NACWA
A Clear Commitment to America's Waters

Issue Outline on Resource Recovery from Wastewater and Coverage of 40 C.F.R. Part 503

I. Overview and Need for an EPA Policy Statement.

A growing number of NACWA members and affiliates are engaged in resource recovery from wastewater. This trend offers many benefits, including producing valuable products and revenues, reducing the volume of solid residuals and simplifying their management. Extraction of resources from wastewater raises important regulatory issues, particularly whether the Part 503 rules extend to these materials. NACWA has researched this issue, consulted with its members employing extraction technologies in the field, and believes that Part 503 does not extend to these products because they are not a sewage sludge or a material derived from sludge.

Based on this research, as explained fully below, NACWA believes that EPA should issue a policy statement to clarify that resource extraction is a different process from bulk solids management and that Part 503 does not govern these materials. While this issue encompasses a wide array of resources that are being evaluated for potential recovery, this paper will focus on a phosphorous product, struvite, which is the best known and most common resource extraction process currently being implemented at a growing number of facilities. EPA clarification of the regulatory status of struvite will encourage the extraction and use of this slow-release fertilizer, leading to reduced phosphorous loading and improved water quality, and will potentially establish a framework for handling other recovered resources.

Struvite does not meet the regulatory definition of sewage sludge under 40 C.F.R. Part 503 and therefore the Environmental Protection Agency ("EPA" or the "Agency") should recognize this through a policy statement and allow wastewater treatment plants to extract this valuable mineral product from sidestream flows. A close review of the Clean Water Act ("CWA"), the Part 503 rule, the Congressional and Agency intent behind these provisions, and the properties of struvite demonstrate that measures designed to ensure the safety of biosolids applied to land are not applicable to and are unnecessary for a granular mineral product.

Struvite is not a residue of the wastewater treatment process or a material derived from sewage sludge and it does not share the characteristics of sewage sludge. Struvite does not pose the same concerns as sewage sludge or sewage sludge products. The text of the CWA and EPA policy over the last forty years show that the focus of sewage sludge regulation has always been bulk sewage products with a significant organic component, not mineral products extracted

through a chemical process. Moreover, Congress' intent to encourage beneficial re-use, foster flexibility and technological innovation, and encourage local autonomy counsels against regulation of struvite as sewage sludge. For all of these reasons, EPA should exclude struvite from regulation as sewage sludge via a policy statement, memorandum, or similar document.

II. Background.

a. **Struvite** is magnesium ammonium phosphate, a naturally-occurring phosphate mineral with the formula NH_4MgPO_4. Struvite forms in certain conditions when there is a 1:1:1 ratio of magnesium to ammonia to phosphate. It forms into an orthorhombic hemimorphic crystalline system as white, yellowish, or brownish-white pyramidal crystals or in plate-like forms. Struvite forms naturally in wastewater treatment plants ("WWTPs") and can lead to great inefficiency and additional costs within the plant by clogging pipes, pumps, or equipment. As a result, many WWTPs have to add chemical aluminum or iron salts to minimize struvite formation. Water Environmental Federal Design of Municipal Wastewater Treatment Plants Manual of Practice 8, Chapter 8: Chemical Precipitation of Phosphorus at 8-5; *see also* Chemical Aids Manual for Wastewater Treatment Facilities, Dec, 1979 (manual by Clean Water Consultants for EPA), at p. 112 (available at online at EPA's National Service Center for Environmental Publications, http://www.epa.gov/nscep/index.html).

The struvite nutrient recovery process has variations but all rely on a basic precipitation/crystallization process to intentionally generate struvite from sludge liquor.. EPA, *Emerging Technologies Report: Wastewater Treatment and In-Plant Wet Weather Management* (March 2013) at p. 2-8.

Struvite's use in agriculture. Struvite has been used in agriculture for over 150 years, valued for its low solubility in water and slow-release mechanism. Barak & Stafford, *Struvite: A Recovered and Recycled Phosphorus Fertilizer*, Proc. of the 2006 Wisconsin Fertilizer, Aglime & Pest Management Conference, Vol. 45. Its use as a fertilizer was in the past limited because of the costs of manufacture. *Id.* Controlled experiments show that struvite to have a relative efficiency of 117% compared with a standard phosphorus fertilizer, diammonium phosphate ("DAP"), even though less struvite was applied. *Id.* Struvite producers market their product for a wide variety of uses, including turf, greenhouse-based agriculture, large field-based agriculture, "specialty" agricultural products, tree and garden nurseries, and more; recommended ratios of struvite to traditional phosphorus fertilizer and application rates and times vary by crop or application. *See, e.g.,* http://www.multiformharvest.com/fertilizer/applications.php and http://www.crystalgreen.com/applications

b. **The Clean Water Act** as enacted in 1972 addressed sewage sludge use and disposal in only one limited circumstance: it prohibited the disposal of sewage sludge if it would result in any pollutant from sludge entering navigable waters except in accordance with a permit issued by EPA. Federal Water Pollution Control Act, 86 Stat. 816, 884-885 (Pub. Law 92-500) (Oct. 18, 1972). In 1977, Congress amended § 405 and required EPA to develop regulations containing guidelines for the use and disposal of sewage sludge, specifically to (1) identify uses for sludge including disposal; (2) specify factors to be taken into account in determining the methods and practices applicable to each of these identified uses; and (3) identify concentrations of pollutants that would interfere with each use. 91 Stat. 1566, 1591-1592 (Pub. Law 95-217) (Dec. 27, 1977). In response to this mandate, EPA adopted guidelines for sewage sludge use and disposal when sewage sludge was applied to land or disposed in landfills. 40 C.F.R. pt. 257.

   In 1987, Congress reaffirmed its 1977 directive that EPA develop comprehensive sewage sludge regulations and set forth a strict compliance schedule for EPA. Water Quality Act of 1987, 100 Stat. 7, 71-72 (Pub. Law 100-4) (Feb. 4, 1987). The statute required EPA to identify toxic pollutants which may be present in sewage sludge in concentrations which may affect public health and the environment, and for each identified use or disposal method, to promulgate regulations that specify acceptable management practices and numerical limitations for sludge that contain these pollutants "adequate to protect human health and the environment from any reasonably anticipated adverse effect of each pollutant." *Id.* at 72 (§ 1345(d)(2)(D)).

c. **40 C.F.R. Part 503.** EPA issued a proposed rule governing sewage sludge in 1989, *see* 54 Fed. Reg. 5746 (Feb. 6, 1989), and a final rule in 1993. 58 Fed. Reg. 9248 (Feb. 19, 1993). The Part 503 standards are designed to protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants that may be present in sewage sludge. 58 Fed. Reg. 9248 (Feb. 19, 1993). To do so, they establish requirements for the three means of disposal of sewage sludge: land application, landfill disposal, and incineration. *Id.*

III. The Definition of Sewage Sludge.

a. **No Congressional definition.** "Sewage sludge" was not defined by Congress in the CWA or any of its amendments. The only definition comes from Part 503.

b. **Part 503's definition of sewage sludge.** "a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage;

scum, or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works." 40 C.F.R. § 503.9(w).

i. There is no legislative or regulatory history dealing directly with the definition.

ii. The Preamble to the proposed rule and the Preamble to the final rule do not further explain the definition.

iii. Accounts of the comments on the proposed rule indicate the scope of the definition was not one of the major issues.

iv. There is no case law interpreting this definition.

c. EPA Guidance/Other.

i. There is no Agency guidance on the scope of the definition.

ii. EPA's "Plain English Guide to the EPA Part 503 Biosolids Rule" provides no further information on the definition.

d. Biosolids are sewage sludge that has been treated and can be beneficially recycled. Preamble to Final Rule for Part 503, 58 Fed. Reg. at 9251.

IV. Struvite Does Not Fit the Regulatory Definition of Sewage Sludge.

Struvite is not a residue generated during the treatment of domestic sewage in a treatment works, nor is it a material derived from sewage sludge. Furthermore, struvite is wholly different in its characteristics than the materials covered by the definition of sewage sludge. Struvite is thus outside of the scope of Part 503.

a. Struvite is not a "residue generated during the treatment of domestic sewage in a treatment works."

i. Residue is defined as "a usually small amount of something that remains after a process has been completed or a thing has been removed; a remnant or remainder." http://www.merriam-webster.com/dictionary/residue. The use of the word "residue" connotes a leftover, often unwanted material that remains when a desired product has been produced.

ii. Struvite is not a byproduct of the treatment of domestic sewage in a treatment works, but rather a valuable, intentionally-created product formed from the wastewater side stream of a WWTP. In a WWTP, sidestreams constitute the flows generated within the plant in addition to the plant influent. *See* EPA, Sidestreams in Advanced Wastewater Treatment Plans – Problems and Remedies (1985). Sidestreams are made up of supernatants, backwash waters, rinse waters, plant drainage water, and other types of liquid streams that are produced in the operation of the wastewater treatment process. *Id.* Though the sidestreams are generally small in volume (5-10%) compared with the influent inflow to the facility, they increase organic loading by as much as 50%. *Id.* Sidestreams are characterized by high organic content (BOD) and total suspended solids (TSS). *Id.* The intentional production of struvite from a WWTP sidestream generally involves adding an external source of magnesium (depending on the characteristics of the sidestream) and controlling the pH of the mixture in a crystallization reactor where crystals of struvite are grown in a controlled environment until they reach the desired size. The entire process is deliberate and occurs only to generate the finished product.

b. Struvite is not a "material derived from sewage sludge."

i. Struvite is a not "a material derived from sewage sludge." Again, struvite is a material derived from a nutrient-rich wastewater sidestream of a WWTP, not from the sewage sludge that is an end product of a WWTP.

ii. Struvite would more accurately be termed "a mineral crystal product produced from the nutrients of a wastewater side stream of a WWTP."

iii. Even if it were considered a "material derived from sewage sludge," there is some point where such material is so transformed that it should no longer be considered sewage sludge. For example, crops grown on fields where biosolids were applied are not considered "material derived from sewage sludge" because they are new products, despite the fact that material derived from sewage sludge played some role in their existence. [See *infra* regarding the European Union's End of Waste framework.]

c. "Sewage sludge" is limited to materials with certain similar characteristics. Struvite should not otherwise qualify as sewage sludge because it is wholly different from sewage sludge in its characteristics.

i. Part 503 differentiates between regulated and unregulated substances on the basis of their characteristics. In explaining why certain materials were included or exempt from Part 503, the Preamble states that the Agency looked to the material's characteristics in making the determination

(although the agency did not specify which characteristics it considered). *See* 58 Fed. Reg. at 9325-27.

1. "Grit . . . generated during the preliminary treatment of domestic sewage in a treatment works that are used or disposed are not subject to part 503 regulation. These materials have characteristics that are different than the characteristics of sewage sludge." 58 Fed. Reg. at 9395.

2. Domestic septage is included as sewage sludge in part because "It also has the characteristics similar to the characteristics of sewage sludge." 58 Fed. Reg. at 9327.

3. Scum, the material that floats on top of the wastewater in a treatment process and is removed by skimming, is included because "[s]cum shares many characteristics with the other residues generated during the treatment of wastewater and often is disposed of with sewage sludge." 58 Fed. Reg. at 9327.

4. The Part 503 definition of sewage sludge "also indicates that any material derived from sewage sludge (e.g., composted sewage sludge blended with another material) is sewage sludge." 58 Fed. Reg. at 9327. Struvite is not a material mixed with sewage sludge; rather, the struvite process uses some of the same compounds that could become sewage sludge to make a totally different product.

5. Ash generated during the incineration of sewage sludge is not included. Incinerator ash, which is disposed typically in landfills, is sterile and dry like other ash material. It does not have the same characteristics as other residues from wastewater treatment processes." 58 Fed. Reg. at 9327. Struvite resembles ash more than sewage sludge or its residuals.

6. "Grit and screenings also are not included in the definition of sewage sludge. Grit is the material, such as sand and gravel that settles out before primary treatment. Screenings are relatively large pieces of solid material caught on bar screens at the headworks of the treatment works. These wastes are small in quantity; have characteristics that are different from the characteristics of sewage sludge; and usually are handled and disposed of separately." 58 Fed. Reg. at 9327.

7. Part 503 applies to domestic septage because it has characteristics similar to sewage sludge, but not to industrial septage, which has different characteristics. 58 Fed. Reg. at 9395.

ii. Because struvite is a mineral compound with completely different characteristics from sewage sludge, struvite is not sewage sludge.

1. Sewage sludge characteristics. Sewage sludge is the residual, semi-solid material left over from the sewage treatment process. It varies greatly in its physical and chemical make-up. It can be in almost completely liquid or almost completely solid. "The chemical composition and biological constituents of the sludge depend upon the composition of the wastewater entering the treatment facilities and the subsequent treatment processes. Typically these constituents may include volatile organics, organic solids, nutrients, disease-causing pathogenic organisms (e.g., bacteria, viruses, and others), heavy metals and inorganic ions, and toxic organic chemicals from industrial wastes, household chemicals, and pesticides." 58 Fed. Reg. at 9249. The composition of sewage sludge can vary widely based on the input of the treatment plant or the processes used at the plant. *See, e.g.*, "Biosolids Properties," Colorado State Extension Service website, comparing three biosolids from nearby areas, http://www.ext.colostate.edu/pubs/Crops/00547.html.

2. Struvite characteristics. Struvite by contrast, is a mineral that always consists of the same chemicals in the same ratio. It occurs naturally in crystalline structure, one of nature's most rigid, fixed, and consistent formats. Though the crystals can vary somewhat in size and can vary slightly in color, the basic structure and constituents of the material are unchanged.

3. Struvite is more similar to the materials exempt from Part 503 than to sewage sludge. Like incinerator ash, struvite is dry. Like grit and screenings, struvite is a hard solid material that can be removed from the treatment process.

iii. EPA was concerned about being overbroad in initial definitions and considered the negative effects of an overly broad definition.

1. In the Proposed Rule, the Agency stated that septage and sewage sludge products are included in the definition of sewage sludge, but was concerned with the effects. The Agency stated: "By including septage in the definition of sewage sludge, the Agency does not wish to infer that it intends to regulate the location and operation of septic tanks. Therefore, septic tanks are specifically excluded from the definition of a treatment work." 54 Fed. Reg. 5746 (Feb. 6, 1989).

2. In defining sewage sludge for Part 503, the Agency decided to include sewage sludge products in the definition, defining sewage sludge

products as "mixtures of sewage sludge and other materials frequently added during composting" and stating that the rule "includes sewage sludge products within the definition of sewage sludge no matter how small the percentage of sewage sludge in the product." Proposed Rule, 54 Fed. Reg. 5746 (Feb. 6, 1989). Yet, the agency solicited comment on the possibility of sewage sludge products that contain so small a percentage of sewage sludge in the product that they no longer have the characteristics of sewage sludge." *Id.* This shows EPA never intended to regulate pure, precipitated crystalline products such as struvite.

V. To Regulate Struvite Under Part 503 Would Conflict With Congress' Intent.

Congressional concern over sewage sludge focused on sludge: the semi-solid or solid end product of wastewater treatment. Congress was initially concerned with dumping and disposal of sludge in oceans and waterways. Later, Congress worked towards banning dumping and began to focus on regulating the use of sludge. Given its articulated concerns and the plain meaning of the term sludge, Congress expressed intent to regulate sludge, not mineral products that are not derived from end-product sewage sludge. Additionally, regulation of mineral products as sewage sludge does not further the broader goals of the Act.

a. When it passed the CWA and its subsequent amendments, Congress's specific concern was unregulated disposal or use of sludge, the end product of the wastewater treatment system.

i. Congress initially required EPA to develop guidelines for the use and disposal of sewage sludge in the original 1972 CWA because of the growing problem of sludge dumping.

1. *See, e.g.,* Testimony of Sen. Muskie, 92 Cong. Senate Debates 1971, 38797, at 38799 (Nov. 2, 1971) ("The sludge remaining from secondary treatment can create special problems. Some localities burn sludge, thus contributing to air pollution. Other localities use sludge for landfill. Still others dump sludge into the oceans where it is hazardous to sea life.") and at *28863-64, Testimony of Sen. Williams ("One of the most serious environmental problems facing the people of New Jersey, particularly those living on or near the shore, is the dumping of wastes into the ocean. Some 5 million tons of sewage sludge is poured into U.S. coastal wasters every year, and close to 90 percent of it is dumped less than 6 miles off the New Jersey Coast.")

2. Section 405 was added in Conference Committee in response to these concerns. Testimony of Sen. Muskie, 92 Cong. Senate Debates 1972 ("The Conferees have included a provision, not in either bill, which relates to the disposal of sewage sludge from waste treatment plants. During the Conference it became apparent that, unless a regulatory mechanism was established to control the by-products of advanced waste treatment plants, the disposal of residual sludge could cause a serious problem. Present practices which permit sewage sludge to be hauled out to sea and dumped or placed in areas on land where it is washed into streams and lakes, without regard to the impact on health and welfare, recreation, fish and shellfish and wildlife, are unsatisfactory.")

ii. Numerous references to "sludge" and the "end product" of sewage treatment during the 1977 and 1987 amendments to the CWA show that Congress remained focused on regulating sludge, the solid or semi-solid end product of a WWTP, not sewage or wastewater more generally.

1. In 1977, Congress continued to discuss regulating the dumping of sewage sludge in the ocean. *See* Testimony of Mr. Jorling before the Subcommittee on Environmental Pollution, 95 Cong. Senate Hearings 1977 481, at *642 (June 28, 29, and 30, 1977).

2. There are numerous references throughout the legislative history to "sludge" rather than "sewage sludge." *See, e.g.,* 95 Cong. Conf. Bill H.R. 3199 (Dec. 6, 1977) at * 29 (stating proposed changes to section 405).

3. There are references to effluent and sludge as the two end-products of a wastewater treatment plant. 95 Cong. Conf. Bill H.R. 3199 (Dec. 6, 1977) at * 71 (discussing section 516).

4. Sludge is referred to as "the unavoidable product of sewage treatment plant operations." 99 Cong. Senate Debates 1985 15301 at *15325 (Consideration of S. 1128, June 12, 1985).

5. By 1986, EPA hadn't acted on the 1977 directive to create regulations governing sewage sludge, and Congress was worried about unregulated land application of sewage sludge. *See, e.g.* Speech by Sen. Bentsen in support of the amendments, 99 Cong. Senate Debates 1986 32380 at *32384 (Congressional Record, Oct. 16, 1986) (EPA "utterly failed to heed [Congress' directive in the 1977 law]. Although I am told EPA has detected at least 76 toxic priority pollutants in <u>POTW sludge</u>, it has issued rules only for two pollutants: cadmium and PCBs – and only if these pollutants are landfilled or land spread.

EPA has no limits whatsoever on the toxicity of marketed sewage sludge products, and no limits for the many other toxic pollutants in sewage sludge which is landfilled or land spread.")

iii. Given the plain meaning of "sewage sludge" and "sludge," and especially the tendency to use the word "sludge" alone during Congressional debate, Congress could not have meant to regulate a mineral product like struvite.

1. Merriam Webster defines sewage as "waste material (such as human urine and feces) that is carried away from homes and other buildings in a system of pipes" or "refuse liquids or waste matter usually carried off by sewers." http://www.merriam-webster.com/dictionary/sewage. Merriam Webster defines sludge generally as "a muddy deposit, ooze, a muddy or slushy mass, deposit or sediment" and more specifically as "solid matter produced by water and sewage treatment processes." http://www.merriam-webster.com/dictionary/sludge

2. Oxford Dictionaries defines sewage sludge as "semiliquid waste obtained from the processing of municipal sewage." http://www.oxforddictionaries.com/definition/english/sewage-sludge.

3. None of these definitions encompass a pure, solid mineral crystal like struvite.

iv. EPA, like Congress, has viewed "sewage sludge" in line with its commonly accepted meaning as the organic sludge material that is the end product of a WWTP. *See* EPA Website at http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm, defining "sewage sludge (biosolids)" as "nutrient-rich organic materials resulting from the treatment of domestic sewage in a treatment facility."

1. Moreover, EPA has viewed organic fertilizers as inherently different than inorganic fertilizers. *See, e.g.,* EPA, *Background Report on Fertilizer Use, Contaminants and Regulations* (January 1999) at *i.*

b. Congress' overarching goals for the CWA indicate that the intent was not to regulate materials like struvite.

i. Congress' broader intent was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" when it enacted the CWA. 33 U.S.C. § 1251(a).

1. Regulating struvite as sewage sludge does not further this purpose.

2. Encouraging the development of struvite as a slow-release fertilizer that could cut down on N and P loading in waterways does further CWA goals. Non-point source pollution is currently the greatest hurdle to achieving better water quality. To continue to fulfill the goals of the Act, EPA should encourage a technology that could cut down on non-point source pollution from the agriculture, turf and ornamental markets.

ii. Using the grants program for the construction of treatment works, Congress tried to "encourage waste treatment management which results in the construction of revenue producing facilities providing for (1) the recycling of potential sewage pollutants through the production of agriculture, silviculture, or aquaculture products, or any combination thereof; (2) the confined and contained disposal of pollutants not recycled; (3) the reclamation of wastewater; and (4) the ultimate disposal of sludge in a manner that will not result in environmental hazards." 33 U.S.C. Section 1281(d).

1. Congress wanted to encourage the development of processes and technologies for recycling and reclamation of WWTP wastewater.

2. Number (4) also shows that Congressional concerns over disposal were linked to sludge from a WWTP, not wastewater more generally or other products that might result from different treatment processes.

iii. Congress generally addressed sewage sludge management in four ways: (1) the use or disposal of sewage sludge was subject to a permitting program (33 U.S.C. §1345 (a)-(c)); (2), EPA was directed to establish standards for sewage sludge use and disposal (33 U.S.C. § 1345(d)); (3) states were allowed to establish more stringent standards if they wished (33 U.S.C. § 1345 (e)); and (4) grants were authorized for the conduct of scientific studies, demonstration projects, and public information and education programs concerning the safe and beneficial management of sewage sludge (33 U.S.C. § 1345(g)).

1. These provision show Congress' intent was to require permits for sewage sludge use and disposal, that EPA should establish a floor of basic standards, that states could have higher standards, and that more information should be collected to further greater beneficial use. Overall, these different parts indicate a balancing approach between potential harms and potential beneficial use.

2. As explained *infra*, struvite does not present the same risk profile as sewage sludge, while it does present an opportunity for beneficial re-use of a key nutrient, P.

VI. The Clean Water Act Promotes Beneficial Reuse, Local Autonomy, Flexibility, and Innovation; Exempting Struvite Furthers These Goals.

a. Beneficial reuse. An EPA policy that encourages resource extraction from wastewater would be consistent with long-standing EPA policy to treat wastewater and sewage sludge as a valuable resource. This policy derives from the CWA and EPA pronouncements before and after the promulgation of Part 503 While struvite is not a sewage sludge, the success of EPA and the regulated community in promoting and implementing beneficial use of sewage sludge provides a precedent for promoting resource extraction at wastewater plants.

i. EPA's 1984 *Beneficial Reuse Policy* and 1991 *Interagency Policy on Beneficial Use of Sewage Sludge* strongly support the beneficial reuse of sewage sludge. These objectives are also closely linked to the goal of reducing the volume of waste generated by WWTPs.

ii. The Preamble to the Final Rule notes that each level of treatment (secondary, tertiary, etc.) provides both greater wastewater cleanup and greater amounts of sewage sludge. 58 Fed. Reg. at 9256. "Unless the volume of sludge is reduced, the nation cannot achieve its environmental quality objectives." 58 Fed. Reg. at 9256.

iii. While § 405(e) of CWA reserves choice of use and disposal of sewage sludge to local communities, "EPA's preference is for local communities to reuse this resource in beneficial ways." 58 Fed. Reg. at 9258.

iv. Congressional and EPA policy for decades has highlighted the challenges of the mass and weight of bulk sewage sludge, which also dramatically differentiates it from struvite and underscores that it is not sewage sludge.

v. Due to the beneficial use mandate, EPA examines strategies and processes to recover valuable materials from the WWTP, including from wastewater sidestreams, and including struvite.

1. EPA has studied strategies to recover N from wastewater side streams and has reported that separate treatment of such side streams may be "more efficient and cost effective than the conventional method of returning these side streams untreated to the headworks of the plant."

EPA, *Wastewater Technology Fact Sheet: Side Stream Nutrient Removal* (2008).

2. EPA tracks emerging technologies for wastewater biological treatment processes. EPA, *Emerging Technologies for Wastewater Treatment and In-Plant Wet Weather Management – Chapter 3: Biological Treatment Processes* (2013) (Struvite at p. 2-8).

vi. **Innovation.** Exempting struvite would further Congress and the Agency's intent to foster new innovation. New technologies necessitate new regulatory approaches. A policy statement recognizing that struvite is not a biosolids would lift the burden of 503 compliance and the state regulatory requirements triggered by a federal biosolids status.

1. EPA wrote Part 503 more than 20 years ago and broadly defined sewage sludge as it was understood at that time. New resource recovery technologies, directly in line with the CWA's beneficial use mandate, have rendered the original broad definition untenable. EPA should be flexible and encourage new technologies.

2. The technology to recover struvite did not exist when Part 503 was written. EPA should now look at the technology and decide to exempt struvite in order to foster beneficial re-use and cut down on the waste produced at WWTPs.

3. Requiring treatment, testing, monitoring, and recordkeeping of struvite as a biosolid represents a high burden for manufacturers and will impair the market value of the product.

4. Not only do imposing onerous treatment standards for pathogen and vector attraction reduction present a significant burden, but some states impose additional labeling and use requirements on Class A EQ biosolids that are inappropriate and unnecessary for struvite.

5. If EPA decides to regulate struvite, it will stifle this innovative product and others like it that are emerging or likely to emerge in the future. Processes are likely to be developed to extract a number of valuable products from sewage sludge, including precious metals, algae-based biofuels, and other nutrients. Unnecessary regulation would stifle these innovations, defeating the purpose of the Act to promote beneficial use.

VII. Regulating Struvite Under Part 503 is Unnecessary and Constitutes an Unreasonable Burden to Producers of Struvite.

a. **Regulation of struvite under Part 503 is unnecessary because it does not pose the same potential risks as sewage sludge.**

i. Not only is struvite outside the scope of the regulatory definition of sewage sludge and inherently different from sewage sludge, but it also does not pose the same potential risks as sewage sludge that Congress addressed in the CWA and EPA addressed in Part 503.

1. Sewage sludge, if not treated and regulated to standards to achieve biosolids status, can pose certain risks to the environment and public health. As a result, 40 C.F.R. § 503.13 imposes ceiling concentrations on cumulative pollutant loading rates. Sections 503.32 and 503.33 impose vector attraction reduction and pathogen control requirements on all classes of biosolids. With regard to land application, Class B biosolids are also restricted by public access, crop harvesting, and buffer requirements.

ii. Although there is currently only a limited dataset to compare struvite products to Class A, EQ biosolids, the data that are available indicate that struvite is capable of exceeding the pollutant and pathogen requirements of Class A, EQ biosolids. Because the product has no odor and is not an organic material, vector attraction is generally not a concern.

1. Metals.

a. According to a suite of tests performed on Ostara's Crystal Green struvite product from 2007 and provided to EPA, it naturally meets the ceiling concentrations of pollutants in 503.13, often by orders of magnitude.

b. Extremely low metals reflect that this is essentially a pure phosphorus product extracted from wastewater. EPA has indicated this, noting that "one important benefit of phosphorus recovery technologies is that any metal ions in the sludge remain with the sludge and are not co-precipitated with the phosphorus." EPA, *Emerging Technologies Report: Wastewater Treatment and In-Plant Wet Weather Management* (March 2013) at p. 2-8.

2. Pathogens.

a. According to a 2010 Crystal Green Lab Analysis Summary and a BioVir Laboratory results summary (provided to EPA), Ostara's struvite product is free of salmonella and does not contain detectable levels of fecal coliform, Helminth Ova and Enteric Viruses. Crystal Green studies from 2011 and 2012 indicate the

product meets commercial fertilizer standards by orders of magnitude.

3. Comparison of struvite data with Class A EQ biosolids requirements.

Requirement	Class A EQ Biosolids Limit	Ostara Crystal Green Struvite
Arsenic	75 mg/kg	< 5 mg/kg (2007 Envt. Canada)
Cadmium	85 mg/kg	< .05 mg/kg (2007 Envt. Canada)
Salmonella	Non-detectable	Negative (2010 Crystal Green Lab Analysis)

4. EPA identifies the main producers of struvite from domestic WWTPs as Ostara, Multiform Harvest, and Procorp Enterprises. EPA, *Emerging Technologies Report: Wastewater Treatment and In-Plant Wet Weather Management* (March 2013) at p. 2-8. Additional data from these other producers will be needed to fully assess the range of struvite products

b. Regulation of struvite as sewage sludge is unnecessary because it can be regulated by individual states as a commercial fertilizer.

i. **United States – state regulation**. Like other manufactured goods, states regulate fertilizer quality. Every state has its own fertilizer program, usually administered by the state department of agriculture. State regulations are generally concerned with consumer protection, labeling, protection of human health and the environment, and proper handling and application. *See* generally, EPA, *Background Report on Fertilizer Use, Contaminants and Regulations* (January 1999).

1. States are arguably best suited to regulate fertilizer, because soil conditions, different nutrient levels, crop needs, and weather vary dramatically in states across the country.

2. Example: Oregon. Struvite is regulated as a commercial fertilizer in Oregon and has to meet fertilizer requirements of the Oregon Department of Agriculture ("ODA"). It is not regulated as a biosolids product. See www.nwbiosolids.org/EventPubs/ORStruvitePresentation.pdf

a. Oregon statute defines fertilizer as "any substance . . . that is designed for use primarily as a source of plant food, in inducing

increased crop yields or plant growth, or producing any physical, microbial, or chemical change in the soil, and that contains five percent or more of the total (N), available phosphate (P_2O_5), or soluble potash (K_2O), singly, collectively, or in combination." Ore. Rev. Stat. § 633.311(11). The law requires manufacturers to be licensed (§ 633.318) and fertilizer to be labeled properly, including a derivation statement declaring the sources for all primary nutrients (§ 633.321). The registration process requires in-depth disclosures, including whether a product is "waste-derived," a statement of metals in the product and other substances the department requires by rule. §§ 633.362(9) & (10). ODA will review the permitted levels of metals or other substances in fertilizer every three years according to § 633.362(11).

b. For more information on struvite production in Oregon, *see* http://www.hdrinc.com/portfolio/durham-advanced-wastewater-treatment-plant-struvite-recovery-project.

ii. **Europe – "End of Waste" framework**. In addition to a policy statement that clarifies that struvite is not a biosolids, the Agency could consider guidance or policy that sets certain parameters for extraction of useful products from wastewater. In the European Union, End of Waste legislation created a framework which allows certain materials to fall outside the definition of waste and be regulated as products instead. End-of-Waste criteria are used to determine when a material ceases to be waste and obtains the status of a product or a secondary raw material. According to Article 6 (1) and (2) of the Waste Framework Directive 2008/98/EC, certain specified wastes shall cease to be waste when they have undergone a recovery or recycling operation and complied with specific criteria to be developed in line with certain legal conditions, specifically: (1) the substance or object is commonly used for specific purposes; (2) there is an existing market or demand for the substance; (3) the use is lawful; and (4) the use will not lead to overall adverse environmental or human health impacts. *See* http://ec.europa.eu/environment/waste/framework/end_of_waste.htm.

1. The governments of England, Scotland and Northern Ireland have studied the struvite process and determined that the finished product achieves end of waste status and should be regulated under the European fertilizer regulations and the regulations governing the manufacturing of chemical substances (REACH) apply instead of biosolids regulations.

2. Example: United Kingdom. The UK has taken the position that REACH applies to substances like struvite that are recovered from

waste once they cease to be waste. *See* UK Competent Authority leaflet 14 (Nov. 2012) at http://www.hse.gov.uk/reach/resources/waste.pdf.

VIII. Regulating Struvite Under Part 503 Will Present An Unnecessary Burden for Producers of Struvite.

a. Requiring struvite to meet Class A EQ requirements would be unnecessary and contrary to Congressional and EPA laws, rules, and policy, as outlined above.

i. For example, taking struvite crystals and subjecting them to excessive heat treatment, digestion, lime stabilization or other processes called for under the Class A alternatives would be unnecessary.

ii. Sampling and analysis at point of distribution or use for Alternative 4 criteria would impose an unnecessary burden.

iii. In addition, the biosolids classification would confuse the public regarding the nature of the product, suggesting, for example, that struvite has the organic and trace elements properties that many users seek in biosolids.

iv. A biosolids classification for struvite would trigger additional requirements in some jurisdictions and unwarranted reactions to struvite as a biosolids product in some markets.

b. It is easier to produce, manage, and market a product that is simply a commercial fertilizer than a product considered a biosolid. Requiring struvite producers to jump through unnecessary regulatory hoops in producing and marketing their product is unreasonable given that the product is not sewage sludge and does not pose the same potential concerns as sewage sludge.

IX. Suggested Next Steps.

a. NACWA respectfully requests that EPA issue a policy statement clarifying that in the Agency's view, struvite is not sewage sludge subject to Part 503.

i. Precedent. In other analogous circumstances, EPA has used policy statements or other guidance to clarify the scope of regulatory programs.

1. RCRA. Co-products exemptions. Under RCRA, a potential path to exemption is when a material qualifies as a "co-product." There are no statutory or regulatory definitions of a co-product, but EPA indicated in a Federal Register notice that it considers co-products "materials

produced intentionally, and which in their existing state are ordinarily used as commodities in trade by the general public." 50 Fed. Reg. 625 (Jan. 4, 1985). EPA articulates when a product is co-product exempt from the definition of "solid waste" by case-specific opinion letters. In making its determination, the Agency considers whether the material is produced from a separate production stream, whether it is fit for end use essentially as is, whether it is highly processed and intentionally produced for sale to the public, and whether there is a legitimate market in existing for the product. *See, e.g.* RCRA Guidance Letter 11793 (Nov. 4, 1993). ["By-products" are regulated as solid waste under RCRA; a by-product is defined as "a material that is not one of the primary products of a production process and is not solely or separately produced by the production process." 40 C.F.R. 261.1(c)(3).] Examples:

a. Hydrochloric acid produced from pentachlorophenol manufacturing process. RCRA Guidance Letter 11260 (June 25, 1987).

b. Purge monomer generated from a polystyrene manufacturing process. RCRA Guidance Letter 14589 (Feb. 19, 2002).

c. LX-830 derived from petroleum and coal tar naphtha feedstocks. RCRA Guidance Letter 11936 (Jan. 31, 1995).

d. Coal tar distillate marketed for fuel use. RCRA Guidance Letter 11677 (July 9, 1992).

b. Alternatively, NACWA suggests that EPA establish a regulatory pathway, similar to the European "End of Waste" framework, providing a path for recovered materials to completely exit Clean Water Act regulatory coverage.