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September 5, 2003

Administrative Judge Michael C. Farrar
Presiding Officer
Atomic Safety and Licensing Board Panel
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: CFC Logistics, Inc.
Docket No. 30-36239-ML
ASLBP No. 03-814-01-ML

Dear Judge Farrar:

Enclosed please find Petitioners' Brief in Reply to Staff Briefs.

Please note that the reference to Exhibit F on pages 11 and 12 should instead refer to exhibit E. There is no Exhibit F.

Thank you for your consideration in this matter.

Sincerely,

Robert J. Sugarman

RJS:mlg
Enclosure
cc: Stephen Lewis
Anthony Thompson

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SECY-02

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In matter of CFC LOGISTICS, INC. materials license application	:	DOCKET NO. 30-36239-ML ASLBP NO. 03-814-01-ML

PETITIONERS' BRIEF IN REPLY TO STAFF BRIEFS

INTRODUCTION

Petitioners hereby reply to the NRC Staff briefs filed on August 27, 2003 ("Brief") and September 3, 2003 ("Supplement"). The initial Staff brief supports Petitioners' standing to intervene, and also supports the germaneness of many of the issues. The Staff, however, challenges the germaneness of several concerns raised by Petitioners. As discussed in Section I below, the Staff's arguments are without merit. In addition, the Staff's Supplemental Brief provides erroneous information which, if credited, would undermine Petitioners' standing. This issue is discussed in Section II below.

I. THE CONCERNS RAISED BY PETITIONERS ARE GERMANE

The NRC Staff challenges the germaneness of Concerns: 1.7 - Ozone Dispersion, 1.8 - Installation and Assembly, 2 - Neighbors Security, 3 - Exposure to irradiation facility workers, 4 - Neighbors water dispersion, 5 - Transportation of hazardous

radioactive material, and 7 - General: Air, Water. They will be discussed in turn.

Analytically, the Staff conclusions substantially overlap around one fundamental error, but have other contributing errors. The one fundamental error is the Staff's acceptance of untried, unproven, and grossly inadequate design concept and operating mode, as essentially passive, essentially tight, and essentially certain not to leak into any water sources. Fundamentally, the staff errs because (a) the merits are not at issue herein, pursuant to 10 CFR Sec. 2.1205, and (2) even if they were, Staff's view is erroneous or in material dispute.

Again, as stated at the outset, and conceded by the Staff (Staff Brief, August 27, p. 10) this is an untried, untested facility, of unusually large dimension. As of 2002, the Commission stated that there were only ten facilities in the Country of 1,000 or one curies; this is a two-million curie facility.

The Staff analysis assumes a clearly unduly assumption of a best case scenario, of a highly conservative operator, in which all of the wishes and hopes of CFC and the operators are successful, and there is nothing untoward. Such is contrary to the history of most projects and new businesses, and in any event, cannot obviously be counted as gospel and as obviating any concerns. It is particularly <u>inappropriate</u> and erroneous where

the operator proclaims its own entrepreneurial "take risks" opportunistic philosophy. (Exhibit G). Clearly, this is an operator who can be expected to take risks, not avoid them.

This is particularly true where the Commission itself has acknowledged the inadequacy of such matters as to bond and security, both of which deal with undesirable circumstances, which are significant possible events as shown herein.

A. Concerns Nos. 3: Exposure to Irradiation; and 4: Neighbors Water Dispersion

In Section 3.1 and Section 4, the Staff opposes the use of past events at other facilities to support germaneness. The Staff's argument is totally unwarranted, since the purpose of the documentation was only to say "how that interest might be affected" (Section 1205) and not to prove it in this brief. The test is whether the interveners have "described an interest that might be affected", not whether they have pointed to something in the application. In fact, a major concern is that the application does not address these matters.

However for purposes of, information, without prejudice, the intervenors now state that material in the application suggests that there will be potential for water leakage and exposure of workers, for the reasons set forth in Resnikoff's affidavit. Further, supplementation based on review of the proprietary documents shows that there is no provision to prevent water leakage, and water will be available due to the interaction with

the groundwater table.

B. Concern No. 1.7: Ozone Dispersion

Ozone dispersion is opposed by the Staff (Brief, p. 7) on the ground that the issue as stated "provides no basis". The basis is general literature that irradiation facilities generate high levels of ozone. However, intervenors reassert that providing evidence is not required in order to "describe" how an interest might be affected, as required by Section 1205.

C. Concern No. 1.8: Installation and Assembly

The Staff argues that this area of concern was not admissible at that time. In light of the production to Petitioners of the information contained in previously withheld documents, and that Petitioners could avail themselves of the opportunity to address these concerns, after reviewing the previously withheld documents. (Brief, 7). Petitioners assert that the plans for assembly and installation have still not been made available at all, and therefore remain outstanding as a serious issue, as documented by the Resnikoff affidavit in support of the Stay Motion. (Para. 30-31). In particular, the refueling operation will present a serious possibility or probability of failure, due to the inadequate installation and assembly of the irradiation system; i.e., the failure to provide for safe access and for purposes of source installation and replacement. (Resnikoff Declaration to Stay Motion, para. 12-13).

As set forth by Graystar in the matter of Graystar, Inc., No. 01-07, the refueling operation for Cobalt 60 represents serious risks due to the nature of the material and the installations in which it resides. Applicant and Graystar have provided no information to rebut their own stated concerns about safety of Cobalt 60 due to installation and assembly features.

In the alternative, Petitioners will amend with the normal thirty day period to review the newly acquired documents, and will amend this area of concern accordingly.

D. Concern No. 2: Security

With respect to item 2.1, the Staff states that it determined withheld documents "are safeguard information - modified", which suggests that there are "modifications" which are being withheld. (Brief at 7). This is unacceptable, since it has been represented that there is no safeguard information. "Safeguard modified" implies that there has been a change in the furnished information from what the staff has available, and therefore, the information must be provided in its proper form, not "safeguard modified". Based on the information available, however, the intervenors assert that there are no provisions made for security in any of the areas described by Dr. Resnikoff and incorporated herein, and therefore intervenors' concerns remain significant, e.g., terrorist activities, seismic, accidental. Further, the Staff presentation on August 21 made it clear that

new regulatory provisions have been made to overcome inadequacies in existing securities plans. However, as set forth more fully in the Motion for Stay, which is incorporated herein, implementation of those plans has not been required at the CFC facility, and therefore may not be implemented for some unknown long period, no matter what implementation date is setforth. Moreover, the extent and nature of these security provisions has not been described or identified in any form available to intervenors. Therefore, the obvious security concern is a confirmed obviously a substantial risk, and should be allowed as an appropriate area of concern. (Section 2.2)

E. Concern No. 5: Transporation of Hazardous Radioactive Material

1. Section 5.1 - Accident

In its Brief, the Staff regard this concern as extremely generalized, but suggest the Petitioners raise this concern in this response after previously withheld documents are turned over. (Brief, 9). After reviewing these documents, Petitioners avail themselves of the opportunity to revisit this area of concern.

As to Section 5.1 - Accident, the Graystar proceeding, Nos. 01-07, as well as the Resnikoff affidavit clearly substantiate these concerns. Transportation concerns are not limited to loading or unloading, but general transit. The Resnikoff affidavit provides, as well as the Graystar representations in

the Graystar proceeding providing more than adequate description of what events may occur, how petitioners' interest may be affected.

Section 5.2 - Terrorism is substantiated by the lack of provision in the formerly withheld pages, and there are no emergency procedures of the applicant that have been provided.

The Staff contends that Petitioners' concern may be allayed by the production of previously withheld documents, and requests Petitioners to revisit this concern in this response. Petitioners avail themselves of that opportunity. Upon inspection of the documents in Petitioner's possession, it is clear that the application contains no information to suggest that security is sufficient to ensure that no such occurrence will take place. Contrary, there is a proliferation of operating personnel, with freedom of access to visitors, and thus, access to the irradiator is virtually uncontrolled. The potential for sabotage, together with inadequate security measures, creates an obvious risk to the public. (Resnikoff Declaration, Para. 6 (attached hereto as Exhibit A)).

In the alternative, Petitioners request a period of thirty days to review the newly acquired documents, and will amend this area of concern accordingly.

F. Concern No. 4: Water Dispersion

The Staff manifestly erred in its failure to review the soil

study identified in the Drawing submitted by CFC in response to a Staff inquiry on July 18, 2003. (Staff stated in Conference Call on September 2, stated that Staff did not have possession of the soil study). Obviously, if the Staff did not have possession, the Staff did not review it.

The soil study is a travesty, but provides significant information. It is valueless because it does no more than to conclude that the "PSI" (pounds per square inch) of the anticipated load is supportable by the soils. In itself, therefore, the soil study fails to demonstrate anything other than theoretical soil capacity to handle a theoretical load. It does not address at all the force-energy of a dropped weight.

The study does, however, discuss that the pit in which the facility will sit is flooded to several inches in depth! Moreover, neither the soil study nor any design identifies or provides any basis for doubting the conclusion that the water table is generally located several inches above the bottom of the pit. Therefore, the concern is the system will be continuously flooded, i.e., underwater, all or most of the time.

In addition, the inundation of the soils indicates the lack of stability in the surrounding soils. It also indicates the near certainty of dispersion into the water table of any radioactive leak from the facility! Due to the high water table in the area, contaminated water would immediately enter the

groudwater. (Resnikoff Declaration, Para. 3). This single concern, unconsidered by the Staff, clearly supports the germaneness of the intervenors' concern, where they had in fact already identified the high water table as a concern.

The Staff's failure to procure, consider, analyze and take into account the soil study is sufficient to disqualify the Staff's conclusion regarding germaneness of water concerns.

The soil study disclosure also supports, therefore, the obvious potential of dispersion.

The Staff's claim that the tanks will be reliable, it has ignored critical scenarios which could cause failure of the tightness, allowing dispersion of the radioactive materials into the water.

Dispersion is therefore a clearly germane concern.

Additionally, leakage through failure is documented as a germane concern through several scenarios.

a. Earthquake

The area is seismically active, there was a 3.5 earthquake within eight miles of the site on August 26, 2003. (Exhibit C). Earthquakes are not an insignificant likelihood, and history also shows that earthquakes are often followed by more severe earthquakes. The Quakertown area is located in the same geological formation, the Brunswick formation and Triassic Diabase formation in the Newark-Triassic Basin, as the location

of the quake; the Triassic Basin is a large rift basin, of the type in which geological activity such as earthquakes is predictable, because of the lesser strength of the crust and closer access to the mantle. In fact, diabase outcrops in the immediate vicinity of Quakertown attest to the geological disturbances associated with earthquakes and other emanations from the mantle. (Exhibit D).

b. Corrosion

Corrosion of the type experienced at Davis-Besse and Three Mile Island has occurred at other irradiator facilities, and the steel and concrete construction here is of the same type, though the plan is for the material to be kept in the dry water is associated with the operation, and there is little, if any, protection against water intrusion, and/or salt accumulation, to create the potential for corrosion.

c. Failure

Dr. Resnikoff also negates the Staff argument (Supplement of September 3, p. 2) that the facility is self-contained and can operate without active protective systems. By no realistic measure is the facility self-contained; rather, the facility is intrinsically connected with the environment both in and out of the plant, making it both vulnerable to disturbance; and likely to proliferate any leakage, since air and water contamination is quite plausible. (Resnikoff Declaration, para. 3,4). Moreover,

the facility plans provide no documentation as to any engineering or other studies which would substantiate that the two walls provide any additional degree of safety, especially in the absence of adequate lining monitoring, absence of safety officer from continual presence, and other innumerable potential degradation scenarios.

Leakage of radioactivity into the groundwater through any one of these scenarios or others, is thus an obvious potential. Moreover, it would clearly be a serious matter, since most of the intervenors are on well water in the same aquifer as that underlying the facility. Because of the underlying soils and topography, there would be wide dispersion in a small area, and little dilution, relative to other situations. (The water table in the Quakertown area is a partially confined aquifer due to the underlying clay under soils and relatively impervious rock formations). (Exhibit E). These conditions have created the high water table, and spread the water, where there is no clear direction of flow. In evaluating a Superfund Site, in the vicinity of the CFC facility, and in evaluating the transport of hazardous materials to nearby properties, EPA and its consultants have documented the lack of clear groundwater flow direction associated with retention; indeed, much of area is known as the Great Swamp, attesting to the retention of water in the area, and the susceptibility of the water supply to contamination. (Exhibit

F).

Thus, the water risk in itself is germane, obvious, and significant.

In the alternative, Petitioners request a period of thirty days to review the newly acquired documents, and will amend this area of concern accordingly.

F. Concern No. 7: General - Air, Water (Decommissioning)

Petitioners will submit a petition for the waiver of the regulations, in light of the Staff's concession at the hearing of August 2003, regarding the inadequacies of the facility.

The Bond issue is erroneously refuted by the Staff. In the event that the facility is not commercially successful, there may be a lack of commitment to decommissioning and a lack of resources to accomplish it. As in NMI, in Massachusetts, the Commission does not accept responsibility for protection and clean-up. Accordingly, the consequence of economic loss will be the deterioration without controls of the facility, since the bond requirement is only $75,000 and the cost will be multiples of $75,000 (over $5,000,000 in the NMI case). There is every reason to be concerned and predict commercial failure; since there is no clear market for irradiated food, and much resistance, since customers are unlikely to pay significantly more for irradiated food when they do not want it in any event.

The Staff brief (Brief, pp. 10-11) urges rejection of the

concern regarding the decommissioning. Clearly, the staff misinterprets Section 1205(e) in requiring substantiation at this time. Section 1205(e)(2) only requires that the requests "describe how that interest might be affected", and does not require proof. Intervenors previously pointed out that substantiation is not an issue at this time, the Staff has not justified its position requiring that the Board deferred to its determination. In addition, applicant refers the Board to the partial transcript of the August 21 hearing (attached to the Motion for Stay), wherein the Staff substantiates that the present decommissioning bond procedures are inadequate and are being revised. Therefore, to the extent necessary, the allegation here shall be read as embracing the argument (newly emerging due to the staff statements) that the existing procedures are inadequate, insofar as the staff relies on them.

The staff opposes consideration of unshielded condition of the Cobalt 60 sources, on the grounds that "CCMT has the burden at this stage to allege a reasonably believable event that could cause the loss of the double encapsulation of the sources". (Brief at 11). This staff's proposed burden is unreasonable, as applied to a situation where the facility description was not available to CCMT when it made its submission. Further, substantiation is not required at this stage, and "a reasonably believable event", in staff's view, is beyond the obligation of

the regulation. In the alternative, however, the affidavit in support of the Stay Motion by Dr. Resnikoff provides any necessary substantiation, in showing that due to the lack of provisions, and the both clear potential for terroristic or other breach, there are "reasonably believable" events. (Declaration of Resnikoff, Filed with Stay Motion, para. 26-27). This would include, but not be limited to the type of accidents specified by Dr. Resnikoff, as well as other illustrations set forth in attachment hereto.

The glib assumption that the double wall containment will be unbreachable is naive and ignores the myriad potential for operator error, operator neglect, and seismic events, addressed hereinabove.

II. STANDING WRONGLY AFFECTED

In these circumstances, satisfying the requests of standing, i.e., in the range of potential injured persons, effectively satisfies the need to "describe in detail" how the intervenor might be affected (Section 1205(e)), and therefore precludes cutting off the issue based on simple assertions. Instead of looking at the issue as intervenor's burden to show a "reasonably believable" (by some third party) scenario, the burden is met at the hearing level by the evidence as to "reasonably believable". Thus, Staff's effort to cut off this issue is premature. The Staff itself acknowledges that "assuming three simultaneous

independent failures was not "irrational"" (Brief, p. 3, citing Georgia Institute). If it is "not irrational", then it "might be effective" (Section 1205(e)). The Staff's effort to put a gloss of "reasonably believable" is without support and in the regulations, and contrary to them.

In its Supplemental Brief, the Staff argues that there is no obvious potential for off-site consequences. The facts, and the law, e.g., Georgia Tech, demonstrate quite the contrary.

According to the Declarations of Dr. Marvin Resnikoff, there exists the potential of an extremely high dose rate from one unshielded source. (Declaration, para. 3). Additionally, the potential of dire consequences to the air and water that would result from liner damage in the event of a cask drop accident are obvious. (Declaration, para. 4). The possibilities of off-site release are also great in the event of an electricity accident, sabotage, or security breaches. (Declaration, paras. 5-7). Dr. Resnikoff declares that the irradiator poses an obvious potential for serious off-site risks to the health and safety of the surrounding public. (Declaration, para. 8).

Additionally, NRC precedent supports Petitioners claim of standing in this case. The Commission's decision in In the Matter of Georgia Institute of Technology, 42 N.R.C. 111 (1995) directly identified examples of "obvious potential", which are dispositive here:

> Here, for threshold standing purposes, the Board found it neither "extravagant" nor "a stretch of the imagination" to presume that some injury, "which wouldn't have to be very great," could occur within 1/2 mile of the research reactor. The Board noted that Georgia Tech's own SAR describes accident scenarios in which noble gases could be dispersed beyond the reactor site. Under questioning by the Board, the GTRR's director conceded that noble gases <u>would escape the steel containment building if the reactor core melted. Georgia Tech stresses that such hypothetical scenarios described in the SAR are simply "incredible" because they would first require three independent redundant safety systems to fail.</u> The Board, however, was not convinced that a combined failure of three systems altogether strains credibility. The Board's view is not "irrational." At the threshold standing stage, the Commission will not disturb the Board's presumption that some injury could occur within a 1/2 mile radius of the reactor. (citations and footnotes omitted)(emphasis added).

(42 N.R.C. at 117).

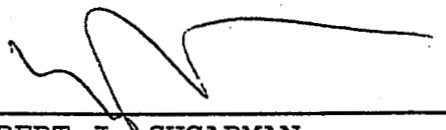
The Staff's contention that there is no obvious potential for off site consequences is contrary to <u>Georgia Tech</u>. It is based on the Staff's trying to determine the merits, and define the issue by its (over optimistic) assumptions as to likely adverse events; assumptions which have proven over optimistic in many previous cases. This contention that "the paths of nature of these systems makes them generally more reliable than active systems" is totally unsubstantiated as a basis for eliminating such concerns; or even in relative terms as applied to these instances. The failures at both Three Mile Island and Davis Bessie were failures of relatively passive systems, as were the failures such as NMI. While it is potentially true that at any

given moment, a more active system will likely fail than a more passive system; logically consideration must also be given to the fact that passive systems tend to remain in place permanently and constantly, and therefore the lower instantaneous risk builds up to equal or match that of active systems. In fact, the relative instantaneous reliability is totally irrelevant to the issue; indeed, the relativity of "more reliable" is itself irrelevant, since the issue is not which system is more likely fail, but whether either one represents "an interest that might be affected", descriptively, staff words like "is not expected", or (supplemental brief, pg. 3) "unlikely" (supplemental brief, pg. 2) are irrelevant to the issue of whether there is a "obvious potential for off site consequences". "Obvious potential" does not address degrees of probability, but rather obviousness of potential. To be excluded, the risk must be "irrational". As previously stated, these matters are appropriate to be addressed at the hearing, the hearing should not be denied based on uncertainty as to the extent of proof and/or the degree of probability of any one adverse incident.

CONCLUSION

All issues and standing should be allowed.

Respectfully submitted,



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Dated: September 5, 2003

September 5, 2003

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of	)	
	)	Docket No. 30-36239-ML
CFC LOGISTICS, INC.	)	
	)	ASLBP No. 03-814-01-ML
(Materials License)	)	

DECLARATION OF MARVIN RESNIKOFF, Ph.D. REGARDING THE QUESTION WHETHER FACILITY CONSTITUTES A SIGNIFICANT SOURCE WITH OBVIOUS POTENTIAL FOR OFF-SITE CONSEQUENCES

Under penalty of perjury, I, Dr. Marvin Resnikoff, hereby declare that:

1. I have filed a declaration in support of the Petitioners' motion for a stay in the proceedings. The declaration contains a statement of my credentials and a list of issues as to why the proposed facility poses irreparable harm to the petitioners. Many of the addressed issues also relate to the presiding officer's question whether the facility constitutes a significant source with obvious potential for off-site consequences. Rather than repeat the statements in my stay declaration, I will reference and summarize the pertinent paragraphs from the non-confidential stay declaration. The paragraph numbers below refer to the stay declaration.

2. The staff and I agree that the facility contains a significant source. We disagree, however, about the question of whether the proposed CFC Logistics plant poses an obvious potential for serious off-site risks to public health and safety.

3. The obvious risks posed by the CFC Logistics facility are discussed in my declaration in support of Petitioners' stay motion. In ¶20, for instance, I discussed the extremely high dose rate from one unshielded source, yielding an LD50 dose in less than one minute.

4. In ¶¶13 through 17, I discuss the potential for a cask drop accident and the consequences. Co-60 would be released to the water and the air. If the liner were damaged, contamination would enter the groundwater. In ¶18, I discuss the fact that the water table is very high at the proposed irradiator. In ¶19, I discuss the fact that the applicant does not have adequate emergency procedures for responding to such an accident.

5. In ¶¶21 through 24, I discuss a loss of electricity accident. The applicant does not appear to have an emergency generator. My main concern here is that the sources could overheat and damage the sealed tubes and the plenum, contaminating the air, leading to a major off-site

EXHIBIT
A

release. The applicant has not correctly modeled the plenum containing one million curies of Co-60 in air, but instead appears to have modeled one 17,000 Ci source in water.

6. In ¶¶26 through 28, I discuss a shipping accident and the potential for sabotage. This would also lead to a major off-site release of Co-60.

7. Finally, in ¶10, I discuss the potential for sabotage of the proposed facility and the inadequacy of security arrangements. This is discussed in more detail in the supplemental confidential declaration I submitted.

8. In my best professional opinion, due to all the problems in CFC's application as discussed above, the operation of the proposed CFC Logistics irradiator poses an obvious potential for serious off-site risks to the health and safety of the surrounding public.

9. If the petitioners' concerns are admitted for litigation, I would testify regarding my opinion in support of their conclusions. The technical facts and analyses described in this declaration and the associated stay declarations provide an abstract of the testimony I would give, based on the information that has been furnished to date. I would expect to be able to expand upon and refine my testimony, after having an opportunity to review materials produced by CFC and the NRC Staff in discovery.

I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed on this 5th day of September, 2003.

Dr. Marvin Resnikoff, Senior Associate
Radioactive Waste Management
526 West 26th Street, Room 517
New York, NY 10001
Phone (212) 620-0526

UNITED STATE OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of CFC Logistics, Inc. Materials License Application	)))))	Docket No. 03036239 ASLBP No. 03-814-01-ML

DECLARATION OF MARVIN RESNIKOFF, Ph.D. IN SUPPORT OF PETITIONERS' MOTION FOR A STAY

Under penalty of perjury, I, Dr. Marvin Resnikoff, hereby declare that:

1. I am a physicist with a Ph.D. in high-energy theoretical physics from the University of Michigan and also the Senior Associate of Radioactive Waste Management Associates (RWMA), a private technical consulting firm based in New York City. I have researched radioactive waste issues for the past 29 years and have extensive experience and training in the field of nuclear waste management, storage, and disposal. RWMA works, among other areas, primarily on three subjects: transportation and storage of radioactive waste and materials, radiation induced injuries, and decontamination and site remediation of radioactively contaminated facilities. A copy of my resume is attached to this declaration as Exhibit A.

2. I have considerable training and experience in the field of risk assessment involving nuclear and hazardous facilities, serving as an expert witness in numerous personal injury cases in which I estimated radiation doses and the likelihood these exposures caused cancer. These cases involved uranium mining and milling, oil pipe cleaning, X-rays, thorium contamination and other issues. This work involved the use of computer codes, such as CAP88PC, RADTRAN, RESRAD, RISKIND, MILDOS and HOTSHOT, and spreadsheets employing dose conversion factors, to estimate radiation doses.

3. A paper on decommissioning reactors I wrote in 1976 (*Environment*, December 1976) was the first to show that reactors would remain radioactive for hundreds of thousands of years. The importance of our discovery was noted by *Science* magazine in 1982, which is attached hereto as Exhibit B. As part of our work analyzing radioactive waste shipments to low-level waste facilities and waste impacts of the nuclear fuel cycle, I have stayed up-to-date on the decommissioning literature, including more recent NRC reports.. I reviewed decommissioning reports for the Rancho Seco reactor in California, the Big Rock Point reactor in Michigan, the Yankee Atomic reactor in Rowe, Massachusetts, and the Connecticut Yankee reactor in Haddam Neck, Connecticut.

4. In addition RWMA has conducted technical analyses for public interest groups and local governments at each of the proposed low-level waste disposal facilities across

EXHIBIT
B

the country, including Martinsville (IL), S. Windsor (CT), Chatham County (NC), Hudspeth County (TX), Ward Valley (CA) and Boyd County (NE). In the process of conducting these analyses, we have examined and used the computer programs MODFLOW, PRESTO-CPG and IMPACTS, used to estimate groundwater flow and risk due to radioactive materials. I served as project manager and focused on the risk assessment sections of our reports.

5. RWMA is involved in several major personal injury cases involving radiation due to uranium mining and milling operations, and oil pipe cleaning operations (NORM). We also serve as technical advisors to the States of Utah and Nevada on issues involving transportation, handling and storage of irradiated fuel.

6. I have previously assisted a local group in Dickerson, MD regarding Neutron Products, Inc., a company that processed Co-60 into specific forms for irradiation devices.

7. I am one of the Petitioners' expert witnesses in support of its petition to intervene in this hearing, which relates to the Materials License Application proposed by CFC Logistics, Inc. for a Genesis Irradiator in Milford Township, Pennsylvania. I participated in the drafting of Petitioners' issues of concern.

8. To prepare this affidavit, I reviewed CFC Logistics' Materials License Application, and other filings in this NRC docket, including the Staff's Request for Additional Information. I am also familiar with NRC regulations and guidance documents related to this application.

9. In my best professional judgment, residents of Milford Township and the petitioners would suffer irreparable harm if the NRC license were granted. This declaration discusses the basis for this conclusion.

10. **Security.** In a public meeting held on August 21, 2003, the NRC stated that it has not yet required CFC Logistics to implement new security measures that the NRC is requiring as a result of the September 11, 2001, terrorist attacks on the World Trade Center and the Pentagon. A partial transcription of that meeting is attached to Petitioners' stay motion. At the meeting, the NRC Staff also stated that CFC Logistics would not be required to implement these new measures until December. It is well-known that Cobalt-60 is an attractive target for terrorists, because it can be used to make dirty bombs. It is also well-known that in general, nuclear facilities are a target of the Al Qaeda organization. Cobalt-60 irradiation facilities are a particularly attractive target, because of their relatively low level of security. If Cobalt-60 were stolen from the proposed facility, or if the facility were attacked, Cobalt-60 could be released into the environment, causing significant adverse health effects and spreading contamination that would be expensive to clean up. Therefore, in my professional opinion, allowing the CFC Logistics facility to operate, before these new security measures have been implemented, poses an unacceptable risk of irreparable injury to the neighbors of the proposed facility. It is also possible these

new security measures are inadequate and it is not clear if they also pertain to transportation, or just to fixed facilities.

11. **Loading and Unloading Equipment and Procedures.** RWMA serves as a technical consultant to the States of Utah and Nevada regarding the transportation, handling and storage of irradiated reactor fuel. The safety issues raised by handling and storage of Co-60 are similar to the safety issues raised by handling and storage of irradiated reactor fuel.

12. Based on my experience with loading and unloading irradiated fuel, this stage is the most precarious and susceptible to a major accident if the equipment, training and emergency procedures were not up to this difficult task. For similar reasons, I believe the loading and unloading of Co-60 at the proposed irradiation facility will be precarious and susceptible to a major accident. According to the license application, a shipping cask containing 200,000 Ci of Co-60 sources would be inserted into the pool. Sources would be removed and placed underwater on one side of the pool, away from the cask. The plenum would be removed before this operation. As the shipping cask, which could weigh upwards of 25 tons, was removed from the pool, it could drop onto the sources, seriously contaminating the pool water. This contamination would have to be removed with ion exchange columns that would become extremely radioactive. The steel-liner of the pool would become radioactive. Some of this radioactivity could be released to the sanitary sewers and the air. The application contains no details about the type and weight of the cask, how the cask is unloaded from the trailer bed and how the cask is attached to the crane and lowered into the water.

13. In 1980 a shipping cask containing irradiated fuel from the Connecticut Yankee reactor overheated, and contaminated the Battelle Columbus Laboratory fuel pool with fission products and Co-60. The contamination in the pool set off the air monitors, and led to major radiation exposures. On the basis of this accident, on behalf of the Sierra Club, I petitioned the NRC to inert all transportation casks, so the contents would not oxidize. While the petition was ostensibly denied, the NRC did order all shippers to inert shipping casks with helium or nitrogen. The physical and chemical properties of irradiated fuel are admittedly different from Co-60 sources at CFC Logistics, but the possibility of radioactivity becoming airborne in an accident is similar to what may occur at CFC Logistics. If the Co-60 sources were damaged in an accident, Co-60 could become airborne and be released to the external environment.

14. To protect against a cask drop at nuclear reactor fuel pools, the cranes at nuclear reactors are designed to be single failure proof. Further, at nuclear reactors, the crane is designed such that shipping casks can never be moved over irradiated fuel. A cask drop at a nuclear reactor is therefore extremely unlikely. In contrast, there is no indication in the CFC Logistics license application that the crane used to lower the shipping cask into the pool is single failure proof, or that a cask could not be moved over the Co-60 source in the pool. If the crane were to fail for any number of causes (electricity outage or earthquake, both of which have happened in the last

two weeks)[1], a cask drop could break the sealed source containers and expose the Co-60 to the pool water, similar to the Battelle accident.

15. A cask drop accident could occur during loading of Co-60 into the proposed facility. It could also occur during removal of the sources from the pool. If the sources were bent out of shape it might not be possible to return them to the shipping cask for removal.

16. As far as can be ascertained by the application, the crane is not designed to stop where the sources are located since it is the same crane used to move product over the entire pool.

17. In my opinion, a cask drop accident could seriously contaminate the pool and lead to water contamination and air contamination that could be ventilated to the external environment. Given that some residents live as close as a quarter mile from the proposed facility, the resulting contamination could have significant adverse effects on public health. It would also be very expensive to clean up. Similar to operations at Neutron Products Incorporated (NPI) in Dickerson, Maryland, where Co-60 material was shaped to fit different irradiators, Co-60 released to the environment could lead to a significant direct gamma dose, and would be expensive to decontaminate. At NPI, despite the presence of HEPA filters to capture particulates, Co-60 was found off-site; the direct gamma dose rates were five times NRC regulatory limits. Therefore, I consider the potential for a cask drop accident to pose a serious risk of irreparable harm.

18. The issue of water contamination is a serious matter at the proposed irradiation facility. The water table at the proposed irradiation facility is high. While the foundation was being excavated for the "cold storage facility," "approximately 4"-8" of ground water (appeared) in (the) bottom of (the) hole."[2] Should an accident occur that causes a leak in the pool, such as a shipping cask drop that cracks the pool liner and concrete, contaminated water from the pool would immediately enter groundwater. Many homes in the vicinity of the proposed irradiator have private wells that tap into the local aquifer.

19. Further, the application has no emergency procedures for accidents that may occur during loading and unloading sources. This is contrary to 10 CFR §36.53(b)(3) and (4). The emergency plans, such as they exist, call for phoning the radiation safety officer (RSO), who may or may not be located in Quakertown. The RSO may be located in NJ, at other irradiation facilities, where she may also serves in a similar capacity. It is unlikely that the RSO could direct the emergency response effectively from a remote location. In addition, the application contains no emergency

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[1] During the week of August 11, 2003, a failure in the grid system caused the largest power blackout in history. Electric power was lost to large portions of the northeastern United States and eastern Canada, and 50 million people were without electricity. On August 26, 2003, a magnitude 3.8 earthquake shook eastern Pennsylvania and portions of New Jersey.

[2] Field Inspection Report, Cowan Associates, Inc. (February 12, 2003). This document was attached to CFC Logistics' February 25, 2003, license application, and is available on ADAMS.

procedures for remedying a cask drop accident. There are no phone numbers for police, or fire and ambulance; nor is there any indication that they would know what to do, as there is no provision for training or drills, contrary to 10 CFR §§36.51(d)(6) and (g).

20. A drop of a 25-ton shipping cask or an earthquake could also damage the pool lining, causing a loss of shielding water. This would greatly increase the radiation dose rate. To put the amount of radiation in each source in perspective, a person standing one meter from an unshielded **one** curie source of Co-60 would receive a dose of 1.37 rem/hr, using specific gamma-ray dose constants.[3] That is, each 17,000 unshielded curie source yields an LD50 dose in one minute. The Genesis irradiator can hold up to 256 sources, or 4.35 million curies[4]. This accident is not discussed in the application.

21. **Loss of electricity.** Contrary to 10 C.F.R. §36.53(b)(6), the licensee has no emergency procedures for accidents involving a prolonged loss of electricity. Without clear measures for recovering from a prolonged loss of electricity, the safety of neighboring members of the public cannot be assured.

22. The licensee does not appear to have an emergency electric generator in case of an extended power failure.

23. Moreover, the license application does not analyze the range of accidents that could be caused by a loss of electricity. While the application does discuss the possibility of the loss of electricity supply in terms of overheating of sources, other credible accidents are not considered. For instance, movement of product near the plenum containing Co-60 sources occurs under bells inserted under water; the bottom of the bell is open, but water cannot enter due to a compressed air supply. In the event that power is lost while a bell is underwater, the product could become water-logged and distribute itself within the pool, thereby clogging the filters and the water circulation system. In the changeover to new filters, Co-60 could bypass the containment system and be released as wastewater. The applicant does not discuss this potential accident, or any procedures for recovering from this loss of electricity accident in which product floats in the pool.

24. Moreover, in discussing the possibility of the loss of electricity supply in terms of overheating of sources, the application fails to provide specific information regarding the heat rate and the number of hours until the source cladding degrades. The application does contain discussion of the heat rate for one source in a pool of water and for 145,000 Ci in a shipping cask, but not for one million curies of Co-60 in a plenum, the situation at CFC[5]. The application should contain detailed information on how rapidly the sources will heat up and the consequences of overheating. This information is needed to know how long the electricity may remain off before a

---

[3] Shleien, B *et al, Handbook of Physics and Radiological Health*, Williams and Wilkins, Baltimore, 1998, Table 6.2.2

[4] The applicant has requested a license for one million curies.

[5] Letter from RN Stein, Gray*Star to S Turner, CFC Logistics (April 18, 2003).

serious accident ensues. In the event of overheating, the cladding around the sources could fail, contaminating the air and overloading the HEPA filters. Co-60 could be released to the external environment.

25. **Damaged air line.** Contrary to §36.53(b)(4) and §36.63(a), the licensee has no emergency procedures for accidents involving a break in the compressed air line. This would allow water to enter the bell, and would degrade the product, similar to the discussion in Para. 23.

26. **Transportation accidents: safety and environmental impact.** Cobalt-60 sources, in transit from Canada or Russia to the CFC Logistics plant, would not be well-protected from a terrorist attack. The NRC does not require armed escorts for Co-60 sources. Yet, potential saboteurs have significant fire power at their disposal. The TOW2 and MILAN anti-tank missiles have a range of one km and can penetrate one meter of steel, far more steel and lead than the walls of a shipping cask. The newer Russian Koronet missile, used by Iraqi armed forces, can penetrate 1.2 meters of steel and can be aimed precisely at a distance up to 5 km. These weapons have the ability to penetrate a shipping cask and disperse its contents. NUREG-0170, that the applicant cites in supporting its safety assurances, is silent on these safety and security issues.

27. A Cobalt-60 cask shipment, attacked within a city, could cause major environmental pollution and cancer fatalities. Local residents would clearly have a greater risk than other persons: while shipments could leave Canada or Europe by a number of routes, once they get close to the facility, the route options are more limited. Such an accident would subject the residents of Milford Township to irreparable harm. In addition to significant adverse health effects caused by contamination, such an accident would have significant economic impacts, and would seriously disrupt the affected communities. Based on an analysis done for the State of Nevada, it is reasonable to estimate that the decontamination due to an accident involving a spill of 200,000 curies of Cobalt-60 costs could easily exceed $1 billion.

28. The environmental impact of shipping Co-60 sources has not been seriously investigated by the applicant, nor the NRC, and is a major deficiency of the application. The applicant downplays the possibility of a transportation accident and security concerns involving transportation, citing a 1976 environmental report by the Nuclear Regulatory Commission, NUREG-0170. But this study, which was inadequate in 1976, is now hopelessly out of date in all relevant respects.

29. **Decommissioning Funding and Liability Insurance.** The applicant has offered the minimum $75,000 financial assurance for decommissioning, but this would clearly be inadequate if a major accident were to occur. Nuclear reactors are insured for billions of dollars under Price-Anderson, but CFC Logistics does not appear to be insured for credible accidents. Therefore, it does not appear that CFC Logistics will have sufficient funds to clean up after any accident that may occur.

30. In my best professional opinion, due to all the problems in CFC's application as discussed above, the operation of the proposed CFC Logistics irradiator poses serious risks to the health and safety of the surrounding public, because CFC Logistics, Inc. has not provided for adequate protection against accidents at the facility. Local residents would suffer significant and irreparable harm if a major accident were to occur.

31. If the petitioners' concerns are admitted for litigation, I would testify regarding my opinion in support of their conclusions. The technical facts and analyses described above provide an abstract of the testimony I would give, based on the information that has been furnished to date. I would expect to be able to expand upon and refine my testimony, after having an opportunity to review materials produced by CFC and the NRC Staff in discovery.

I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed on this 4th day of September, 2003.

Dr. Marvin Resnikoff, Senior Associate
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INSIDE

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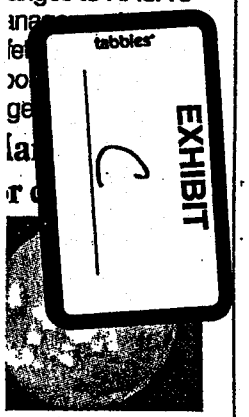

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Earthquake jolts regio

It was only a minor temblor, but it was enough to frighten people not used to the experience. No major damage or injuries were reported.

BY PATRICK LESTER
AND HILARY BENTMAN
Staff Writers

An earthquake shook buildings and caused brief panic in towns along the Delaware River in Upper Bucks County and New Jersey Tuesday, leaving behind no major damage or injuries but rattling plenty of nerves.

The 3.8 magnitude quake, an unusual event in this region, was centered about 1 mile south of Milford, N.J., near the Pennsylvania border, in Hunterdon County, about 30 miles northwest of Trenton.

It was felt in neighborhoods as far south as Warrington and as far north as Bethlehem.

"At the top of the Milford hill, it felt like an explosion," said Milford's emergency management coordinator, Henry Schepens. "In town it felt more like a shaking."

The 2:24 p.m. temblor lasted only seconds but was enough to prompt numerous calls to emergency officials from worried residents along the Delaware River, some reporting plates and curtains being knocked down.

Dottie Schurr felt the floor beneath her shake as she worked inside Swamp's Auto Body & Collision on Route 611 in Nockamixon, more than 35 miles from where the quake happened.

"I was waiting for someone to rock my world, but not an earthquake," the Doylestown woman said. "I thought something hit the building. To find out that it happened in New Jersey amazes me that we felt it this far away."

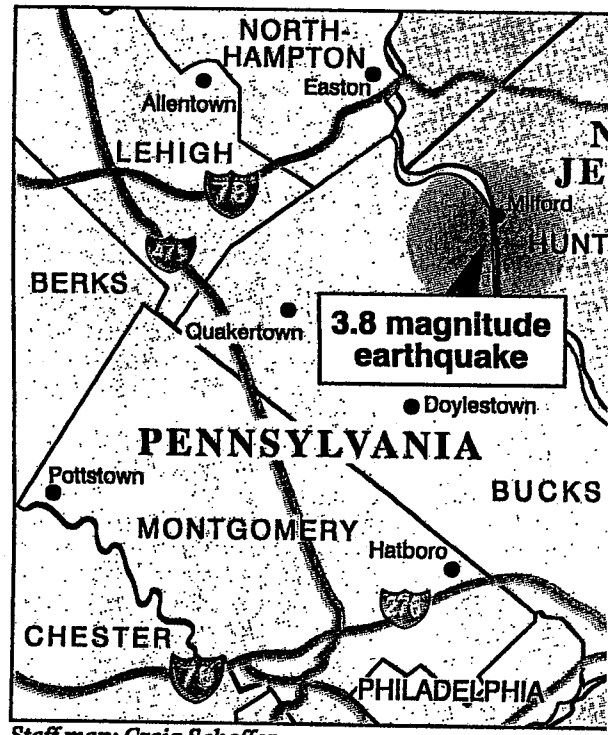
Some were amazed that it happened here.

"There are very few earthquakes in that area," said Waverly Person of the U.S. Geological Survey's Earthquake Information Center. "I think when you talk to people worldwide, people in Alaska, California, Washington state, these earthquakes happen quite frequently.

"In the East, it's so far and few between. And there has been nothing of any significance (in this region)."

The earthquake information center received reports of the quake from at least 200 people from 60 towns. Most of the calls from this area came from Upper Black Eddy, Pipersville, Ottsville, Erwinna and Doylestown. Geological survey officials said aftershocks were unlikely

See **QUAKE,** *Page* **A 2**



Staff map: Craig Schaffer

A matter of life and death

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Quakertown, PA 18951
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e fax.....(215) 538-6375
s.....(215) 538-6367

Horsham office
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HERE TO CALL

ers to the editor
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k Fences

Quake

Continued from Page A 1

but would probably be too mild to be felt anyway.

Linda Wieand, Tinicum Township's manager, fielded many calls from people wondering what happened. "Most people (who called the township building) were elderly and were just really frightened and needed a reassuring voice."

Bucks County's emergency phone lines were clogged during the afternoon, but no crews were dispatched for earthquake-related injuries or damage, according to county spokesman Ron Watson.

"At this point, we're all ears," he said about an hour after the quake, "but it doesn't appear to be something more than dinner conversation."

One person in this region reported cracks in the walls inside his house. The Geological Survey's Person found that hard to believe. Earthquakes don't begin to cause minor damage until they reach magnitudes of 4.0 to 4.9, he said. But it wasn't surprising that people felt the earth shake over such a large area. A 4.0 magnitude quake in this part of the country can be felt as far as 60 miles from the epicenter, Person said.

Those in the range of 3.0 and 3.9 generally are noticeable to people indoors and have vibrations similar to those caused by a passing truck. To put Tuesday's event in perspective, Person's agency documents about 50 quakes on an average day.

An earthquake is a sudden slip on a fault within bedrock and a ground-shaking event caused by stress changes in the ground. There are ancient faults all over the Eastern United States, and some experts theorize that plate tectonics might be causing stress on those faults, according to the Geological Survey's Diane Noserale.

Although earthquakes occur less frequently on the East Coast than the West Coast, small temblors happen here about every two to three years. Moderately damaging ones happen approximately twice a century.

"(The East Coast) is really not an active boundary, but one of the ideas is that some of the ancient faults might be regenerated from stress," she said.

The last quake in the area of Tuesday's event happened in 1986 and measured in at 2.8, Person said. Previous quakes of similar impact were felt in 1983 and 1980.

The most potent earthquake recorded in the United States was a magnitude 9.2 that struck Prince William Sound, Alaska, in 1964, according to the Geological Survey. The largest quake recorded in the world was a 9.5 in Chile in 1960.

Tuesday's quake will turn out to be a blip in the area's history, but it was significant enough for Bernadette Decker, a 16-year Nockamixon resident. She was sitting at her kitchen table when she heard a big bang. "It felt like a tree had fallen in the house," she said. "It was shaking and then it happened again. It was pretty scary. I can't imagine how people in California must feel."

"That was the longest four seconds of my life," said Nancy Dilliplane-Herr, the in Ferndale. "It was frightening as it was have no interest in California now. I wa to move when I want

The Associated tributed to this repor

Patrick Lester can be co e-mail at plester@phillyt

Staff photo by Laurence Kelly

Doylestown resident Dottie Schurr felt the floor beneath her shake as she worked inside Swamp's Auto Body & Collision on Route 611 in Nockamixon, more than 35 miles from where the quake happened.

Quake history in the region

The region is no stranger to earthquake... At have been reported in the past 23 years.

- **March 1980:** A minor earthquake shook Eas Montgomery County. It was felt in Bucks Cou well, causing confusion among residents and seismologists. Scientists said the quake, which measured 3.0 on the Richter Scale, was cente Abington-Willow Grove area.
- **April 1982:** A slight earthquake rumbled and under Lower Bucks County and Northeast Phi The minor quake, said to have originated in th Huntingdon Valley Fault, registered between 2 3.0 on the Richter Scale. No injuries were repo
- **April 1984:** An earthquake measuring 4.1 on t Scale shook homes in Lower Bucks from Bens through Southampton to Middletown Townshi about 20 seconds. The quake sparked a barra phone calls to police but caused no damage.
- **January 1994:** Earthquakes in Reading touch minor trembling in the region. Some 33 hours devastating quake hit the Los Angeles area, ca massive damage. The two were unrelated, a s said.

plate

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EXHIBIT
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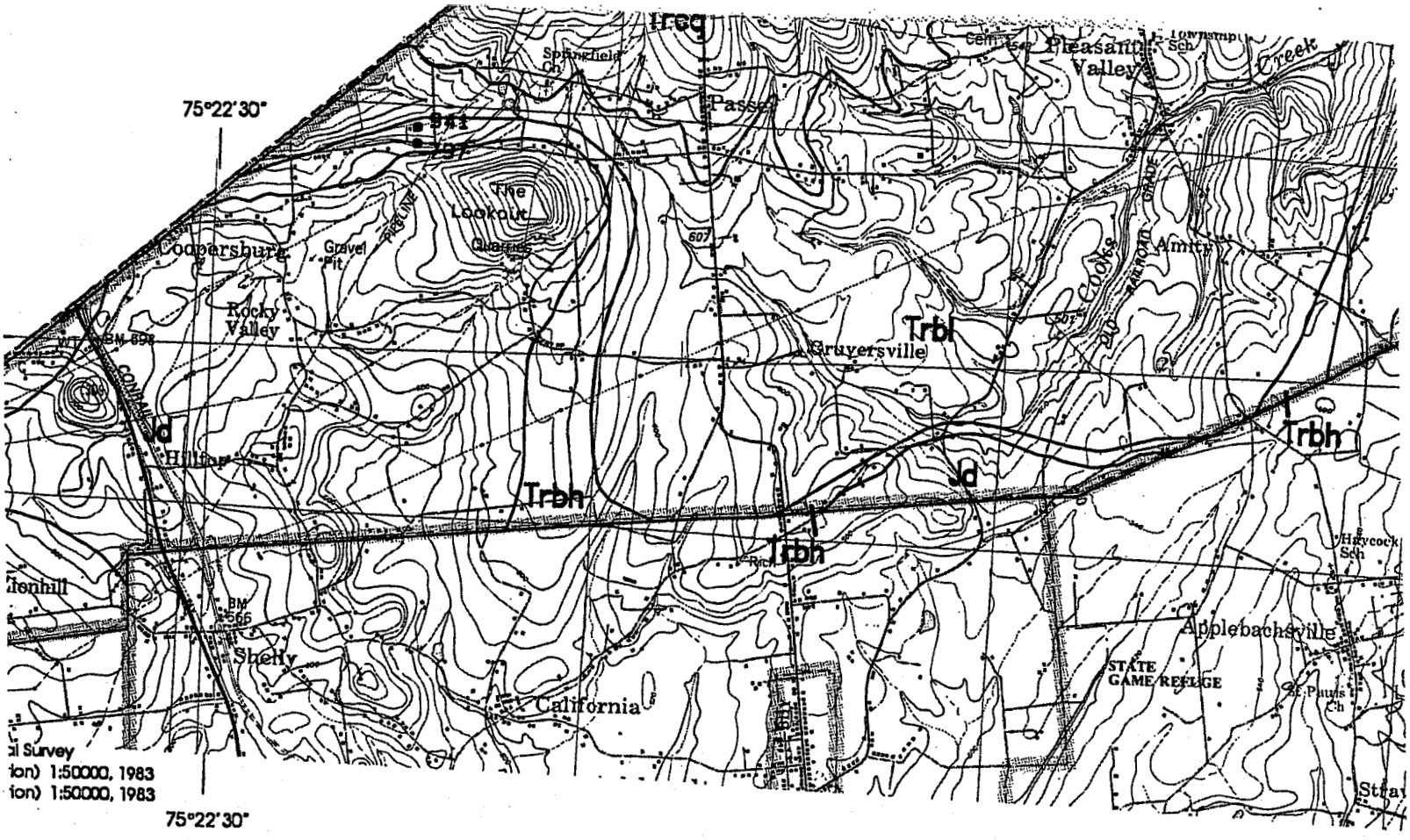


EXPLANATION

ORRELATION OF MAP UNITS

Qd	QUATERNARY
Jd	JURASSIC
Trcq, Trbl, Trbig, Trbigh, Trl, Trlr	TRIASSIC

DESCRIPTION OF MAP UNITS

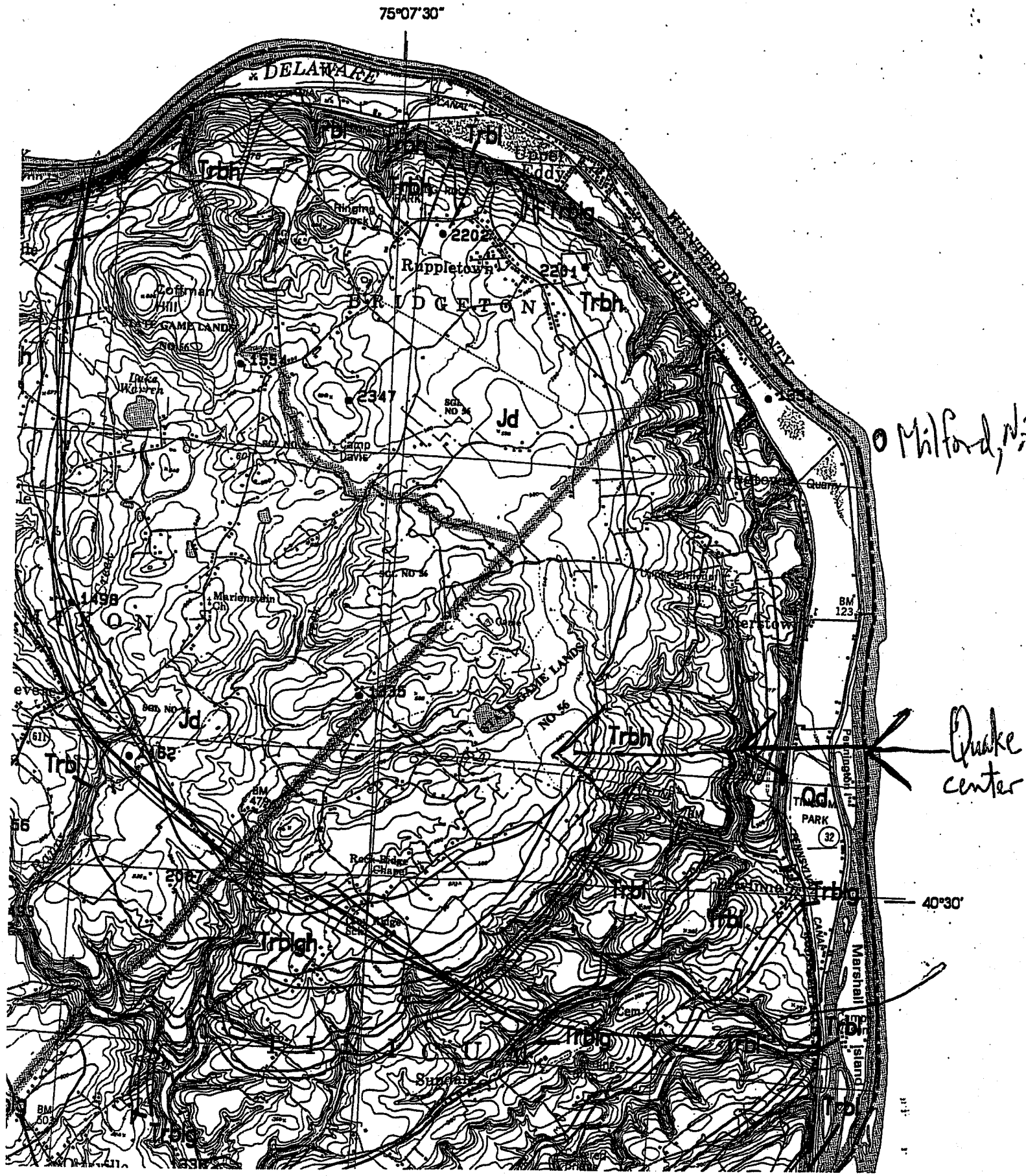
Qd — **ALLUVIUM AND GLACIAL OUTWASH** - sand, and gravel along streams; stratified sa of fluvio-glacial origin, probably of Wisconsin remnants of glacial deposits older than Wisc

Jd — **DIABASE** - Dikes, sheets, and sill-like intru black, fine- to coarse-grained (except very fin chilled border) diabase composed largely of ca augite. Larger bodies interpreted as discorda ringlike outcrop patterns.

Trcq — **QUARTZITE CONGLOMERATE** - Rounde boulders, as much as 1 foot long, of white, ligh quartzite, and lesser calcareous sandstone in arkosic siltstone. Source from Silurian rocks t becomes finer grained southward. About 1,000

Trcl — **LIMESTONE CONGLOMERATE** - Subangu medium-gray limestone and dolomite clasts as diameter (derived from Cambrian limestones i and rare gneiss pebbles and cobbles in a matri sandstone and siltstone. Generally becomes fin

Trbl — **BRUNSWICK GROUP** - Lower part of the Br Predominantly homogeneous, soft, red to reddi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Quake center

Qd

ALLUVIUM AND GLACIAL OUTWASH - Deposits of clay, silt, sand, and gravel along streams; stratified sand and gravel deposits of fluvio-glacial origin, probably of Wisconsin age; may include remnants of glacial deposits older than Wisconsin.

Jd

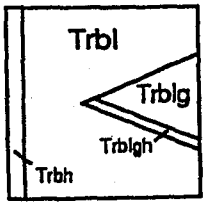
DIABASE - Dikes, sheets, and sill-like intrusives. Dark-gray to black, fine- to coarse-grained (except very fine- to fine-grained near chilled border) diabase composed largely of calcic plagioclase and augite. Larger bodies interpreted as discordant sheets with oval or ringlike outcrop patterns.

Trcq

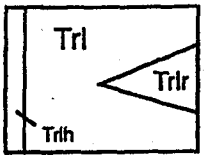
QUARTZITE CONGLOMERATE - Rounded pebbles, cobbles, and boulders, as much as 1 foot long, of white, light-gray, and reddish quartzite, and lesser calcareous sandstone in a matrix of red, partly arkosic siltstone. Source from Silurian rocks to north. Generally becomes finer grained southward. About 1,000 feet thick.

Trcl

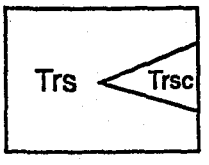
LIMESTONE CONGLOMERATE - Subangular, medium- to dark-medium-gray limestone and dolomite clasts as much a 3.3 feet in diameter (derived from Cambrian limestones in the immediate area) and rare gneiss pebbles and cobbles in a matrix of red, partly arkosic sandstone and siltstone. Generally becomes finer grained southward.



BRUNSWICK GROUP - Lower part of the Brunswick Group. Predominantly homogeneous, soft, red to reddish-brown and gray to greenish-gray mudstones and clay- and mud-shales that crumble easily into hackly fragments. Bedding is irregular and wavy. Some beds are micaceous. Interbedded silt-shales and siltstones are fairly well sorted. Fine-grained sandstone and conglomerate are present in the upper part of the formation near the northern border. Mudcracks, ripple marks, crossbeds, and burrows are common in all of the beds. Contains detrital cycles of medium- to dark-gray and olive- to greenish-gray, thin-bedded and evenly bedded shale and siltstone (Trblg), similar to the rocks in the underlying Lockatong Formation(Trl). The cyclic units are not as continuous as those in the Lockatong Formation. Higher in the formation, the gray beds are softer, largely mud- and silt-shale and siltstone. Shales and siltstones surrounding diabase (Trbh, Trblgh) have been thermally metamorphosed to a purplish-red, light-gray, and dark-gray, indurated, brittle, and fine-grained hornfels in a zone averaging about 2,000 feet wide.The lower contact of the Brunswick Group with the Lockatong Formation is gradational over about 1,640 feet and is either conformable and gradational to older rocks of the Newark Supergroup or is unconformable on basement rocks. Also interfingers laterally with the Lockatong. The boundary between the Brunswick and the Lockatong generally is placed where the thickness of red beds is dominant over the thickness of gray and black beds, both horizontally and vertically. About 3,420 feet thick.



LOCKATONG FORMATION - Predominantly laminated to thick-bedded, gray and black siltstone and shale. Unit composed of alternating detrital and chemical-lacustrine cycles. Detrital cycles: lower part laminated, medium-dark-gray to black, calcareous, pyritic siltstone and shale overlain by platy to massive, disrupted (mudcracked and burrowed), dark-gray, calcareous siltstone, ripple-bedded siltstone, and fine-grained sandstone. Averages about 17.1 feet thick. Chemical cycles: Lower part platy, medium-dark-gray to black, dolomitic siltstone and marlstone with shrinkage cracks and lenses of pyritic limestone, overlain by massive, gray or red, analcime- and carbonate-rich, disrupted siltstone. Average thickness about 10.5 feet. Shales and siltstones surrounding diabase (Trlh) have been thermally metamorphosed to a purplish-red, light-gray, and dark-gray, indurated, brittle, and fine-grained hornfels in a zone averaging about 2,000 feet wide. Lower contact of Lockatong gradational, placed at base of lowest continuous black siltstone bed. Contains interbedded, reddish-brown, sandy siltstone in units about 10 to 270 feet thick (Trlr). Interfingers laterally with and gradationally into the underlying Stockton Formation (Trs) as well as up into the lower part of the Brunswick Group (Trbl). Maximum thickness about 3,500 feet.



STOCKTON FORMATION - Light-to medium-gray and light-yellowish-gray to pale, reddish-brown, thin- to thick-bedded, fine- to coarse-grained sandstone, arkose and arkosic conglomerate with pebbles of quartzite, feldspar, shale, limestone, and metamorphic rock locally more than 3 inches long; grayish-red to moderate-reddish-brown, and light- to medium-gray siltstone and shale, bioturbated by roots and burrows, and grayish-red to reddish-brown, thin- to thick-bedded, very fine- to medium-grained arkosic sandstone, generally fining upward with abrupt lateral lithic changes. These rocks contain channels, ripple marks, mudcracks, crossbeds, pinch-and-swell structures, and minor burrows. Purplish siltstone near the middle and top. Well-bedded, gray and gray-green, [illegible] siltstone present locally in the upper part. Local gray

40°22'30"

Triassic Sedimentary Rocks

Sedimentary rocks of Triassic age crop out over 74 percent of northern Bucks County. The principal formations are the Brunswick Group, the Lockatong Formation, and the Stockton Formation.

In the Triassic sedimentary rocks, ground water in the weathered zone moves through intergranular openings that have formed as a result of weathering. In some places, permeability of the weathered zone may be poor because of a high percentage of clay derived from weathering of siltstone and mudstone. Ground water in the unweathered zone moves through a network of interconnecting secondary openings—fractures, bedding planes, and joints. Beds within a formation are hydraulically connected by vertical joints that cross each other at various angles throughout the beds. Some water-bearing openings may be slightly enlarged by circulating ground water that has decomposed and disintegrated mineral constituents in the walls of fractures. Primary porosity that may have originally existed has been almost eliminated by compaction and cementation. Some water may move through intergranular openings in the rock below the weathered zone where the cement has been removed and the permeability has increased, but this generally is restricted to a few sandstone and conglomerate beds.

The ground-water system can be visualized as a series of sedimentary beds with a relatively high transmissivity separated by beds with a relatively low transmissivity. The beds, a few inches to a few feet thick, act as a series of alternating aquifers and confining or semiconfining units that form a leaky, multiaquifer system. Each bed generally has different hydraulic properties, and permeability commonly differs from one bed to another. Soft shale beds deform without breaking under stress and, as a result, have lower permeability than the harder sandstone beds, which tend to develop fractures and joints and are more permeable. Thick, hard, competent sandstone beds develop fewer joints than thin sandstone beds (Wood, 1980, p. 16) and bedding planes are widely spaced; therefore, they are less permeable.

Ground water is unconfined in the shallower part of the aquifer and confined or semiconfined in the deeper part of the aquifer. Under confined conditions, ground water is confined under pressure greater than atmospheric by less permeable beds or hydrogeologic units and is not free to rise and fall. Differences in vertical hydraulic conductivity within and among hydrogeologic units create confining conditions. The water level in a well constructed in a confined aquifer rises above the top of the aquifer. The imaginary surface to which water will rise in wells tightly cased in a confined aquifer is the potentiometric surface. If the potentiometric surface is above the land surface, the well will flow.

Most deep wells are open to several water-bearing zones and are multiaquifer wells. Some wells may be open to more than one hydrogeologic unit. Each water-bearing zone usually has a different hydraulic head. The hydraulic head in a deep well is the composite of the heads in the several water-bearing zones penetrated. This can cause water levels in some wells to be different than water levels in adjacent wells of different depths. If the composite head is below the uppermost water-bearing zone or zones, water from these zones will drain into the well and cascade down the borehole to the water surface.

Where differences in hydraulic head exist between water-bearing zones, water in the well bore flows under nonpumping conditions in the direction of decreasing head. Flow from an upper zone of higher head to a lower zone of lower head can result in a cone of depression forming around the well under nonpumping conditions and can locally lower water levels.

The ground-water-flow system in Triassic sedimentary rocks is highly anisotropic with the predominant flow direction in the direction of strike (Vecchioli and others, 1969, p. 154). The network of interconnected water-bearing openings is more or less continuous along strike, but the continuity of individual beds downdip is limited because fractures are closed by compression or absent with depth. Because of anisotropy, wells aligned parallel to strike generally show more interference than wells aligned perpendicular to strike. Drawdown in wells aligned along strike may be many times greater than in wells aligned in other directions (Vecchioli and others, 1969, p. 157). Wells drilled to the same depth along strike generally penetrate the same water-bearing beds, whereas wells drilled to the same depth several hundred feet downdip of each other rarely intersect the same water-bearing beds (fig. 6). Therefore, the potential for well interference caused by pumping is greater in wells along strike than in wells in the direction of dip. In the anisotropic Triassic formations, cones of depression are usually elliptical, with the long axis aligned parallel to strike.

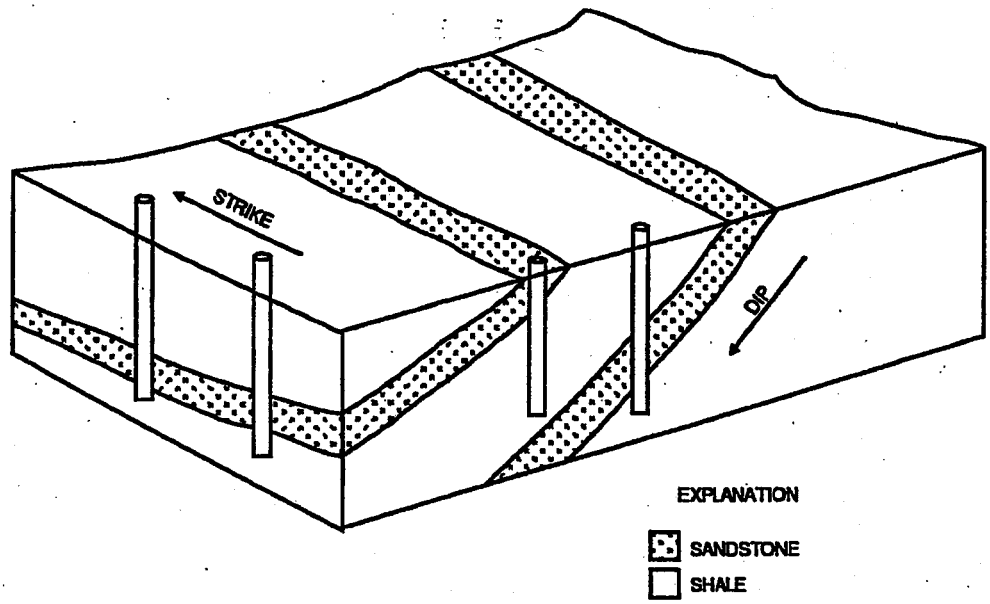


Figure 6. Wells tapping sedimentary rocks of Triassic age. (Modified from Biesecker and others, 1986.)

In the anisotropic systems of the Newark Basin, ground-water flow is not necessarily perpendicular to lines of equal hydraulic head, but may be skewed in the direction of strike (Lewis, 1992, p. 96). Because the beds dip and because fractures are absent or closed at depths greater than a few hundred feet, ground water flows preferentially along strike, even in places where the cross-strike hydraulic gradient is substantial.

Ground-water flow in the Triassic sedimentary rocks has local and regional components. Shallow ground water discharges locally to nearby streams. Deeper, regional ground-water flow is toward points of regional ground-water discharge, such as the Delaware River. Ground-water divides may be different for each zone of ground-water flow, and may not coincide with surface-water divides. Ground-water-flow directions may be different for each zone. For example, the potentiometric surface map of McManus and Rowland (1993) shows that in the area northeast of Bucksville in Nockamixon Township, ground water in the shallow part of the aquifer system flows S. 60° E., assuming flow is perpendicular to equipotential lines. At the same point in the deeper part of the aquifer system, ground water flows S. 35° W., assuming flow is perpendicular to equipotential lines.

Brunswick Group

Rocks of the Brunswick Group underlie 39 percent of the study area. The Brunswick is highly fractured and has many closely spaced joints, which accounts for the relatively high well yields from a shale and siltstone formation. Bedding plane openings may extend to 300 ft below land surface (Kasabach, 1966, p. 33). However, the upper part of the weathered zone, although more fractured than the lower part, may be less permeable than the lower part because the fractures may be clogged with clay derived from weathered shale and siltstone.

Borehole geophysical logs were run in 13 wells at 7 sites in the Brunswick Group; 2 of the wells are completed in the lower beds, and 1 well is completed in hornfels. A borehole television survey was run in well BK-1343. Borehole-flow measurements were made in seven wells at six sites; measurable borehole flow was observed in only three wells. In well BK-2205, upward flow of 3.9 and 2.6 gal/min was measured at 140 and 190 ft below land surface, respectively (fig. 7). Water enters the well through water-producing fractures at 205 and 167 ft below land surface and flows upward to a water-receiving fracture at 94 ft below land surface where it exits the well. Measurable borehole flow was not observed in two nearby wells of the same depth (BK-2206 and BK-2207) at the same site.

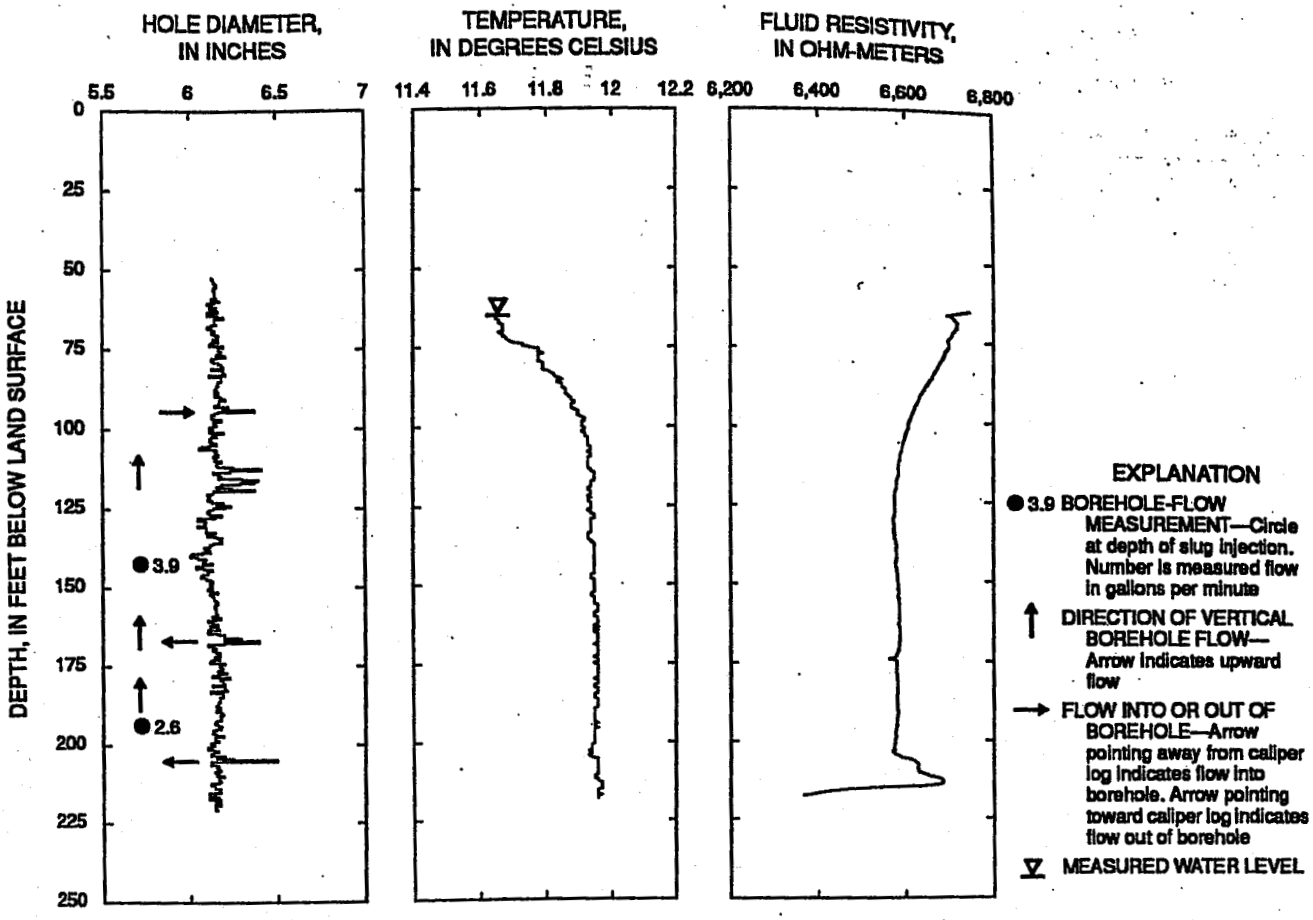


Figure 7. Caliper, fluid-temperature, and fluid-resistivity logs of well BK-2205, Solebury Township, northern Bucks County.

Downward borehole flow was measured in two wells in the lower beds of the Brunswick Group. Wells BK-1493 and BK-1556, which are located 0.6 mi apart along strike, penetrate the same beds. The beds penetrated from 28 to 222 ft below land surface by well BK-1556 are the same beds penetrated from 55 to 249 ft below land surface by well BK-1493. In the lower beds of the Brunswick Group, individual beds may be laterally continuous for some distance. Natural-gamma borehole geophysical logs can be used to correlate lithology. On the basis of the natural-gamma logs, the correlation between beds penetrated by wells BK-1493 and BK-1556, labeled bed "A" and bed "B" is shown on figure 8. The geophysical logs also show that fractures, water-producing zones, and water-receiving zones are not found in the same beds penetrated by both wells. Water enters well BK-1493 through a water-producing fracture at 141.5 ft below land surface and flows downward at 1 gal/min to a water-receiving fracture at 196-203 ft below land surface where it exits the well (fig. 8). Water enters well BK-1556 through a water-producing fracture at 66 ft below land surface, which is above the water surface in the well. The water cascades down the well bore to the water surface at 101 ft below land surface and then flows downward at 0.7 gal/min to a water-receiving fracture at 314 ft below land surface where it exits the well (fig. 8).

The borehole television survey of well BK-1343 showed that most of the fractures intersected by the well above 60 ft below land surface are horizontal (openings along the plane of bedding within a lithologic unit or between lithologic units), and most of the fractures intersected by the well below 60 ft below land surface (fig. 9) are vertical or steeply dipping (joints within a lithologic unit). The major water-bearing zone (25 gal/min) penetrated by well BK-1343 is the intersection of two vertical fractures at 137-138 ft below land surface (fig. 9).

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Expanded Site Inspection
Watson Johnson Landfill
Richland Twp., Bucks Co., PA

16 June 2000

Prepared for

U.S. Environmental Protection Agency Region III

Site Assessment Section

Philadelphia, PA

ATA
Assistance

EXHIBIT
E

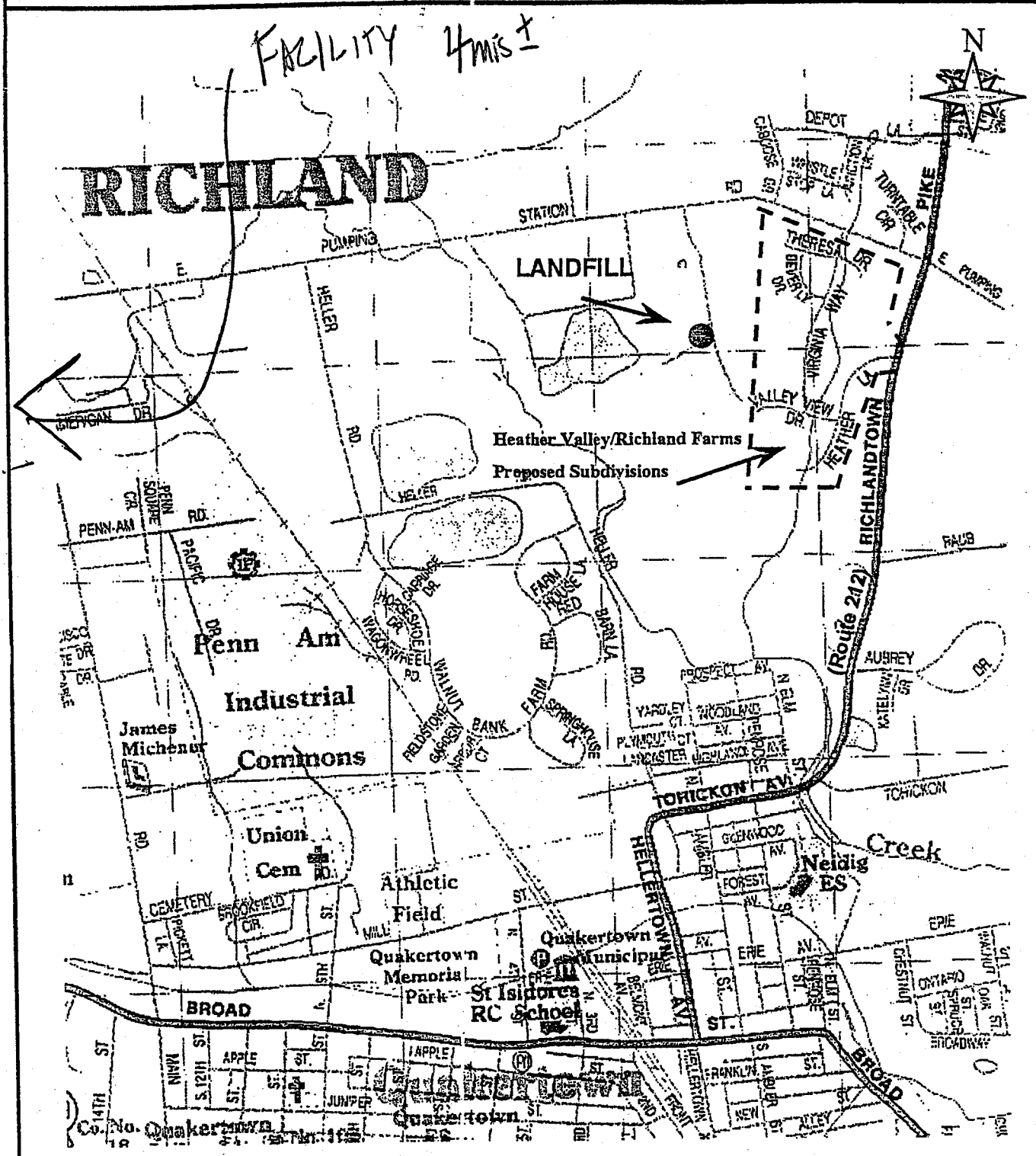
TDD No. 0003-15A
Contract No. 68-S5-3002

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 BACKGROUND 2
2.1 Location 2
2.2 Site Description 7
2.3 Operational History and Waste Characteristics 7
2.4 Previous Investigations 8
2.5 Remedial/Removal Actions 8
3.0 WASTE SOURCE SAMPLING 9
3.1 Sample Locations 9
3.2 Analytical Results 10
3.2.1 July Analytical Results 10
3.2.2 August Analytical Results 12
3.2.3 September Analytical Results 15
3.3 Conclusions 17
4.0 GROUNDWATER MIGRATION PATHWAY 17
4.1 Hydrogeologic Setting 17
4.2 Targets 19
4.3 Sample Locations 20
4.4 Analytical Results 20
4.5 Conclusions 21
5.0 SURFACE WATER MIGRATION PATHWAY 21
5.1 Hydrologic Setting 21
5.3 Sample Locations 22
5.4 Analytical Results 22
5.5 Conclusions 23
6.0 SOIL EXPOSURE AND AIR MIGRATION PATHWAYS 23
7.0 SUMMARY AND CONCLUSIONS 23
8.0 LIST OF REFERENCES 25

Appendix 1 (Analytical Result Tables)
Appendix 2 (Well Construction Logs)
Appendix 3 (Geophysics Report)

WESTON FEDERAL PROGRAMS DIVISION	Watson Johnson Landfill Richland Twp., Bucks Co., PA	TDD No. 0003-15A CONTRACT No. 68-S5-3002



Not to Scale

Figure 1
Site Location Map

Table 6
Metal and Cyanide Analytical Results (Waste Source)

Compound (µg/L)	MW-02D	MW-03S	MW-03D	MW-04S	MW-04D	MW-05S
aluminum	----	423	----	----	2,060	605
arsenic	4.2	----	3	----	3.2	----
boron	83.5	----	120	----	57.1	----
chromium	----	----	55.1	----	----	----
copper	----	----	6.4	----	----	----
iron	139	----	1,270	----	786	----
lithium	----	31.6	----	40.9	----	31.6
manganese	8.1	92	42.6	91.6	21.5	115
magnesium	28,000	571,000	31,000	----	15,800	59,800
nickel	----	32.8	121	17.6	12.5	30.1
potassium	----	----	----	52,500	----	----
sodium	----	----	----	42,000	----	----

---- = No result was reported or the result was not elevated above the background concentration ((Reference 19, p. 51589, Table 2-3)

3.3 Conclusions

The Watson Johnson Landfill received solid waste and various chemical wastes. From 1965 through 1968, the landfill accepted a total of 3,200 tons of waste from W.R. Grace & Company's Quakertown chemical facility. Unknown quantities of solid wastes were also reported to have been accepted from Quakertown Borough, portions of Perkasie, and Sellersville Borough, and other Upper Bucks County areas. The landfill was closed in 1972 after it was suspected to have caused a fish kill in the Tohickon Creek (Reference 6, p. 5; Reference 9, pp. 1 and 2). Soil borings collected during the SI showed the presence of elevated VOAs, SVOCs, PCBs, and inorganic compounds. Monitoring well samples collected during the ESI also showed elevated VOAs, SVOCs, and inorganic compounds.

4.0 GROUNDWATER MIGRATION PATHWAY

4.1 Hydrogeologic Setting

The Watson Johnson Landfill is underlain by the Brunswick Group formerly called a Formation (Reference 1, Sec. 3, p. 1; Reference 7, p. 4). This group is mostly composed of red and gray silty mudstone and shales forming Van Houten cycle. These cycles are made up of thick cyclic repetitions of black to gray shale grading up into massive gray silty mudstones, typically found in the Brunswick Group. Van Houten cycles in the lower most part of the Brunswick Group include the Graters and Perkasie Members that contain thick black shales that are distinctive and traceable across the length of the Newark basin. These laminated black shales are characteristically pyritic (Reference 34, pp. 186-187). Pyrite is a

mineral (FeS_2) isometric and is commonly found in striated cubes or in pyritohedrons. It is brass yellow in color and is commonly known as Fools Gold (Reference 35, p. 405).

Secondary porosity (groundwater moving through joints and faults) is the primary pathway for the groundwater flow. The groundwater flow through the Brunswick Group is difficult to determine, due to the different size and frequency of the fractures (Reference 11, pp. 15 and 16). The water table is approximately 15-35 feet from the land surface, and the saturated thickness is approximately 150 feet. The groundwater is expected to flow toward the Tohickon Creek, southwest of the site (Reference 1, Sec. 7, p. 1).

The following observations were made during the installation of seven wells (four shallow and three deep). SATA observed alternating layers of red brown shale and light to dark gray calcareous shale. Pyrite was also noted in some of the wells at approximately 130 feet (Appendix 3). The borehole geophysics report indicated that there were multiple shallow fractures, which were found at the same depth at each location. The most dominant shallow fracture was at approximately 84-87 feet and is a major water bearing zone. The deeper fractures that were consistent at each location were between 154-175 feet. These fractures were smaller in size than the one at 84-87 ft. (Appendix 2 & 3). The pyrite that has been found throughout the site was documented in a 1999 study to create elevated levels of arsenic in the surrounding groundwater (Reference 46). Overall, the Brunswick Group was made up of highly competent rock starting at 4 to 7 feet on-site (Appendix 2 & 3). The following table provides information pertaining to each well. For in-depth well information, the logs are provided in Appendix 2.

study was in

Table 4
Monitoring Well Construction Data

Monitoring Well ID	Total Depth (ft.)*	Screen Interval (ft)*	Water Level (ft.)*
MW-01S	105	80-100	15.9
MW-01D	202	150-170	27.1
MW-02D	205	165-185	20.2
MW-03S	105	80-100	16.2
MW-03D	184	150-175	17.2
MW-04S	105	70-90	15.7
MW-04D	205	160-180	14.4

* All measurements were taken from the top of the outer casing.

During the well preparation at monitoring well location 4, a drum was found approximately 6-12 inches below the surface. The drum was partially crushed with multiple holes and contained a product. The drum was promptly overpacked and sampled. Sample results indicated that the drum contained PCE, which was

APPALACHIAN
GEOPHYSICAL SURVEYS

276 PA Route 366 - Mamont
Apollo, Pennsylvania 15613
Telephone (724) 327 - 8119
(800) 653 - 8119

ROY F. WESTON, INC.
5 Underwood Court
Delran, NJ 08075-1229

July 26, 1999
revised July 30, 1999

Attn: Stephen Grieco

LETTER REPORT

re: WATSON & JOHNSON LANDFILL SITE
Geophysical Borehole Logging

Dear Mr. Grieco:

July 13, 14 and 22, off this year APPALACHIAN GEOPHYSICAL SURVEYS conducted geophysical borehole logging in some 4 boreholes drilled as monitoring wells at or near the WATSON & JOHNSON LANDFILL SITE as part of your geological and groundwater investigation of the site. The wells were designated MW-1,through MW-4. A comprehensive suite of logs; including caliper, natural gamma, full wave sonic, temperature, single point resistance, spontaneous potential and flow meter; was run in the boreholes. Descriptions of the individual sondes and the curves they produce are as follow:

CALIPER: Our caliper sondes are 3-arm bridge type. The log is generated by measuring the change in resistance across a variable resistor which is coupled to three dependent arms by a geared, spring-loaded rack assembly. As the arms open wider for large hole diameters or less wide for smaller hole diameters, the resistance increases or decreases respectively. The instrument is calibrated by measuring the resistance values of known diameters on the surface prior to logging.

NATURAL GAMMA: The Natural gamma sondes run by APPALACHIAN GEOPHYSICAL SURVEYS are scintillometer type, utilizing a Sodium Iodide detector. Gamma rays from naturally occurring radioactive isotopes pass through the crystal, creating a flash of light. These light flashes are counted electronically to generate the log. In so far as most naturally occurring radioactive isotopes (K40 and others) are associated with clay minerals and virtually all clay rich strata are more radioactive than other strata, the natural gamma log is universally accepted as a clay or shale indicator. The tool is calibrated by exposure to an artificial gamma ray source of known intensity prior to logging.

PRESENTATION OF RESULTS

The raw data from the field has been processed with an interpolation program (or series of programs) which establish uniform depths on each curves, make any necessary scale or depth correction determined in the calibration and survey closure procedures, linearize logarithmic scales and, when appropriate, filter noise from data. The thermal gradient were synthesized from the temperature log and flow meter impeller speed was subtracted from logging speed and the average of the up hole and down hole traverses was computed. The curves were then merged onto a single file for plotting. Disk copies of those files have been forwarded to your office. One set of prints, at a scale of 1 in. = 10 ft., of each suite of log curves, for each borehole, was printed on reproducible velum in high resolution mode, and was forwarded to your office. Each log print has a heading indicating the site, borehole number, date of logging, logged depth and other pertinent information.

RESULTS

Summaries of observations made on the logs from the individual boreholes are attached. Preliminary correlation of marker beds and fracture zones among the boreholes were made in the field, following completion of the final borehole.

The lithology suite of curves (natural gamma, delta T and resistivity) generally gives the best indication of formation lithology. The natural gamma log indicated that virtually all of the boreholes penetrated strata with a moderately high clay content, typically between 40 and 80 CPS, indicating 40 to 80 percent clay minerals. The sonic log indicated an unfractured matrix transit times between 60 and 70 micro seconds per foot. This combination indicates the predominate lithology is probably a hard siltstone, with interbeds of shale or clay and possibly limestone or marlstone. MW-2 appears to pass through a formation contact at about 165 feet (below top of casing). This formation has a somewhat lower gamma count, 30-50 CPS and faster transit times, 55-65 micro seconds per foot. This may be a carbonate lithology, such as marlstone. Clean limestone generally has gamma counts in the 5-20 CPS range.

One unit creates a uniquely high gamma peak (exceeding 100 CPS) in all of the wells. This is most likely a marine black shale unit, as these units often contain higher than normal concentrations of heavy metal minerals. (Other types of lithology, including volcanic ash, can yield similar gamma counts). The unique signature to this unit allows it to function as a marker bed, facilitating the calculation of bedding attitudes. It can be observed at 137-138 feet (below top of casing) in MW-1, 79-80 feet in MW-2, 129-130 feet in MW-3 and 182-183 feet in MW-4. Three point analysis of these data yields a roughly North-South strike with a westerly dip ranging from 4 to 11 degrees, apparently increasing to the west.

Of the log run at this site, the sonic log is the best at identifying fractures. Fractures in the borehole wall cause the "P" wave to slow, increasing the transit time. In addition, major fractures can cause dissipation of the tube wave which can be observed on the VDL plot. MW-4 showed soil like velocities to a depth of 65 feet, and these anomalies may represent weathering rather than fractures. All of the wells showed one major fracture at similar depths; MW-1, 87 feet; MW-2, 89 feet, MW-3, 86 feet, and MW-4, 76 feet. It is not possible from the geophysical logs alone to determine if these represent points on the same fracture plane. Three point analysis of these data suggest an undulating surface, dipping 0 to 8 degrees, and not in a uniform direction.

The temperature log and thermal gradient plot, derived from the slope of the temperature log, indicate a negative geothermal gradient over the area. While this is not the normal pattern in most areas, our experience has indicated it is not unusual in the major valleys of the Ridge and Valley Province of the eastern United States. We believe that it may possibly be related to the structure beneath this area, a lack of confining strata or some combination there of. In addition, logging was conducted in July with daily high air temperatures exceeding 90 degrees F. Some solar heating of shallow surface waters could have occurred, and this may be affecting the gradient in the upper portion of the wells

The strong negative gradient in all of the wells made it somewhat difficult to detect cooling from groundwater inflow. Subtle shifts in the slope of the temperature curve can be magnified when the gradient is calculated. Plotting this curve against fractures from the sonic log and flow meter results aid in finding the location of inflow points.

Because flow meter testing was done under static conditions)and no artesian flow was observed), both the impeller flow meter and the heat pulse flowmeter indicated very low volumes of flow in these wells. The flow rates measured were close to the operational limits of the tools (generally less than 1 ft./min. and less than 0.10 gpm respectively). As such we believe these values should be considered to be relative, rather than precise measured values. The direction of flow at various points within the individual wells were noted to concur reasonably well between the two flow meters as well as with the gradient and sonic log. This allows a qualitative assessment of the relative contribution of fractures and/or aquifer beds within the well.

CONCLUSION

Geophysical borehole logging consists of a number of remote (electronic) measuring techniques which provide clues to the type and nature of rock exposed in the borehole wall. As with any remote technique the measurements must be combined and interpreted, much the way mathematicians require two equations to solve for two unknowns. The interpretations we have presented are possible explanations of the anomalies observed on the various log curves. They have been based on the data as isolated points, without the benefit of accurate geologic maps, or borehole locations and elevations. While we have attempted to present the most likely explanations to the observations, we recognize that there may be other explanations. As such the interpretations should be considered preliminary.

The logs, disks, tapes and this letter report represent a collection of data relating to the geology and groundwater conditions at and near your project area. As data they represent a point to initiate the interpretation process. We are aware that you intend to incorporate these geophysical borehole data into a comprehensive study of the subsurface geology, and will examine it in the three dimensional perspective along with the information from geologic mapping, drill records and pumping tests to create a model of the subsurface. We believe that to be the proper approach and are willing to further assist in this evaluation as your needs require.

If you have any questions concerning the data or presentation please do not hesitate to call. It has been a pleasure to work with ROY F. WESTON on this project.

Respectfully Submitted,

Craig B. Clemmens
Managing Partner

enclosures

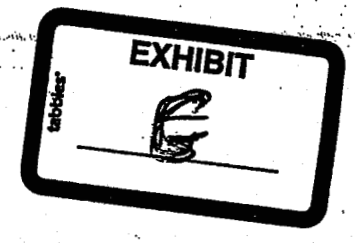
list).

~Kim

On Thu, 4 Sep 2003 17:21:48 -0400 "brenda" <brenic@Access4less.net> writes:

> My reply from Jim Wood to my reply to his email.
> ----- Original Message -----
> **From:** jim wood
> **To:** 'brenda'
> **Sent:** Thursday, September 04, 2003 3:15 PM
> **Subject:** RE: Lies?
>
> How much business and strategic planning experience do you have? How many start-up operations and new ventures have you been involved with? We are an ENTREPRENEURIAL business which means we take advantage of new business opportunities as they arise. That in essence is the definition of entrepreneurialism and if the founders of our company hadn't been that way from the beginning all those decades ago, then they never would have grown to the point where they are now.
> THINK ABOUT IT BEFORE JUMPING TO YOUR OWN CONCLUSIONS WITHOUT ANY OF THE FACTS.
>
> **Jim Wood, President**
> **CFC Logistics**
> **4000 AM Drive**
> **Quakertown, PA 18951**
> **(215) 529-1500**

Friday, September 05, 2003 America Online: RJSugarman



-----Original Message-----
From: brenda [mailto:brenic@Access4less.net]
Sent: Wednesday, September 03, 2003 8:15 PM
To: jim wood
Subject: Re: Lies?

Jim,

I don't believe that anyone building a multimillion dollar facility would not know from the very beginning what they were going to do with it. If you didn't, then it's an example of very poor planning on your part. If that is the kind of care you take in your planning, I don't feel very confident of the kind of care you will take handling radioactive material. Brenda

----- Original Message -----
From: jim wood
To: brenic@access4less.net
Sent: Wednesday, September 03, 2003 9:49 AM
Subject: Lies?

Brenda -
I'm sorry you think we lied, but the fact is that we never lied about anything. If you go back and read all the town minutes, the newspaper reports from February through June, you will see that the township approved our irradiation facility in February after we spent the months of December and January reviewing the equipment and asking them for their input and direction on how and if we should proceed.

Can you even explain to me why we would lie? What would we lie about? If we were planning to do the irradiator in November of 2001 (when we were getting approvals for the warehouse), why on earth wouldn't we have just discussed it then rather than in December of 2002? It's much easier to deal with all the township approvals at one time rather than stringing it out over years! I have trouble understanding what motivation you could even pin on us for lying. It makes no sense.

I'm sorry that you were never involved in the process when we got our approval for the irradiator on Feb 4 at a public meeting, but that does not make us liars. We were open and honest with the township and followed the township's direction for permits and approvals.

Sincerely,

Jim Wood

Jim Wood, President
CFC Logistics
4000 AM Drive
Quakertown, PA 18951
(215) 529-1500

CERTIFICATE OF SERVICE

I, Robert J. Sugarman, certify that I have e-mailed a copy of the Petitioners' Brief in Reply to Staff Briefs to the following and mailed by first-class mail, postage pre-paid:

Administrative Judge Michael C. Farrar
Presiding Officer
Atomic Safety and Licensing Board Panel
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Anthony Thompson, Esquire
Law Offices of Anthony J. Thompson, PC
1225 19th Street, NW
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Washington, DC 20036

Steven Lewis, Esquire
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Mail Stop O - 15 D21
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ROBERT J. SUGARMAN

Dated: September 5, 2003

F:\Concerned Citizens of Milford\Pleadings\cos 9-5.wpd