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AMERICIUM DECONTAMINATION PROPOSAL FOR THE TOWN OF TONAWANDA SEWAGE TREATMENT PLANT AND RELATED FACILITIES

ENSA, Inc.

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by

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I SUMMARY

1. Objective

The purpose of this proposal is to describe a revised decontamination plan for the Town of Tonawanda sewage treatment plant and related facilities.

This revision incorporates the comments made by the State of New York, Reference 1, on the original plan which was submitted on August 29, 1984. The contamination referred to concerns an isotope of americium (Am-241) which had over a period of seven years resulted in exceeding recommended concentration limits for these facilities. Specifically, this plan encompasses the entire sewage treatment plant, a single sewer line leading from the former EAD Metallurgical Manufacturing facility on 71 Pearce Avenue, and those contaminated portions of the Town of Tonawanda landfill. The proposed plan has been designed for rapid and expeditious implementation in an environmentally safe manner with minimal inconvenience to town residents.

2. Approach

The proposal recommends an initial re-survey of the entire sewage treatment plant plus decontamination of incinerator number 2. This is to be followed by decontamination of the affected sewer line and landfill, each with appropriate pre- and post-decontamination surveys. The rationale for the proposed sequence is based upon the following arguments:

1. A clear operational need exists to provide a redundant

incinerator in order to sustain sewer treatment plant operations. Incinerator number 1 has been in continuous operation for over a year and is overdue for maintenance shutdown. Furthermore, in the event of an extended emergency shutdown, sewer plant operations would be severely curtailed without an operational incinerator.

2. Decontamination of the sewer line initially may result in no available incinerator operation in the event of an inadvertant, albiet remote, release of additional contamination during decontamination efforts. This could severely impact upon subsequent sewer plant operation.
3. Additional experience would be obtained in the decontamination of incinerator number 2 involving large quantities of ash with relatively known concentrations. This would be a subsequent advantage prior to the decontamination of the sewer line where greater uncertainties exist relative to resultant concentrations.

Surveys are recommended prior to all decontamination efforts as a part of this proposal in order to more clearly define initial conditions as well as decontamination effects. These results will be compared against surveys subsequent to each decontamination phase in order to measure the effects of each effort.

3. Decon Plan Modifications

Several modifications have been incorporated into Revision 1 of the Decontamination Plan. These revisions have been made to improve the

scope and safety, and include the following major items:

1. Elimination of Vacuum Truck - This was necessitated in order to eliminate decontamination and liability concerns for a major capital expense item. A specialized vacuum system based upon current TMI clean-up technology is to be used in lieu of the vacuum truck.
2. Initial and Final Surveys - These are to be required for all decontamination areas including the TSTP, sewer line and landfill. Specifically, a novel probe design is to be used to survey the affected sewer lines. Pre- and post-decontamination surveys are required in order to measure the relative effects of decontamination. Additionally, multiple borings for the landfill have been added in order to fully assess the extent of contaminated ash deposition.
3. Ash Characterization - This will be performed to ascertain the relative leachability as well as particle size distribution for further health physics evaluations.
4. Furnace Ash Encapsulation - All contaminated ash to be removed from the TSTP is to be encapsulated in secure 55-gallon drums. These are to be buried at the Tonawanda landfill on a special pad with an appropriate drain and monitor sump design.
5. Comparative Analysis of Heavy Metals - This was performed to ascertain the hazard of americium relative to other heavy metals in landfill ash. The analysis indicates that a considerably greater environmental hazard may exist for heavy metals (lead, cadmium, chromium) than for the americium.

6. Comparative Leaching Hazard - Hydrological analysis concludes that on a worse case basis, potential leachate from the landfill will not exceed drinking water standards for americium.

7. Public Information - A new section has been added which recognizes the need to keep both workers and members of the public informed as to decontamination details. This includes all specifics, precautions and safety measures to be undertaken.

4. Conclusion

Decontamination of the proposed facilities is feasible based upon recent decontamination experiences with private residences as well as partial completion of work at the former EAD Metallurgical facility. This effort should include extensive use of survey experience with americium plus appropriate instrumentation and techniques developed specifically for this isotope.

Additionally, considerable cooperation will be required from both Town and State bodies in order to effect the desired results in a timely manner. This is inclusive of minimal assistance by the Town of Tonawanda in regard to decontamination of the sewer line and landfill. Additionally, New York State assistance will be required for the issuance of permits related to the transportation of contaminated material, landfilling of same, use of calibration sources on site, and a final closeout survey by personnel from the Department of Health.

Subsequent to the completion of all decontamination work, restoration of full incinerator operation and release of sewer line restrictions are expected. Completion of landfill work will include an appropriate four foot cover plus a permanent marker. Additionally, a suitable deed restriction on future use of the property is to be instituted.

II CURRENT STATUS

1. General

The current contaminated condition of the sewage facilities and landfill has been postulated to be the result of contamination from the former EAD Metallurgical facility at 71 Pearce Avenue in Tonawanda New York. This has resulted in the off site contamination of the sewer line, incinerator number 2 in the Town of Tonawanda Sewage Treatment Plant (TSTP) and the Town of Tonawanda sanitary landfill. The relative locations of each are shown in Figure 1, Appendix A. Evidence currently available suggest that this contamination was largely a consequence of routine releases of americium during the 7-year operating history. Additionally, the advanced features of the TSTP and the relative plant throughput of sewage and americium have resulted in concentration levels above allowable limits.

The extent of the contamination condition has been studied by ENSA and the New York State Department of Health, Labor, and Environmental Conservation personnel. This has included ground surveys, test borings, and test well leachate studies as identified in Reference 2. Additionally, aerial surveys were performed and officially reported in Reference 3. The latter confirmed ground survey observations plus identified additional potential problem areas.

2. TSTP

Contamination surveys have been performed at the TSTP of the entire sewage processing stream. This has been performed from plant

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inlet to outlet. These surveys were inclusive of, but not limited to, inlet channels, traveling screens, reaction cells, bio-clarifiers, filtration systems and vacuum de-watering systems. Additionally, preliminary surveys were also performed of both furnace areas. Based upon these surveys, contamination at the sewage treatment facility has been found to be essentially confined to incinerator number 2. Incineration by either of two units is the end stage in processing of all solid sludge material as shown in Figure 2, Appendix A.

Due to a history of presumably high concentrations of americium in feed material, incinerator 2 is currently found to contain high ash concentrations of the isotope. This history, discussed in Reference 4, indicates that incinerator 2 operation was terminated during July, 1983.

Incinerator 1, on the other hand, has been operating since that time which corresponds to a time interval subsequent to termination of operations at EAD Metallurgical. Currently, incinerator 1 is operating with negligible americium concentrations ($\sim$ 10-pCi/gm) and is not of concern at this time. These results are based upon surveys by both New York State and ENSA personnel. The trace concentration noted is believed to be due to the leaching of minute quantities of americium from the affected sewer line.

Incinerator 2 consists of a 22-ft., 4-inch high structure with an outer diameter of 22-ft., 3-inches. The unit is gas fired with five hearths numbered 0 through 4. These are described in Figure 3 along with additional plant details in Figures 4, 5 and 6.

Access to each hearth is obtained through either of two doors. The largest door for each hearth measures 22-inches by 22-inches thereby

presenting some access difficulty. Incinerator 2 is located in the same building and is adjacent to incinerator 1. No dividers or room partitions separate the two incinerators.

The interior of each hearth contains a rabble arm which is used to mechanically agitate and move ash downward through successive hearths. Considerable quantities of contaminated ash remain within each hearth of incinerator 2 from the last operation date on July 23, 1983. This represents the bulk of contaminated ash to be removed from the TSTP. A lesser quantity is contained in a dump truck plus residual material throughout the incinerator 2 area.

Firebrick linings are used for the interior of each hearth. Both interior walls as well as each hearth floor are constructed from low porosity firebrick. During construction, each precision made brick was individually dipped into refractory cement thereby resulting in brick surfaces devoid of separation cracks. The firebrick floors and ceilings derive their structural integrity from their arched construction. This integrity is to be checked in incinerator 2 by the contractor responsible for initial construction during the initial month of 1985 prior to any decontamination work.

The net quantity of contaminated ash in the TSTP is believed to be about 30-tons. The average concentration of americium has been determined to be about 480-pCi/gm. This translates into a net estimated activity of 14-mCi for the entire TSTP. The volume of ash to be disposed of amounts to 1557-cubic feet based upon a specific gravity of 1.6.

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Several site walk throughs have been performed in anticipation of future decontamination work. This has resulted in a review of likely areas required for surveillance and clean-up efforts which are listed in the following Table I.

TABLE I

List of Incinerator 2 Decontamination Areas

Hearths 0, 1, 2, 3, 4

Furnace Drive

Heat Exchanger

Scrubber System

Screw Conveyor to ash elevator from Furnace No. 2

Ash (Bucket) Elevator

Screw Conveyor to ash bin from Ash Elevator

Ash Conditioning Room (Dust Room)

Ash Bin

Screw Conveyor to garage load area from Ash Bin

Ash Truck

Garage

External surfaces, gratings

Contact areas during decontamination

3. **Sewer Line**

The sewer line from the EAD facility extends about 8000 lineal feet to the TSTP. Approximately half of this line experiences very low or trickle flow until a connection is made at a major trunk line from the Village of Kenmore.

Details of the sewer line are shown in Figures 7 and 8 of Appendix A. Manhole 2 (MH-2) is situated immediately in front of the EAD building at 71 Pearce Avenue. A connection is made to the sanitary sewage line between MH-1 and MH-3 as shown in Figure 7. Piping at this point consists of 10-inch extra strength vitreous fired pipe. This extends to Oriskany Drive where connection is made to a 12-inch sewer pipe, also vitreous fired, at MH-5. The 12-inch line extends along the latter road to the manhole connection at East Park Drive, as shown on Figure 8. The sewage lines along both Pearce Avenue and Oriskany Drive were installed relatively recently (1970). These lines were constructed with premium joints using gasketed fittings at all connections.

A 12-inch sewer line extends some 800 feet along East Park Drive to Ensminger Road. The next connection is made to an 18-inch line at MH-9. The East Park line was installed in 1942 using the appropriate technology at that time which consisted of vitreous fired piping with tar and oakum joints. An additional 8-foot long 18-inch line extends along Ensminger between MH-9 and MH-10 where a transition occurs to 21-inch piping. This extends along Ensminger Road to MH-11 where the line meets with the major 42-inch trunk line from the Village of Kenmore.

Preliminary surveys have been performed at each manhole which indicate considerable activity at MH-2 through MH-10. No activity was

observed upstream from EAD in MH-1 as expected. Similarly, no activity was observed at MH-11. This latter observation is attributed to the major flow which always occurs through the large 42-inch trunk line. This apparently suffices to prevent accretion or deposition of americium contamination.

Current ash being processed at the TSTP indicates a trace concentration of americium on the order of 10-pCi/gm. This quantity also corresponds to an average throughput of dry ash on the order of 40 tons per day. Based upon the analytical model suggested in Reference 4, this suggests that approximately 67-μCi of americium is entering the sewage treatment plant daily. Since operations at EAD Metallurigical have not been conducted during the past year, this small amount of contaminant is presumably being leached from the affected sewage line.

The observed americium concentration in the TSTP ash has remained at a relatively constant value (10-pCi/gm) during the past seven months of observations. This suggests that a relatively large source of americium may remain in the contaminated portion of the sewer line. A reasonable first estimate suggests that this source is about 1000 times the daily release (67-μCi), or 67-mCi. Subsequent decontamination efforts should therefore ensure complete recovery of all contaminated effluents in order to prevent consequential further contamination of the TSTP.

The sewage flows vary significantly in the affected sewerlines. For the most part, a trickle flow of less than 1-gpm exists in the line along Pearce Avenue, Oriskany Drive and East Park. This low flow is totally insufficient to provide any scouring action in this 10 and 12-

inch section of piping. The total length of this sewer line is 1983 feet which comprises 85% of the affected sewerline.

The low flow is largely due to the relatively sparce number of buildings being served along these roads. Eight lateral connections exist from Pearce to Ensminger which, for the most part, serve warehousing types of operations. The one exception to this is a church and parish house at the intersection of East Park and Ensminger. The lateral from the ajacent parochial school building at this location also connects to East Park. However, this building is not being utilized other than for Wednesday night bingo and for Sunday instruction.

The sewerline along Ensminger Road carries the sewage from a large area of the Town of Tonawanda. This line is generally half full the year round with an estimated flow of 2000-gpm. The affected section of this sewerline is only 342-feet and constitutes only 15% of the affected line. Owing to the relatively full condition of this 18-inch line, little or no americium is expected to remain in the pipe interior by virtue of the constant flushing and scouring conditions.

4. <u>Landfill</u>

The Town of Tonawanda landfill consists of a 51-acre site immediately to the north of the EAD facility and adjacent to the TSTP. The relative locations of each are shown in the map of Figure 1.

The area of the landfill where highly contaminated ash appears at the surface consists of a single large area of approximately 3-acres plus two much smaller pockets. Previous surveys by NYS-DOH have been performed at the site with results summarized in Reference 2. Partial

survey results of the site are indicated in Figures 9 and 10 from Reference 2. This has been supplemented and substantiated by aerial radiological surveys of the landfill, per Reference 3. The results of this aerial survey are summarized in Figure 16.

The net amount of contaminated ash in the entire landfill is estimated to be 10,000-tons based upon the 7-year TSTP throughput during which time EAD was in operation. Specific activity estimates vary considerably with a conservative estimate placed at 380-pCi/gm for the average value. This results in a convervative upper estimate of the net total activity for the entire landfill of 3.4-curies. Based upon actual discharge records from both EAD and the TSTP, the latter amount is calculated to be only 0.298-Ci per Reference 4. Furthermore, the analysis of Reference 4 indicates an average ash americium concentration of only 68.6-pCi/gm.

Several leachate test wells around the site have been sampled with the result that no americium was found in any well per Reference 2. The approximate location of each leachate sampling point is shown in Figure 11. Additionally, ditches along the sides of the landfill have been sampled with no evidence of americium contamination of run-off water.

A detailed study of the landfill has recently been completed persuant to a permit application for re-use of the site. This study, Reference 5, performed detailed topography, drainage, and leachate analysis in support of the permit. The existing topography and drainage system is described in Figures 12 and 13. Drainage flow for the site is generally in an east to west direction with groundwater at a depth of 15-feet below grade. As reported in Reference 5, the site is not in a

known flood plain area. An extensive drainage and sampling system currently surrounds the site.

The proposed modifications to the landfill per Reference 5 include a Leachate Emergency Plan whereby all drainage may be directed to two concrete basins at the adjacent former incineration site. This is indicated in Figures 14 and 15 and includes the addition of a new 25 to 30-foot tie line should problems arise.

Additional toxic materials have also been identified in the landfill ash in the past. This consists mainly of heavy metals which have been throughly oxidized as a result of the incineration process at 1400°F. Based upon the representative analysis of Reference 7, the following heavy metals are known to occur in the Tonawanda landfill in substantial quantities:

Element	Ash Concentration Per Reference 6
Cadmium	19.7-mg/kg
Chromium	133-mg/kg
Lead	1900-mg/kg

The concentration values noted are generally typical for sewage treatment plant ash residue and are within the EPA allowable limits for landfilling per Reference 8. Other metals of hazardous concern include arsenic, mercury and selenium, but are of lesser or indeterminate quantities in the Tonawanda landfill.

The total amount of heavy metals may be calculated by assumming the above values to be representative of all the landfill ash (10,000-Tons). This calculation results in the following gross calculated quantities:

cadmium	178,800-grams	(394-lbs)
chromium	1,206,500-grams	(2,659-lbs)
lead	17,236,800-grams	(38,000-lbs)

These values are several orders of magnitude greater than the conservative upper limit of 3.4-grams for americium.

The relative toxicity of these metals have been investigated intensively in the past by several researchers per Reference 8. Both cadmium and chromium are known carcinogens per well documented toxicology experiments. Furthermore, both elements are known to be toxic to plant life for soil concentrations as low as 5-ppm. Lead, while not a known carcinogen, has well known deleterious health consequences in man, per Reference 9. No known lead toxicity to plant life is known. Upper limits of 30-ppm have been established, however, for domestic animals intended for human consumption. Drinking water limits for each of the above heavy metals have been established by the EPA per Reference 10. These limits are 50-μgm/L for lead and chromium and 10-μgm/L for cadmium.

The previous data on ash heavy metals does not include several analytical refinements which are important factors on the relative toxicity to man. Such details as landfill chemical reactions, lechability, biological uptake and biological half-life, which are also appropriate for americium, have not been included in the discussion owing to the complexity and diversity of possibilities. The data does indicate, however, that americium is not the only toxic element of concern in the landfill ash and may be considered only one of several hazards.

The contamination potential of americium in the Tonawanda landfill may also be considered from hydrological considerations. The worse case model for this scenario assumes that all americium leaches from the landfill in a single year. This event is highly unlikely from basic first principles. This aside, a conservative leaching hypothesis may be considered for upper bound analysis only. Such gross leaching is further not supported by recent sampling which indicates that no americium is appearing in either run-off water or in leachate wells after several years in the landfill.

Based upon the EPA models described in Reference 8, the net average infiltration of water in the Tonawanda area amounts to 10-inches per year. This is the water net balance for the area given average amounts of precipitation and evaporation. Based upon the entire landfill, or 51-acres, an average net leachate generation rate of 13,849,000-gallons may be expected per year. Based upon the best estimate value of americium in the landfill (0.3-Ci), and assuming complete leaching of all americium in one year, this may result in a theoretical concentration of $5.7(10)^{-7}$-μCi/ml in leachate water. This is considerably less than the most stringent NRC standard for drinking water which is $3.0(10)^{-5}$ (μCi/ml) per Reference 12.

A worse case estimate for americium concentrations may also be calculated using the upper bound estimate of 3.4-Ci for the landfill. Again, assuming total release of all americium in one given year results in a concentration of $6.48(10)^{-5}$-μCi/ml. This is only slightly greater than the drinking water standard of Reference 12 for these extreme hypothetical conditions. This comparison therefore indicates that no

consequential environmental hazard due to americium may be expected either now or in the future due to leaching for the Tonawanda landfill.

5. Criteria

Applicable protection limits for proposed americium decontamination work are described in Appendix B. The values listed are recommended as guidelines appropriate for decontamination operations. Most values have been taken from the Department of Health code rule, Reference 13, and from NRC rules per Reference 12.

The airborne concentration value listed in Appendix B assumes insoluble respirable particulates. The water concentration limit is based upon the soluble, most restrictive condition for americium. In addition, an upper limit for intentional daily discharge is set at 50-µCi, in order to keep incinerator ash concentration below 30-pCi/g. This is conservatively below the 200-µCi/day limit identified in Reference 4 and is selected to accomodate known leaching from the sanitary sewer line.

The soil/ash concentration limit of Appendix B has been adopted from the NRC recommendations of Reference 6 and 11. This is required since soil contamination limits due to Am-241 are not specifically addressed in 10NYCRR16.

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III DECONTAMINATION

1. Sewage Treatment Plant

Decontamination work at the TSTP is to be preceeded by a thorough documented re-survey of the entire facility. This survey will be sufficiently detailed for benchmark purposes and shall be inclusive of all flowstreams and working areas. Concurrently, a characterization analysis will be performed upon furnace ash for particle size, contamination distribution (with size) and leachability. The later shall be inclusive of the expected pH range for rainfall in the Tonawanda area and will be used for health physics evaluation. Initial decontamination of incinerator 2 at the TSTP is recommended in order to minimize the potential for severe disruption of plant operations. This also serves the advantage of providing additional experience prior to decontamination work on the more difficult sanitary sewer line.

All work to be performed will be designed to minimize the potential for airborne releases at the TSTP and environs. To this end, a high duty vacuum system will be utilized with sufficient capacity to ensure efficient pickup of both large and small particulate. The system to be used will be similar in design to the unit currently in operation at Three Mile Island for scabbling operations. The latter refers to concrete surface removal operations within the containment and AUX building areas. Such operations were witnessed by ENSA personnel at TMI in order to ascertain the efficacy of a similar operations where significant quantities of contaminated chips and dust were being removed.

A portable vacuum system shall be used for ash removal operations. This shall consist of a removable 55-gallon barrel receptor with a cyclone and roughing filter head. This is followed by a three stage filtration bank and pump. The last stage filter will utilize an absolute filter capable of removing particles down to 0.3-micron sizes with an absolute filtration efficiency of 99.99%.

Operation of the vacuum system will be maintained under strict health physics supervision. This will include establishment of appropriate procedures for barrel changeout, filter replacement and vacuum pump exhaust monitoring.

All ash collected by the system will be retained in 55-gallon drums for subsequent removal and burial. The drums selected shall be DOT 17H rated with gasketed covers. These are typically used for hazardous waste applications and are suitable for burial purposes. Approximately 100 such drums will be sufficient to contain all the known ash at the TSTP.

Decontamination work on the hearths is to be preceded by an evaluation of hearth integrity. This evaluation will be performed by the builders, Multiple Hearth of Rochester, NY. The latter are scheduled to take place during an inspection-repair visit by the same company during the latter part of January, 1985.

The decontamination of incinerator 2 is intended to take place in the order described in Table I of Section II. 2. Initial work would take place in hearth 0 with a special Health Physics (HP) control station at each hearth door. Maximal amounts of ash will be vacuumed from each hearth door prior to manned entry. In addition, minor amounts

of scraping may be required on the furnace interior in order to remove all ash. This is of minor consequence with the exception of the rabble arm which may require insulation replacement. Cleaning shall progress from hearths 0 to 4 in that order. Hearth entry would take place through a controlled area HP tent at each of the large hearth doors. Each entry is intended using full body protection with supplied air and 5-minute emergency back-up air.

Complete HP monitoring shall be performed during all phases of decontamination. This shall include personnel surveys, area wipes, and a high-vol grab sampler at the hearth entrances. Additionally, ion chamber measurements inside each hearth will be made to establish local field levels. This is to be supplemented with film badges of all decontamination workers plus a BZ sampler inside each enclosed work area.

Final surveys of the entire incinerator 2 area are to be performed subsequent to all decontamination. These are to be documented and recorded for evaluation of the decontamination effort. This evaluation shall include a comparision of initial and final surveys in a comparative analysis. Equipment to be utilized during the decontamination shall include the items listed on Table II.

TABLE II

On Site Equipment List

During TSTP Decontamination

	Item	Model	Quantity
1.	alpha scintillation counters	Eberline SAC-4	2
2.	portable alpha detectors	Eberline RM-19/AC-3	2
3.	portable gamma detector	Eberline RM-19/PG-2	1
4.	breathing air supply		1
5.	whole body suits w/full face masks - heavy duty		2
6.	explosion proof lighting		2
7.	lifeline, tools (misc.)		1
8.	vacuum system		1
9.	continuous air monitor	Eberline Alpha-3	

Disposal of contaminated ash is intended to take place in the Tonawanda landfill in accordance with recommendations of the Advisory Committee, per Reference 2. This is consistent with EPA recommendations regarding americium concentrations of this magnitude and serves as the basis for the NRC position statement of Reference 11. All ash containing barrels are to be situated at a documented referenced location on the landfill site adjacent to the largest known area of surface contamination as noted in Figure 9. The specific site location will be determined subsequent to a complete landfill survey and in concurrence with New York State DOH, DOL, DEC and the Town of Tonawanda.

A specially prepared site will be designed for the barrels to provide for long term monitoring of potential leaching problems from the barrels. This shall include a 250-ft^2 pad with a corner drain system sufficient to hold 100 barrels stacked 2 high. A PVC drain system (SDV-35) s[illegible] be constructed from this drain point to a concrete monitor well at the edge of the ultimate landfill birm. The concrete pad shall be constructed of 6-inches (minimum) reinforced concrete with a 12-inch No.2 stone underlayment.

Subsequent to the siting of all barrels, the area will in turn be covered with a minimum of 20-inches of No.2 stone and additional 4-feet of compacted clay. The latter is readily available from a nearby site. Normal landfilling operations are then anticipated for the site over the next several years with an ultimate depth of 30-feet of additional hard fill.

2. <u>Sanitary Sewer Line</u>

The initial objective of the decontamination effort for the sewer line will be to meet the uncontrolled area limits of Appendix B. Pursuant to this, detailed surveys of the sewer line will be performed both prior to and subsequent to decontamination. These surveys will include surveys of all affected manholes plus interstitial sewer lines.

The planned approach for the sewer line shall be based upon initially surveying, decontamination, and re-surveying the manhole and 80-foot section between MH-2 and MH-3. This is to be repeated until successful decontamination levels are reached per Appendix B values. The latter is to be determined by phantom testing using the survey probe in simulated sewer line conditions. Experience will then be gained from a complete cycle of inspection and cleaning on a relatively short length of sewer line.

Having successfully completed this, the next sewer line section between MH-3 and MH-4 will be approached using the benchmark data previously obtained. Such information as total time required, number of decontamination cycles required, etc. will be utilized for further scheduling. Present estimates indicate that 3-hours will be required for each survey and 5-hours for each decontamination. This is to be repeated for each subsequent manhole and sewer line section until decontamination is complete.

Each decontamination cycle on a manhole and sewer line section is to be performed by plugging the downstream section with an inflatable plug containing a suction port. This suction port is to be attached to a suitable suction pump and hose for collection of all contaminated

material. Decontamination material is to be collected for later treatment and testing. Additionally, mechanically operated back-up plugs (plumbers' helper) will be utilized immediately upstream and downstream of each manhole and sewer line section to be decontaminated. These will be required to prevent accidental unauthorized releases of contamination as well as the prevention of recontamination of previously cleaned sewer line sections.

Radiological surveys are to be performed using a specially designed ruggedized NaI probe in a water tight housing. The probe will include appropriate voltage dividers and pre-amplifiers specifically tailored for long lead lengths (500-ft.). Probes of this type have been used in the past for well logging operations and are available with circumferential low photon energy pickup characteristics. A unique probe design has been scoped out with a leading manufacturer for this application that will satisfy the maximum manhole clearance of 4-feet.

The surveys and decontamination cycles will be performed by initially isolating flow from each lateral along Pearce, Oriskany and East Park Drives. This has been done in the past and is easily accomplished for this relatively low flow (<1-gpm) section of piping. Town of Tonawanda officials have been contacted in this regard and have expressed a willingness to cooperate in this effort (as well as others) by assisting in the isolation. Additional measures will be taken to limit both survey and decontamination efforts to minimal use periods for sanitary sewer usage.

Isolation of the single section of sewer line along Ensminger Road will be considerably more difficult owing to the high flow rate (2000-

gpm). Isolation for this section of line will be accomplished through the combined use of plugs and pumping. Large pumps have been used in the past for such isolation purposes and will be needed to divert flow around manhole No.9. Two skid mounted diesel powered pumps are anticipated for this use with a combined pumping capacity of 3000-gpm. Special highway access ramps over pumping lines are to be provided with traffic control by the Town of Tonawanda as required.

High pressure water spray of the sanitary sewer line is expected to be very effective in reducing the present levels of contamination. Further investigation is however warranted in order to establish accurate decontamination factors to be expected. Preliminary data based upon entry into MH-2 has indicated decontamination factors to be on the order of 10:1 using only a brief scrub of the concrete manhole floor with a brush and soap followed by water rinse. An alpha scintillation probe (Eberline AC-3) was used for this purpose. More reliable factors will have to be established using a gamma scintillation probe and high pressure spray techniques. The high pressure spray method is a standard plumbing technique for sewer line cleanout and one that is capable of scouring the interior of sewer lines. In addition, one such system has the design capability to inject abrasives into the water spray in order to increase decontamination factors. This is accomplished through the use of special mixing adaptors that will be available for this effort and used as required.

All spray water and sewer line material released during decontamination shall be collected, stored and treated at the EAD site. A single tank currently located at this site is of sufficient capacity

($500-ft^3$) to contain all material in a completely filled 12-inch line between manholes ($353-ft^3$). Therefore, all liquids between each manhole section will require filtration and treatment to remove all significant quantities of americium. Cleaned water shall then be returned to the nearest sewer line upon meeting the drinking water standards of Appendix B as well as the 50-μCi limit for the TSTP.

The filtration system to be used will consist of a series of filters effective at different particle sizes preceded by roughing strainers. Filter housings will contain one or more wound cartridge filters, and shall be capable of being used with 50, 40, 25, 20, 5, 4, and 1-micron filters. The precise filter sequence required will be determined only through actual decontamination. Filtration capability will extend to particle sizes on the order of one micron. Chemical treatment and an ion exchange resin bed in line with these filters shall be used in order to meet or exceed the Appendix B criteria.

Contaminated filters, housings, pumps, pressure hoses, tanks and other contaminated materials generated in this work which are in excess of DOH Table 7 limits will be disposed of as rad-waste. All solid or liquid materials not satisfying the Appendix B criteria will also be treated, packaged and disposed of as radwaste in an appropriate manner per DOT regulations. This shall be inclusive of dehydration, packaging and labeling as required.

All surveying and decontamination work will be under direct HP control and supervision. This shall include the use of all required personnel protection (double boots, double gloves, coveralls and head covers) as well as personnel monitors. The latter shall include the use

of film badges and BZ samples. Additionally, a portable air sampler shall be used to monitor possible airborne activity, although none will be expected due to the wet conditions.

Sewer gas meter readings will also be required prior to manned entry into each manhole. All required precautions will be taken to prevent worker distress and to provide for continuous monitoring and emergency pull-out. A special screened enclosure will be constructed around each manhole to be worked on in order to control public access.

3. Town of Tonawanda Landfill

The approach to be followed for the landfill shall include an initial radiological re-surveying of the landfill. This is to be performed in conjunction with a documented land survey of all areas of the landfill where the past potential existed for receiving contaminated furnace ash. Approximately 10-acres of the landfill have been identified in this category although only 3-acres are known to have high surface concentrations. Contaminated areas where surface concentrations exceed the 30-pCi/gm of Appendix B will be identified and staked. These surveys will be assisted by visual observations (red furnace ash), recollections of landfill operators, and past surveys (References 2 and 3).

Surface surveys are to be supplemental with landfill borings both in and around areas of known contaminated ash. Borings will be used to profile the vertical distribution of ash. Additionally, these will be needed to ascertain the area extent of contamination since surface radiological surveys may be masked by several inches of uncontaminated

soil. A total of 30 to 40 such borings are anticipated depending upon the combined results of all surveys. These will be performed using a powered hand auger to a depth of 8-feet which is sufficient to include all past furnace ash disposals.

All surveys conducted of the landfill are to be utilized in conjunction with the ultimate design of the clay cap. Additionally, this information will be required in the design and location of the concrete pad for the burial of barrels containing furnace ash. Land survey stakes will therefore require color coding to distinguish the contaminated zone for subsequent cover operations.

The appropriate action to be undertaken at the landfill, in concurrence with NRC recommendations, should involve the on-site burial of furnace ash and stabilization of contaminated ash and soil. The approximate limits for this portion of work are identified in Appendix B.

Packaging and transport of the contaminated ash and soil to a licensed disposal site cannot be justified from the standpoint of risk to the public health. It is believed that such a package and transport scenario may in fact entail greater risks to both the environment and to radiation workers involved in packaging and transport operations. This view is consistent with the committee recommendations per Reference 2. In addition, design specifications for on-site burial and stabilization are thought to be quite effective in isolating the radioactive materials, provided sufficient safeguards are operative. This includes design criteria to reduce the possibility for harm to the environment and/or risk to the public health and safety.

A minimum 4-foot cover will be emplaced over all the landfill areas where contamination is found to exceed the 30-pCi/gm limit. The exact extent of this cover will be determined by the land, surface, and vertical surveys. This will also be identified by color coded staking. Approximately 10-acres of landfill, including the location for furnace ash drums, may ultimately require such coverage.

Clay from a nearby clay bank will be trucked to the area for spreading and grading by means of a bulldozer to obtain the 4-foot cover. This is to be followed by compaction with a sheepsfoot compactor. All operations of heavy equipment will be monitored to ensure that (1) no contact is made by heavy equipment with contaminated soil, and (2) a 4-foot cover is achieved over the staked-out contaminated zone. Decontamination of heavy equipment will subsequently be avoided for cover operations. All activities related to covering the landfill will be monitored for appropriate health physics criteria.

ENSA personnel, heavy equipment operators, and other personnel in the immediate vicinity of soil removal operations will be required to wear special coveralls and be equipped with respirators as required. BZ samples of their environment will be taken to assess respirable airborne activity. A control zone will be established within which unauthorized personnel may not enter. Prior to leaving the controlled zone, all personnel will be monitored via wipe samples to detect possible contamination per Appendix B limits. Should decontamination of an individual be necessary, they will be required to change into clean coveralls. The individual shall then be required to shower at the TSTP. A change of clothes will be required for all persons having performed

work in the controlled zone.

Environmental monitoring will be conducted at various locations about the controlled zone and landfill site using continuous alpha air monitors and stationary fly paper samplers. Fly paper samplers may pick up airborne activity that settles out of the air even after bulldozing operations have been completed. These are intended to remain overnight and will be removed for analysis the following day.

A final radiological survey and land survey of the site should be made after completion of burial operations. This is to be followed by subsequent installation of permanent markers delineating the area and use restrictions. Future restrictions on land use as recorded on the land title documents should include a covenant running with the land such that the land:

1) May not be excavated without clearance by appropriate health and environmental authorities.
2) May not be used for residential or industrial buildings.
3) May not be used for agricultural purposes.

Monitor wells are further recommended to determine the possible leaching action of americium within the landfill. Approximately 5 such wells are recommended for this purpose, the exact location of which are to be determined by survey results. Each well is to be constructed using 4-inch capped concrete piping. Sufficient well depth should be utilized in order to reach the saturated zone beneath the landfill. A gravel bottom and porous bottom well casement is to be used to assure collection of representative leachate. The well cap is to be designed such that additional pipe sections may be attached as the landfill depth

increases above its present height. This is expected to include an additional 30-feet of hard fill per the current design of the Town of Tonawanda.

Future sampling of each well is anticipated using a suction lysimeter. This is recommended quarterly the first year and annually each year thereafter until such time as landfill operations are terminated, which is expected several years from now.

IV PUBLIC INFORMATION

A clear need exists to inform members of the public of all aspects of the remedial action to be taken. This need is an essential component of good health physics and engineering practice and is necessary in order to avoid mis-information, speculation, unwarranted sensationalism and attendant public fear. To this end all phases of the decontamination remedial program, once formulated and accepted, should be explained and demonstrated to the public in a complete manner. This should logically be performed by the management contractor for the decontamination work.

Briefings are therefore proposed for public information on each and every phase of the proposed program. This shall include meetings for neighboring residents, TSTP and Town workers, and members of the press as required. Tours shall be provided upon request by the managing decontamination contractor and all procedures, precautions and safety measures shall be clearly described.

V MANAGEMENT

The overall management of the project is to be conducted in such a manner as to ensure safe and expeditious completion of all tasks. This shall include adequate cost, performance, and health physics control over subcontractors, should these be required, as well as adequate reporting of all project elements to client and NY State representatives.

1. Project Manager

The management of the entire project shall be under the direct control of a Project Manager. He shall be responsible for the day to day operation of project as well as fiscal control. All reporting is to be through the Project Manager who in turn shall be responsible for all responses to the client. He shall also be responsible for the Quality Assurance conduct of the project as specified in a Project Plan. Additionally, he shall also be responsible, either personally or through a qualified subordinate, for informing the public of all phases of the work effort.

2. Senior Health Physicist

All health physics related matters shall be the responsibility of the Health Physics Manager. He shall be responsible for ensuring that all applicable health, safety, and environmental rules and precautions are observed during the course of decontamination work. He shall also be responsible for ensuring that all instrumentation is properly calibrated and properly used and that decontamination personnel are

adequately trained and supervised. He shall report directly to the Project Manager on all project related matters.

VI DOCUMENTATION

All work performed in this effort will be done in accordance with the ENSA QA program. This program has been designed to meet the criteria of ANSI Standard N45.2 and 10CFR-50, Appendix B. Accordingly, this program has been audited several times during the last several years of active use.

A QA Project Plan will be required prior to the initiation of decontamination work. Furthermore, all daily survey results are to be accurately recorded and verified.

Sample forms for both the Project Plan Cover Sheet and Survey Sheets to be used in conjunction with this effort are shown as follows:

ENSA, Inc.

PROJECT PLAN CHECKLIST

Approved: ______________
Date: ______________

Project Name: ______________
Project No.: ______________
Client: ______________
Project Manager: ______________
Effective: ______________
Revision: ______________

PROJECT PLAN CHECKLIST

Item	Included in Project Plan Yes	N/A	Explanation
1. Staffing level specified	___	___	______________
2. Staff Qualifications specified	___	___	______________
3. QA requirements specified (i.e., safety related, all or part)	___	___	______________
4. Specification of controlled conditions	___	___	______________
5. Specification of the type and extent of analysis required	___	___	______________
6. Identification of special controls, process, tools, test equipment	___	___	______________
7. Need for verification identified	___	___	______________
8. Verification method specified	___	___	______________
9. Manpower or budgetary restraints specified	___	___	______________
10. Project organization specified	___	___	______________
11. Project schedule included	___	___	______________
12. Deliverables identified	___	___	______________
13. Documentation requirements included	___	___	______________
14. Records retention plan specified	___	___	______________

ENSA, Inc.

Client: ____________________ Location: ________________ Sheet ___ of ___

Background

Area Surveyed:
Date of Survey: ______________________
Survey Method:

Instrument Used:

Type (Circle One): Removable / Fixed
Surveyors Initials & Date: ___________
Verification/Review: ______________

Background Count Rate: ______
Count Time: ______________
Efficiency: ______________
Conversion Factor: __________

Area Layout

ENSA, Inc.

Client: ____________________ Location: __________________ Sheet ___of___

Results

Area/Smear Number	Gross Counts	Net Counts	DPM Per $100cm^2$
		Average Value:	

VII REFERENCES

1. "Americium-241 Contamination in the Town of Tonawanda", J.T. Lacey, NYS DEC, letter to EAD Metallurgical, September 13, 1984.
2. "Report to the Committee on Radioactive Materials in the Environment", by Dr. K. Rimawi, et al., NYS Department of Health, June 12, 1984 Meeting.
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5. "Sanitary Landfill Status Report and Landfill Permit Information", A.A. Massey, Town of Tonawanda, August 3, 1984.
6. "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", U.S. Nuclear Regulatory Commission Division of Fuel Cycle and Material Safety, Washington, D.C. 20555, June 1980.
7. "Town of Tonawanda Wastewater Treatment Plant - Results of Analysis of Ash and Sludge Samples", Ecology and Environment, October 6, 1982.
8. "Hazardous Waste Land Treatment", US EPA, SW-874, April 1983.
9. "Neurological Sequelae of Plumbism in Children", M.A. Perlstein and R. Attala, Clinical Pediatrics, 1966.
10. "Handbook of Federal Regulations and Criteria for Multimedia Environmental Control", US EPA, EPA-600/7-79-175, 1982.

11. "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations", US NRC, Federal Register, Vol.46, No.205, October 23, 1981.

12. "Standards for Protection Against Radiation", Title 10, Code of Federal Regulations, Part 20; Appendix B-"Concentrations in Air and Water above Natural Background", 1983.

13. "Ionizing Radiation", New York State Sanitary Code, Chapter 1, Part 16, August 31, 1976.

APPENDIX A

MAP OF TOWN OF TONAWANDA

LOCAL AREA MAP

FIG - 1

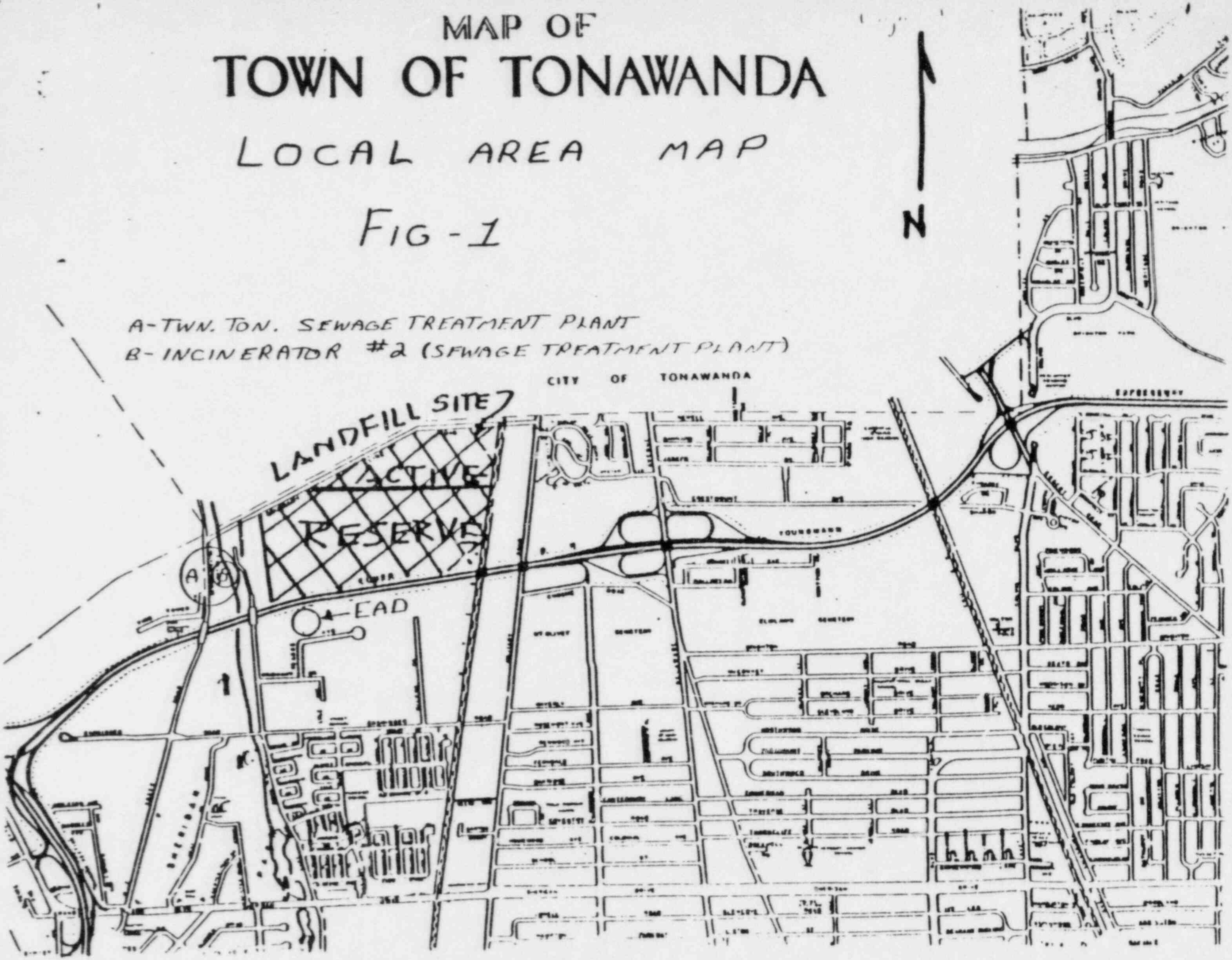
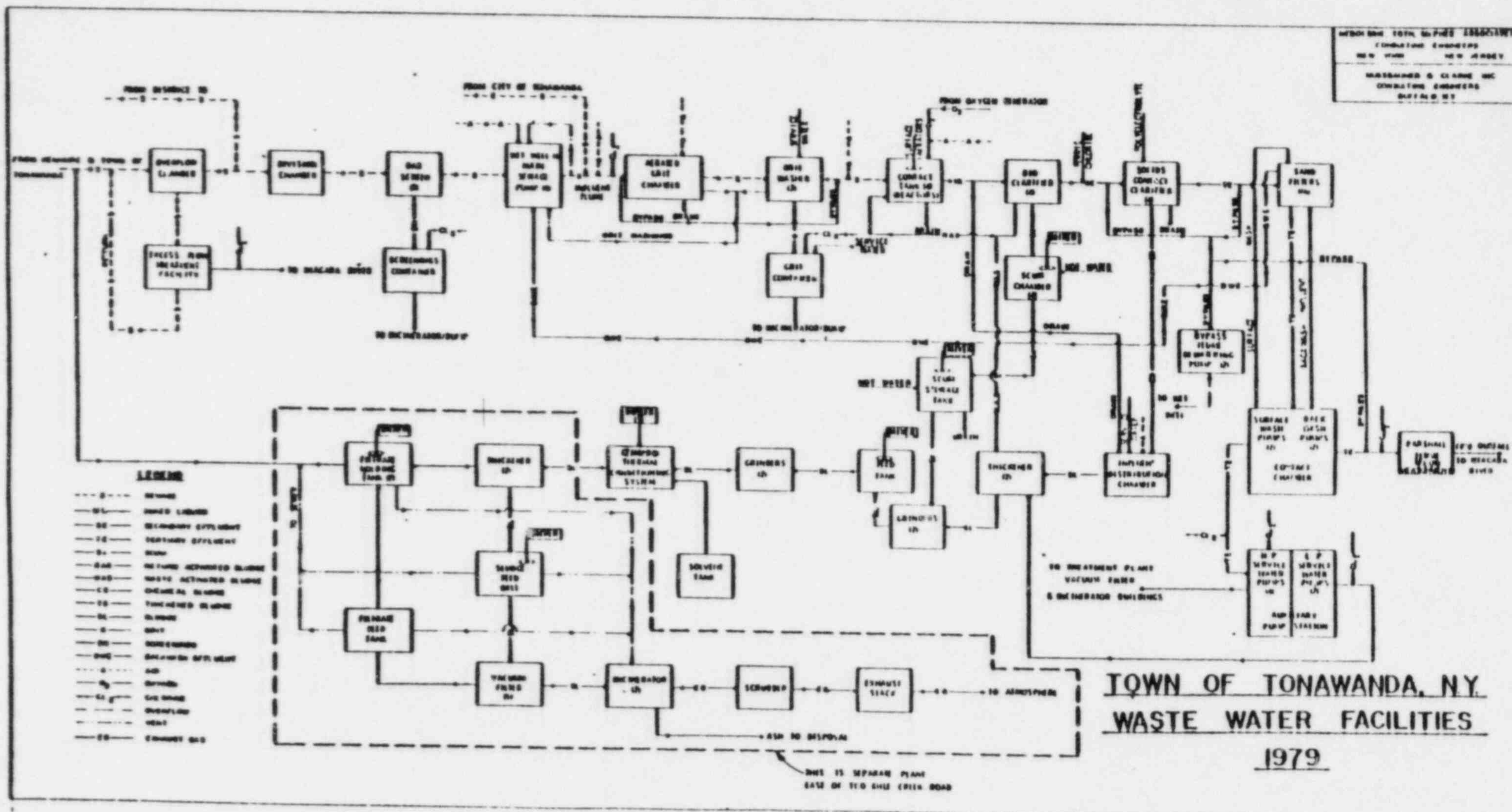


FIG-2

PROCESS FLOW DIAGRAM

OF THE TOWN OF TONAWANDA SEWAGE TREATMENT FACILITY



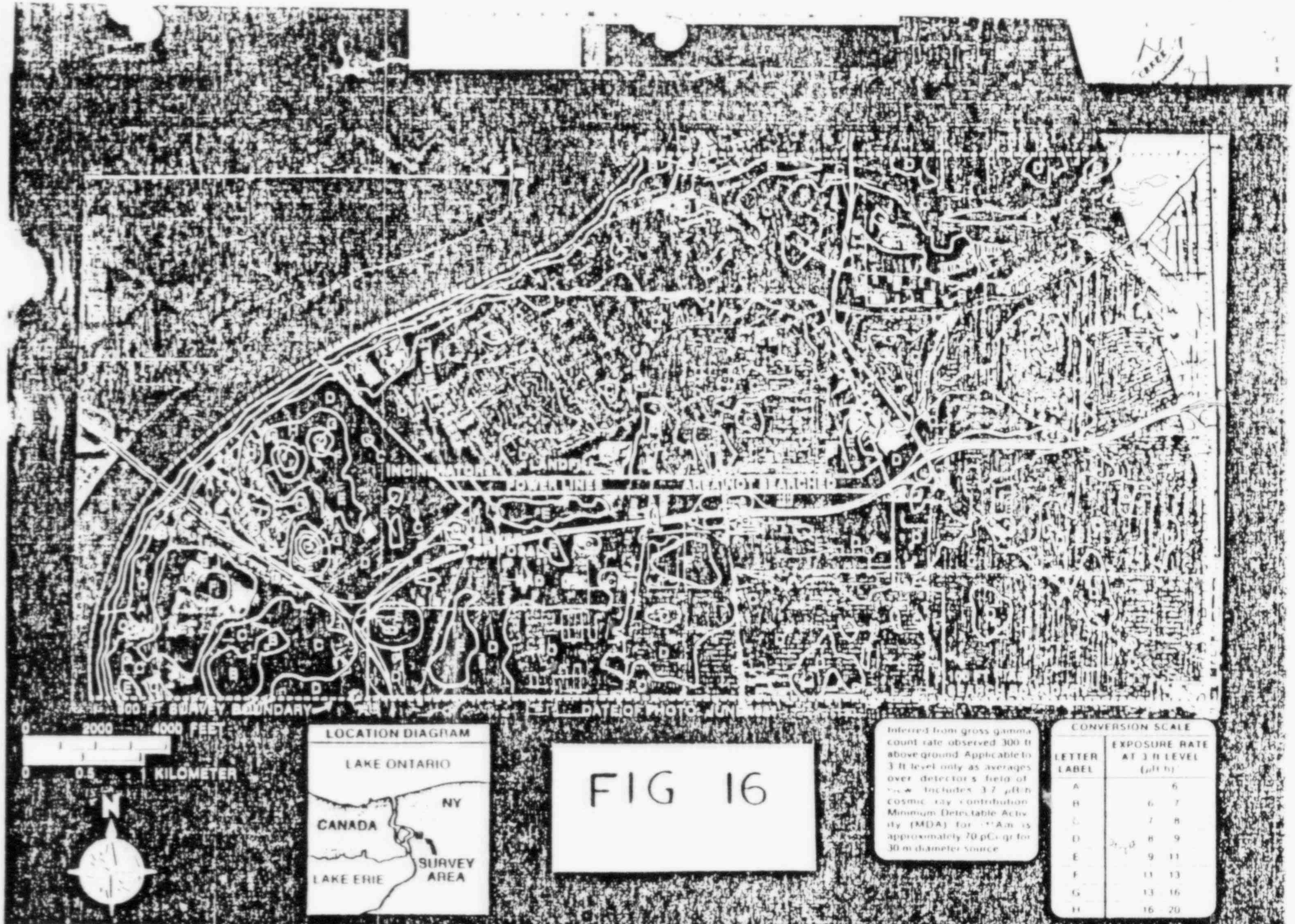


Figure 1. AERIAL RADIOLOGICAL SURVEY AND ^{241}Am SEARCH RESULTS SUPERIMPOSED ON AN AERIAL PHOTOGRAPH OF TONAWANDA, NEW YORK. *Isoradiation contours of total external gamma exposure rate present the result of the aerial survey. Areas contaminated with ^{241}Am, located in the aerial search, are identified with blue cross-hatching.*

APPENDIX B

Limits Applicable to Decontamination

Uncontrolled areas - including STP

Soil/Ash - 30(pCi/g)

Surfaces - fixed 2500(dpm/100cm^2) max.

500(dpm/100cm^2) aver.

- removable 100(dpm/100cm^2)

Skin, personal clothing - fixed 500(dpm/100cm^2)

- removable not detectable

Airborne concentration - insoluable $4x10^{-12}$(uCi/ml)

Water concentration - soluable $4x10^{-6}$(uCi/ml)

Controlled area (for radiation workers only)

Airborne concentration - insoluable $1x10^{-10}$(uCi/ml)

Water concentration - for release into sewer system

- $4x10^{-6}$(uCi/ml) (max. daily discharge not to exceed 50(uCi) total)

Landfill

- No restrictions, Recommended Limit: $\leq$30 pCi/g
- Minimum depth 4 feet below surface stabilized to prevent transport away from site.
- Future land use restrictions w/deed notation
- Permanent site and boundary markers

Dr. Rimawi

AMERICIUM DECONTAMINATION PROPOSAL FOR THE TOWN OF TONAWANDA SEWAGE TREATMENT PLANT AND RELATED FACILITIES

ENSA, Inc.

[illegible]
Revision No. 1
1/16/85

AMERICIUM DECONTAMINATION PROPOSAL FOR THE TOWN OF TONAWANDA SEWAGE TREATMENT PLANT AND RELATED FACILITIES

by

ENSA, Inc.
4550 Bailey Avenue
Buffalo, NY 14226

ENSA, Inc.

TABLE OF CONTENTS

I SUMMARY

1. Objective

The purpose of this proposal is to describe a revised decontamination plan for the Town of Tonawanda sewage treatment plant and related facilities.

This revision incorporates the comments made by the State of New York, Reference 1, on the original plan which was submitted on August 29, 1984. The contamination referred to concerns an isotope of americium (Am-241) which had over a period of seven years resulted in exceeding recommended concentration limits for these facilities. Specifically, this plan encompasses the entire sewage treatment plant, a single sewer line leading from the former EAD Metallurgical Manufacturing facility on 71 Pearce Avenue, and those contaminated portions of the Town of Tonawanda landfill. The proposed plan has been designed for rapid and expeditious implementation in an environmentally safe manner with minimal inconvenience to town residents.

2. Approach

The proposal recommends an initial re-survey of the entire sewage treatment plant plus decontamination of incinerator number 2. This is to be followed by decontamination of the affected sewer line and landfill, each with appropriate pre- and post-decontamination surveys. The rationale for the proposed sequence is based upon the following arguments:

1. A clear operational need exists to provide a redundant

incinerator in order to sustain sewer treatment plant operations. Incinerator number 1 has been in continuous operation for over a year and is overdue for maintenance shutdown. Furthermore, in the event of an extended emergency shutdown, sewer plant operations would be severely curtailed without an operational incinerator.

2. Decontamination of the sewer line initially may result in no available incinerator operation in the event of an inadvertant, albiet remote, release of additional contamination during decontamination efforts. This could severely impact upon subsequent sewer plant operation.
3. Additional experience would be obtained in the decontamination of incinerator number 2 involving large quantities of ash with relatively known concentrations. This would be a subsequent advantage prior to the decontamination of the sewer line where greater uncertainties exist relative to resultant concentrations.

Surveys are recommended prior to all decontamination efforts as a part of this proposal in order to more clearly define initial conditions as well as decontamination effects. These results will be compared against surveys subsequent to each decontamination phase in order to measure the effects of each effort.

3. Decon Plan Modifications

Several modifications have been incorporated into Revision 1 of the Decontamination Plan. These revisions have been made to improve the

scope and safety, and include the following major items:

1. Elimination of Vacuum Truck - This was necessitated in order to eliminate decontamination and liability concerns for a major capital expense item. A specialized vacuum system based upon current TMI clean-up technology is to be used in lieu of the vacuum truck.
2. Initial and Final Surveys - These are to be required for all decontamination areas including the TSTP, sewer line and landfill. Specifically, a novel probe design is to be used to survey the affected sewer lines. Pre- and post-decontamination surveys are required in order to measure the relative effects of decontamination. Additionally, multiple borings for the landfill have been added in order to fully assess the extent of contaminated ash deposition.
3. Ash Characterization - This will be performed to ascertain the relative leachability as well as particle size distribution for further health physics evaluations.
4. Furnace Ash Encapsulation - All contaminated ash to be removed from the TSTP is to be encapsulated in secure 55-gallon drums. These are to be buried at the Tonawanda landfill on a special pad with an appropriate drain and monitor sump design.
5. Comparative Analysis of Heavy Metals - This was performed to ascertain the hazard of americium relative to other heavy metals in landfill ash. The analysis indicates that a considerably greater environmental hazard may exist for heavy metals (lead, cadmium, chromium) than for the americium.

6. Comparative Leaching Hazard - Hydrological analysis concludes that on a worse case basis, potential leachate from the landfill will not exceed drinking water standards for americium.

7. Public Information - A new section has been added which recognizes the need to keep both workers and members of the public informed as to decontamination details. This includes all specifics, precautions and safety measures to be undertaken.

4. Conclusion

Decontamination of the proposed facilities is feasible based upon recent decontamination experiences with private residences as well as partial completion of work at the former EAD Metallurgical facility. This effort should include extensive use of survey experience with americium plus appropriate instrumentation and techniques developed specifically for this isotope.

Additionally, considerable cooperation will be required from both Town and State bodies in order to effect the desired results in a timely manner. This is inclusive of minimal assistance by the Town of Tonawanda in regard to decontamination of the sewer line and landfill. Additionally, New York State assistance will be required for the issuance of permits related to the transportation of contaminated material, landfilling of same, use of calibration sources on site, and a final closeout survey by personnel from the Department of Health.

Subsequent to the completion of all decontamination work, restoration of full incinerator operation and release of sewer line restrictions are expected. Completion of landfill work will include an appropriate four foot cover plus a permanent marker. Additionally, a suitable deed restriction on future use of the property is to be instituted.

II CURRENT STATUS

1. General

The current contaminated condition of the sewage facilities and landfill has been postulated to be the result of contamination from the former EAD Metallurgical facility at 71 Pearce Avenue in Tonawanda New York. This has resulted in the off site contamination of the sewer line, incinerator number 2 in the Town of Tonawanda Sewage Treatment Plant (TSTP) and the Town of Tonawanda sanitary landfill. The relative locations of each are shown in Figure 1, Appendix A. Evidence currently available suggest that this contamination was largely a consequence of routine releases of americium during the 7-year operating history. Additionally, the advanced features of the TSTP and the relative plant throughput of sewage and americium have resulted in concentration levels above allowable limits.

The extent of the contamination condition has been studied by ENSA and the New York State Department of Health, Labor, and Environmental Conservation personnel. This has included ground surveys, test borings, and test well leachate studies as identified in Reference 2. Additionally, aerial surveys were performed and officially reported in Reference 3. The latter confirmed ground survey observations plus identified additional potential problem areas.

2. TSTP

Contamination surveys have been performed at the TSTP of the entire sewage processing stream. This has been performed from plant

inlet to outlet. These surveys were inclusive of, but not limited to, inlet channels, traveling screens, reaction cells, bio-clarifiers, filtration systems and vacuum de-watering systems. Additionally, preliminary surveys were also performed of both furnace areas. Based upon these surveys, contamination at the sewage treatment facility has been found to be essentially confined to incinerator number 2. Incineration by either of two units is the end stage in processing of all solid sludge material as shown in Figure 2, Appendix A.

Due to a history of presumably high concentrations of americium in feed material, incinerator 2 is currently found to contain high ash concentrations of the isotope. This history, discussed in Reference 4, indicates that incinerator 2 operation was terminated during July, 1983.

Incinerator 1, on the other hand, has been operating since that time which corresponds to a time interval subsequent to termination of operations at EAD Metallurgical. Currently, incinerator 1 is operating with negligible americium concentrations (~ 10-pCi/gm) and is not of concern at this time. These results are based upon surveys by both New York State and ENSA personnel. The trace concentration noted is believed to be due to the leaching of minute quantities of americium from the affected sewer line.

Incinerator 2 consists of a 22-ft., 4-inch high structure with an outer diameter of 22-ft., 3-inches. The unit is gas fired with five hearths numbered 0 through 4. These are described in Figure 3 along with additional plant details in Figures 4, 5 and 6.

Access to each hearth is obtained through either of two doors. The largest door for each hearth measures 22-inches by 22-inches thereby

presenting some access difficulty. Incinerator 2 is located in the same building and is adjacent to incinerator 1. No dividers or room partitions separate the two incinerators.

The interior of each hearth contains a rabble arm which is used to mechanically agitate and move ash downward through successive hearths. Considerable quantities of contaminated ash remain within each hearth of incinerator 2 from the last operation date on July 23, 1983. This represents the bulk of contaminated ash to be removed from the TSTP. A lesser quantity is contained in a dump truck plus residual material throughout the incinerator 2 area.

Firebrick linings are used for the interior of each hearth. Both interior walls as well as each hearth floor are constructed from low porosity firebrick. During construction, each precision made brick was individually dipped into refractory cement thereby resulting in brick surfaces devoid of separation cracks. The firebrick floors and ceilings derive their structural integrity from their arched construction. This integrity is to be checked in incinerator 2 by the contractor responsible for initial construction during the initial month of 1985 prior to any decontamination work.

The net quantity of contaminated ash in the TSTP is believed to be about 30-tons. The average concentration of americium has been determined to be about 480-pCi/gm. This translates into a net estimated activity of 14-mCi for the entire TSTP. The volume of ash to be disposed of amounts to 1557-cubic feet based upon a specific gravity of 1.6.

Several site walk throughs have been performed in anticipation of future decontamination work. This has resulted in a review of likely areas required for surveillance and clean-up efforts which are listed in the following Table I.

TABLE I

List of Incinerator 2 Decontamination Areas

Hearths 0, 1, 2, 3, 4

Furnace Drive

Heat Exchanger

Scrubber System

Screw Conveyor to ash elevator from Furnace No. 2

Ash (Bucket) Elevator

Screw Conveyor to ash bin from Ash Elevator

Ash Conditioning Room (Dust Room)

Ash Bin

Screw Conveyor to garage load area from Ash Bin

Ash Truck

Garage

External surfaces, gratings

Contact areas during decontamination

3. Sewer Line

The sewer line from the EAD facility extends about 8000 lineal feet to the TSTP. Approximately half of this line experiences very low or trickle flow until a connection is made at a major trunk line from the Village of Kenmore.

Details of the sewer line are shown in Figures 7 and 8 of Appendix A. Manhole 2 (MH-2) is situated immediately in front of the EAD building at 71 Pearce Avenue. A connection is made to the sanitary sewage line between MH-1 and MH-3 as shown in Figure 7. Piping at this point consists of 10-inch extra strength vitreous fired pipe. This extends to Oriskany Drive where connection is made to a 12-inch sewer pipe, also vitreous fired, at MH-5. The 12-inch line extends along the latter road to the manhole connection at East Park Drive, as shown on Figure 8. The sewage lines along both Pearce Avenue and Oriskany Drive were installed relatively recently (1970). These lines were constructed with premium joints using gasketed fittings at all connections.

A 12-inch sewer line extends some 800 feet along East Park Drive to Ensminger Road. The next connection is made to an 18-inch line at MH-9. The East Park line was installed in 1942 using the appropriate technology at that time which consisted of vitreous fired piping with tar and oakum joints. An additional 8-foot long 18-inch line extends along Ensminger between MH-9 and MH-10 where a transition occurs to 21-inch piping. This extends along Ensminger Road to MH-11 where the line meets with the major 42-inch trunk line from the Village of Kenmore.

Preliminary surveys have been performed at each manhole which indicate considerable activity at MH-2 through MH-10. No activity was

observed upstream from EAD in MH-1 as expected. Similarly, no activity was observed at MH-11. This latter observation is attributed to the major flow which always occurs through the large 42-inch trunk line. This apparently suffices to prevent accretion or deposition of americium contamination.

Current ash being processed at the TSTP indicates a trace concentration of americium on the order of 10-pCi/gm. This quantity also corresponds to an average throughput of dry ash on the order of 40 tons per day. Based upon the analytical model suggested in Reference 4, this suggests that approximately 67-μCi of americium is entering the sewage treatment plant daily. Since operations at EAD Metallurigical have not been conducted during the past year, this small amount of contaminant is presumably being leached from the affected sewage line.

The observed americium concentration in the TSTP ash has remained at a relatively constant value (10-pCi/gm) during the past seven months of observations. This suggests that a relatively large source of americium may remain in the contaminated portion of the sewer line. A reasonable first estimate suggests that this source is about 1000 times the daily release (67-μCi), or 67-mCi. Subsequent decontamination efforts should therefore ensure complete recovery of all contaminated effluents in order to prevent consequential further contamination of the TSTP.

The sewage flows vary significantly in the affected sewerlines. For the most part, a trickle flow of less than 1-gpm exists in the line along Pearce Avenue, Oriskany Drive and East Park. This low flow is totally insufficient to provide any scouring action in this 10 and 12-

inch section of piping. The total length of this sewer line is 1983 feet which comprises 85% of the affected sewerline.

The low flow is largely due to the relatively sparce number of buildings being served along these roads. Eight lateral connections exist from Pearce to Ensminger which, for the most part, serve warehousing types of operations. The one exception to this is a church and parish house at the intersection of East Park and Ensminger. The lateral from the ajacent parochial school building at this location also connects to East Park. However, this building is not being utilized other than for Wednesday night bingo and for Sunday instruction.

The sewerline along Ensminger Road carries the sewage from a large area of the Town of Tonawanda. This line is generally half full the year round with an estimated flow of 2000-gpm. The affected section of this sewerline is only 342-feet and constitutes only 15% of the affected line. Owing to the relatively full condition of this 18-inch line, little or no americium is expected to remain in the pipe interior by virtue of the constant flushing and scouring conditions.

4. <u>Landfill</u>

The Town of Tonawanda landfill consists of a 51-acre site immediately to the north of the EAD facility and adjacent to the TSTP. The relative locations of each are shown in the map of Figure 1.

The area of the landfill where highly contaminated ash appears at the surface consists of a single large area of approximately 3-acres plus two much smaller pockets. Previous surveys by NYS-DOH have been performed at the site with results summarized in Reference 2. Partial

ENSA, Inc.

survey results of the site are indicated in Figures 9 and 10 from Reference 2. This has been supplemented and substantiated by aerial radiological surveys of the landfill, per Reference 3. The results of this aerial survey are summarized in Figure 16.

The net amount of contaminated ash in the entire landfill is estimated to be 10,000-tons based upon the 7-year TSTP throughput during which time EAD was in operation. Specific activity estimates vary considerably with a conservative estimate placed at 380-pCi/gm for the average value. This results in a convervative upper estimate of the net total activity for the entire landfill of 3.4-curies. Based upon actual discharge records from both EAD and the TSTP, the latter amount is calculated to be only 0.298-Ci per Reference 4. Furthermore, the analysis of Reference 4 indicates an average ash americium concentration of only 68.6-pCi/gm.

Several leachate test wells around the site have been sampled with the result that no americium was found in any well per Reference 2. The approximate location of each leachate sampling point is shown in Figure 11. Additionally, ditches along the sides of the landfill have been sampled with no evidence of americium contamination of run-off water.

A detailed study of the landfill has recently been completed persuant to a permit application for re-use of the site. This study, Reference 5, performed detailed topography, drainage, and leachate analysis in support of the permit. The existing topography and drainage system is described in Figures 12 and 13. Drainage flow for the site is generally in an east to west direction with groundwater at a depth of 15-feet below grade. As reported in Reference 5, the site is not in a

known flood plain area. An extensive drainage and sampling system currently surrounds the site.

The proposed modifications to the landfill per Reference 5 include a Leachate Emergency Plan whereby all drainage may be directed to two concrete basins at the adjacent former incineration site. This is indicated in Figures 14 and 15 and includes the addition of a new 25 to 30-foot tie line should problems arise.

Additional toxic materials have also been identified in the landfill ash in the past. This consists mainly of heavy metals which have been throughly oxidized as a result of the incineration process at 1400°F. Based upon the representative analysis of Reference 7, the following heavy metals are known to occur in the Tonawanda landfill in substantial quantities:

Element	Ash Concentration Per Reference 6
Cadmium	19.7-mg/kg
Chromium	133-mg/kg
Lead	1900-mg/kg

The concentration values noted are generally typical for sewage treatment plant ash residue and are within the EPA allowable limits for landfilling per Reference 8. Other metals of hazardous concern include arsenic, mercury and selenium, but are of lesser or indeterminate quantities in the Tonawanda landfill.

The total amount of heavy metals may be calculated by assuming the above values to be representative of all the landfill ash (10,000-Tons). This calculation results in the following gross calculated quantities:

cadmium	178,800-grams	(394-lbs)
chromium	1,206,500-grams	(2,659-lbs)
lead	17,236,800-grams	(38,000-lbs)

These values are several orders of magnitude greater than the conservative upper limit of 3.4-grams for americium.

The relative toxicity of these metals have been investigated intensively in the past by several researchers per Reference 8. Both cadmium and chromium are known carcinogens per well documented toxicology experiments. Furthermore, both elements are known to be toxic to plant life for soil concentrations as low as 5-ppm. Lead, while not a known carcinogen, has well known deleterious health consequences in man, per Reference 9. No known lead toxicity to plant life is known. Upper limits of 30-ppm have been established, however, for domestic animals intended for human consumption. Drinking water limits for each of the above heavy metals have been established by the EPA per Reference 10. These limits are 50-µgm/L for lead and chromium and 10-µgm/L for cadmium.

The previous data on ash heavy metals does not include several analytical refinements which are important factors on the relative toxicity to man. Such details as landfill chemical reactions, lechability, biological uptake and biological half-life, which are also appropriate for americium, have not been included in the discussion owing to the complexity and diversity of possibilities. The data does indicate, however, that americium is not the only toxic element of concern in the landfill ash and may be considered only one of several hazards.

The contamination potential of americium in the Tonawanda landfill may also be considered from hydrological considerations. The worse case model for this scenario assumes that all americium leaches from the landfill in a single year. This event is highly unlikely from basic first principles. This aside, a conservative leaching hypothesis may be considered for upper bound analysis only. Such gross leaching is further not supported by recent sampling which indicates that no americium is appearing in either run-off water or in leachate wells after several years in the landfill.

Based upon the EPA models described in Reference 8, the net average infiltration of water in the Tonawanda area amounts to 10-inches per year. This is the water net balance for the area given average amounts of precipitation and evaporation. Based upon the entire landfill, or 51-acres, an average net leachate generation rate of 13,849,000-gallons may be expected per year. Based upon the best estimate value of americium in the landfill (0.3-Ci), and assuming complete leaching of all americium in one year, this may result in a theoretical concentration of $5.7(10)^{-7}$-μCi/ml in leachate water. This is considerably less than the most stringent NRC standard for drinking water which is $3.0(10)^{-5}$ (μCi/ml) per Reference 12.

A worse case estimate for americium concentrations may also be calculated using the upper bound estimate of 3.4-Ci for the landfill. Again, assuming total release of all americium in one given year results in a concentration of $6.48(10)^{-5}$-μCi/ml. This is only slightly greater than the drinking water standard of Reference 12 for these extreme hypothetical conditions. This comparison therefore indicates that no

consequential environmental hazard due to americium may be expected either now or in the future due to leaching for the Tonawanda landfill.

5. Criteria

Applicable protection limits for proposed americium decontamination work are described in Appendix B. The values listed are recommended as guidelines appropriate for decontamination operations. Most values have been taken from the Department of Health code rule, Reference 13, and from NRC rules per Reference 12.

The airborne concentration value listed in Appendix B assumes insoluble respirable particulates. The water concentration limit is based upon the soluble, most restrictive condition for americium. In addition, an upper limit for intentional daily discharge is set at 50-µCi, in order to keep incinerator ash concentration below 30-pCi/g. This is conservatively below the 200-µCi/day limit identified in Reference 4 and is selected to accomodate known leaching from the sanitary sewer line.

The soil/ash concentration limit of Appendix B has been adopted from the NRC recommendations of Reference 6 and 11. This is required since soil contamination limits due to Am-241 are not specifically addressed in 10NYCRR16.

III DECONTAMINATION

1. Sewage Treatment Plant

Decontamination work at the TSTP is to be preceeded by a thorough documented re-survey of the entire facility. This survey will be sufficiently detailed for benchmark purposes and shall be inclusive of all flowstreams and working areas. Concurrently, a characterization analysis will be performed upon furnace ash for particle size, contamination distribution (with size) and leachability. The later shall be inclusive of the expected pH range for rainfall in the Tonawanda area and will be used for health physics evaluation. Initial decontamination of incinerator 2 at the TSTP is recommended in order to minimize the potential for severe disruption of plant operations. This also serves the advantage of providing additional experience prior to decontamination work on the more difficult sanitary sewer line.

All work to be performed will be designed to minimize the potential for airborne releases at the TSTP and environs. To this end, a high duty vacuum system will be utilized with sufficient capacity to ensure efficient pickup of both large and small particulate. The system to be used will be similar in design to the unit currently in operation at Three Mile Island for scabbling operations. The latter refers to concrete surface removal operations within the containment and AUX building areas. Such operations were witnessed by ENSA personnel at TMI in order to ascertain the efficacy of a similar operations where significant quantities of contaminated chips and dust were being removed.

A portable vacuum system shall be used for ash removal operations. This shall consist of a removable 55-gallon barrel receptor with a cyclone and roughing filter head. This is followed by a three stage filtration bank and pump. The last stage filter will utilize an absolute filter capable of removing particles down to 0.3-micron sizes with an absolute filtration efficiency of 99.99%.

Operation of the vacuum system will be maintained under strict health physics supervision. This will include establishment of appropriate procedures for barrel changeout, filter replacement and vacuum pump exhaust monitoring.

All ash collected by the system will be retained in 55-gallon drums for subsequent removal and burial. The drums selected shall be DOT 17H rated with gasketed covers. These are typically used for hazardous waste applications and are suitable for burial purposes. Approximately 100 such drums will be sufficient to contain all the known ash at the TSTP.

Decontamination work on the hearths is to be preceded by an evaluation of hearth integrity. This evaluation will be performed by the builders, Multiple Hearth of Rochester, NY. The latter are scheduled to take place during an inspection-repair visit by the same company during the latter part of January, 1985.

The decontamination of incinerator 2 is intended to take place in the order described in Table I of Section II 2. Initial work would take place in hearth 0 with a special Health Physics (HP) control station at each hearth door. Maximal amounts of ash will be vacuumed from each hearth door prior to manned entry. In addition, minor amounts

of scraping may be required on the furnace interior in order to remove all ash. This is of minor consequence with the exception of the rabble arm which may require insulation replacement. Cleaning shall progress from hearths 0 to 4 in that order. Hearth entry would take place through a controlled area HP tent at each of the large hearth doors. Each entry is intended using full body protection with supplied air and 5-minute emergency back-up air.

Complete HP monitoring shall be performed during all phases of decontamination. This shall include personnel surveys, area wipes, and a high-vol grab sampler at the hearth entrances. Additionally, ion chamber measurements inside each hearth will be made to establish local field levels. This is to be supplemented with film badges of all decontamination workers plus a BZ sampler inside each enclosed work area.

Final surveys of the entire incinerator 2 area are to be performed subsequent to all decontamination. These are to be documented and recorded for evaluation of the decontamination effort. This evaluation shall include a comparision of initial and final surveys in a comparative analysis. Equipment to be utilized during the decontamination shall include the items listed on Table II.

TABLE II

On Site Equipment List

During TSTP Decontamination

Item	Model	Quantity
1. alpha scintillation counters	Eberline SAC-4	2
2. portable alpha detectors	Eberline RM-19/AC-3	2
3. portable gamma detector	Eberline RM-19/PG-2	1
4. breathing air supply		1
5. whole body suits w/full face masks - heavy duty		2
6. explosion proof lighting		2
7. lifeline, tools (misc.)		1
8. vacuum system		1
9. continuous air monitor	Eberline Alpha-3	

Disposal of contaminated ash is intended to take place in the Tonawanda landfill in accordance with recommendations of the Advisory Committee, per Reference 2. This is consistent with EPA recommendations regarding americium concentrations of this magnitude and serves as the basis for the NRC position statement of Reference 11. All ash containing barrels are to be situated at a documented referenced location on the landfill site adjacent to the largest known area of surface contamination as noted in Figure 9. The specific site location will be determined subsequent to a complete landfill survey and in concurrence with New York State DOH, DOL, DEC and the Town of Tonawanda.

A specially prepared site will be designed for the barrels to provide for long term monitoring of potential leaching problems from the barrels. This shall include a 250-ft^2 pad with a corner drain system sufficient to hold 100 barrels stacked 2 high. A PVC drain system (SDV-35) shall be constructed from this drain point to a concrete monitor well at the edge of the ultimate landfill birm. The concrete pad shall be constructed of 6-inches (minimum) reinforced concrete with a 12-inch No.2 stone underlayment.

Subsequent to the siting of all barrels, the area will in turn be covered with a minimum of 20-inches of No.2 stone and additional 4-feet of compacted clay. The latter is readily available from a nearby site. Normal landfilling operations are then anticipated for the site over the next several years with an ultimate depth of 30-feet of additional hard fill.

2. Sanitary Sewer Line

The initial objective of the decontamination effort for the sewer line will be to meet the uncontrolled area limits of Appendix B. Pursuant to this, detailed surveys of the sewer line will be performed both prior to and subsequent to decontamination. These surveys will include surveys of all affected manholes plus interstitial sewer lines.

The planned approach for the sewer line shall be based upon initially surveying, decontamination, and re-surveying the manhole and 80-foot section between MH-2 and MH-3. This is to be repeated until successful decontamination levels are reached per Appendix B values. The latter is to be determined by phantom testing using the survey probe in simulated sewer line conditions. Experience will then be gained from a complete cycle of inspection and cleaning on a relatively short length of sewer line.

Having successfully completed this, the next sewer line section between MH-3 and MH-4 will be approached using the benchmark data previously obtained. Such information as total time required, number of decontamination cycles required, etc. will be utilized for further scheduling. Present estimates indicate that 3-hours will be required for each survey and 5-hours for each decontamination. This is to be repeated for each subsequent manhole and sewer line section until decontamination is complete.

Each decontamination cycle on a manhole and sewer line section is to be performed by plugging the downstream section with an inflatable plug containing a suction port. This suction port is to be attached to a suitable suction pump and hose for collection of all contaminated

material. Decontamination material is to be collected for later treatment and testing. Additionally, mechanically operated back-up plugs (plumbers' helper) will be utilized immediately upstream and downstream of each manhole and sewer line section to be decontaminated. These will be required to prevent accidental unauthorized releases of contamination as well as the prevention of recontamination of previously cleaned sewer line sections.

Radiological surveys are to be performed using a specially designed ruggedized NaI probe in a water tight housing. The probe will include appropriate voltage dividers and pre-amplifiers specifically tailored for long lead lengths (500-ft.). Probes of this type have been used in the past for well logging operations and are available with circumferential low photon energy pickup characteristics. A unique probe design has been scoped out with a leading manufacturer for this application that will satisfy the maximum manhole clearance of 4-feet.

The surveys and decontamination cycles will be performed by initially isolating flow from each lateral along Pearce, Oriskany and East Park Drives. This has been done in the past and is easily accomplished for this relatively low flow (<1-gpm) section of piping. Town of Tonawanda officials have been contacted in this regard and have expressed a willingness to cooperate in this effort (as well as others) by assisting in the isolation. Additional measures will be taken to limit both survey and decontamination efforts to minimal use periods for sanitary sewer usage.

Isolation of the single section of sewer line along Ensminger Road will be considerably more difficult owing to the high flow rate (2000-

gpm). Isolation for this section of line will be accomplished through the combined use of plugs and pumping. Large pumps have been used in the past for such isolation purposes and will be needed to divert flow around manhole No.9. Two skid mounted diesel powered pumps are anticipated for this use with a combined pumping capacity of 3000-gpm. Special highway access ramps over pumping lines are to be provided with traffic control by the Town of Tonawanda as required.

High pressure water spray of the sanitary sewer line is expected to be very effective in reducing the present levels of contamination. Further investigation is however warranted in order to establish accurate decontamination factors to be expected. Preliminary data based upon entry into MH-2 has indicated decontamination factors to be on the order of 10:1 using only a brief scrub of the concrete manhole floor with a brush and soap followed by water rinse. An alpha scintillation probe (Eberline AC-3) was used for this purpose. More reliable factors will have to be established using a gamma scintillation probe and high pressure spray techniques. The high pressure spray method is a standard plumbing technique for sewer line cleanout and one that is capable of scouring the interior of sewer lines. In addition, one such system has the design capability to inject abrasives into the water spray in order to increase decontamination factors. This is accomplished through the use of special mixing adaptors that will be available for this effort and used as required.

All spray water and sewer line material released during decontamination shall be collected, stored and treated at the EAD site. A single tank currently located at this site is of sufficient capacity

($500\text{-}ft^3$) to contain all material in a completely filled 12-inch line between manholes ($353\text{-}ft^3$). Therefore, all liquids between each manhole section will require filtration and treatment to remove all significant quantities of americium. Cleaned water shall then be returned to the nearest sewer line upon meeting the drinking water standards of Appendix B as well as the 50-μCi limit for the TSTP.

The filtration system to be used will consist of a series of filters effective at different particle sizes preceded by roughing strainers. Filter housings will contain one or more wound cartridge filters, and shall be capable of being used with 50, 40, 25, 20, 5, 4, and 1-micron filters. The precise filter sequence required will be determined only through actual decontamination. Filtration capability will extend to particle sizes on the order of one micron. Chemical treatment and an ion exchange resin bed in line with these filters shall be used in order to meet or exceed the Appendix B criteria.

Contaminated filters, housings, pumps, pressure hoses, tanks and other contaminated materials generated in this work which are in excess of DOH Table 7 limits will be disposed of as rad-waste. All solid or liquid materials not satisfying the Appendix B criteria will also be treated, packaged and disposed of as radwaste in an appropriate manner per DOT regulations. This shall be inclusive of dehydration, packaging and labeling as required.

All surveying and decontamination work will be under direct HP control and supervision. This shall include the use of all required personnel protection (double boots, double gloves, coveralls and head covers) as well as personnel monitors. The latter shall include the use

of film badges and BZ samples. Additionally, a portable air sampler shall be used to monitor possible airborne activity, although none will be expected due to the wet conditions.

Sewer gas meter readings will also be required prior to manned entry into each manhole. All required precautions will be taken to prevent worker distress and to provide for continuous monitoring and emergency pull-out. A special screened enclosure will be constructed around each manhole to be worked on in order to control public access.

3. Town of Tonawanda Landfill

The approach to be followed for the landfill shall include an initial radiological re-surveying of the landfill. This is to be performed in conjunction with a documented land survey of all areas of the landfill where the past potential existed for receiving contaminated furnace ash. Approximately 10-acres of the landfill have been identified in this category although only 3-acres are known to have high surface concentrations. Contaminated areas where surface concentrations exceed the 30-pCi/gm of Appendix B will be identified and staked. These surveys will be assisted by visual observations (red furnace ash), recollections of landfill operators, and past surveys (References 2 and 3).

Surface surveys are to be supplemental with landfill borings both in and around areas of known contaminated ash. Borings will be used to profile the vertical distribution of ash. Additionally, these will be needed to ascertain the area extent of contamination since surface radiological surveys may be masked by several inches of uncontaminated

soil. A total of 30 to 40 such borings are anticipated depending upon the combined results of all surveys. These will be performed using a powered hand auger to a depth of 8-feet which is sufficient to include all past furnace ash disposals.

All surveys conducted of the landfill are to be utilized in conjunction with the ultimate design of the clay cap. Additionally, this information will be required in the design and location of the concrete pad for the burial of barrels containing furnace ash. Land survey stakes will therefore require color coding to distinguish the contaminated zone for subsequent cover operations.

The appropriate action to be undertaken at the landfill, in concurrence with NRC recommendations, should involve the on-site burial of furnace ash and stabilization of contaminated ash and soil. The approximate limits for this portion of work are identified in Appendix B.

Packaging and transport of the contaminated ash and soil to a licensed disposal site cannot be justified from the standpoint of risk to the public health. It is believed that such a package and transport scenario may in fact entail greater risks to both the environment and to radiation workers involved in packaging and transport operations. This view is consistent with the committee recommendations per Reference 2. In addition, design specifications for on-site burial and stabilization are thought to be quite effective in isolating the radioactive materials, provided sufficient safeguards are operative. This includes design criteria to reduce the possibility for harm to the environment and/or risk to the public health and safety.

A minimum 4-foot cover will be emplaced over all the landfill areas where contamination is found to exceed the 30-pCi/gm limit. The exact extent of this cover will be determined by the land, surface, and vertical surveys. This will also be identified by color coded staking. Approximately 10-acres of landfill, including the location for furnace ash drums, may ultimately require such coverage.

Clay from a nearby clay bank will be trucked to the area for spreading and grading by means of a bulldozer to obtain the 4-foot cover. This is to be followed by compaction with a sheepsfoot compactor. All operations of heavy equipment will be monitored to ensure that (1) no contact is made by heavy equipment with contaminated soil, and (2) a 4-foot cover is achieved over the staked-out contaminated zone. Decontamination of heavy equipment will subsequently be avoided for cover operations. All activities related to covering the landfill will be monitored for appropriate health physics criteria.

ENSA personnel, heavy equipment operators, and other personnel in the immediate vicinity of soil removal operations will be required to wear special coveralls and be equipped with respirators as required. BZ samples of their environment will be taken to assess respirable airborne activity. A control zone will be established within which unauthorized personnel may not enter. Prior to leaving the controlled zone, all personnel will be monitored via wipe samples to detect possible contamination per Appendix B limits. Should decontamination of an individual be necessary, they will be required to change into clean coveralls. The individual shall then be required to shower at the TSTP. A change of clothes will be required for all persons having performed

work in the controlled zone.

Environmental monitoring will be conducted at various locations about the controlled zone and landfill site using continuous alpha air monitors and stationary fly paper samplers. Fly paper samplers may pick up airborne activity that settles out of the air even after bulldozing operations have been completed. These are intended to remain overnight and will be removed for analysis the following day.

A final radiological survey and land survey of the site should be made after completion of burial operations. This is to be followed by subsequent installation of permanent markers delineating the area and use restrictions. Future restrictions on land use as recorded on the land title documents should include a covenant running with the land such that the land:

1) May not be excavated without clearance by appropriate health and environmental authorities.
2) May not be used for residential or industrial buildings.
3) May not be used for agricultural purposes.

Monitor wells are further recommended to determine the possible leaching action of americium within the landfill. Approximately 5 such wells are recommended for this purpose, the exact location of which are to be determined by survey results. Each well is to be constructed using 4-inch capped concrete piping. Sufficient well depth should be utilized in order to reach the saturated zone beneath the landfill. A gravel bottom and porous bottom well casement is to be used to assure collection of representative leachate. The well cap is to be designed such that additional pipe sections may be attached as the landfill depth

increases above its present height. This is expected to include an additional 30-feet of hard fill per the current design of the Town of Tonawanda.

Future sampling of each well is anticipated using a suction lysimeter. This is recommended quarterly the first year and annually each year thereafter until such time as landfill operations are terminated, which is expected several years from now.

IV PUBLIC INFORMATION

A clear need exists to inform members of the public of all aspects of the remedial action to be taken. This need is an essential component of good health physics and engineering practice and is necessary in order to avoid mis-information, speculation, unwarranted sensationalism and attendant public fear. To this end all phases of the decontamination remedial program, once formulated and accepted, should be explained and demonstrated to the public in a complete manner. This should logically be performed by the management contractor for the decontamination work.

Briefings are therefore proposed for public information on each and every phase of the proposed program. This shall include meetings for neighboring residents, TSTP and Town workers, and members of the press as required. Tours shall be provided upon request by the managing decontamination contractor and all procedures, precautions and safety measures shall be clearly described.

V MANAGEMENT

The overall management of the project is to be conducted in such a manner as to ensure safe and expeditious completion of all tasks. This shall include adequate cost, performance, and health physics control over subcontractors, should these be required, as well as adequate reporting of all project elements to client and NY State representatives.

1. Project Manager

The management of the entire project shall be under the direct control of a Project Manager. He shall be responsible for the day to day operation of project as well as fiscal control. All reporting is to be through the Project Manager who in turn shall be responsible for all responses to the client. He shall also be responsible for the Quality Assurance conduct of the project as specified in a Project Plan. Additionally, he shall also be responsible, either personally or through a qualified subordinate, for informing the public of all phases of the work effort.

2. Senior Health Physicist

All health physics related matters shall be the responsibility of the Health Physics Manager. He shall be responsible for ensuring that all applicable health, safety, and environmental rules and precautions are observed during the course of decontamination work. He shall also be responsible for ensuring that all instrumentation is properly calibrated and properly used and that decontamination personnel are

adequately trained and supervised. He shall report directly to the Project Manager on all project related matters.

VI DOCUMENTATION

All work performed in this effort will be done in accordance with the ENSA QA program. This program has been designed to meet the criteria of ANSI Standard N45.2 and 10CFR-50, Appendix B. Accordingly, this program has been audited several times during the last several years of active use.

A QA Project Plan will be required prior to the initiation of decontamination work. Furthermore, all daily survey results are to be accurately recorded and verified.

Sample forms for both the Project Plan Cover Sheet and Survey Sheets to be used in conjunction with this effort are shown as follows:

ENSA, Inc.

PROJECT PLAN CHECKLIST

Approved: ______________
Date: ______________

Project Name: ______________
Project No.: ______________
Client: ______________
Project Manager: ______________
Effective: ______________
Revision: ______________

PROJECT PLAN CHECKLIST

Item	Included in Project Plan Yes	N/A	Explanation
1. Staffing level specified	___	___	______________
2. Staff Qualifications specified	___	___	______________
3. QA requirements specified (i.e., safety related, all or part)	___	___	______________
4. Specification of controlled conditions	___	___	______________
5. Specification of the type and extent of analysis required	___	___	______________
6. Identification of special controls, process, tools, test equipment	___	___	______________
7. Need for verification identified	___	___	______________
8. Verification method specified	___	___	______________
9. Manpower or budgetary restraints specified	___	___	______________
10. Project organization specified	___	___	______________
11. Project schedule included	___	___	______________
12. Deliverables identified	___	___	______________
13. Documentation requirements included	___	___	______________
14. Records retention plan specified	___	___	______________

ENSA, Inc.

Client: ________________ Location: ______________ Sheet ___of___

Background

Area Surveyed:
Date of Survey: ____________________
Survey Method:

Type (Circle One): Removable / Fixed
Surveyors Initials & Date: ___________
Verification/Review: ________________

Instrument Used:

Background Count Rate: _______
Count Time: _______________
Efficiency: _______________
Conversion Factor: __________

Area Layout

ENSA, Inc.

Client: ________________ Location: ________________ Sheet __ of __

Results

Area/Smear Number	Gross Counts	Net Counts	DPM Per 100cm^2
		Average Value:	

VII REFERENCES

1. "Americium-241 Contamination in the Town of Tonawanda", J.T. Lacey, NYS DEC, letter to EAD Metallurgical, September 13, 1984.
2. "Report to the Committee on Radioactive Materials in the Environment", by Dr. K. Rimawi, et al., NYS Department of Health, June 12, 1984 Meeting.
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5. "Sanitary Landfill Status Report and Landfill Permit Information", A.A. Massey, Town of Tonawanda, August 3, 1984.
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7. "Town of Tonawanda Wastewater Treatment Plant - Results of Analysis of Ash and Sludge Samples", Ecology and Environment, October 6, 1982.
8. "Hazardous Waste Land Treatment", US EPA, SW-874, April 1983.
9. "Neurological Sequelae of Plumbism in Children", M.A. Perlstein and R. Attala, Clinical Pediatrics, 1966.
10. "Handbook of Federal Regulations and Criteria for Multimedia Environmental Control", US EPA, EPA-600 7-79-175, 1982.

11. "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations", US NRC, Federal Register, Vol.46, No.205, October 23, 1981.

12. "Standards for Protection Against Radiation", Title 10, Code of Federal Regulations, Part 20; Appendix B-"Concentrations in Air and Water above Natural Background", 1983.

13. "Ionizing Radiation", New York State Sanitary Code, Chapter 1, Part 16, August 31, 1976.

APPENDIX A

MAP OF
TOWN OF TONAWANDA

LOCAL AREA MAP

FIG - 1

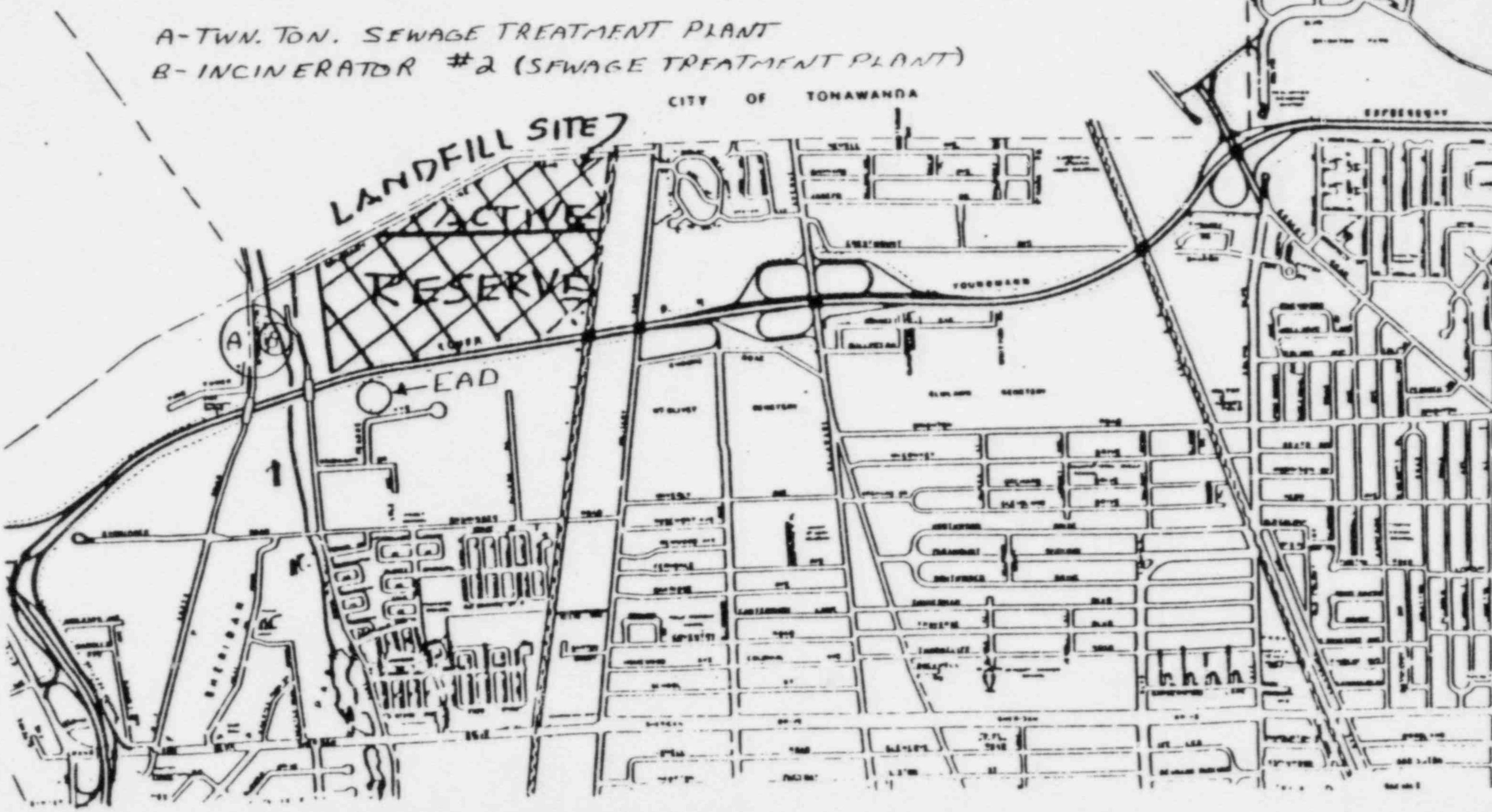
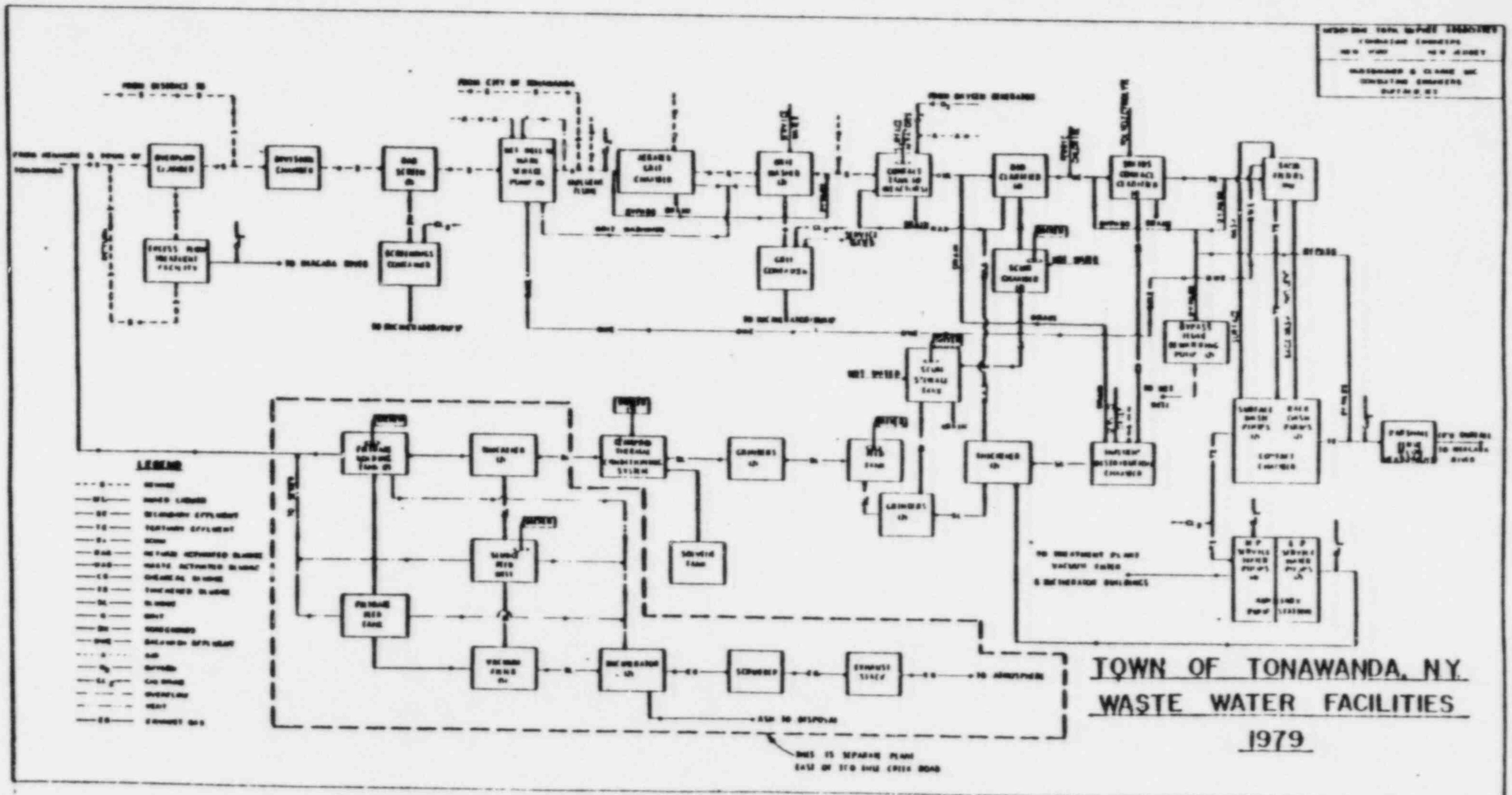


FIG - 2

PROCESS FLOW DIAGRAM

OF THE TOWN OF TONAWANDA SEWAGE TREATMENT FACILITY



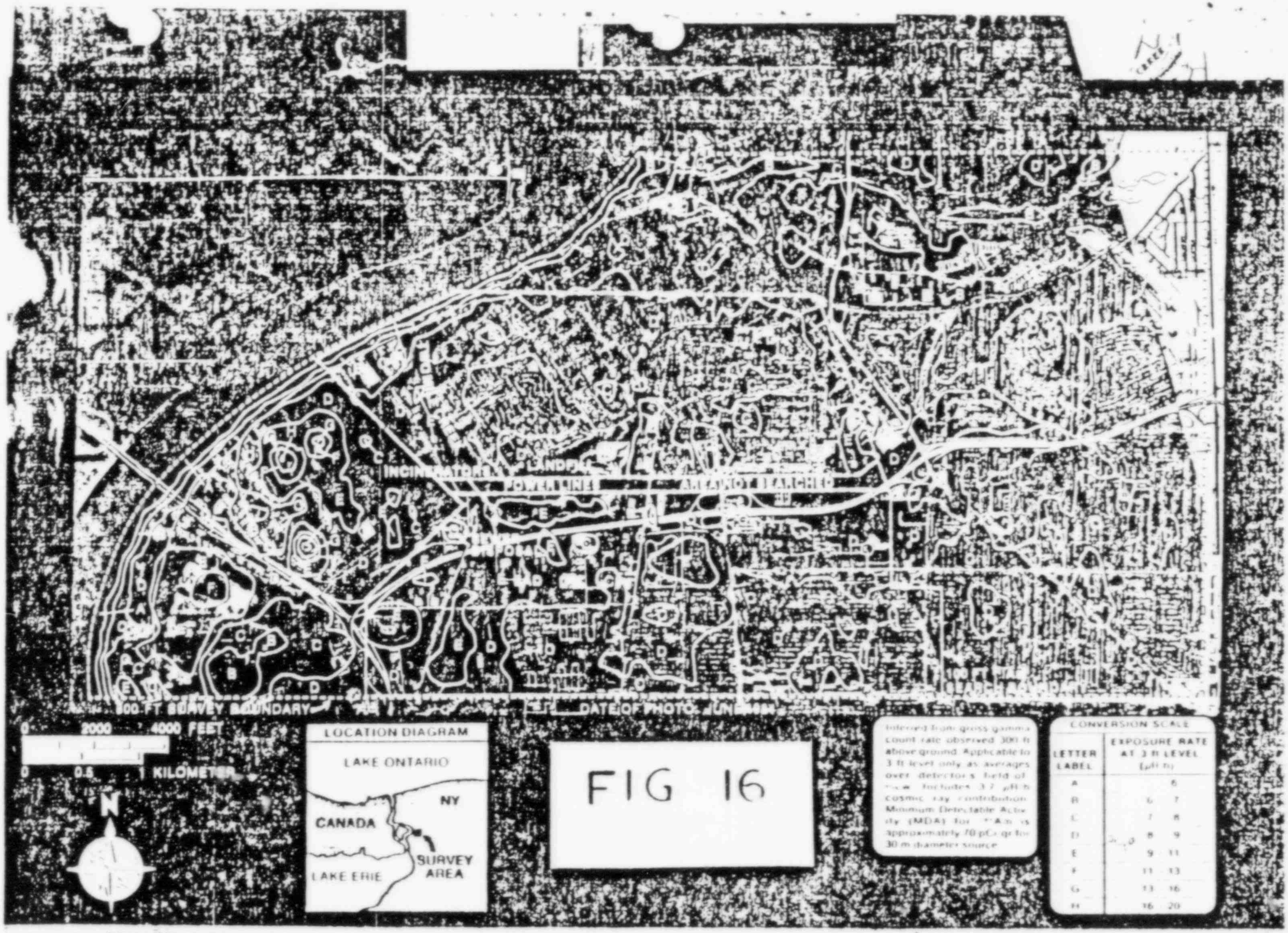


Figure 1. AERIAL RADIOLOGICAL SURVEY AND ^{241}Am SEARCH RESULTS SUPERIMPOSED ON AN AERIAL PHOTOGRAPH OF TONAWANDA, NEW YORK. Isoradiation contours of total external gamma exposure rate present the result of the aerial survey. Areas contaminated with ^{241}Am, located in the aerial search, are identified with blue cross-hatching.

APPENDIX B

Limits Applicable to Decontamination

Uncontrolled areas - including STP

Soil/Ash - 30(pCi/g)

Surfaces - fixed 2500(dpm/100cm^2) max.

500(dpm/100cm^2) aver.

- removable 100(dpm/100cm^2)

Skin, personal clothing - fixed 500(dpm/100cm^2)

- removable not detectable

Airborne concentration - insoluable $4x10^{-12}$(uCi/ml)

Water concentration - soluable $4x10^{-6}$(uCi/ml)

Controlled area (for radiation workers only)

Airborne concentration - insoluable $1x10^{-10}$(uCi/ml)

Water concentration - for release into sewer system

- $4x10^{-6}$(uCi/ml) (max. daily discharge not to exceed 50(uCi) total)

Landfill

- No restrictions, Recommended Limit: $\leq$30 pCi/g
- Minimum depth 4 feet below surface stabilized to prevent transport away from site.
- Future land use restrictions w/deed notation
- Permanent site and boundary markers