ENVIRONMENTAL ASSESSMENT

Superstition Mountains Recharge Project

Central Arizona Water Conservation District

Pinal County, Arizona

APPENDIX A
AIR EMISSIONS ESTIMATE

CAP CENTRAL ARIZONA PROJECT | MEMO

DATE: Oct 27, 2009

TO: Tim Gorey, Sr. Hydrogeologist

FROM: Don Crandall, Sr. Mechanical Engineer Don D. Crandall

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THROUGH: Patrick Dent, Engineering Resources Supervisor

SUBJECT: (SMRP) Air Emissions Estimate Revision 2 (Including Operations)

The Central Arizona Water Conservation District (CAWCD) has proposed to construct and operate the Superstition Mountains Recharge Project (SMRP) on Bureau of Reclamation (Reclamation) and Arizona State land in Pinal County, Arizona. The proposed project is located in parts of sections 23, 24, 25, and 26 of Township 2 South, Range 8 East of the Gila and Salt River Baseline and Meridian in the northern portion of Pinal County, Arizona. Pursuant to the National Environmental Policy Act (NEPA), Reclamation is preparing an environmental assessment (EA) to describe and address potential environmental consequences resulting from the construction and operation of the SMRP. The purpose of this memo is to provide an estimate of the proposed projects air emissions during normal routine operations and during construction of the project. Additionally these estimated will be compared to the relevant regulatory permitting thresholds and local air quality data.

In general, the project scope consists of the construction of groundwater recharge facility which consists of multiple vertical turbine lift pumps in the existing CAWCD canal, conveyance piping from the canal to the recharge basins; approximately 155 acres of recharge basins, 231 acres of recharge basin embankments, access roads, and a control building. The project will be constructed in three phases. The South project will be constructed initially and includes 107 acres of recharge basins and embankments in phase one and 140 acres of recharge basins and embankments in phase two. The North project will be constructed last and includes 139 acres of recharge basins and embankments.

Emissions from normal operations and construction will be derived from the same types of sources, namely heavy earth moving equipment. On-going operation and maintenance of the project will consist of:

- Fugitive dust from annual scarification of the basins

- Fugitive dust from scraping of the basins every three years
- Criteria pollutant emissions from combustion byproducts associated with off-road heavy equipment.

The duration of the construction for each phase of the project is estimated to be 12 months, with most heavy earth moving construction activity occurring over a nine month period. During Construction air emissions will be generated from off-road construction equipment and by the generation of fugitive dust resulting from disturbed areas during the recharge basin excavation.

A project specific estimate of off-road construction equipment air emissions was developed using an estimate for the quantity of equipment required to complete the project and specific emissions factors developed for each equipment type. The results of this analysis are shown in Table 1. To estimate the quantity and type of equipment that will be required for the project the following assumptions were made:

1. Worse case ongoing annual maintenance would include up to 1 dozer on site for 1 month and 1 scraper on site for 1 month out of the year.
2. Work crew unit output was estimated using RS Means construction crew unit outputs for earthwork and trenching.
3. The project duration when construction equipment will be used was assumed to be 9 months for excavation of the recharge basins and two months for trenching and backfill.
4. One generator, compressor, and welding rig was assumed to be on the site for the duration of the project.
5. The 8-hour emissions were calculated using all of the equipment on site.
6. The Average Annual emission was calculated by averaging the total emissions for the equipment over a 12 month period.

Project specific emissions factors were developed using a similar methodology to EPA's Non-Road emissions model for off-road emissions. The modeling approach outlined in the US EPA document "*Exhaust and Crankcase Emission Factors for Non-road Engine Modeling – Compression-Ignition*" uses an emission factor obtained based on a "zero-mile" emissions where emissions have been measured on new equipment at a baseline run rate. For HC, CO, NOx and PM this emissions factor is then adjusted for the relevant emission control standard, age of the equipment, and transient loading of the equipment. Emission factors for SO2 are calculated based on brake-specific fuel consumption (BSFC). Since the specific make and model year of equipment that will be used for the SMRP project is unknown at this time, several conservative simplifying assumptions were made in developing the project specific emissions factors.

1. All equipment at a minimum meets the Tier 3 emission control standard and Tier 3 emission factors were used for all equipment.
2. All equipment is at 80% of its useful life.
3. All equipment will utilize low sulfur diesel fuel.
4. All PM is assumed to be PM_{10}

Table 1. Project Specific Equipment Count and Emissions Factors

	Operation Equipment Qty					Construction Equipment Qty					Project Specific Emission Factor				
	South		North			South		North			Adj g/hp-hr				
Total Equipment	8hr	1mo	8hr	1mo	HP	8hr	9mo	8hr	9mo	HP	VOC	CO	Nox	PM	SO2
Dump Truck (5-15 Ton)	0	0	0	0	300	2	1	2	1	300	0.20	1.32	2.62	0.32	0.45
Excavator\Backhoe	0	0	0	0	150	3	1	3	1	150	0.20	1.53	2.62	0.48	0.45
Front End Loader	0	0	0	0	150	2	2	2	2	150	0.44	2.56	3.05	0.77	0.52
Dozer	1	1	1	1	300	6	6	4	4	300	0.20	1.31	2.62	0.32	0.45
Scraper	1	1	1	1	300	5	5	3	3	300	0.20	1.31	2.62	0.32	0.45
Grader	0	0	0	0	150	1	0	1	1	150	0.20	1.53	2.62	0.48	0.45
Roller Compactor	0	0	0	0	150	2	0	2	1	150	0.20	1.53	2.62	0.48	0.45
Boring/Jacking Rig	0	0	0	0	150	1	0	1	1	150	0.19	1.00	2.52	0.32	0.44
Generator/Compressor/Welder	0	0	0	0	200	3	3	3	3	200	0.19	1.00	2.52	0.22	0.44

HC – Hydrocarbons, CO – Carbon Monoxide, NOx – Oxides of Nitrogen, PM Particulate Matter, SO2 – Sulfur Dioxide, g/hp-hr – grams/horsepower-hour, 8hr – Peak Construction Equipment Quantity, 9mo –Construction Equipment for Recharge Basin Only construction

The peak emission rate during construction characterized as a maximum 8 hour average emission rate and the total project emissions during operation and construction for the heavy equipment used on the project site have been summarized in Table 2.

Table 2. Project Specific Off-Road Equipment Emission Rates During Construction

Emission Rate	VOC	CO	Nox	PM	SO2
South: kg/hr 8-hour avg	1.2	8.0	15.4	2.1	2.6
North: kg/hr 8-hour avg	1.0	6.4	12.2	1.7	2.1
South: Construction Total Tons	1.8	11.5	22.3	3.0	3.8
North: Construction Total Tons	1.5	9.6	18.5	2.5	3.2
South: Operation Total Tons	0.05	0.20	0.87	0.07	0.07
North: Operation Total Tons	0.05	0.20	0.87	0.07	0.07

In addition to the off-road fugitive emissions from diesel engines of construction equipment, fugitive dust emissions will be generated during the ongoing maintenance of the recharge basins and construction of the recharge basins and transmission piping.

For routine maintenance a emission factor of 4.6 lbs PM10/acre-pass for agricultural tilling from the California Air Resource Board's Emission Inventory Methodology was utilized. This results in a worse case annual average PM emissions summarized in Table 3. No credit was taken for a reduction in normal wind blown dust associated with native desert that will be reduced through the wetting of the recharge basins during recharge operations.

For construction estimates, emissions factors for fugitive dust emissions were obtained from the US EPA's document *"AP42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources"*. The emission factor in AP-42 for heavy construction operations includes all types of construction activities at a site including travel on unpaved roads, track-out, and excavation. Since construction activities vary substantially day to day depending on the level of activity, the specific construction activities occurring at the time and the prevailing meteorological conditions the EPA provides an emission factor for un-controlled total suspended particles of 1.2 tons/acre/month of activity to represent the overall construction activity on the site.

The primary method for dust control at the project will be likely be watering. EPA's document *"Particulate Emission Measurements from Controlled Construction Activities"* provides an estimated PM10 control efficiency between 70-80% for a comprehensive dust control watering program. The EPA study quantifies the cumulative percentage of total suspended particles from scrapper operations to below the 10 micron particle size as to be between 70 to 80%.

Since the majority of construction operations will be earthwork associated with the recharge basins over the 9 month period of actual construction operations the active area that is being worked on at any given time was assumed to be the average acreage construction completion rate. The total fugitive dust PM_{10} emission from construction is summarized in Table 4.

Table 3 – Fugitive Dust Emissions from Routine Maintenance and Operations

Project Phase	PM_{10} Uncontrolled EF lbs/acre-pass	Duration (mo)	Distrubed Area (acre)	PM_{10} 8hr (g/hr)	Annual PM_{10} (Tons)
South	4.5	1	143.00	405.76	0.322
North	4.5	1	52.00	147.55	0.117

TSP – Total Suspended Particulate, Duration – Maintenance Duration in Months, Disturbed Acreage – Estimated Area of Total Tillage Acreage.

Table 4 – Fugitive Dust Emissions from Construction Operations

	TSP Uncontrolled EF	Emission Control %	PM_{10}% of TSP	PM_{10} Controlled EF
	1.2	70	80	0.288
Project Phase	Duration (mo)	Daily Disturbed Acreage	PM_{10} kg/hr	PM_{10} Tons
South	9	0.528	138	29.7
North	9	0.272	71	15.3

TSP – Total Suspended Particulate, Duration – Project Duration in Months, Daily Disturbed Acreage – Estimated Area of Daily Construction Activity.

Table 5 summarizes the total emissions of the project during both normal operations and construction and compares the emissions to the PSD threshold criteria used for PSD review applicability. Although the PSD thresholds are not applicable to the fugitive dust emissions from recharge projects, it is still a useful comparison to note that the total project emissions during operation would be significantly below any regulatory thresholds for air quality permitting. Additionally a comparison of the project emissions to the 2002 overall emissions inventory for Pinal County shows the emissions from the project to be negligible.

Table 5 – Emissions Comparisons

(Tons/Year)	VOC	CO	NOx	PM_{10}	SO2
Operational	0.11	0.40	1.7	0.6	0.14
South Construction	1.8	11.5	22.3	3.0	3.8
North Construction	1.5	9.6	18.5	2.5	3.2
PSD Threshold[1]	40	100	40	15	40
2002 Inventory[2]	8,691	69,488	13,578	23,034	724
% of Total	0.00124%	0.00058%	0.01285%	0.00254%	0.01988%

[1] 40 CFR 52.21(b)(23), Not applicable to Fugitive Emission Source from Groundwater Recharge Projects
[2] 2002 EPA National Emissions Inventory (NEI) Database