Additionant back to the obtained of interaction a submerie to ansage 1 but get response including the formation and the submeries of interaction. Additional competition and accompatible and interaction. Additional competition and interaction. Additional competitional	Iblic reporting burden for this collection of information is estimated to average 1 hour pertinent of maintaining the data needed, and completing and reviewing the collection of information, including suggestions for reducing this burden, to Washington He avis Highway, Suite 1204, Arlington, VA 2202-4302, and to the Office of Management and AGENCY USE ONLY (Leave blank) AGENCY USE ONLY (Leave blank) 2. REPORT DATE 03/01/77 Image: The state of the	r response, including the time information. Send comments eadquarters Services, Directora d Budget, Paperwork Reductio 3. REPORT TYPE	for reviewing instru- regarding this burch te for Information 1 Project (0704-0188 AND DATES C 5. FUNDI 8. PERFO	Inctions, searching existing data so den estimate or any other aspect Operations and Reports, 1215 Jef J. Washington, DC 20503. COVERED NG NUMBERS
1. AGENCY USE ONLY (Leave Diank) 2. REPORT DATE 3. REPORT TYPE AND DATES COVERED 4. AZELEANDE SUPPLIAT POWDERED CARBON FLOW VARIATION STUDY 5. FUNDING NUMBERS 6. AUTHOR(S) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 11. SUPPLEMENTARY NOTES 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES) 11. SUPPLEMENTARY NOTES 12a. DISTRIBUTION/AVAILABILITY STATEMENT 12b. DISTRIBUTION IS UNLIMITED 12b. DISTRIBUTION COD 13. ABSTRACT (Maximum 200 words) 12b. DISTRIBUTION IS UNLIMITED 12b. DISTRIBUTION MATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. 11. SUPPLOADER THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. 11. SUPPLOADER THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT	AGENCY USE ONLY (Leave blank) 2. REPORT DATE 03/01/77 220-EPANPIEUB PLANT POWDERED CARBON FLOW VARIATION STUDY AUTHOR(S) PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO	3. REPORT TYPE	AND DATES C	COVERED
4. 2224 4 MP 2 SWP WUAT POWDERED CARBON FLOW VARIATION STUDY 5. FUNDING NUMBERS 6. AUTHOR(S) 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION/AVAILABILITY STATEMENT 12. DISTRIBUTION /AVAILABILITY STATEMENT 12. DISTRIBUTION /AVAILABILITY STATEMENT 12. DISTRIBUTION /AVAILABILITY STATEMENT 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVUTY FOR TWO DIFFERENT CARBON BED HEIGHT SENSITIVUTY FOR TWO STUDY WAS TO DETERMINE AN VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. 19950223 027	AUTHOR(S) PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO		5. FUNDI	NG NUMBERS
AUTHOR(S) PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOINTAIN ARSENAL (CO.) COMMERCE CITY, CO SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) COMMERCE CITY, CO SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) COMMERCE CITY, CO SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) SPONSORING/MONITORING AGENCY NAME(S) ADDRESS(ES) SPONSORING/MONITORING AGENCY NAME(S) SPONSORING/MONITORING AGENCY NAME(S) SPONSORING/MONITORING AGENCY NAME(S) ADDRESS(ES) SPONSORING/MONITORING AGENCY NAME(S) SPONSORING/MONITORING AGENCY NAME(S) SPONSORING/MONITORING AGENCY NAME(S) SOUNDALITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED SATISCUPACY OF A REPLACEMENT CARBON BADS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE.	AUTHOR(S) PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO		8. PERFO	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGAN ROCKY MOUNTAIN ARSENAL (CO.) 82161R01 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 82161R01 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESCETTED 10. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESCETTED 11. SUPPLEMENTARY NOTES 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION/AVAILABILITY STATEMENT 12b. DISTRIBUTION COD 13. ABSTRACT (Maximum 200 words) 11. SUPPLEMENT RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON PLACEMENT CARBON BEDS AT VARIOUS AND ADDRESS	PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO	<u></u>	8. PERFC	
ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO 3. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (IFFICE DECTED MAR 01 1995 DC 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT RATE. 1995502223 027	ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO		REPOR	RMING ORGANIZATION
82161R01 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDREY (ETTED ELECTE MAR 01 1995 D 10. SPONSORING/MONITAGENCY REPORT NU AGENCY REPORT NU 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE PORDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. DTIC QUALITY INSPECTED : 199550223 027				
SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESSEE ELECTE MAR 01 1995 D 10. SPONSORING/MONITAGENCY REPORT NU ELECTE MAR 01 1995 D 11. SUPPLEMENTARY NOTES 12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. DTTC QUALITY INSPECTED			82	161R01
11. SUPPLEMENTARY NOTES 12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. DTIC QUALITY INSPECTED A 199950223 027	SPONSORING/MONITORING AGENCY NAME(S) AND ADDRES (E	ECTE 01 1995	10. SPON AGEN	SORING/MONITORING ICY REPORT NUMBER
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. DTTC QUALITY INSPECTED TO 199550223 027	2a. DISTRIBUTION / AVAILABILITY STATEMENT	U	12b. DIS	TRIBUTION CODE
13. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VARIATION STUDY WAS TO DETERMINE AN COMPARE THE CARBON BED HEIGHT SENSITIVITY FOR TWO DIFFERENT CARBON BEDS AT VARIOUS INFLUENT WATER RATES WITHOUT THE INFLUENCE OF A REPLACEMENT CARBON RATE. DTIC QUALITY INSPECTED : 19950223 027	APPROVED FOR PUBLIC RELEASE; DISTRIBUTION	IS UNLIMITED		
19950223 027	3. ABSTRACT (Maximum 200 words) THE PURPOSE OF THE POWDERED CARBON FLOW VA COMPARE THE CARBON BED HEIGHT SENSITIVITY VARIOUS INFLUENT WATER RATES WITHOUT THE I RATE.	ARIATION STUDY FOR TWO DIFFEF INFLUENCE OF A	WAS TO DE EENT CARBO REPLACEME	TERMINE AND ON BEDS AT ONT CARBON FEED
	19950223 027	DTIC	QUALITY	INSPECTED 4
14. SUBJECT TERMS 15. NUMBER C	4. SUBJECT TERMS			15. NUMBER OF PAGES
WATER RATES, WATER SOURCES	WATER RATES, WATER SOURCES			16. PRICE CODE
17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION	7. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION	19. SECURITY CLA	SSIFICATION	20. LIMITATION OF ABS

.*

•

Prescribed by ANSI Std. 298-102

82161R01 ORIGINAL

Rocky Mountain Arsenal

Information Center

Commerce City, Colorado

ROCKY MOUNTAIN ARSENAL DENVER, COLORADO 80240

420 GPH PILOT PLANT POWDERED CARBON FLOW VARIATION STUDY

Accesion	For			
NTIS (RA&I	X	1	
DTIC 7	ΓAΒ			
Unannounced			ł	
Justification				
By Distribu	ition /			
Availability Codes				
Dist	Avail a Spe	ind / or cial		
A-1				

APPROVED: JOHN P. BYRNE, COL, Cm1C Commanding

FILE COPY

1 MAR 77

420 GPH PILOT PLANT POWDERED CARBON FLOW VARIATION STUDY

1. <u>Purpose</u> - The purpose of the powdered carbon flow variation study was to determine and compare the carbon bed height sensitivity for two different carbon beds at various influent water rates without the influence of a replacement carbon feed rate.

2. Procedure

a. The chemical concentrations and their feed rates remained constant. The chemicals were injected with the agitator functioning.

b. The Erdlator was filled with influent well water through the downcomer.

c. Powdered carbon was introduced to the Erdlator through the downcomer.

d. The agitator and influent well water feed operations were continued until the carbon bed stabilized.

e. Various flow rates were introduced and maintained until a stable condition was established. Measurements were then made to obtain bed height.

g. Well water was transported in a truck tanker from the well location to Building 742. The water was unloaded from the truck and stored in 3,000 gallon storage tanks at the test site.

3. Test Conditions

a. Carbon bed composition -- a 20 pound and 30 pound bed of Hydro Darco C powdered carbon.

b. Influent water rates -- 1, 3, 5, 6, 7, and 7½ gpm.

c. Replacement carbon feed rate -- none.

d. Cationic solution -- 6 gm Catfloc/gal @ 25 CC/min feed.

e. Anionic solution -- 0.5 gm Hercufloc/gal @ 120 CC/min feed.

f. Water source -- water from wells PW 2 and 3.

420 GPH PILOT PLANT POWDERED CARBON FLOW VARIATION STUDY - Cont

4. Comments

a. The cationic and anionic solution concentrations and their feed rates were determined from previous runs as having demonstrated reliability and stability over the operating range of the experiment.

b. The 20 pound carbon bed displayed a uniform increase of bed height in relation to the change in water rate until the 5 gpm capacity was attained. At the 6 and 7 gpm water rate, the bed height increased rapidly, yet within the design operating parameters. Attempting to operate the water treatment plant above the design criteria revealed a drop in bed height of $2\frac{1}{2}$ " plus a turbid condition through the product water had set in, as shown at the $7\frac{1}{2}$ gpm water rate (Incl 1).

c. Similarly, the 30 pound carbon bed displayed a uniform increase of bed height in relation to the change in water rate, except the uniformity extended to the 6 gpm water rate capacity. At the 7 gpm water rate, the bed height increased rapidly, yet within the design operating parameters. Although the bed deterioration is less than the 20 pound carbon dosage while operating above the design criteria, a turbid condition existed, plus a bed height drop of $\frac{1}{4}$ " was noted at the 7 $\frac{1}{2}$ gpm water rate (Incl 1).

d. Bed Height Data (inches)

laterflow	Carbon Dosage		
(gal/min)	20#		
1	15 3/4	17 1/4	
3	18 1/4	20 1/4	
5	18 3/4	21 1/4	
6	20 1/4	21 1/4	
7	20 1/2	27 1/4	
7 1/2	17	27	

5. Conclusions

a. Recommend operating the 420 gph pilot water treatment plant at 5 gpm. The 5 gpm water feed rate shows the most stable condition at the highest feed to operate the pilot plant. 420 GPH PILOT PLANT POWDERED CARBON FLOW VARIATION STUDY - Cont

b. The larger carbon dosage presents a more uniform carbon bed height change in relation to water rate modifications.

c. The carbon bed heights degenerate above the design criteria of 7 gpm water rate.

d. Since this test was primarily run to evaluate the relation of carbon bed height sensitivity to various influent water rates, no replacement carbon feed rate nor filtration efficiency were evaluated.

e. Extrapolation of this test data would indicate that it is doubtful the 10,000 gph Erdlator could process water in excess of its rated capacity and may, in fact, be operationally stable over extended periods at a maximum rate of 8,000 gph.

3

f. Further tests will be necessary to fully evaluate the maximum potential of the system.

] Incl as

PROCESS TECHNOLOGY

420 GPH FLOW VARIATION STUDY

