NPDES PERMIT
New Bedford, Massachusetts
No. MA100781
Wastewater Treatment Facilities

Parameters	Old Limits	New Limits	A c u t a l
Concentrations	(Max Daily Avg)	(Max Daily Avg)	(Quartely Avg)
BOD	50 mg/l	50 mg/l	
TSS	50 mg/l	50 mg/l	54.5 mg/l
Oil and Grease	15 mg/l	15 mg/l	
Setteable Solids	.3 ml/l	.3 mg/l	
Fecal Coliform	400/100 ml	400/100 ml	
Chlorine, total residual		0.06 mg/l	
PCBs	0.5 ug/l	0.63 ng/l (Monthly Avg)	
VOCs	Test 624	Test 624	
NOAEL	40% or greater	----	
NOEC	20% or geater	12.5% or greater	
LC50	---	100% or greater	
Amonia-Nitrogen	---	10.4 mg/l (Monthly Avg)	13.2 mg/l
Copper, T.R. (total recoverable)	---	0.23 mg/l	.039 mg/l
Cyanide, T.R.	---	0.008 mg/l	
Lead, T.R.	---	1.76 mg/l	.004 mg/l
Mercury, M.R.	---	0.017 mg/l	
Nickel, T.R.	---	0.6 mg/l	.029 mg/l
4-4-DDT	---	0.001 mg/l	

Parameter	Type I Sludge Maximum Allowable Industrial Loadings: (Lbs/d)
Antimony	415.33
Arsenic	3.98
Beryllium	1.32
Boron	10.62
Cadmium	.062
Chromium	5.87
Copper	11.07
Lead	3.44
Mercury	0.00
Molybdenum	0.50
Nickel	4.72
Selenium	10.92
Silver	0.06
Thallium	15.10
Zinc	13.88
Cyanide	2.09

NPDES PERMIT
New Bedford, Massachusetts
No. MA100781
Wastewater Treatment Facilities

Parameters Concentrations	Old Limits (Max Daily Avg)	New Limits (Max Daily Avg)	Acutal
BOD	50 mg/l	50 mg/l	
TSS	50 mg/l	50 mg/le	
Oil and Grease	15 mg/l	15 mg/l	
Setteable Solids	.3 ml/l	.3 mg/l	
Fecal Coliform	400/100 ml	400/100 ml	
Chlorine, total residual		0.06 mg/l	
PCBs	0.5 ug/l	0.63 ng/l (Monthly Avg)	
VOCs	Test 624	Test 624	
NOAEL	40% or greater	----	
NOEC	20% or geater	12.5% or greater	
LC50	---	100% or greater	
Amonia-Nitrogen	---	10.4 mg/l (Monthly Avg)	
Copper, T.R. (total recoverable)	---	0.23 mg/l	
Cyanide, T.R.	---	0.008 mg/l	
Lead, T.R.	---	1.76 mg/l	
Mercury, M.R.	---	0.017 mg/l	
Nickel, T.R.	---	0.6 mg/l	
4-4-DDT	---	0.001 mg/l	

2.0 REQUIREMENTS FOR WWTP RESIDUALS MANAGEMENT

2.1 PROJECTED WWTP RESIDUALS QUANTITY

This section updates the previous residuals quantity projections. Wastewater treatment plant residuals are solid materials removed from wastewater at the WWTP or pump stations. Residuals to be generated at the secondary WWTP can be categorized as:

- Grit
- Screenings
- Scum and Skimmings
- Primary Sludge
- Secondary Sludge

Previous estimates of average daily and maximum monthly quantities for these residuals, for both the initial year of secondary WWTP operation (1994) and the design year (2014), were summarized in the *Final FP/EIR* (January 1990), Volume III, Table 5-1.

During the design of the new secondary WWTP (1990-1991), a mass balance evaluation of all unit processes that produce residuals was performed to establish solids loading design criteria for treatment plant systems processing solids. The results of the mass balance evaluation became the basis of plant design criteria, equipment selection, design details, and specification preparation.

The mass balance evaluations conducted during facility design were more detailed than the previous estimates made for facilities planning purposes, but did not result in any changes in the estimated quantities for grit, scum, skimmings, or screenings as presented in the 1990 *Final FP/EIR*. However, the mass balance evaluations did result in some minor revisions to the estimated initial and design year quantities of primary and secondary sludge. These revisions are within 5 percent of the *Final FP/EIR* estimates. The revised quantities that formed the plant's design criteria are listed on Table 2-1; these are the most appropriate quantity estimates for use in this *Supplemental Facilities Plan*.

TABLE 2-1

ESTIMATED SOLIDS QUANTITIES (1)

	Initial Year 1996	Design Year 2016
Flow (mgd)		
Average	26.5	29.6
Maximum Month	35.4	38.5
Grit (cu. ft/day)		
Average Day	149	167
Maximum Month	196	214
Screenings (cu.ft/day)		
Average	135	150
Maximum Month	177	193
Skimmings (lb.day) (2)	1,600	1,800
Primary Sludge (lb/day) (2), (3)		
Dry Weather		
Average	28,400	38,300
Maximum Month	44,000	58,200
Maximum 3-day	62,100	83,500
Secondary Sludge (lb/day) (2), (3)		
Dry Weather		
Average	15,700	21,800
Maximum Month	28,700	38,500
Maximum 3-day	36,700	48,600
Total (Sludge and Skimmings, lb/day) (2), (3)		
Dry Weather		
Average	45,700	61,900
Maximum Month	74,300	98,500
Maximum 3-day	100,400	133,900

NOTES:
(1) Data from WWTP Contract No. 1 Sheet GD-M-3 Design Criteria
(2) Pounds of dry solids per day
(3) Includes 10% allowance for side stream loadings

A complete copy of the final New Bedford, MA Wastewater Treatment Plant Process Design Data submitted to DEP at the completion of the WWTP design is in Appendix B.

2.2 PROJECTED WASTEWATER TREATMENT PLANT RESIDUALS QUALITY

This section updates sludge quality projections. The quality of the residuals must be known to determine regulatory restrictions on beneficial reuse potential of the sludge, and on solids processing alternatives such as incineration, heat drying, composting, and alkaline stabilization. Previous evaluations of sludge quality were presented in the *Final FP/EIR* (January 1990), Volume III, Section 5.4. Information on existing primary treatment plant dewatered sludge quality, and a discussion on the predicted sludge quality from the new secondary WWTP were included.

The *Final FP/EIR* (Tables 5-2 through 5-13) presented primary sludge quality data from the City of New Bedford, Industrial Pretreatment Program (Table 5-2), from the *Final FP/EIR* (Table 5-3), from the *Final FP/EIR* (Table 5-4), from the PCB Pilot Plant study (Table 5-5), and from an analysis of predicted sludge quality from the new secondary wastewater treatment plant (Tables 5-6 through 5-13). A copy of each table is included for reference in Appendix B.

Since the completion of the *Final FP/EIR* in January 1990, additional primary sludge cake samples were taken by the Professional Services Group (PSG), the contract operator of the existing primary treatment plant. Two samples were collected in February 1992, and four samples were taken in January-February 1993. Table 2-2 shows results from each sludge sampling program, and the predicted secondary WWTP sludge quality.

2.3 REGULATORY FRAMEWORK

2.3.1 FEDERAL REGULATIONS AND POLICIES

Federal regulations of wastewater sludge have been revised since 1989. On November 25, 1992, the EPA Administrator signed the final rule on standards for the use or disposal of wastewater treatment plant residuals under an amendment to Title 40, Chapter I,

TABLE 2-2

POLLUTANT CONCENTRATIONS (mg/kg)

Pollutant	Existing Primary Sludge Concentration (1)			Predicted New WWTP Concentration (3)	
	1989	Feb. 1992	Feb. 1993 (2)	Initial Year	Design Year
Antimony	<2.5	ND		15.95	15.59
Arsenic	<1.0	0.34		6.02	5.85
Barium	182	210		-	-
Beryllium	<1.0	0.21		21.14	20.65
Boron	<50	4		70	69
Cadmium	2	5		5	5
Chromium	265	223		366	357
Copper	**1283**	**603**	**623**	**597**	**582**
Cyanide	2	4		27	26
Lead	162	129		90	88
Mercury	0.16	0.42		1.70	1.68
Molybdenum	**19**	**9**	**43**	**52**	**50**
Nickel	**235**	**136**	**284**	**122**	**119**
Selenium	3	4		11	11
Silver	16	24		41	40
Thallium	<1.0	ND		14	14
Zinc	730	957		819	798
PCBs	**9**	**35**	**5**	**3**	**3**

NOTES:

(1) Average of primary sludge samples taken in February and May 1989 and the averag of two primary sludge samples taken in February 1992.

(2) Average of four primary sludge samples taken between Jan. 27 and Feb. 17, 1993. PCBs were below detection limit of 2.5 in three samples, but were 16.5 mg/kg in one sa

(3) Predicted initial year (1995) and design year (2015) sludge quality assuming average dry weather loading. (Ref. Final Phase 2 FP/EIR Volume III, Tables 5-6 and 5-7)

Subchapter O of the *Code of Federal Regulations.* The amendment to Subchapter O added *Part 503: Standards For The Use Or Disposal Of Sewage Sludge.* These final regulations address land application, surface disposal, pathogen and vector attraction reduction, and incineration of wastewater treatment plant sludge and were published in the Federal Register on February 19, 1993. The rule takes effect 30 days after publication in the Federal Register.

The new federal standards:

- Set pollutant concentration limits for ten pollutants typically contained in municipal wastewater plant residuals for residuals that are to be land applied as the method of final disposal (see list on Table 2-3).
- Require pathogen and vector attraction reduction prior to land application of residuals or prior to disposal in a sludge-only monofill.
- Set concentration limits for seven heavy metals in sewage sludge that will be subject to thermal destruction.
- Set an operational standard for the air concentration of total hydrocarbons in the flue gas from thermal destruction processes.
- Set monitoring and reporting standards for each of the sludge disposal options identified in Part 503.

The requirements of these standards on specific technologies and implications for New Bedford are discussed below. Note that the regulations do not address or limit the interstate transfer of sludge or sludge products.

Land Application

The land application sections of the new EPA regulations cover the application of sludge or sludge derived products to agricultural and nonagricultural lands. Agricultural lands include land used for food crops (including home gardens) feed crops, range land, and pasture. Nonagricultural land uses include forests, disturbed lands, and lands with potential public contact such as parks, ball fields, and golf courses.

Land application management practices in the new EPA regulations include:

- Sludge application shall not cause or contribute to the harm of a threatened or endangered species of plant, fish, or wildlife or result in the destruction or adverse modification of the critical habitat of a threatened or endangered species.

- Sludge application shall not cause a hazard to human health, wildlife, land, or water resources by contact with the runoff from a 24-hour storm event with a frequency occurrence of 25 years.

- Sludge shall not be applied to land that is flooded.

- Sludge shall not be applied to land that is frozen or snow covered so that the sludge enters waters of the United States.

- Sludge shall not be applied to land that is frozen or snow covered so that the sludge enters a wetland, except as provided in a permit.

- Sludge shall be applied to land at no more than the agronomic rate.

- Sludge shall not be applied to land that is 10 meters or less from water bodies.

These standards and management practices are implemented through a permit. The permitting process depends on a given state's sludge management program. For Massachusetts, sludge treatment and disposal is currently regulated through the NPDES permitting program under the direction of the State Department of Environmental Protection, Division of Water Pollution Control.

While EPA's original draft of these regulations (1989) proposed pollutant concentration limits for 25 pollutants, the newly issued standards are focusing on only the ten pollutants listed in Table 2-3. The concentration for each pollutant listed in Table 2-3 is the maximum allowable proposed concentration in sewage sludge applied to agricultural land, forest, a public contact site, a reclamation site, a lawn, or a home garden and in sewage sludge sold or given away in a bag or similar enclosure for application to the land.

The EPA standards specifically exclude sewage sludge with a concentration of polychlorinated biphenyls (PCBs) equal to or greater than 50 milligrams per kilogram of total solids (dry weight basis). Beyond this exclusion, the regulations do not contain standards for PCBs. The regulations, therefore, imply that a sludge with a PCB

TABLE 2-3

POLLUTANT CONCENTRATION LIMITS FOR LAND APPLICATION OF MUNICIPAL WASTEWATER TREATMENT PLANT SLUDGES

Pollutant	EPA Concentration mg/kg (1)	Massachusetts Limits Type I mg/kg	Massachusetts Limits Type II mg/kg
Arsenic	41	-	-
Boron (water soluble)	-	300	300
Cadmium	39	14	25
Chromium (total)	1200	1,000	1,000
Copper	1500	1,000	1,000
Lead	300	300	1,000
Mercury	17	10	10
Molybdenum	18	10 / 25 (2)	10 / 25 (2)
Nickel	420	200	200
Selenium	36	-	-
Zinc	2800	2,500	2,500
PCB's	<50	1 / 2 (3)	10

(1) The concentration for each pollutant in bulk sewage sludge applied to agricultural land, forest, a public contact site, a reclamation site, a lawn, or a home garden and in sewage sludge sold or given away in a bag or similar enclosure for application to the land shall be equal to or less than the concentration for the pollutant as listed.
Ref: EPA Part 503 Regulations, 11/25/92

(2) 10 mg/kg if sludge is applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown; 25 mg/kg if sludge is applied to land where neither of the above conditions are applicable.

(3) 1 mg/kg if sludge is used as a soil conditioner pursuant to 310 CMR 32.11 (b);
2 mg/kg if sludge is used in a commercial stabilizer pursuant to 310 CMR 32.11 (b).

concentration that is less than 50 mg/kg is acceptable for beneficial reuse in all the applications listed above.

Surface Disposal

Surface disposal refers to the permanent disposal of sludge in sludge-only landfills, in lagoons, in stock piles, or at dedicated beneficial use sites. Pathogen and vector reduction requirements apply to surface disposal, such as the disposal of wastewater sludge in a sludge-only landfill. Sludge landfilled in a municipal solid waste landfill does not have to adhere to the Federal 503 rule, however, the DEP has regulations governing sludge disposal to those landfills.

The 503 regulations contain two classes of pathogen reduction; Class A and Class B. Class A sludge requires the geometric mean of the density of fecal coliform in the samples collected to be less than 1,000 fecal coliforms per gram of dry solids. Sludges with this classification would have the most reuse flexibility. The regulations present six alternative means of achieving or demonstrating this fecal coliform performance level. These Class A processes are:

- Maintaining the temperature of the sludge at a specific value for a period of time (regulations provide a formula with the variables of time and temperature along with guidance on minimum requirements).

- Maintaining the pH of the sewage sludge above 12 for 72 hours along with maintaining the temperature of the sewage sludge above 52 degrees Celsius for 12 hours or longer during the period that the pH of the sewage sludge is above 12. At the end of the 72 hours, air drying the sludge to achieve a percent solids in the sewage sludge greater than 50 percent.

- Analyzing the sewage sludge for enteric viruses and viable helminth ova prior to pathogen removal treatment. If the densities are less than the established minimums for enteric viruses and viable helminth ova after the sludge is subjected to a pathogen treatment process, the sewage sludge is considered to be Class A quality and the particular pathogen treatment process used to obtain this result would be acceptable for continued use.

- Analyzing the sewage sludge for enteric viruses and viable helminth ova at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet other specified requirements in the rule shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis). If the material meets the requirements, it is Class A.

- Sewage sludge shall be treated in one of the Processes to Further Reduce Pathogens described in regulation Appendix B. These are:

  - Composting using the within-vessel method or the static aerated pile method to maintain the sewage sludge temperature at 55 degrees Celsius or greater for a period of 3 days, or the windrow method to maintain the sewage sludge temperature at 55 degrees Celsius or greater for a period of 15 days with a minimum of 5 turnings of the windrow.

  - Heat drying by contact with hot gases to reduce sewage sludge moisture content to 10 percent or lower. The temperature of the sewage sludge or the wet bulb temperature of the gas leaving the dryer must exceed 80 degrees Celsius.

  - Heat treatment by heating liquid sludge to a temperature of 180 degrees Celsius or higher for 30 minutes.

  - Thermophilic aerobic digestion by agitating liquid sludge with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sludge at 10 days at 55 to 60 degrees Celsius.

  - Beta ray irradiation by irradiating sewage sludge with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (20 degrees Celsius).

  - Gamma ray irradiation by irradiating sewage sludge with gamma rays from certain isotopes, such as 60 Cobalt and Cesium 137, at room temperature (20 degrees Celsius).

  - Pasteurization by maintaining the temperature of the sewage sludge at 70 degrees Celsius or higher for a minimum of 30 minutes.

- Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

  The potential applicability of these PFRP processes is discussed in Section 3.0.

The regulations allow a higher number of fecal coliforms per gram of dry solids for the Class B sludge; however, there are more restrictions on use of the sludge or sludge product. Class B sludge can be disposed in a sludge-only landfill. According to the EPA standards, the geometric mean of the density of fecal coliforms in the collected samples must be less than 2,000,000 Most Probable Number (MPN) per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units (CFU) per gram of total solids (dry weight basis).

Alternately, sludge can meet Class B through treatment of one of the Processes to Significantly Reduce Pathogens (PSRP). These include:

- Aerobic digestion by agitating sludge with air or oxygen to maintain specific temperature for a specific time; values are between 20 degrees Celsius for 40 days and 15 degrees Celsius for 60 days.

- Air drying on sand beds, or basins for a minimum of three months, with average ambient temperature above 0 degrees Celsius for two of the three months.

- Anaerobic digestion by maintaining in the absence of air specific temperature for a specific time; values are between 35-55 degrees Celsius for 15 days and 20 degrees Celsius for 60 days.

- Composting using either the in-vessel, static aerated pile, or window method to raise and maintain the sludge temperature to 40 degrees Celsius for five days, with the temperature exceeding 55 degrees Celsius for four hours.

- Lime stabilization by adding sufficient lime to raise the sludge pH to 12 after two hours of contact.

The new secondary WWTP will be capable for lime stabilization of dewatered sludge (lime can be added downstream of the high solids centrifuges). Lime stabilization is sufficient to meet EPA's Class B requirements for pathogen and vector reduction, which is required prior to sludge-only landfill disposal. The new plant's lime stabilization process is the first step towards meeting Class A requirements; however, additional processing at an off-site location would be needed.

Incineration

The EPA standards for sludge incineration set limits for heavy metals in the sludge prior to burning, and specify operational standards for total hydrocarbons and management practices for monitoring combustion performance. Part 503 regulates the quality of sewage sludge to be incinerated with a formula. Variables in the formula include emission rate and other site-specific data, so a table of numerical standards cannot be presented. However, the formula was applied to several sites and with New Bedford design criteria to determine how the limits could affect the incineration alternative for New Bedford. The results showed that the sludge quality projections meet the standards. The projected concentrations are lower than the calculated limits by factors of seven (Chromium) to 80 (Nickel).

2.3.2 MASSACHUSETTS REGULATIONS AND POLICIES

The Massachusetts Department of Environmental Protection (DEP) regulates use and disposal of wastewater sludge through its administration of the NPDES permit program (jointly with EPA) and through 310 CMR 32.00, *Land Application of Sludge and Septage* (last amended September 11, 1992).

The DEP sets standards for land application and compost in its regulations (310 CMR 32.00) but relies on policies rather than regulations for other types of sludge processing and disposal. The state's policy for the design and operation of sludge (and sludge ash) landfills (DEP Division of Water Pollution Control, 1983) addresses environmental considerations of siting sludge landfills, operations, and the design of the landfill liner. The policy states that the cover application requirements shall be determined on a case-by case basis, in consideration of sludge characteristics, landfill location and design, and cover material. The policy does not restrict sludge quality and does not specify bulking requirements.

The DEP does not have specific written policies for sludge incineration, heat drying, alkaline stabilization, or other technologies. Generally, proposals to implement such technologies are reviewed individually. DEP's major considerations in evaluating such proposed technologies are:

- feasibility
- environmental soundness
- potential for interruptions in operations
- potential for adverse impacts such as odors

Based on recent discussions with DEP, certain technologies have previously been evaluated for several proposals. In particular, DEP has reviewed the reuse of alkaline stabilized sludge (such as ChemFix product) as solid waste landfill cover supplement. According to DEP, several operations using the ChemFix process for this application have experienced significant difficulties, including problems with the sludge texture, with mixing sludge and cover materials, and with odors. DEP requires researching these operational issues before approving any additional proposal to use the ChemFix process or other alkaline stabilization product as landfill cover supplement.

DEP also has considered heat drying sludge with pelletization. Two large scale operations--South Essex Sewerage District (currently under design) and Massachusetts Water Resources Authority (MWRA) (currently in operation)--were approved in the past several years. DEP has raised some concerns about this technology, due to operational problems at the recently constructed MWRA facility.

For land application, DEP classifies sludges and compost as Type I, II, or III according to the concentrations of certain heavy metals and other chemicals in the sludges. The 1992 amendments to 310 CMR 32.00 revised the sludge suitability limits for cadmium and molybdenum, and revised the criteria for the sale and distribution of Type I, II, and III sludge and septage. Table 2-3 shows the current pollutant concentration limits for Type I and Type II sludges.

The new Type I limit for cadmium is 14 mg/kg (versus 2 mg/kg previously); the Type II limit remains unchanged at 25 mg/kg. The new Type I and Type II limits for molybdenum has two components. The Type I and Type II limit is 10 mg/kg if the sludge is applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown; the Type I and Type II limit is 25 mg/kg if sludge is applied to land where neither of the previous two conditions apply. The previous limit for Molybdenum was 10 mg/kg without specification of application limitations.

Once the EPA Part 503 regulations are promulgated (expected to be published in the federal register in early February; they take effect 30 days after the date of publication), all states must adopt these criteria as <u>minimum</u> standards. Currently, there are some differences in allowable pollutant concentration limits for land applied sludge between the EPA Part 503 regulations and the current Massachusetts regulations under 310 CMR 32.00. As shown in Table 2-3, Massachusetts land application regulations currently have limits on nine heavy metals, one of which (water soluble boron) is not included in EPA's proposed list of 10 metals. EPA's list of ten regulated pollutants includes arsenic and selenium, neither of which have specified limits under current Massachusetts sludge classification regulations. A Massachusetts Type I classification currently has stricter pollutant concentration limits than the EPA's Part 503 regulations for seven parameters (cadmium, copper, mercury, molybdenum, nickel, zinc, and PCBs) . The limit for chromium is not as strict and the limit for lead is the same as the EPA limit. A Massachusetts Type I classification has no use restrictions. The state has its own sludge management practices for land application of residuals and they are similar to the EPA Part 503 management practices listed above.

2.3.3 COMPARISON OF PROJECTED RESIDUALS QUALITY WITH REGULATIONS

Federal limits for the ten pollutants and the exclusion for PCBs/and Massachusetts limits are listed in Table 2-4. They can be compared with the dewatered primary sludge quality data from recent years and the predicted average quality of the secondary sludge.

Comparison of the data shows that:

- Based on the average existing *1989 primary sludge data* obtained during the preparation of the *Final FP/EIR*, the concentration of molybdenum exceeds EPA Table 3 limits; the concentrations of copper, molybdenum, nickel, and PCBs exceed MA Type I limits.

- Based on the *projected sludge quality* from the secondary plant, the projected concentration of molybdenum exceeds EPA Table 3 limits and MA Type I limits.

- Based on the *February 1992 sludge sampling data*, no pollutants exceed the EPA Table 3 limits; only the concentration of PCBs exceeds MA Type I limits.

TABLE 2-4

COMPARISON OF OBSERVED AND PROJECTED SLUDGE QUALITY WITH REGULATORY LIMITS (mg/kg)

	Existing Primary Sludge Concentration (1)			Predicted New WWTP Concentration (3)		MA Type I	EPA Part 503
Pollutant	1989	Feb. 1992	Feb. 1993 (2)	Initial Year	Design Year	Limits	Table 3 Limits (4)
Antimony	<2.5	ND		15.95	15.59	-	-
Arsenic	<1.0	0.34		6.02	5.85	-	41
Barium	182	210		-	-	-	-
Beryllium	<1.0	0.21		21.14	20.65	-	-
Boron	<50	4		70	69	300	-
Cadmium	2	5		5	5	14	39
Chromium	265	223		366	357	1,000	1,200
Copper	**1283**	**603**	**623**	**597**	**582**	**1,000**	**1,500**
Cyanide	2	4		27	26	-	-
Lead	162	129		90	88	300	300
Mercury	0.16	0.42		1.70	1.68	10	17
Molybdenum	**19**	**9**	**43**	**52**	**50**	**10 / 25 (5)**	**18**
Nickel	**235**	**136**	**284**	**122**	**119**	**200**	**420**
Selenium	3	4		11	11	-	36
Silver	16	24		41	40	-	-
Thallium	<1.0	ND		14	14	-	-
Zinc	730	957		819	798	2,500	2,800
PCBs	**9**	**35**	**5**	**3**	**3**	**1 / 2 (6)**	**50 (6)**

NOTES:

(1) Average of primary sludge samples taken in February and May 1989 and the average of two primary sludge samples taken in February 1992.

(2) Average of four primary sludge samples taken between Jan. 27 and Feb. 17, 1993. PCBs were below detection limit of 2.5 in three samples, but were 16.5 mg/kg in one sample.

(3) Predicted initial year (1995) and design year (2015) sludge quality assuming average dry weather loading. (Ref. Final Phase 2 FP/EIR Volume III, Tables 5-6 and 5-7)

(4) Pollutant concentrations from EPA Part 503 Paragraph 503.13 Table 3. A sludge with pollutants within these concentrations along with a Class A pathogen reduction classification has the most flexibility for beneficial reuse.

(5) MA Type I limit for sludge which is to be applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown is 10 mg/kg. If neither of these conditions apply, the MA Type I limit is 25 mg/kg.

(6) MA Type I limit for use as a commercial fertilizer is 2 mg/kg; the MA Type I limit for use as a soil conditioner is 1 mg/kg. The EPA Part 503 regulations (503.6f Exclusions) states that the EPA regulations do not establish requirements for the use or disposal of sewage sludge with a concentration of polychlorinated biphenyls (PCB's) equal to or greater than 50 mg/kg of total solids (dry weight basis). This implies that concentrations less than 50 mg/kg are acceptable.

- Based on the January-February 1993 data, the concentration of molybdenum exceeds EPA Table 3 limits; the concentrations of molybdenum, nickel, and PCBs exceeds MA Type I limits.

Thus, on the basis of the data sets, considered together, the parameters copper, nickel, molybdenum, and PCBs are of concern.

Copper appears to be of lesser concern, since the limits were met both by the 1992 and 1993 data and the predicted quality concentrations. As noted in the *Final FP/EIR* (Volume III Page 5-14), the primary sludge data did not always compare with expected removals of non-conventional pollutants from a properly operated and maintained primary treatment plant. Since those primary sludge samples were taken (March, June, and July 1987), the operation and maintenance of the primary plant has been under the control of a contract operator. Plant performance has benefitted from this operations arrangement. The 1992 and 1993 primary sludge data for copper shows considerable improvement over the 1987 data.

Since the *Final FP/EIR* was completed, the City has put a greater emphasis on compliance with the City's industrial pretreatment program which could also be reflected in the lower concentrations of copper in the 1992 and 1993 data (nickel, chromium, and lead were also lower). The 1992 and 1993 levels and the predicted quality suggest that copper limits would likely be met.

Nickel will likely meet the EPA limit, but has potential to exceed the MA limits. While February 1992 primary plant data showed a decline in nickel concentration, the January-February 1993 data is more consistent with the *Final FR/EIR* data. Nickel will continue to be targeted by the City's industrial pretreatment program.

Molybdenum is slightly more problematic, since the 1989 and 1993 data and the projected quality exceed the EPA limit, and the more restrictive of the MA Type I limits.

The projected concentration may not accurately indicate the secondary plant sludge quality. The projected sludge quality for molybdenum is based on an assumed influent mass loading.

During the *Final FP/EIR* wastewater sampling program, molybdenum was never detected in the influent wastewater, but it appeared in all the *Final FP/EIR* primary sludge samples. To account for this aberration, the sludge quality projections in the *Final FP/EIR* assumed an influent wastewater concentration of one-half the analytical detection limit for molybdenum. Thus the projected sludge quality is not based on an actual measured influent wastewater concentration.

The concentration of molybdenum in primary sludge has been variable from 1989 to 1993. The 1992 concentrations were lower than the 1989 concentrations, however the 1993 samples showed an increase in the concentration of molybdenum. These recent data have prompted the City to target this chemical in its current industrial pretreatment program actions.

Molybdenum can frequently be traced to industries using processes with recirculating cooling water systems. Additives containing molybdenum may be added to these cooling water systems to control corrosion and scaling in the cooling water piping. An investigation to identify the possible sources of molybdenum is being initiated to limit the likelihood that molybdenum becomes a factor in Type I sludge quality compliance once the new treatment plant is operating. It should also be noted that the molybdenum-utilizing industries have filed suit against EPA for these limits, citing in part, mathematical error. While the case is unlikely to be settled for sometime, there appears to be some potential for a change in the molybdenum limit. Notwithstanding this potential, the MA limit would presumably remain relatively low.

The higher level of PCBs in the February 1992 data exceed the state Type I standards but not the EPA limits. The Type I exceedance may be the result of work being conducted on the Belleville Avenue interceptor which has pockets of PCB contaminated grit, that may have been disturbed by the construction activity.

Concentrations of PCBs in the primary plant effluent have typically been below detection levels throughout 1991 and 1992. These low levels can be attributed to industries in New Bedford no longer discharging PCBs in their effluent. The main section of sewer in the wastewater collection system with known deposits of PCB contaminated sediments is being replaced. As there are no known users of PCBs within the City, and no other known pockets of PCB contaminated grit in the collection system, it is thought that the occasional observed PCBs in sludge could originate in industrial sewer connections or internal plumbing. This is supported by the 1993 data, which had three sludge samples below the detection limit, and one sample at 16.5 mg/kg, well below the EPA Table 3 limit. Because there are no additions of PCBs to the collection system, the concentration of PCBs in the influent should continue to decrease as any possible remaining pollutant is flushed and discharged from the wastewater collection system.

The new plant's dewatered sludge should further comply with current state standards due to the dilution factor from the addition of waste activated sludge. The additional solids in the waste activated sludge stream will tend to dilute the PCB concentration of the dewatered sludge.

In summary, both the recent primary sludge quality data and the previously predicted secondary WWTP sludge quality data comply with Massachusetts Type I and EPA Part 503 pollutant concentration limits for all regulated heavy metals except molybdenum and nickel (exceeds MA only). The only other potential obstacle in attaining a Massachusetts Type I classification is the concentration of PCBs. However, the concentration of PCBs may be lower in the actual secondary sludge and comply with the limits.

The *Final FP/EIR* concluded that until the new secondary wastewater treatment plant begins to operate and produce a dewatered primary and secondary sludge for laboratory analysis (currently scheduled by the Modified Consent Decree to be ready to receive flow by July 19, 1996 and to be under full operation by January 19, 1997), <u>sludge quality predictions will always have a degree of uncertainty</u>. This is still a valid conclusion.

2.3.4 SUMMARY OF PROJECT CONFINES

The *Final FP/EIR* assumed the worst case classification because of the data available during preparation of the *Final FP/EIR*, the presence of an industrial base in New Bedford, and the uncertainty in predicting sludge quality from a plant not yet operating. Thus, solids processing and solids disposal siting evaluations in that document assumed the sludge could have a (Massachusetts) Type III classification. A Type III classification is the most restrictive state classification and severely limits opportunities for beneficial product reuse.

Changes in federal regulations and amendments to state regulations, along with primary sludge quality and primary plant effluent quality information obtained since the completion of the *Final FP/EIR* in 1990, provide a basis for revising that assumption. Given the pollutant concentrations in the EPA Part 503 regulations, the amendments to the Massachusetts regulations governing sludge classification, and the apparent improvement in primary plant effluent and primary dewatered sludge quality (most likely related to the City's implementation and strengthening of the industrial pretreatment program) it appears that the dewatered sludge quality from the new secondary wastewater treatment plant could be suitable for both a Massachusetts Type I classification and a Federal "Clean Sludge" classification. This classification would make dewatered, stabilized sewage sludge from the secondary WWTP eligible for unrestricted land application uses in Massachusetts, as well as other states (provided the land application uses comply with the limitations specified in the respective state regulations and in the EPA Part 503 regulations). Thus, the alternatives analysis in Section 3 will assume that sludge quality will be suitable for beneficial reuse.

2.4 STATUS OF PREVIOUSLY RECOMMENDED PLAN

2.4.1 PREVIOUS RESIDUALS MANAGEMENT PLAN

The previously recommended plan (as presented in Volume V Section 10 of the *Final FP/EIR*) suggested reusing chemically-fixed sludge as a daily cover supplement at the proposed Crapo Hill municipal refuse landfill in Dartmouth MA, with a back-up sludge-only landfill in New Bedford at Site 47, also called the airport site.

Reuse of Chemically Fixed Sludge

Under this plan, chemical would be mixed with the sludge at the WWTP to stabilize it for reuse. The patented process ChemFix was selected for stabilization. The stabilized sludge would then be trucked to the proposed Crapo Hill landfill for use as daily cover supplement. The Greater New Bedford Regional Refuse Management District (the District), voted

8.2.6 CONCLUSION

The detailed evaluation of alternative residuals management plans, in consideration of engineering, environmental, implementation, and cost criteria, resulted in the selection of the following plans for Phase 2 consideration:

Plan	*Description*
A-1	Combustion at site 20
A-3	Combustion at site 48
A-4	Combustion at site 49
B-1	Heat drying at site 20
B-3	Heat drying at site 48
B-4	Heat drying at site 49
C	Lime stabilization; landfilling out of City
D	Privatization; site not provided
E-1	Privatization at site 20
E-3	Privatization at site 48
E-4	Privatization at site 49

Essentially, plans using site 26 were eliminated. As noted above, the evaluations failed to distinguish any clear advantages among the basic technologies and privatization, especially without known sludge quality. However, the analyses show that these plans represent feasible, long-term residuals management solutions, and provide a basis for further planning efforts.

8.3 RECOMMENDED APPROACH FOR RESIDUALS

Based on Phase I evaluations, there are several, feasible alternatives for the long-term management of New Bedford's wastewater residuals.

Direct landfilling of sludge at an out of City landfill after lime stabilization at the new secondary WWTP offers the most advantages. This alternative would require no new City facilities, so would certainly have fewer implementation and community acceptance issues. Private landfilling also appears to be cost effective. The disadvantages of this alternative is its dependence upon the private waste disposal market. At this time, private landfills exist and appear to have long-term capacity. Still, potential changes in price and the interstate waste transfer laws are uncertainties. As discussed in Section 3, the City cannot obtain a committed price for its sludge until the new secondary WWTP is operating and the sludge characteristics and quality are established.

For a City processing facility, heat drying with pelletizing or combustion (whether incineration or a modified process such as Thermofix) appear to be the most promising. Either alternative would require selection and permitting of a site. While site issues can be adequately characterized, comparison of environmental impacts between the two technologiesis difficult at this stage of analysis. Among the most difficult aspects of proceeding with a City sludge processing facility would be implementation issues. For example, determining appropriate air quality controls and obtaining the requisite state air emissions permits would be a potentially difficult hurdle. Detailed air emissions modeling will require knowledge of concentrations of various contaminants in the sludge, and is hindered by the lack of definitive sludge quality data. Community acceptance also would be a difficult obstacle, particularly if combustion is pursued.

For a private facility, there appear to be a variety of possibilities. If the City's sludge is as "clean" as now projected, all of the reuse processes would probably be possible including heat drying. The advantage of full or partial privatization is that the City transfers responsibility for the material, process, and ultimate disposal to another party. Also, reuse would presumably be easier for a private, in most cases national specialty firm to achieve, than a single municipality. There is also potential for a contract arrangement involving an existing public facility with excess capacity.

The main uncertainty of privatization at this stage is the difficulty in estimating cost. The City cannot request specific cost proposals from the private sector (to compare to the cost of City-developed facilities) until there are specific data representing actual sludge quality and quantity from the new secondary WWTP. A formal Request for Proposals process would be required, and the City would need to define the level of privatization desired.

Figure 8-1 summarizes the relative cost, engineering, and implementation advantages for combustion, heat drying, privatization, and stabilization with out-of-City landfilling.

In conclusion, definitive cost-based comparison of the alternative plans is not currently possible. The City will not be able to determine which alternative is best on a cost basis until responses to a private sector RFP can be evaluated and compared to a City-owned and operated facility or to lime stabilization and disposal at a private landfill outside the City. Such an RFP process cannot take place until the new secondary WWTP is operating, producing dewatered sludge, and the City has been able to document residuals quantity and quality. The private sector cannot give a responsive bid without being able to assess specific information about the residuals for which they are being asked to assume processing, marketing, and/or disposal responsibility.

Technology/Option	Cost	Engineering	Environmental	Implementation
Combustion	◒	◒	◒	●
Heat Drying and Pelletizing	◒	◒	◒	●
Privatization	?	?	?	?
Stabilization and Private Landfilling	○	○	○	○

○ Most Preferred

◒

● Least Preferred

? Unknown

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CITY OF NEW BEDFORD, MASSACHUSETTS
SUPPLEMENTAL FACILITIES PLAN/EIR

RELATIVE RANKING OF ALTERNATIVE RESIDUALS MANAGEMENT PLANS BASED ON PRESENT INFORMATION

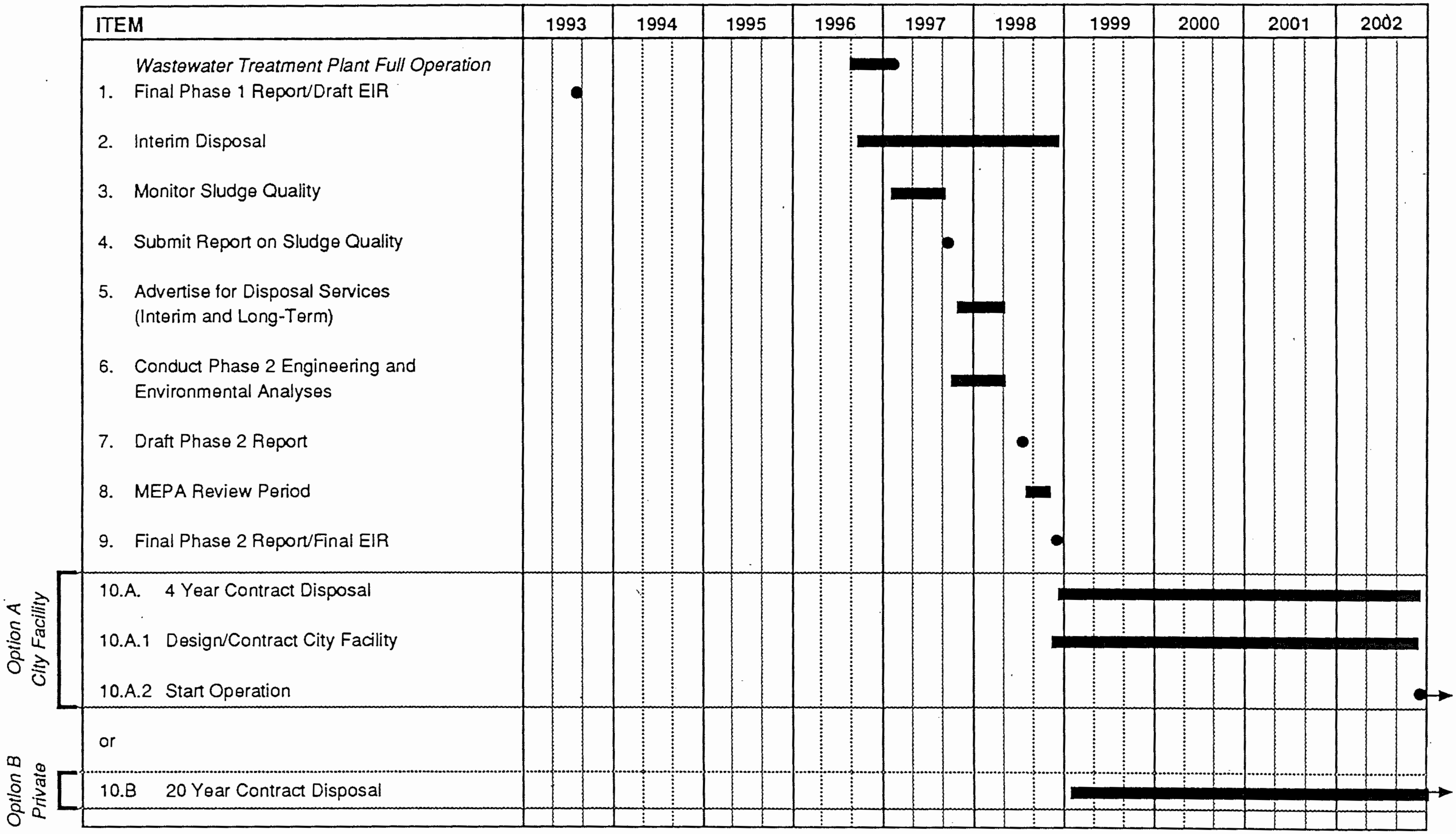
Figure 8-1

With the information presently available, it is likely the City would elect to pursue privatization or private landfilling, since the latter is cost competitive with the potential City facilities, yet would be far easier in terms of implementation. No site selection and permitting would be required, and the cost of disposal would be paid out of the City's annual revenues, rather than requiring bonding for upfront capital costs.

Based on these significant considerations, it is proposed to delay Phase 2 until data from the secondary WWTP is available.

This delay can be accommodated by extending the already-planned interim disposal contract by about four months, as shown on Figure 8-2, the proposed schedule. This change will allow the City to monitor characteristics of the secondary WWTP sludge for six months. After preparation of a report on sludge quality, the City proposes to issue a Request for Proposals (RFP) for interim (4 year) and long-term (20 year) disposal, potentially open to the full range of companies and technologies. Concurrent with the RFP process, the City will commence the Phase 2 analyses of in-City alternatives and sites, in accordance with the scope previously submitted to MEPA (see Appendix A). After completion of the RFP process, the City will complete Phase 2 evaluations and develop a long-term residuals management program in the Phase 2 Supplemental Facilities Plan/EIR. Based on that document, the City would pursue either an in-City facility (with continued interim disposal by contract while it is being built), or long-term privatization.

While several completion dates in the consent decree would need revision, this approach provides the most responsible means for proceeding with facilities planning, and will lead to the selection of the most appropriate long-term facility, while providing for proper disposal of wastewater residuals in the interim.



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CITY OF NEW BEDFORD, MASSACHUSETTS
SUPPLEMENTAL FACILITIES PLAN/EIR

PROPOSED SCHEDULE

Figure 8-2

TABLE 3-13

CHARLES RIVER POLLUTION CONTROL DISTRICT ALLOWABLE ~~ALLOCATION~~ TO INDUSTRIAL USERS

Parameter	Type I Sludge Maximum Allowable Industrial Loading lbs/d	Total Industrial Contributory Flow MGD	Local Limit mg/l
Antimony	415.33	1.31	38.02
Arsenic	3.98	1.31	0.36
Beryllium	1.32	1.31	0.12
Boron	10.62	1.31	0.97
Cadmium	0.03	1.31	0.01 *
Chromium	5.87	1.31	0.54
Copper	-11.09	1.31	**
Lead	3.44	1.31	0.31
Mercury	0.00	1.31	0.0005 *
Molybdenum	0.50	1.31	0.05
Nickel	4.72	1.31	0.43
Selenium	10.90	1.31	1.00
Silver	0.06	1.31	0.01
Thallium	15.10	1.31	1.38
Zinc	13.88	1.31	1.27
Cyanide	2.09	1.31	0.19

$$\text{Local Limit} = \frac{\text{Maximum allowable industrial loading}}{8.34 * \text{Total Industrial Flow}}$$

* Detection Limit

** Local limit for copper would be below the domestic wastewater background concentration. Industrial users should not allowed to increase their copper discharges above the domestic wastewater background level (0.87 mg/l).

EXECUTIVE SUMMARY

PROJECT:	Supplemental Facilities Plan for Residuals Management Draft Phase I Facilities Plan/EIR
PROPONENT:	City of New Bedford
EOEA No.:	6425

PROJECT DESCRIPTION: In 1987, the City of New Bedford entered into a consent decree with the U.S. Environmental Protection Agency (EPA), the Massachusetts Department of Environmental Quality Engineering (now the Department of Environmental Protection, DEP), and the Conservation Law Foundation. The consent decree addressed facilities planning for secondary wastewater treatment. New Bedford responded with a facilities plan that consisted of a new secondary wastewater treatment facility, collection system improvements, residuals management, and wastewater treatment plant outfall.

The Secretary of Environmental Affairs approved a plan for the secondary WWTP in 1990. Construction began in December 1992; the plant is expected to operate mid 1996.

The residuals management portion of the plan was proposed and involved two components:

Principal Disposal

- stabilization of dewatered sludge using the ChemFix process
- use of stabilized sludge, mixed with a bulking agent, as daily cover material supplement at the Crapo Hill sanitary landfill

Backup Disposal
- landfilling of dewatered sludge at City-owned backup sludge monofill

This plan is no longer a viable alternative for long-term sludge disposal for two reasons: (1) DEP is concerned about the use of chemically fixated sludge as a daily landfill cover supplement, (2) the Crapo Hill sanitary landfill could only reuse about 20 to 55 percent of the City's generated sludge, depending on the bulking requirements.

At this time two issues, sludge (residuals) disposal management and septage receiving facility location, are outstanding. This project develops a plan for long term WWTP residuals management and for Phase 1 of a septage receiving facility. Factors, such as cost, requirements for further disposal capacity, need for/potential for product reuse, and operational issues are incorporated to determine technologies for handling WWTP residuals. Screening criteria, such as engineering requirements potential for environmental impacts, are applied to determine appropriate locations for the septage receiving facility and the sludge processing facility. Top-ranked alternatives are selected for septage receiving facility location and for sludge processing facility locations, and technology.

ALTERNATIVES:

A full range of residuals management alternatives are considered, including combustion, heat drying, chemical fixation, anaerobic digestion, composting, alkaline stabilization, lime stabilization, and landfilling. Among these, several are potentially capable of meeting the City's 20-year residuals management needs:

- Combustion with ash landfilling
- Heat drying with product reuse
- Stabilization with landfilling
- Full privatization

Potential sites for a City sludge processing facility are also reviewed. After several screenings and evaluation of key environmental impact, four sites were selected for further evaluation:

- Site 20 - Inactive junkyard (between Route 140 and Church Avenue)
- Site 26 - Inactive gravel pit (north of Sassaquin Pond)
- Site 48 - Former Tallyrand property (Industrial Park)
- Site 49 - Former City Incinerator Shawmut Avenue Municipal Landfill

The four potential sites are paired with the most suitable technologies to form specific alternative residuals management plans. Table 1 shows these plans.

For alternatives for septage receiving facility locations, consideration of the existing pump stations is logical to eliminate the need for an additional wastewater facility in the system, reducing cost and additional maintenance needs. The City's existing pump station alternatives are listed in Table 2.

SUMMARY OF IMPACTS: Impacts of alternatives are evaluated in detail. Table 1 summarizes impacts of technology alternatives for sludge management. Table 2 summarizes the environmental impacts of potential septage receiving facility locations.

RECOMMENDED PLAN: Based on the analyses in this report, sludge quality must be known to determine regulatory restrictions on beneficial reuse potential of the sludge, and on solids processing alternatives such as incineration, heat drying, composting, and alkaline stabilization. *No definitive projection of sludge quality can be made until the secondary WWTP is operating. Therefore,*

TABLE ES-1
SLUDGE PROCESSING FACILITY
SUMMARY OF ENVIRONMENTAL IMPACTS

Plan No.	Alternative	Impact on Wetlands	Impact on Terrestrial Ecology	Land Use Conflicts	Impact on Cultural Resources	Traffic Impacts	Impact on Air Quality	Noise Impacts
A-1	Combustion at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
A-2	Combustion at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
A-3	Combustion at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
A-4	Combustion at site 49	Moderate	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred
B-1	Heat drying at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
B-2	Heat drying at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
B-3	Heat drying at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
B-4	Heat drying at site 49	Moderate	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred
C	Lime stabilization	n/a	n/a	n/a	n/a	Minimal	n/a	n/a
D	Privatization; no site provided	n/a	n/a	n/a	n/a	Minimal	n/a	n/a
E-1	Privatization at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
E-2	Privatization at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
E-3	Privatization at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
E-4	Privatization at site 49	Significant	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred

TABLE ES-2
SEPTAGE RECEIVING STATION
SUMMARY OF ENVIRONMENTAL IMPACTS

ALTERNATIVE	ENVIRONMENTAL IMPACTS	
	Traffic	Noise
Apponagansett Street P.S	Unfavorable	Unfavorable
Cove Road P.S	Unfavorable	Unfavorable
Howland Street P.S	Favorable	Unfavorable
Front Street P.S.	Favorable	Favorable
Pearl Street P.S.	Unfavorable	Favorable
Wamsutta Street P.S.	Favorable	Favorable
Coggeshall Street P.S.	Favorable	Favorable
Belleville Avenue P.S.	Favorable	Favorable
Howard Avenue P.S.	Unfavorable	Unfavorable
Hathaway Road P.S.	Favorable	Favorable
Airport P.S.	Favorable	Favorable
Jones Street P.S.	Favorable	Favorable
Joyce Street P.S.	Favorable	Unfavorable
Welby Road P.S.	Favorable	Unfavorable
Phillips Road P.S.	Favorable	Favorable
Duchaine Boulevard P.S.	Highly Favorable	Favorable
Area IV P.S.	Highly Favorable	Favorable
Peckham Road P.S.	Unfavorable	Unfavorable
Pequot Street P.S.	Highly Unfavorable	Unfavorable
Sassaquin Avenue P.S.	Highly Unfavorable	Unfavorable

Phase 2 will be delayed until data from the secondary WWTP is available to accurately characterize the quantity and quality of the sludge. This delay can be accommodated by extending the already-planned interim disposal contract by about four months. This change will allow the city to monitor secondary WWTP sludge characteristics for six months. A report on sludge quality will then be prepared and a Request for Proposals (RFP) for interim (4 year) and long-term (20 year) disposal will be issued. At this time, Phase 2 of the project will be conducted, including more detailed impact evaluations and selection of a long-term residuals management program, either pursuing an in-City facility, or long-term privatization. MEPA submittals during Phase 2 will include the draft and Final EIR. This approach provides the most responsible means for proceeding with facilities planning, and will lead to the selection of the most appropriate long-term facility, while providing for proper disposal of wastewater residuals in the interim.

REQUIRED PERMITS AND MITIGATION:

Potential sites for the sludge processing facility have been screened in this report. Re-evaluation of alternatives will take place after the secondary WWTP is completed and accurate sludge quality projections can be made. It is likely that if an in-city sludge facility is selected numerous state permits will be required. Permit requirements and mitigation will be addressed in Phase 2 when a specific facility type and location are proposed.

The Industrial Impact of EPA's Part 503 Sewage Sludge Regulation

Nicholas J. Melas and Mary Ann Latko, CSP
Carnow, Conibear & Associates, Ltd., Chicago, IL

With the promulgation of the Sewage Sludge Regulations by the United States Environmental Protection Agency (USEPA) in the spring of 1993, it became clear that a major emphasis of the agency is the beneficial reuse of sewage sludge for food-chain and non-food products. The goal of most publicly-owned treatment works (POTWs) as a result is to produce an alternative pollutant limit (APL) sludge (many refer to this as "biosolids"), a sludge [illegible] levels below the alternative pollutant limits for metals. Such sludge can be applied to land with minimal permitting. To produce this quality of sludge, POTWs are beginning to vigorously enforce the categorical effluent standards on influent streams to their treatment plants. To meet these standards, industrial facilities must provide more extensive pretreatment before their wastewater enters public systems. POTWs have enhanced their already aggressive enforcement programs to ensure that standards are being met.

The Industrial Impact of USEPA's 40 CFR Part 503 Sewage Sludge Regulation

With the promulgation of the final Sewage Sludge Regulations by the USEPA in the spring of 1993, it became clear that a major emphasis of the agency is the beneficial reuse of sewage sludge. These regulations are a major concern for municipal sewerage agencies throughout the country. Indeed, the Association of Metropolitan Sewerage Agencies (AMSA) had the implementation of the Sewage Sludge regulations as the theme of its 1993 Winter Technical Conference.

Simply put, the regulations established two sets of sludge quality limits for land application (see Figure 1).

Constituent Metal	Pollutant Ceiling Limit (mg/Kg)	Alternative Pollutant Limit (mg/Kg)
Arsenic	75	41
Cadmium	85	39
Chromium	3,000	1,200
Copper	4,000	1,500
Lead	850	300
Mercury	57	7
Molybdenum	75	18
Nickel	420	420
Selenium	100	36
Zinc	7,500	2,800

FIGURE 1[1]

Sludge exceeding the specified pollutant ceiling concentrations for any of the ten metals may not be used in land application. Sludge which has less than these pollutant ceiling concentrations but greater than specified alternative pollutant concentrations may be used in land application programs but with limitations on maximum cumulative pollutant loadings. Sludge which has less than the alternative pollutant concentrations is essentially unregulated and may be used in land application programs with no significant restrictions.

At the AMSA Winter Technical Conference, there was much discussion on the beneficial reuse of sewage sludge, since that seemed to be the thrust of the USEPA approach. In fact, many of the speakers emphasized this approach by substituting the word "biosolids" for "sludge". Biosolids then becomes a valuable natural resource. Beneficial uses of biosolids, which can include a variety of land applications and incineration through which energy is recovered, must continue to be built upon and expanded.

The goal for most POTW now is to produce an APL sludge (biosolids) that has contaminant levels below the alternative pollutant limits for metals. In order to produce this quality sludge, POTWs must vigorously enforce the categorical effluent standards on influent streams to their treatment plants. In implementation of this regulation and looks forward to working in partnership with EPA on this effort."

Specifically, AMSA recommends:

- Federal support for timely development and distribution of public education and technical guidance materials as well as training and workshops to facilitate local implementation

- Federal funding for ongoing research

- Encouragement of state responsibility for biosolids management in a manner consistent with the new federal regulations

- Development of a federal interagency policy in support of the beneficial use of biosolids

- Targeted activities to improve and enhance public perception of biosolids

- Development of national marketing strategies in support of beneficial use

- Interstate implementation of biosolids be evaluated as an issue independent from municipal solids waste

To meet these standards, industrial facilities must provide more extensive pretreatment before their wastewaters enter public systems. To accomplish this, POTWs have enhanced their already aggressive enforcement programs to ensure the standards are being met. To illustrate the efforts along these lines, we take as an example the efforts of the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).

The November 1992 *Research & Development News* states "since the District's Sludge Management Program is based on land application and beneficial use of sludge, the District's goal is to produce sludge which contains less than the alternative pollutant concentrations."

"Review of the Draft Regulations and Preamble has revealed that the District's current sludge production is of such quality that it will not meet all of the alternative pollutant concentrations specified in the Draft Regulations. Specifically, it appears that sewage sludge produced at the Stickney and Calumet Water Reclamation Plants will have cadmium, chromium and lead concentrations which do or may exceed the limits in the Draft Regulations. Needless to say, this potential non-compliance with the Draft Regulations will put the District's Sludge Management Program in jeopardy."

"Most of the metals found in District sludges come from industrial users (IUs). We believe that the quantity of metals from IUs can be controlled under the District's existing Sewage and Waste Control Ordinance through vigorous monitoring of IUs found to be discharging the problem metals. Further, we believe that through vigorous monitoring of IUs, the District should be able to bring its sludge quality, particularly for cadmium, chromium and lead, well within the alternative pollutant concentrations in the Draft Regulations by July 1, 1993."

The Metropolitan Water Reclamation District demonstrated its determination to achieve APL-quality sludge in its 1993 budget document which was adopted in December, 1992. There was a significant increase in the number of positions allocated to the Industrial Waste Division of the Research & Development Department. The number of positions in that department increased from 154 employees to 196, with the largest increase occurring in the field surveillance sections which rose from 87 positions in 1992 to 134 in 1993. This dramatic increase is seen in Figure 2[2], the Table of Organization of the R&D Department, taken from the 1993 MWRDGC budget, and graphically shown in Figure 3[3] in the 1994 MWRDGC Budget Recommendations document. Along with increased personnel, the District provided an additional $2 million for waste monitoring, an increase of 18.2% over the previous year's expenditures. This increase, shown in Figure 4[4], also from the 1993 MWRDGC budget, has the following explanation in footnote (a): "increase reflects addition of personnel and equipment for intensive monitoring of industrial users to achieve compliance with USEPA's sludge regulations."

other words, more efficient pretreatment will be required of POTW users.

AMSA had previously approved a pretreatment policy in a position statement adopted in May, 1992. The policy states that "the Association of Metropolitan Sewerage Agencies (AMSA) supports the control of toxic pollutants discharged by industrial, commercial and domestic users of publicly-owned treatment works (POTWs). AMSA further supports a federal legislative and regulatory approach that allows the implementation of both national and local standards and programs to control toxic pollutants that may interfere with POTWs ability to meet National Pollutant Discharge Elimination Systems (NPDES) permit requirements or result in danger to worker or community health and safety air toxic regulations, or sludge regulations. AMSA supports a cooperative effort between the U.S. Environmental Protection Agency (USEPA) and local agencies to implement and enforce existing standards, and believes that these efforts provide the necessary framework to justify and maintain the domestic sewage exclusion."

In its 1993-1994 position statement, AMSA addressed the question of improving water quality through pretreatment. "The association supports a national program of pretreatment and pollution prevention to control toxic pollutants discharged by industrial, commercial and domestic users of publicly-owned treatment works (POTWs). The pretreatment program of the 1990s is an unqualified success. One needs only to look to the high quality of our effluent and biosolids to verify the effectiveness of this Clean Water Act Success Story."

"While substantial improvements in environmental quality have occurred through pretreatment program implementation, there is a growing awareness that end-of-pipe controls are an inefficient mechanism for further pollutant reductions. For this reason, pollution prevention initiatives including source elimination, waste minimization and product modification are an essential components of national efforts to protect the environment. Therefore, AMSA supports the implementation of a national multimedia pollution prevention program."

Specifically, AMSA urges:

- Environmental Protection Agency (EPA) to incorporate the cross media impacts of pretreatment as an integral part of all future regulations
- Development of better indices to determine pretreatment program performance
- EPA to direct future efforts toward development of water quality and toxicity standards which can be translated by POTWs into local site-specific limits.
- EPA to promulgate new categorical standards for industrial categories
- Continuation of the domestic sewage exclusion provided by the Resource Conservation and Recovery Act;
- Elimination of federal facilities exemptions for Clean Water Act violations and penalties
- EPA to incorporate pollution prevention considerations in environmental planning and decision making
- Assessment of those commercially-available household and industrial product constituents that have the potential to impede the attainment of beneficial uses followed by responsive regulatory or legislative actions
- Support of regional, state and local pollution prevention efforts

Finally, in another 1993-1994 position statement, AMSA addressed the question of managing the biosolids resources. The statement went on to say that "the Association of Metropolitan Sewerage Agencies played an important role in the development of EPA's 40 CFR Part 503 Standards for the Use of Disposal of Sewage Sludge Final Rule, which regulates municipal biosolids under the Clean Water Act. AMSA fully supports the

BUDGETED POSITIONS

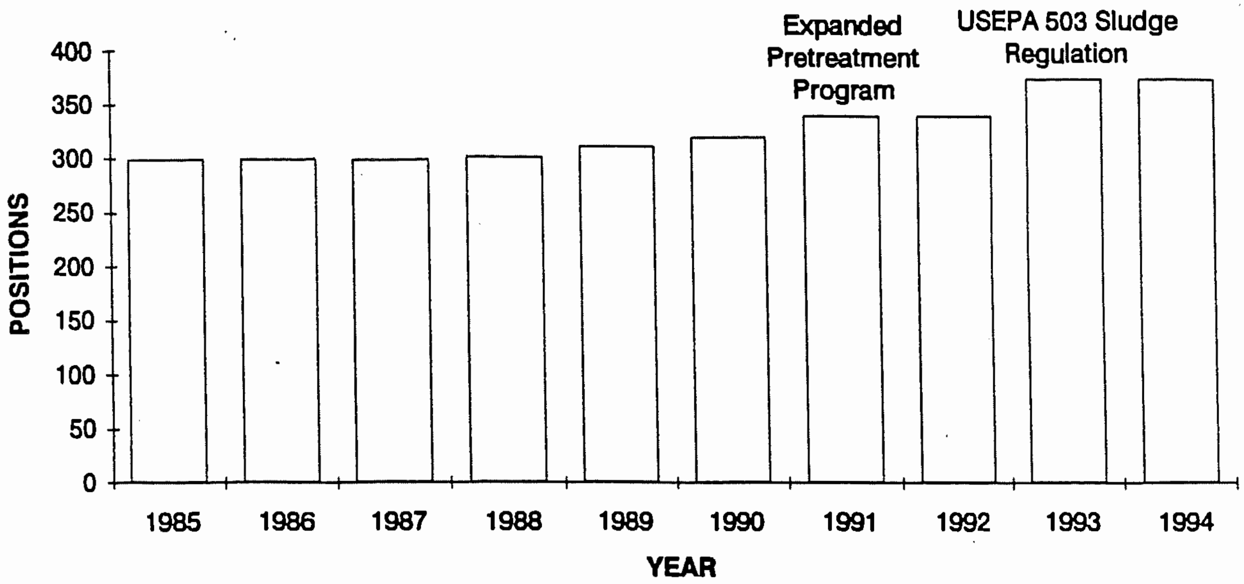

FIGURE 3

PROGRAMS BY PRIORITY

NUMBER	NAME	1991 ACTUAL COSTS	BUDGETED POSITIONS		BUDGETED COSTS	$ AMOUNT CHANGE	PERCENT CHANGE
4650	OPERATIONS MONITORING	$5,531,729	1993	96	$5,916,350	($481,457)	(7.5)
			1992	99	$6,397,807		
4660	WASTE MONITORING	$9,170,118	1993	221	$13,112,095	$2,016,101	18.2 (a)
			1992	176	$11,095,994		
4670	ENVIRONMENTAL MONITORING	$3,474,634	1993	36	$2,002,106	($243,510)	(10.8) (b)
			1992	38	$2,245,616		
4680	TECHNICAL ASSISTANCE	$1,020,251	1993	24	$1,470,831	$270,269	22.5 (c)
			1992	21	$1,200,562		
4690	OPERATIONS AND APPLIED RESEARCH	$298,355	1993	6	$388,118	$19,697	5.3
			1992	6	$368,421		
	TOTALS:	$19,495,087	1993	383	$22,889,500	$1,581,100	7.4
			1992	340	$21,308,400		

(a) Increase reflects addition of personnel and equipment for intensive monitoring of industrial users to achieve compliance with new USEPA sludge regulations.
(b) Decrease reflects completion of Comptehensive Water Quality Monitoring Study in 1992 and reallocation of staff.
(c) Increase reflects reallocation of personnel costs to identify Regulatory Review and Response activity.

FIGURE 4

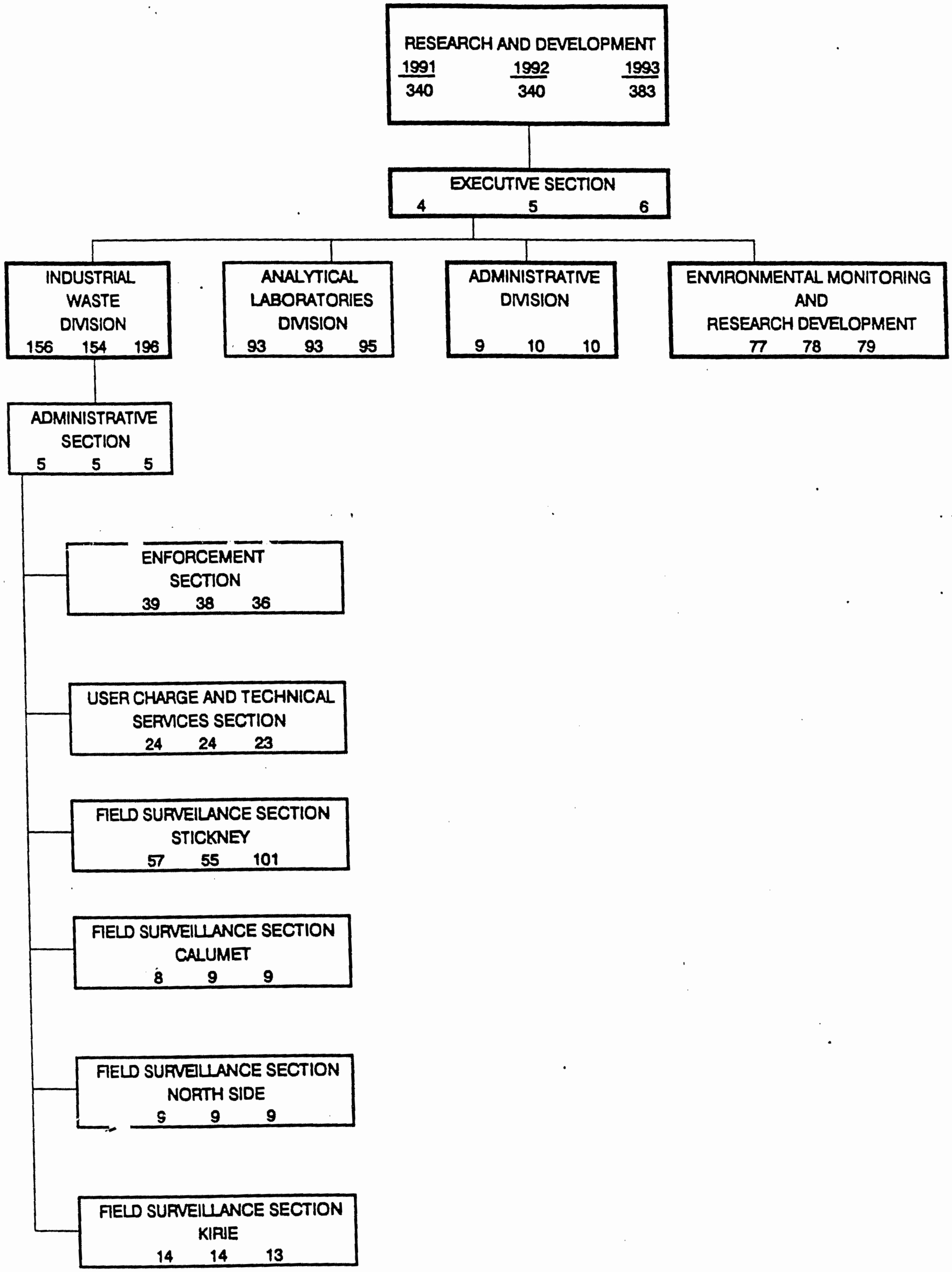
RESEARCH AND DEVELOPMENT
1991 1992 1993
340 340 383
EXECUTIVE SECTION
4 5 6
INDUSTRIAL WASTE DIVISION
156 154 196
ANALYTICAL LABORATORIES DIVISION
93 93 95
ADMINISTRATIVE DIVISION
9 10 10
ENVIRONMENTAL MONITORING AND RESEARCH DEVELOPMENT
77 78 79
ADMINISTRATIVE SECTION
5 5 5
ENFORCEMENT SECTION
39 38 36
USER CHARGE AND TECHNICAL SERVICES SECTION
24 24 23
FIELD SURVEILANCE SECTION STICKNEY
57 55 101
FIELD SURVEILLANCE SECTION CALUMET
8 9 9
FIELD SURVEILLANCE SECTION NORTH SIDE
9 9 9
FIELD SURVEILLANCE SECTION KIRIE
14 14 13

FIGURE 2

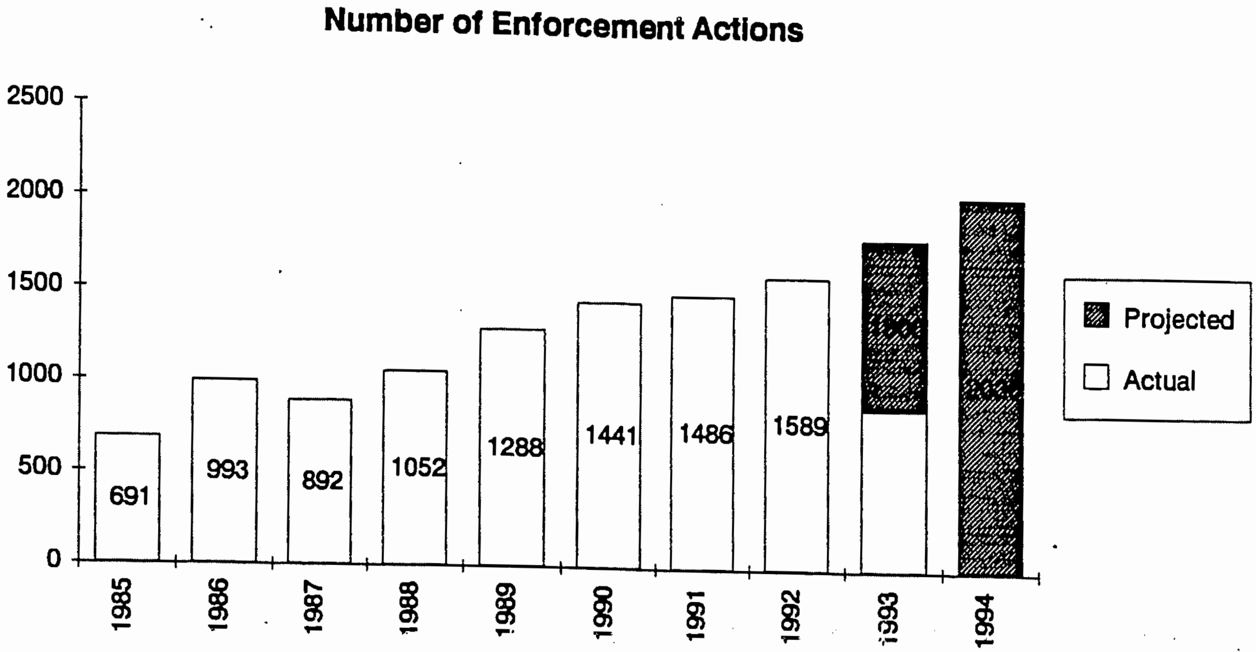
Number of Enforcement Actions
2500
2000
1500
1000
500
0
691
993
892
1052
1288
1441
1486
1589
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
Projected
Actual

FIGURE 5

The increased waste monitoring provided for in the 1993 MWRDGC budget had a significant effect. The number of enforcement actions increased dramatically during 1993 with a larger number projected in 1994. This is shown graphically in Figure 5[5], which is taken from the MWRDGC 1994 Budget Recommendations document. In that document, a narrative under the heading of "Sewage and Waste Control" states "the Sewage and Waste Control Ordinance specified limits on the quality of waste discharged by industries into the District's system. Surveillance of these industries is an ongoing activity. When field inspections and/or pollutant analyses indicate noncompliance with Ordinance limits or conditions, a notice of violation or noncompliance is issued to the discharger. An increase in the number of notices issued annually has resulted from the increased restrictiveness and industrial user self-reporting requirements in the Federal Pretreatment Regulations."

As a result of this increased enforcement activity, the MWRDGC was able to report in the June 1993 *Research & Development News* a significant improvement in the quality of sludge produced during the first quarter of 1993. The *Research & Development News*, under a heading entitled "503EI Improves Sludge" went on to say "as reported in the March 1993 issue of *R&D News*, as a result of the issuance of the U.S. Environmental Protection Agency (USEPA) Regulations on the Use or Disposal of Sewage Sludge, the District implemented the 503 Enforcement Initiative (503EI) in an effort to bring the concentration of metals in its sludge compliance with the regulatory limits.

"Early implementation of the 503EI, in the fall of 1992, led to measurable improvement in sludge quality . . ."

"As of the close of the first quarter of 1993, the District had installed 101 automatic samplers at those IUs targeted under the 503EI. Our intensive inspections of IUs suspected of discharging metals into the sewer system have been productive and have led to the improvements in the quality of District sludges."

The October 1993 *R&D News* reported that the District's 503EI goal had been achieved. The article states . . . "the District undertook the 503 Enforcement Initiative in the Fall of 1992, in an effort to bring its sludge quality into compliance with USEPAs Regulations on the Use or Disposal of Sewage Sludge . . ."

"For the second quarter of 1993, final sludge produced at the Calumet, Hanover Park and Stickney Water Reclamation Plants (WRPs) met the USEPA alternative pollutant limits (APLs) which allows for practically unrestricted use and disposal options for the land application of sludges ...".

"In September 1992, when the proposed regulation was released in draft form, the District began the 503EI and forecast compliance with USEPA's Regulations on the Use or Disposal of Sewage Sludge . . ."

"In September 1992, when the proposed regulation was released in draft form, the District began the 503EI and forecast compliance with APLs by July 1, 1993. That goal has been achieved. The 503EI will continue into the future to insure that District sludge quality continues to meet the APLs."

The success of the initiative undertaken by the MWRDGC will, undoubtedly be noted by other POTWs throughout the country. In their need to dispose of sewage sludge in the most economical manner possible, those POTWs must seek to produce what we have chosen to call "biosolids". Industry users of POTWs must recognize the necessity to expand and enhance their pretreatment facilities in order to produce a quality of effluent from their plants that will enable the POTWs to meet the standards required to produce an APL sludge. This, it seems to us, is the most prudent and, in the long run, the most economical approach.

References

1. *Research & Development News*, Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) (March, 1993.)
2. MWRDGC Budget, 113 (1993).
3. MWRDGC Budget Recommendations, 11 (1994).
4. MWRDGC Budget, 125 (1993).
5. MWRDGC Budget Recommendations, 121 (1994).

2983801.192

TABLE 2-4

COMPARISON OF OBSERVED AND PROJECTED SLUDGE QUALITY WITH REGULATORY LIMITS (mg/kg)

Pollutant	Existing Primary Sludge Concentration (1)			Predicted New WWTP Concentration (3)		MA Type I Limits	EPA Part 503 Table 3 Limits (4)
	1989	Feb. 1992	Feb. 1993 (2)	Initial Year	Design Year		
Antimony	<2.5	ND		15.95	15.59	-	-
Arsenic	<1.0	0.34		6.02	5.85	-	41
Barium	182	210		-	-	-	-
Beryllium	<1.0	0.21		21.14	20.65	-	-
Boron	<50	4		70	69	300	-
Cadmium	2	5		5	5	14	39
Chromium	265	223		366	357	1,000	1,200
Copper	**1283**	**603**	**623**	**597**	**582**	**1,000**	**1,500**
Cyanide	2	4		27	26	-	-
Lead	162	129		90	88	300	300
Mercury	0.16	0.42		1.70	1.68	10	17
Molybdenum	**19**	**9**	**43**	**52**	**50**	**10 / 25 (5)**	**18**
Nickel	**235**	**136**	**284**	**122**	**119**	**200**	**420**
Selenium	3	4		11	11	-	36
Silver	16	24		41	40	-	-
Thallium	<1.0	ND		14	14	-	-
Zinc	730	957		819	798	2,500	2,800
PCBs	**9**	**35**	**5**	**3**	**3**	**1 / 2 (6)**	**50 (6)**

NOTES:

(1) Average of primary sludge samples taken in February and May 1989 and the average of two primary sludge samples taken in February 1992.

(2) Average of four primary sludge samples taken between Jan. 27 and Feb. 17, 1993. PCBs were below detection limit of 2.5 in three samples, but were 16.5 mg/kg in one sample.

(3) Predicted initial year (1995) and design year (2015) sludge quality assuming average dry weather loading. (Ref. Final Phase 2 FP/EIR Volume III, Tables 5-6 and 5-7)

(4) Pollutant concentrations from EPA Part 503 Paragraph 503.13 Table 3. A sludge with pollutants within these concentrations along with a Class A pathogen reduction classification has the most flexibility for beneficial reuse.

(5) MA Type I limit for sludge which is to be applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown is 10 mg/kg. If neither of these conditions apply, the MA Type I limit is 25 mg/kg.

(6) MA Type I limit for use as a commercial fertilizer is 2 mg/kg; the MA Type I limit for use as a soil conditioner is 1 mg/kg. The EPA Part 503 regulations (503.6f Exclusions) states that the EPA regulations do not establish requirements for the use or disposal of sewage sludge with a concentration of polychlorinated biphenyls (PCB's) equal to or greater than 50 mg/kg of total solids (dry weight basis). This implies that concentrations less than 50 mg/kg are acceptable.

2.0 REQUIREMENTS FOR WWTP RESIDUALS MANAGEMENT

2.1 PROJECTED WWTP RESIDUALS QUANTITY

This section updates the previous residuals quantity projections. Wastewater treatment plant residuals are solid materials removed from wastewater at the WWTP or pump stations. Residuals to be generated at the secondary WWTP can be categorized as:

- Grit
- Screenings
- Scum and Skimmings
- Primary Sludge
- Secondary Sludge

Previous estimates of average daily and maximum monthly quantities for these residuals, for both the initial year of secondary WWTP operation (1994) and the design year (2014), were summarized in the *Final FP/EIR* (January 1990), Volume III, Table 5-1.

During the design of the new secondary WWTP (1990-1991), a mass balance evaluation of all unit processes that produce residuals was performed to establish solids loading design criteria for treatment plant systems processing solids. The results of the mass balance evaluation became the basis of plant design criteria, equipment selection, design details, and specification preparation.

The mass balance evaluations conducted during facility design were more detailed than the previous estimates made for facilities planning purposes, but did not result in any changes in the estimated quantities for grit, scum, skimmings, or screenings as presented in the 1990 *Final FP/EIR*. However, the mass balance evaluations did result in some minor revisions to the estimated initial and design year quantities of primary and secondary sludge. These revisions are within 5 percent of the *Final FP/EIR* estimates. The revised quantities that formed the plant's design criteria are listed on Table 2-1; these are the most appropriate quantity estimates for use in this *Supplemental Facilities Plan*.

TABLE 2-1

ESTIMATED SOLIDS QUANTITIES (1)

	Initial Year 1996	Design Year 2016
Flow (mgd)		
Average	26.5	29.6
Maximum Month	35.4	38.5
Grit (cu. ft/day)		
Average Day	149	167
Maximum Month	196	214
Screenings (cu.ft/day)		
Average	135	150
Maximum Month	177	193
Skimmings (lb.day) (2)	1,600	1,800
Primary Sludge (lb/day) (2), (3)		
Dry Weather		
Average	28,400	38,300
Maximum Month	44,000	58,200
Maximum 3-day	62,100	83,500
Secondary Sludge (lb/day) (2), (3)		
Dry Weather		
Average	15,700	21,800
Maximum Month	28,700	38,500
Maximum 3-day	36,700	48,600
Total (Sludge and Skimmings, lb/day) (2), (3)		
Dry Weather		
Average	45,700	61,900
Maximum Month	74,300	98,500
Maximum 3-day	100,400	133,900

NOTES:
(1) Data from WWTP Contract No. 1 Sheet GD-M-3 Design Criteria
(2) Pounds of dry solids per day
(3) Includes 10% allowance for side stream loadings

A complete copy of the final <u>New Bedford, MA Wastewater Treatment Plant Process Design Data</u> submitted to DEP at the completion of the WWTP design is in Appendix B.

2.2 PROJECTED WASTEWATER TREATMENT PLANT RESIDUALS QUALITY

This section updates sludge quality projections. The quality of the residuals must be known to determine regulatory restrictions on beneficial reuse potential of the sludge, and on solids processing alternatives such as incineration, heat drying, composting, and alkaline stabilization. Previous evaluations of sludge quality were presented in the *Final FP/EIR* (January 1990), Volume III, Section 5.4. Information on existing primary treatment plant dewatered sludge quality, and a discussion on the predicted sludge quality from the new secondary WWTP were included.

The *Final FP/EIR* (Tables 5-2 through 5-13) presented primary sludge quality data from the City of New Bedford, Industrial Pretreatment Program (Table 5-2), from the *Final FP/EIR* (Table 5-3), from the *Final FP/EIR* (Table 5-4), from the PCB Pilot Plant study (Table 5-5), and from an analysis of predicted sludge quality from the new secondary wastewater treatment plant (Tables 5-6 through 5-13). A copy of each table is included for reference in Appendix B.

Since the completion of the *Final FP/EIR* in January 1990, additional primary sludge cake samples were taken by the Professional Services Group (PSG), the contract operator of the existing primary treatment plant. Two samples were collected in February 1992, and four samples were taken in January-February 1993. Table 2-2 shows results from each sludge sampling program, and the predicted secondary WWTP sludge quality.

2.3 REGULATORY FRAMEWORK

2.3.1 FEDERAL REGULATIONS AND POLICIES

Federal regulations of wastewater sludge have been revised since 1989. On November 25, 1992, the EPA Administrator signed the final rule on standards for the use or disposal of wastewater treatment plant residuals under an amendment to Title 40, Chapter I,

TABLE 2-2

POLLUTANT CONCENTRATIONS (mg/kg)

Pollutant	Existing Primary Sludge Concentration (1)			Predicted New WWTP Concentration (3)	
	1989	Feb. 1992	Feb. 1993 (2)	Initial Year	Design Year
Antimony	<2.5	ND		15.95	15.59
Arsenic	<1.0	0.34		6.02	5.85
Barium	182	210		-	-
Beryllium	<1.0	0.21		21.14	20.65
Boron	<50	4		70	69
Cadmium	2	5		5	5
Chromium	265	223		366	357
Copper	**1283**	**603**	**623**	**597**	**582**
Cyanide	2	4		27	26
Lead	162	129		90	88
Mercury	0.16	0.42		1.70	1.68
Molybdenum	**19**	**9**	**43**	**52**	**50**
Nickel	**235**	**136**	**284**	**122**	**119**
Selenium	3	4		11	11
Silver	16	24		41	40
Thallium	<1.0	ND		14	14
Zinc	730	957		819	798
PCBs	**9**	**35**	**5**	**3**	**3**

NOTES:

(1) Average of primary sludge samples taken in February and May 1989 and the averag of two primary sludge samples taken in February 1992.

(2) Average of four primary sludge samples taken between Jan. 27 and Feb. 17, 1993. PCBs were below detection limit of 2.5 in three samples, but were 16.5 mg/kg in one sa

(3) Predicted initial year (1995) and design year (2015) sludge quality assuming average dry weather loading. (Ref. Final Phase 2 FP/EIR Volume III, Tables 5-6 and 5-7)

Subchapter O of the *Code of Federal Regulations.* The amendment to Subchapter O added *Part 503: Standards For The Use Or Disposal Of Sewage Sludge.* These final regulations address land application, surface disposal, pathogen and vector attraction reduction, and incineration of wastewater treatment plant sludge and were published in the Federal Register on February 19, 1993. The rule takes effect 30 days after publication in the Federal Register.

The new federal standards:

- Set pollutant concentration limits for ten pollutants typically contained in municipal wastewater plant residuals for residuals that are to be land applied as the method of final disposal (see list on Table 2-3).
- Require pathogen and vector attraction reduction prior to land application of residuals or prior to disposal in a sludge-only monofill.
- Set concentration limits for seven heavy metals in sewage sludge that will be subject to thermal destruction.
- Set an operational standard for the air concentration of total hydrocarbons in the flue gas from thermal destruction processes.
- Set monitoring and reporting standards for each of the sludge disposal options identified in Part 503.

The requirements of these standards on specific technologies and implications for New Bedford are discussed below. Note that the regulations do not address or limit the interstate transfer of sludge or sludge products.

Land Application

The land application sections of the new EPA regulations cover the application of sludge or sludge derived products to agricultural and nonagricultural lands. Agricultural lands include land used for food crops (including home gardens) feed crops, range land, and pasture. Nonagricultural land uses include forests, disturbed lands, and lands with potential public contact such as parks, ball fields, and golf courses.

Land application management practices in the new EPA regulations include:

- Sludge application shall not cause or contribute to the harm of a threatened or endangered species of plant, fish, or wildlife or result in the destruction or adverse modification of the critical habitat of a threatened or endangered species.

- Sludge application shall not cause a hazard to human health, wildlife, land, or water resources by contact with the runoff from a 24-hour storm event with a frequency occurrence of 25 years.

- Sludge shall not be applied to land that is flooded.

- Sludge shall not be applied to land that is frozen or snow covered so that the sludge enters waters of the United States.

- Sludge shall not be applied to land that is frozen or snow covered so that the sludge enters a wetland, except as provided in a permit.

- Sludge shall be applied to land at no more than the agronomic rate.

- Sludge shall not be applied to land that is 10 meters or less from water bodies.

These standards and management practices are implemented through a permit. The permitting process depends on a given state's sludge management program. For Massachusetts, sludge treatment and disposal is currently regulated through the NPDES permitting program under the direction of the State Department of Environmental Protection, Division of Water Pollution Control.

While EPA's original draft of these regulations (1989) proposed pollutant concentration limits for 25 pollutants, the newly issued standards are focusing on only the ten pollutants listed in Table 2-3. The concentration for each pollutant listed in Table 2-3 is the maximum allowable proposed concentration in sewage sludge applied to agricultural land, forest, a public contact site, a reclamation site, a lawn, or a home garden and in sewage sludge sold or given away in a bag or similar enclosure for application to the land.

The EPA standards specifically exclude sewage sludge with a concentration of polychlorinated biphenyls (PCBs) equal to or greater than 50 milligrams per kilogram of total solids (dry weight basis). Beyond this exclusion, the regulations do not contain standards for PCBs. The regulations, therefore, imply that a sludge with a PCB

TABLE 2-3

POLLUTANT CONCENTRATION LIMITS FOR LAND APPLICATION OF MUNICIPAL WASTEWATER TREATMENT PLANT SLUDGES

Pollutant	EPA Concentration mg/kg (1)	Massachusetts Limits	
		Type I mg/kg	Type II mg/kg
Arsenic	41	-	-
Boron (water soluble)	-	300	300
Cadmium	39	14	25
Chromium (total)	1200	1,000	1,000
Copper	1500	1,000	1,000
Lead	300	300	1,000
Mercury	17	10	10
Molybdenum	18	10 / 25 (2)	10 / 25 (2)
Nickel	420	200	200
Selenium	36	-	-
Zinc	2800	2,500	2,500
PCB's	<50	1 / 2 (3)	10

(1) The concentration for each pollutant in bulk sewage sludge applied to agricultural land, forest, a public contact site, a reclamation site, a lawn, or a home garden and in sewage sludge sold or given away in a bag or similar enclosure for application to the land shall be equal to or less than the concentration for the pollutant as listed.
Ref: EPA Part 503 Regulations, 11/25/92

(2) 10 mg/kg if sludge is applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown; 25 mg/kg if sludge is applied to land where neither of the above conditions are applicable.

(3) 1 mg/kg if sludge is used as a soil conditioner pursuant to 310 CMR 32.11 (b);
2 mg/kg if sludge is used in a commercial stabilizer pursuant to 310 CMR 32.11 (b).

concentration that is less than 50 mg/kg is acceptable for beneficial reuse in all the applications listed above.

Surface Disposal

Surface disposal refers to the permanent disposal of sludge in sludge-only landfills, in lagoons, in stock piles, or at dedicated beneficial use sites. Pathogen and vector reduction requirements apply to surface disposal, such as the disposal of wastewater sludge in a sludge-only landfill. Sludge landfilled in a municipal solid waste landfill does not have to adhere to the Federal 503 rule, however, the DEP has regulations governing sludge disposal to those landfills.

The 503 regulations contain two classes of pathogen reduction; Class A and Class B. Class A sludge requires the geometric mean of the density of fecal coliform in the samples collected to be less than 1,000 fecal coliforms per gram of dry solids. Sludges with this classification would have the most reuse flexibility. The regulations present six alternative means of achieving or demonstrating this fecal coliform performance level. These Class A processes are:

- Maintaining the temperature of the sludge at a specific value for a period of time (regulations provide a formula with the variables of time and temperature along with guidance on minimum requirements).

- Maintaining the pH of the sewage sludge above 12 for 72 hours along with maintaining the temperature of the sewage sludge above 52 degrees Celsius for 12 hours or longer during the period that the pH of the sewage sludge is above 12. At the end of the 72 hours, air drying the sludge to achieve a percent solids in the sewage sludge greater than 50 percent.

- Analyzing the sewage sludge for enteric viruses and viable helminth ova prior to pathogen removal treatment. If the densities are less than the established minimums for enteric viruses and viable helminth ova after the sludge is subjected to a pathogen treatment process, the sewage sludge is considered to be Class A quality and the particular pathogen treatment process used to obtain this result would be acceptable for continued use.

- Analyzing the sewage sludge for enteric viruses and viable helminth ova at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet other specified requirements in the rule shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis). If the material meets the requirements, it is Class A.

- Sewage sludge shall be treated in one of the Processes to Further Reduce Pathogens described in regulation Appendix B. These are:

    - Composting using the within-vessel method or the static aerated pile method to maintain the sewage sludge temperature at 55 degrees Celsius or greater for a period of 3 days, or the windrow method to maintain the sewage sludge temperature at 55 degrees Celsius or greater for a period of 15 days with a minimum of 5 turnings of the windrow.

    - Heat drying by contact with hot gases to reduce sewage sludge moisture content to 10 percent or lower. The temperature of the sewage sludge or the wet bulb temperature of the gas leaving the dryer must exceed 80 degrees Celsius.

    - Heat treatment by heating liquid sludge to a temperature of 180 degrees Celsius or higher for 30 minutes.

    - Thermophilic aerobic digestion by agitating liquid sludge with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sludge at 10 days at 55 to 60 degrees Celsius.

    - Beta ray irradiation by irradiating sewage sludge with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (20 degrees Celsius).

    - Gamma ray irradiation by irradiating sewage sludge with gamma rays from certain isotopes, such as 60 Cobalt and Cesium 137, at room temperature (20 degrees Celsius).

    - Pasteurization by maintaining the temperature of the sewage sludge at 70 degrees Celsius or higher for a minimum of 30 minutes.

- Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

  The potential applicability of these PFRP processes is discussed in Section 3.0.

The regulations allow a higher number of fecal coliforms per gram of dry solids for the Class B sludge; however, there are more restrictions on use of the sludge or sludge product. Class B sludge can be disposed in a sludge-only landfill. According to the EPA standards, the geometric mean of the density of fecal coliforms in the collected samples must be less than 2,000,000 Most Probable Number (MPN) per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units (CFU) per gram of total solids (dry weight basis).

Alternately, sludge can meet Class B through treatment of one of the Processes to Significantly Reduce Pathogens (PSRP). These include:

- Aerobic digestion by agitating sludge with air or oxygen to maintain specific temperature for a specific time; values are between 20 degrees Celsius for 40 days and 15 degrees Celsius for 60 days.

- Air drying on sand beds, or basins for a minimum of three months, with average ambient temperature above 0 degrees Celsius for two of the three months.

- Anaerobic digestion by maintaining in the absence of air specific temperature for a specific time; values are between 35-55 degrees Celsius for 15 days and 20 degrees Celsius for 60 days.

- Composting using either the in-vessel, static aerated pile, or window method to raise and maintain the sludge temperature to 40 degrees Celsius for five days, with the temperature exceeding 55 degrees Celsius for four hours.

- Lime stabilization by adding sufficient lime to raise the sludge pH to 12 after two hours of contact.

The new secondary WWTP will be capable for lime stabilization of dewatered sludge (lime can be added downstream of the high solids centrifuges). Lime stabilization is sufficient to meet EPA's Class B requirements for pathogen and vector reduction, which is required prior to sludge-only landfill disposal. The new plant's lime stabilization process is the first step towards meeting Class A requirements; however, additional processing at an off-site location would be needed.

Incineration

The EPA standards for sludge incineration set limits for heavy metals in the sludge prior to burning, and specify operational standards for total hydrocarbons and management practices for monitoring combustion performance. Part 503 regulates the quality of sewage sludge to be incinerated with a formula. Variables in the formula include emission rate and other site-specific data, so a table of numerical standards cannot be presented. However, the formula was applied to several sites and with New Bedford design criteria to determine how the limits could affect the incineration alternative for New Bedford. The results showed that the sludge quality projections meet the standards. The projected concentrations are lower than the calculated limits by factors of seven (Chromium) to 80 (Nickel).

2.3.2 MASSACHUSETTS REGULATIONS AND POLICIES

The Massachusetts Department of Environmental Protection (DEP) regulates use and disposal of wastewater sludge through its administration of the NPDES permit program (jointly with EPA) and through 310 CMR 32.00, *Land Application of Sludge and Septage* (last amended September 11, 1992).

The DEP sets standards for land application and compost in its regulations (310 CMR 32.00) but relies on policies rather than regulations for other types of sludge processing and disposal. The state's policy for the design and operation of sludge (and sludge ash) landfills (DEP Division of Water Pollution Control, 1983) addresses environmental considerations of siting sludge landfills, operations, and the design of the landfill liner. The policy states that the cover application requirements shall be determined on a case-by case basis, in consideration of sludge characteristics, landfill location and design, and cover material. The policy does not restrict sludge quality and does not specify bulking requirements.

The DEP does not have specific written policies for sludge incineration, heat drying, alkaline stabilization, or other technologies. Generally, proposals to implement such technologies are reviewed individually. DEP's major considerations in evaluating such proposed technologies are:

- feasibility
- environmental soundness
- potential for interruptions in operations
- potential for adverse impacts such as odors

Based on recent discussions with DEP, certain technologies have previously been evaluated for several proposals. In particular, DEP has reviewed the reuse of alkaline stabilized sludge (such as ChemFix product) as solid waste landfill cover supplement. According to DEP, several operations using the ChemFix process for this application have experienced significant difficulties, including problems with the sludge texture, with mixing sludge and cover materials, and with odors. DEP requires researching these operational issues before approving any additional proposal to use the ChemFix process or other alkaline stabilization product as landfill cover supplement.

DEP also has considered heat drying sludge with pelletization. Two large scale operations--South Essex Sewerage District (currently under design) and Massachusetts Water Resources Authority (MWRA) (currently in operation)--were approved in the past several years. DEP has raised some concerns about this technology, due to operational problems at the recently constructed MWRA facility.

For land application, DEP classifies sludges and compost as Type I, II, or III according to the concentrations of certain heavy metals and other chemicals in the sludges. The 1992 amendments to 310 CMR 32.00 revised the sludge suitability limits for cadmium and molybdenum, and revised the criteria for the sale and distribution of Type I, II, and III sludge and septage. Table 2-3 shows the current pollutant concentration limits for Type I and Type II sludges.

The new Type I limit for cadmium is 14 mg/kg (versus 2 mg/kg previously); the Type II limit remains unchanged at 25 mg/kg. The new Type I and Type II limits for molybdenum has two components. The Type I and Type II limit is 10 mg/kg if the sludge is applied to land utilized for grazing or on land upon which one or more forage crops are intended to be grown; the Type I and Type II limit is 25 mg/kg if sludge is applied to land where neither of the previous two conditions apply. The previous limit for Molybdenum was 10 mg/kg without specification of application limitations.

Once the EPA Part 503 regulations are promulgated (expected to be published in the federal register in early February; they take effect 30 days after the date of publication), all states must adopt these criteria as <u>minimum</u> standards. Currently, there are some differences in allowable pollutant concentration limits for land applied sludge between the EPA Part 503 regulations and the current Massachusetts regulations under 310 CMR 32.00. As shown in Table 2-3, Massachusetts land application regulations currently have limits on nine heavy metals, one of which (water soluble boron) is not included in EPA's proposed list of 10 metals. EPA's list of ten regulated pollutants includes arsenic and selenium, neither of which have specified limits under current Massachusetts sludge classification regulations. A Massachusetts Type I classification currently has stricter pollutant concentration limits than the EPA's Part 503 regulations for seven parameters (cadmium, copper, mercury, molybdenum, nickel, zinc, and PCBs) . The limit for chromium is not as strict and the limit for lead is the same as the EPA limit. A Massachusetts Type I classification has no use restrictions. The state has its own sludge management practices for land application of residuals and they are similar to the EPA Part 503 management practices listed above.

2.3.3 COMPARISON OF PROJECTED RESIDUALS QUALITY WITH REGULATIONS

Federal limits for the ten pollutants and the exclusion for PCBs/and Massachusetts limits are listed in Table 2-4. They can be compared with the dewatered primary sludge quality data from recent years and the predicted average quality of the secondary sludge.

Comparison of the data shows that:

- Based on the average existing *1989 primary sludge data* obtained during the preparation of the *Final FP/EIR*, the concentration of molybdenum exceeds EPA Table 3 limits; the concentrations of copper, molybdenum, nickel, and PCBs exceed MA Type I limits.

- Based on the *projected sludge quality* from the secondary plant, the projected concentration of molybdenum exceeds EPA Table 3 limits and MA Type I limits.

- Based on the *February 1992 sludge sampling data,* no pollutants exceed the EPA Table 3 limits; only the concentration of PCBs exceeds MA Type I limits.

TRANSMITTAL SHEET

environmental engineers, scientists, planners, & management consultants **CDM**

Date 6 April 1994

Job

To Mr. Fred Kalisz
Buzzards Bay Project
2 Spring St.
~~Att~~ Marion MA 02738

Steve: Copy & Keep 1 copy

We are sending | herewith ..... / under separate / by messenger . ☐

1 print(s) each of the following: Selected sections of New Bedford Supplemental Facilities Plan for Residuals Management

which are | approved. ☐ / approved as noted ☐ / returned to you for correction and resubmittal ☐ / for your information ☐ / as requested ☒

Please call Steve Hickox or me if you have any questions.

By Liz Beardsley

TABLE 3-13

CHARLES RIVER POLLUTION CONTROL DISTRICT ALLOWABLE ALLOCATION TO INDUSTRIAL USERS

Parameter	Type I Sludge Maximum Allowable Industrial Loading lbs/d	Total Industrial Contributory Flow MGD	Local Limit mg/l
Antimony	415.33	1.31	38.02
Arsenic	3.98	1.31	0.36
Beryllium	1.32	1.31	0.12
Boron	10.62	1.31	0.97
Cadmium	0.03	1.31	0.01 *
Chromium	5.87	1.31	0.54
Copper	-11.09	1.31	**
Lead	3.44	1.31	0.31
Mercury	0.00	1.31	0.0005 *
Molybdenum	0.50	1.31	0.05
Nickel	4.72	1.31	0.43
Selenium	10.90	1.31	1.00
Silver	0.06	1.31	0.01
Thallium	15.10	1.31	1.38
Zinc	13.88	1.31	1.27
Cyanide	2.09	1.31	0.19

$$\text{Local Limit} = \frac{\text{Maximum allowable industrial loading}}{8.34 * \text{Total Industrial Flow}}$$

* Detection Limit

** Local limit for copper would be below the domestic wastewater background concentration. Industrial users should not allowed to increase their copper discharges above the domestic wastewater background level (0.87 mg/l).

EXECUTIVE SUMMARY

PROJECT: Supplemental Facilities Plan for Residuals Management
Draft Phase I Facilities Plan/EIR

PROPONENT: City of New Bedford

EOEA No.: 6425

PROJECT DESCRIPTION: In 1987, the City of New Bedford entered into a consent decree with the U.S. Environmental Protection Agency (EPA), the Massachusetts Department of Environmental Quality Engineering (now the Department of Environmental Protection, DEP), and the Conservation Law Foundation. The consent decree addressed facilities planning for secondary wastewater treatment. New Bedford responded with a facilities plan that consisted of a new secondary wastewater treatment facility, collection system improvements, residuals management, and wastewater treatment plant outfall.

The Secretary of Environmental Affairs approved a plan for the secondary WWTP in 1990. Construction began in December 1992; the plant is expected to operate mid 1996.

The residuals management portion of the plan was proposed and involved two components:

Principal Disposal

- stabilization of dewatered sludge using the ChemFix process
- use of stabilized sludge, mixed with a bulking agent, as daily cover material supplement at the Crapo Hill sanitary landfill

Backup Disposal
- landfilling of dewatered sludge at City-owned backup sludge monofill

This plan is no longer a viable alternative for long-term sludge disposal for two reasons: (1) DEP is concerned about the use of chemically fixated sludge as a daily landfill cover supplement, (2) the Crapo Hill sanitary landfill could only reuse about 20 to 55 percent of the City's generated sludge, depending on the bulking requirements.

At this time two issues, sludge (residuals) disposal management and septage receiving facility location, are outstanding. This project develops a plan for long term WWTP residuals management and for Phase 1 of a septage receiving facility. Factors, such as cost, requirements for further disposal capacity, need for/potential for product reuse, and operational issues are incorporated to determine technologies for handling WWTP residuals. Screening criteria, such as engineering requirements potential for environmental impacts, are applied to determine appropriate locations for the septage receiving facility and the sludge processing facility. Top-ranked alternatives are selected for septage receiving facility location and for sludge processing facility locations, and technology.

ALTERNATIVES:

A full range of residuals management alternatives are considered, including combustion, heat drying, chemical fixation, anaerobic digestion, composting, alkaline stabilization, lime stabilization, and landfilling. Among these, several are potentially capable of meeting the City's 20-year residuals management needs:

- Combustion with ash landfilling
- Heat drying with product reuse
- Stabilization with landfilling
- Full privatization

Potential sites for a City sludge processing facility are also reviewed. After several screenings and evaluation of key environmental impact, four sites were selected for further evaluation:

- Site 20 - Inactive junkyard (between Route 140 and Church Avenue)
- Site 26 - Inactive gravel pit (north of Sassaquin Pond)
- Site 48 - Former Tallyrand property (Industrial Park)
- Site 49 - Former City Incinerator Shawmut Avenue Municipal Landfill

The four potential sites are paired with the most suitable technologies to form specific alternative residuals management plans. Table 1 shows these plans.

For alternatives for septage receiving facility locations, consideration of the existing pump stations is logical to eliminate the need for an additional wastewater facility in the system, reducing cost and additional maintenance needs. The City's existing pump station alternatives are listed in Table 2.

SUMMARY OF IMPACTS: Impacts of alternatives are evaluated in detail. Table 1 summarizes impacts of technology alternatives for sludge management. Table 2 summarizes the environmental impacts of potential septage receiving facility locations.

RECOMMENDED PLAN: Based on the analyses in this report, sludge quality must be known to determine regulatory restrictions on beneficial reuse potential of the sludge, and on solids processing alternatives such as incineration, heat drying, composting, and alkaline stabilization. *No definitive projection of sludge quality can be made until the secondary WWTP is operating. Therefore,*

TABLE ES-1
SLUDGE PROCESSING FACILITY
SUMMARY OF ENVIRONMENTAL IMPACTS

Plan No.	Alternative	Impact on Wetlands	Impact on Terrestrial Ecology	Land Use Conflicts	Impact on Cultural Resources	Traffic Impacts	Impact on Air Quality	Noise Impacts
A-1	Combustion at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
A-2	Combustion at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
A-3	Combustion at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
A-4	Combustion at site 49	Moderate	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred
B-1	Heat drying at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
B-2	Heat drying at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
B-3	Heat drying at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
B-4	Heat drying at site 49	Moderate	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred
C	Lime stabilization	n/a	n/a	n/a	n/a	Minimal	n/a	n/a
D	Privatization; no site provided	n/a	n/a	n/a	n/a	Minimal	n/a	n/a
E-1	Privatization at site 20	Minimal	Acceptable	Preferred	Preferred	Slight	Slight	Preferred
E-2	Privatization at site 26	Significant	Acceptable	Least Preferred	Preferred	Minimal	Significant	Least Preferred
E-3	Privatization at site 48	Slight	Acceptable /Preferred	Preferred	Less Preferred	Minimal	Moderate/ Slight	Most Preferred
E-4	Privatization at site 49	Significant	Preferred	Preferred	Preferred	Moderate	Moderate/ Slight	Most Preferred

TABLE ES-2
SEPTAGE RECEIVING STATION
SUMMARY OF ENVIRONMENTAL IMPACTS

ALTERNATIVE	ENVIRONMENTAL IMPACTS	
	Traffic	Noise
Apponagansett Street P.S	Unfavorable	Unfavorable
Cove Road P.S	Unfavorable	Unfavorable
Howland Street P.S	Favorable	Unfavorable
Front Street P.S.	Favorable	Favorable
Pearl Street P.S.	Unfavorable	Favorable
Wamsutta Street P.S.	Favorable	Favorable
Coggeshall Street P.S.	Favorable	Favorable
Belleville Avenue P.S.	Favorable	Favorable
Howard Avenue P.S.	Unfavorable	Unfavorable
Hathaway Road P.S.	Favorable	Favorable
Airport P.S.	Favorable	Favorable
Jones Street P.S.	Favorable	Favorable
Joyce Street P.S.	Favorable	Unfavorable
Welby Road P.S.	Favorable	Unfavorable
Phillips Road P.S.	Favorable	Favorable
Duchaine Boulevard P.S.	Highly Favorable	Favorable
Area IV P.S.	Highly Favorable	Favorable
Peckham Road P.S.	Unfavorable	Unfavorable
Pequot Street P.S.	Highly Unfavorable	Unfavorable
Sassaquin Avenue P.S.	Highly Unfavorable	Unfavorable

Phase 2 will be delayed until data from the secondary WWTP is available to accurately characterize the quantity and quality of the sludge. This delay can be accommodated by extending the already-planned interim disposal contract by about four months. This change will allow the city to monitor secondary WWTP sludge characteristics for six months. A report on sludge quality will then be prepared and a Request for Proposals (RFP) for interim (4 year) and long-term (20 year) disposal will be issued. At this time, Phase 2 of the project will be conducted, including more detailed impact evaluations and selection of a long-term residuals management program, either pursuing an in-City facility, or long-term privatization. MEPA submittals during Phase 2 will include the draft and Final EIR. This approach provides the most responsible means for proceeding with facilities planning, and will lead to the selection of the most appropriate long-term facility, while providing for proper disposal of wastewater residuals in the interim.

REQUIRED PERMITS AND MITIGATION:

Potential sites for the sludge processing facility have been screened in this report. Re-evaluation of alternatives will take place after the secondary WWTP is completed and accurate sludge quality projections can be made. It is likely that if an in-city sludge facility is selected numerous state permits will be required. Permit requirements and mitigation will be addressed in Phase 2 when a specific facility type and location are proposed.

- Based on the January-February 1993 data, the concentration of molybdenum exceeds EPA Table 3 limits; the concentrations of molybdenum, nickel, and PCBs exceeds MA Type I limits.

Thus, on the basis of the data sets, considered together, the parameters copper, nickel, molybdenum, and PCBs are of concern.

Copper appears to be of lesser concern, since the limits were met both by the 1992 and 1993 data and the predicted quality concentrations. As noted in the *Final FP/EIR* (Volume III Page 5-14), the primary sludge data did not always compare with expected removals of non-conventional pollutants from a properly operated and maintained primary treatment plant. Since those primary sludge samples were taken (March, June, and July 1987), the operation and maintenance of the primary plant has been under the control of a contract operator. Plant performance has benefitted from this operations arrangement. The 1992 and 1993 primary sludge data for copper shows considerable improvement over the 1987 data.

Since the *Final FP/EIR* was completed, the City has put a greater emphasis on compliance with the City's industrial pretreatment program which could also be reflected in the lower concentrations of copper in the 1992 and 1993 data (nickel, chromium, and lead were also lower). The 1992 and 1993 levels and the predicted quality suggest that copper limits would likely be met.

Nickel will likely meet the EPA limit, but has potential to exceed the MA limits. While February 1992 primary plant data showed a decline in nickel concentration, the January-February 1993 data is more consistent with the *Final FR/EIR* data. Nickel will continue to be targeted by the City's industrial pretreatment program.

Molybdenum is slightly more problematic, since the 1989 and 1993 data and the projected quality exceed the EPA limit, and the more restrictive of the MA Type I limits.

The projected concentration may not accurately indicate the secondary plant sludge quality. The projected sludge quality for molybdenum is based on an assumed influent mass loading.

During the *Final FP/EIR* wastewater sampling program, molybdenum was never detected in the influent wastewater, but it appeared in all the *Final FP/EIR* primary sludge samples. To account for this aberration, the sludge quality projections in the *Final FP/EIR* assumed an influent wastewater concentration of one-half the analytical detection limit for molybdenum. Thus the projected sludge quality is not based on an actual measured influent wastewater concentration.

The concentration of molybdenum in primary sludge has been variable from 1989 to 1993. The 1992 concentrations were lower than the 1989 concentrations, however the 1993 samples showed an increase in the concentration of molybdenum. These recent data have prompted the City to target this chemical in its current industrial pretreatment program actions.

Molybdenum can frequently be traced to industries using processes with recirculating cooling water systems. Additives containing molybdenum may be added to these cooling water systems to control corrosion and scaling in the cooling water piping. An investigation to identify the possible sources of molybdenum is being initiated to limit the likelihood that molybdenum becomes a factor in Type I sludge quality compliance once the new treatment plant is operating. It should also be noted that the molybdenum-utilizing industries have filed suit against EPA for these limits, citing in part, mathematical error. While the case is unlikely to be settled for sometime, there appears to be some potential for a change in the molybdenum limit. Notwithstanding this potential, the MA limit would presumably remain relatively low.

The higher level of PCBs in the February 1992 data exceed the state Type I standards but not the EPA limits. The Type I exceedance may be the result of work being conducted on the Belleville Avenue interceptor which has pockets of PCB contaminated grit, that may have been disturbed by the construction activity.

Concentrations of PCBs in the primary plant effluent have typically been below detection levels throughout 1991 and 1992. These low levels can be attributed to industries in New Bedford no longer discharging PCBs in their effluent. The main section of sewer in the wastewater collection system with known deposits of PCB contaminated sediments is being replaced. As there are no known users of PCBs within the City, and no other known pockets of PCB contaminated grit in the collection system, it is thought that the occasional observed PCBs in sludge could originate in industrial sewer connections or internal plumbing. This is supported by the 1993 data, which had three sludge samples below the detection limit, and one sample at 16.5 mg/kg, well below the EPA Table 3 limit. Because there are no additions of PCBs to the collection system, the concentration of PCBs in the influent should continue to decrease as any possible remaining pollutant is flushed and discharged from the wastewater collection system.

The new plant's dewatered sludge should further comply with current state standards due to the dilution factor from the addition of waste activated sludge. The additional solids in the waste activated sludge stream will tend to dilute the PCB concentration of the dewatered sludge.

In summary, both the recent primary sludge quality data and the previously predicted secondary WWTP sludge quality data comply with Massachusetts Type I and EPA Part 503 pollutant concentration limits for all regulated heavy metals except molybdenum and nickel (exceeds MA only). The only other potential obstacle in attaining a Massachusetts Type I classification is the concentration of PCBs. However, the concentration of PCBs may be lower in the actual secondary sludge and comply with the limits.

The *Final FP/EIR* concluded that until the new secondary wastewater treatment plant begins to operate and produce a dewatered primary and secondary sludge for laboratory analysis (currently scheduled by the Modified Consent Decree to be ready to receive flow by July 19, 1996 and to be under full operation by January 19, 1997), sludge quality predictions will always have a degree of uncertainty. This is still a valid conclusion.

2.3.4 SUMMARY OF PROJECT CONFINES

The *Final FP/EIR* assumed the worst case classification because of the data available during preparation of the *Final FP/EIR*, the presence of an industrial base in New Bedford, and the uncertainty in predicting sludge quality from a plant not yet operating. Thus, solids processing and solids disposal siting evaluations in that document assumed the sludge could have a (Massachusetts) Type III classification. A Type III classification is the most restrictive state classification and severely limits opportunities for beneficial product reuse.

Changes in federal regulations and amendments to state regulations, along with primary sludge quality and primary plant effluent quality information obtained since the completion of the *Final FP/EIR* in 1990, provide a basis for revising that assumption. Given the pollutant concentrations in the EPA Part 503 regulations, the amendments to the Massachusetts regulations governing sludge classification, and the apparent improvement in primary plant effluent and primary dewatered sludge quality (most likely related to the City's implementation and strengthening of the industrial pretreatment program) it appears that the dewatered sludge quality from the new secondary wastewater treatment plant could be suitable for both a Massachusetts Type I classification and a Federal "Clean Sludge" classification. This classification would make dewatered, stabilized sewage sludge from the secondary WWTP eligible for unrestricted land application uses in Massachusetts, as well as other states (provided the land application uses comply with the limitations specified in the respective state regulations and in the EPA Part 503 regulations). Thus, the alternatives analysis in Section 3 will assume that sludge quality will be suitable for beneficial reuse.

2.4 STATUS OF PREVIOUSLY RECOMMENDED PLAN

2.4.1 PREVIOUS RESIDUALS MANAGEMENT PLAN

The previously recommended plan (as presented in Volume V Section 10 of the *Final FP/EIR*) suggested reusing chemically-fixed sludge as a daily cover supplement at the proposed Crapo Hill municipal refuse landfill in Dartmouth MA, with a back-up sludge-only landfill in New Bedford at Site 47, also called the airport site.

Reuse of Chemically Fixed Sludge

Under this plan, chemical would be mixed with the sludge at the WWTP to stabilize it for reuse. The patented process ChemFix was selected for stabilization. The stabilized sludge would then be trucked to the proposed Crapo Hill landfill for use as daily cover supplement. The Greater New Bedford Regional Refuse Management District (the District), voted

8.2.6 CONCLUSION

The detailed evaluation of alternative residuals management plans, in consideration of engineering, environmental, implementation, and cost criteria, resulted in the selection of the following plans for Phase 2 consideration:

Plan	*Description*
A-1	Combustion at site 20
A-3	Combustion at site 48
A-4	Combustion at site 49
B-1	Heat drying at site 20
B-3	Heat drying at site 48
B-4	Heat drying at site 49
C	Lime stabilization; landfilling out of City
D	Privatization; site not provided
E-1	Privatization at site 20
E-3	Privatization at site 48
E-4	Privatization at site 49

Essentially, plans using site 26 were eliminated. As noted above, the evaluations failed to distinguish any clear advantages among the basic technologies and privatization, especially without known sludge quality. However, the analyses show that these plans represent feasible, long-term residuals management solutions, and provide a basis for further planning efforts.

8.3 RECOMMENDED APPROACH FOR RESIDUALS

Based on Phase 1 evaluations, there are several, feasible alternatives for the long-term management of New Bedford's wastewater residuals.

Direct landfilling of sludge at an out of City landfill after lime stabilization at the new secondary WWTP offers the most advantages. This alternative would require no new City facilities, so would certainly have fewer implementation and community acceptance issues. Private landfilling also appears to be cost effective. The disadvantages of this alternative is its dependence upon the private waste disposal market. At this time, private landfills exist and appear to have long-term capacity. Still, potential changes in price and the interstate waste transfer laws are uncertainties. As discussed in Section 3, the City cannot obtain a committed price for its sludge until the new secondary WWTP is operating and the sludge characteristics and quality are established.

For a City processing facility, heat drying with pelletizing or combustion (whether incineration or a modified process such as Thermofix) appear to be the most promising. Either alternative would require selection and permitting of a site. While site issues can be adequately characterized, comparison of environmental impacts between the two technologiesis difficult at this stage of analysis. Among the most difficult aspects of proceeding with a City sludge processing facility would be implementation issues. For example, determining appropriate air quality controls and obtaining the requisite state air emissions permits would be a potentially difficult hurdle. Detailed air emissions modeling will require knowledge of concentrations of various contaminants in the sludge, and is hindered by the lack of definitive sludge quality data. Community acceptance also would be a difficult obstacle, particularly if combustion is pursued.

For a private facility, there appear to be a variety of possibilities. If the City's sludge is as "clean" as now projected, all of the reuse processes would probably be possible including heat drying. The advantage of full or partial privatization is that the City transfers responsibility for the material, process, and ultimate disposal to another party. Also, reuse would presumably be easier for a private, in most cases national specialty firm to achieve, than a single municipality. There is also potential for a contract arrangement involving an existing public facility with excess capacity.

The main uncertainty of privatization at this stage is the difficulty in estimating cost. The City cannot request specific cost proposals from the private sector (to compare to the cost of City-developed facilities) until there are specific data representing actual sludge quality and quantity from the new secondary WWTP. A formal Request for Proposals process would be required, and the City would need to define the level of privatization desired.

Figure 8-1 summarizes the relative cost, engineering, and implementation advantages for combustion, heat drying, privatization, and stabilization with out-of-City landfilling.

In conclusion, definitive cost-based comparison of the alternative plans is not currently possible. The City will not be able to determine which alternative is best on a cost basis until responses to a private sector RFP can be evaluated and compared to a City-owned and operated facility or to lime stabilization and disposal at a private landfill outside the City. Such an RFP process cannot take place until the new secondary WWTP is operating, producing dewatered sludge, and the City has been able to document residuals quantity and quality. The private sector cannot give a responsive bid without being able to assess specific information about the residuals for which they are being asked to assume processing, marketing, and/or disposal responsibility.

Technology/Option	Cost	Engineering	Environmental	Implementation
Combustion	◒	◒	◒	●
Heat Drying and Pelletizing	◒	◒	◒	●
Privatization	?	?	?	?
Stabilization and Private Landfilling	○	○	○	○

○	Most Preferred
◒	
●	Least Preferred
?	Unknown

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CITY OF NEW BEDFORD, MASSACHUSETTS
SUPPLEMENTAL FACILITIES PLAN/EIR

RELATIVE RANKING OF ALTERNATIVE RESIDUALS MANAGEMENT PLANS BASED ON PRESENT INFORMATION

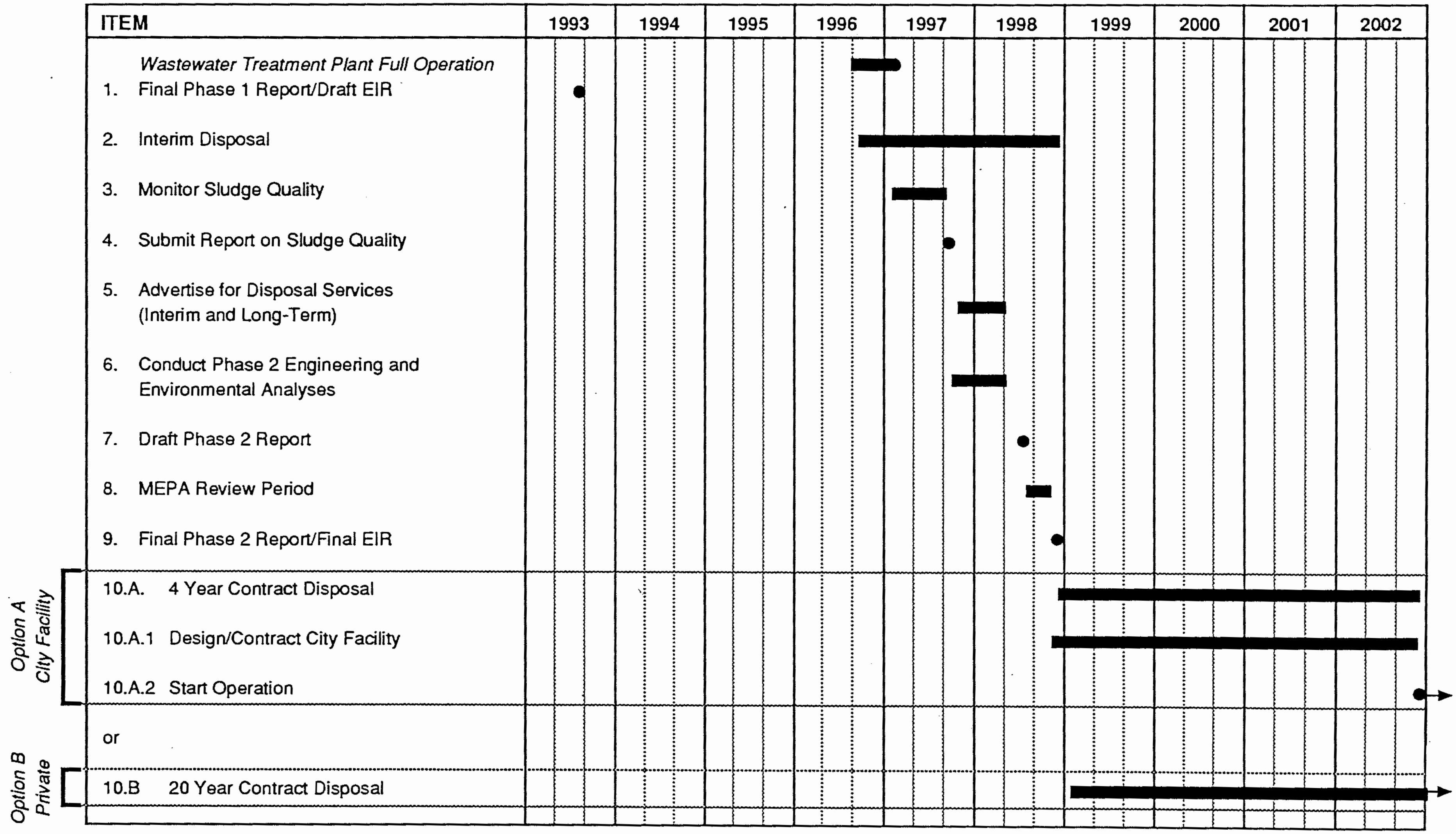
Figure 8-1

With the information presently available, it is likely the City would elect to pursue privatization or private landfilling, since the latter is cost competitive with the potential City facilities, yet would be far easier in terms of implementation. No site selection and permitting would be required, and the cost of disposal would be paid out of the City's annual revenues, rather than requiring bonding for upfront capital costs.

Based on these significant considerations, it is proposed to delay Phase 2 until data from the secondary WWTP is available.

This delay can be accommodated by extending the already-planned interim disposal contract by about four months, as shown on Figure 8-2, the proposed schedule. This change will allow the City to monitor characteristics of the secondary WWTP sludge for six months. After preparation of a report on sludge quality, the City proposes to issue a Request for Proposals (RFP) for interim (4 year) and long-term (20 year) disposal, potentially open to the full range of companies and technologies. Concurrent with the RFP process, the City will commence the Phase 2 analyses of in-City alternatives and sites, in accordance with the scope previously submitted to MEPA (see Appendix A). After completion of the RFP process, the City will complete Phase 2 evaluations and develop a long-term residuals management program in the Phase 2 Supplemental Facilities Plan/EIR. Based on that document, the City would pursue either an in-City facility (with continued interim disposal by contract while it is being built), or long-term privatization.

While several completion dates in the consent decree would need revision, this approach provides the most responsible means for proceeding with facilities planning, and will lead to the selection of the most appropriate long-term facility, while providing for proper disposal of wastewater residuals in the interim.



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environmental engineers, scientists, planners, & management consultants

CITY OF NEW BEDFORD, MASSACHUSETTS
SUPPLEMENTAL FACILITIES PLAN/EIR

PROPOSED SCHEDULE

Figure 8-2