WEST VIRGINIA SURFACE MINE DRAINAGE TASK FORCE SYMPOSIUM

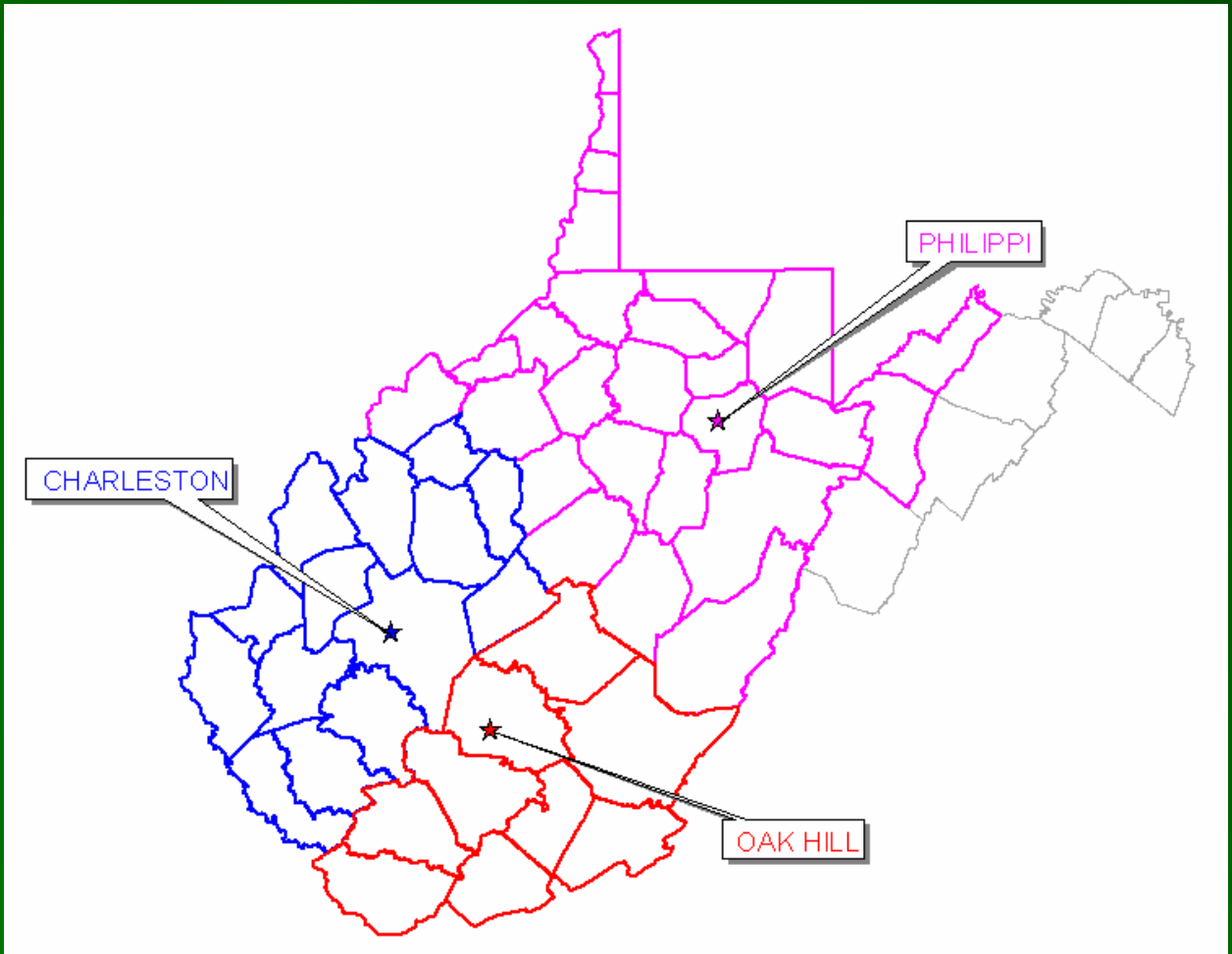
Morgantown, West Virginia
April 19-20, 2005

Water Treatment at Permit Revoked Coal Mine Sites in West Virginia

Contributors: Mike Sheehan, Jim Seckman, Mike Reese, Charlie Stover, Dave Martin, Roger Green, Carla Poling and Charles Miller

Office of Special Reclamation

- Headquarters – Charleston
  - Regional Office – Oak Hill
  - Regional Office – Philippi
  - Regional Office – Kanawha City



History of the Bonding Program

- Pre-Law (August 3, 1977)
  - 1939 House Bill 390
    - Required a permit to extract coal for commercial purposes
    - Required mined land to be re-contoured
    - Required coal operators to minimize hazards to streams
    - Required a reclamation performance bond

1963 Legislative Amendments

- $30 per acre fee on land to be mined
- Established the Special Reclamation Fund
- Reclamation bond in the amount of $500 per acre
- Reclaimed as much as possible
  - Impoundments
  - Pits
  - Portals
  - Highwalls
    - Level benches
    - Georgia V-Ditch
    - 30 ft. highwalls
  - AMD was incidental and not a specific goal

1968 – 1971 Legislative Status

- Legislative initiative to abolish surface coal mining in West Virginia
- Moratorium on coal mining in 22 counties
- Increased Special Reclamation Fee to $60 per acre
- Increased Bond Rate to $1000 per acre

United States Surface Mining Control and Reclamation Act of 1977

- Bonding Requirements
  - If no reclamation, issued NOV's, Revoked Permit, Forfeited Bond, Permit Block via Applicant Violator System
  - Establish the authority to collect excess reclamation costs
  - The regulatory authority, not the permittee determines the cost of reclamation
  - Reclamation Bond is to pay for all costs of reclamation in the event the permittee is unable to reclaim the site.
- West Virginia Primacy of Regulatory Program on January 21, 1981.

West Virginia Surface Coal Mining and Reclamation Act

June 1, 2004 Revision

- Established an "Alternative Bonding System"
  - Reclamation Bond posted by permittee
  - The Special Reclamation Fund
    - Forfeited Bonds
    - Special Reclamation Coal Tax
    - Civil Penalty Collections

Section 22-3.11.e

It is unlawful for the owner of surface or mineral rights to interfere with the present operator in the discharge of the operator's obligations to the state for the reclamation of lands disturbed by the operator.

Section 22-3.11.g

The Special Reclamation Fund previously created is continued. The Secretary may use the Special Reclamation Fund for the purpose of designing, constructing, and maintaining water treatment systems when they are required for a complete reclamation of the affected lands.

Section 22-3.11.h

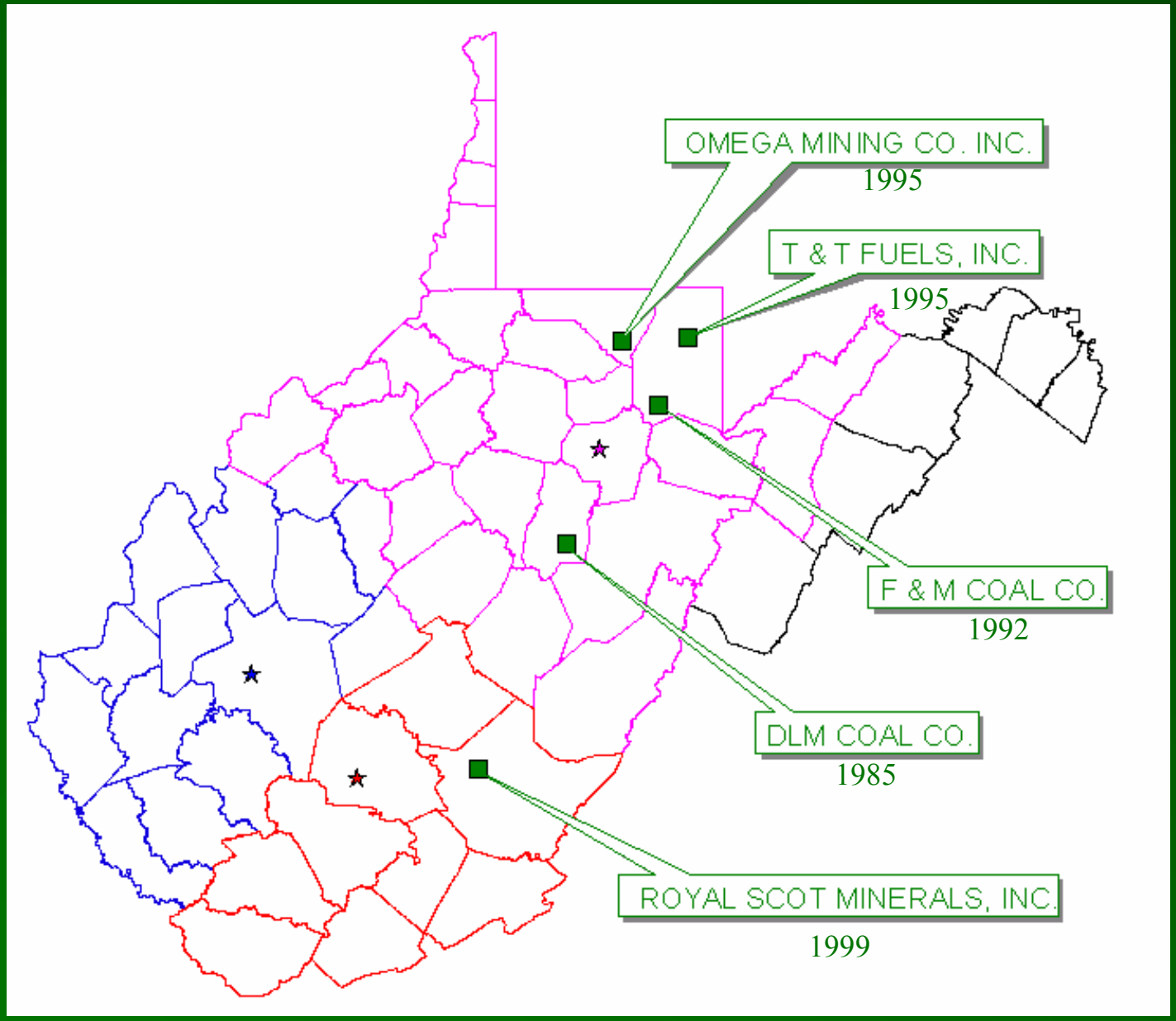
After January 1, 2002, every person conducting coal mining operations shall contribute to the fund as follows:

- For a period not to exceed thirty-nine months, seven cents per ton of clean coal mined; and
- An additional seven cents per ton of clean coal mined.

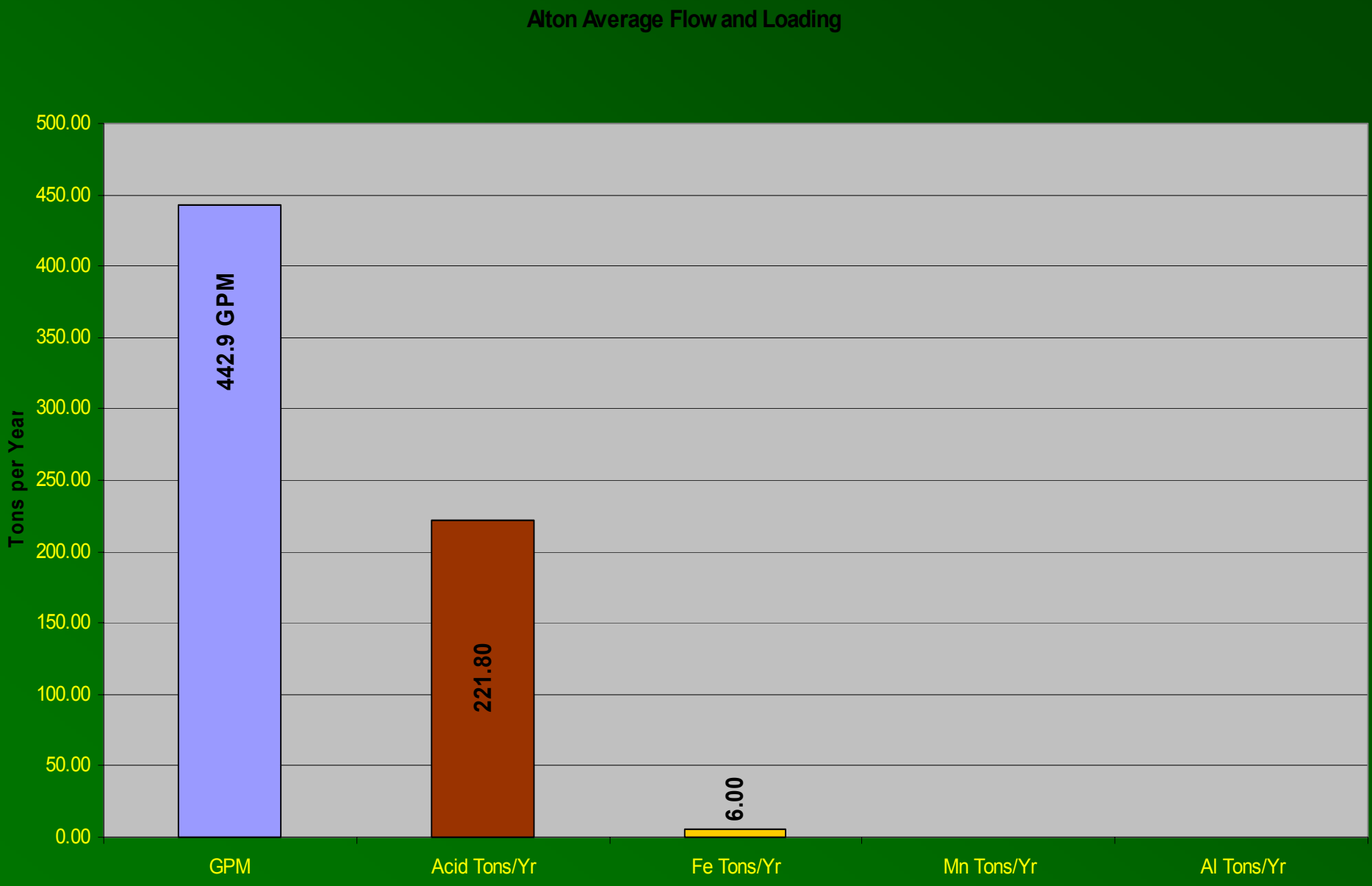
Environmental Good Samaritan Act

To encourage voluntary reclamation of lands adversely affected by mining activities; these voluntary reclamation projects are intended to reduce and abate water pollution that results from these locations being unreclaimed.

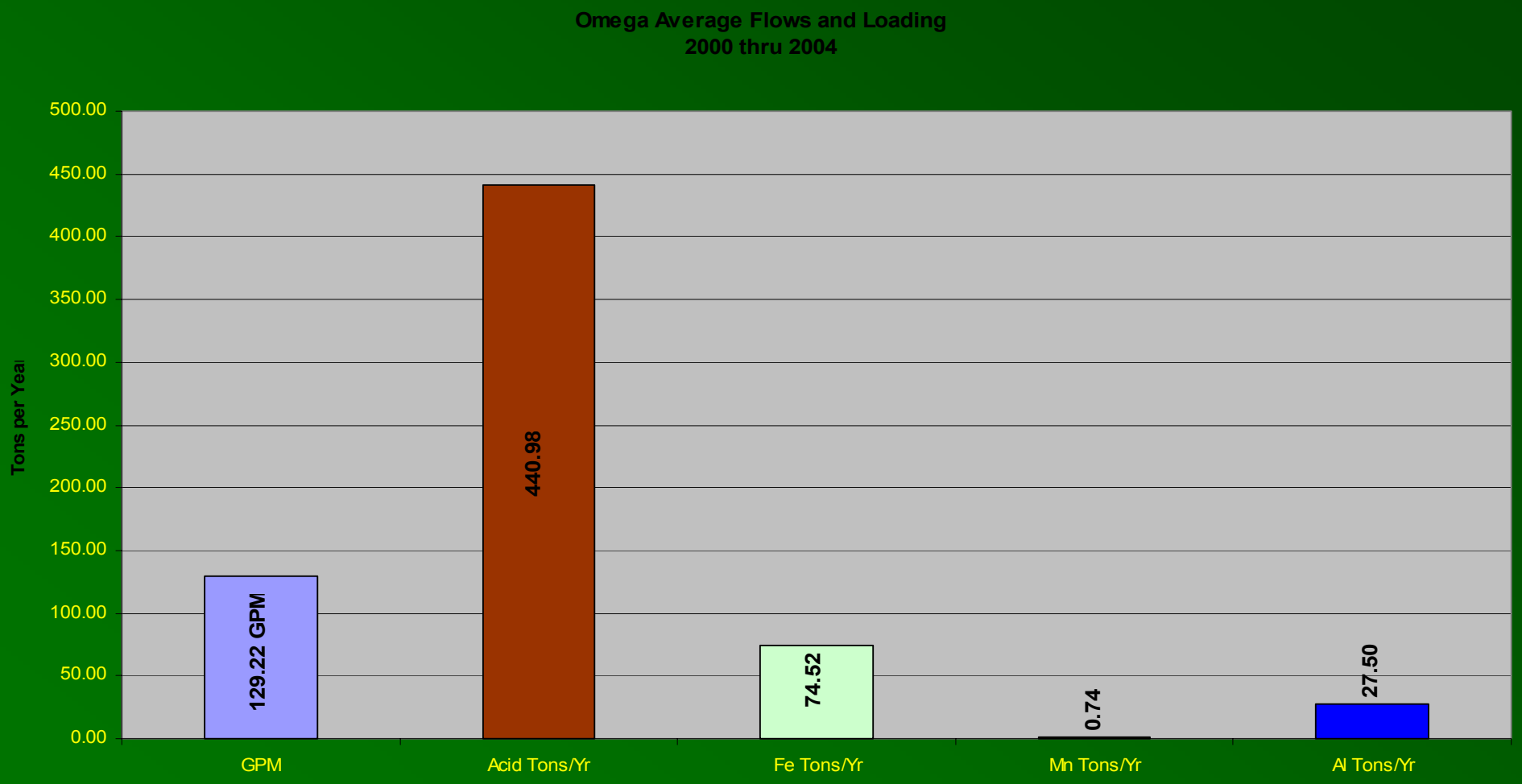
Fixed Base Sites



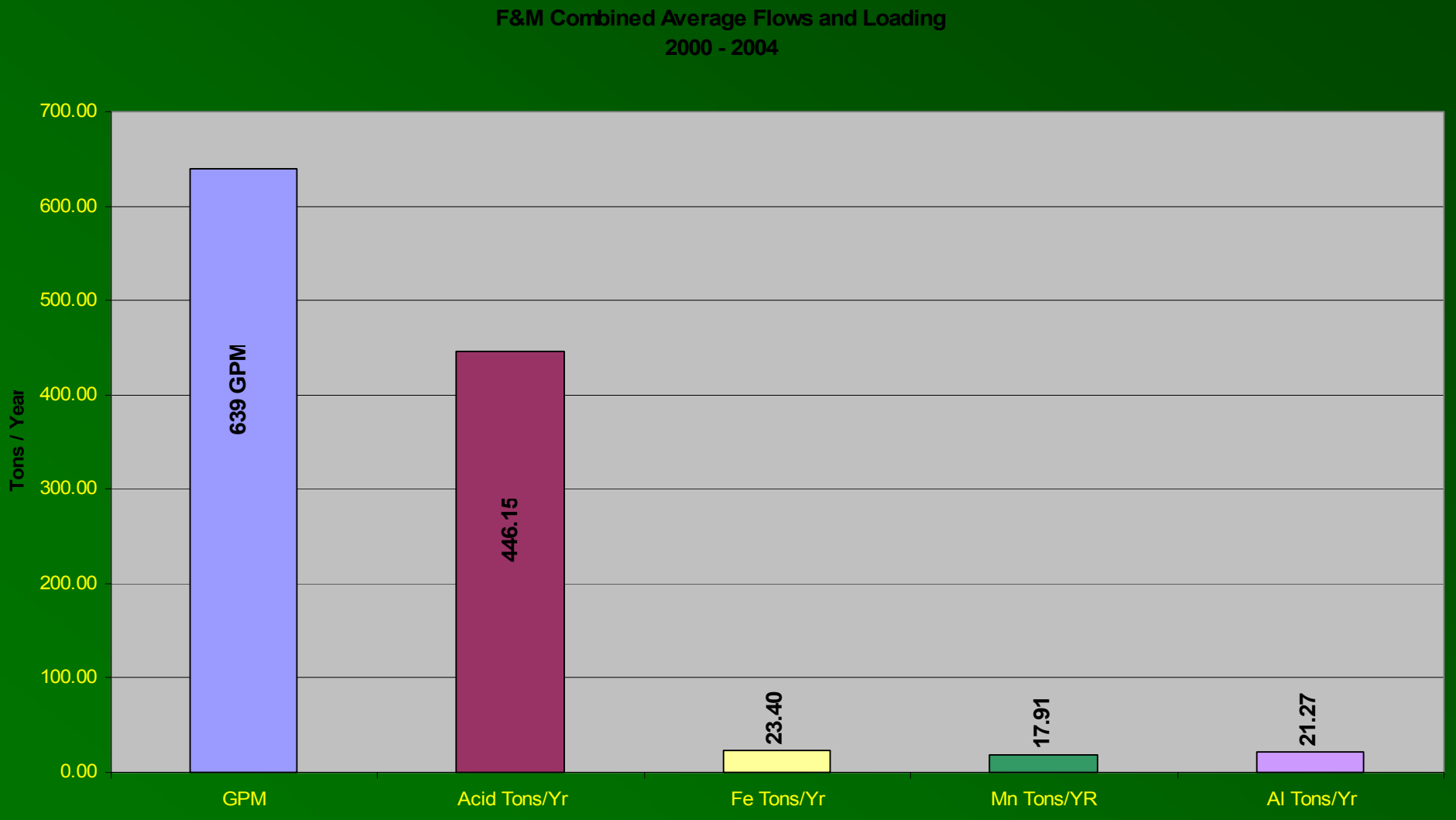
Alton


Alton Average Flow and Loading
Tons per Year
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
442.9 GPM
221.80
6.00
GPM
Acid Tons/Yr
Fe Tons/Yr
Mn Tons/Yr
Al Tons/Yr

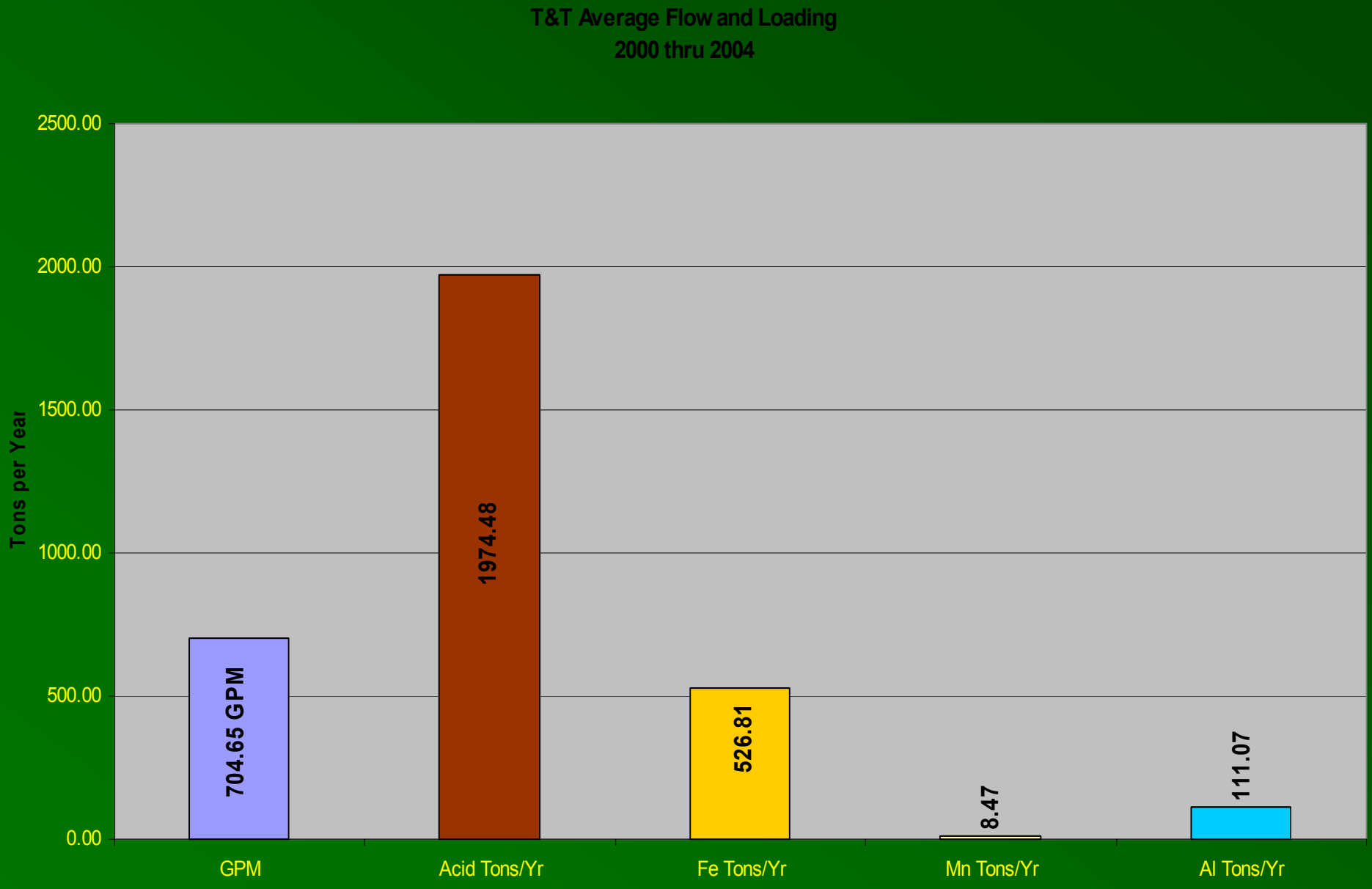
Omega


Omega Average Flows and Loading
2000 thru 2004
Tons per Year
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
129.22 GPM
440.98
74.52
0.74
27.50
GPM
Acid Tons/Yr
Fe Tons/Yr
Mn Tons/Yr
Al Tons/Yr

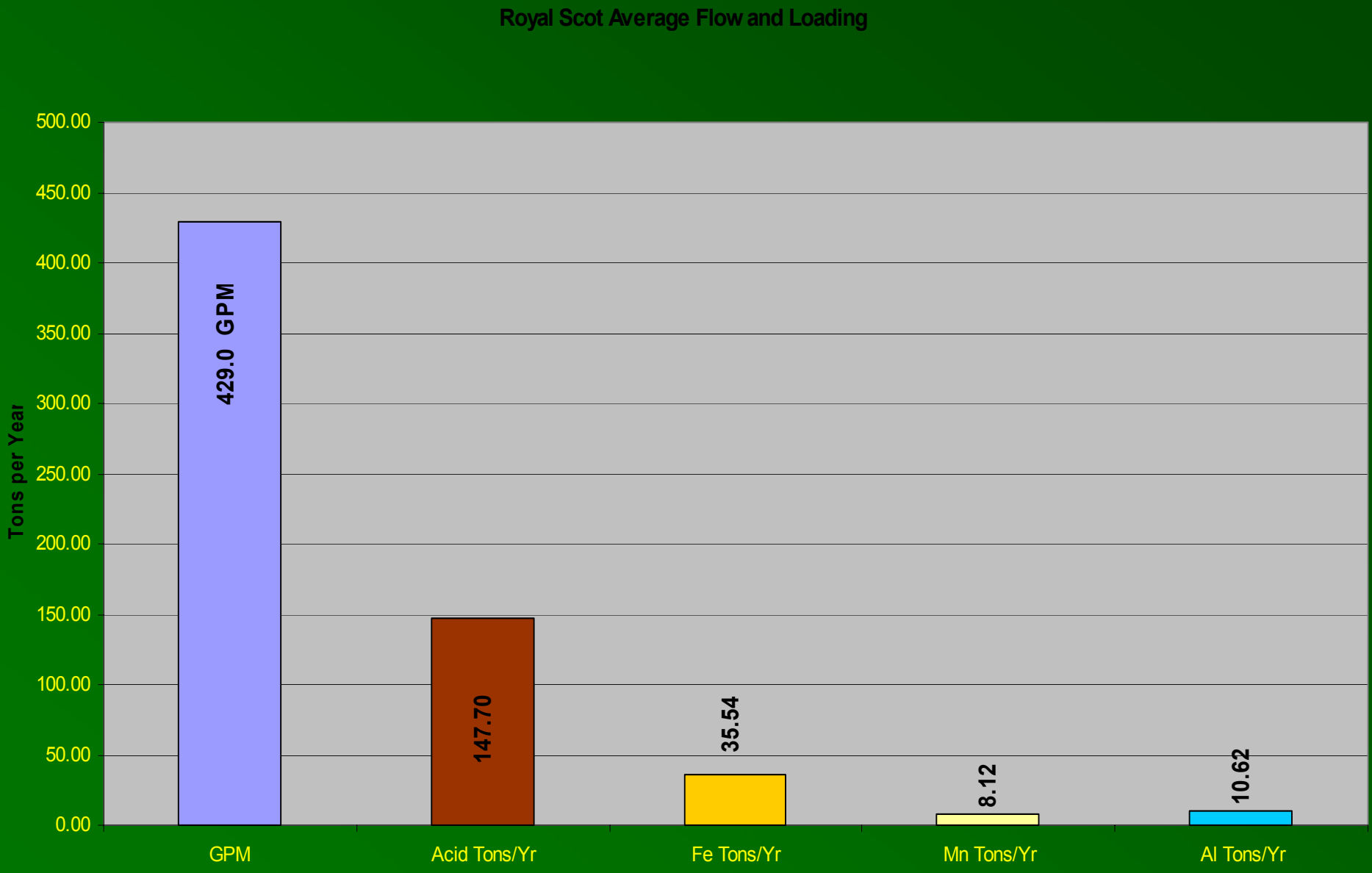
F & M


F&M Combined Average Flows and Loading
2000 - 2004
Tons / Year
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
639 GPM
446.15
23.40
17.91
21.27
GPM
Acid Tons/Yr
Fe Tons/Yr
Mn Tons/YR
Al Tons/Yr

T & T


T&T Average Flow and Loading
2000 thru 2004
Tons per Year
2500.00
2000.00
1500.00
1000.00
500.00
0.00
704.65 GPM
1974.48
526.81
8.47
111.07
GPM
Acid Tons/Yr
Fe Tons/Yr
Mn Tons/Yr
Al Tons/Yr

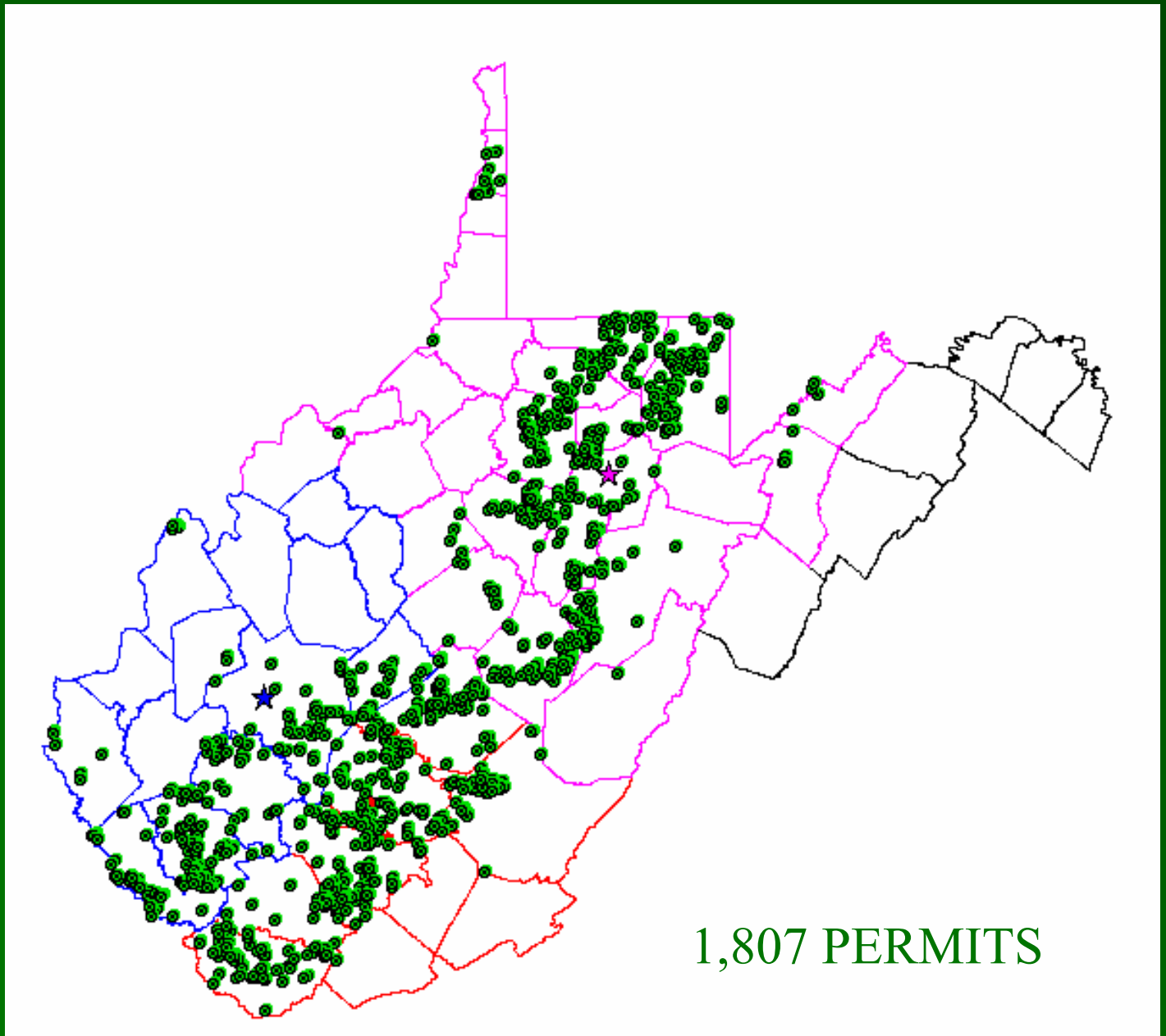
Royal Scot


Royal Scot Average Flow and Loading
Tons per Year
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
429.0 GPM
147.70
35.54
8.12
10.62
GPM
Acid Tons/Yr
Fe Tons/Yr
Mn Tons/Yr
Al Tons/Yr

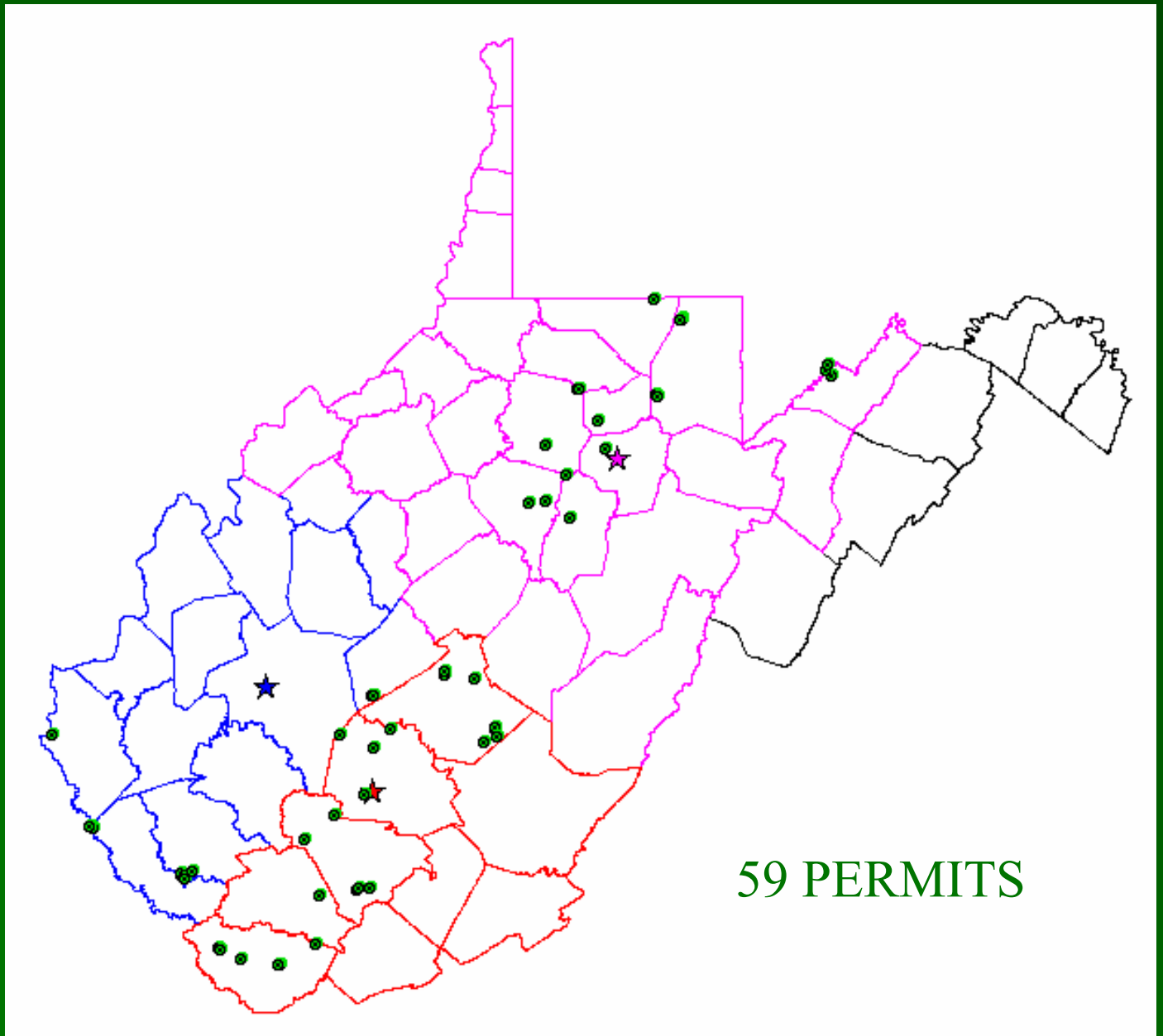
What mined lands are included?

- Permit Revoked
- Bond Forfeited

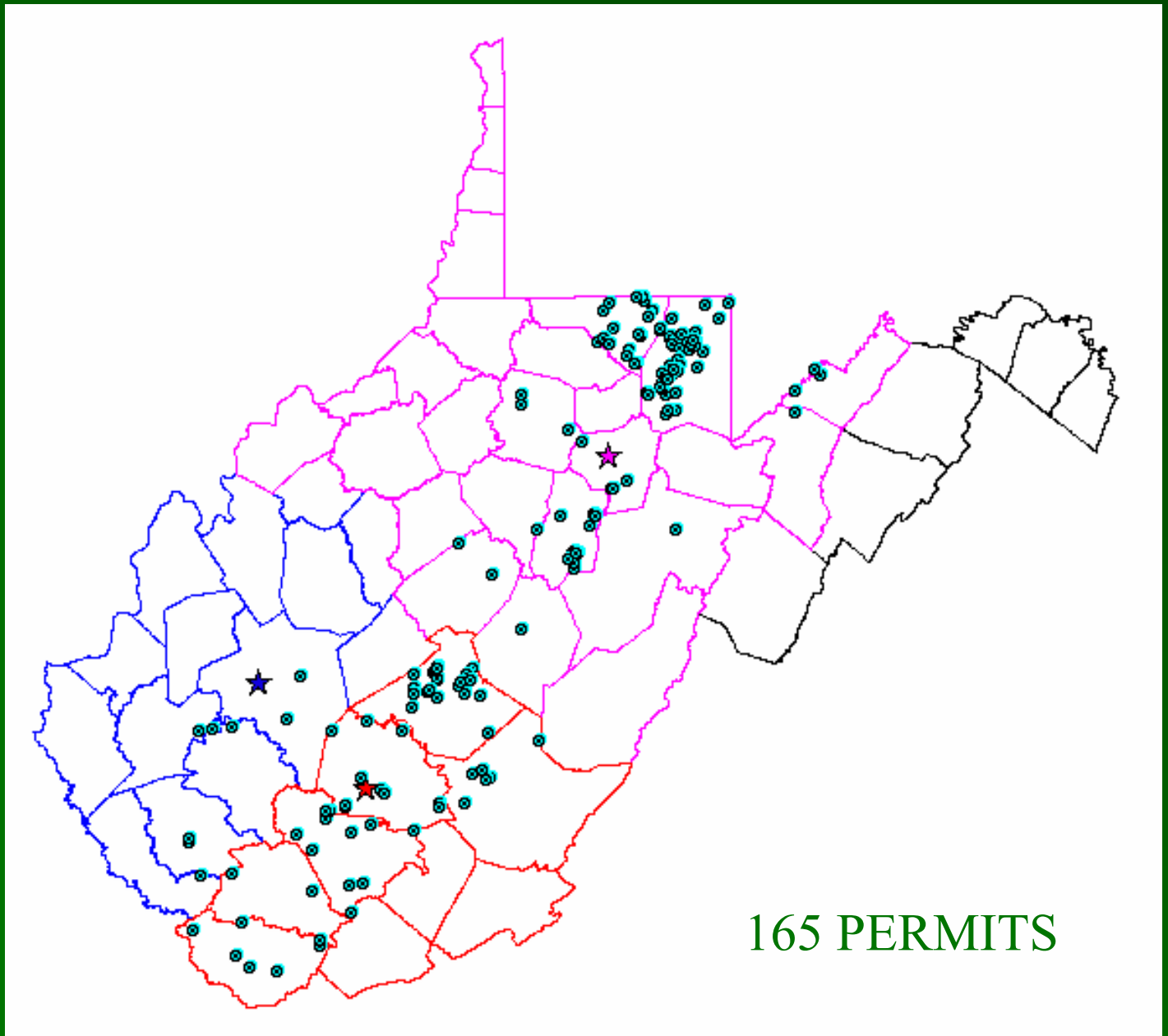
Total Land Forfeitures



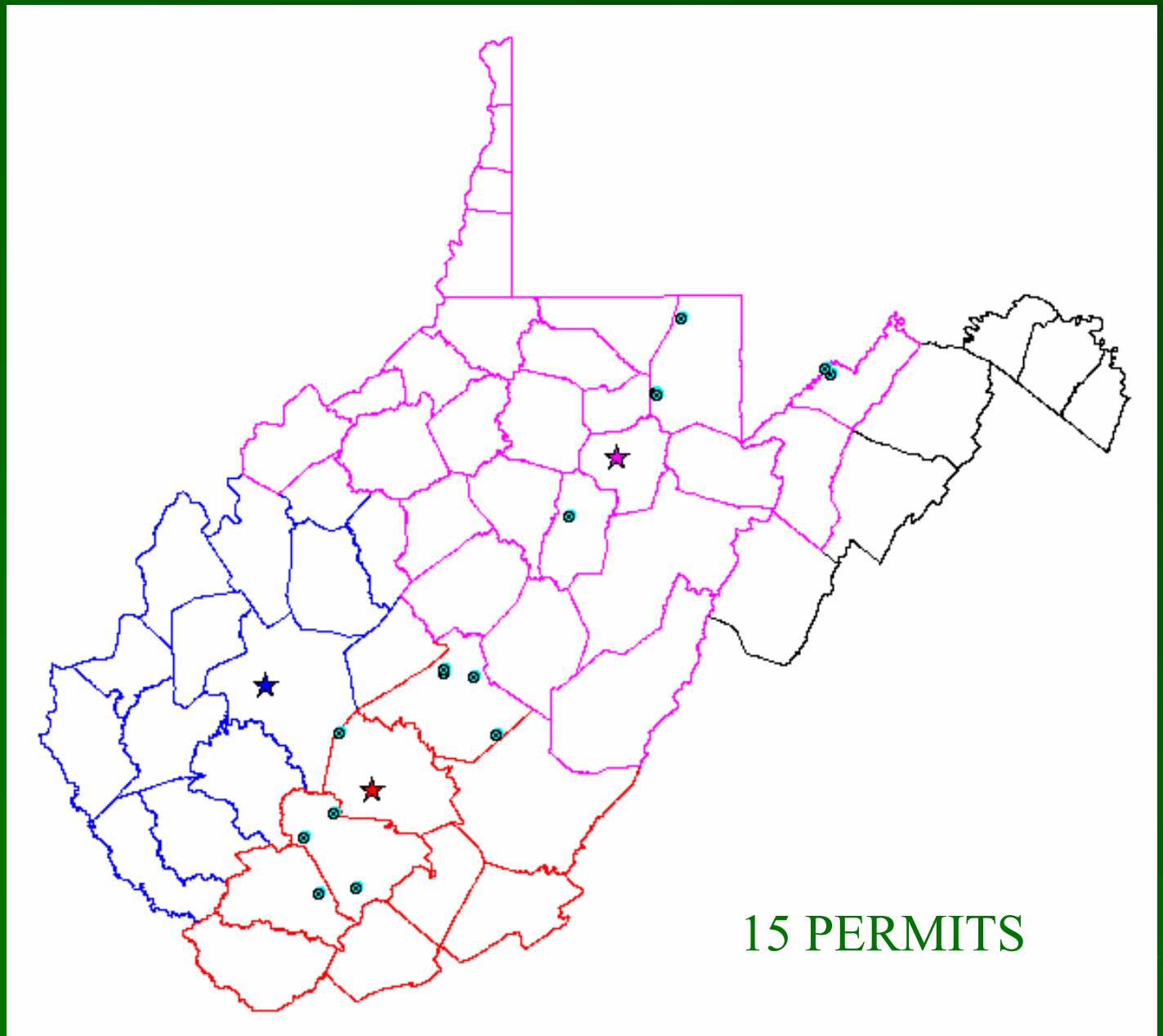
Land Forfeitures after January 1, 2002



Total Water Forfeitures



Water Forfeitures after January 1, 2002



Science

- Alkaline Mine Drainage
  - ✧ Aeration - Oxidation
  - ✧ Detention time
  - ✧ Flocculation
- Acid Mine Drainage
  - ✧ Same as above
- AMD Treat
- Titrations

FIELD TITRATIONS

As the following table indicates conducting field titrations using 20% NaOH provides the necessary information to:

1. Determine the CaO requirement (~ 2 CaO : 1 NaOH)
2. Estimate annual chemical amounts
3. Estimate annual chemical cost
4. Estimate daily chemical consumption rates under low, average, and peak flow conditions
5. Estimate annual sludge production
6. Size settling ponds and sludge disposal cells
7. Have a better understanding of the chemical characteristics for a particular site i.e. kinetics of iron, aluminum, manganese.

WOCAP Energy Resources - Permit S-26-85 - Evaluated 5/23/2002 - "DRAFT"

General Treatment Statistics Summary - Settling Rate FAST

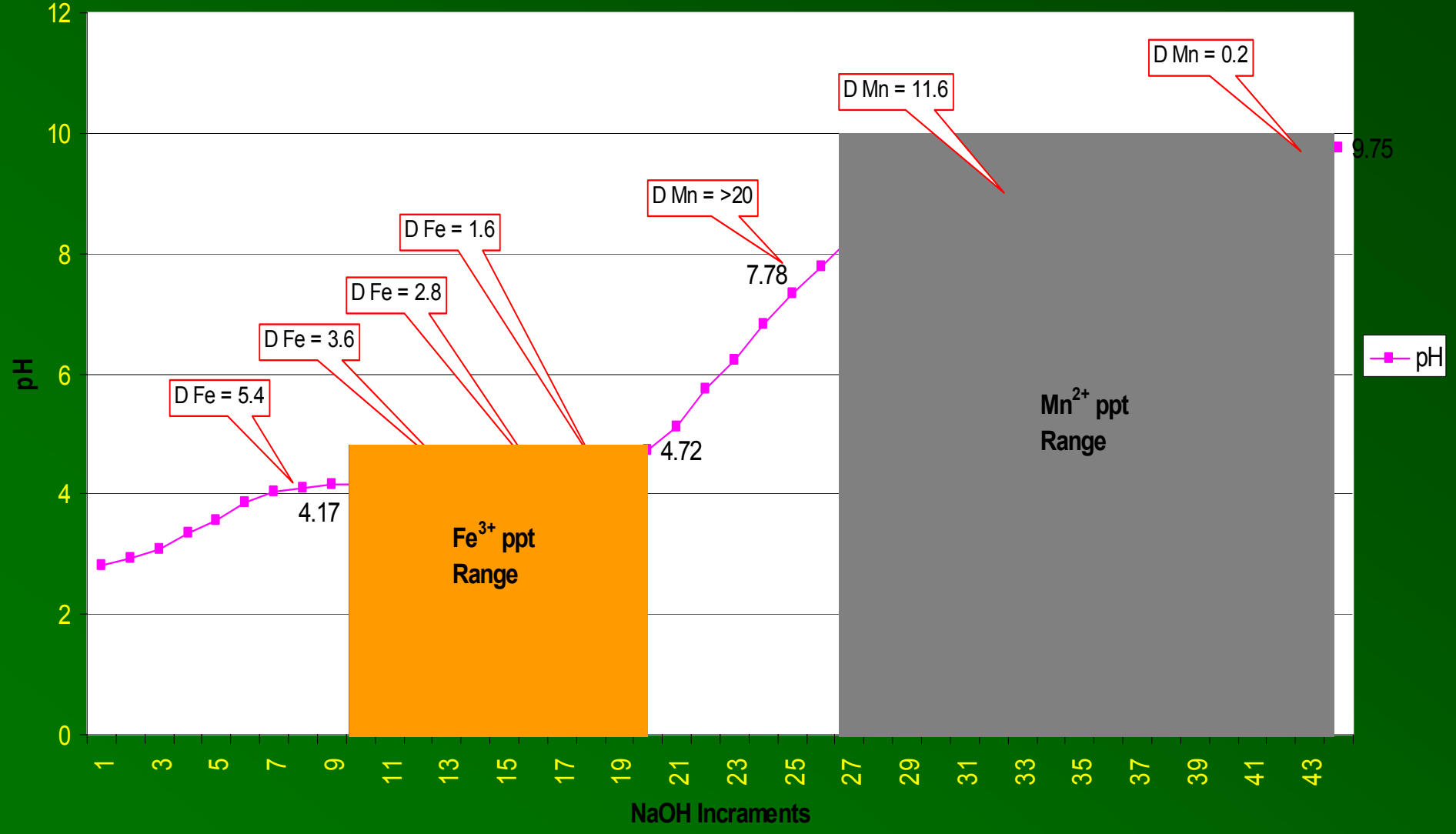
Chemical	pH for Mn	Amt./Gal	Chem. Cost	$/Gal	Sludge Gals./Gal	Sludge Cost	Average Flow	An. Chem	An. Chem $	An. Sludge	An. Sludge $	Total Chem./Sludge$
20% NaOH	9.16	0.0044 gal.	$0.50/gal	0.002200	0.01062	$0.05/Gal	32 gpm's	74004 Gal	$37,002	178,620 Gal	$8,931	$45,933
NH_3	9.12	0.0028 lbs	$0.15/lb	0.000420	0.01062	$0.05/Gal	32 gpm's	47,094 Lbs	$7,064	178,620 Gal	$8,931	$15,995
CaO	9.34	0.0088 lbs	$0.05/lb	0.000440	0.00375	$0.05/Gal	32 gpm's	148,009 Lbs	$7,400	63,072 Gal	$3,154	$10,554

Daily Chemical Treatment Statistics Summary for Sizing - Low/Average/Peak Flows

Chemical	Amt./Gal.	Low Flow	Avg. Flow	Peak Flow	Daily Use Low Flow	Daily Use Avg. Flow	Daily Use Peak Flow	Hr. Use Low Flow	Hr. Use Avg. Flow	Hr. Use Peak Flow
20% NaOH	0.0044 gal	1.48 gpm's	32 gpm's	200 gpm's	9.37 Gal./Day	202.75 Gal./Day	1,267.2 Gal/Day	0.39 Gal./Hr.	8.45 Gal./Hr.	52.8 Gal./Hr.
NH_3	0.0028 lbs	1.48 gpm's	32 gpm's	200 gpm's	5.96 Lbs./Day	129.02 Lbs./Day	806.4 Lbs/Day	0.25 Lbs.Hr.	5.38 Lbs./Hr.	33.6 Lbs./Hr.
CaO	0.0088 lbs	1.48 gpm's	32 gpm's	200 gpm's	18.75 Lbs./Day	405.5 Lbs./Day	2,534.4 Lbs/Day	0.78 Lbs./Hr.	16.90 Lbs./Hr.	105.6 Lbs./Hr.

Information Provided by Tiff Hilton, WOPEC (Working On People's Environmental Concerns)

ROCKVILLE MINING 237-76
SEEP AT OLD POND 3



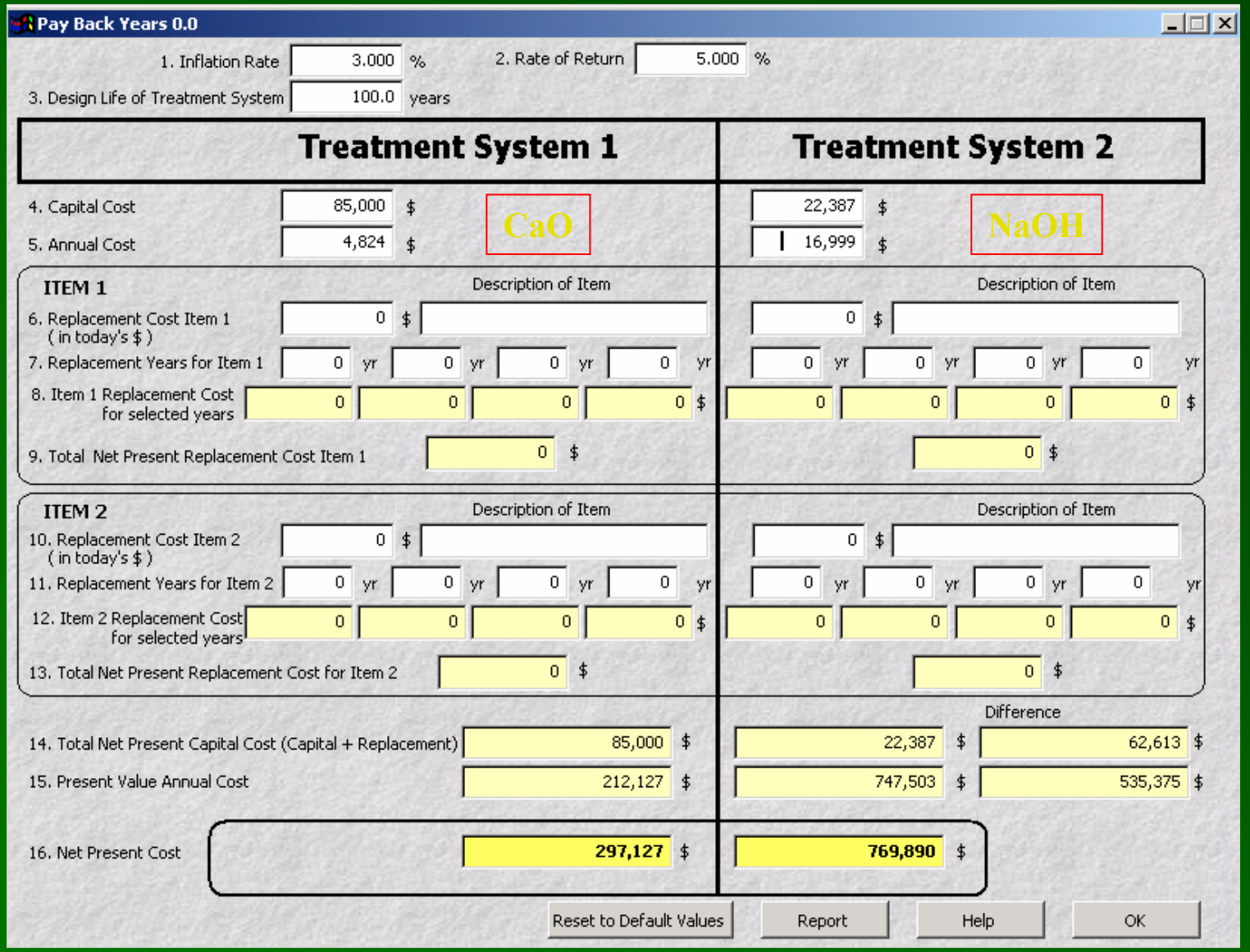
Strategic Treatment Plans

- Cost
- Safety
- Reliable
- Effective

Reagent Economics

- Anhydrous Ammonia
- Sodium Hydroxide
- Calcium Oxide

LONGTERM TREATMENT COST
CALCIUM OXIDE vs SODIUM HYDROXIDE

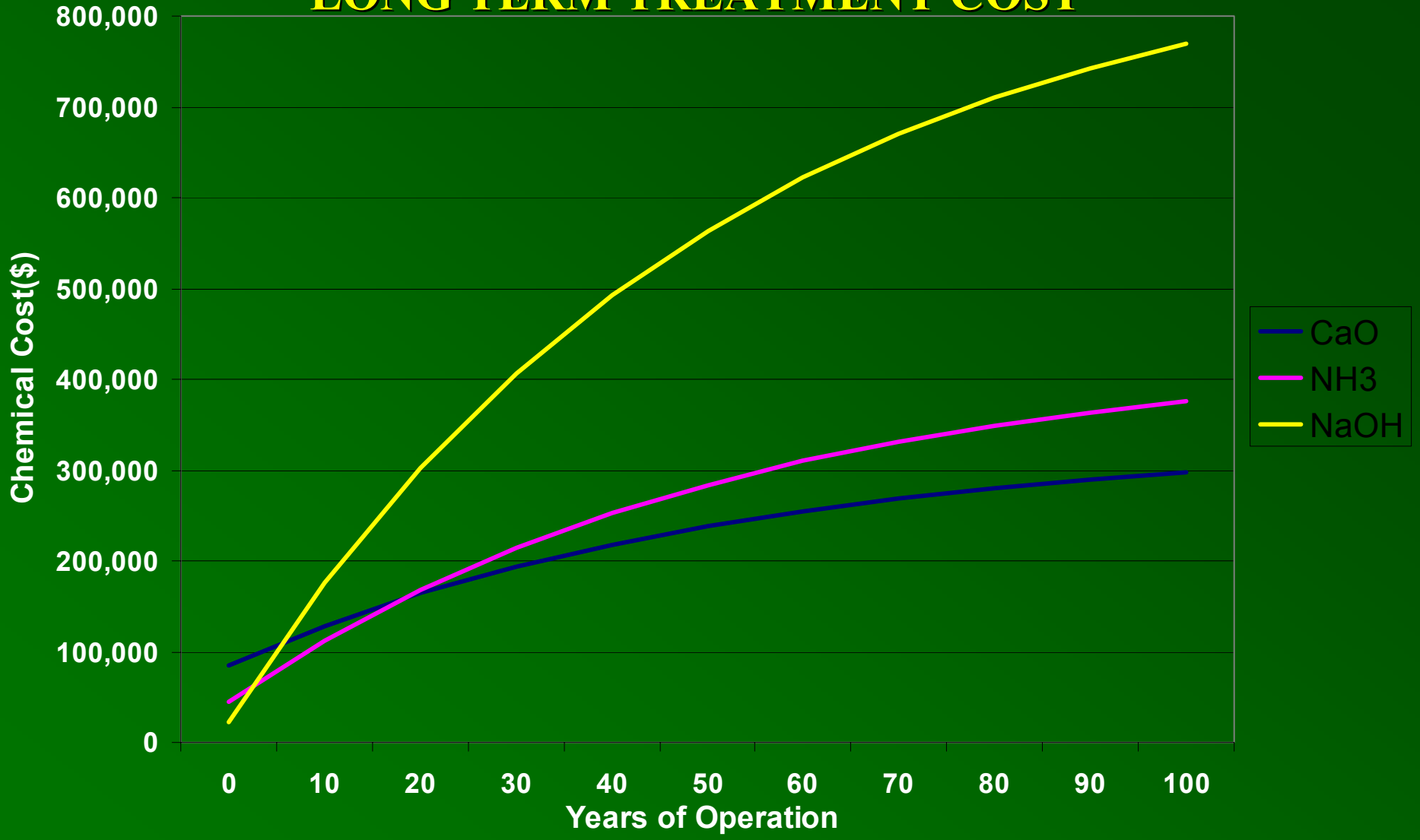


LONG TERM TREATMENT COST

Water Quality: Flow = 50 gpm, H Acidity = 585 mg/l as $CaCO_3$, T Fe = 65 mg/l, T Al = 55 mg/l, T Mn = 7 mg/l

Years of Operation	CaO	NH3	NaOH
0	$85,000	$44,492	$22,387
10	$128,464	$112,319	$175,548
20	$164,324	$168,280	$301,913
30	$193,910	$214,450	$406,171
40	$218,321	$252,543	$492,189
50	$238,460	$283,972	$563,157
60	$255,076	$309,902	$621,710
70	$268,785	$331,295	$670,018
80	$280,096	$348,946	$709,875
90	$289,428	$363,508	$742,759
100	$297,127	$375,523	$769,890

LONG TERM TREATMENT COST



WOCAP ENERGY RESOURCES
S-26-85

Raw Water

Site Description	Flow	pH	H. Acidity	Alkalinity	T. Fe.	T. Al	T. Mn
Deep Mine Discharge	GPM	S.U.	mg/l	mg/l	mg/l	mg/l	mg/l
Avg	35		1029.50	0.00	231.76	77.39	13.96
Min	1	2.30	548.00	0.00	83.80	43.20	6.88
Max	200	2.60	2160.00	0.00	477.00	136.00	23.80

Post Treatment

Site Description	Flow	pH	H. Acidity	Alkalinity	T. Fe	T. Al	T. Mn
Final Discharge	GPM	s.u.	mg/l	mg/l	mg/l	mg/l	mg/l
Avg	54.79		15.00	132.23	0.74	4.13	0.93
Min	13.44	4.44	0.00	0.00	0.03	0.00	0.02
Max	147.84	12.10	99.00	980.00	5.24	15.60	3.85

HIDDEN VALLEY COAL CO.
S-60-84

Raw Water							
Site Description	Flow	pH	H. Acidity	Alkalinity	T. Fe.	T. Al	T. Mn
Seep	GPM	S.U.	mg/l	mg/l	mg/l	mg/l	mg/l
Avg	6		49.33	0.50	1.83	3.94	10.98
Min	0	3.30	5.00	0.00	0.27	1.10	4.26
Max	16	5.00	93.00	2.00	5.33	7.19	19.90
Site Description	Flow	pH	H. Acidity	Alkalinity	T. Fe.	T. Al	T. Mn
Seep from Rock Core	GPM	S.U.	mg/l	mg/l	mg/l	mg/l	mg/l
Avg	13		95.38	0.25	1.73	8.16	13.59
Min	1	3.30	42.00	0.00	0.20	3.30	6.20
Max	40	3.90	153.00	1.00	3.28	14.40	19.40

Post Treatment							
Site Description	Flow	pH	H. Acidity	Alkalinity	T. Fe	T. Al	T. Mn
Final Discharge (100)	GPM	s.u.	mg/l	mg/l	mg/l	mg/l	mg/l
Avg	45.80		0.44	27.33	0.18	0.22	1.08
Min	4.48	6.10	0.00	20.00	0.00	0.00	0.17
Max	112.00	9.09	1.00	52.00	1.48	0.82	2.98


BL#3


TUFF-R
TUFF-R


RTMENT OF
VIRONMENTAL
ROTECTION

Sludge Management

- Collection
- Transportation
- Disposal


KOMATSU
CHRISTIE


BUILT AND INSTALLED BY
BEITZEL CORPORATION
1-301-245-4107
9-20-99
Next purge
Do AT 750HS
Allen-Bradley
PanelView 550
7.5 H.P.
SUBMERSIBLE PUMP
PUMP NO.1
50 H.P.
SLUDGE PUMP
PUMP NO.2
50 H.P.
SLUDGE PUMP
PUMP NO.3
50 H.P.
SLUDGE PUMP
PUMP NO.4
CRANE


DEERE

Operation and Maintenance

- Monitoring

- Materials and supplies
  - ✧ Purchasing Requests

PURCHASING REQUEST

Employee: _____ Project: _____ Date Requested: _____

Vendor Name: _____ Contact Person: _____

(If you are using a 1-800 number or calling a large company, please obtain the last name of your contact person OR their extension number.)

Does Vendor accept VISA?: Yes _____ No _____

Address: _____ Phone: ( ) - _____ Ext. _____

Tax exempt #556000769W - Total purchase may not exceed $1000 (including shipping and handling)

Qty	Name of item	Description of Use	SR#	Obj. Code	% split Y / N	Catalog #	Page #	Unit price	Total price
Total Order									

____ Pickup ____ Delivery ____ To Be Shipped Order Placed by: _____ Date: _____ Time: _____ am/pm

(Will be shipped to Philippi office unless stated otherwise)

Supervisor Approval: _____ Date: _____ Management Approval: _____ Date: _____

(Requests exceeding $100 require Supervisor approval. Requests exceeding $200 require Management approval. If signature is NOT obtained, please note verbal approval.)

Authorized (Cardholder Signature): _____ Date: _____

- Purchase Orders

- Statewide Contracts
  - Hydrogen Peroxide
    - $ 2.82 per gallon / $0.28 per lb.
  - Calcium Oxide
    - $170 per ton (partial loads of 1-5 ton)
    - $120 per ton (full loads)
    - $.06 per pound
  - Sodium Hydroxide
    - $ 0.389 per gallon

Operation and Maintenance

- Drive water inlets
- Dispensers
- Sludge lines and valves
- Sludge Ponds
- Access Roads
- Collection Systems

Operation and Maintenance

- Drive Water Inlets
- Dispensers


AQUA FIX

Operation and Maintenance

- Drive water inlets
- Dispensers
- Sludge lines and valves

Operation and Maintenance

- Drive water inlets
- Dispensers
- Sludge lines and valves
- Sludge Ponds

Operation and Maintenance

- Drive water inlets
- Dispensers
- Sludge lines and valves
- Sludge Ponds
- Access Roads


STATE CAR


Kmader U-3020-90

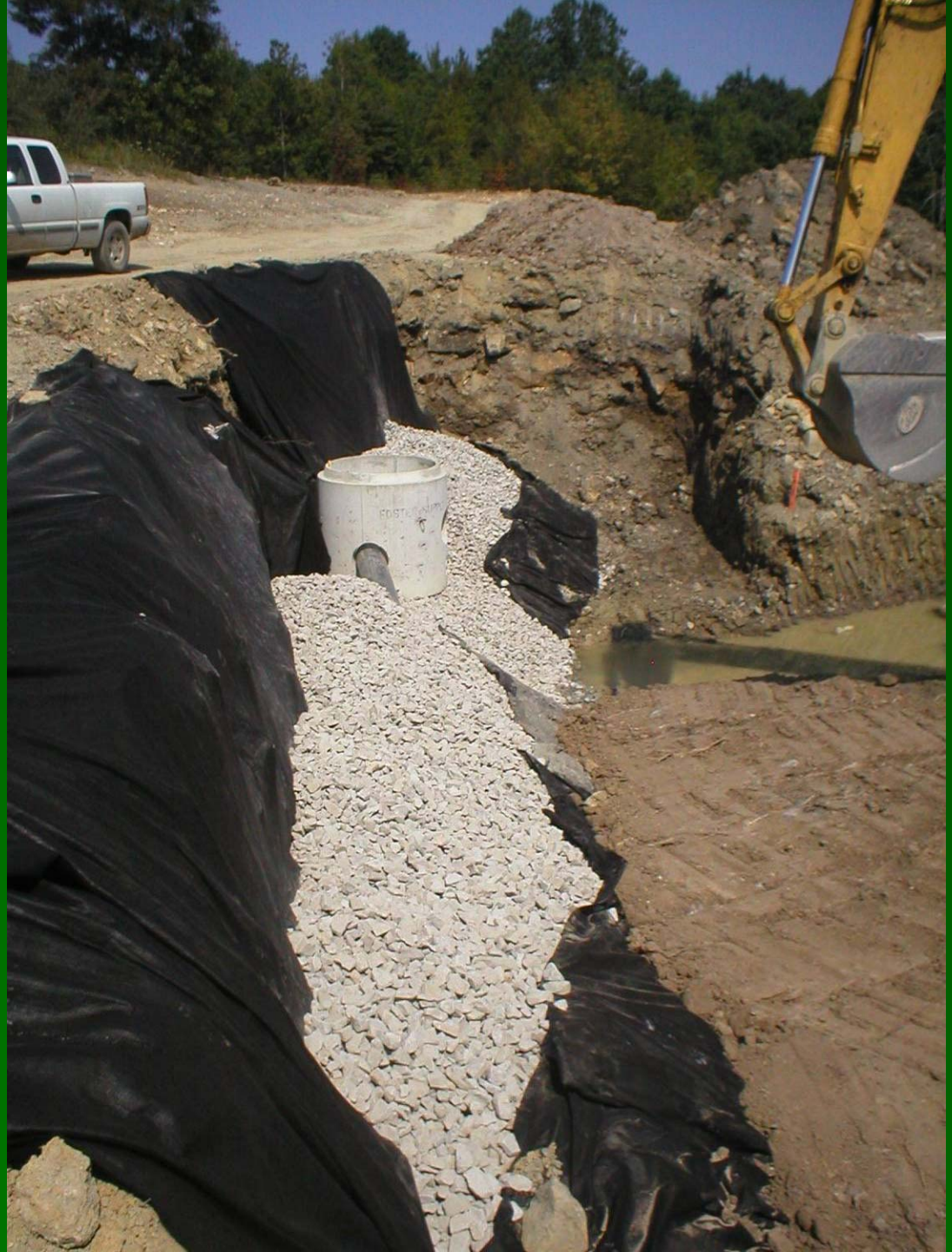

KRISTY & BRIGGS KRISTEN


CRISTY ALBRIGHT KRISTEN
JACOB MANDY SAM

Operation and Maintenance

- Drive water inlets
- Dispensers
- Sludge lines and valves
- Sludge Ponds
- Collection Systems


FOSTER



Considerations

- Sludge Disposal

Considerations

- Sludge Disposal
- Vandalism

Considerations

- Sludge Disposal
- Vandalism
- Winter Hardened


STATE CAR


energo

Considerations

- Sludge Disposal
- Vandalism
- Winter Hardened
- Security


HELP !