PN-ACQ-064

Global Environment Facility
Danube Transboundary Pollution Reduction
ENVIRONMENTAL ASSESSMENT

Romania

Prepared for:
USAID Contract DHR-0039-C-00-5080-00

September 2000

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1.0 Introduction

The purpose of this Environmental Assessment (EA) is to comply with the United States Agency for International Development (USAID) Environmental Procedures regulations (22 CFR 216) and to comply with the requirements of the National Environmental Policy Act of 1970, as amended (42 USC 4371 et seq.). This EA focuses on the numerous tasks associated with the reduction of toxic compounds and pathogens entering international waters from select areas of Romania. These tasks, to be implemented with USAID funds, encompass a myriad of activities including assistance to government agencies, industrial pollution and waste reduction, municipal wastewater treatment improvements, and institutional development. Separate EAs are being completed for similar USAID activities aimed at reducing transboundary pollution in Hungary and Slovakia.

1.1 General Program Overview

The Danube River basin covers 817,000 km^2 in the heart of Central Europe encompassing all of Austria, Hungary, Romania, and Serbia and parts of eleven other countries from Germany to Moldova (Figure 1). The Danube River, from its source in western Germany, meanders through seven countries before it empties into the Black Sea. Along its course, the river receives pollutants discharged from a variety of activities along the banks of the river. Cities and smaller communities along various rivers in the Danube River system discharge municipal waste directly into the river without treatment. Industrial discharges from smelters, paper mills, petroleum refineries, mining operations, chemical plants, and tanneries have contaminated dozens of tributaries and water supplies. Runoff from agricultural areas, typically including fertilizers, pesticides, and manure, drains from adjacent farmlands and enters the river system. The cumulative inflow of pollutants and nutrients continues to exacerbate the pollution of surface water and groundwater and the eutrophication of the river, as well as contribute to the degradation of the Danube delta and the northwest shelf region of the Black Sea (ISEP, 1999).

Rather than compete for water resources and pollute with no regard for neighbors, the Danube region nations began collaborations to eliminate pollution of the river and preserve the vital resource for future generations. After decades of political division, eight Danubian countries, the European Commission, United Nations, and international financing organizations established the Environmental Program for the Danube Basin, a multilateral program to strengthen and coordinate comprehensive environmental management across the entire basin. This consortium of governments and international institutions created the Program Coordination Unit (PCU), located in Vienna, to oversee and support the multitude of activities to be implemented in the Danube River basin countries.

As early as 1991, studies were conducted through the Environmental Program for the Danube River Basin, with funding from the World Bank, USAID, European Bank for Reconstruction and Development (EBRD) and various European countries. These studies identified specific sources of pollution in major Danube tributary river systems. These tributaries included the Upper Tisza River, the Cris/Körös River, and the Mures/Maros River.

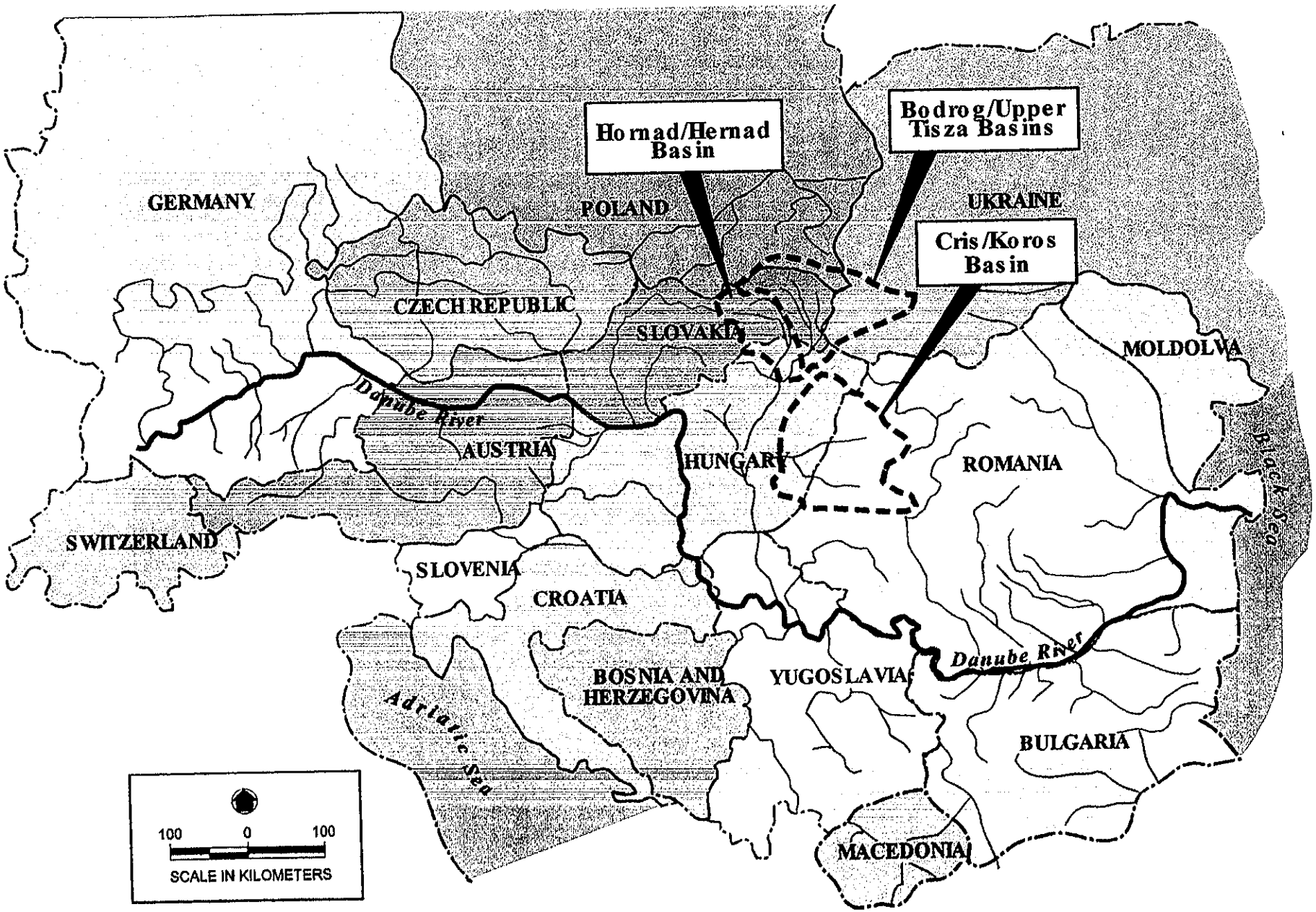

Figure 1 - Catchment Area of the Danube River

2.

As part of the Government of the United States contribution to the Global Environment Facility (GEF) Project, USAID proposed to support projects in the Danube River basin in portions of Hungary, Slovakia, and Romania. The overall USAID objective of the transboundary program is to reduce pollutant loads entering the Danube River tributary basins, to detect and issue warnings when potential contamination has occurred, and to fortify and sustain environmental awareness through educational and assistance programs. The project includes the implementation of a monitoring and warning system in Hungary and Slovakia; improvements to a wastewater treatment plant in Slovakia; and improvements to a wastewater treatment plant, numerous industrial facilities, and environmental management programs in Romania. The following discussion describes the specific tasks associated with the USAID project in Romania.

1.2 Romania Program

In December 1996, USAID published the *ENI Bureau Results Framework for Strategic Objectives, USAID/Romania* which outlines the strategic objectives of the USAID project in Romania and presents the goals that USAID plans to achieve. The proposed project in Romania was designed to accomplish the reduction of toxic pollutants and pathogens in cross-border rivers used for potable, irrigation, and recreational purposes. Investigations during the conceptual phase of project planning identified several significant contributors of pollution within the Danube tributary basin. The contamination was directly caused by failing equipment or lack of equipment at industrial sites or municipal treatment plants in the vicinity of Oradea in Bihor County. Implementation of the proposed project in Romania will result in the improvement of the water quality in the Danube River tributary basins through replacement of existing old and outdated equipment, procurement of new equipment, fortification of regulatory authorities, and development of public participation, thereby diminishing human exposure to potential pathogens and toxic substances.

The proposed activities, which are located entirely within the Cris River Basin in Romania, included:

- Assistance to Government Agencies
- Industrial Pollution and Waste Control (seven targeted industries)
- Municipal Wastewater Improvements at Oradea

The location of the seven industries identified for Industrial Pollution and Waste Control, as well as the Oradea Municipal Wastewater Treatment Plant, are indicated on Figure 2. The other two components of the USAID plan are not depicted on this figure, since they will be implemented on a regional basis, within various parts of the Cris River Basin. Details of each task are provided in the following paragraphs.

The objective of the government assistance component is to strengthen regulatory agencies in the Oradea area to plan, achieve, and sustain industrial pollution control and wastewater treatment plant management. The implementation of the USAID program will result in compliance with

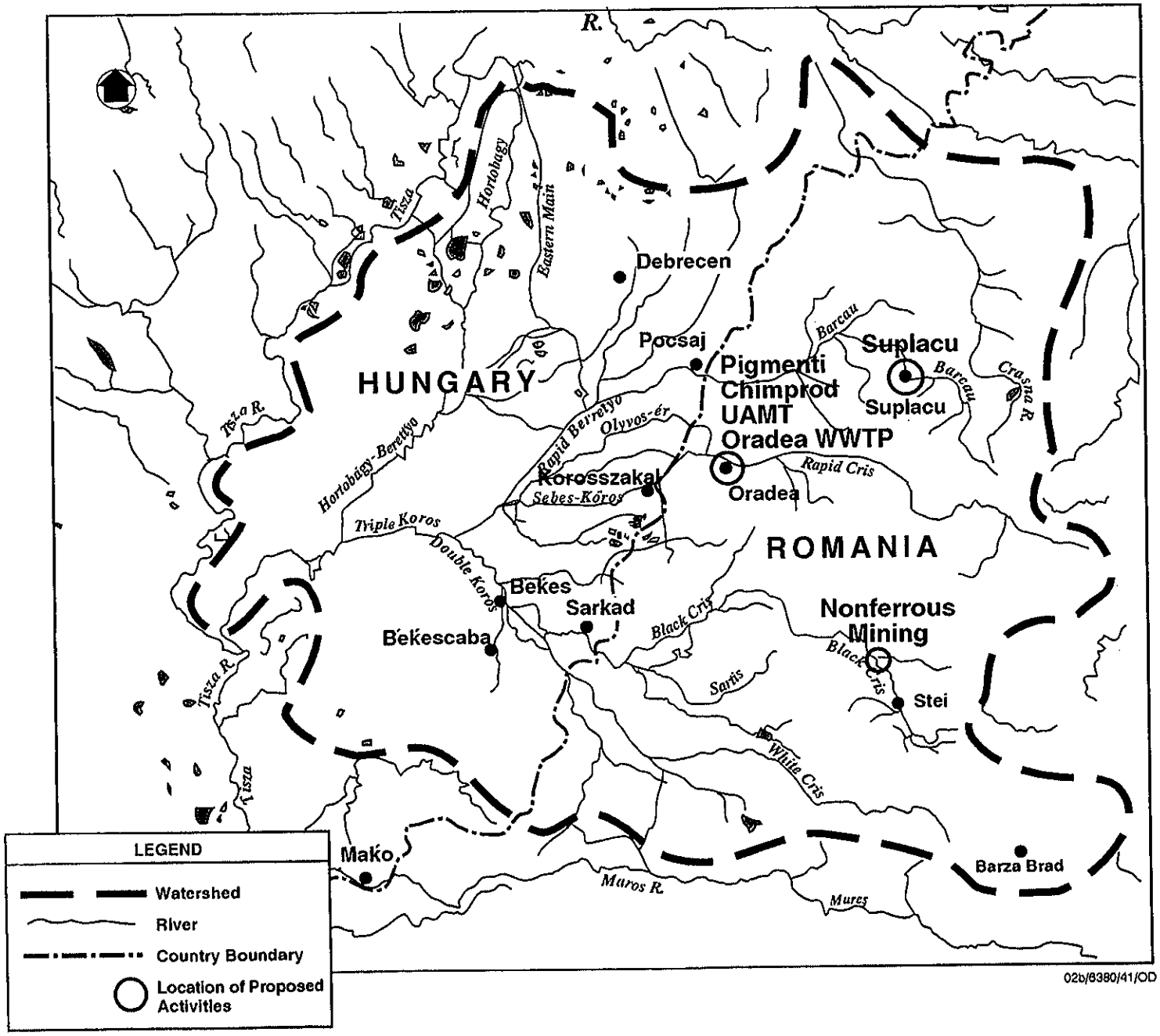

FIGURE 2. CRIS RIVER BASIN ACTIVITIES

Romanian environmental standards of effluent discharged from industrial and municipal sites. The two government agencies targeted for USAID intervention and guidance include the agencies responsible for inspecting and monitoring the discharge from the industrial and municipal facilities identified as significant contributors of pollution to the Cris Basin.

The intent of the industrial pollution and waste control component of the project is to reduce pollutant loads entering the river from industrial wastewater and mining operations. The reduction of industrial wastewater will be accomplished through industrial waste minimization, and wastewater management and treatment. Seven industries in the Oradea area were identified as contributors of transboundary pollution: Suplacu Petrom, Suplacu PetrolSub, Pigmenti, Chimprod, UAMT, uranium mining, and non-ferrous metals mining.

The goal of the municipal wastewater treatment program at Oradea is to reduce the discharge of partially treated wastewater to the Rapid Cris River and improve the reliability of existing operations. The discharge of partially treated wastewater is due to the insufficient capacity of the existing treatment plant and outdated equipment. Improved reliability in wastewater treatment will be achieved through modifications to existing equipment and the procurement and installation of new equipment to replace worn equipment.

2.0 Overview of Romania

Romania is located north of the Balkan Peninsula on the Lower Danube River. The country borders Bulgaria (southern, 608 kilometers (km)), Hungary (western, 443 km), Moldova (eastern, 450 km), Serbia and Montenegro (southwestern, 476 km), and Ukraine (northern, 362 km; eastern, 169 km) (Figure 1). Romania, with 225 km of coastline along the Black Sea, constitutes 237,500 km^2 of the land area in Southeastern Europe. The country is located in a strategic geographical position on commercial passage routes, such as the canal route connecting the Black Sea and the North Sea. A number of ports and harbors including Braila, Constanta, Galati, Mangalia, Sulina, and Tulcea are located in Romania (CIA, 1999).

The surface waters of Romania consist primarily of rivers that meander through the vast countryside. The Danube River, the second longest river in Europe, flows 1,075 km through Romanian territory and empties into the Black Sea through three branches, Chilia, Sulina, and Sfantu Gheorghe. The three branches form the Danube delta of which 86 percent is located in Romanian territory. Other rivers in Romania include the White Cris, Black Cris, Rapid Cris, Mures, Prut, Olt, Siret, Ialomita, Somes, the Arges, and others. Most of these rivers are tributaries to the Danube River.

The remaining surface waters of Romania include approximately 3,500 lakes, of which less than one percent exceeds an area of 1 km^2. Larger fresh water lakes and seacoast lakes are located in southern and southwestern Romania, respectively, in association with the Danube River and Black Sea. Glacial lakes can be found in the Carpathian Mountain ranges.

Romania is located in the central Transylvanian basin, which is separated from the Plain of Moldavia on the east by the Carpathian Mountains and separated from the Walachian Plain on

the south by the Transylvanian Alps (CIA, 1999). Romania demonstrates three major, well-differentiated topographical steps: the Carpathian Mountains, the Sub-Carpathian Mountains, and the plains. The Carpathian Mountains, with the highest elevations, occupy 31 percent of the country's area and resemble the shape of an amphitheater. The Sub-Carpathians, with lower altitudes, are comprised of the Western Hills, the Moldavian Tableland plateaus, and the Dobrogea Tableland plateaus. The plains, formerly sea and lake bottoms, cover the low, flat elevations of the southeastern and western portions of the country (NIRDI, 1999).

Romania demonstrates a temperate-continental climate of transition type specific to Central Europe. The country experiences four distinct seasons with local fluctuations due to oceanic, mediterranean, and continental influences. The mean annual temperature in southern Romania is 11 degrees Celsius (°C) and northern Romania is 8 °C. Winters are cold and cloudy with frequent snow showers and a mean temperature that falls below –3 °C. Summers are sunny with frequent rain showers and thunderstorms and mean temperatures between 22 to 24 °C. Annual rainfall in Romania averages 637 millimeters (mm), with a slight decrease from west to east and higher values in the mountain areas than in the plain and delta regions (NIRDI, 1999).

Cultivated farmland accounts for 40 percent of the Romanian territory, forest 26 percent, while pastures and hayfields cover 21 percent (CCIRB, 1999). More than 15 million hectares of arable land is devoted to agriculture, which represents 19 percent of the national economy (CCIRB, 1999). Forests, which previously covered the majority of the country, were partially destroyed due to the encroachment of agriculture and currently account for 26 percent of the country's area. Forests occupy most slopes too steep for cultivation. Hardwoods such as oak, beech, elm, ash, sycamore, maple, hornbeam, and linden account for 71 percent of the forests, and coniferous trees account for remaining 29 percent (LC, 1999). Alpine pastures cover extensive areas at altitudes higher than 1,800 meters (m) and are used mainly for sheep foraging. Over 400,000 hectares (ha) of alpine pastures are affected by pollution from sulfur compounds or emitted by heating plants (NIRDI, 1999).

Romania is a country of rich flora and fauna biodiversity. The floral diversity includes over 3,700 species including 228 endemic species. The strategic location between biographical regions has produced a biological convergence of migratory species. The fauna diversity is estimated at 33,802 species of which 1,000 are endemic. The country supports some of the more rare and even unique species of the continent. Chamois, brown bear, Carpathian deer, wolves, lynx, martens, and capercaillies populate the mountains, while hares, fox, wild boar, roes, partridges, and quail typically inhabit the hills and plains. The Danube Delta remains a sanctuary for native and migrating waterfowl and for a variety of fishes including carp, sheat fish, pike, and zander. Sturgeon can be found in the lower course of the Danube River. Dolphins, herring, horse mackerel, and gray mullet are typically found in the Black Sea. Over the past 20 years, Increased pollution and intensive harvesting (both legal fishing and illegal poaching) have steadily depleted fish stocks. Terrestrial hunting resources, such as deer, have decreased by 10-20 percent in the past few years (NIRDI, 1999).

Romania is endowed with a wide range of natural resources including petroleum, timber, natural gas, coal, iron ore, and salt. Petroleum reserves are declining due to ongoing conflicts with Ukraine regarding ownership of the continental shelf in the Black Sea and oil deposits therein. As of 1992, Romania had 2,800 km of crude oil pipelines, 1,429 km of petroleum product pipelines, and 6,400 km of natural gas pipelines. Natural gas deposits are found primarily in the Transylvanian Plateau while most of the coal deposits are found in the southern Carpathians (LC, 1999). Other industries in Romania include construction materials, metallurgy, chemicals manufacturing, machine building, and food processing (CIA, 1999).

At present, Romania is the most densely populated country in Southeast Europe and the second most densely populated country in Central Europe. With a population of approximately 22.3 million people (CIA, 1999), more than half of the population (55 %) lives in towns. There are 25 towns in the country whose population exceeds 100,000 inhabitants, and there are 8 cities whose population exceeds 300,000. The capital of the country, Bucharest, is situated in southern Romania with approximately 2,037,000 inhabitants. Other major population centers are: Constanta (346,000); Iasi (346,000); Timisoara (332,000); Galati (327,000); Cluj-Napoca (332,000); Brasov (319,000); Craiova (310,000); Ploiesti (253,000), Braila (235,000) (ER, 1999). Oradea, the focus of much of the USAID pollution control improvements, has a population of 221,885 (1994).

The ethnicity of Romania is relatively homogeneous with approximately 89.1 percent Romanian, 8.9 percent Hungarian, 0.4 percent German, and the remaining 1.6 percent comprised of Ukrainian, Serb, Croat, Russian, Turk, and Gypsy (CIA, 1999). Romania became independent from Turkey in 1881 and proclaimed a republic in 1947. The republic has an executive branch, a legislative branch, and a judicial branch. The executive branch consists of a president and prime minister, and a cabinet (CIA, 1999).Romania is a member of the United Nations Organization (UN), International Monetary Fund (IMF), International Bank for Reconstruction and Development (World Bank), and World Trade Organization (WTO). In 1993, Romania signed an association with the European Community (EC) and a free trade agreement with the European Free Trade Association (EFTA). In 1993 Romania was also granted membership in the Council of Europe. On January 26, 1994 Romania was the first Eastern European state to sign in Brussels the NATO Partnership for Peace (USDE, 1999). On February 1, 1995 Romania became an associate member of the European Union (EU) (ER, 1999).

3.0 Existing Conditions – Water Quality

The Cris/ Körös basin encompasses a small region of western Romania and extends across the border to the eastern portion of Hungary (Figure 2). The Cris River basin has a total drainage area of 10,386 km^2 and contains numerous tributaries to the Danube River including, but not limited to, the Rapid Cris, White Cris, Black Cris, and Barcau River. The Rapid Cris originates in the Apuseni Mountains and joins the Black Cris and White Cris Rivers to form the Tripe Cris (or Triple Körös) River in Hungary. The Barcau River meanders into Hungary until its confluence with the Rapid Cris River north of Triple Cris. The Cris River system drains into the Tisza River, which eventually extends across national boundaries to enter the Danube River.

The following discussion identifies the existing water quality within the Cris River system, specifically within the Rapid Cris, Black Cris, and Barcau Rivers. These rivers are the receiving waters for the six targeted industries, as well as the wastewater treatment plant in Oradea. The World Bank Study of the Cris River basin conducted between 1992-1994 identified the following major contributors of industrial pollution within the Cris River system:

1) City of Oradea Wastewater Treatment Plant and numerous other industries (pigments, pharmaceuticals, and metal works) on the Rapid Cris,
2) uranium mines and non-ferrous metal mines on the Black Cris,
3) petroleum production facilities and crude oil refineries on the Barcau River

At the time of the 1992-1994 World Bank study, water quality monitoring data indicated that over 64 percent of the Cris River system violated water quality standards. As compared to the White Cris, which demonstrated the highest water quality, the Rapid Cris, Black Cris, Barcau, and rivers demonstrated poor water quality for a variety of parameters (USAID, 1998a).

The Rapid Cris River, which demonstrated the poorest water quality of three rivers identified in the World Bank study, registered high levels of zinc, BOD, ammonia, and total phosphorous. Monitoring of the Rapid Cris in the Oradea area typically registers high levels of chromium. The Black Cris River typically exceeds allowable thresholds for zinc, BOD, and ammonia and exceeds limits for copper in the vicinity of uranium mines and non-ferrous metal mines located on the Black Cris. The Barcau River water quality violated established standards for a variety of parameters, especially BOD and ammonia (USAID, 1998a).

The high concentrations of pollutants in the receiving waters and subsequent violations of water quality standards may be attributed to current industrial discharge practices, such as the dilution of wastewater to meet permitted thresholds. The improperly treated industrial wastewater may impact downstream water consumption. Typically, over 90 percent of water users in the Cris River basin rely solely on these surface waters (USAID, 1998a). The rivers provide irrigation for Romania's agricultural sector, support a productive fishing industry (for both commercial and sport fishing) and potentially recharge shallow wells located within the vicinity of the river. Finally, these rivers are used for bathing and recreational uses such as swimming. The pollution of these rivers from industrial wastewater compromises the quality of the water available for downstream users and threatens the public health due to the presence of toxic compounds.

In addition to the contribution of pollution from industrial facilities, the municipal treatment plant in Oradea discharges partially treated wastewater containing pathogens and toxic compounds to the Rapid Cris. Table 3-1 presents the 1996 average concentration of the primary contaminants of concern within the Oradea Wastewater Treatment Plant effluent. Table 3-2 indicates the observed concentrations of pollutants discharged from on-site lagoons. Equipment failures at the treatment plant result in discharge effluent high in BOD, ammonia, phenols, and heavy metals.

Table 3-1. 1996 Effluent Water Quality from Oradea WWTP

Parameter	Romanian Water Quality Standards (mg/L)	Observed Concentration			
		Min	Max	Median	Percent Time in Compliance
BOD_5	15	6	65	28	Less than 50%
Total Suspended Solids	25	11	117	65	Less than 50%
Zinc	0.03	0.02	1.34	0.17	Less than 50%
Copper	0.050	0.0	0.06	0.02	More than 50%
Cyanide	0.010	0.0	0.03	0.004	More than 50%
Phenol	0.030	0.0	0.42	0.04	Less than 50%

Source: USAID, 1998a

Table 3-2. Effluent Water Quality from On-site Lagoons

Parameter	Romanian Water Quality Standards (mg/L)	Observed Concentration			
		Min	Max	Median	Percent Time in Compliance
BOD_5	15	10	78	38	Less than 50%
Total Suspended Solids	25	22	91	62	Less than 50%
Zinc	0.03	0.04	0.58	0.21	0%
Chromium (VI)	0.05	0.0	0.020	0.002	100%
Copper	0.050	0.02	0.05	0.02	100%
Cyanide	0.010	0.0	0.01	0.004	100%
Phenol	0.030	0.0	1.83	0.42	Less than 50%

Source: USAID, 1998a

4.0 Existing Conditions – Infrastructure

The following discussion identifies the existing conditions in Romania as they pertain to the infrastructure of six industries and municipal wastewater treatment plants targeted as contributors of pollution.

4.1 Industrial Pollution and Waste Control

As previously indicated, within Romania, several industries suffer for inadequate infrastructure, resulting in the discharge of inadequately treated effluent to the receiving waters of the Danube system. Table 4-1 illustrates the six industries identified by USAID, and lists the type of pollutant, the affected receiving body, and general aspects of facility operation. The following discussion elaborates upon the facility operations, identifying failing or lacking equipment.

Table 4-1 Six[1] Targeted Industrial Facilities in Romania

Industrial Facility	Pollutant(s)	Receiving Water Body	Environmental Issues / Comments
Suplacu Petrom [1]	Petroleum products	• Barcau River	• produces 1,400 tons per day of heavy crude oil • phenols generated by extraction process • exceeded permitted levels of phenols in wastewater discharge • no spill containment or runoff prevention around 140 injection wells and/or 560 production wells (40 wells closed per year) • process wastewater discharged to municipal sewer
Suplacu Petrolsub [1]	phenols, suspended solids, BOD_5, and petroleum products	• Barcau River	• processes over 400,000 tons of crude oil annually • phenols enter refinery with crude oil received from Petrom
Pigmenti	Zinc and chromium	• Rapid Cris River	• production of Milori blue, chromium yellow, and chromium green pigments • operating at 10-30% design capacity • treatment plant receives wastewater high in zinc and phenols from other upstream industries
Chimprod	Phenols	• Rapid Cris River	• only salicylic plant in Romania exports more than 150 tons per month of salicylic acid product • total production is exceeding design capacity • industrial process wastewater is approximately 80 percent by volume of the total wastewater discharged from Chimprod • using volumetric method to determine wastewater discharge
UAMT	heavy metals	• city sewer	• operating at full capacity and plans to increase capacity by 15 percent within 2 years • in situ treatment of neutralizing and rinse water • inadequate laboratory monitoring of acidity/alkalinity, cyanide, hexavalent chromium
Uranium mining [2]	Radioactive substances	• Black Cris	• soil samples exhibit levels of radioactivity five times higher than permissible levels • runoff from solid waste deposits is transported to river • wastewater effluent does not meet Romanian standards
Nonferrous mining	copper, zinc, cyanide, and hexavalent chromium	• Black Cris	• produces approximately 50,000 metric tons of ore per year • total capacity of 250 tons/day • 8 tons of cyanide used for 40,000 tons/year of zinc-containing ore processed

[1] For the purposes of this EA, Suplacu Petrom and Suplacu Petrolsub are considered one facility.

[2] Pursuant to the July 15, 1999 meeting between the uranium mine and USAID representatives, it was determined that a site visit, inspection, and environmental assessment would most likely be necessary to identify the specific environmental concerns at the mine.

Source: (USAID, 1998a) (USAID, 1999b)

4.1.1 Suplacu Petrom/Petrolsub

Both Petrom and Petrolsub are located at the Suplacu complex. The treatment plant located at the Petrolsub site treats wastewater from both facilities.

Petrom

The petroleum extraction-separation process to recover pure petroleum includes the following phases: extraction, crude oil separation, and crude petroleum purification. The wastewater generated during these processes is transported to the wastewater treatment plant located at the Petrolsub site (USAID, 1999b).

Petrolsub

The final product from the Petrom oil extraction unit, which includes petroleum with less than one percent water, is transported from Petrom to the Petrolsub refinery. The refinery, founded in 1968, has a current processing capacity of 400,000 tons of petroleum per year. The refinery produces oils and fuels by distillation and asphalt oxidation. Wastewater from these processes is conveyed to the wastewater treatment plant.

The wastewater treatment plant was commissioned in 1968, with an initial capacity of 2,000 m^3/day. Between 1981-1983, the plant was expanded to a maximum capacity of 4,000 m^3/day as a consequence of the increase in underground combustion extraction activities. The initial treatment design included the following treatment steps: homogenization, oil-water separation, coagulation-flocculation (lime milk and aluminum sulfate), settling, and sand filtration. The wastewater treatment plant currently operates with only mechanical and a physical/chemical treatment. A plan for a biological treatment step was conceptualized and initially pursued. The treatment process was never fully functional due to the inoperable aeration equipment, nutrient preparation and dosage system, and sludge pumps; therefore, the biological treatment basins are currently used as a supplementary settling step, as opposed to the intended biological treatment. In addition, four sand filters that have been built to finish the purification process are not operable. Wastewater from the treatment facility is discharged to the Barcau River (USAID, 1999b). The sludge and the sludge wash water from the settling basin are discharged to the municipal sewer.

4.1.2 Pigmenti

Pigmenti manufactures inorganic pigments, zinc-based materials, stabilizers and additives for plastics, coating products, and chemical products for domestic use. Only 75 percent of the facility's production equipment is currently operating. The percentage of operating equipment only produces approximately 10-30 percent of the design capacity of the entire facility. Pigmenti became privatized from Sinteza Chemical Enterprise in 1992; however, it is located on Sinteza property and downstream of other production facilities operated by Sinteza. Due to the original intent of the wastewater treatment plant to treat wastewater from all the Sinteza industries, the plant receives wastewater high in contaminants from a number of sources, other than Pigmenti.

The wastewater treatment plant was originally designed to process 150 m^3/hour, or 2,329 m^3/day of wastewater. Presently, the maximum daily process is 1,000 m^3/day due to a reduction in production. The wastewater generated during pigment production receives physical/chemical treatment only. These treatment processes involve the reduction of hexavalent chromium to trivalent chromium with sodium sulfate at a low pH, the precipitation of metal hydroxides, and settling. The sludge generated during the treatment process is conveyed to a receiving basin and then to a liquids dump(USAID, 1999b). The wastewater, as well as neutralized supernatant from the liquids dump, is discharged to the Rapid Cris River.

The existing equipment in the wastewater treatment plant includes a reagent preparation room, wastewater receiving basin, wastewater storage basin, pump station, reaction basin, neutralizing basin, vertical decanter, and sludge receiving basin. The existing equipment is antiquated and typically results in an inefficient reduction reaction for chromium due to an inability to regulate the pH during the reactions. The facility also demonstrates a low efficiency of metal hydroxide precipitation and subsequent separation of suspended solids. Finally, the facility lacks the ability to adequately control and monitor the effluent discharged to the Rapid Cris River (USAID, 1998a).

4.1.3 Chimprod

Similar to Pigmenti, Chimprod was originally a part of the Sinteza Chemical Enterprise; however, in 1992, Chimprod was privatized. The pharmaceutical company produces mostly salicylic acid and derivative products; however, it also produces smaller quantities of benzoic acid and sodium benzoate products, coating products, various chemical conditioning products, and organo-phosphorous pesticides. In 1997, the production of salicylic acid at Chimprod was approximately 1,967 tons/year. In 1998, the production decreased to 1,500 tons/year due to production inefficiency from failing equipment (USAID, 1999b).

The current production equipment includes twelve autoclaves, system of condensers, seven plunger-type pumps, and centrifuge. The seven pumps require frequent maintenance and no more than four are typically operating at one time. This creates an insufficient vacuum resulting in inefficient production of salicyclic acid. This impedes the extraction of unreacted phenol. Also, phenol and water are not completely separated in the condensing system, since the phenol in the plunger pumps can not be recovered.

Chimprod has recently implemented a number of measures that have reduced phenol consumption and losses to the process wastewater stream. The installation of a new centrifuge for salicylic acid washing and phenol separation has reduced the consumption of water during processing (USAID, 1999b).

4.1.4 UAMT

UAMT, established in 1951, manufactures parts for road, railway, naval transport, and consumer products. The company has undergone five stages of plant expansion, development, and revamping since its initial operation. The results of these extensions include an improved

production quality and reduced pollution discharge. However, the metal plating section of the UAMT facility was identified as a major source of wastewater pollution from heavy metals and cyanide. The metal plating production includes zinc, nickel, chromium, and copper plating. The industrial wastewater includes solutions from main process operations, rinse water from metal parts, rinse water from plating baths, and pavement wash water (USAID, 1999b).

The equipment at the treatment plant includes acidic wastewater reception tank, alkaline and pavement washing water reception tank, homogenization tanks, neutralization tanks, transfer pumps, and metering pumps. Recycled wastewater containing chromium and zinc along with acidic wastewater is conveyed to the homogenization tank, aerated, and conveyed to a neutralization tank where the pH is adjusted. Recycled wastewater containing cyanide and alkaline flows are also homogenized and then conveyed to the same neutralization tank. In the neutralization tank, the combined flows are treated according to the wastewater composition. However, treatment is typically regulated based on pH. Chromium treatment and cyanide treatment require different pH levels to adequately catalyze each reactions completely. Therefore, the inefficiencies of the treatment plant are twofold: antiquated equipment and insufficient equipment. This results in a discharge of metals in excess of permitted thresholds and a high consumption of chemical reagents. In addition, sludge generated during the final filter press process is not properly stored or disposed (USAID, 1999b).

4.1.5 Uranium mining

Solid waste deposits from the uranium mining operations are located adjacent to the Baita River, a tributary to the Black Cris River. Radioactive material is transported overland via stormwater runoff to the river where it accumulates in the sediments. Effluent from mining operations is discharged from three point sources into the Baita River. This effluent does not meet Romanian standards for uranium and radium concentrations (USAID, 1998b).

4.1.6 Nonferrous metals mining

The non-ferrous mine industry is located along the Baita River, a tributary to the Black Cris River , in the city of Stei. The small-scale sub-level mine produces approximately 50,000 metric tons of ore per year (USAID, 1999c). The mining operation has been identified as contributor of pollution to the Baita River. Cyanide, which is used during the processing of the ore, and copper levels frequently exceed established discharge limits. Hexavalent chromium and zinc occasionally exceed permissible thresholds. Wastewater from the mining operations is pretreated with calcium hydroxide prior to conveyance through pipe to the tailings pond located adjacent to the river. Supernatant from the tailings pond overflows into a discharge pipe and enters the river. The remaining liquid in the pond seeps through the soils and into the freshwater aquifer located below the pond.

4.2 Municipal Wastewater Treatment Plant

The Oradea Wastewater Treatment Plant is located on the banks of the Rapid Cris River, approximately 1.5 km downstream and to the west of Oradea. The plant receives wastewater flow from the city's municipal and industrial sewers and discharges the partially treated wastewater effluent to the Rapid Cris River (USAID, 1998a).

Inadequate plant infrastructure is the major cause of the inefficiency of the wastewater treatment plant and subsequent discharge of raw or partially treated wastewater. Sewer pipes in Oradea collect both separate sewer flows and combined sewer and stormwater flows and convey these flows to the treatment plant. The existing plant typically can not hydraulically accommodate the volume of influent conveyed to the facility. More than 70 percent of the influent raw wastewater is diverted to the lagoons near the plant site without primary treatment (USAID, 1998a). The discharge from the lagoons does not meet the required effluent standards, thereby contributing to the pollution of the Rapid Cris River.

The existing infrastructure failures identified by USAID include (USAID, 1999a):

- Wastewater pumped into the primary distribution box frequently overflows due to an incorrect sizing of the box
- Only one of four secondary clarifiers is currently functioning
- Ineffective return activated sludge system is implemented at the facility
- Existing pumps do not have the capacity to pump effluent to recently constructed aeration tanks
- Existing digesters can not operate in an anaerobic mode because of the inoperable transfer pump, heat exchange, and mixing system

5.0 Proposed Activities

5.1 Industrial Pollution and Waste Control

The intent of the USAID assistance program with regard to industrial pollution and waste control is to reduce pollution of river systems in the project area caused by wastewater from industrial sites and mining operations. Industrial pollution at the six targeted sites will be reduced through waste minimization and treatment and site runoff management and treatment. Proposed measures to achieve the objective of this task include improvements to on-site wastewater treatment plants, as well as improvements to production or process equipment. By facilitating efficient production, USAID anticipates achieving the generation of less waste and reduction of energy consumption (USAID, 1999b).

5.1.1 Suplacu Petrom/Petrolsub

The objective of USAID involvement at Suplacu Petrom/Petrolsub is to reduce the contamination of the Barcau River from petroleum products and phenols, both of which are released through point discharges and through nonpoint surface runoff over land contaminated by

spills and leaks. The reduction will be accomplished through the procurement of equipment to improve the extraction-separation process, installation of concrete aprons to control runoff, and improvements to the biological treatment system at the Wastewater Treatment Plant.

Petrom

The proposed activities at Petrom include the installation of equipment to improve the production process prior to the discharge of wastewater to the treatment plant. The improvements to facilitate cleaner production include additional demulsifying and coagulation/flocculation treatment equipment. The proposed equipment includes transfer pumps, dosing pumps, and control meters to maintain the appropriate dosing of cationic polyelectrolyte solution and aluminum sulfate to catalyze the demulsifying and flocculation processes. This will result in an increased removal efficiency of petroleum products from the existing level of 60 to 80 percent, to 98 percent.

The installation of the pump and meter equipment will require the construction of approximately 100 square feet of new housing to be located on Petrom property in close proximity to the petroleum storage tanks and an electrical power supply (USAID, 1999).

Concrete aprons with curbs will be constructed around new wellheads to minimize the conveyance of spilled oil, via surface runoff, to the river. The selection of new wellheads to receive this upgrade will be based on the potential for oil entering the Barcau River from surface runoff (USAID, 1998a).

Petrolsub

The proposed activities at Petrolsub consist of improvements to the physical/chemical process and initiation of a biological process at the wastewater treatment plant. The proposed equipment installation includes a tank and vacuum pump for the preparation of the lime milk suspension and storage tanks, meter pump, and pH meter for the storage and appropriate dosing of the reagent. Other chemical feed improvements include chemical feed systems for aluminum and polymers to improve coagulation and flocculation unit processes and for the capture of residual oil in the wastewater.

The initiation of the biological treatment process at the existing wastewater treatment plant will require new equipment for the aeration system, nutrient preparation-dosage equipment, and sludge recycling pumps. The equipment includes: two air blowers to supply air to the existing activated sludge basins, dissolved oxygen meter, nutrient preparation vessel, meter pump, transfer pump, and a flow meter. The new air blowers will require the construction of a new building within the vicinity of the aeration tanks.

5.1.2 Pigmenti

The USAID objective as it applies to Pigmenti is to minimize the generation of chromium and zinc in production process and to maximize chromium and zinc removal from wastewater generated by Pigmenti. This goal will be accomplished through improvements at the chromium

treatment process and metals precipitation system, such as automatic pH controls and new automatic reagent dosing equipment.

The proposed activities include the replacement of the present pH automatic control equipment with a dosing pump and a pH control system which will control the automatic dosing of sulfuric acid to maintain a pH of 2.5-3 during the chromium (VI) reduction reaction. The reaction requires a low pH in the wastewater to facilitate a complete reduction of chromium.

Similar equipment will be installed to automatically dose hydroxide solution so the wastewater pH is maintained at a level sufficient to precipitate metallic ions. The equipment will also ensure the appropriate dosage of anionic polyelectrolye solution during the neutralizing step, to improve the suspension of sediments especially during periods of low flow.

No new construction will be required to house the new equipment.

5.1.3 Chimprod

The USAID objective for Chimprod includes the installation of equipment to increase efficiency of the plant, thereby minimizing the waste production and energy consumption. The proposed activities include the installation of new wet type vacuum pumps with a total capacity of 2,400 m^3/hr. The existing plunger pumps will be kept in reserve for emergency services. The new pumps will operate 24 hours/day all year except for one month during the summer for maintenance.

No new construction will be required to house the new equipment.

5.1.4 UAMT

The USAID objective for UAMT is to revamp the existing wastewater treatment plant to achieve compliance with established wastewater effluent discharge limitations. The proposed activities include the procurement of necessary equipment to reroute wastewater through new or rehabilitated sewer lines to the treatment area, separate wastewater prior to treatment to identify specific pollutants, implement automatic dosing of reagents according to identified pollutant, replace existing treatment tank, and monitor final effluent before discharge. The new equipment will facilitate a complete reduction of hexavalent chromium to trivalent chromium, oxidation of cyanides, and final neutralization and hydroxide precipitation. The installation of the new equipment and implementation of the proposed activities will result in the efficient treatment of wastewater prior to discharge to the river. The equipment will be housed within the existing structure where wastewater is treated.

5.1.5 Uranium mining

Pursuant to the July 15, 1999 meeting between the uranium mine and USAID representatives, no action is currently proposed due to the uncertainty of the environmental problems at the mine. It was determined that due to the lack of technical data, a complete environmental assessment, including a site visit and inspection, would be required to determine the specific course of reclamation action for the mine. Resulting from that meeting, however, was the recommendation

of possible modifications of the environmental permit for the mine based on the application of more appropriate Western European environmental standards for uranium and radium. In addition, the production of the mine has been significantly reduced in anticipation of the complete closure of the mine within 10 years. Mine representatives have indicated that a closure plan, that includes approximately 70 percent of environmentally-related control measures, has been developed.

5.1.6 Nonferrous metals mining

The USAID goal is to accomplish the reduction the discharge of cyanide into the Black Cris from the nonferrous metals mining industry. The proposed activities include the procurement and installation of equipment to neutralize cyanide by the addition of lime milk and hypochlorite and provide for the automatic regulation of the neutralization process. The equipment includes two tanks to house the reactions and pumps to dose the appropriate reagent into the tanks. Monitoring wells will be installed around the existing tailings pond to monitor the fluctuation of groundwater levels which may undermine the stability of the dike (USAID, 1999c).

5.2 Municipal Wastewater Improvements

The overall objective for USAID improvement of the Oradea Wastewater Treatment Plant is to eliminate the discharge of inadequately treated wastewater to the Rapid Cris River; thereby decreasing the risk of pathogens and other pollutants currently discharged by the plant from reaching the food chain downstream in both Romania and Hungary. The proposed activities to improve the treatment efficiency of the plant include new equipment in existing digesters and other improvements to facilitate full treatment of influent wastewater. The plant improvements have been designed for a 24-hour design flow of 2,200 liters/second (L/s), and the peak-hour design flow is 4,000L/s.

The proposed improvements include three components to minimize the discharge of inadequately treated wastewater to the Rapid Cris River. The three components are described below. In addition to equipment procurement and installation, the USAID project includes training on new equipment, assistance with operation and maintenance of the plant (including the issuance of guidance documents), and development of a plan to establish performance standards to monitor the effectiveness of the treatment plant.

Return Activated-Sludge Pump Stations

The proposed activities for pump station improvements include the installation of three submersible return activated-sludge pumps with a rate of 209 l/s each and two submersible waste activated sludge pumps with a rate of 30 l/s each at two existing pump stations. The new pumps will increase hydraulic capacity and will completely replace the existing pumps. Flow meters and control units will be included with the pump installation to monitor the flow of sludge by the pumps. This will be located within a reinforced concrete manhole adjacent to the existing pump station (USAID, 1999a).

Primary Sludge Pump Stations
The proposed activities to improve the treatment efficiency at the plant include the replacement of existing primary sludge pumps at two existing pump stations. Sludge will be withdrawn by gravity from the secondary clarifier to the wet well of the new pump stations. The wet wells will be designed to accommodate two operating pumps and one spare. Each new pump will have a capacity of 158.5m^3/h (USAID, 1999a).

Digester Repairs and Improvements
The proposed activities to improve digestion of sludge at the treatment plant includes the installation of three new sludge recirculation pumps, two new spiral type heat exchangers, two new draft tube mechanical mixers, and a control panel to regulate the digestion process and facilitate complete destruction of volatile solids. A grinder device will be also installed to prevent clogging from thickened sludge (USAID, 1999a).

6.0 Environmental Consequences – No Action Alternative

Without the implementation of the program, i.e. the No Action Alternative, the current situation of poorly regulated discharges of pollutants to various rivers in Romania would continue. The continuation of the current situation would result in continued risks to public health and poor water quality for downstream users including irrigation for food crops, subsistence fishing, or other uses, as well as continued degradation of aquatic life.

Without USAID assistance and equipment procurement, regulatory agencies would continue to inefficiently inspect industrial and municipal facilities' effluent discharges. Inaccurate water sampling and analysis of the water quality would disguise the actual pollutant loads present in the water resources. With the No Action alternative, no new equipment would be installed to improve treatment of wastewater from industrial and municipal activities. Finally, with the No Action alternative, there would be continued lack of education and public participation regarding environmental hazards and preventative measures for environmental protection.

Since the No Action alternative would entail no new construction, improvements, or operations, the No Action alternative would have no direct short-term environmental impacts; however, the No Action alternative would allow an adverse long-term condition to persist, thereby continuing and exacerbating long-term detrimental environmental impacts to the rivers, as well as the downstream water users. Thus, the No Action alternative is clearly not within the stated goals of the Global Environmental Facility or USAID; nor is the no action alternative in the best interest for the environmental resources and people of Romania.

7.0 Environmental Consequences - Proposed Alternative

7.1 Industrial Pollution and Waste Control

The installation of the proposed equipment for industrial pollution control is anticipated to have minimal, short-term adverse impacts on the natural and human environment in the immediate

vicinity of the construction sites at the six targeted industries. The proposed improvements at Petrom and Petrolsub will require the construction of a small new building to house the new equipment. The new equipment for the remaining industries will be installed within existing structures.

All the construction activities will be located on the site of the existing production area or existing treatment area. Disruptions in these vicinities would be consistent with those typical of similarly scaled utility construction, and are not anticipated to have a significant impact on the surroundings. The proposed construction may result in moderate, localized increases in noise, dust, and traffic. Construction noise levels may be mitigated through restrictions on hours of operations, or by adjustments made to equipment, such as retrofitting mufflers or back-up alarms. Construction dust may be mitigated through application of chemical dust suppressants, routine spraying of water, or utilization of tarps of other fabrics to cover loose storage materials.

The proposed activities will occur at facilities that are currently, or have been historically, used for similar wastewater treatment; thus, construction and operation of the proposed improvements would not impact the current or future land use of the six locations. Additionally, since most of the work will occur in the vicinity of existing structures, the proposed activities are not anticipated to significantly impact the soils or geology of the region. The improvements will not adversely impact the aesthetic resources of the communities proximate to the facilities. During construction of new treatment equipment there may be a small, but positive, benefit to the local economy, either through direct utilization of local construction workers and materials, or indirectly through patronization of local businesses by construction personnel.

Most of the work would be associated with existing structures to be modified and would take place at an upland location; however, due to the water dependency of the industries, some activity may be located near a river and/or associated wetland. Thus, there is the potential for some very localized, adverse impact to existing vegetation and/or wildlife habitat; overall the potential short-term impact to biological resources is considered to be minimal. Appropriate mitigation measures will be employed to minimize the potential for sedimentation or erosion, resulting from this component of the activity. Overall, the minimal, short-term impacts at these six locations is greatly outweighed by the widespread benefits that will be realized by the downstream water users, as a result of the proposed activities.

Suplacu Petrom/Petrolsub
The installation of the equipment to improve the extraction-separation process, control runoff, and improve the biological treatment system at the Suplacu Wastewater would result in the reduced discharge of BOD5, TSS, phenols, and petroleum products to the Barcau River.

Pigmenti
The installation of dosing equipment will improve treatment efficiency at Pigmenti treatment plant, thereby resulting in the reduction of chromium and zinc discharged to the Rapid Cris River.

Chimprod
The installation to the process efficiency at the Chimprod plant would improve the recovery of phenols, reducing the amount of phenols discharged to the Rapid Cris River. Additional benefits would also be realized from the reduced power consumption associated with the improved process efficiency.

UAMT
The provision of new equipment and replacement of antiquated equipment at UAMT would result in the reduction of heavy metals, such as chromium and cyanide, discharged to the municipal sewers in Oradea.

Uranium Mining
The improvements to the industrial tailings management and monitoring at the Uranium mines could reduce or prevent contamination to the Black Cris River caused by the discharge of mine water or runoff from abandoned mine operations, both of which have the potential to carry radioactive materials into the river system. Upon further investigation, a definitive course of action may be determined.

Nonferrous Metals Mining
The process modifications at the nonferrous metal mines would reduce the potential for heavy metals, such as copper, zinc, cyanide, and hexavalent chromium, to the Baita River which is a tributary to the Black Cris River.

7.2 Municipal Wastewater Improvements

The proposed activity will reduce the overflow of either raw or partially treated wastewater into the Rapid Cris River. New equipment will be installed and existing equipment modified to facilitate complete treatment of municipal wastewater prior to discharge. The equipment will be installed within the existing facility footprint and is expected to be consistent with the surrounding land use. Aesthetic impacts to the local community are expected to be minimal, as are the impacts to the soils and geology of the region, due to the previous disturbance associated with the existing treatment plant facility. The proposed construction may result in moderate, localized increases in noise, dust, and traffic. Construction noise levels may be mitigated through restrictions on hours of operations, or by adjustments made to equipment, such as retrofitting mufflers or back-up alarms. Construction dust may be mitigated through application of chemical dust suppressants, routine spraying of water, or utilization of tarps of other fabrics to cover loose storage materials.

Most of the work would be associated with existing structures to be modified and would take place at an upland location; however, some work at the treatment plant will require activity near a river, and/or associated wetland. Thus, there is the potential for some very localized, adverse impact to existing vegetation and/or wildlife habitat; overall the potential short-term impact to biological resources is considered to be minimal. Appropriate mitigation measures will be employed to minimize the potential for sedimentation or erosion, resulting from this component of the activity. The minimal, short-term impacts at the treatment plant are greatly outweighed by

the widespread benefits that will be realized by the downstream water users, as a result of the proposed activities.

8.0 Conclusion

The overall goal of the USAID project is to reduce the amount of contamination entering the Danube River tributary basins. The proposed project in Romania encompasses a myriad of activities including assistance to government agencies, industrial pollution and waste control, municipal wastewater treatment improvements, and institutional development to facilitate a reduction in pollution. The implementation of the individual tasks associated with these project components will contribute to the achievement of the USAID/GEF objective of the reduction of transboundary pollution and improvements in receiving water quality, namely the Rapid Cris, Black Cris, and Baracu Rivers, all of which are tributaries to the Danube River.

Seven industries along the banks of various tributaries to the Danube River have been identified as sources of pollution from industrial wastewater discharges. At these plants, the process and treatment equipment is worn which results in increased waste generation, high-energy consumption, and inadequate treatment prior to discharge. The proposed industrial pollution and waste control component includes the procurement and installation of new equipment to replace failing equipment. The proposed improvements will reduce the addition of petroleum products, phenols, and heavy metals to the various water resources within the Oradea area.

The proposed activities for industrial waste control will require minor construction activities within the vicinity of the existing industrial wastewater treatment plants. The proposed construction may result in short-term impacts such as increases in noise levels, dust generation, and traffic. Because the proposed activities will occur on the site of existing facilities, no impacts to land use, soils or geology, or aesthetics are anticipated. Although the industries are water dependent, the proposed construction activities would be associated with existing structures and therefore be sited in an upland location. No direct impacts to biological resources, including vegetation and wildlife are anticipated. Therefore, the minimal, short-term impacts associated with the proposed improvements to six targeted industries within the Danube Tributary basin are greatly outweighed by the widespread benefits that will be realized by the downstream water users.

The Oradea Wastewater Treatment Plant currently discharges raw or partially treated wastewater to the Rapid Cris River. The lack of pump capacity coupled with no biological treatment systems results in the discharge of wastewater high in BOD, ammonia, phenols, and heavy metals. The proposed improvements to the plant include equipment installation to enhance the treatment capacity and efficiency of the plant. The improvements will result in the reduction of raw or partially treated wastewater to the Rapid Cris River, thereby promoting the attainment of water quality standards and protecting the quality of the river for those dependent on the resource.

The anticipated impacts associated with these construction activities at the treatment plant will be short term including increased noise and dust. The aesthetics of the area will not be extensively impacted due to the presence of existing equipment. The generation of noise and dust during the

construction will be minimized to the extent possible. Sedimentation and erosion control measures will be implemented to minimize impacts to surrounding vegetation and waterway. The construction of new buildings and the installation of new equipment may result in the permanent loss of vegetation in the areas of new buildings or equipment, however, these activities will be consistent with the current land use.

The implementation of the proposed project for Romania will result in the reduction of pollutants entering tributaries to the Danube River through various industrial and municipal activities. To supplement the direct infrastructure improvements to these facilities, the proposed project entails the development of training programs and education programs to environmental awareness among both facility operators, and the local community.

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