123 Main Street
White Plains, New York 10601
914 681.6240

New York Power Authority

John C. Brons
Executive Vice President
Nuclear Generation

September 25, 1987
IPN-87-044

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
PWR Erosion/Corrosion Questionnaire

Reference: 1. NRC letter (M. M. Slosson) dated 7/20/87 to NYPA (J. C. Brons) transmitting PWR Erosion/Corrosion Questionnaire.

Dear Sir:

As a result of the Surry incident in December of 1986, the NRC requested in Reference 1 that PWR licensees complete an Erosion/Corrosion questionnaire. The Attachment to this letter transmits the Authority's response for Indian Point 3. The information provided follows the questionnaire's format.

As noted in the letter forwarding the questionnaire, the information being requested is quite extensive requiring a diligent effort to assure accurate and timely completion. Due to the short time available to respond (60 days), and resource limitations associated with completing the recent refueling outage and returning Indian Point 3 to power operation, the information provided in the Attachment has not been subjected to the rigorous verification checks normally applied to transmittals of this nature. In addition, several questionnaire items lacked specificity concerning the requested information. The aforementioned time restraints prohibited lengthy dialogues with the NRC.

In those instances where calculational work was necessary to respond, best-estimate data is provided (e.g. maximum flow velocities). The majority of the information requested required a data collection/data reduction effort to respond. The Authority is confident that the information provided is representative and, therefore, appropriately incorporated into the compilation of erosion/corrosion information the staff plans to develop.

A001

Should you or your staff have any questions regarding this matter, please contact Mr. P. Kokolakis of my staff.

Very truly yours,

John C. Brons
Executive Vice President
Nuclear Generation

cc: U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Resident Inspector's Office
Indian Point 3
U.S. Nuclear Regulatory Commission
P.O. Box 377
Buchanan, NY 10511

Joseph D. Neighbors, Senior Project Manager
Project Directorate I-1
Division of Reactor Projects I/II
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20014

ATTACHMENT TO IPN-87-044

PWR EROSION-CORROSION QUESTIONNAIRE ENCLOSURE
(Check or Circle All Applicable)

Utility Company: New York Power Authority Unit Name: Indian Point 3 MWe 965

Filled by: Licensing Group Date: 9/87 Phone No. (914) 681-6254

In service: 19 .76. Water Treatment: (AVT with ammonia,) morpholine, hydrazine.

Condensate polishers: none, cation, powdex, (mixed bed;) .....75.....% of feedwater flow;
installed 19 .86.; operated in: (H-OH,) NH4-OH form.
Cooling water: fresh, salt, (brackish,) cooling tower.
Copper alloy condenser tubing: yes, (no) Copper alloy FW heater tubes: LP, HP, (none.)
Boric acid used between 1982-86 during: (operation,) layup, (low load soaks,) other.....
(Currently Not Used)

A. EROSION-CORROSION EXPERIENCE

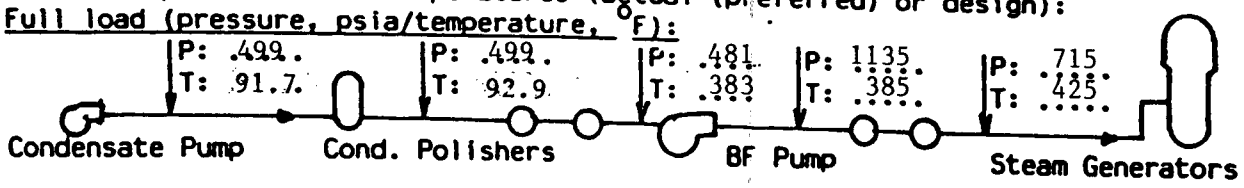
1. Erosion-Corrosion identified in wet steam piping: (yes,) no.
2. Erosion-Corrosion of MSR ~~Chevrons or~~ mesh: (yes,) no.
   Mesh/~~Chevron~~ material: stainless steel, (carbon steel,) other .....
3. Erosion-Corrosion of feedwater piping: yes, (no.) Date found ....N/A.....
   Feedwater piping materials: (see response to Item D.1).....
4. Erosion-Corrosion of: .NA. elbows, .NA. Ts, N/A. diffusers, ..N/A.: reducers, N/A valves, N/A orifices, N/A other components (specify).....
5. Erosion-Corrosion of J-Tubes: (yes,) no.
6. Erosion-Corrosion of feedwater distribution ring: yes, (no.)
7. Erosion-Corrosion of turbine: HP, (LP;) identify components: Last Stage Blades (L_0)
8. Erosion-Corrosion of other cycle components (identify) .MSR.Drain.Piping.(elbows&expanders)
9. Feedwater temperature range where erosion-corrosion found: from N/A to ——— °F
10. Inspection frequency for feedwater piping ~1.5* years. Steam lines ~1.5* years.
11. Inspection methods used: (ultrasonic thickness,) radiography, (visual,) other.....

* Refueling Outage

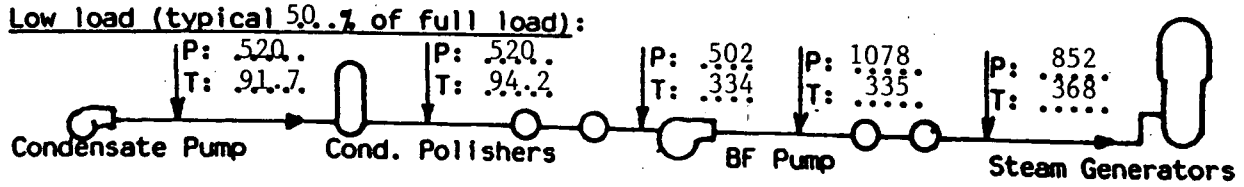
B. PIPING DESIGN (Data For 1,000 MWe - initial guarantee)

1. Maximum feedwater flow velocity .19. (Note 1) feet/second. @ MB Feedpump 20" discharge
2. No. of feed pumps operating at 100% load ...2..., second pump On at .40..% load.
3. Maximum flow velocity when only 1 pump is operating .....19..... feet/second. (B.1)
4. No. of feedwater piping components: ..127.. elbows, ..25.... Ts, ..8..... diffusers, ...3.. reducers, ..43.. valves, ..4.... orifices, .4.... Venturi ..12.. other components (specify) ..U - Bends.....
5. Maximum flow velocity in wet steam piping ...328..... feet/second. (Cross-Under Piping)
6. Feedwater pressures and temperatures ~~(actual (preferred) or~~ design):

Full load (pressure, psia/temperature, °F):



Low load (typical 50.% of full load):



Please attach copies of the heat balance diagrams for your actual full load and typical low load. (See attached FSAR Figs. 10.2 - 16 and 10.2-18)

C. FEEDWATER AND CONDENSATE CHEMISTRY

1. Please complete the attached Table.
2. Feedwater chemistry history (~~average or~~ typical values, final feedwater):

Year of oper.:	1st	1974	1976 1ST. OPER. NOV.	1978 JAN.	1980 JUNE	1982 JAN.	1983 SHUT DOWN	1985 JAN.	1986 OCT.	1987 FEB.
pH of FW maximum			NA	NA	NA	NA		9.10	9.12	9.05
minimum			NA	NA	NA	NA		8.80	8.98	8.85
average			NA	NA	NA	NA		8.90	9.05	8.98
pH of condensate maximum			9.2	9.2	9.2	9.4		9.4	9.1	9.1
minimum			8.6	8.6	8.6	8.8		9.1	8.8	8.8
average			8.95	9.0	8.9	9.15		9.25	9.0	9.0
DO, ppb maximum			1.0	1.0	1.0	1.0		1.0	1.0	1.0
minimum			1.0	1.0	1.0	1.0		1.0	1.0	1.0
average			1.0	1.0	1.0	1.0		1.0	1.0	1.0
Cat. Cond. uS/cm			0.75	0.40	1.40	0.75		0.45	0.057	0.059
Spec. Cond. uS/cm			NA	NA	NA	NA		NA	2.25	2.25
NH_3, ppb			NA	NA	NA	NA		1150	275	250
N_2H_4, ppb			6	12	16	5		12	20	22
Boron, ppb			0	0	500	0		700	0	0
Air Inleakage, SCFM			NA	NA	NA	14		8	6	7

Please send any water chemistry summary reports and data.

* 1982 & 1985: 10% SGBD Boron
1986 & 1987: No Boron

3. Chemical additions

3.1 Ammonia: typical concentration in feedwater 250 ppb; added at Condensate
3.2 Hydrazine: typical concentration in feedwater 20 ppb; added at Polisher
3.3 Boric acid: typical concentration in feedwater 0 ppb as B; added at NA Effluent

D. MATERIALS

1. Feedwater piping - list ASTM or other specification numbers: A 106 GR.C, A 53 GR.B, A 106 GR.B, A 335 GR.P-22, A 155 EFW GR.KC-70, A 155 EFW, GR.C-55 Class 2

2. Wet steam piping: A 155 EFW GR.C-55, Class 2; A 53 Seamless; A 106 GR.B; A 335 GR.P5; A 335 GR.P-22

3. Attach results of chemical analysis by you or pipe vendors.

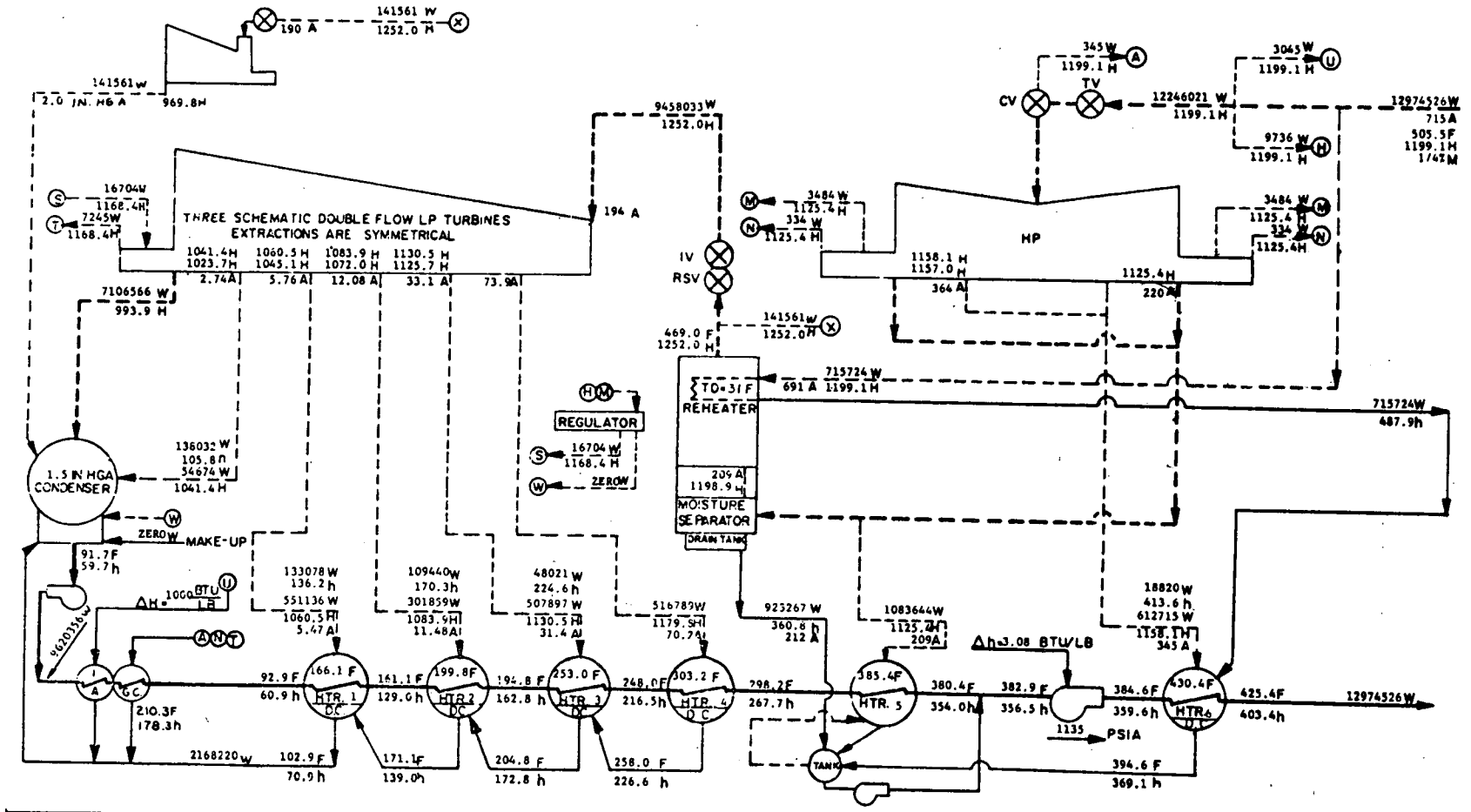
(See enclosed sample report)

Note 1:

a) Majority of FW has a velocity of 16.5 ft./sec.
b) At BFP discharge (inside casing) velocity is 31.3 ft./sec.
c) At BFP recirculation line (4" line) velocity is 61.3 ft./sec.

INDIAN POINT 3 — FSAR UPDATE

1000630 KW NET LOAD HEAT BALANCE - INITIAL GUARANTEE AT 715A INLET



NET HEAT RATE = $\frac{12974526\ (1199.1 - 403.4)}{1000630}$ = 10317 BTU/KWHR

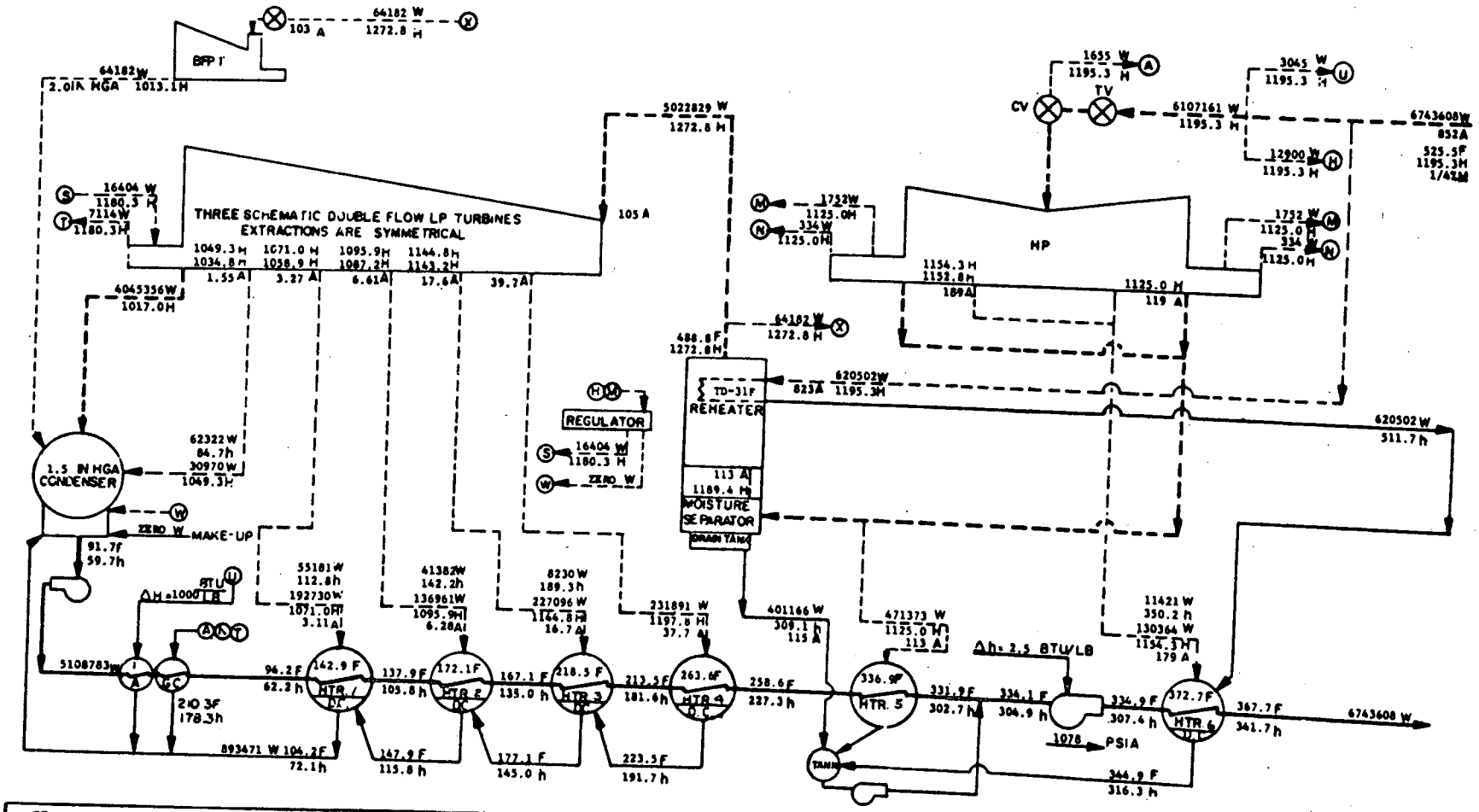
(1) CALCULATIONS ARE BASED ON NO RADIATION LOSSES TO HEATERS OR EXTRACTION PIPING LOCATED IN THE CONDENSER NECK.
(2) PRIMARY VALVE AND ABOVE HEAT RATES ARE CALCULATED ON LOCUS OF VALVE POINTS.

STEAM GEN FLOW AT MAX.CALC. IS NOT GUARANTEED.
MAX.GUAR. S.G. FLOW = 13283282 LB/HR. MAX.CALC. S.G. FLOW = 13947446 LB/HR.

TEP = 993.7BTU/LB
ELEP = 977.2BTU/LB
MECH LOSS = 3646 KW
ELECT LOSS = 12500 KW
0.90PF 75# H_2
DFP POWER = 11705 KW
BFP EFF = 86%

1021793 KW TURB-GEN. UNIT TC6F-44 IN.
730PSIA - 507.8 F 1.5 IN. HGA
1125630 KVA 0.90 PF 22000 VOLTS 75 # H_2

LESTER, PENNA.
ENGR. W.R./JAK
LCD 2099
DATE: 12/15/69
A8935-0364
REV.



NET HEAT RATE = $\frac{6743608\ (1195.3-341.7)}{510897}$ = 11267 BTU/KW HR

(1) CALCULATIONS ARE BASED ON NO RADIATION LOSSES TO HEATERS OR EXTRACTION PIPING LOCATED IN THE CONDENSER NECK.
(2) PRIMARY VALVE AND ABOVE HEAT RATES ARE CALCULATED ON LOCUS OF VALVE POINTS.

STEAM GEN. FLOW AT MAX CALC. IS NOT GUARANTEED.
MAX. GUAR. S.G. FLOW = 13283282 LB/HR. MAX. CALC. S.G. FLOW = 13947446 LB/HR.

TEP = 1016.6 BTU/LB
ELEP = 1010.9 BTU/LB
MECH LOSS = 3648 KW
ELECT LOSS = 6573 KW
0.90 PF 75 #H2
FWP POWER = 4883 KW
FWP EFF = 77 %

1021793KW TURB-GEN. UNIT TC6F-44 IN.
730 PSIA - 507.8F 1.5 IN. HGA
1125600KVA 0.90 PF 22000 VOLTS 75 #H2

LESTER, PENNA

ENGR. VJH
LCD 2099
DATE: 2/9/68
CT- 21373
REV. A 4/1/68

INDIAN POINT 3 FSAR UPDATE

510897 KW LOAD HEAT BALANCE 50% LOAD

REV. 0 | JULY, 1982 | FIGURE NO. 10.2-18

Complete results of the analysis performed are appended.

Respectfully submitted,

LUCIUS PITKIN, INC.

R. S. Vecchio, Ph.D.
Engineer

Approved:

A. J. Vecchio, P.E.
Vice President

DSR # 136765
OF PAGES

Lucius Pitkin
INCORPORATED

Metallurgical and Chemical Consultants

Testing Laboratories–Nondestructive Examination Services

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TELEX 12-6615 · CABLE NIKTIP · (212) 233-2558

REPORT

July 21, 1987

M-9124S1

New York Power Authority
123 Main Street
White Plains, NY 10601

Attention: Mr. Karl Jacobs

Subject: CHEMICAL ANALYSIS OF ELBOW FILINGS

Metal filings reportedly removed from two 90 degree power piping elbows were submitted to Lucius Pitkin, Inc. for qualitative emission spectrographic analysis and limited (chromium only) quantitative chemical analysis. We were advised that the submitted filings were alloy, ASTM: A106 grade C.

The submitted samples were identified as follows:

LPI NO.	New York Power Authority Metal Filings Identification
A	90 Elbow d/s of FCV - 427 18" (?) A 106 Gr. C Sch. 80
B	90 Elbow on discharge of MFP # 31 20" (?) A 106 Gr. C. Sch. 80

Lucius Pitkin
INCORPORATED
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TELEX 12-6615 · CABLE NIKTIP (212) 233-2558

SPECTROGRAPHIC ESTIMATES

Report No. Date July 21, 1987

The following is our analysis of 2 sample(s) of Filings

TABLE I

	Sample A	Sample B
Iron	Major	Major
Silicon	0.X	0.X
Nickel	0.X	0.X
Manganese	0.X	0.X
Chromium	0.X low (0.11%)	0.X low (0.09%)
Copper	0.0X high	0.0X high
Molybdemum	0.0X high	0.0X
Aluminum	0.0X	0.0X
Vanaduim	0.0X low	0.0X low
Magnesum	0.00X high	0.0X low
Tin	0.00X	0.00X
Lead	0.00X	0.00X low
Titanuim	0.00X low	0.00X low

LUCIUS PITKIN, INC.

By

pg. 3 of 3.

NOTE: Major = above 5% estimated. Minor = 1.5% estimated. .X, .OX, .OOX, etc. = concentration of the elements estimated to the nearest decimal place – e.g. .OX = .01-.09% estimated. *= less than. NF = not found.
The numbers in parenthesis indicate the estimated relative concentration of the element among the various samples.
Detectability varies considerably among the elements and also depends upon the amount and nature of the sample, therefore, "Not Found" or NF means not detected in the particular sample by the technique employed.