herein, and applicable statutory standards or criteria, and having confirmed the need for the above-captioned regulation;

NOW, THEREFORE, IT IS ORDERED that this regulation identified as Minnesota Pollution Control Agency Regulation WPC 37 is hereby adopted this 14 day of May, 1976, pursuant to authority vested in me by resolution of the Minnesota Pollution Control Agency Board.

MINNESOTA POLLUTION CONTROL AGENCY

Marion E. Watson
Chairwoman

Peter L. Gove
Executive Director

STATE OF MINNESOTA

COUNTY OF RAMSEY

MINNESOTA POLLUTION

CONTROL AGENCY

In the Matter of the Adoption of Agency Regulation WPC 37, Including Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners

STATEMENT OF COMPLIANCE WITH RULEMAKING PROCEDURES
WPC 37

I, Special Assistant Attorney General William P. Donohue, do hereby declare that I have examined the proposed rules entitled "Standards for the Limitation of the Amount of Phosphorus in Various Cleaning Agents and Chemical Water Conditioners," and all related documents and that, based on them and my personal familiarity with the applicable procedures, the Manual of Rule-making Procedures has been followed.

William P. Donohue

William P. Donohue
Special Assistant
Attorney General

Dated: May 17, 1976

STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

Chapter Thirty-Seven: WPC 37

STANDARDS FOR THE LIMITATION OF THE AMOUNT OF PHOSPHORUS IN VARIOUS CLEANING AGENTS AND CHEMICAL WATER CONDITIONERS

WPC 37: The official policy and purpose of the State of Minnesota in regard to these matters is set forth in Section 116.21 through 116.35 of Minnesota Statutes 1971 which are stated in part as follows:

Section 116.21. NUTRIENTS IN CLEANING AGENTS AND WATER CONDITIONERS, CONTROL; STATEMENT OF POLICY

The Legislature seeks to encourage the Minnesota Pollution Control Agency through the passage of sections 116.21 to 116.35, to set standards limiting the amount of nutrients in various cleaning agents and water conditioning agents. The Legislature realizes that the nutrients contained in many of these products serve a valuable purpose in inceasing their overall effectiveness, but we are also aware that they overstimulate the growth of aquatic life and eventually lead to an acceleration of the natural eutrophication process of our state's waters. Limitations imposed under section 116.21 to 116.35 should, however, be made taking the following factors into consideration:

(1) The availability of safe, non-polluting and effective substitutes.

(2) The difference in the mineral content of water in various parts of the state.

(3) The differing needs of industrial, commercial and household users of cleaning agents and chemical water conditioners.

Section 116.24. REGULATIONS.

The Pollution Control Agency may make regulations:

(a) Prescribing, for the purpose of section 116.23, nutrients and the maximum permissible concentration, if any, of a prescribed nutrient in any cleaning agent or chemical water conditioner;

(b) Respecting the manner in which the concentration of any prescribed nutrient in a cleaning agent or chemical water conditioner shall be determined; and

(c) Requiring persons who manufacture in Minnesota any cleaning agent or chemical water conditioner to maintain books and records necessary for the proper enforcement of sections 116.21 to 116.35 and regulations thereunder, and to submit samples of cleaning agents or water conditioners to the Pollution Control Agency.

(a) INTRODUCTION

(1) SCOPE. The following controls, prohibitions or restrictions hereby adopted and established shall apply to all ingredients of cleaning agents and chemical water conditioners distributed, sold, offered or exposed for sale in the State of Minnesota within the scope of this regulation.

(2) PROHIBITION., No person shall sell, offer, expose for sale or distribute for use in Minnesota any cleaning agent or chemical water conditioner which contains a prescribed nutrient in a concentration that is greater than the prescribed maximum permissible concentration of that nutrient in that cleaning agent or chemical water conditioner.

(3) SEVERABILITY. The provisions of this regulation shall be severable, and the validity of any lettered paragraph or any sub-paragraph or subdivision thereof shall not make void any other lettered paragraph, sub-paragraph, subdivision or any other part thereof.

(b) DEFINITIONS. For purposes of this regulation, the terms defined in this section shall have the meanings given them:

(1) "Cleaning agent" means a heavy duty laundry detergent, laundry additive, dishwashing compound, household cleaner, industrial cleaner, phosphate compound or other substance intended to be used for cleaning purposes.

(2) "Nutrient" means a substance or combination of substances which, if added to waters in sufficient quantities, provide nourishment that promotes growth of aquatic vegetation in densities which:

A. interfere with use of the waters by man or by any animal, fish or plant useful to man, or

B. contribute to degradation or alteration of the quality of the waters to an extent detrimental to their use by man or by any animal, fish or plant that is useful to man.

(3) "Chemical water conditioner" means a water softening chemical, anti-scale chemical, corrosion inhibitor or other substance intended to be used to treat water.

(4) "Dishwashing machine" means equipment manufactured for the purpose of cleaning dishes, glassware and other utensils involved in food preparation, consumption or use, using a combination of water agitation and high temperature.

Other terms and abbreviations used herein not specifically defined in the law shall be construed in conformance within the context and professional usage.

(c) PRESCRIBED NUTRIENT. Phosphorus, as elemental phosphorus, is prescribed as a nutrient for the purpose of this regulation pursuant to Minnesota Statute 116.23.

(d) NUTRIENT LIMITATION. After January 1, 1977, the maximum permissible concentrations of the prescribed nutrient in the below listed cleaning agents or chemical water conditioners shall be as follows:

(1) Laundry detergents and built soaps for machine laundry excluding chemical water conditioners: not to exceed 0.5% phosphorus, by weight.

(2) Household and commercial detergents for machine dishwashing: not to exceed 11% phosphorus, by weight.

(3) All household cleaning agents except those listed in (d)(1) and (2) intended to be used in the home: not to exceed 0.5% phosphorus, by weight.

(4) Chemical water conditioners for machine laundry use: not to exceed 20% phosphorus, by weight.

(e) The amounts of phosphorus permissible in all cleaning agents and chemical water conditioners other than those identified in section (d) of this regulation are not limited by this regulation.

(f) The concentration by weight of prescribed nutrient in any cleaning agent or chemical water conditioner shall be determined by the current applicable method prescribed by the American Society for Testing and Materials (A.S.T.M.).

(g) VARIANCE. In any case where, upon application of the responsible person or persons, the Agency finds that by reason of exceptional circumstances the strict enforcement of any provision of this regulation would cause undue hardship; that the use of cleaning or water conditioning agents containing phosphorus in excess of the permissible levels set forth herein is necessary for the public health, safety or welfare; or that strict conformities with these limits would be unreasonable, impractical or not feasible under the circumstances, the Agency in its discretion may permit a variance therefrom upon such conditions as it may prescribe for prevention, control or abatement of pollution in harmony with the general purpose of this regulation and the intent of applicable state and national laws.

APPROVED AS TO FORM AND LEGALITY
JUN 4 1976 19____
WARREN SPANNAUS, ATTORNEY GENERAL
BY /s/ Michael B. Miller
SPECIAL ASSISTANT ATTORNEY GENERAL

STATE OF MINNESOTA
DEPARTMENT OF STATE
FILED
JUN 4 - 1976 - 2:30 pm
Joan Anderson Growe
Secretary of State

FILED
RICHARD L. BRUBACHER
Commissioner of Administration
JUN 4 [redacted]
BY Eda Staudenmaier
AUTH. SIGNATURE
2:55 pm.

ADMIN 1000

STATE OF MINNESOTA

DEPARTMENT Attorney General - MPCA

Office Memorandum

TO : Michael Miller
Special Assistant
Attorney General

DATE: 5/17/76

FROM : William P. Donohue
Special Assistant
Attorney General

PHONE: 7345

SUBJECT: Minn. Reg. WPC-37

Enclosed are the rulemaking documents for the above-referenced regulation. I have also enclosed a list of the exhibits received at the hearing. If you want to review any of the exhibits, please contact me and I will have it brought over to you.

In addition, I have enclosed two documents at the request of Mr. Raymond Haik, Attorney for the Soap & Detergent Association. These are a proposed Findings of Fact and Conclusion and an analysis of the Agency Staff's Findings of Fact, both of which were prepared by Mr. Haik on behalf of his client. Both of these documents were before the Agency Board at or prior to their decision to adopt these regulations.

WPD/mg

cc: Raymond Haik

STATE OF MINNESOTA

COUNTY OF RAMSEY

BEFORE THE MINNESOTA POLLUTION CONTROL AGENCY

In re Proposed WPC No. 37

Proposed Findings of Fact and Conclusions

The Minnesota Pollution Control Agency, after due consideration of testimony, exhibits and the entire record of the hearings held on proposed WPC 37 on February 11, 12 and 13, and April 7, 8 and 9, 1975, finds facts and makes conclusions as follows:

F I N D I N G S O F F A C T

I. STATUTORY PROVISIONS

1. Minn. Stat. Sec. 115.03(e)(8) provides in part that:

> Prior to establishment of any such effluent limitation, the agency shall hold a public hearing to determine the relationship of the economic and social costs of achieving such limitation or limitations, including any economic or social dislocation and the effect to the communities, to the social and economic benefits to be obtained and to determine whether or not such effluent limitations can be implemented with available technology or other available control strategies. If a person affected by such limitation demonstrates at such hearing that, whether or not such technology or other alternatives control strategies are available, there is no reasonable relationship between the economic and social costs and the benefits to be obtained, such limitations shall not become effective and shall be adjusted as it applies to such person . . .

2. Minn. Stat. Sec. 116.07 Subd. 6 provides that:

> In exercising all its powers, the Pollution Control Agency shall give due consideration to the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic and other economic factors and other material matter affecting the feasibility and practicability of any proposed action, including but not limited to the burden on a municipality of any pacts that may result therefrom and shall take or provide for such action as may be reasonable,

STATE OF MINNESOTA

COUNTY OF RAMSEY

BEFORE THE MINNESOTA POLLUTION CONTROL AGENCY

In re Proposed WPC No. 37

Proposed Findings of Fact and Conclusions

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feasible and practicability of any proposed action, including but not limited to the burden on a municipality of any tax which may result therefrom and shall take or provide for such action as may be reasonable, feasible and practicable under the circumstances.

3. Minn. Stat. Sec. 116.21 provides that any limitations imposed must take into account the following factors:

(1) The availability of safe, non-polluting and effective substitutes;

(2) The difference in the mineral content of water in various parts of the state;

(3) The differing needs of industrial, commercial and household users of cleaning agents and chemical water conditioners.

II. HISTORICAL BACKGROUND

1. In January, 1974, the Division of Water Quality of the Minnesota Pollution Control Agency issued a memorandum which referred to the statutory provisions listed above and based its conclusions upon the information developed by the Midwest Research Institute, a consultant retained by the Agency. According to the Agency memorandum, the Midwest Research Institute concluded substantially as follows:

> (1) No suitable replacement is available for phosphates in terms of performance and safety, and a minimum level of phosphate is necessary in detergents, automatic dishwashing compounds and water conditioning agents.
>
> (2) For laundry detergent, the phosphorus content of 8.5 to 9% (dry weight) is necessary for adequate performance with most Minnesota water supplies.
>
> (3) A phosphorus content of 7% could be set as a maximum level for laundry detergents. However, those using water supplies that were 100 mg/l hardness (20%) would need to use more detergent and in extreme cases would need to add polyphosphate water conditioners.

(4) Only phosphate detergents will allow retention of the fire-retardant coating of garments through washing.

(5) A phosphorus content of 9-11% in automatic dishwashing compounds will result in adequate performance. Water conditioners can be limited to 20% phosphorus and still provide effective performance. Other detergents can be limited to less than 5% phosphorus.

(6) Information on the oral toxicity, and primary eye or skin irritation characteristic of the product, should be registered with the state, and labeling of the detergent should be consistent with the requirements of the Federal Hazardous Substance Act and Interstate Commerce Commission regulations. Fire retardancy coating of children's sleepwear, is required by federal regulation.

(7) Any promulgated regulation should be sufficiently broad to require use of suitable phosphate replacements if they are developed.

2. The January 1974 Agency memorandum also noted that the Midwest Research Institute recommendations included a provision recommending that heavy duty detergents and built soaps for machine laundry be reduced to no lower than 9% phosphorus, automatic dishwashing detergents should be restricted to no less than 11% phosphorus, and that water softening additives for machine laundry use should not exceed 20% phosphorus. The recommendations expressed considerable concern about oral toxicity, eye irritation and skin irritation as well as the effect on fire retardant fabrics.

3. The January, 1974 memorandum noted that "the EPA (Federal Environmental Protection Agency) has not supported a ban on phosphorus and detergents, but is relying instead on incorporation of phosphorus reduction units in sewage treatment works with discharge to lakes."

4. The staff recommendations included several alternatives. Two of those alternatives considered the possibility of only minor restrictions of phosphate content in laundry detergents. Two others suggested the adoption of no restrictions on phosphorus content detergents. The reasons given for the latter recommendations included the fact that there were no satisfactory substitutes

for phosphorus in detergents and that the effects of a total ban on phosphorus on algal and acquatic plant growth could not be predicted with any reasonable degree of certainty. It was also noted that advanced waste treatment for nutrient reduction in areas required by Minnesota regulations would continue to be necessary even though phosphorus might be banned from detergents in whole or in part.

5. The Agency memorandum issued in support of the proposed phosphorus regulations (WPC 37) concedes that sufficient data is not available to determine conclusively what effect phosphate reductions have had or will have on the biological productivity of lakes and reservoirs. It also notes that nutrient removal facilities will still be required at sewage treatment plants.

6. The 52,000 member American Home Economics Association has adopted a resolution supporting the use of phosphate in detergents. This same position has been taken by the New York State Home Economics Association and the Indiana State Home Economics Association where phosphate restrictions presently exist. (Transcript 4/8, p. 115 (hereinafter referred to as "Tr.")).

III. TECHNICAL, SOCIAL AND ECONOMIC FACTORS

A. Functions of Phosphorus in Detergents

7. There are two major ingredients common to most laundry detergents. (1) phosphate is the builder component which enhances the action of the (2) surface active agent or surfactant. Surfactants are inhibited by water hardness minerals which are primarily calcium and magnesium. While some surfactants are less calcium sensitive than others, the performance of virtually all of them will be affected to some degree by water hardness. (Tr. 2/12, p. 124). A builder must necessarily be helpful in controlling water hardness but a good builder has other characteristics as

well. (Tr. 2/12, pp. 124-125). Phosphate used as a builder is efficient, effective and safe. It has the following characteristics:

(a) It sequesters calcium ions to control water hardness by sequestration without precipitating any undesirable deposits out of the wash solution.

(b) It buffers the wash solution at a pH of approximately 9.5 which is safe and effective because it remains slightly alkaline but not too caustic. It creates an optimum pH for the performance of surfactants. This pH is most easily maintained throughout the wash cycle by phosphorus because of its ample buffering capacity.

(c) It helps to emulsify soils and thereby remove them.

(d) It helps suspend soils in wash solutions such that no redeposition of soil particles on cleaning clothing occurs.

(e) It contributes to the removal of a wide variety of soils.

(f) Its physical properties enhance finished detergent products because it helps create a rapidly soluble granule which is free-flowing even in extreme humidity; it is virtually dust-free. (Tr. 4/7, p. 138).

8. Detergent cleansing action is decreased as water hardness increases. In Minnesota, approximately 60% of the population experiences hard or very hard water. (Tr. 4/7, p. 141). The water softening industry representatives in Minnesota concede that 61% of Minnesota residents are supplied with hard water in excess of 9 grains per gallon. (Tr. 4/9, p. 209).

9. Soil introduced into the washing solution by soiled clothing elevates water hardness in the average load of dirty clothes by at least three grains per gallon (51 parts per million). (Tr. 4/7, p. 142). Therefore, the increase in clothes washing problems that will result from a ban on detergent phosphates will

be the greatest for families who must use hard water and have heavily soiled clothes to wash. Such problems will also be more severe for families who have more than three children and/or use coin operated laundries. (Tr. 4/7, p. 143).

10. Carbonate built detergents soften hard water by creation of calcium carbonate, an insoluble precipitate which is deposited on clothing and washing machines. (Tr. 4/7, p. 146).

11. 9.7% of the total U. S. population uses mechanical water softeners. (Tr. 2/13, p. 14). Water conditioner representatives conclude that extreme water hardness conditions in Minnesota are generally well serviced by water softeners. However, that conclusion was supported entirely by estimation; no statistics are available to support it. (Tr. 4/9, p. 212).

12. Minnesota's experience with mechanical water softeners indicates that they are often not well maintained. They are often not used where needed, and even where used, soil in the washing solution increases hardness to the point where water softeners do little good. (Tr. 4/9, p. 156). Even in those water softeners which are maintained on a regular basis, it is common to experience a dramatic increase in water hardness prior to the monthly recharging of the unit with salt. (Tr. 4/9, p. 160).

B. Problems With Phosphorus Substitutes

13. Substitutes for phosphate-built detergents are uniformly inferior in their ability to remove body soils, particulate matter, mud, clay and stains. (Tr. 2/12, p. 126 and Tr. 4/7, p. 140). Invariably use of nonphosphate substitutes as the builder in detergents results in a formula which is deficient in one or more of the cleansing characteristics found in detergents using a phosphate builder. See for example, Public Exhibit #3 which is a letter from Mrs. LaVerne Halverson, a home economist and homemaker who is unaffiliated with any of the detergent associations

or manufacturers. It is her opinion, based on personal experience and contacts with homemakers, that cleaning products that substitute other ingredients for phosphates are uniformly inferior. (Tr. 2/11, p. 41). See also Public Exhibit #4, which is a letter from Elizabeth F. Boyle, a private citizen who is also a home economist and who advises the Agency that to ban phosphates would be ill-advised. (Tr. 2/11, p. 42).

14. The Agency, in their memorandum on phosphate detergent control and during the instant hearings, has suggested that liquid laundry detergents be used as a substitute for the phosphate-containing powders. While this type of detergent is currently available in the State of Minnesota, its acceptance by the consumer has been at best lukewarm. At the maximum, liquid laundry detergents have acquired only an approximate 15% share of the total laundry market. Currently, liquids are used primarily for pretreating spots and greasy soils, and only about 5% of detergent users use liquid detergents as their sole product. (Tr. 213, p. 104).

15. While it is true that most liquid formulas do not use phosphate, they do require a large increase in the level of surfactant to get effective cleaning. Since surfactants are derived from petrochemicals, both supply and cost are likely to be reoccurring problems. The use of liquids to replace all phosphates as builders in detergents will require the increased use of petrochemicals equivalent to approximately 100,000 barrels of oil per year in Minnesota. (Tr. 4/7, p. 196). Furthermore, increased surfactant use means an increased organic waste load on sewage treatment plants and/or the waters receiving sewage treatment plant effluent.

16. Citrates have been suggested as a substitute for phosphorus as the builder component in detergents. However, citrates

are not as effective as phosphorus. The Gillette Research Institute has stated that citrates are "relatively weak cleaning agents." (Tr. 4/9, p. 151). Citrates are also in limited supply. There is no existing reserve and it would take several years for manufacturers to be able to create an adequate supply for detergent usage. Citrates are also approximately one and a half times as expensive as phosphorus. In addition, the use of citrates would require more surfactants in the detergent which would require an additional use of petrochemical. Still more cost would be required because citrates are also more difficult to process into a finished product. (Tr. 4/7, p. 151).

17. NTA is not a viable alternative to phosphate at this point. The Department of Health, Education and Welfare has cast considerable doubt on the utility of NTA because of the questions raised in Department studies concerning potential health problems with the product.

18. CMOS which is more ineffective than either NTA or sodium tripolyphosphate, also lacks present production capability. (Tr. 4/7, p. 156).

19. HEIDA is still in the research stage and any statements about its safety would be mere speculation. It too is less effective than either NTA or sodium tripolyphosphate and lacks present production capability. (Tr. 4/7, p. 156).

20. Nor is soap a viable substitute for phosphate. Soap creates a precipitate when combined with water hardness ions. The precipitate masks the flame retardant characteristics of fabrics. Also, the cleansing capability of soap is substantially inferior to phosphate in all but the softest water. (Tr. 4/7, p. 158 and Tr. 4/7, p. 160). In addition, a complete changeover to 100% soap products would increase the BOD load on domestic sewage treatment plants by more than 85%. (Tr. 4/7, p. 207).

21. Both the Midwest Research Institute and Consumers

Research Magazine have concluded that there are no adequate substitutes for phosphates. (Tr. 4/7, p. 145). In a study by the Gillette Research Institute, which was originally prepared for the U. S. Government, no substitutes for phosphates were found sufficiently promising to continue with product feasibility studies that had been originally planned by the research project. (Tr. 4/7, p. 151).

22. Due to lack of performance requiring many loads of clothing to be rewashed and rerinsed, substitutes also require increased energy use and increased time and attention. (Tr. 2/13, pp. 101 and 106).

23. Even proponents of the phosphorus substitutes such as Dr. Anthony Schwartz recommend that the Agency take the time to evaluate the major economic impact on manufacturers that would result in forcing such manufacturers to switch over to nonphosphorus substitutes. (Tr. 2/11, p. 206).

24. Reclamation of phosphate from sewage for fertilizer is now chemically possible, whereas the technology for recovering builders based on organic chemicals is not yet on the horizon. In addition, surfactant usage would be substantially increased in any attempt to replace phosphates with other builder components. (Tr. 4/7, p. 198).

25. Minnesota companies have discovered that their attempts to market nonphosphate products are fruitless because Minnesota consumers do not accept an ineffective product which also contributes to other problems. (Tr. 4/9, pp. 178, 192 and 197). For example, in the testimony before the Agency by Dr. Hugh B. Cosgrove, who is the Executive Director of the Minnesota Food Retailers Association, Dr. Cosgrove indicated that in Minnesota, where shoppers now have the freedom to choose which type of product they want to buy, the vast bulk of their detergent purchases are of the phosphate brands. It was Dr. Cosgrove's opinion that

forcing the removal of phosphate from the store shelves and permitting only the less preferred nonphosphate products to be sold, would have a substantial negative effect on the business of many members of the wholesale and retail grocery industry in Minnesota. (Tr. 2/12, p. 57).

26. In his statement before the Agency Mr. Paul Dodge, who is a senior chemist for Tennant Company located in Golden Valley, Minnesota and involved in the manufacture and sale of cleaning equipment used in industry, indicated that Tennant Company has no particular interest whether phosphate or nonphosphate products are used in their cleaning machinery, except to the extent that it affects the cleaning ability of the machines. Mr. Dodge indicated that phosphates have been found to give Tennant machines a much better detergent and that if Tennant is to continue to have available the best detergent, it must use phosphate detergent. Mr. Dodge also pointed out that Tennant has tried nonphosphate detergents, but they just do not work. (Tr. 2/12, p. 90).

27. In the statement by Wayne Boand, the Vice President and Technical Director of Lanosheen, Inc., a local Minnesota corporation, Mr. Boand indicated the disasterous experience that Lanosheen had had in attempting to switch over to nonphosphate products. Mr. Boand indicated that longtime users of Lanosheen products simply quit buying the product and despite the fact that Lanosheen did everything that it could to develop a suitable substitute for phosphate based detergents, it could find nothing available that would provide the same sort of effective cleaning available with phosphate detergents. (Tr. 4/9, p. 197).

C. Health Concerns

28. At this time there is no assurance that phosphate substitutes are safe in terms of their impact on human health through exposure to these substitutes during use of the product. The

safety of phosphates is certain. See for example, the concern expressed by Janice Wallraff, Mary Bailey and Sharon Lafferty, all home economists, who in their letter to the Agency, marked as Public Exhibit #11, expressed their concern with the toxic and irritant affect on children and users involved with nonphosphorus detergents. (Tr. 2/11, p. 139).

29. Professor Greene of the University of Minnesota, in his statement to the Agency, indicated that for 25 years he has been teaching that tripolyphosphate as a cleaning agent is a significant advance in health and technology and that if we did not have such a compound today its discovery would be hailed as a real boon to mankind. It is Professor Greene's opinion that phosphate is safe and is extremely effective. It is inexpensive and it is compatible with the water supply of nearly every community in the United States. It is Dr. Greene's opinion that the Agency should be very hesitant to ban such a safe and effective product. (Tr. 2/11, p. 224).

30. The economics involved in utilizing phosphate substitutes also directly impacts human health where nonphosphate detergents are marketed which do not clean as well as current phosphate based products or which cost more to do the same cleaning job. Poorer sanitation will result, particularly for those less able to bear increased cleaning costs. A consequence of poor sanitation is greater likelihood of disease. Historically, those less able to bear increased costs are also more susceptible to disease. (Tr. 4/7, p. 108).

31. Substitutes for phosphate may ultimately mask the flame retardant characteristics of fabrics. It is anticipated that future regulation will require that approximately 22% of all fabrics be flame retardant. (Tr. 4/7, pp. 159-160). One of the fabric types most susceptible to masking of flame retardant characteristics is cotton flannel, which enjoys a larger share of the clothing market in Minnesota than elsewhere. (Tr. 4/7, p. 160).

32. Using vinegar as an acid rinse to reestablish flame retardant characterisitics is not a solution because vinegar damages porcelain in washing machines. (Tr. 4/7, p. 160).

D. Adverse Effect of a Phosphate Ban on Clothing and Machinery

33. The use of carbonate built detergents has been shown to decrease the service life of garments between 5 and 20 percent depending on water hardness. (Tr. 2/12, p. 191). Some estimates of increased wear have been as high as 40 percent. (Tr. 4/9, p. 253). It is realistic to expect an increased wear of 15% when carbonate is used in place of phosphorus as a detergent builder. (Tr. 4/7, p. 47). (Tr. 2/13, p. 12 and Tr. 4/9, p. 155). See for example, Public Exhibit #10, which is a letter from Mrs. H. Peter McDonald, a home economist and a homemaker, who expresses grave concern about the undesirable effects of nonphosphate detergents. In her letter, Mrs. McDonald encourages the Agency to consider the damage to washers, flame retardant finishes and general poor laundering results that have been caused by nonphosphate detergents and to consider the proposed standards in view of the consumer problems that they will inevitably create. (Tr. 2/11, p. 139). In addition is the joint letter from Janice Wallraff, Mary Bailey and Sharon Lafferty (Public Exhibit #11), all home economists who strongly oppose the ban on phosphate detergents in Minnesota because of the problem that nonphosphate detergents will cause in regard to flame retardant finishes, stiff, harsh and faded clothing and the deterioration of porcelain and metal parts of washers because of the white lime residue created by nonphosphorus detergents. (Tr. 2/11, p. 139).

34. Based upon experience from the State of Indiana where a phosphorus ban in detergents has been in effect long enough for appliance manufacturers to develop field experience, carbonate

buildup related problems have appeared no matter what mix of products were used. (Tr. 2/12, pp. 203-204). In phosphorus ban areas such as Indiana which has water characteristics similar to Minnesota, there is an 80% probability that an additional service call on washing machines will be required within the first year after the ban has gone into effect. (Tr. 4/7, p. 48).

35. Carbonate built products have led to poor cleaning, inability to remove stains, redeposition of soil, poorer solubility of soils in warm and cold water, skin irritation, white streaks on colored fabrics, loss of flame retardant characteristics on cottons, broken threads in elastic fabrics, malfunction of zippers, yellowing and graying of fabrics, increased tendency to scorch upon ironing, and required use of more detergent and increased numbers of laundry aids. (Tr. 4/7, p. 148 and Tr. 2/12, p. 31 and Tr. 2/13, p. 24).

36. In the testimony of Robert Shuck, a chemist for General Electric Company, which is not involved in the manufacture of detergent products, Mr. Shuck reported on the testing that had been done by General Electric in regard to the effect of nonphosphate detergents on washing machines manufactured by General Electric. Mr. Shuck indicated that the nonphosphate detergents containing sodium carbonate as building agents, resulted in a progressive buildup of lime scale on the side of the washing machines, while the same machine using a phosphate product remained essentially free of any such deposits. (Tr. 2/12, p. 182). Mr. Shuck also indicated that General Electric has begun to develop and compare some service cost information for areas with the phosphate ban versus areas without such ban. Data developed to date indicates that the service costs are 50% higher in areas where a phosphate ban is in effect. (Tr. 2/12, p. 206).

37. The statement of Ann Olson, of the Speed Queen Company in Ripon, Wisconsin, testifying on behalf of her company which is not directly involved in the detergent industry, expressed great concern over the proposed ban of phosphate detergents because in her opinion there are currently not available substitutes which provide adequate cleaning. This opinion was based on tests that have been run by Speed Queen and also on comments that Speed Queen had received from its customers who were complaining of deposits and lime residue which was being generated from the use of non-phosphate detergents. (Tr. 2/13, pp. 16-47).

38. Similarly, the statement by Eugenia Hatcher, President of Homemaker Testing Corporation, who had done some consumer research in areas where a phosphate ban was in effect, indicated that nonphosphate detergents were causing serious problems with residue buildup. (Tr. 2/13, pp. 77-87).

E. Waste Treatment - The Real Solution

39. Dr. Sidney A. Schwartz, Director of Research for the New York State Department of Environmental Conservation and Commissioner of Environmental Conservation, although a proponent of the phosphate ban in New York State, has expressed his opinion that the most practical and efficient way to achieve phosphorus removal is through waste water treatment plants. (Tr. 2/22, p. 36).

40. Dr. James Etzel, a professor and head of the Environmental Department of the School of Civil Engineering, Purdue University, West Lafayette, Indiana, who has worked almost all of his life in the area of water pollution control, testified that in his opinion a rather grievous harm has happened in Indiana, as a result of the phosphate ban on detergent phosphates. In Dr. Etzel's opinion, the proponents of the phosphate ban did such a job in brainwashing both the public and the lawmakers into thinking that taking the phosphate out of detergents would really solve the

phosphorus pollution problem that there is decreased public concern and support for the sewage treatment needed to achieve real improvement in water quality and that, in fact, Indiana is about two years behind where they should be in water treatment because the lawmakers and the lay public have been led to believe that once they remove the phosphate from detergent they would have solved the pollution problem. (Tr. 2/13, p. 170).

41. A more effective, low cost, and immediate means to maintain water quality is to initiate chemical precipitation in sewage treatment rather than to ban phosphate in detergents. See for example, Public Exhibit #7, which is a letter from the City of Rochester addressed to Mr. Grant Merritt, dated January 6, 1975, wherein the City points out that the proposed phosphate ban would not solve the problem of phosphorus in surface water and would not reduce the capital or operating costs of the removal facilities that would have to be installed to really cure the problem of nutrient pollution.

42. Chemical precipitation is a coagulation process which removes a number of sewage components. (Tr. 2/13, p. 184, Tr. 4/8, p. 210).

These include:

(1) Elements which increase biological oxygen demand (BOD)

(2) Suspended solids

(3) Nitrogen

(4) Parasite eggs

(5) Virus

(6) Bacteria

(7) Color

(8) Heavy metals

Carbonate which is not presently removed by any reasonably advanced waste treatment facility could also be removed. (Tr. 2/13, p. 186).

Because chemical precipitation removes a number of harmful elements from water as well as phosphorus, it is inappropriate to speak only of phosphorus removal. (Tr. 2/13, p. 203).

43. Only about 35-40% of sewage phosphorus comes from detergents. The total amount of phosphorus in sewage is sufficient such that treatment costs will be virtually independent of the amount of phosphorus it contains. (Tr. 4/7, pp. 207-208). Treatment costs are primarily a function of the concentration desired in the effluent once it has cleared the treatment facility, rather than of the concentration of phosphorus found in the sewage as it enters the treatment plant. (Tr. 4/7, p. 208). In other words, the removal of phosphate from detergents will save very little operating money if total phosphorus removal is installed in the treatment plant. This has been borne out by actual practice in Sweden. (Tr. 4/8, pp. 69 and 72).

44. Chemical precipitation also has advantages which are cogent concerns for Minnesota. It works well in subzero cold. It can treat storm water as well as sewage effluent and it requires less chlorine which therefore lowers the toxicity of the efffluent and decreases dependence on a commodity which is in short supply presently and its use is being questioned by the Agency. (Tr. 4/7, p. 211).

45. Chemical precipitation systems do not require special skills or operations other than those common to sewage treatment plant operators in general. (Tr. 2/13, p. 191 and Tr. 4/8, p. 20). It is appropriate for Minnesota trickling filter plants and activated sludge plants as well with no significant difference in cost. (Tr. 2/13, p. 205). One plant was operated for a full year without evening or night duty personnel. A check was made in the morning, the flow of chemical was increased at midday to compensate for increased sewage flow and the flow was decreased in the evening. (Tr. 4/9, p. 42). Chemical precipitation facilities can be accomplished in a matter of weeks. (Tr. 4/7, p. 212).

46. Chemical precipitation is practical for all facilities (Tr. 4/8, p. 4) and is realistic for groups as small as 500 to 1,000 people. (Tr. 4/9, p. 78). Finland has plants presently functioning for groups of 100 to 200 people. (Tr. 4/9, p. 78).

47. Chemical precipitation practice in small plants can be as simple as allowing the coagulating chemical to drip into the final clarification tank. No metering devices or sophisticated equipment is required. (Tr. 4/8, p. 43).

48. Phosphorus presents no problems to septic tanks and tile fields. Tile fields have the ability to regenerate absorption spaces for phosphorus for 30 to 300 years. Tile fields efficiently remove phosphorus. (Tr. 4/8, p. 14).

49. Carbonate could have an adverse effect on tile fields. There is a possibility that carbonate precipitates could eventually clog tile fields. (Tr. 4/8, p. 189).

50. Mr. Warren Goss, a retired chemist now, President of Ten Mile Lake Association in Cass County, indicated his concern for the substitutes that would be used to replace phosphates by pointing out that carbonates which are found in most of the non-phosphate detergents is a soil sealant which is used on farms to seal the bottom of ponds to reduce the loss of water through percolation and therefore would have adverse effects on drain fields. (Tr. 2/13, p. 5).

F. Ineffectiveness of Phosphate Bans Presently in Force

51. None of the areas in which a phosphate ban is in effect have yet generated sufficient data to show that a ban has in fact decreased algal growth. In Chicago, a ban on phosphate built detergents left 25-50 times the amount of phosphorus in the receiving waters over that required to support an algal bloom. In Dade County, Florida, no measurable change in phosphorus

concentration was noted in the canals except immediately next to sewage treatment plants. No change in the amount of weeds in the canals was observed. (Tr. 4/9, pp. 5-6).

52. In summarizing the conclusions drawn from the study done by Purdue University on the effect of the phosphate ban on algal growth in Indiana, Dr. James Etzel, who participated in that study, pointed out that while the phosphate ban had lowered the level of phosphate in the streams somewhat, the result was so insignificant that in Dr. Etzel's opinion the ban has accomplished very little. There is no indication that it has done anything to delay the aging of the surface waters of Indiana. (Tr. 2/13, p. 177).

53. Proponents and opponents of the phosphate ban are agreed that measurements made at Lake Onondaga, Syracuse, New York, shows nothing conclusive. (Tr. 4/9, pp. 18 and 111). Observations in Erie County, New York on county streams also demonstrate nothing of significance for Minnesota conditions. (Tr. 4/9, pp. 20 and 114).

54. In experiments conducted at several universities throughout the country using lake waters of the area, university scientists determined that sewage without detergents provided sufficient nutrients to give a strong algal bloom. The addition of detergent, either with or without phosphate, generated little increase in algal growth. These experiments were carried out at Utah State University; Wabash College, Indiana (Tr. 4/9, pp. 8-14); Lake George Limnological Research Center, New York (Tr. 4/9, pp. 14-17); and the University of North Carolina.

55. In the Minnesota Pollution Control Agency's Statement of Need and Explanation of WPC 37, it was conceded that sufficient data is not available at this time to determine conclusively what

effect the phosphorus reductions have had or will have on the biological productivity of lakes and reservoirs. In addition, the Agency has conceded that phosphorus removal facilities will still be required even with a phosphorus ban where the discharge is directly to or affects a lake or reservoir. (Tr. 2/11, p. 14).

56. It is agreed by proponents of phosphate bans that information on streams has no bearing on lake conditions as found in Minnesota. Over one half of the population of Minnesota resides in a position where sewage effluent is discharged into a moving stream (i.e., the Mississippi River). It is conceded that phosphorus limitations will have no effect on streams. Therefore, there is no indication that a phosphorus ban would have an effect on greater than one half the population of the State of Minnesota in any event. (Tr. 4/9, p. 114).

57. In no case has a phosphate ban decreased phosphorus available in waters to the range of 10 to 40 parts per billion in which phosphorus becomes the limiting nutrient and curtails additional algal growth in the absence of additional phosphorus. Every state agency that has faced the issue has decided that waste treatment would be necessary for nutrient reduction even though phosphorus might be banned from detergents in whole or in part.

G. Costs Borne by Minnesota Residents if Phosphorus Ban Were to be Introduced.

58. Additional costs for washing machine maintenance due to calcium and magnesium buildup and clogging of parts could amount to a $15.61 service call for 80% of washer owners. This would result in a total cost of approximately $11.2 million per year in Minnesota to repair only one of the affected parts, recirculation system nozzles. Sixty percent of the washing machine owners in

Minnesota would be expected to experience repairs for filter malfunctions for a total of approximately $11.3 million per year. If vinegar was used to rinse to avoid buildup at the rate of one quart per week at average prevailing prices it would amount to approximately $42.90 per year. (Tr. 4/8, p. 84).

59. Clothing costs would be increased because of carbonate precipitation and deposits on clothes which would result in extra wear on clothes themselves. A phosphate ban would increase clothing costs by $40.80 per family per year for a total added cost to Minnesota residents of $36.5 million each year (Tr. 4/8, p. 88).

60. Comparison of washing costs in two cities of similar water hardness, one in a phosphate ban area and one in an area where phosphate detergents were used, demonstrates an increase of 41% in the cost of doing laundry which amounts to an average of $20.28 per family per year of $18.8 million per year for the State of Minnesota. That cost was based upon field results and demonstrates the choices consumers make over the full range of available detergent choices. However, it did not include increased energy costs which would be required to heat more water and the use of more water to rerinse and rewash. Comparison between the two cities indicate that approximately 190,000 extra gallons per year of water were used by the 200 families surveyed in the phosphate ban area over that used by the same number of families in the area where phosphate detergents were available. (Tr. 2/13, p. 113).

61. If Minnesota residents were to install water softeners at a cost of $150 to $500 and operate them at a cost of $20 to $50 per year for all 894,000 families in Minnesota, it would cost Minnesota families $120,000,000 to install water softeners and $16,000,000 to operate them each year. Clearly all families do not have water softeners; the situation demonstrates further that the economically deprived suffer the most. (Tr. 4/8, p. 91).

62. Capital costs for installation of chemical precipitation vary from $1,000 to $22,000. Therefore the total cost of installation in Minnesota where phosphate limitation concern exists in 152 plants equals $152,000 to $3,344,000. (Tr. 4/8, p. 9). Annual chemical costs per capita equal a total cost of approximately $1.25 to $2.250 per person per year. The Federal Environmental Protection Agency uses a figure of approximately $1.86 per year. (Tr. 4/9, pp. 48-49). Of the total costs described above, none of the capital costs and only 40% of the operating cost, at most, can be ascribed to the detergent phosphorus.

63. The total cost for a phosphate ban due to facts described above in Minnesota could amount to $65.8 million and would vary down as low as $29.3 million if fabric wear decreased to zero.

64. This cost is astronomical when compared to the approximate $200,000 that would be needed to provide additional chemical precipitation capacity so as to remove the phosphate from sewage that results from the use of phosphate detergents. (Tr. 4/8, p. 83). Chemical precipitation at sewage treatment plants is clearly the cost-effective approach.

H. Availablility of Phosphorus Versus Substitutes

65. There is no shortage of phosphorus. Those shortages claimed in MAN IN THE LIVING ENVIRONMENT were acnowledged to be errors by the members of the Task Force which made the analysis. (Tr. 4/7, p. 192). Phosphorus is the fourth most abundant element in the earth's crust of commercially important elements. (Tr. 4/7, p. 195). There is sufficient phosphorus remaining for uses in the world for several centuries. (Tr. 4/9, p. 24). Lack of concern over availability is demonstrated by the fact that the United States exports phosphorus. (Tr. 4/9, p. 27).

66. Minnesota businesses conclude that economic pressures for economy and cleaning performance require that phosphorus

be used rather than substitutes. In addition, substitutes are difficult to obtain in the marketplace. (Tr. 4/9, pp. 182, 183 and Tr. 4/9, p. 199). Minnesota businesses would suffer substantially if forced to rely on substitutes. (Tr. 4/9, pp. 184, 188 189 and 199). The proposed regulation which would prohibit manufacture of phosphate detergents in Minnesota would work a hardship on Minnesota based companies which do business in other states.

C O N C L U S I O N S

1. Information presented at the hearing did not demonstrate that recent discoveries have altered the conclusions of previous investigators who concluded that there are no "safe, nonpolluting, effective" substitutes for phosphates and detergents.

2. MPCA staff noted that the proposed regulation would exempt chemical water conditioners from limitation of phosphorus content. No information was presented concerning the economic or other consequences of using such water softeners as a means of taking into account different water hardness in the various parts of the State of Minnesota.

3. No information was presented that demonstrated that the needs of industrial commercial and household users were separately considered.

4. The record is devoid of any testimony which demonstrates that the Agency has attempted to determine the economic and social costs of achieving the proposed limitations, despite major concerns expressed by public witnesses and University of Minnesota staff members.

5. No information was presented at the hearing demonstrating that the Pollution Control Agency had given due consideration

to the establishment, maintenance, operation and expanse in business, commerce, industry and traffic and other economic factors, and other matters affecting the feasibility and practicability of the proposed action as required by statute. The effect of such a product control system as represented by WPC 37 was not discussed with relation to ability to develop and market new products.

6. No information was presented demonstrating a reasonable basis for a complete change of conclusions from the January, 1974 memorandum of the Division of Water Quality of the MPCA to the memorandum of 1975 in support of the regulation limiting the phosphorus.

7. No information was presented showing any relationship between the decrease in phosphorus which would result from a phosphate detergent ban and correlation with decreased algal growth. No data was presented to support the position that reduction of phosphorus in water will reduce or ameliorate eutrophic conditions.

8. The approach proposed by the proposed regulation is speculative in terms of effect to be accomplished and effect of the wholesale use of substitutes upon consumers in both the short and the long run.

9. The studies and information to-date clearly demonstrates that additional treatment at the sewage plants is the better public policy to implement rather than the program suggested by the staff to ban phosphates.

10. The public health and social concerns expressed by independent witnesses from the University Home Economics and Public Health Departments evidence both the questionable nature of the alleged public benefits to be achieved by a ban and the adverse impacts that will be the result of a ban. These opinions of public witnesses with a background and experience in dealing with public health,

cleaning and day-to-day social problems should be afforded great weight by the Agency.

11. A ban on phosphate detergents is an inappropriate way to deal with the problem of excessive algal growth when viewed either in terms of the economic considerations or in terms of its effectiveness as a means of substantially improving water quality.

Dated _____.

Respectfully submitted,

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ANALYSIS OF STAFF'S PROPOSED FINDINGS
FROM HEARINGS ON WPC 37

Under Minnesota Statutes § 116.21, the Pollution Control Agency is authorized to set limitations on nutrient levels in various cleaning agents in order to reduce the over stimulation such nutrients provide to the growth of aquatic life in our state's waters. Such limitations, however, are only authorized after careful consideration of not only the effectiveness of such proposed nutrient limitations, but also the availability of effective, safe, nonpolluting substitutes and the relative needs of the prospective users of such substitutes.

The Findings of Fact prepared by the Agency staff, which are allegedly based on the public hearings related to WPC 37, not only fail to adequately respond to the many important considerations militating against such a ban, but also fail to establish the conclusion that a phosphate ban is an effective and efficient way of dealing with the problem of accelerated eutrophication.

Examples of the staff's failure to respond to the concern that the promulgation of WPC 37 will have severe and disproportionate impacts on various segments of the Minnesota community are numerous:

a) The availability of cost-effective substitutes for phosphates in laundry detergents has not been established.

b) Evidence concerning increased costs associated with use of nonphosphate laundry detergents has been dismissed or referred to only in passing.

c) The cost to consumers of using additional chemical water conditioners (containing phosphates) to make up for performance deficiencies in nonphosphate detergents has not been considered.

d) The very real possibility of deleterious effects of WPC 37 on sanitation and thus on public health; concerns which are based on sound bacteriological principles have been dismissed without adequate investigation.

e) The problems caused by phosphate substitutes which tend to mask the flame retardant capability of children's flannel sleepwear, are admitted, but unresolved by the Agency staff.

f) The disproportionate impact of proposed WPC 37 on larger families with heavy soil loads has not been considered, though it was included in the record.

Equally important is the fact that the staff has failed to establish that significant benefits will result from the promulgation of WPC 37 as evidenced by the following:

a) The extent to which algal blooms and aquatic vegetation would be reduced, if any, has not been documented but only speculated.

b) The alleged significant postban cost savings for removal of phosphorus at waste treatment plants has not been documented.

c) That proposed WPC 37 provides a cost-effective approach to reducing algal blooms and other aquatic vegetation in Minnesota waters has not been documented.

Attached is a paragraph by paragraph analysis of the selective fact finding by the Agency staff. A careful review will show that the findings not only fail to establish that proposed WPC 37 provides a cost-effective approach for reducing algal blooms and other aquatic vegetation, but will also show that the staff's findings fail to negate the argument that the adverse consequences of such a ban clearly outweigh the minimal benefits to be derived therefrom.

FORM OF ANALYSIS: A complete reprint of the proposed findings prepared by the staff follows with our analysis inserted in brackets following the paragraph to which the analysis is primarily directed.

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STAFF'S PROPOSED FINDINGS AND ANALYSES

I. INTRODUCTION

1. In 1971 the Legislature encouraged the Minnesota Pollution Control Agency to "...set standards limiting the amount of nutrients in various cleaning agents and water conditioning agents."

2. In authorizing such regulations the Legislature recognized that the nutrients contained in many of these products "...overstimulate the growth of aquatic life and eventually lead to an acceleration of the natural eutrophication process of our state's waters."

3. These regulations are intended to carry out the legislative purpose of keeping the waters of the state in a pollution free condition by prescribing the use of the nutrient phosphorus above specific concentrations in various cleaning agents and water conditioners.

II. EUTROPHICATION AND THE IMPORTANCE OF PHOSPHORUS CONTROL

4. Eutrophication is a natural aging process of lakes which is accompanied by a gradual increase in biological productivity. Abnormally high nutrient inputs attributable to human activities greatly accelerate the rage of the eutrophication process. There are many detrimental effects associated with accelerated eutrophication, but it is chiefly characterized by the stimulation of excessive blooms of blue-green algae.

5. Virtually all nutritive elements required by algae, except phosphorus, are readily available from natural sources. Large quantities of phosphorus are usually not available in Minnesota waters under natural conditions; hence phosphorus is the essential nutrient commonly found to be in shortest supply. Phosphorus then becomes a "limiting nutrient" which controls the growth of aquatic plants and algae (ref. PCA Exhibits 1, 3, 4, 5, 9, 10, 64, 67, 110).

6. Major sources of excess phosphorus in eutrophic waters in Minnesota are sewage treatment plant effluents, inadequate soil absorption sewage disposal systems, erosion, and runoff from feedlots and fertilized agricultural lands.

7. Since phosphorus plays a key role in limiting the growth of algae and since its distribution in the environment is largely attributable to man, its input to the environment can and should be controlled to the fullest extent possible (PCA Exhibits 1, 2, 3).

8. Major programs are currently underway in Minnesota to control phosphorus pollution from sewage effluents through the incorporation of advanced wastewater treatment, and from feedlot runoff through the implementation of suitable runoff containment measures. Control of phosphorus originating from complex non-point sources such as on-site sewage disposal systems, erosion, or fertilized farmlands is more difficult and will take time. A meaningful and effective phosphorus control program requires that the attempt be made to limit phosphorus entering the lakes and streams of Minnesota from all controllable sources.

9. Pursuant to the authorization of Minnesota Statutes 116.23, phosphorus has been identified as a prescribed nutrient in Section (c) of WPC 37, for the purpose of limitation.

III. ENVIRONMENTAL BENEFITS OF DETERGENT PHOSPHORUS CONTROL

10. The discharge of phosphorus from sewage treatment plants adds significantly to the nutrient load of Minnesota surface waters. When such discharges occur directly to lakes or reservoirs, or to streams which flow into lakes or reservoirs, the resulting nutrient enrichment accelerates the eutrophication process, promoting the growth of algae and other undesirable aquatic life.

11. Information from the states of New York and Indiana, and other jurisdictions where phosphate-based detergents are banned indicates that laundry detergents with phosphate builders contribute 50 percent or more of the total amount of phosphorus contained in

sewage effluents. Monitoring of sewage effluents in these areas demonstrated that detergent phosphorus control measures rapidly and effectively reduced the amount of phosphorus entering receiving waters (ref. PCA Exhibits 12, 13, 14, 18, 19).

[It must be remembered that sewage effluent is only one source of phosphate. As the staff's paragraph No. 14 indicates, other major sources of phosphate include agricultural and erosional sources that will not be affected by the proposed ban. The allegation that detergent phosphates make up 50% of phosphate in sewage effluent is an outdated figure based on data from other states and fails to take into consideration the use of low phosphate and nonphosphate detergents now in use in Minnesota. In addition, much of the sewage effluent in Minnesota is deposited in septic tanks and cesspools, which the staff has failed to show contributes to the eutrophication problem (see response to paragraph 19). The staff has failed to provide any evidence as to the exact magnitude of phosphorus reduction that could be expected to occur as a result of a ban on phosphate detergents. Mere speculation is not the basis for sound regulation.]

12. Water quality monitoring studies of sewage-impacted streams in New York, Indiana and Dade County, Florida have shown that significant reductions in the concentrations of phosphorus in streams have directly resulted from the lowering of phosphorus levels in sewage treatment plant effluents after the implementation of detergent phosphorus control measures and that these reductions have been permanent (ref. PCA Exhibits 12, 19, 20, 21, 100).

[The important issue is not whether a reduction in phosphorus levels has occurred, but whether a significant reduction in amounts of algae and aquatic weeds has occurred. The above cited monitoring studies fail to provide proof of such reductions!]

13. While the control of detergent phosphorus alone cannot be expected to eliminate eutrophication, it can reduce the number and magnitude of algal blooms. Scientific evidence based on background information in New York and Indiana provides indications that reductions of algae and aquatic plant growths have occurred (ref. PCA Exhibits 21, 23, 70, 100).

[The above finding is a blatant overstatement of scientific fact. The proposed effectiveness of phosphate bans are not established either qualitatively or quantitatively. PCA Exhibits 21, 23 and 100 provide "indications" of the most tentative nature and do not represent substantiation of a

significant effect. PCA Exhibit 70 only indicates that the New York detergent phosphorus ban "should" have a beneficial effect. Other significant PCA exhibits are ignored. PCA Exhibit 20 indicates that in Erie County, N. Y. sewage nutrient pollution overrides any local beneficial effect from the detergent phosphate ban in that county. PCA Exhibit 19, concerning Dade County, provides no documentation on the alleged reduction in aquatic vegetation in county's canals. In fact, the exhibit concludes "it is extremely difficult to show an improvement in canal conditions related to the phosphate ban." A case for significant water quality improvement due to a ban on phosphates has not been documented.]

14. Water quality improvements in Minnesota lakes can be expected to occur in proportion to the phosphorus inflow to a lake attributable to sewage-related sources. Lakes which receive all their phosphorus from agricultural or erosional sources will not be benefited. This measure can, however, be expected to help restore or protect lakes which receive municipal or private sewage effluents or have sewered populations in their watersheds (ref. PCA Exhibits 24, 26, 60; Testimony: Shapiro, Vol. I., p. 59).

[Any water quality improvements in Minnesota lakes which might occur would occur in proportion to the phosphorus inflow only where the lake in question is phosphorus-limited. Based on the EPA data presented by the staff, a significant number of sewage-impacted lakes in the state are not phosphorus-limited. (See PCA Exhibit 26).]

15. In 1972, the U. S. Environmental Protection Agency National Eutrophication Survey sampled 74 of the sewage-impacted lakes in Minnesota. Nearly all of these lakes were found to be seriously eutrophic. Many of these lakes are expected to show substantial water quality improvements as a direct result of detergent phosphorus control (ref. PCA Exhibits 24, 25, 26; Testimony: Shapiro, Vol. I., pp. 57-58).

[The number of sewage-impacted lakes in Minnesota is a very small fraction of the total number. Of the 63 sewage-impacted Minnesota lakes studied by EPA, point source control of phosphorus was not recommended at 32! According to PCA Exhibit 25,

substantial water quality improvements would not be likely to occur in phosphorus-limited lakes. The findings fail to document how many of the lakes would show substantial water quality improvement as a direct result of detergent phosphorus control.]

IV. WASTEWATER TREATMENT AND DETERGENT PHOSPHORUS CONTROL

16. At the present time, approximately 575 Minnesota municipalities discharge treated sewage into the waters of the state. Existing standards require that roughly 140, or 25 percent of these sources provide phosphorus removal to prevent or reduce the effects of accelerated eutrophication. However, only about 10 percent of the municipalities required to control phosphorus have completed construction of the necessary facilities.

[If the Agency does not have basis for requiring phosphorus reductions at more than 75% of the municipal waste treatment plants, how can it have a basis for requiring the state-wide elimination of phosphorus in detergents.]

17. Future construction of phosphorus removal facilities will continue to depend on the availability of Federal construction grant funds and cannot be predicted from year to year. The control of detergent phosphorus will provide some interim relief in problem areas prior to the time that necessary facilities can be constructed and placed into operation and will complement the phosphorus removal process after facilities are completed.

[The conclusion that controlling detergent phosphorus will provide some interim relief in problem areas is speculative and presumptive, and is certainly not quantitative. No documentation is provided in support of this finding. Is the mere possibility of some interim relief "really worth the risk and cost associated with a ban on phosphate detergents?]

18. Over 400 Minnesota municipalities are currently not being required to limit phosphorus in their sewage effluents. Detergent phosphorus control will of itself decrease the amount of

22. Chemical treatment processes at municipal sewage treatment plants utilizing alum or ferric chloride for phosphorus removal can expect to experience significant savings in chemical costs (up to 30 percent) due to a reduction of phosphorus in raw sewage (ref. PCA Exhibits 13, 16, 65, 117). Where lime precipitation processes are used, little or no chemical cost savings can be expected to occur.

> [The savings in chemical costs for phosphorus removal should be insignificant. (Tr. 2/13, p. 194). The cited cost savings of up to 30% were made when high phosphate detergents were in use.]

23. By reducing the concentration of phosphorus in raw sewage and thereby the amount of alum needed to precipitate phosphorus, the amount of chemical sludge produced and associated sludge handling or disposal problems and expenses will also be reduced. This would help to lower operating costs for phosphorus removal, particularly for small plants, and could enhance the overall sludge handling capacity of new or upgraded plants which include phosphorus removal (ref. PCA Exhibit 13, 65, 98).

> [Again the staff fails to quantify its finding in terms of how much benefit will be achieved but speaks only in vague generalities.]

24. Chemical precipitation and phosphorus removal technology represent advanced waste treatment processes requiring a higher degree of maintenance and process control than secondary treatment. In situations where communities are having difficulty providing adequate plant supervision, or are for other reasons (equipment breakdown, repairs, plant upset, etc.) unable to maintain optimum operating conditions, a phosphate detergent ban will provide an extra margin of phosphorus control (ref. PCA Exhibits 65, 98).

> [Exaggerating the complexity of the chemical precipition process serves only to slow down the acceptance of chemical precipitation by Minnesota municipalities, contrary to the objectives of the Agency. A balanced review of the removal would have included comments in

PCA Exhibit 117 to the effect that the chemical precipitation system is strongly self-regulating and that the only needed adjustment of dosage can be done manually a few times during the day shift. Comments to this effect are also found in PCA Exhibit 98.]

V. AVAILABILITY OF PHOSPHATE-FREE DETERGENTS

25. A typical laundry detergent (heavy duty detergent) in use today contains surfactant, usually a mixture of ingredients acting as a wetting agent; a phosphate or phosphate-free builder or water softener (phosphate builders have secondary properties which aid in the cleaning process); an anti-corrosive agent to protect washing machine parts; an anti-redeposition agent; a fluorescent whitening agent or optical brightener, color and fragrance; and an inert standardizing diluent, usually sodium sulfate.

26. Section (d)(1) of WPC 37 specifies a level of 0.5 percent elemental phosphorus may be present in heavy duty detergents, additives, and built soaps for machine laundry, excluding chemical water conditioners. Phosphates are not an indespensible component in laundry detergents in that safe and effective phosphate-free products are readily available. A 0.5 percent level is essentially a trace amount which allows for possible impurities in industrial grade chemicals or contamination during the manufacturing process.

[The question is not only whether safe and effective phosphate-free products are readily available, but also whether or not the proposed regulation is cost-effective when <u>all</u> costs are taken into account.]

27. Phosphate-free detergents currently available vary considerably with respect to the chemical composition of the builder or water softening system employed. All of the major detergent manufacturers market more than one type of phosphate-free detergent, some of which are available nationwide, others only in phosphate-ban states and cities.

28. There are essentially six categories of commerical phosphate-free detergents:

a. Silicate-based, granular detergents with synthetic surfactant plus upwards of 20-25 percent sodium silicate as builder. All phosphate-free powdered detergents manufactured by Colgate-Palmolive Company are of this type. Colgate's share of the 1974 St. Paul laundry detergent market has been estimated at 15.3 percent (PCA Exhibit 74).

b. Low carbonate, granular detergents containing synthetic surfactant with a mixture of about 20 percent sodium carbonate and 20 percent sodium silicate as builder. All phosphate-free powdered detergents manufactured by the Procter and Gamble Company are of this type. Lever Brothers, Inc. generally markets phosphate-free powdered detergent containing 30-45 percent sodium carbonate and 10-15 percent sodium silicate, although some Lever detergents may occasionally contain more than 50 percent carbonate. Procter and Gamble's share of the 1974 St. Paul detergent market has been estimated at 57.2 percent while Lever's was 21.2 percent (PCA Exhibit 74).

c. High carbonate, granular detergents with synthetic surfactant plus 50-70 percent sodium carbonate as builder. High carbonate detergents are generally not typical of phosphate-free detergents sold in phosphate-ban areas.

d. Liquid citrate-built detergents containing synthetic surfactant with 20-25 percent sodium citrate as builder and sometimes with sodium silicate as supplemental builder. Detergents of this type are manufactured by Lever Brothers, Inc.

e. Unbuilt liquid detergents containing a combination of synthetic anionic and nonionic surfactants at relatively

high concentration with no builder. Detergents of this type are made by Colgate-Palmolive Company and the Procter and Gamble Company.

f. Soap with soap as the major surfactant, usually without any substantial quantity of builder but sometimes with sodium carbonate.

VI. PERFORMANCE OF PHOSPHATE-FREE DETERGENTS

29. Among commercial laundry detergents, performance can vary considerably with good quality phosphate-free detergents frequently out-performing phosphate detergents depending on the types of soils, fabrics and washing conditions. As such, it is believed that differences in overall cleaning ability that may exist between a standard high quality phosphate detergent and its phosphate-free counterpart are minimal and will not be noticeable to the average user.

> [The conclusion that good quality phosphate-free detergents frequently outperform phosphate detergents is not only undocumented but false. The belief that "differences in overall cleaning ability that may exist between the standard high quality phosphate detergents and its phosphate-free counterpart are minimal and will not be noticeable to the average user" is baised, presumptive and unsupported by the evidence. In fact, it is contradicted in testimony presented at the hearings (Tr. 2/13, p. 77).]

30. Advertising claims made by the major detergent manufacturers for their phosphate-free products variously state that they are effective, powerful, and economical laundry detergents suitable for removing all types of soils, from all types of fabrics and under any normal washing conditions.

> [The effectiveness and general acceptability of laundry detergents is determined by homemaker acceptance. Item 30 is irrelevant.]

31. In many performance tests, phosphate-free detergents are compared to a single, high-phosphate (12% elemental phosphorus) standard detergent. Tests of this nature do not take into consider-

ation the performance variations of detergents within the phosphate group itself, which can be shown to be substantial (PCA Exhibit 94), or that reductions in the phosphorus content of currently-marketed phosphate-based detergents may affect their performance (PCA Exhibits 31, 101).

32. Laundering tests which compare a single, less desirable type of phosphate-free detergent to a standard phosphate detergent cannot be used to evaluate the performance of other types of phosphate-free detergents.

33. Silicate-built phosphate-free detergents have been found to possess effective soil removal properties (PCA Exhibits 27, 30, 114). In one test, a phosphate-free silicate-built version of a commercial laundry detergent gave slightly better performance than its phosphate-based counterpart with the same brand name (PCA Exhibit 114).

> [Again, the homemaker acceptance of silicate-built phosphate-free detergents has not been established.]

34. Phosphate-free detergents with a building system of sodium carbonate in low concentration plus silicate give results comparable to or slightly lower than phosphate detergents under normal laundering conditions but may be less desirable when used in hard or very hard water with hardness greater than 154 mg/l (PCA Exhibits 27, 30, 47, 114).

> [The documented problems with sodium carbonate-silicate-based detergents in hard water should militate <u>against</u> accepting the proposed Regulation (Note paragraph 49 of staff's finding in which the average hardness of Minnesota's groundwater is reported as 275 mg/l). In addition, the fact that sodium carbonate acts as a soil-sealant which may eventually impair the permeability of absorption septic systems, makes it a questionable substitute for phosphate.]

35. High carbonate detergents of 50 percent or more sodium carbonate give performance generally comparable to phosphate-based detergents under normal laundering conditions but are recommended for use only in softer water less than 60-80 mg/l hardness. High

carbonate detergents have been found to be less effective when washing fabrics made of 100 percent cotton fiber (PCA Exhibits 27, 30, 47, 94, 114; Public exhibits 120; Testimony: A. Schwartz, Vol. I, p. 210).

[As the staff's finding indicates, high carbonate detergents are recommended for use in water less than 60-80 mg/l hardness. Compare this with the fact that 60% of the state's population receives water in excess of 154 mg/l hardness (Staff finding No. 47) and that the average hardness of Minnesota groundwater supplies is 275 mg/l (Staff finding No. 49) which is of particular importance in rural areas where unfinished water is very common.]

36. Citrate-based phosphate-free laundry detergents have been found to perform effectively under any normal laundry conditions. When compared to phosphate detergents, citrate built detergents are generally less effective on 100 percent cotton fabrics but comparable in performance on cotton/synthetic blend fabrics (PCA Exhibit 28, 29, 47; Public Exhibit 120).

[Citrates are not as effective as phosphates (Public Exhibit No. 47). The effectiveness of citrate-based laundry detergents is supported in the Findings of Fact only by laboratory data. PCA Exhibit 47 notes that there is no real substitute for actual performance tests under everyday conditions. The Agency has not established that these products are accepted by the consumer as complete substitutes for phosphate based detergents under the consumer's conditions of use. PCA Exhibit 47 also contains the information that "citrate-based solid home laundry detergents fall somewhat short on potential economics."]

37. Citrate-built detergents are known to possess superior properties for the removal of grease and greasy soils.

[No supporting documentation has been provided.]

38. Suitable formulations of anionic and nonionic surfactants in combination in an unbuilt liquid detergent provide effective cleaning performance under any normal washing conditions. In direct comparison with phosphate detergents, commercial unbuilt liquid formulations displayed good soil removal properties for both 100 percent cotton and cotton/synthetic blend fabrics (PCA Exhibit 27, Public Exhibit 120).

39. Unbuilt liquid detergents commercially available at this time also possess superior grease and oily soil removal properties.

40. Soap will continue to be used by some Minnesota consumers and will give good results when used with soft water. However, soap is less desirable for general laundry use because of its tendency to produce organic deposits on fabrics.

VII. SAFETY AND ENVIRONMENTAL ACCEPTABILITY OF PHOSPHATE-FREE DETERGENTS

41. Present day phosphate-free detergents in general present no greater health hazard to humans than do phosphate detergents (PCA Exhibits 18, 33, 34, 38).

42. The sanitizing properties of the laundry process are almost entirely dependent on the use of hot water (greater than 130°F) and on the use of a detergent in adequate concentration (0.1 - 0.15 percent). There were no data presented to support speculation that the use of phosphate-free detergents will promote the retention or redeposition of pathogenic bacteria or other organisms on clothing, bedding or other materials (PCA Exhibits 91, 92).

> [No data were presented to support the conclusion that use of phosphate-free detergents would not promote retention or redeposition of pathogenic bacteria or other organisms on clothing, bedding or other materials. It is the staff that seeks to impose this risk on the Minnesota consumer. It is up to the staff to prove that such a risk is not being taken.]

43. Special attention must be given to washing flame retardant childrens sleepwear as certain types of phosphate-free laundry products may be unacceptable.

a. Soap-containing detergents, phosphate or phosphate-free, are not acceptable for washing flame retardant garments under any conditions.

b. Carbonate-containing phosphate-free detergents are generally acceptable for washing most types of synthetic flame retardant fabrics. They are definitely not acceptable for washing 100 percent cotton fabrics

phosphorus entering Minnesota waters from these sources by approximately 3 to 4 million pounds annually (PCA Exhibits 52, 65). This will reduce the phosphorus load of streams receiving these discharges and will be of benefit to the many lakes and reservoirs in Minnesota with significant sewered populations in their watersheds.

[If there is insufficient reason for requiring over 400 Minnesota municipalities to limit phosphorus in their sewage effluents, how can there be sufficient basis to impose a phosphate ban on the entire population of the State of Minnesota. The projected reduction of approximately 3-4 million pounds annually of phosphorus discharge to Minnesota waters is probably accounted for the most part by discharges to the Mississippi. The question these findings fails to answer is how many lakes and reservoirs will be affected by a ban and how significantly.]

19. Approximately 25 percent of the 70,000 permanent and seasonal lake homes in unincorporated areas of Minnesota are equipped with laundry facilities. The elimination of phosphate detergents will help to control phosphorus inputs to lakes and streams originating from these sources which for the most part utilize septic tank/soil absorption sewage disposal systems (ref. PCA Exhibits 41, 42).

[The findings present no quantitative estimate of how much phosphorus output from septic tank-soil absorption sewage disposal systems will be reduced, but relies only on speculation. No documentation is presented to quantify any possible benefit in terms of reduced amounts of algal blooms and aquatic weeds. (See also comment after paragraph 34.)]

20. In situations where stormwater runoff in combined sewers results in bypassing and the discharge of untreated sewage to surface waters, detergent phosphorus control will exert a partial reduction in the amount of phosphorus entering the affected waters.

[No supporting documentation has been provided.]

21. The control of phosphorus in municipal wastewaters can be accomplished by the addition of chemical precipitants, on-land disposal of all effluent by spray irrigation or other means, or by the diversion of treated wastewaters where appropriate (e.g. Lake Minnetonka).

under any conditions (PCA Exhibit 113, Public Exhibit 123). However, 100 percent cotton fiber fabrics presently account for only about 6-8 percent of the children's sleepwear market (PCA Exhibit 96, Testimony: Johnson, Vol, VI, p. 220).

c. Silicate-based, non-carbonate, phosphate-free detergents may compromise flame retardance of 100 percent cotton fabrics (Public Exhibit 123).

d. Citrate and unbuilt phosphate-free liquid detergents do not interfere with the retention of flame retardant properties of children's sleepwear and may be superior to 8.7 percent phosphorus detergents in this regard (PCA Exhibit 113). Among phosphate-free detergents, therefore, liquid detergents are preferred for washing flame retardant garments.

44. There are no known environmental hazards associated with the phosphate substitutes currently used in detergent formulations sold in the United States (PCA Exhibits 27, 60, 66, 79, 108).

[What of the adverse impact on septic tanks due to the sealant attributes of sodium carbonate, one of the most commonly recommended phosphate substitutes? The documentation concerning alleged environmental hazards associated with phosphate substitutes is casual in the extreme. PCA Exhibits 66 and 79 discuss only the carbonate-based products, but the Agency Findings of Fact failed to note that these products contribute higher alkalinity to waste water, which affects the type of aquatic life present in the receiving water. PCA Exhibit 108 is limited to a consideration of sodium citrate, which is not likely to be a sole or a major phosphate substitute. PCA Exhibit 60 is the Agency staff's own statement and cannot be considered a primary reference.]

VIII. WATER HARDNESS IN MINNESOTA

45. As a general rule, the performance of laundry detergents and other cleaning agents declines as the hardness of the wash water increases. With the use of carbonate-containing detergents, water hardness takes on added importance because of the formation of in-

organic precipitates, primarily calcium carbonate, formed by the softening activity of the sodium carbonate builder.

46. Inorganic precipitate formed in this way can be deposited on clothing or washing machine parts. The amount of deposition which can form is dependent on the hardness of the washwater, the carbonate content of the detergent, the type of fabric and the quality of the formulation in use.

47. Public and private water supplies in Minnesota are generally hard to very hard. It is estimated that 60 percent of the State's population receives water greater than 154 mg/l hardness (PCA Exhibit 105, Public Exhibit 19).

> [The estimate that 60% of the state's population receives water greater than 154 mg/l hardness is support for rejection, not acceptance, of the proposed regulation.]

48. Usage of home water softening equipment in Minnesota amounts to an estimated 28-42 percent of the population and is concentrated among consumers whose water supplies are high in hardness. On this basis, it is estimated that from 66 to 79 percent of Minnesota cunsumers are using water of less than 154 ppm hardness in their homes (PCA Exhibit 105).

> [Again, estimates and speculation are being used rather than hard data. The percentages noted will undoubtedly be reduced by families who cannot afford to buy and use a mechanical water softener. This is support for rejection of a ban on phosphorus in detergents.]

49. The average hardness of finished public water supplies in Minnesota is less than half the hardness of finished public water supplies in Indiana, a state which has had a phosphate detergent ban in effect since January 1, 1973. Groundwater supplies in Indiana are on the average 29 percent higher in hardness than groundwater supplies in Minnesota, 354 mg/l vs. 275 mg/l (PCA Exhibit 54).

> [The 29% difference between the groundwater hardness in Minnesota as opposed to that of Indiana is irrelevant. The fact is that Minnesota with an average groundwater hardness of

275 mg/l is a hard water state and its citizens will experience all the sorts of problems associated with non-phosphate detergents which in general are inferior to phosphate detergents in hard water.]

50. Adequate phosphate-free alternatives to carbonate-containing detergents do exist for consumers who use only hard water for laundering. These include granular silicate, liquid citrate-based, and unbuilt liquid detergents.

[The statement that adequate phosphate-free alternatives to carbonate-containing detergents exist for consumers who use only hard water for laundering is presumptive. Economic costs are completely ignored. No documentation is provided.]

IX. COST OF LAUNDRY AND PHOSPHATE-FREE DETERGENTS

51. In general, phosphate-free detergents are comparably priced to their phosphate-based counterparts (PCA Exhibits 18, 60; Public Exhibit 40).

52. Among those homemakers who notice a reduction in cleaning performance with the use of a phosphate-free detergent, there may be attempts to compensate for loss of cleaning ability through the use of laundry additives such as bleach, fabric softener, etc.

[The attempts to compensate for loss of cleaning ability through the use of laundry additives such as bleach, fabric softener, lead to an increase in laundry costs on the order of 41%. (Tr. 2/13, p. 113).]

53. Minnesota consumers are already using phosphate-free detergents. In 1974, it was estimated that 18 percent of the homemakers in the St. Paul area were using phosphate-free detergents (PCA Exhibit 74). Hence, they would experience no added costs should phosphate detergents be eliminated.

54. A large share of a cost increase may be expected to be due to the use or overuse of laundry additives, especially bleach, which may do little to improve performance and may actually be harmful to fabrics. Therefore, an obvious responsibility exists to adequately educate consumers on correct laundry practices, use of

detergent, etc. (Public Exhibit 40).

[A cost increase due to homemaker attempts to make up for the relatively poor performance of non-phosphate detergents is a basis for rejecting the proposed regulation. Assigning the cost increase to overuse of laundry additives is pure unadulterated speculation.]

X. EFFECT OF PHOSPHATE-FREE DETERGENTS ON CLOTHING AND WASHING MACHINES

55. Commercial liquid phosphate-free detergents, citrate or unbuilt, do not have negative effects on clothing or machine parts associated with their use. Silicate built phosphate-free detergents may produce a small but insignificant buildup of insoluble deposits on clothing with prolonged use in very hard water (Testimony: A. Schwartz, Vol. I, p. 191).

56. Carbonate containing detergents can cause troublesome buildup of inorganic deposits on the fiber and machine surfaces. However, a deposition extensive enough to cause noticeable deterioration of fabric or finish before 30 or 50 washings is encountered only with high carbonate detergents used without any precaution in hard or very hard water (Testimony: A. Schwartz, Vol. I, p. 191).

57. Experimentally, the buildup of inorganic deposit on clothing of 100 percent cotton has been found to be 7 times more extensive when a high carbonate detergent is used than when a low carbonate detergent is used (PCA Exhibit 47).

58. According to other estimates, the buildup from high carbonate detergents can occur at twice the rate of a low carbonate detergent on 100 percent cotton and at three times the rate on fabric containing synthetic fibers (Public Exhibit 101).

59. The potential severity of these problems cannot be accurately assessed based on the limited data presented. The potential that problems will develop can be eliminated or substantially reduced through the use of low or non-carbonated detergents, home water softeners, and by observing manufacturer's recommendations for use of carbonate-containing detergent, i.e. dissolving deter-

gent in the washwater before adding clothes and do not use more detergent than is necessary.

> [The above finding has completely ignored the fact that the suggested solutions call for a substantial increase in both time and money to the alleged consumer completely out of proportion to the benefits to be derived from the ban.]

60. It is estimated that 10 percent of the families in the U. S. do not have automatic laundry machines (PCA Exhibit 31). In Minnesota this would further reduce the potential number of families subject to possible added machine costs.

> [The 10% of the families without automatic laundry machines will be affected. The cost and effectiveness of cleaning in coin-operated washing machines will be affected by a ban as much if not more so than home laundries. The increased machine wear to which coin-operated washing machines will also be subjected to will undoubtedly be passed on to the users of such machines.]

61. Sales of liquid phosphate-free detergents have reportedly increased in areas where phosphate detergents are banned (PCA Exhibit 39, Testimony: A. Schwartz, Vol. II, p. 41). Liquid detergents cause no additional wear on fabrics or machines as a result of the laundry process.

> [The reported increase in liquid phosphate-free detergent sales in phosphate ban areas is not based on expert testimony or adequate documentation. In addition, this finding fails to point out that liquid detergents are generally substantially more expensive than the granulated detergents.]

62. Procter and Gamble Company and Colgate-Palmolive, who collectively manufacture 70 percent of all laundry detergents sold in the U.S., do not market phosphate-free detergents of the high carbonate type. The bulk of laundry detergents manufactured by Lever Brothers, Inc. are of the reduced carbonate type (PCA Exhibits 71, 87, 88). Therefore, the usage of potentially problem-causing high-carbonate detergents is reduced to a small percentage.

> [The problems associates with high carbonate laundry detergents do not disappear with use of low carbonate products. The expected problems merely take longer to develop and may be less

severe, but they do occur (PCA Exhibit 47, Public Exhibit 101). In addition, increased washer repair costs in Indiana are clearly associated with the entire mix of available non-phosphate detergents, and not only with the high carbonate products.]

XI. ECONOMIC IMPACT ON DETERGENT MANUFACTURING

63. Major detergent manufacturers will be expected to experience costs associated with adjustments in manufacturing and inventorying practices. Major manufacturers would not experience additional costs for product development since they currently market complete lines of non-phosphate products in phosphate ban areas with a total population greater than 32,000,000 people.

64. Raw material suppliers will experience a partial loss of market for higher-priced phosphate materials (e.g. tripoly-phosphate) and only partial replacement by lower-priced commodities (e.g. sodium carbonate).

65. Manufacturers of laundry applicances may experience costs resulting from the possible necessity of redesigning new models to avoid the potential for deposit accumulation and increased costs of meeting service contracts and warranties of machines in service (Public Exhibits 20, 34). However, these costs will not materialize with the use of citrate, unbuilt liquid, silicate or well-formulated low carbonate products in areas with moderately hard water, or in areas where soft water is available.

[The significant cost that is associated with use of non-phosphate detergents in laundry appliances is conceded in the findings. Costs will arise with the well-formulated low carbonate products albeit at a slower rate and possibly to a lesser extent. The finding fails to note that there are other costs associated with use of citrate, unbuilt liquids or silicate-based products or that Minnesota is basically a hard water state. (See paragraph 49 of staff's findings)]

66. Wholesalers who maintain inventories of laundry products for interestate distribution will experience undetermined operating cost increases associated with the need to stock both

phosphate and phosphate-free detergents of the same brand names, or from other modification of distribution practices (Public Exhibit 14).

[Wholesaler operating costs associated with the need to stock both phosphate and phosphate-free detergents of the same brand names or from other modification of distribution practices are admitted, and provide a basis for rejecting the proposed regulation. The fact that these cost increases are undetermined is certainly not a basis for adopting WPC 37.]

67. Retail grocery outlets located near state borders may experience a loss of sales of cleaning products to retailers outside the state.

68. Some local manufacturers of detergent products may experience increases in manufacturing costs as a result of a detergent phosphorus ban.

a. The Tennant Company and Economic Laboratories, Inc. do not market products affected by the limits imposed.

b. Grace-Lee Products, Inc. manufactures janitorial maintenance items, institutional cleaners and disinfectants, rest room sanitation products, kitchen and laundry supplies and a number of specialty products for commercial and industrial use. The company employs approximately 48 persons. About 150 of the 180 products currently sold contain phosphate ingredients. However, Grace-Lee apparently does not manufacture household laundry or dishwashing detergents since in 1974 the company did not report the phosphorus content of its products to the Agency. Such reporting is required by law for all household laundry and dishwashing compounds. Thus, it would not appear that Grace-Lee Products would be seriously affected by WPC 37.

c. Lan-O-Sheen, Inc. manufactures some detergents and other cleaning agents which would be affected by the limits set in WPC 37. This company would be expected

to experience increased costs associated with adjustments in manufacturing processes, labelling, distribution, etc. Lan-O-Sheen would not be expected to experience additional costs for the development of new formulations since they are currently marketing phosphate-free products in states with phosphate detergent bans.

d. National Purity Soap and Chemical Company is involved in the manufacture of industrial, institutional and commercial cleaning products. NPS would experience production cost increases similar to Lan-O-Sheen but may also incur added costs in developing phosphate-free formulations and raw material shortages. Not all products marketed by NSP are affected by the proposed limits, however, NSP currently employs about 25 persons.

[Economic Laboratories manufactures machine dishwashing detergents and detergents for "on premise" laundry at motels, hotels, hospitals, etc. and is affected by the proposed limits. WPC 37 would also limit Economic Laboratories ability to develop products and to test market them in Minnesota (Tr. 4/9, p. 161 ff).]

[Lan-O-Sheen, Inc. manufactures machine dishwashing detergents and laundry detergents. Lan-O-Sheen has had difficulty competing in phosphate ban areas. Experience has shown Lan-O-Sheen that phosphate substitutes are difficult to formulate into good products and are hard to obtain (Tr. 4/9, p. 196). Lan-O-Sheen representatives expect losses in distributor and private label business if WPC 37 is promulgated.]

[National Purity and Soap has private label business which would be affected by WPC 37. A company representative indicates that losses are expected if the regulation is adopted.]

69. The cost of continued acceleration of the rate of eutrophication can be expressed in terms of water quality degradation, reduced usefulness of recreational waters, lowered lakeshore property values and reduced income from the tourism and travel industry. These costs, however, are complex and impossible to accurately assess.

XII. ATTITUDES CONCERNING PHOSPHATE DETERGENT BANS

70. Industry representatives have reported that the number of complaints from customers has increased in areas where phosphate detergents have been banned. These complaints generally reflect dissatisfaction at being unable to obtain the same cleaning results with the use of phosphate-free detergents. The actual extent of the complaints among the total number of consumers cannot be determined.

> [Consumer dissatisfaction with phosphate-free products is a basis for <u>rejecting</u> the proposed regulation. Lack of documentation of the actual extent of complaints is a basis for developing more information, but it is <u>not</u> a basis for adopting the regulation.]

71. Consumers surveys conducted by industry and independent analysts generally agree with respect to consumer satisfaction with the performance of phosphate-free detergents. In general, 3 out of 5 homemakers were very or somewhat satisfied with the cleaning performance of phosphate-free detergents while about 1 person in 3 were somewhat or very dissatisfied with cleaning performance. Others were neutral (PCA Exhibits 37; Public Exhibits 37, 38).

> [Dissatisfaction with the cleaning performance of phosphate-free detergents by 33% of the consumers is a basis for <u>rejecting</u> the proposed regulation.]

72. Consumer support for detergent phosphate bans was found to be greater than consumer satisfaction with phosphate-free detergent performance. In general, 80 percent of the consumers surveyed supported the phosphate detergent bans in their areas while from 5 to 16 percent were opposed. This support was largely based on the belief that a phosphate detergent ban was beneficial to the environment. An industry survey in Erie County, New York concluded that the homemaker's "primary concern is the polluted lakes and streams."

[The consumer support for a phosphate detergent ban shown in consumer surveys is based on the assumption stated in the survey question that the detergent ban was beneficial to the environment.]

73. In 1972, a survey of Minnesota residents living in areas adjacent to the Mississippi River drainage was conducted under the auspices of the University of Minnesota Water Resources Research Center. At that time better than 9 out of 10 individuals indicated their willingness to use soap instead of phosphate detergents in order to abate pollution. (Public Exhibit 15).

[It is unlikely that the individuals surveyed by the University of Minnesota Water Resources Research Center understood that complete replacement of phosphate-based detergents by soap would increase the BOD load on discharges from waste treatment plants by more than 50%. (Tr. 4/7, p. 207). Such uninformed response is not the basis for sound regulation.]

74. The International Joint Commission of the United States and Canada has concluded that "programs implemented by both countries have resulted in substantial reduction in phosphorus loadings to the lower Great Lakes. . ." and further concluded that "limiting by regulation the amounts of phosphorus used in the manufacture of detergents contributes substantially to the achievement of the agreed water quality objectives of the Great Lakes," (Testimony: S. Schwartz, Vol. II, p. 37).

[The most recent IJC report contains no documentation of significant lake improvement. The most recent annual report of the Council of Environmental Quality indicates that point source phosphorus control has failed as an eutrophication control program, and that much more emphasis needed to be directed towards diffuse source phosphorus control which will be be affected by the proposed ban (see paragraph No. 14).

XIII. OTHER CLEANING AGENTS AND WATER CONDITIONERS

75. There are currently no acceptable replacements for phosphate-based automatic machine dishwashing detergents. It is felt that existing commercial dishwashing machine detergents containing 8.7 to 11 percent phosphorus will provide effective and economical performance.

[While machine dishwashing detergents containing 11% phosphorus may be adequate under normal conditions, they are inadequate under problem conditions. The health implications are serious. Furthermore, the proposed limitation precludes the development of more concentrated products which would be used in lower amounts in special commercial applications. (Tr. 4/9, p. 161). No limitation is appropriate.]

XII. OTHER CLEANING AGENTS AND WATER CONDITIONERS

77. Water conditioning agents marketed for household use generally consist almost entirely of sodium tripolyphosphate. These products are used for personal cleansing purposes as well as laundry in areas of extreme water hardness and a maximum level of 20 percent phosphorus should be permitted. However, their use for home laundry should be discouraged in favor of one of the several good quality phosphate-free detergents.

[Controlling the maximum level of phosphorus in a phosphate-based water conditioning agent will not reduce phosphorus input from this source. If a given product contains less phosphorus the consumer will use more to obtain the same performance.]

XIV. CONSIDERATION OF ENERGY AND RESOURCE CONSERVATION

78. The present use of phosphate for detergent builders accounts for about 13 to 14 percent of the world's production. According to industry estimates, the continued use of phosphate builders in cleaning products would not appear to threaten the world's total phosphate reserves, however, there are factors which must be taken into consideration relative to the consumption of phosphate supplies (Public Exhibit 115).

a. Industry estimates of the size of phosphate reserves do not account for the use of phosphate-bearing reserve land for other purposes. For example, the Director of Mining for Monsanto Chemical Company estimates that there are 20 million acres of phosphate reserve land in the State of Florida. However, the full exploitation of this reserve would mean that 60 percent of the land area of the state would be mined.

b. The availability of these reserves may be reduced by environmental restrictions and water use for processing.

c. The retrieval of phosphate from lower grade ore supplies will be increasingly expensive and energy consumptive. The economic costs associated with large-scale utilization of phosphates from sources such as the ocean floor, sewage treatment processes, and lower grade ores could increase greatly.

d. The future environmental costs associated with phosphate utilization include strip mining as a primary production technique and the high cost of new mines and plants which comply with air and water quality standards and waste disposal regulations.

e. According to a 1974 forecast by the U. S. Department of the Interior Bureau of Mines, a gap between the projected U. S. domestic demand and export demand for phosphates and the phosphate rock production capacity of new and existing U. S. mines will begin to widen substantially after 1978. Thus, it would appear likely that this country will become increasingly reliant on foreign supplies to meet its phosphate needs.

> [The record has been incorrectly interpreted. The present use of phosphate for detergent builders accounts for only about 6%-7% of the world's production. The phosphorus mines in Florida provide phosphate for agricultural uses, not for detergents. Detergent phosphate supplies in the U. S. largely come from lower grade ore reserves than these mined for fertilizer. The pertinent reserves in the Western United States are expected to last 2,000 years! Where this supply will come from in the future depends upon the economics of mining and distribution.]

79. In general, phosphate-free detergent surfactant levels on a per wash basis are comparable to phosphate detergents. Thus, the increased usage of petrochemicals for surfactant production associated with a switch to phosphate-free detergents does not appear to be an important factor with respect to the overall consumption of oil (PCA Exhibit 66).

[The comparability of phosphate-free detergent surfactant usage on a per wash basis with phosphate detergent surfactant usage has not been established. In any case, a per wash basis comparison is inapplicable since washing will be done more frequently with nonphosphate detergents thus causing more nonphosphate detergent to be used. (Tr. 2/13, p. 77). The Findings of Fact does not discuss possible increases due to forced use of unbuilt liquids containing only surfactants. The point is not so much that usage of petrochemicals in detergents consumes major quantities of petrochemicals, but rather that petrochemical shortages will continue to force the most efficient use of all petrochemicals by all industries, including the detergent industry.]

80. Generally, the most cost-effective chemical precipitation process for phosphorus removal in a sewage treatment plant uses chemicals containing aluminum. Owing to the cost and energy consumed in their production, any reduction in chemical usage for phosphorus removal is deemed desirable (PCA Exhibit 65).

[While any reduction in chemical usage for phosphorus removal is desirable, that is not the critical question. The real question is what is the cost-effective way to perform all of the necessary cleaning functions and to reduce phosphorus levels in sewage treatment plant effluents to the necessary levels simultaneously. The Agency has not demonstrated that the cost-effective approach is a ban on phosphorus in detergents.]

81. A possible reduction in cleaning efficiency with the use of phosphate-free detergents may cause some homemakers to use more warm or hot water for laundry purposes resulting in added energy consumption. Hot water washing would be of some benefit, however, in enhancing the sanitizing effects of the laundry process. Water consumption may also increase due to rerinsing.

[The use of more warm or hot water for laundry purposes, resulting in added energy consumption in a ban area, is indeed likely. Increased water consumption is also a factor to be considered. Lack of quantitative estimates on these increases is a basis for rejecting the proposed regulation. It is not a basis for accepting the regulation.]

Respectfully submitted,

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