APS
The Power To Make It Happen
FOUR CORNERS POWER PLANT
P.O. Box 355 * FRUITLAND, NEW MEXICO 87416

April 18, 2005

CERTIFIED MAIL

Ms. Nancy Yoshikawa
WTR-5
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, California 94105

Dear Ms. Yoshikawa:

Arizona Public Service Company (APS) Four Corners Generating Station is submitting the enclosed Proposal for Information Collection (PIC) as a component of the Comprehensive Demonstration Study (CDS) required for compliance with Section 316(b) of the Clean Water Act. Section 316(b) ensures cooling water intake structures reflect the Best Technology Available (BTA) for minimizing adverse environmental impacts to aquatic life species.

APS is required to comply with Phase II of the Final Rule (published in the Federal Register July 9, 2004) since the Four Corners Generating Station uses cooling water intake structures that utilize a design flow withdrawal greater than 50 million gallons per day (MGD) from a water of the United States, and more than 25% of the withdrawn water is used exclusively for cooling purposes. APS withdraws cooling water from Morgan Lake and is therefore only required to comply with the impingement mortality performance standard.

The Rule requires facilities to demonstrate the BTA for meeting performance standards through a CDS, which is submitted with the facility's National Pollutant Discharge Elimination System (NPDES) permit. For facilities whose existing NPDES permit expires before four years after the publication date of the Rule (July 9, 2008), the Rule allows facilities to request a schedule of submission that does not exceed three years and 180 days from the date of publication of the Rule. This was intended to allow sufficient time to collect the vast array of required information to comply with all applicable aspects of the rule. Since APS's Four Corners' NPDES permit expires on April 6, 2006, APS is requesting the full three years and 180 days for submittal of the CDS. The CDS will be submitted no later than January 7, 2008.

The enclosed PIC is the first component of the CDS (§125.95(b)) to be submitted for review which includes 1) *a description of the proposed or implemented technologies, operational measures, and/or restoration measures to be evaluated in the study* (§125.95(b)(1)(i)); 2) *a list and description of any historical studies characterizing impingement and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to the proposed study* (§125.95(b)(1)(ii)); 3) *a summary of any past or ongoing consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to the proposed study and a copy of written comments received as a result of such consultation* (§125.95(b)(1)(iii)); and 4) *a sampling plan for new studies proposed to be conducted in order to ensure sufficient data to develop a scientifically valid estimate of impingement* (§125.95(b)(1)(iv)).

This PIC is submitted prior to the start of information collection activities, although facilities are allowed to begin data collection before receiving the Director's comments. The Rule encourages Directors to provide comments expeditiously (within 60 days) to allow facilities enough time to modify the proposal. APS requests the Director first provide comments on the Sampling Plan for the Impingement Mortality Characterization Study, to expedite the start of data collection activities, followed by comments

on the remaining PIC. An important component of the Sampling Plan that requires special consideration is a discussion of a nuisance species to be excluded from the Study.

If you have any questions concerning the submitted PIC please contact Valisa Nez at (505) 598-8443 or Carl Woolfolk at (505) 598-8799.

Sincerely,

David L. Saliba
Fossil Plant Manager

CDW/VEN/jmd

Enclosure

xc: Mr. Jeff Cole, Navajo Fish & Wildlife
Mr. Patrick Antonio, NNEPA/NPDES Program

A subsidiary of Pinnacle West Capital Corporation

Proposal for Information Collection

Arizona Public Service
Four Corners Generating Station
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Submitted In Partial Compliance with
316(b) Phase II Regulatory Requirements

April 2005

EPRI SOLUTIONS

Proposal for Information Collection
Four Corners Generating Station

Arizona Public Service

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List of Acronyms

APS	Arizona Public Service
BTA	Best Technology Available
CDS	Comprehensive Demonstration Study
EPA	Environmental Protection Agency
IM	Impingement Mortality
IM&E	Impingement Mortality and Entrainment
NPDES	National Pollutant Discharge Elimination System
PIC	Proposal for Information Collection
PSIG	Pounds Per Square Inch Gauge
TIOP	Technology Installation and Operation Plan

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EXECUTIVE SUMMARY

This Proposal for Information Collection (PIC) is submitted in compliance with final 316(b) Phase II Regulations for existing electric generating stations published in the federal register on July 9, 2004. Because the facility is located on a freshwater reservoir it will only be subject to the impingement mortality (IM) performance standard which requires an 80 to 95% reduction in impingement mortality. The PIC provides EPA Region IX with APS's plans for conducting necessary biological studies, analyzing existing biological information and evaluating alternative fish protection technologies and use of the Rule's compliance alternatives. It is APS's intention to evaluate a wide range of options and alternatives. Currently APS has identified several alternatives that it considers to be preferred options due to their cost effectiveness. These preferred options include potential use of restoration under compliance alternative 2 and/or 3, use of a barrier net or fixed panel screens to reduce the maximum design intake velocity under compliance alternative 1, and use of site-specific standards (either the cost-cost or cost-benefit test) under compliance alternative 5. The basis for these preferred alternatives are discussed in Section 3 of the PIC. APS is also planning to initiate a one year impingement sampling study in 2005.

Based on the results of a one year impingement study proposed to begin in 2005, a quantitative assessment will be conducted to select a compliance alternative or set of alternatives for use at Four Corners. Additional studies and evaluations may be conducted as necessary and appropriate to gather the necessary information to prepare the Comprehensive Demonstration Study (CDS) for submittal to EPA Region IX on or before January 7, 2008. The Rule encourages the NPDES permitting authority to review and provide comments on the PIC within 60 days. While EPA may not be able to comment on all aspects of the PIC in this time frame, APS is particularly interested in feedback on the proposed IM study plan presented in Attachment B. The results of the study plan will form the basis of decision making for selection of compliance alternatives and the CDS documents that will be submitted.

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1. INTRODUCTION

EPA signed into regulation new requirements for existing electric power generating facilities for compliance with Section 316(b) of the Clean Water Act on July 9, 2004. These regulations became effective on September 7, 2004 and are based on numeric performance standards[1]. The Rule has established that all facilities must meet performance standards of reducing impingement mortality by 80-95% from a calculation baseline, and only a selection of facilities must reduce entrainment by 60-90% from a calculation baseline.

The Rule at 125.94(a)(1-5) provides facilities with five compliance alternatives as follows:

1. A facility can demonstrate it has or will reduce cooling water flow commensurate with wet closed cycle cooling and be determined to be in compliance with all applicable performance standards. A facility can also demonstrate it has or will reduce the maximum design through-screen velocity to less than 0.5 ft/s in which case it is deemed in compliance with the impingement mortality (IM) performance standard (the entrainment standard, if applicable still applies).
2. A facility can demonstrate that it has technologies and/or operational measures and/or restoration measures in place that will meet the applicable performance standards.
3. A facility can propose to install new technologies and/or operational measures and/or restoration measures to meet applicable performance standards.
4. A facility can propose to install, operate and maintain an approved design and construction technology.
5. A facility can request a site-specific determination of Best Technology Available (BTA) by demonstrating that either the cost of installing technologies and/or operational measures and/or restoration measures are significantly greater than the cost for the facility listed in Appendix A of the rule or that the cost is significantly greater than the benefits of complying with the applicable performance standards.

All facilities that use compliance alternatives 2, 3, and 4 are required to demonstrate a minimum reduction in impingement mortality of 80% (125.94(b)(1)). Facilities with a capacity factor that is greater than 15% that are located on oceans, estuaries or the Great Lakes or on rivers and have a design intake flow that exceeds more than 5% of the mean annual flow must also reduce entrainment by a minimum of 60% (125.94(b)(2)).

The Rule further requires that facilities using compliance alternatives 2, 3, and 5 prepare a Comprehensive Demonstration Study (CDS) as described at 125.95(b) of the Rule. The CDS

[1] Performance standards are found at 125.94(b) of the Federal Registrar.

includes seven components necessary to support the compliance alternative or alternatives selected. Facilities using compliance alternative 1 are not required to submit a CDS and those using compliance alternative 4 are only required to submit the Technology Installation and Operation Plan (TIOP) and Verification Monitoring Plan. All facilities that use compliance alternatives 2, 3 and 5 are required to prepare and submit a "Proposal for Information Collection", the first component of the CDS. The Rule at 125.95(b)(1) requires that the PIC include:

1. *A description of the proposed and/or implemented technologies, operational measures, and/or restoration measures to be evaluated in the Study.*
2. *A list and description of any historical studies characterizing impingement mortality and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to this proposed Study. If you propose to use existing data, you must demonstrate to the extent to which the data are representative of current conditions and that the data were collected using appropriate quality assurance/quality control procedures.*
3. *A summary of any past or ongoing consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to this Study and a copy of written comments received as a result of each consultation.*
4. *A sampling plan for any new studies you plan to conduct in order to ensure that you have sufficient data to develop a scientifically valid estimate of impingement mortality and entrainment at your site. The sampling plan must document all methods and quality assurance/quality control procedures for sampling and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and include consideration of the methods used in other studies performed in the source waterbody. The sampling plan must include a description of the study area (including the area of influence of the cooling water intake structure(s)), and provide a taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish).*

The preamble to the Rule on Federal Register Page 41635 states that the proposal should provide other information, where available, to the NPDES permitting authority on plans for preparing the CDS such as how the facility plans to conduct a Benefits Valuation Study; or gather additional data to support development of a Restoration Plan.

An important feature of the Rule is use of the calculation baseline. The calculation baseline is defined in the rule as follows:

Calculation baseline means an estimate of impingement mortality and entrainment that would occur at your site assuming that: the cooling water system has been designed as a once-through system; the opening of the cooling water intake structure is located at, and the face of the standard 3/8-inch mesh traveling screen is oriented parallel to, the shoreline near the surface of the source waterbody; and the baseline practices, procedures, and structural configuration are those that your facility would maintain in the absence of any structural or operational controls,

including flow or velocity reductions, implemented in whole or in part for the purposes of reducing impingement mortality and entrainment. You may also choose to use the current level of impingement mortality and entrainment as the calculation baseline. The calculation baseline may be estimated using: historical impingement mortality and entrainment data from our facility or another facility with comparable design, operational, and environmental conditions; current biological data collected in the waterbody in the vicinity of your cooling water intake structure; or current impingement mortality and entrainment data collected at your facility. You may request that the calculation baseline be modified to be based on a location of the opening of the cooling water intake structure at a depth other than at or near the surface if you can demonstrate to the Director that the other depth would correspond to a higher baseline level of impingement mortality and/or entrainment.

This definition allows existing facilities to take credit for facility features that deviate from the calculation baseline and provide the benefit of fish protection or credit for previously implemented restoration measures. Facilities can also simply develop the baseline by documenting the baseline using the "as built" approach.

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2. DESCRIPTION OF FACILITY

APS's Four Corners Generating Station (Four Corners) is located on Morgan Lake, seven miles southwest of Fruitland, New Mexico. Four Corners is a point source facility and withdraws more than 50 MGD from a water of the U.S., its primary activity is generation and transmission of electric power and it uses at least 25% of withdrawn water for cooling. Therefore, it meets the definition of a Phase II facility.

Four Corners has five once-through cooling Units. Units 1 & 2 are each rated for 170 MW, Unit 3 is rated for 220 MW, and Units 4 & 5 are each rated at 740 MW each. From 2000–2003, the average capacity factor for the facility was 83%, making it a base loaded facility.

Condenser cooling and service water is withdrawn under a skimmer wall located in the south-western corner of the lake. The skimmer wall is positioned at the mouth of the intake canal and extends down to El. 5,285.0 ft, 42.5 ft below the high water elevation (EL. 5,327.5 ft) and is 10 ft above the invert of the intake canal based on the original design. The facility uses two screenhouses located downstream of the skimmer wall. The screenhouse for Units 1–3 is located about 450 ft downstream of the skimmer wall and the Units 4 & 5 screenhouse is located at the end of an intake canal west of the Units 1–3 screenhouses.

The screenhouse for Units 1–3 has seven bays, each with a curtain wall and traveling water screen. All screens are 27 ft high and have 0.25 in. rectangular mesh. This mesh provides a 64% open area. The traveling screens are rotated daily to remove debris. During operation the screens are rotated less than one revolution. The screens also rotate automatically when there are high differential pressures across the screen. Fish and debris on the screens are removed by a high-pressure (80 psi) front spray wash during cleaning. The wash water and debris from Units 1-3 discharges into the intake canal leading to Units 4 & 5.

Downstream of the traveling water screens are six circulating water pumps, two pumps per unit. The pumps for units 1 & 2 are each rated for 50,000 gpm (72MGD). Unit 3 has larger pumps each rated for 64,250 gpm (92.52MGD). The total circulating water flow is about 328,500 gpm (473.04MGD).

The screenhouse for Units 4 & 5 is located at the end of a long intake canal, which was added to the western bank of the Unit 1–3 intake canal. It has four bays that are 15.2 ft wide and have 14 ft wide traveling water screens. These screens have 5/8 in. square mesh and have been modified with serrated plates that bisect the screen baskets horizontally. Fish and debris washed off the screens are deposited in a trash basket for disposal. The screens are typically only cleaned when there is a high differential pressure across the screens. Unit 4 pumps are rated for a flow of

229,000 gpm (329.76MGD) and Unit 5 pumps are rated at 215,000gpm (309.6MGD). In addition, each intake bay has either a screenwash or an ash sluice pump. Unit 5 (north) and Unit 4 (south) have screenwash pumps, these pumps are rated for 3,050 gpm (4.392MGD). Ash sluice pumps rated for 2,200 gpm (3.168MGD) are located in the Unit 5 (south) and the Unit 4 (north) intake bays. With all pumps operating, this intake withdraws 898,500 gpm (1293.84MGD) based on design values.

Cooling water for all five units is returned to Morgan Lake via a discharge canal to the east extremity of the lake. The water then flows back to the center of the lake and is recirculated to the intake canal.

Morgan Lake is a man-made reservoir that was created in 1961 to provide cooling water for Four Corners. The water rights for the lake are currently owned by BHP, a mining company. The lake is maintained between high and low water levels of El. 5,327.5 ft and El. 5,325.5ft, respectively, based on operational records. Normal water level in the lake is high water. The lake has an approximate surface area of 1,200 acres, and contains about 39,000 acre ft of water. The dominant current in the lake is caused by the recirculating cooling water system used by Four Corners. Make-up water for the lake is provided by a river water pumphouse. This pumphouse pumps about 16,667 gpm (24MGD) from the San Juan River.

To calculate the velocities in the intake canal, it was assumed that minimal siltation has occurred and that the intake canal bottom is at El. 5,275.0 ft under the skimmer wall and at El. 5,306.0 ft in the intake canal. The approach velocities at the traveling screens for Units 1 & 2 are 0.9 fps, 1.0 fps for Unit 3 and 2.4 fps for Units 4 & 5.

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3. COMPLIANCE ALTERNATIVES TO BE EVALUATED

APS plans to evaluate potential use of each of the Rule's compliance alternatives before making a final decision on which alternative or combination of alternatives to use as the basis for the Comprehensive Demonstration Study (CDS). In this Section each of the Rule's compliance options and alternatives to be evaluated for use at the Four Corners Generating Station are discussed. APS plans to consider use of each of the Rule's five compliance alternatives, however based on currently available information some alternatives appear to be more cost effective for meeting the IM standard than others. The PIC specifies that a description of the technologies, operational measures and restoration measures to be evaluated must be provided and that is the purpose of this section of the PIC. The Rule's compliance options and alternatives that will be evaluated are as follows:

Use of Restoration Under Compliance Alternatives 2 and 3

Morgan Lake was constructed in the desert terrain for the purpose of providing cooling water for the Four Corners Generating Station. The surface area of approximately 1,200 acres and the approximately 39,000 acre ft of water contained were scaled for the purpose to ensure adequate condenser cooling. Four Corners subsequently agreed to allow the Navajo Tribe to make use of the aquatic habitat provided through construction of the Lake for the purpose of creating a recreational fishery. While some incidental introduction of fish probably occurred when water was pumped from the San Juan River to fill Morgan Lake, the current recreational fishery is largely the result of Tribal fishery management efforts to introduce species for recreational harvest. Currently the species of highest interest is largemouth bass. The Rule specifically allows credit for existing restoration projects under compliance alternative 2 as long as the restoration measures currently in place are not the result of mitigation required for compliance with Section 404 or some regulatory requirement other than 316(b). Restoration measures were implemented in many cases under existing State 316(b) regulatory programs as a means of offsetting impingement and/or entrainment losses. Four Corners' creation of aquatic habitat that supports the current Morgan Lake recreational fishery is no different that other such restoration programs. APS plans to pursue quantification of the aquatic habitat created to determine if it is adequate to support a level of fish production adequate to offset 80% to 95% of the annual impingement mortality necessary to comply with the IM performance standard. If there is not adequate habitat to meet the standard APS plans to evaluate use of additional restoration measures to achieve the level necessary to comply under compliance alternative 3 (See Attachment A). APS, as part of the requirement for use of restoration, plans to fully evaluate available technologies and/or operational measures to demonstrate that existing and any necessary supplemental restoration is more feasible, cost effective or environmentally desirable than meeting performance standards through the use of technologies and/or operational measures (see below in this Section). Also, as a prerequisite to determining if the amount of aquatic

habitat has been created to provide a benefit equivalent to an 80% to 95% impingement mortality reduction, the results of a proposed impingement mortality characterization study will be needed. The PIC discusses plans to acquire this information in Section 4 and Attachment B. APS is also aware that use of restoration is currently the subject of Phase II Rule litigation. The Second Circuit ruled restoration could not be used in the 316(b) Phase I Rule. Based on the Courts decision, EPA added significant text to the final Phase II Rule to support the legal basis for use of this option. APS, based on the time for the Court to reach a decision on the Phase I Rule believes that the Phase II Rule decision should be rendered at approximately the same time that results of the proposed impingement sampling data will become available in the spring of 2006. When the impingement data necessary for restoration scaling and results of the litigation are available, APS can quantitatively determine if adequate restoration has been created or if supplemental restoration would be necessary to meet the IM reduction standard.

Use of Fish Protection Technologies and/or Operational Measures under Compliance Alternatives 1, 3 and 4

Should use of restoration measures not be available as a result of Rule litigation APS plans to evaluate use of fish protection technologies. APS has already engaged Alden Research Laboratory Inc to conduct a very preliminary evaluation of available fish protection technologies and operational measures. Based on this analysis, APS plans to evaluate use of the following fish protection technologies and operational measures.

Reduce Intake Velocities to Not Exceed 0.5 ft/sec under Compliance Alternative 1

Reducing the maximum through screen design velocity to not exceed 0.5 fps would automatically comply with the impingement mortality standard and avoid the need for preparation of the Comprehensive Demonstration Study (CDS) and impingement mortality reduction performance monitoring. This velocity could be achieved by increasing the current intake screen surface area. For example, APS can evaluate installing fixed panel screens in front of the existing skimmer wall in a manner to increase surface area or install a barrier net year round.

Expanding the open area under the skimmer wall and installing fixed panel screens in its place could be a means of reducing the average through-screen velocity of 0.5 ft/sec or less. This velocity would meet the criteria for EPA Compliance Alternative 1 required to meet the IM standard. To achieve this velocity of 0.5 ft/sec the open area would need to be 35 ft high, which would require the skimmer wall to be removed up to El. 5,310.5 ft, 10 ft below the water surface. Withdrawing water from the closer to the surface may cause the recirculation of warmer water into the intake, and lower unit efficiencies which could significantly increase the cost of using this option. The screens could be made out of wedge wire with a 3/8" slot size. The screens could be mounted to the existing skimmer wall structure. A trash rack may need to be located upstream of the fixed panel screens to minimize damage from large debris.

The screens would be cleaned with a mechanized rake or lifted with a hoist for periodic cleaning. Head loss across the screens would be minimal (<0.1 ft).

A second option to be evaluated will be design of a barrier net can that can be maintained in place year round. The design would have a mesh size that would not exceed 3/8 in and ensure that a continuous seal is maintained year round. Use of a barrier net is also discussed as an alternative under use of compliance alternative 3 below. For use as a compliance alternative 1 option, a double barrier net system would be necessary to ensure that a continuous barrier remained in place year round when one net was removed for cleaning or maintenance.

Use of Fish Protection Technologies and/or Operational Measures under Compliance Alternative 3:

Several technologies have been identified that have the potential for use at Four Corners that will be evaluated and include:

Coarse Mesh Ristroph Traveling Water Screens

The existing traveling water screens for all five units, 10 screens total, could be replaced with a new state-of-the-art coarse mesh Ristroph screens to reduce the mortality of impinged fish. These screens are typically designed to have a screen approach velocity of 1.0 ft/sec at plant design flow, to assure impingement survival. The existing velocities within the Units 1–3 screenhouse are consistent with the screen design velocity and therefore no expansion of the intake would be necessary. The velocities at the screenhouse for Units 4 & 5 are more than twice the recommended velocity. To lower the velocity, additional screenbays could be added to the intake. However, because of space constraints, this may not be a feasible option. Alternatively, flow reduction could be used to lower velocity without additional civil/structural modifications to the intake. Flow reductions, however, could result in substantial lost generation.

The ability of coarse mesh Ristroph screens to effectively reduce impingement mortality is highly species specific. This technology requires the collection of fish on the screens, transfer to a transport system followed by transport back to the source waterbody. Many fish species are highly tolerant of the required handling and transport while others are not. Results of the proposed impingement sampling study will be necessary to document the species in need of protection to fully evaluate the potential of this technology to meet the performance standard. Site specific pilot studies would be necessary to verify site specific survival rates for impinged species. This will be especially important since velocities of Units 4 and 5 are greater than the 1.0 design and space constraints limit APS's ability to add more screens.

New Ristroph screens in both screenhouses would be rotated continuously to minimize impingement times, thereby, improving survival. New fish return and debris troughs would be added to each screenhouse which would discharge back to the lake.

Modular Inclined Screens

An MIS module consists of a square entrance, upstream and downstream dewatering gates, an inclined screen set at a shallow angle (10–20°) to the flow, and a bypass for directing diverted fish to a transport pipe. The module is completely enclosed and is designed to operate at relatively high water velocities ranging from 2 to 10 ft/sec, depending on species and life stages to be protected. MIS modules may be a good retrofit option for Units 4 & 5 due to the high velocities in the intake canal and traveling water screens.

Units 4 & 5 would require five modules, each with 10 ft square openings installed at the mouth of the Units 4 & 5 intake canal. This location was selected to minimize dredging and the length of the fish return pipe.

The average approach velocity to each screen would be 5.8 ft/sec at the design intake flow of 2,551 cfs. The screen material would be wedge wire, with the screen bars arranged parallel to the flow direction. The screen panel would have a uniform porosity of 50% with a 2 mm clear bar spacing along their entire length. The screen would be rotated to backwash debris from the screen face. The fish bypass entrances (3 ft square) would be located at the downstream end of the screens and would direct fish to a 6 ft diameter pipe that would be connected to fish pumps. The fish pumps would pump bypass flow into a drop basin to a fish return pipe, exiting back to the lake. It is not expected that large debris will be a problem downstream of the skimmer wall; therefore, the MIS modules will not need trash racks.

Cleaning of the screens would be necessary to minimize adverse impacts on facility operation resulting from debris accumulation (additional head losses) and to maintain the fish diversion efficiency of the inclined screens. The traveling water screens would be required to operate during a backwash to collect debris.

MIS installation would be expected to significantly reduce IM. However, pilot tests with RS may be necessary to determine effectiveness in meeting the performance standards.

Barrier Net

A 3/8 in. (or similarly sized) mesh barrier net designed for a 0.25 ft/sec approach velocity could be installed upstream of the skimmer wall in Morgan Lake. Assuming the water depth in front of the skimmer wall is about 50 ft deep, the net would need to be about 220 ft long and 55 ft high. The net would be placed in an arching configuration about 100 ft upstream from the skimmer wall. This configuration should allow for a relatively even flow through the entire net. The net would be supported by bottom anchors and top floatation. Top and bottom anchor lines would run between the anchors and attach to net panels where they connect. A breakaway panel would be installed in the middle of the net to minimize damage to the nets and support system if severe debris loading occurred. The existing traveling

screens would need to remain in place and operational with this alternative to remove any debris that is behind the net or in case the net fails.

Replacement of the net may be required as frequently as every year. Since the rate of debris loading and biofouling of a barrier net in Morgan Lake is not known and could not be determined until actual installation, it is assumed at this point that the net would have to be removed about 42 times a year for cleaning, (every week throughout the year with the exception of winter when the net would only need removal biweekly). Two nets would be needed to allow for this cleaning schedule. Replacement would take approximately 1 day for divers to remove the dirty net and install a clean one.

Barrier nets have been proven to reduce IM by reducing total impingement; therefore, a pilot study would not be required. Optimizing the mesh size, deployment period, and cleaning schedule could be determined after installation of the net, with an adaptive management plan based on the results of in situ testing.

APS plans to conduct a more detailed analysis of the feasibility, effectiveness and cost of the alternatives described above in 2005. When results of the impingement sampling are available in 2006, should APS decide to comply using one or a combination of technology or operational measures, they may propose pilot studies in 2006/2007.

Use of a Pre-approved Technology under Compliance Alternative 4

Currently use of wedge wire screens in rivers that meet certain criteria is the only named pre-approved technology. However the Rule provides a process that allows additional technologies to become listed pre-approved technologies. New technologies can be so designated by providing information to demonstrate that if installed in the facilities waterbody type, the technology would have little trouble meeting performance standard for which it was pre-approved.

In general as a result of the final Rule there is significant research in the market place to develop new, more cost-effective fish protection options. APS plans to monitor the development and testing of new technologies for potential use under this compliance alternative. Should a candidate technology be identified, APS will notify EPA Region IX and request to amend the PIC to identify any additional technologies to be evaluated for use at Four Corners.

Use of Site Specific Standards under Compliance Alternative 5

APS plans to evaluate potential use of both the cost-cost and cost-benefit tests under compliance alternative 5. Use of these alternatives are provided to allow Phase II facilities to avoid compliance costs that would be considered either significantly greater that the costs estimated by EPA for facilities or the economic value of the environmental benefits that would be achieved through meeting applicable performance standards.

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In developing the National Cost of implementing the Rule EPA considered the cost for each Phase II facility to comply. The cost for Four Corners is found in Appendixes A and B of the Rule. Appendix B can be used to identify the facility number which in the case of Four Corners is AUTO453. Using the ID number the Rule's estimated cost for Four Corners is listed as n/a. The Rule's preamble states that for facilities assigned n/a, $0 should be the cost used for the cost-cost test. However, APS believes the listing as n/a was due to an error in the response to the original Short Industry Technical Questionnaire and has requested re-evaluation of costs for the facility in a letter to the EPA dated January 19, 2005. APS plans to evaluate use of the cost-cost test based on the revised Appendix A estimate to determine if the cost of the technologies to be evaluated is significantly different.

The economic value of the environmental benefit of meeting the performance standard will also be evaluated. This analysis cannot be conducted until the proposed impingement study is completed, since that data will serve as the basis for the environmental benefit quantification. The proposed method for conducting the environmental benefit valuation is provided in Attachment C. This is the approach planned for the environmental benefit evaluation that will be conducted in 2006, based on results of the 2005 impingement study and the more detailed engineering assessment of alternative fish protection measures also planned for 2005.

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4. BIOLOGICAL STUDIES

The Rule requires that a summary of historical IM studies and/or physical and biological studies conducted in the vicinity of the cooling water intake structure be provided as well as study plans for any new IM studies to be conducted. This information is summarized in Attachment B. No impingement studies were previously conducted at the Four Corners. One year of impingement sampling is proposed to begin in 2005.

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5. SUMMARY OF CONSULTATIONS WITH AGENCIES

The Rule requires that "a summary of any past or ongoing consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to the CDS and a copy of written comments received as a result of such consultations be provided".

There has been only one consultation with a Federal, State, or Tribal fish and wildlife agency related to 316(b). On January 20, 2005 APS conducted a meeting with the Navajo Nation Department of Fish and Wildlife (NNFW) to discuss 316(b) and more specifically, plans for conducting impingement sampling on Morgan Lake. NNFW manages Morgan Lake as a recreational fishery for largemouth bass. They also identified catfish and green sunfish as important species within the lake management plan. The green sunfish was selected due to its importance as the preferred forage base to support recreational species and largemouth bass and channel catfish because of their importance as recreational species. NNFW recommended that impingement studies be focused on the above three species of interest.

They identified several other species that were accidentally introduced into Morgan Lake and which have since become nuisance species. These species include Pacu (a South American exotic species), Plecostomus sp., gizzard shad, common carp, and mosquito fish. The presence of these species in Morgan Lake adds a risk to the management of important recreational species and may even pose a risk to threatened or endangered species in nearby waterbodies (i.e. the San Juan River) if these species were to be transported downstream of Morgan Lake. NNFW would prefer that these species be extirpated from the Lake as long as this could be accomplished without risk to the important species. A copy of the letter received from NNFW after the meeting is provided in Attachment D.

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6. SCHEDULE FOR INFORMATION COLLECTION

The Rule allows facilities with NPDES permits that expire within four years of the date of publication of the Rule in the Federal Register (July 9, 2004), up to three years and six months to submit the CDS (125.95(2)(ii)). APS considers three and a half years to be a very short time frame to complete the required studies and believes that the full three years and 180 days will be required to complete the CDS for Four Corners. The Rule requires that this PIC be submitted to EPA Region IX prior to initiating new 316(b) studies. While the Rule allows facilities to initiate studies after submittal, APS is anxious to provide time for EPA Region IX to review and comment on the study plan. The Rule encourages that Region IX provide comments within 60 days to allow time to make any necessary modifications to our study plans.

In order to make final compliance alternative determinations for Four Corners it will be necessary to evaluate the results of the one year impingement mortality data. It is anticipated that after the conclusion of the one year of proposed data collection it is likely to take up to 3 months to complete input of results into a database, QC the database and analyze the data for use in compliance decision making. This should allow APS to quantitatively evaluate the various compliance alternatives discussed in Section 3 of the PIC. It is anticipated that by this time frame the results of the Phase II litigation should be available for making compliance decisions on compliance alternatives and options. Should restoration be available, APS can evaluate the IM characterization study results to quantitatively assess use of restoration under compliance alternatives 2 and 3. This information can be considered in context with the results of the detailed evaluation of alternative fish protection technologies. The IM data analysis will also allow quantification of the benefits in order to evaluate potential use of the cost-benefit test based on technology and operational cost estimates developed in 2005. Finally, these study results can also be used to assess the potential effects of feasibility, efficacy and cost of the alternative technologies and/or operational measures being evaluated.

APS then plans to use the remainder of 2006 and the early part of 2007 to engage in the necessary work to develop the information to support the CDS based on the compliance alternative(s) selected. If restoration is used, a final decision on the nature of the restoration project will be made and work on the Restoration Plan will be initiated. If use of technologies and/or operational measures is selected for compliance, appropriate pilot studies or testing will be conducted to collect information necessary to support the Design and Construction Technology Plan, Technology Installation and Operation Plan and the Verification Monitoring Plan. If use of site specific standards is used for compliance, work will be initiated to prepare the necessary documents to support this alternative including the Comprehensive Cost Evaluation Study, Benefits Valuation (if the Cost-Benefit Test is used) and Site-Specific Technology Plan.

The Rule recognizes that the CDS studies are an iterative process[2] and allows facilities to modify the PIC based on new information. APS may request that the PIC be amended, as necessary, based on new information relative to technologies and operational measures, use of restoration measures, Phase II Rule litigation or subsequent Agency guidance.

[2] See Rule preamble first column pg 41235 of Federal Register/Vol. 69, No. 131/Fri 7/9/04.

A. RESTORATION MEASURES TO BE EVALUATED

Restoration Measures to be Evaluated for 316(b) Compliance at Four Corners Steam Electric Generating Station

The final Phase II Rule provides that applicants may use restoration measures in addition to, or in lieu of, technology measures to meet performance standards or in establishing best technology available (BTA) on a site-specific basis. Specifically, EPA's final Phase II Rule states the following requirement relative to the use of the restoration approach:

> *Facilities that propose to use restoration measures must demonstrate to the permitting authority that they evaluated the use of design and construction technologies and operational measures and determined that the use of restoration measures is appropriate because meeting the applicable performance standards or requirements through the use of other technologies is less feasible, less cost-effective, or [emphasis added] less environmentally desirable than meeting the standards in whole or in part through the use of restoration measures.*

Types of Restoration Applicable to §316(b)

The Rule does not specify the types of restoration measures that can be used. This lack of specification provides flexibility in developing/proposing a restoration approach. Restoration measures that have been used at other power stations to meet §316(b) requirements include:

- Wetland restoration (e.g., Public Service Electric & Gas (PSEG) Delaware Bay wetland restoration program for the Salem Generating Station)(Weinstein et al. 2001).
- Fish stocking (e.g., Mirant's fish hatchery at the Chalk Point Station (Bailey et al. 2000); Exelon's (formally Commonwealth Edison) walleye hatchery at Quad Cities Station on upper Mississippi River (LaJeone and Monzingo 2000); and Southern California Edison's white sea bass hatchery).
- Submerged aquatic vegetation (SAV) restoration (e.g., Southern California Edison's kelp restoration for the San Onofre Nuclear Generating Station)(Deysher et al. 2002).
- Provision of fish passage (e.g., fish ladders or dam removal) at non-hydropower projects (e.g., PSEG fish ladders in Delaware Bay tributaries for the Salem Generating Station).
- Contribution to, or maintenance of, a restoration fund related impacts associated with the re-powering of the Moss Landing Station on Elkhorn Slough near Monterrey Bay, California.
- Water quality improvements (e.g., riparian area protection or implementation of non-point source best management practices) that minimize sediment/pollutant runoff thereby resulting in fishery habitat improvements, and practices that increase dissolved oxygen content in waterbodies thereby increasing available habitat for fish spawning and survival. While this

approach is plausible, there are no known existing examples of such a 316(a&b) restoration project.

Potential Restoration Measures to be Evaluated for APS's Four Corners Steam Electric Generating Station

APS plans to consult and coordinate with the Navajo Nation Department of Fish and Wildlife to determine restoration efforts that would be of value to the recreational management and interests of the Department for Morgan Lake as a fishery.

APS also plans to consider the example restoration projects discussed in this section to attain the impingement mortality reduction performance standard or as part of a site-specific standard developed by the permit director. These projects are listed because of their (1) 316(b) application history by other power companies, (2) known interest to fish and wildlife agencies in the Four Corners based on an internet review of state programs, and (3) because design and implementation information is readily available.

- Fish stocking– this involves the direct supplementation (stocking) of a fish species of concern to aid restoration efforts for that species. It is anticipated there are potential species of interest for restoration in Morgan Lake.

- Habitat Protection Program Participation – The importance of wetlands as aquatic habitat for fish and invertebrates and as habitat for wildlife is generally known. Loss of wetland habitat is well documented and wetland restoration, or habitat restoration in general, is increasingly becoming popular across the U.S.. There is a growing case history with use of habitat restoration as a §316(b) mitigation approach.

- Alternative restoration measures – Other potential approaches include nonpoint source pollutant runoff abatement and other water quality improvement programs. Non-point source runoff has been identified as a significant issue and could be an area of restoration interest. While these types of efforts focus on water quality improvements, the long-term benefit is improved fish and shellfish habitat. Such efforts would have to demonstrate a clear linkage between the two as compensation for impingement mortality losses at APS's Four Corners.

B. PROPOSED NEW STUDY DESIGN

See following pages.

SAMPLING PLAN FOR THE IMPINGEMENT MORTALITY CHARACTERIZATION STUDY AT THE FOUR CORNERS GENERATING STATION

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SAMPLING PLAN SUMMARY

An impingement sampling plan is proposed for the Four Corners Generating Station, located on Morgan Lake in Fruitland, New Mexico. The station is subject to the Clean Water Act §316(b) Phase II Rule for its NPDES permit, which requires that impingement mortality be reduced by 80 to 95 percent compared to a baseline level specifically determined for the facility. To comply with this Rule, the proposed sampling plan will provide information required to complete an Impingement Mortality Characterization Study for submission with its NPDES permit application. This sampling plan: 1) identifies existing data on the fish community in the vicinity of the cooling water intake structure and on impingement mortality occurring at the intake; 2) evaluates the sufficiency of these data to characterize current fish abundance, distribution, and impingement mortality at the intake; 3) makes a preliminary selection of Representative Species for detailed study; and 4) describes a work scope for impingement monitoring.

The Phase II Rule allows impingement mortality reduction to be quantified using Representative Species (RS), chosen to be surrogates for other species not selected for detailed study. RS typically are those most frequently observed in impingement collections, or those deemed to be most important because of their economic value (e.g., commercially or recreationally exploited species), value to the ecosystem (e.g., abundant prey species), or societal value (e.g., threatened or endangered species). Based on their current abundance in Morgan Lake, the preliminary selection of RS includes largemouth bass, channel catfish, and green sunfish.

Impingement mortality has never been monitored at the Four Corners Generating Station. Therefore, an impingement monitoring program is proposed to document diel, seasonal and annual impingement rates that reflect the current status of the fish community of Morgan Lake and the current intake operation. The table below summarizes the proposed features of the impingement mortality sampling program.

FOUR CORNERS GENERATING STATION SAMPLING PROGRAM SUMMARY

Program	Duration	Sampling Frequency	Data Collected
Impingement Monitoring	1 year	Biweekly for 12 months at each of the two sets of cooling water intake screens; samples over 24-hour period, with two 12-hour sampling intervals	Counts and biomass by species and life stage, length frequency, scale/otolith samples for RS, specimen condition, collection efficiency, ancillary environmental and operation data

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1. INTRODUCTION

ASA Analysis & Communication, Inc. has prepared this Impingement Mortality Sampling Plan as a component of the Proposal for Information Collection (PIC) for the Four Corners Generating Station (Four Corners). The PIC is being submitted to the U.S. Environmental Protection Agency (EPA) Region IX as required for an NPDES permit under the recently published §316(b) Phase II Rule of the Clean Water Act (CWA). The CWA §316(b) states that an applicant must demonstrate that the location, design, construction and capacity of its cooling water intake structure represents Best Technology Available (BTA) for minimizing adverse environmental impact. The primary impacts of concern under §316(b) are entrainment of smaller aquatic organisms into the cooling water system or impingement of larger organisms onto traveling screens in the cooling water intake. However, other non-impingement or entrainment impacts associated with various technologies or operating alternatives also may be considered in reaching a BTA decision.

The Phase II Rule applies to existing electric generating facilities (construction commenced prior to January 17, 2002) that have cooling water intake structures (CWIS) with a design capacity of 50 million gallons per day (MGD) or more, withdraw water from waters of the U.S., and use 25 percent or more of the water withdrawn for cooling purposes. Four Corners fits this definition for a Phase II facility. Compliance with the Phase II Rule is based on achieving performance standards for reduction of impingement mortality and entrainment set by the EPA on the basis of facility location. The Rule requires that impingement mortality be reduced by 80 to 95 percent compared to a baseline level (i.e., the calculation baseline) specifically determined for the facility. Since Four Corners is located on a reservoir, it is not subject to entrainment reduction performance standards.

The Rule requires development of a Comprehensive Demonstration Study (CDS), unless the applicant can demonstrate that their facility's CWIS flow is commensurate with a closed-cycle recirculating system or that its design intake velocity is 0.5ft/s or less. The PIC is a component of the CDS and includes a sampling plan for the proposed field studies necessary to supplement existing information about the source waterbody, its fish and shellfish community, and the current impingement mortality rate. If it is determined that existing information might not accurately represent current impingement mortality, the sampling plan will propose impingement sampling in support of an Impingement Mortality (IM) Characterization Study, a required component of the CDS.

This Impingement Mortality Sampling Plan fulfills this requirement for the Four Corners Generating Station. Additional biological monitoring might be desirable depending on the specific compliance approach being used. Given that a compliance approach for Four Corners has not yet been selected at this early stage in the planning process, plans for such additional studies were not included in this document.

1.1 IM CHARACTERIZATION STUDY

The IM Characterization Study is an integral part of the CDS and the overall determination of BTA compliance. The IM Characterization Study provides information needed for development of all subsequent parts of the CDS, including the Design and Construction Technology Plan, the Technology Installation and Operation Plan, the Restoration Plan (optional), a site-specific determination of BTA (if justified), and ultimately the Verification Monitoring Plan. The IM Characterization Study provides data on the rates of impingement

mortality currently occurring at the plant, as well as a foundation for estimating the calculation baseline. The Rule requires that the IM Characterization Study provide:

1. Taxonomic identifications of all life stages of fish, shellfish, and protected species in the vicinity of the CWIS and susceptible to impingement;
2. A characterization of these species and life stages in terms of their abundance and their spatial and temporal distribution, sufficient to characterize the annual, seasonal and diel variations in impingement mortality; and
3. Documentation of current impingement mortality of these species and life stages.

In addition to these basic requirements, the IM Characterization Study can provide information necessary for the permit applicant to choose the appropriate Rule compliance alternative, such as applying for a site-specific determination of BTA. To justify this alternative, the results of the IM Characterization Study are needed to evaluate the benefits of implementing technology, operational, or restoration measures, in terms of the numbers or biomass of fish and shellfish potentially saved by their implementation.

The Phase II Rule allows impingement mortality to be quantified either for all taxa or through the use of Representative Species (RS) as part of the compliance assessment. RS are chosen to be surrogates for other species not selected for detailed study. RS typically are those most frequently observed in impingement and entrainment collections, or those deemed to be most important because of their economic value (e.g., commercially or recreationally exploited species), value to the ecosystem (e.g., abundant prey species), or societal value (e.g., threatened or endangered species). Since biological information necessary to complete analyses for the CDS are not available for all species, we believe it is both more practical and more technically defensible to base all analyses on RS. In this sampling plan, we provide the technical rationale for the RS likely to be used for Four Corners.

1.2 SAMPLING PLAN OBJECTIVES AND ORGANIZATION

This Impingement Mortality Sampling Plan has been prepared to meet the following objectives:

1. To identify and summarize existing data on the fish community in the vicinity of the station's CWIS;
2. To identify and summarize existing data on fish impingement mortality within the station's CWIS;
3. To evaluate the sufficiency of existing data to describe the current fish abundance and spatial and temporal distribution of fish in the vicinity of the station's CWIS, and the current rates of impingement mortality;
4. To make an initial selection of RS; and
5. To prepare a work scope for a monitoring program to quantify impingement mortality at Four Corners.

This sampling plan is organized to first present background information on the station, including the source waterbody (Section 2.1), the cooling water intake design and operation (Section 2.2), historical biological data (Section 2.3), and a discussion of the need for data for the IM Characterization Study (Section 2.4). Section 3 describes the fish community in the vicinity of the station's CWIS, using available historical data. Section 3 also briefly