WATERSIDE INDUSTRIAL SITES ON THE OUACHITA RIVER IN ARKANSAS

Summary

The purpose of this study is to identify potential waterside sites for industrial plants that would benefit from direct access to water transportation. The study region encompasses that portion of the Ouachita River that reaches from Camden to the Arkansas-Louisiana boundary, along with the Arkansas hinterland of this 110-mile stretch of navigable water. The major portion of this hinterland comprises the five counties: Ashley, Bradley, Calhoun, Ouachita and Union. This hinterland, not precisely defined here, will be referred to as the Ouachita Region.

The Ouachita-Black River connects with the Red, Atchafalaya and Mississippi rivers and, via either of the last two, with the Gulf Intercoastal Waterway and the Gulf of Mexico. Thus Camden and points downstream can reach, via protected commercial waterways, many cities, including Brownsville, Texas; Tulsa; Kansas City; Minneapolis; Chicago; Pittsburgh; Knoxville; Carrabelle, Florida; Mobile; and New Orleans, to mention some of the peripheral locations.

Important natural resources of the Ouachita Region include forest lands, oil and gas, bromine, gravel and clays. Sizable present industries in the region include the following: lumber, plywood, paper and related products at Crossett; paper, related products and lumber at Camden; oil refining, chemicals, rubber fabrication, wood products, and asphalt rock products in El Dorado and vicinity; and steel products and hardwood flooring in or near Magnolia (Columbia County). Potential waterside industry might include expansion of existing industries, elaboration of more complex products from

those presently produced, feed milling and blending for a regional poultry and cattle feeding industry, and regional distribution of gravel, rock, cement, asphalt, fuel oils and chemicals, some of which are presently moving on the Louisiana portion of the Ouachita-Black River system. A speculative but interesting possibility is the manufacture of gypsum board based on regional wood and Mexican anhydrite. It is not unusual for footloose industries to locate in a well planned industrial park once it is under development, but the difficulty of predicting which ones will locate in a particular park is notorious.

The most promising locations for a waterside industrial park in the Ouachita Region appear to be: Cullendale, some six river miles downstream from the Port of Camden; Frenchport Landing, six and a half miles further downstream; and Millers Bluff, some seven miles east-northeast of Smackover. The suggested Cullendale site has some 800 acres of fairly level forested land that could be protected from floods by a levee. It is close to utilities, rail (2000 feet) and good highways and has fairly good access to the river. At Frenchport Landing there are some 460 acres of forested land that is almost all flood free and mostly fairly level (with no significant areas steeper than ten percent). The landing could be reached by about five miles of railroad. Road access is not nearly as good as at Cullendale and there are no utilities nearby. At Millers Bluff there is, within one mile of the Bluff, at least one square mile of flood free land with no significant area steeper than ten percent, and additional usable land further out. A 4 3/4-mile rail extension would reach the Bluff. There are no utilities nearby and no good roads, but the Cross Oil and Refining Company is operating a barge-to-pipeline transfer

facility on the river and moving petroleum in. At Cullendale the land required for the suggested development is held by ten owners; at the Frenchport site the land, except for some 18 acres, is held by a lumber company; at Millers Bluff, most of the land suitable for industrial development is owned by one company. The best truck-barge transfer location to serve the El Dorado area appears to be at the City of Calion.

Introduction

The objective of the present study is to identify feasible sites for industrial plants that would benefit from direct access to water transportation. The study region encompasses the Ouachita River from the head of navigation at Camden to the Arkansas-Louisiana boundary and the lands bordering this stretch of river. Mileage on the Ouachita-Black navigation route is measured upstream beginning with Mile 0.0 at its confluence with Red River. The Tensas River and Little River flow into the Ouachita River just above Mile 41 (at Jonesville, Louisiana), and from there downstream to mile 0.0 the stream is called the Black River. The Arkansas-Louisiana boundary crosses the Ouachita River near Mile 221 and the head of navigation is at Mile 337. Therefore, the nominal distance from the state line to Camden is 116 miles. The actual navigation distance is about 110 miles, however, because the Felsenthal Lock and Dam cut off one mile and the H.K. Thatcher Lock and Dam cut off five miles, and the official river mileage was not adjusted for these changes. Now, the stretch of navigable waterway under study here can properly be referred to as “the navigable portion of the Ouachita River that lies in Arkansas.” But because this stretch comprises the upstream 110 miles of the Ouachita-Black navigation system, we shall, for the sake of brevity, refer to

it as the “Top One Ten.” This is the entity that is referred to wherever the term, “the river,” is used in this report.

The Top One Ten touches five Arkansas counties (Map No. 30): Ashley, Bradley, Calhoun, Ouachita and Union, but only the last two have sites where the river comes within 500 feet of land that lies above the 100-year flood level or is adequately protected from it by a levee.

The Geographic Setting

Shallow draft inland vessels can navigate between any point on the Top One Ten and the Mississippi-Gulf Inland Waterway System. As Map No. 1 suggests, the shortest route to the Gulf of Mexico is down the Ouachita, Black, Red and Atchafalaya rivers and then out through Atchafalaya Bay. An ocean-river vessel could, for example, ply between Camden, Arkansas, and Veracruz, Mexico, and avoid the need to transfer cargo in route. Or barges could haul cargo as far as Morgan City, Louisiana, and transfer it there to oceangoing ships. Vessels from the Top One Ten can reach the Gulf Intercoastal Waterway at Morgan City or, via Old River Channel and Old River Lock and the Mississippi River, at New Orleans. The position of the Top One Ten in the Mississippi-Gulf Inland Waterway System is shown in Map No. 2. A view of the southern portion of this system is shown, at a larger scale, in Map No. 3. Inset A in this map is shown in Map No. 4, at an even larger scale. A barge tow can navigate from Camden to Morgan City and go through no more than four locks, two in Arkansas and two in Louisiana. During periods of sufficiently high water the locks in Arkansas can be bypassed. On the Arkansas-Black system the channel is 9 feet deep and 100 feet wide and the locks have usable interior dimensions of 84 feet by 600 feet. The navigation channel from the Mississippi River to Shreveport, Louisiana, via Old River and Red River, is 9 feet deep and 200 feet wide. Interior dimensions are 75 feet by 1,190 feet for Old River Lock and 84 feet by 685 feet for each of the five locks on Red River. The Atchafalaya River navigation channel is 12 feet by 125 feet. Ocean vessels drawing no more than 20 feet can reach Morgan City via Atchafalaya Bay.

Map No. 5 shows the Ouachita River and nearby waterways along with some cities and waterway junctions that define particular reaches, or route segments. For almost every one of these reaches, the navigation distance is shown for the convenience of the reader who wishes to determine selected point-to-point distances. It is easy, for example to compare the distance from Camden to the Gulf of Mexico via Morgan City with that via New Orleans--518 miles for the former route, 689 for the latter.

Map No. 6 shows railroads in portions of Arkansas, Louisiana and Mississippi. It is noteworthy that Camden, at the head of navigation, is served directly by a main line of the Union Pacific System. The highway system for more than half of the State of Arkansas is shown on Map No. 7. U.S. Highway 79 serves Camden and Magnolia, U.S. 167 serves El Dorado and U.S. 82 serves Crossett, El Dorado and Magnolia. (Additional information for the entire state of Arkansas can be found on Map No. 32, for railroads, and on Map No. 33, for highways. Map No. 31 shows the position of Arkansas in the Inland River System.) Map No. 8 shows most of what is here termed the Ouachita Region, depicting railroads, major highways and the Top One Ten with its two public ports, seven potential industrial sites, and Millers Bluff, a potential industrial site too but also the locus of a barge-pipeline transfer facility that is an integral part of a petroleum refining, storage and transportation operation.

Natural Resources, Markets and Hinterlands

In order to judge the merits of any particular parcel of land for a navigation-related industrial park, one should have some idea of what sorts of industry could best use that land. And what sorts would be best might depend, to some extent, on what natural resources were readily available. Availability in turn may depend on proximity to a resource and also on the proximity of a competing buyer to the same resource. All of this can raise the question of just what scope of territory constitutes the major supply area or hinterland of a particular site for a particular navigation-related industry. And this question suggests that two industrial establishments located in the same waterside industrial park might conceivably have distinct, overlapping or identical hinterlands. Further, the direction that the product of the natural resource takes as it goes to market may influence hinterland boundaries.

Consider, for example, some product made from wood, say, at Camden, and suppose that the product is amenable to barge transportation. If the market is in the northeastern United States, then a competing producer at Pine Bluff would have a transportation cost advantage over the Camden producer. From either producer, the product would move past Memphis. To get that far, the Camden producer would have to traverse 836 river miles, the Pine Bluff producer, only 247 river miles (see Map No. 5). Therefore, the latter could, certeris paribus, reach out more than half way to Camden to truck in the wood. Now suppose, instead, that the product was going to Mexico and that both producers barged the product as far as Morgan City. Then the Pine Bluff producer would have to traverse 489 river miles, the Camden producer, only 474. Thus, in long run equilibrium the boundary between the Camden hinterland and the Pine Bluff hinterland should shift toward Pine Bluff because of a

change in direction to the market.

Some of the more likely locations that would compete with the Top One Ten for natural-resource-based tenants are Pine Bluff, Yellow Bend, Shreveport and Monroe. Other possibilities are Sterlington, Louisiana, 25 river miles upstream from Monroe, and Lake Providence. Some of the more significant regional natural resources for navigation based industry in south central Arkansas would appear to be wood, petroleum, natural gas, sand and gravel, clays, and low cost and remote land for poultry production. A considerable amount of information about forests in twenty counties in southern Arkansas is available in *Forest Statistics for Southwest Arkansas Counties* - 1995, published by the U.S. Department of Agriculture, Forest Service. Selected data for twelve of the twenty southwest Arkansas counties are presented in Table 1. These twelve counties are the ones that the Vicksburg District Corps of Engineers selected for the Arkansas portion of their August 1990 Socioeconomic Profile of the Ouachita-Black Rivers Navigation System project area (*Ouachita-Black Navigation Project Economic Reanalysis*, Attachment 1). Map No. 30 includes the counties involved.

Other significant natural resources in the region of the Top One Ten include sand and gravel, and clays. *Mineral Resources and Industries of Arkansas* (Bulletin 645, U.S. Department of the Interior, Bureau of Mines, 1969) appears to be the latest and most comprehensive publication covering these and other minerals, county by county, for Arkansas. Statistical tables in the publication typically include data as recent as 1966. Nothing like Bulletin 645 has been published since 1969. It may therefore be worthwhile to present a number of pertinent quotations from this authoritative document. All

quotations in the next three paragraphs are from Bulletin 645; figure numbers (figures are maps) and page numbers are shown in parentheses.

Let us deal only with the five counties that touch the Top One Ten. With regard to sand and gravel, there is a commercial deposit of this heterogeneous stuff in Ashley County about four straight-line miles east-southeast of the Port of Crossett (Fig. 40, p. 187). “Sand and gravel production has totaled 1.6 million tons in Ashley County . . . . In 1966, reserves of sand and gravel were estimated at 5.8 million tons (p. 188).” There is a deposit of sand and gravel at Moro Bay in Bradley county (Fig. 41, p. 188). In this county, “the largest of individual deposits is estimated to have contained 1.3 million tons originally. Total estimated reserves of reported operations exceed 10 million tons” (p. 197). For Calhoun County “it has been estimated that numerous pits have yielded a total of more than 13 million short tons of sand and gravel . . . Individual beds are as thick as 15 feet” (p. 199). In Ouachita County “sand and gravel is obtained from the Pleistocene terrace deposits, from the Wilcox Group, and from sand bars in Ouachita River . . . A 10-foot bed of [Pleistocene] gravel in a pit adjacent to the St. Louis Southwestern Railway [about 11 straight-line miles north-northeast of the Port of Camden] yielded about 135,000 tons of washed sand, pea gravel, and 1 1/2-inch gravel per year for 25 years. Reserves in the terrace deposits in this part of the county may total several million tons . . . . Sand and gravel mining contributes substantially to the economy of Ouachita County. Total production during 1952-1966 was about 2.8 million short tons valued at $2.7 million” (pp. 315, 316). “Union County contains an abundance of sand . . . Small quantities of clean sand are produced for construction use from sand lenses along water courses in

the south-central part of the county" (p. 387).

With regard to clay, "A few clays in Bradley County have been tested and found suitable for brick and tile. The clay resources are undoubtedly large but the exact volume and value of clays is unknown and can be determined only by field study and exploration" (p. 195). Of the seven localities at which clays have been reported (Table 104, p. 196), the one closest to the Ouachita River is about eight straight-line miles from Caney Marais Bend (Mile 249) in the Felsenthal National Wildlife Refuge. In Calhoun County, "plastic clay and potters clay in beds that range from 4 to 20 feet thick have been reported in the Claiborne Group, especially in numerous localities along Champagnolle Creek, Moro Bay, Two Bayou Creek . . . None of the clay has been utilized for clay products" (p. 198). In Ouachita County a clay pit lies some eleven straight-line miles northwest of the Port of Camden (Fig. 90, p. 311). "Clay deposits are numerous in sediments of Wilcox Group and in Claiborne sediments . . . Clay beds exposed at the surface range from a few inches to more than six feet. Well records show that the maximum thickness measured in the subsurface is about 30 feet . . . Raw clay from the Chidester pits is shipped to Hope in Hempstead County for use at Hope Brick Works" (p. 310).

In Union County, "building brick has been manufactured at El Dorado from locally mined clay since 1919. Earlier, a brick plant at Felsenthal was operated in 1907-09 . . . Quaternary clay of the buckshot type occurs in the east and southeast parts of the county but does not meet current ceramic clay requirements. This type of clay was used in the Felsenthal brick plant. Average annual output of the El Dorado brick plant is about 2 million bricks per year. Clay reserves on the property are adequate for several years" (p.

381).

The *Annual Oil and Gas Report* of the Arkansas Oil and Gas Commission provides detailed information on the oil and gas industry in Arkansas. For South Arkansas as a whole, the 1994 issue reports the following: production in 1994 of "8,970,580 barrels of oil and 33,348,619 MCF of gas . . . [and there were] oil and condensate reserves as of January 1, 1995, [of] . . . 222,942,961 barrels while the gas reserves associated with the oil and condensate are estimated to be 566,306,975 MCF" (p. 5). The significant producing counties in South Arkansas are Ashley, Bradley, Calhoun, Columbia, Hempstead, Lafayette, Miller, Nevada, Ouachita and Union. As can be seen in Map No. 30, these ten counties form two tiers across most of the southern border of the state, and five of them touch the Top One Ten. Map No. 30 shows, by county, the major mineral resources (except for oil, gas and coal) for most of the state.

Present and Prospective Industries

The geographic area of primary interest here is the “Ouachita Region,” most of which is shown on Map No. 28. It is what may be regarded as the immediate hinterland of the Top One Ten and will sometimes be referred to hereinafter as “the region.” Shown on this map are fourteen reasonably distinct existing manufacturing locations, each of which pertains to just one organization but some of which have more than one plant or operation as listed in the 1995 *Arkansas Directory of Manufacturers* (ADM). For example, in Crossett, Georgia-Pacific has its “Chemical Division,” its “Crossett Paper Operations,” and its “Crossett Plywood Plant.” Call each of these an *operation*. Then the fourteen locations plotted on the map represent seventeen operations. The ADM indicates that twelve of these operations are involved in exporting. The thirteen companies listed on Map No. 28 are here judged to be the most likely candidates for using the Top One Ten for commercial navigation, although there may be others.

Visiting these fourteen locations from east to west, we would find first, in Crossett, the Bemis Company making multiwall, pasted valve and small paper bags and Georgia-Pacific producing various paper products, food board, softwood lumber and plywood, chemicals involved in paper and plywood manufacture, and urea for fertilizer. In the El Dorado area we find: Cooper Engineered Products (a Division of Cooper Tire & Rubber Company) producing molded rubber goods for the automotive industry; El Dorado Chemical Company producing sulfuric acid, nitric acid and ammonium nitrate; Georgia-Pacific Corporation, Mid-Continent Wood Products, turning out softwood lumber, chips, dust and bark; Jet Asphalt & Rock Company, Inc., producing asphalt material in

two separate plants; and the Lion Oil Refinery operation producing aluminized paint, various petroleum products and asphalt roofing cements. In Smackover, Cross Oil & Refining Company produces fuel oil, diesel fuel, naphthenic lubricating oils, naphthas and asphalt. In Camden, Celotex Corporation produces dimensional shake shingles and dry felt heavyweight paper; International Paper makes recycled and specialty grade unbleached kraft paper and extensible file folders in its main plant and paper dunnage bags, multiwall paper specialty bags and polyethylene film in its nearby Multiwall Plant; and Rogers Lumber Company produces hardwood lumber, crossties, wood chips, sawdust, shavings, bark, and pallet cut stock. In Magnolia the Partee Flooring Mill produces stacking sticks and hardwood lumber and flooring. And some four miles south-southeast of Magnolia, on the Louisiana and North West Railroad (see map No. 6), SMI Steel produces merchant bars, concrete reinforcing bars and steel fence and highway sign posts.

With regard to new plants, the most likely kinds of industry that would locate in an industrial park on the Top One Ten would appear to include wood processing and related activities, the milling and blending of feeds for the poultry and cattle raising industries, the processing and fabrication of metals, elastomers and plastics and the warehousing and transhipping or distributing of products entering or leaving the region by river vessel.

For new waterside plants, likely wood products include lumber, crossties, veneer, plywood, particle board, fiberboard, pulp, paper, food board and various paper products. These would presumably be based largely on wood grown in the region, although the importing of some tropical woods is a possibility. With regard to metal processing, an electric furnace steel mill

based on scrap could bring in domestic and foreign raw materials by barge, and ship basic products out primarily by rail and truck. More elaborate fabrication of steel could be based on the output of such a mill and perhaps also on imported steel, Mexico being one possible source.

The fabrication of rubber is well established in Arkansas, and there is some such fabrication in and near the Ouachita Region: tires at Texarkana, rubber coated fabrics at Magnolia and mechanical rubber goods at El Dorado, to mention the larger operations. A sizable rubber fabricating industry on the Top One Ten would very likely justify the transportation of raw materials--natural and synthetic rubbers--by barge. The Port of New Orleans handles considerable quantities of imported natural rubber, and synthetic rubber is produced near Baton Rouge and on the Gulf Coast. Production of polyethylene film is often associated with the fabrication of multiwall paper bags and would therefore seem to be a likely industry in a riverside industrial park in the region.

The preparation of feeds for poultry and cattle could be based on an expanded poultry and cattle raising industry promoted by the availability of cheaper feeds. For broiler production the cost of feed runs about two-thirds of the total cost (Austic and Nesheim, *Poultry Production*, 1990, p. 14). The ability to bring corn, rice milling byproducts, fish meal and oyster shell north from Louisiana by barge might reduce the cost of these ingredients. It is conceivable but somewhat speculative with regard to the Ouachita Region, that cattle feeding could be integrated with wood production. In the growing of a crop of trees after clear cutting there is, at least with some thinning regimes, a period of years when the trees are large enough to be invulnerable to browsing and still small enough to let a lot of sunlight reach ground cover on which cattle might feed. Lower cost supplementary feed could conceivably promote a wood-and-beef operation based on crop rotation and the above mentioned reforestation practice. It is known that profitable cattle raising has been carried on on forest lands in Florida.

Even more speculative, perhaps, is the raising of poultry on oil-waste land such as that found in some creek bottoms in the southeastern part of Ouachita County. According to *Soil Survey, Ouachita County Arkansas* (1973), “this land is not suited to any farm use,” being “severely polluted with crude oil and salt water” (p. 17). But for poultry raised indoors the pollution might not matter very much. At any rate, lower cost feed would tend to promote poultry raising in the region, and the cost of land is not a major item of expense.

In addition to manufacturing and processing, the warehousing, packaging and distribution of various commodities might be carried on in a riverside

industrial park. Rip rap, crushed rock, portland cement, asphalt, fuel oils, gasoline and chemicals brought upstream by barge would appear to be possibilities. The first two of these would very likely come downstream on the Mississippi River to Old River and thence upstream on the Red, Black and Ouachita rivers. Chemicals, liquid fertilizer, crushed rock and petroleum fuels presently move by barge on the Louisiana portion of the Ouachita-Black River System. Another possible sort of riverside activity is the sizing of sand and gravel and the crushing of some of the coarser gravel. Whether such an activity would locate in an industrial park is problematic. At any rate there is a sizable market for gravel in Louisiana, and some has been barged as far as Houma--57 highway miles southwest of New Orleans.

Trade with Latin America seems likely to increase substantially as tariffs and other barriers are eased or eliminated. Some of this trade, particularly with Mexico, may follow the Ouachita-Atchafalaya route through Morgan City. This is highly speculative, but one operation that may be worth some thought is the importation of anhydrite from Mexico, with a return haul of wood pulp or paper. The idea is that gypsum board could be produced in the Top One Ten region using imported anhydrite and in Mexico using imported pulp or paper. To balance the tonnage flows it might be feasible to bring grains and oilseeds from eastern Arkansas by rail to the Ouachita River for waterborne movement to Mexico. In 1993, Mexico produced about 5.34 million metric tons of gypsum, ranking as the number three producer in the Western Hemisphere, and it does export gypsum to the United States and Canada (*Minerals Yearbook*, “The Mineral Industry of Mexico”--1993, p. 198, U.S. Bureau of Mines). Another possibility is the importation of Portland cement

from Mexico for regional distribution from some location on the Top One Ten. The following dollar values of U.S. exports to, and imports from, Mexico in 1995 may bear on the feasibility of the foregoing speculations and suggest other possibilities for the region. The totals were compiled from very narrowly defined categories of goods and in some cases may not include everything that should have been included. But of each figure it is true that it is “at least this much.” Furthermore, only the larger categories will be included here.

Imports included (in millions of dollars): crude petroleum, 5,418; coffee, 569; cement, lime, gypsum, sulfur, 77.8; and sugar cane, raw, 9.5. Exports included: grains, 892; oilseeds, 500; woodpulp (excluding groundwood), 348; feeds 104.4; kraft paper, 85.4; flour, meal, etc., 78.2; soybean oil and fractions, 36.4; plywood, 21.6; particle board, 17.9; and veneer, 10.3 (calculated from *U.S. Exports and Imports of Merchandise on CD-ROM*, CDEX/IM, U.S. Department of Commerce, Bureau of the Census).

Waterside Sites

In this report the term, potential industrial waterside site, will refer to a parcel of land that is: large enough and level enough to be useable for industrial operations; above the 100-year flood level or amenable to flood protection by earth fill or levee at reasonable cost; and accessible to commercial vessels on the Top One Ten. In considering sites, the investigators relied on the 100-year flood maps provided by the U.S. Army Corps of Engineers, Vicksburg District. Areas having a slope of ten percent or more were considered to be too steep for industrial use. This slope criterion has been used by the Tennessee-Tombigbee Waterway Development Authority, who also used a 100-year flood plain criterion. (*Industrial Site Acquisition Analysis: Tennessee-Tombigbee Waterway Corridor*, Tennessee-Tombigbee Waterway Development Council, Hammer, Siler, George Associates, March 1994.)

Included in the present report is a description and at least one map of the immediate area for all but four of the nine places on the Top One Ten where presently unleveed 100-year-flood-free land lies within 500 feet of the river bank. Call this the 500-foot criterion. The exceptions are: the stretch of high riverfront ground that includes the Port of Camden; the site of the power plant about three miles downstream from the port; Champagnolle Landing; and the Pigeon Hills. These four places are excluded because, in each case, the quantity of suitable land that is not already in incompatible uses is relatively small. This is not to deny that some redevelopment at the first two places may be worth considering, now or in the future. The other five places that satisfy the 500-foot criterion are Frenchport Landing (Mile 324.5); Starvation Point (Mile 316); Newport (Mile 314); Millers Bluff (Mile 305.4);

and Wilmington Landing (Mile 277). Two places are considered herein as potential industrial sites even though they do not satisfy the 500-foot criterion and would need levee construction. They are the Cullendale Site (Mile 331.1) and the Moro Bay Site (Mile 270.5). The eighth potential industrial site comprises the City of Calion (Mile 293.6) and some nearby land. The portion of this site that is below the 100-year flood level is already protected by levees, although it is possible that additional land will be brought under levee protection.

These eight potential sites, along with the Port of Camden and the Port of Crossett, are shown on Map No. 8. Not shown there are: the power plant (between Camden and Cullendale), Champagnolle Landing, (which is just downstream from Calion) and the Pigeon Hills (which meet the river just downstream from the Moro Bay Site). The Port of Camden has a wharf, a conveyor for loading barges, a stiffleg derrick in need of repair and a transit shed with a railroad siding on the landside. The Port of Crossett, situated on a fill with room to spare for limited industrial development, has a wharf (with space for a mobile crane), a transit shed and outside storage space. It is adjacent to U.S. Highway 82 and about seven miles from rail (in Crossett).

Maps No. 9 through No. 15 if cut out, matched, and pasted together, would comprise a single map showing the entire Top One Ten and the nearby land. They are black and white copies, in the original 1: 62,500 scale, of the 100-year flood plain maps supplied to the investigators by the U.S. Army Corps of Engineers, Vicksburg District--uncluttered except for the scales pasted on for the convenience of the reader. Map No. 9 takes in Camden and Frenchport (cf. Map No. 8); Map No. 10 ranges from Starvation Point to Millers Bluff and

beyond; No. 11 takes in Calion; No. 12 covers Wilmington Landing and Moro Bay; No. 13 gets into the Felsenthal National Wildlife Refuge, No. 14 takes in U.S. Highway 82 and the site of the Port of Crossett; and No. 15 takes us to the Louisiana state line. For a more detailed view of the river (charts and aerial photos) the reader is referred to *Ouachita and Black Rivers Navigation Charts, Camden, Arkansas to Red River, Louisiana*, 1976 (U.S. Army Engineer District, Corps of Engineers, Vicksburg, Mississippi).

The series of maps running from No. 16 through No. 27 pertain to the eight sites selected for discussion in this report. Each of these maps shows a site or else the general geographic setting of a site. The large penned-in numbers are the 100-year flood elevations provided by the Vicksburg Corps of Engineers, unless the number is preceded by the word, “about,” in which case the number is a linear interpolation, based strictly on river miles, between the pair of Corps-supplied numbers that bracket the point in question.

The Cullendale Site

Map No. 16 shows the general area of the Cullendale site. The major advantages of locating industry here appear to be the existence of a sizable and compact acreage that is almost level, mainly in forest, close to the river and to a main line of the Union Pacific Railroad, and near a city served by a U.S. Highway and several state highways. These advantages are somewhat tempered by the fact that enough of this otherwise very desirable acreage is far enough below the 100-year flood level to make an industrial fill too costly, although construction of a levee might be feasible.

Map No. 17 shows a possible waterside Cullendale site. The area bounded by the suggested levee (broken line) and, on the uphill side, by a 10-percent

slope, encloses about 800 acres of usable land. Measuring from the western boundary, the distance to rail (the Camden - El Dorado branch line) is about 2000 feet, and the Union Pacific main line is about two railroad miles further on. That industrial-capacity utilities are not far way is suggested by the fact that the Internation Paper Company's plant is less than a mile and a half from the site. (See Map No. 16 and Map No. 17.) The straight-line distance from the nearest rail to the nearest point on the river (Mile 331.1) is about 2.2 miles. The distance from the river to the nearest 110-foot contour line is about 850 feet. To put rail on a barge wharf would require a fill from the levee out to the river, an artificial channel from river to levee, or some combination of fill and channel. The "about 114-foot" 100-year flood level shown on Map No. 17 is an interpolation between two actual Corps of Engineer estimates, as explained above. The February 17, 1993, map published by the Federal Emergency Management Agency (*FIRM Flood Insurance Rate Map, Community-Panel Number* 0501612 0008C) shows a 100-year flood level of 113 feet along a line running north and slightly east from a point near the north end of Senrac Lake and passing just west of the sewage disposal ponds (see Map No. 16). A levee about 3.2 miles in total length is shown on Map No. 17. Note that more than half of this length is on land that lies above the 110-foot contour. According to the Corps of Engineers, the freeboard on this sort of levee ordinarily ranges from one to three feet measured from the highest flood level to be defended against, which in this case can be expected to range from 113 feet to about 114 feet, based on the 100-year flood estimates. Map No. 16 shows that the runoff area that would naturally drain into the levied area (Map No. 17) is rather small and it suggests that a significant portion of the

natural runoff could rather easily be shunted outside the levee, at least during high floods. The land needed for the development suggested here--for industrial park, levee and river connection--is held by ten owners (1996 *Ouachita County, Arkansas, Platt Book of Ownership*, Distributed by Smith Mapping Service, Fordyce, Arkansas).

Map No. 28 shows the kinds of soils that lie within and near the suggested site. This map and the following information about soils are taken from *Soil Survey, Ouachita County, Arkansas* (U.S. Department of Agriculture and Arkansas Agricultural Experiment Station, May 1973). The first letter of a symbol is the initial letter of the soil name. The second letter, in conjunction with the first, identifies the soil name. The third letter (B, C, D or E) shows the slope. A symbol without a slope letter indicates a nearly level soil. The most abundant soil within the levee is “Smithton fine sandy loam, nearly level,” indicated by Sm. The second most abundant soil appears to be “Norfolk fine sandy loam, 1 to 3 percent slopes,” its symbol being NoB. There is also a relatively small acreage of NoC, which is the same soil but with slopes ranging from 3 to 8 percent. There is a small acreage classified as AS inside the suggested levee and large expanses of it outside but near the levee. This is the symbol for the “Amy association, frequently flooded.” On the higher ground there is an area of “Alaga loamy sand, 1 to 8 percent slopes,” symbolized by AgC. There are also ribbons of “Bibb soils” consisting of “nearly level, poorly drained, moderately permeable soils on bottom lands along creeks.” These soils are symbolized by BB. Note that most of the land within the suggested levee is either sandy loam or loamy sand. All of the soils mentioned above are classified, with regard to “shrink-swell potential,”

as “low.” With regard to “soil features affecting highway location,” all of the above-mentioned soils except AgC are said to have “moderate traffic-supporting capability.” AgC, NoB and NoC are said to be “erodible and excessive cut and fill if slopes are more than 6 percent.”

The *Soil Survey* mentioned above contains soil maps for Ouachita County and detailed descriptions of soils series, including layer by layer descriptions going down, for most series, to 72 inches below the surface. The set of tables includes information pertinent to agricultural, recreational, residential and industrial uses of land.

The Frenchport Site

The waterway connection of the Frenchport Site would most likely be at Frenchport Landing, at Mile 324.5. There the 100-year flood level is at 111.6 feet. Map No. 18 shows a flood free 320-acre site that has no slope greater than 10 percent detectible on a 10-foot-interval contour map. A small levee across the mouth of the bay would add 27 acres and make the site more compact. A nearby parcel has about 113 acres that is flood free and, with a few minor exceptions, no slope steeper than 10 percent. All this adds up to some 460 acres. The waterfront area has a 110-foot contour line within some 330 feet of the river bank. A 5 1/5-mile rail extension from Union Pacific's Camden - El Dorado branch line at Rendezvous would reach a wharf at Frenchport Landing. The straight-line distance from the 320-acre parcel to Arkansas Highway 7 is about 2.5 miles; the present road-and-trail distance from the landing to Arkansas Highway 7 is just over five miles. Of the suggested 347-acre parcel (located next to Frenchport Landing), all but about 18 acres is owned by a lumber company (1996 *Ouachita County, Arkansas, Platt Book of Ownership*, Distributed by Smith Mapping Service, Fordyce, Arkansas). The Ouachita County *Soil Survey* shows that this 347-acre parcel is made up largely of: Amy association soils (AS, frequently flooded, nearly level, poorly drained and slowly permeable) and Smithton fine sandy loam (Sm). There is also a small amount of Norfolk fine sandy loam, 3 to 8 percent slopes (NoC). These three are also present in the Cullendale Site. In addition, the 347-acre parcel has some Kirvin-Sacul association (rolling, slopes 8 to 20 percent, subject to erosion, moderate shrink-swell potential, low traffic supporting capacity, KSC), and small amounts of: SKB (Sacul-Kirvin association, undulating); GOB (Goldsboro fine sandy loam); and OU (Ouachita association, frequently

flooded). Thus the *Soil Survey* seems to suggest that this parcel, safe from the 100-year flood, may have less satisfactory foundation conditions than the suggested Cullendale site, which would be largely inundated by a 100-year flood. It appears that more information is needed.

Starvation Point

At Starvation Point (Mile 316) the river approaches the very edge of the 100-year flood plain, whose right-bank boundary is shown as a heavy line on Map No. 19. The 100-year flood level is at 109 feet, approximately. The topography of the flood free area is too rough for an industrial park, and the nearby flood plain lies so far below the 100-year flood level that protection by a levee would probably be impractical. Furthermore, the cost of road access would be high and that of rail access prohibitive. However, if a local demand for transportation of a pipelineable commodity were to arise, Starvation Point might be worth considering as a location for a pipeline-barge transfer facility.

The Newport Site

Map No. 20 shows nearly all of the community of Newport (Mile 313.6), which consists mostly of a road along the right bank of the river and a number of dwellings strung out alongside it. According to the map, most of the land near the riverbank lies between the 95-foot and the 100-foot contour lines; whereas, the 100-year flood level along the riverfront is just a little less than 108 feet. The flood-free land is too steep to accommodate an industrial park and the flood plain is low enough to require a sizable levee, which would be hard to justify in view of the distance from rail and a major road and the somewhat rough topography that would have to be crossed by a road or rail

extension. The site could be used for a barge-pipeline transfer facility if the need arose.

Millers Bluff

Map No. 21 shows that, in a 100-year flood, the Millers Bluff Site (Mile 305.4) would be located near the south end of a peninsula. Within one mile of the point where the river meets the bluff there is at least one square mile of flood-free land that, with minor exceptions, has no slope steeper than 10 percent; further out from this point there is additional flood-free land that has similar topography. The map also shows how a 4 2/3-mile rail extension from Union Pacific's Camden - El Dorado branch line might reach the point where the river meets the bluff. With a small trestle and a little cutting and filling, the maximum grade could be held to two percent.

The topography is depicted more clearly on Map No. 22, where the high-water mark of the hypothetical 100-year flood is shown as a heavy line. This flood level is estimated at 104.4 feet, the normal pool level is 77 feet and the elevation at the top of the bluff is about 125 feet. The Cross Oil and Refining Company has built and is operating a facility for transferring liquid cargo between barge and pipeline and plans to build tankage on the site to supplement existing off-site tankage currently connected to the facility by pipeline. Most of the land that would be suitable for industrial use is owned by one company; very few small holdings would be involved.

On the flood-free lands that are within one mile of Millers Bluff Landing (Mile 305.4) and have less than 10 percent slopes, the main soils are: the Cahaba-Norfolk association, undulating (CNB): the Sacul-Kirvin association, undulating (SKB); the Kirvin-Sacul association, rolling (KSC); Norfolk fine sandy loam, 3 to 8 percent slopes (NoC); and Leadvale silt loam, 1 to 3 percent (LeB). The shrink-swell potential is low for Cahaba, Norfolk and Leadvale soils and low to moderate for Kirvin and Sacul soils. Traffic-supporting capacity is moderate for Cahaba, Norfolk and Leadvale soils, low for Kirvin and Sacul soils. The better soils from the engineering point of view (Cahaba, Leadvale and Norfolk) generally occur closer to the Landing than do the others.

The Calion Site

Map No. 23 shows the City of Calion (population 558), Calion Lake and the immediate vicinity. Of the Chicago, Rock Island and Pacific Railroad facilities shown on the map, only the roadbed remains. The river meets naturally flood free ground near Champagnolle, at Champagnolle Landing (not identified on the map). The city and lake are protected from Ouachita River floods by levees, which show up more clearly on Map No. 24. The Calion Lumber Company used to unload timber from barges in the vicinity of Mile 293.6. This location would appear to be suitable for a truck-barge transfer facility, being close to U.S. Highway 167. The trucking distance from the river to the industrial district east of El Dorado would be some 11 to 12 miles. Rail could be extended from El Dorado on the abandoned railroad grade, but this would require the laying of about 11 1/2 miles of track. A shorter but probably more costly connection to existing rail could be had by following the old grade to

Quinn (about 5 miles) and then constructing about 3 miles of new railroad to reach the Union Pacific line.

Lands suitable and available for industrial use in and near Calion are rather limited and scattered. The maps presented here are taken from a U.S. Geological Survey 7.5 minute quadrangle map dated 1962, photorevised in 1978, so they are not necessarily accurate guides with regard to the location and extent of unimproved parcels of land. But an investigator who made a recent reconnaissance of the area got the impression that the situation has not changed very much since the map was made. Almost all of the flood protected potential industrial lands lie southeast of U.S. Highway 167 and in fairly close proximity to residential areas. If land near residential areas was in fact zoned for industrial use, something on the order of 400 acres could be had within two straight-line miles of Calion Lumber Company's dock site, not counting lands with slopes steeper than 10 percent. The potential sites are held by a considerable number of owners. Most of the reasonably level land to the northwest of the highway lies below the 100-year flood level, which in that area would be somewhere between 99 and 100 feet. There, some 340 acres of land could be protected by a mile and a half of levee following the trend of the 90-foot contour line. Of course the height of such a levee would have to be some 9 or 10 feet plus freeboard. The land involved is held by six owners.

The Wilmington Site

Map No. 25 shows Wilmington Landing at Mile 277. The point where the river first touches flood-free land, however, it at mile 277.6 and near a likely location for a wharf, if one should be built to serve an industrial park. The attraction of this location is not just the outside bend of the river but also the proximity to the mouth of a valley. (See Map No. 26 for a clearer view.) This valley has a relatively gentle slope (for this immediate area) and could accommodate a road connecting the riverfront with the almost level, flood free headwaters area that begins about six tenths of a mile back from the river. The local high point of this area is at or near a 217-foot benchmark on Arkansas Highway 15, about 1.7 miles south and 0.4 mile east of river Mile 277.6. For flood-free land, this headwaters area is unusually level. But the nearest rail is 15 miles away, at El Dorado, and there is no U.S. highway nearby. Although the Wilmington Site does not appear to be a candidate for an industrial park at this time, it could be of interest in the future. It is 74 river miles closer than the Cullendale Site to downstream points, is located in a region of heavy wood production and may be better positioned than any of the other sites discussed herein to tolerate unavoidable air pollution. The land in the near vicinity of the river is held by a timber company; that in the relatively level headwaters area is held by a number of owners, including the timber company.

The Moro Bay Site

The Moro Bay Site comprises some 600 acres of fairly level land in the 100-year flood plain. As Map No. 27 shows, this parcel lies between the Pigeon Hills on the south and the river on the north. Pigeon Hill Landing, at Mile

270.4, would appear to be a likely location for a wharf, located as it is close to Arkansas Highway 15 and on the outside of a bend in the river. The industrial park area would need protection by a levee, which for a considerable part of its length would not need to be very high. Although the land varies from about 80 to 90 feet in elevation, the three 91-foot benchmarks on the right bank of the river suggest the existence of a natural levee or second bank. The 100-year flood level would appear to be about 93.5 feet in the vicinity of these benchmarks. A possible locus of a levee is shown as a broken line on the map. The area is served by Arkansas highways 15 and 275. The former crosses the river on a bridge that has replaced the ferry shown on the map. Thus, industry at this site could conveniently tap natural resources and reach markets on both sides of the river. The site is about 18 straight-line miles from rail (at El Dorado). It appears that the holdings of fourteen owners would be involved, in whole or in part, in the suggested Moro Bay Site.

Recommendations

The most promising sites for an industrial park on the Ouachita River in Arkansas appear to be Cullendale, Millers Bluff and Frenchport. Any one of these can be connected to rail and highway, apparently at acceptable cost, and each is flood free or can be made so, probably at reasonable cost. The foundation conditions appear to be at least satisfactory. Each comprises a sizable and reasonably compact acreage practically free of incompatible developments and has a good location close to an outside bend of the river. In two instances, most of the land is held by one owner, at Cullendale there are just ten owners that would be involved in a development encompassing some 900 acres of suburban land. The most promising site for truck-barge transfer and associated warehousing, other than the existing ports at Camden and Crossett, is at Calion, which is some 11 to 12 miles from the industrial district east of El Dorado, mostly via U.S. Highway No. 167. It should be kept in mind that these opinions are based on a rather limited study. Having entered this caveat, the investigators recommend that these sites be given serious consideration and further study. More information is needed, particularly on topography and foundation conditions.

Our information relating to foundation conditions has been limited to the 1973 *Soil Survey* for Ouachita County. The comparable survey for Union County has not yet been published, but the mapping has been completed and the maps may be consulted at the office of the Natural Resource Conservation Service in Camden, Arkansas. The soil survey maps are valuable but the surveys do not go very deep. In the Ouachita County *Soil Survey* the soil profiles typically go down no more than 72 inches below the surface, the greatest depth

being 80 inches. Also, soil variations that involve small areas are not ordinarily mapped. Thus it may be desirable to have some field work done on foundation conditions before the site selection process goes very much further.

An interesting future location for navigation-related industry is the Moro Bay Site. Although a rail connection does not appear to be feasible, industry here could reach both sides of the river by road. Resources in the surrounding area include wood, sand and gravel, clays, and oil and gas. And, given a levee, some 600 acres of almost level land could be made available for industrial use.

We also recommend that some state or regional agency look into the possibility of obtaining regional water rights in the Ouachita River for industrial use. There are a number of reservoirs in the Ouachita drainage basin that could be used to maintain specified minimum flows in the river, say, at Camden. There would be questions of costs and of how these would be shared. The working out of an arrangement might take many years, but the existence of such an arrangement, or even the reasonable prospect of one, could help reassure present water users and industrial prospects about long-term water supply.

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Table 1. Volume and average annual removals of growing stock and sawtimber on timberland for twelve southwest Arkansas counties.

	Volume, 1995		Average annual removals, 1988-1995	
	Million Cubic Feet	*Million Board Feet*	*Million Cubic Feet*	*Million Board Feet*
County	**Growing Stock**	**Sawtimber**	**Growing Stock**	**Sawtimber**
Ashley	474.5	2210.3	34.6	164.4
Bradley	511.2	2329.2	28.7	126.9
Calhoun	454.8	1741.0	25.9	99.6
Clark	564.2	2362.1	20.0	78.5
Cleveland	549.7	2438.1	28.9	129.4
Columbia	562.6	2253.7	34.5	130.9
Dallas	520.7	2197.6	25.3	101.0
Grant	526.7	1947.8	24.5	78.2
Hot Spring	314.4	851.6	12.4	50.4
Nevada	426.2	1804.9	27.7	107.9
Ouachita	600.0	2494.7	25.0	116.0
Union	901.5	3842.2	41.3	187.4

Source: *Forest Statistics for Southwest Arkansas Counties*--1995, U.S. Department of Agriculture, Forest Service, Southern Research Station, New Orleans, Louisiana, September 1995.

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