Lafayette (Teays) Bedrock Valley
Ohio State Line to Geneva

Ground-water conditions are generally good to excellent in many parts of this segment of the Lafayette (Teays) Bedrock Valley. Both an intermediate level and a basal sand and gravel aquifer are present within and above the bedrock valley. The intermediate zone, which occurs at a depth of about 100 to 150 feet, appears in most areas to offer the greater potential for obtaining wells yielding 500 to 1,000 gallons per minute (gpm).

Wells drilled into the valley can generally be expected to encounter an upper zone of till, silt, or clay for the first 100 to 150 feet of drilling before encountering the thicker sand and gravel aquifers. Locally, near Geneva, thick deposits of sand are found in the deeper portions of the valley with gravel being a minor component of the valley fill.

Near the Ohio-Indiana state line, as can be seen from Cross-Section A-A' (Plate 1, Figure 7), the valley is quite narrow with the deeper portion less than one mile in width. In Test Hole (T.H.) #15 (Figure 6), a particularly coarse zone of sand and gravel is present at a depth from about 107 to 155 feet. Less important sand and gravel aquifers are found at various points below this level to a depth of slightly over 300 feet. The bedrock is encountered at a depth of 323 feet, or elevation 492 feet mean sea level (msl). From this point near the state line, the Lafayette (Teays) Bedrock Valley turns southwest toward Berne (Figures 1 and 2) where it is joined by a prominent tributary valley leading south from the Town of Monroe. The tributary valley extends to Decatur and has been called the Decatur Valley in some discussions.

The valley broadens near the point of juncture with the tributary and increases beyond the typical width of one mile. In this area the valley contains locally thick deposits of sand or sand and gravel (Cross-Section B-B') (Plate 1, Figure 8). East of Berne where the well fields for the cities of Decatur and Berne are located, (and to the southwest at Geneva) an excellent sand and gravel aquifer is encountered at a depth beginning at about 100 feet below land surface. Wells in the Decatur field encountered a zone of very course gravel and boulders that created very difficult drilling conditions and, for this reason, the wells were terminated at a depth of about 150 feet, even though usable sand and gravel formation was present to a depth of about 180 feet. The wells reportedly are capable of yielding 1500 gpm or more each. In T.H. #19, (Figures 6 and 8) a sand and gravel zone beginning at a depth of about 175 to 180 feet, and a basal sand and gravel within the deeper part of the bedrock valley, appears to have the capability to yield larger volumes of water, although the effects of barrier boundaries (such as bedrock valley walls) and the availability of recharge could alter the usability on a long-term basis.

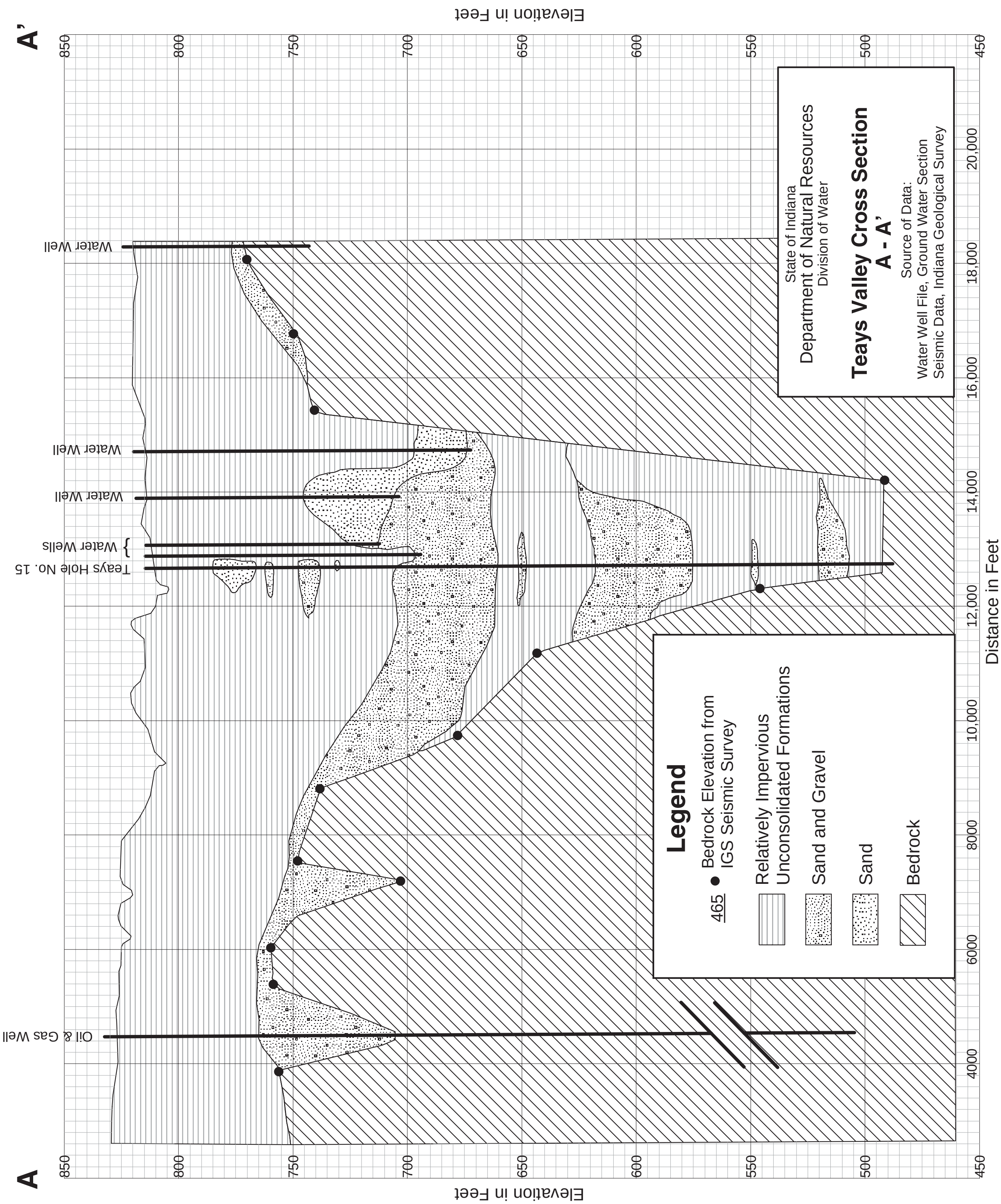
The valley takes a southwesterly path (Figures 1 and 2) from its juncture with the tributary valley, proceeding to a point about two miles southwest of Geneva where it begins trending westward into Jay County. In the Geneva area a thick deposit of sand, containing some gravel, locally fills the deeper portions of the valley; however, the potential of this zone does not appear to be as good as the aquifer occurring at a depth of 100 feet and greater.

Lafayette (Teays) Bedrock Valley
Geneva to Balbec

Water well data and other information concerning the materials filling the bedrock valley in this portion of the state are limited. However, it appears that moderately good prospects exist for the development of wells yielding 500 gpm or more. A basal sand and gravel unit is present in many places that has a reported composite thickness that approaches 100 feet of sand, and sand and gravel that includes some thin clay layers. An intermediate aquifer generally occurs at depths of 180 to 200 feet is encountered in T.H. #14 (Figure 6). Locally, shallower zones appear to offer reasonable prospects for the development of moderate (100 to 300 gpm) capacity wells.

The intermediate zone appears to offer the greatest potential for the development of wells capable of meeting the needs of most municipal, industrial, or irrigation users. In T.H. #14 (Cross-Section C-C') (Plate 1, Figure 9), the intermediate zone extends from about 195 to 270 feet, with a basal sand and gravel occurring at a depth from about 310 to 390 feet. Near the small community of Balbec, a well drilled for oil and gas encountered four prospective sand and gravel zones within the bedrock valley at depths of 50, 90, 180 and 380 feet. These potential aquifers vary from 15 to 50 feet in thickness.

Again, although prospects appear reasonably good in some parts of this segment of the valley, little data are available on the composition of the fill materials, and therefore the nature and the potential of the aquifers remains largely a matter of specula-



A
A’
Elevation in Feet
Distance in Feet
Oil & Gas Well
Teays Hole No. 15
Water Wells
Water Well
Water Well
Water Well
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
A - A’
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 7

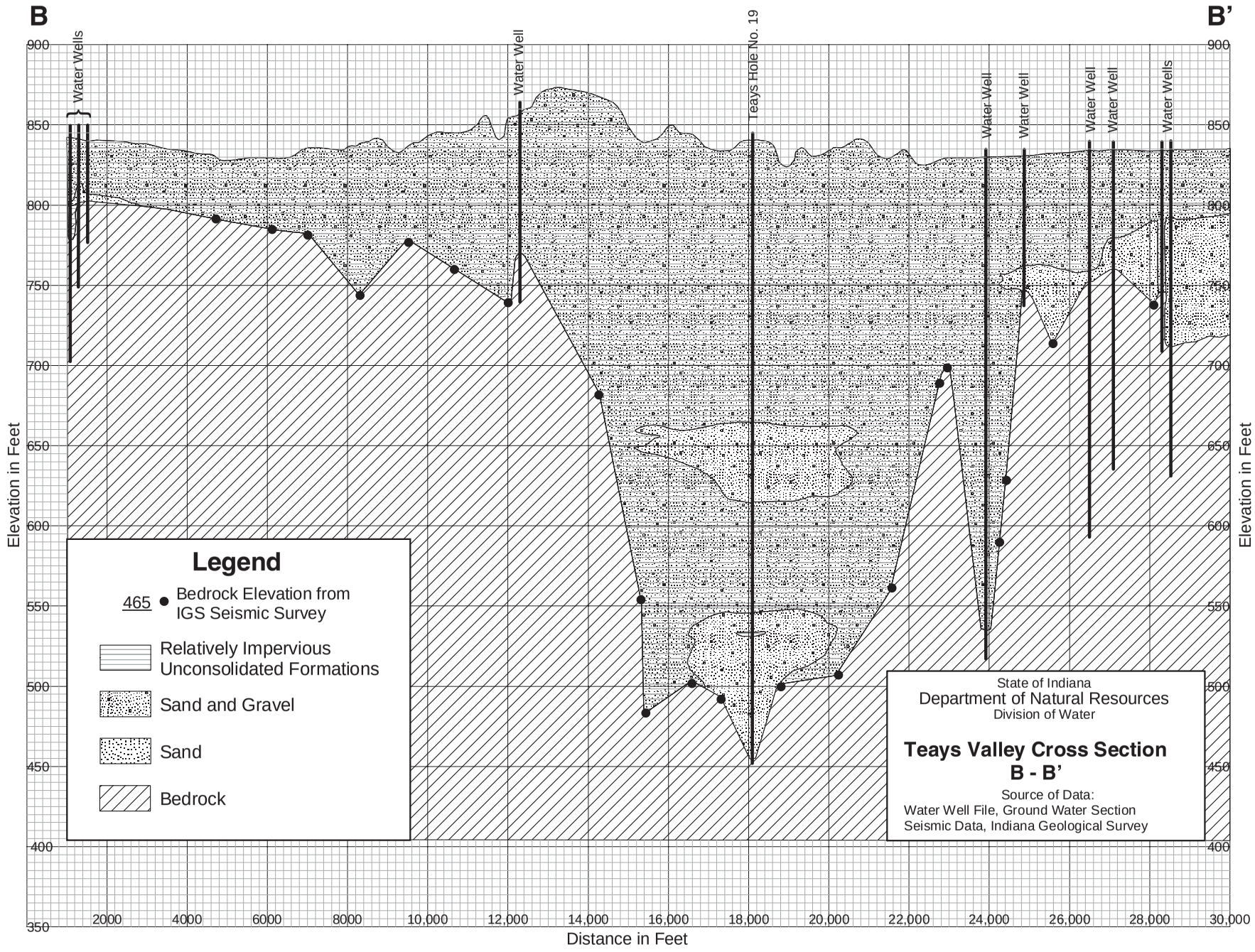

B
B'
Water Wells
Water Well
Teays Hole No. 19
Water Well
Water Well
Water Well
Water Well
Water Wells
900
850
800
750
700
650
600
550
500
450
400
350
Elevation in Feet
2000
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
Distance in Feet
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
B - B'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 8

tion. Poor aquifer conditions were encountered in the drilling of T.H. #18 (Appendix A) at the Blackford-Jay County line with only a thick fine sand being encountered, and a well drilled at a nearby farm did not encounter any water-bearing materials to a depth of 339 feet.

Lafayette (Teays) Bedrock Valley
Balbec to Jadden

Ground-water availability is highly variable in this segment of the bedrock valley, ranging from little or no potential for the development of appreciable amounts of water (250 gpm +), to areas where excellent development prospects are present. In general, available information is so limited for this segment of the valley regarding the valley fill materials that any comments on the water-bearing capabilities are at best speculative.

In the eastern part of this segment of the valley, near the Blackford-Jay County line, the prospect for the presence of significant aquifers appears to be quite limited, with some portions of the valley being filled with till and thick deposits of silt or fine sandy materials. As shown in T.H. #18 (Figure 6), only a few thin streaks of sand and gravel are noted in the upper portions of the materials filling the valley, with fine-grained silt, clays, and till comprising the upper 240 feet of this hole. From a depth of 240 feet downward to the bedrock surface at a depth of 390 feet (elevation 465 feet msl), only local zones of sand and gravel occur in the thick sand section.

North of Hartford City conditions are substantially better than in the area of T.H. #18. In T. H. #13 (Figure 6) large amounts of sand and gravel are present in two separate major aquifer zones. As can be seen from Cross-Section D-D' (Plate 1, Figure 10) a thick sand and gravel zone occurs at a depth of 85 to 200 feet, with a second zone (basal) occurring from 370 to 420 feet. Bedrock is present at a depth of 422 feet, or elevation 463 msl. Either of these aquifer zones should be more than capable of supplying 1,000 gpm or more to properly designed wells.

This segment of the valley, as with the areas to the east, is overlain by till and in places by units of silt and lacustrine clay. In T.H. #13 reddish-brown clay was noted at several intervals beginning at about 220 feet. This clay is usually a significant diagnostic unit within the valley and denotes a major change in the depositional environment of the fill materials. In many cases this reddish clay marks the point below which sand and gravel become a minor component of the materials filling the deeper portions of the valley.

Northwest of Hartford City, near the small community of Jadden, a basal sand and gravel aquifer is present in the valley at a depth from about 390 to 430 feet (T.H. #17, Appendix A); however, it is expected that recharge to this aquifer would be limited and it is doubtful that conditions would be favorable for the development of wells of any particular sustained capability. This basal sand and gravel unit is noted in several of the test wells drilled during the study. No other zones of water-bearing significance are recorded in T.H. #17, drilled at the Blackford-Grant County line (Figure 6).

Elsewhere in this segment of the bedrock valley, units of sand and gravel are present above the main portion of the valley-fill materials, which would appear to offer reasonable prospects for the location of wells yielding moderate amounts of water, generally less than 500 gpm. A basal sand and gravel is present in many places, but because of the apparent lack of continuity of this formation and limitations in recharge, it is doubtful that this aquifer would offer significant potential for ground water development except as previously noted in the areas north of Hartford City near T.H. #13 (Appendix A). In general the prospects for encountering aquifers with the capability of meeting the needs of wells supplying 500 gpm or more is uncertain in this section of the bedrock valley.

Lafayette (Teays) Bedrock Valley
Jadden to La Fontaine

This segment of the valley appears to have only fair to moderately good prospects for the development of wells yielding 500 gpm or more. An extensive but shallow aquifer system overlies much of the valley in this portion of the state. Depths to the top of this aquifer vary from 60 to 120 feet; and typical aquifer thicknesses range from 20 to 50 feet. Locally, as much as 100 feet of sand and fine gravel are present.

As can be seen from Cross-Section E-E' (Plate 1, Figure 11) the flank areas of the bedrock valley are appreciably wider than in the sections to the east; however, the central deeper part of the valley remains, as elsewhere, a mile or less in width.

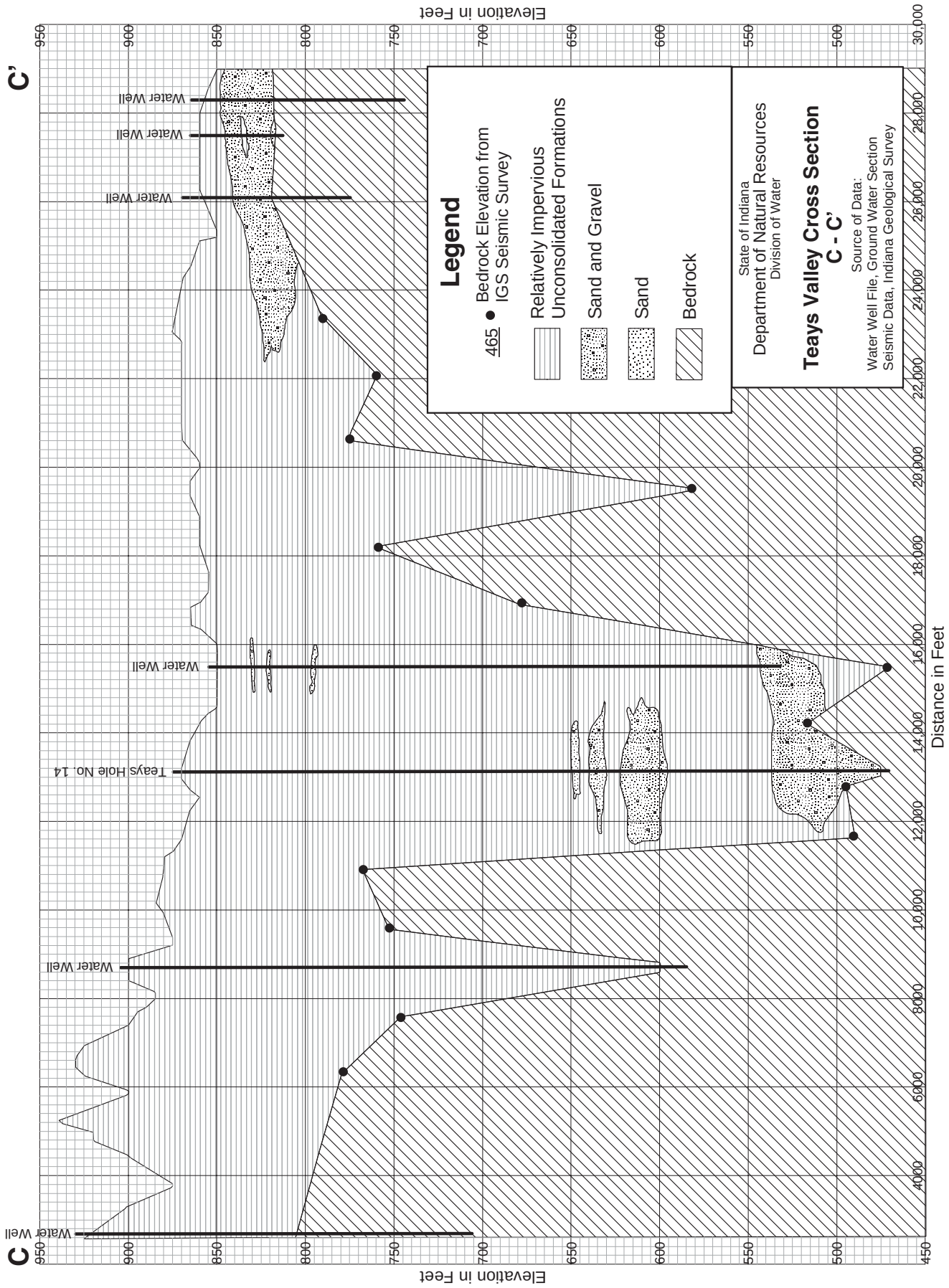

C
C'
Elevation in Feet
Distance in Feet
Legend
Bedrock Elevation from IGS Seismic Survey
465
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
C - C'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey
Water Well
Teays Hole No. 14

Figure 9

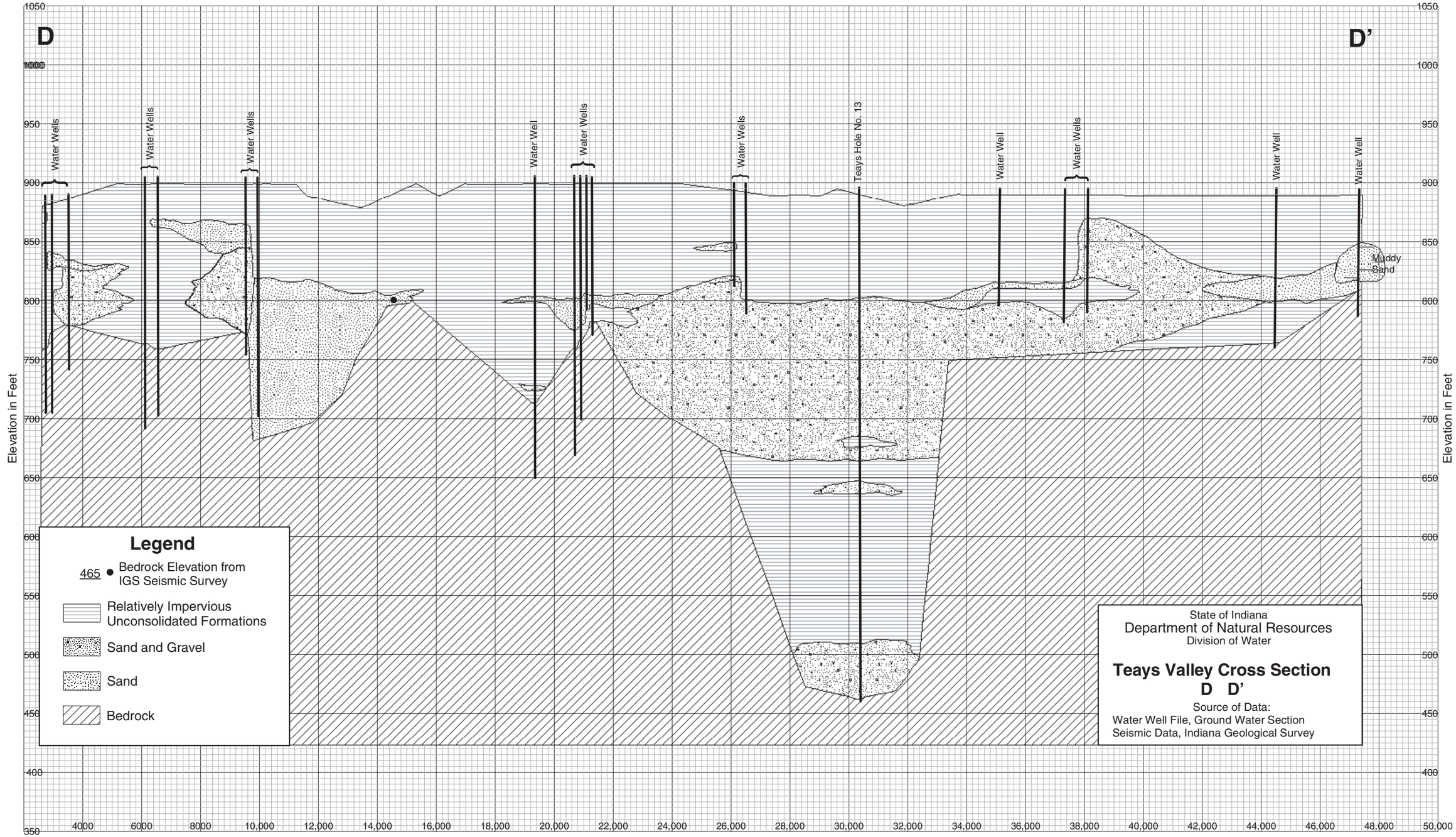

D
D'
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
Water Wells
Water Wells
Water Wells
Water Well
Water Wells
Water Wells
Teays Hole No. 13
Water Well
Water Wells
Water Well
Water Well
Muddy Sand
Elevation in Feet
Elevation in Feet
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
D D'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
38,000
40,000
42,000
44,000
46,000
48,000
50,000
Distance in Feet

Figure 10

A basal sand and gravel is present in a number of places in the deepest part of this segment of the valley; however, this aquifer lacks continuity and is capped by considerable thicknesses of overlying till, clay, and silt units. For these reasons this system would probably not support any significant level of pumpage.

In the area of Marion's "Northeast" well field, the shallow aquifer, as described earlier, merges with the basal aquifer to form the greatest known thickness of sand and gravel in the Marion area. Sand and gravel having saturated thicknesses or 100 feet or greater are present in a small area. Similar thicknesses also occur in the NE SE, of Section 27, T. 25N, R. 8E (northwest of the intersection of County Roads 200N and 400E). The potential for thicker deposits of sand and gravel appears to be greatest over the flanks of the valley, rather than in the main part of the valley where the deposits of glacial drift are in excess of 400 feet thick. In T.H. #11 and T.H. #12 (Figure 6), which terminated at 426 (470 feet msl) and 405 feet (460 feet msl) respectively, an appreciable amount of the brownish-red clay was encountered within the main bedrock valley. In these test wells both the shallow aquifer and basal sand and gravel units are present; however, neither appears to offer significant ground-water development potential (Appendix A).

In the La Fontaine area a thick "dirty sand" was recorded in many places, and it may be associated with the extensive shallow aquifer that is present in much of this segment of the valley, and from which La Fontaine obtains its water supply. According to N.K. Bleuer (oral communication, 1986), the shallow deposit of sand and gravel occurs below the base of the Wisconsinan till which overlies the valley in this area. The new "North Well Field" for the city of Marion is located in the aquifer along the Grant-Wabash County line (Figure 2 and Plate 1).

In the vicinity of the old Marion well field, in downtown Marion near the Mississinewa River, reasonably thick sand and gravel units are present in the NW SW of Section 5, T. 24N, R. 8E (southeast of the intersection of State Roads 15 and 18). Wells in this unit reach a depth of about 150 feet, with saturated thicknesses of 70 feet or more reported in some exploratory holes. This aquifer is apparently associated with a small tributary valley that runs parallel to, but that is separated by a low bedrock divide from, the main tributary bedrock valley in which the "Northeast" well field is located. The tributary valleys coalesce northeast of Marion and join the main Lafayette (Teays) Bedrock Valley in the vicinity of Section 27, T. 25N, R. 8E (northeast of the intersection of County Roads 200N and 300E)(Figure 2).

Lafayette (Teays) Bedrock Valley
La Fontaine to Richvalley Areas

This portion of the Lafayette (Teays) Bedrock Valley appears to offer only poor to moderate prospects for development of wells yielding 500 gpm or more. In some areas ground water is available in such limited quantities that it has been a problem to secure enough water for even residential use.

Locally, shallow zones of sand and gravel (50 to 100 feet in depth), positioned over and adjacent to the deeper part of the valley appear to offer moderate prospects for the development of wells yielding in the range of 300 to 500 gpm each. However, the materials filling the main part of the bedrock valley do not appear to offer favorable prospects for the occurrence of significant deposits (15 feet or greater) of sand and gravel. In several places, the valley contains a thick deposit of brown silty clay. Generally, significant water-bearing sand and gravel deposits are not found below this brown silty clay.

As may be noted from Cross-Section F-F' (Plate 1, Figure 12), an upper sand and gravel is present in places, and locally attains moderate thickness. In T.H. #10 a sandy, fine- to medium-grained gravel containing clay layers is present from approximately 55 to 110 feet in depth. No significant deposits of sand and gravel are present below that point until a depth of about 290 feet, where forty feet of silty sand and gravel is encountered. In this segment, the valley broadens slightly (Cross-Section F-F') indicating a possible change in the bedrock lithology. From one valley wall to the other, the valley approaches a width of about three miles; however, the main deep part of the valley remains about one mile in width, as it does in much of the valley to the east.

Southeast of the City of Wabash, a narrow northeast to southwest trending tributary valley is present (Figure 2 and Plate 1) that contains, in places, moderately thick deposits of water-bearing sand and gravel. It is within this valley that the old city wells for Wabash were first drilled. However, over the years additional water was required by the city, and a new well field was developed about three miles southwest of Wabash in a second tributary valley leading to the Teays. This tributary valley runs parallel to, but west of, the tributary valley in which the old city wells were located. This short tributary valley contains an excellent sand and gravel aquifer, which in places is in excess of 100 feet in thickness. Wells in this aquifer are rated at greater than 1,000 gpm each. This "Smith Well Field" tributary valley enters the Lafayette (Teays) Bedrock Valley in Section 33, T. 27N, R. 6E (northwest of the intersection of County Road 400W and State Road 124), approximately 3 miles south of Wabash.

Exclusive of the localized conditions outlined above, ground-water prospects within the main Lafayette (Teays) Bedrock Valley from La Fontaine to Richvalley are expected to be only marginal at best for the development of significant supplies of ground water. Although only a limited amount of data are available for this segment of the valley, the potential for an intermediate level aquifer and a consistent basal sand and gravel aquifer does not appear promising. The upper level aquifer, when present in thicknesses of fifteen feet or more, may yield in the range of from 300 to 500 gpm to properly constructed wells.

Lafayette (Teays) Bedrock Valley
Richvalley Area to U.S. 31 Near Peru

This portion of the Lafayette (Teays) Bedrock Valley exhibits some of the greatest potential for the development of ground water of any segment in the state. The intersection of the present day Wabash River valley with the buried bedrock valley has resulted in a noticeable broadening of the Wabash River topographic valley and in the deposition of large amounts of sand and gravel. In places these outwash sand and gravel deposits extend from near the surface to depths approaching 200 feet. While locally these materials may contain clay layers, zones of till, silt, and cemented deposits of broken stone, cobbles, and gravel, the probability of encountering an aquifer exceeding 40 feet in thickness is excellent. This segment of the valley is oriented in an east to west direction, departing from the northwesterly trend, which had prevailed from the Jadden, Marion, La Fontaine to Richvalley area (Figure 2). The valley is much wider than to the east, and in this segment widths up to two miles prevail, as compared to a width of less than one mile in most other areas.

Well yields in the range of 500 to 1,000 gpm or greater can be expected for properly constructed wells for much of this segment of the bedrock valley. Peru obtains its water supply from wells completed in outwash sand and gravel deposits which are positioned above the Lafayette (Teays) Bedrock Valley. The old city wells were about 110 to 115 feet in depth and yielded in the range of 1,200 to 1,500 gpm. New wells drilled at the north edge of Peru on the south side of the bedrock valley are capable of yielding 2,000 gpm each. These wells, 136 feet and 157 feet in depth, are two of the most productive wells tapping the valley aquifer.

Layers of cemented gravel, broken limestone and cobbles are common in the valley segment near Peru, and these deposits have led in some instances to the completion of wells at a shallower depth rather than risking the loss of equipment or broken casing in attempting to drill deeper into the cobbley deposits. Available data including T. H. #16 (Figure 6 and Appendix A) and test wells drilled for Peru at the new well field confirm the presence of sand and gravel at depth below these zones, and the potential of these deeper sand and gravels in the Lafayette (Teays) Bedrock Valley should not be excluded. In Cross-Section G-G' (Plate 1, Figure 13) the character and variation in fill materials in the valley can be seen.

Northeast of the community of Richvalley a narrow northeast to southwest trending tributary valley contains deposits of sand and gravel that locally approach 100 feet in thickness. It is questionable whether these narrow deposits would have much potential as a significant water supply source; however, the area is noted for future examination and possible test drilling.

Throughout much of the Richvalley to Peru segment of the valley, sand and gravel is the major component of the materials overlying and filling the deeper portions of the valley, and deposits of till do not cover these materials as they do to the east. However, in the extreme western portion of the area, the bedrock valley departs from its parallel course with the Wabash River valley, and takes a more northwesterly trend. In that area a thick sequence of till, silt, and clay overlies the sand and gravel aquifers contained within the valley. Land surface elevations above the valley also increase as the buried valley trends northwestward away from the present day Wabash River valley and into the hilly area that lies to the north. The total thickness of materials filling the valley increases dramatically, changing from 200 feet or less near Peru, to over 325 feet to the northwest in the higher ground. A notable change in aquifer conditions also occurs in the bedrock valley near U.S. 31. A substantial drop in ground-water potential occurs as the sand and gravel becomes confined between layers of glacial till and other fine-grained deposits. While reasonably thick units of sand and gravel are present beneath the clay cover, these confined aquifers are less easily recharged and are thinner than the more productive water table aquifer found between Peru and Richvalley. The confined aquifers to the north of the Wabash valley can generally be expected to yield less than 500 gpm to properly constructed wells.

Lafayette (Teays) Bedrock Valley
U.S. 31 near Peru to Logansport (S.R. 17)

This segment of the Lafayette (Teays) Bedrock Valley offers generally good to excellent prospects for the development of wells having the capability of yielding 500 gpm or greater. In the area near U.S. 31, till comprises a major part of the overlying valley fill materials. Aquifers within and above the valley have a lesser capability as noted earlier, as compared to the mid-

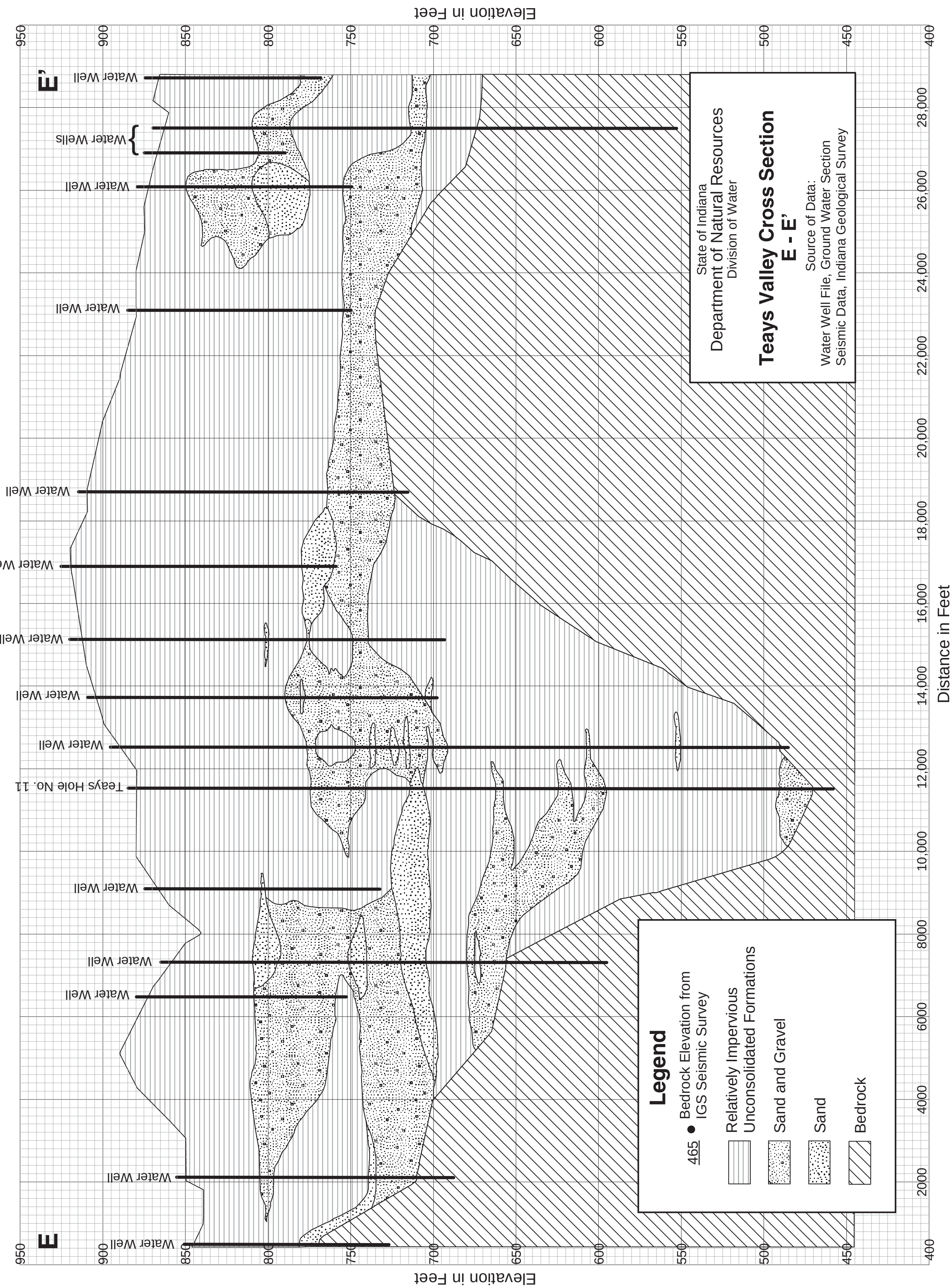

E
E'
Elevation in Feet
Distance in Feet
Water Well
Water Wells
Teays Hole No. 11
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
E - E'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
950
900
850
800
750
700
650
600
550
500
450
400
2000
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000

Figure 11

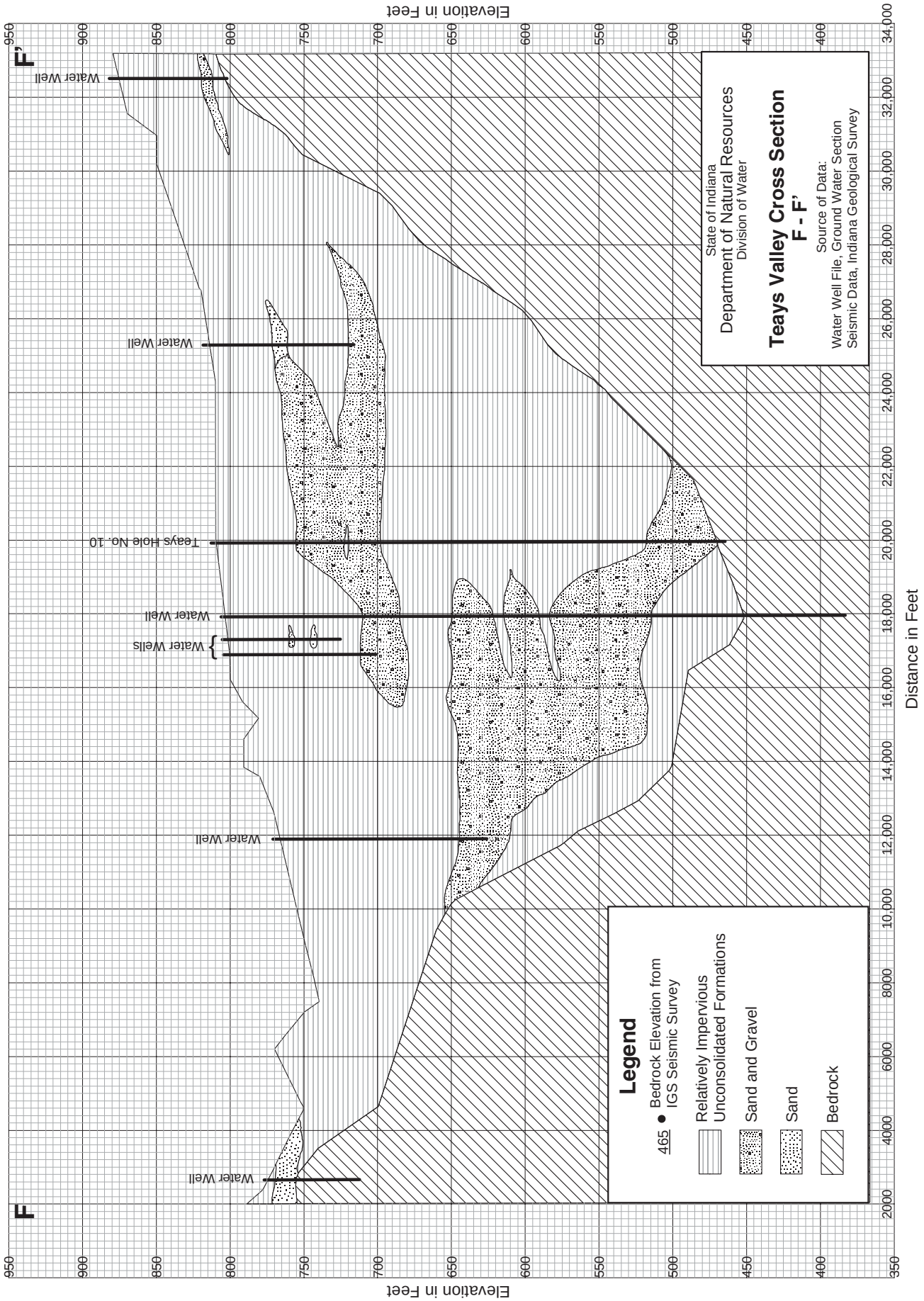

Elevation in Feet
Distance in Feet
F
F'
Water Well
Water Wells
Teays Hole No. 10
Legend
Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
F - F'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 12

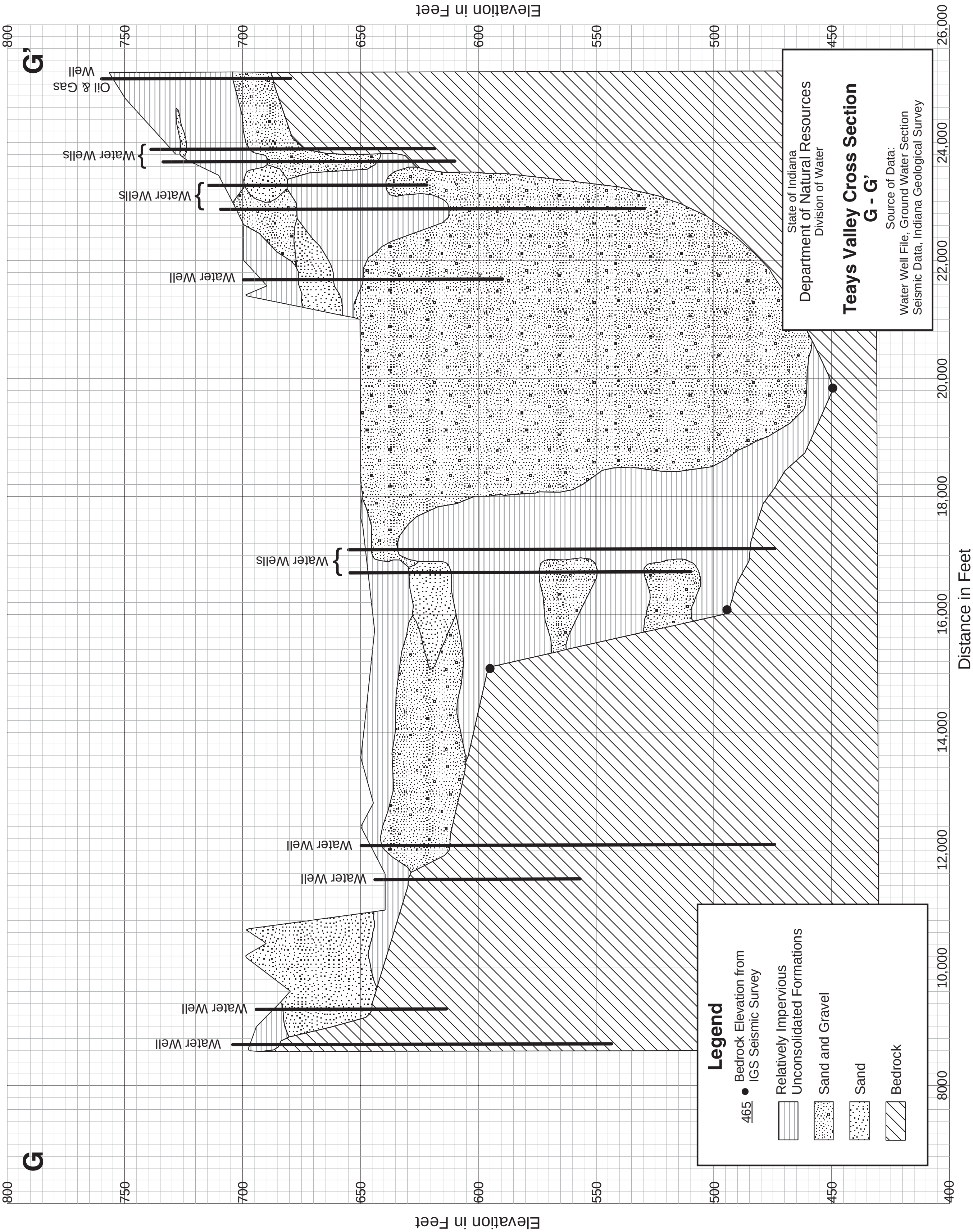

G
G'
Elevation in Feet
Distance in Feet
800
750
700
650
600
550
500
450
400
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
Water Well
Water Well
Water Well
Water Well
Water Wells
Water Well
Water Wells
Water Wells
Oil & Gas Well
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
G - G'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 13

dle portion of this segment where the valley underlies the present-day Eel River, or to the west where a basal and intermediate sand and gravel aquifer are present.

The configuration of the topography of the valley throughout this area is substantially different from the canyon-like conditions, which prevailed further to the east. The upland areas and valley flanks are more subdued in character, and changes in elevation are less precipitous at the edge of the valley. The elevation of the valley bottom is less than 450 feet msl in the deepest part, and the valley is generally about one and one-half miles in width, with wider areas at the intersections with major tributary valleys (Cross-Section H-H', Plate 1, and Figure 14).

In the eastern portion of this segment of the valley, a very rocky, possibly cemented sand and gravel, is present in the T.H. #9 (Figure 6 and Appendix A) at a depth from 277 to 305 feet. This zone occurs only a short distance above the bedrock surface that is encountered at a depth of 324 feet. Another sand and gravel zone separated by about 10 feet of clay overlies this zone, and occurs at depth from 211 to 267 feet. A third potential aquifer was noted in T.H. #9 from about 116 to 149 feet in depth. Westward in the Eel River valley an intermediate level aquifer occurs at a depth from 75 to 100 feet below ground level, extending downward to a depth of about 150 feet. Also, a near-surface deposit of outwash sand and gravel is present in the Eel River valley to a depth of about 50 feet. The materials filling the deeper portions of the valley contain few zones of water-bearing sand and gravel. A reddish-brown clay similar to that noted in the Marion area is the primary material filling the lower part of the valley. This clay denotes the blockage of the valley during the early part of the glacial period (N.K. Bleuer, oral communication, 1984).

The bedrock valley is coincident with the present day Eel River valley for several miles before it departs to the west and is buried again beneath a thick cover of till northeast of Logansport. In that area, and for one to two miles to the west, no significant deposits of sand and gravel were noted in test wells drilled by the U.S. Geological Survey (USGS) in a 1976 study (Gillies, 1981). Further west, a 50- to 60- foot thick sand and gravel deposit is present in the deeper parts of the valley, along with scattered thinner aquifers at shallower depths. These zones were noted in USGS test wells #93, #94, #95, and #137 (Figure 6). Near highway S.R. 17, north of Logansport, the deeper materials filling the bedrock valley become finer, and more clay-rich deposits replace the coarser sand and gravel deposits noted to the east. In a tributary valley in the SW, NW, of Section 35, T.28N, R.2E (northeast of the intersection of County Roads 500E and 440 N), an exceptionally thick section of sand and gravel is encountered in USGS test hole #137, marking this area as one that bears further ground-water evaluation.

In general, the west-central segment of this part of the bedrock valley appears to offer reasonably good prospects for the siting of wells yielding 500 gpm or more. An intermediate level aquifer is present beneath the Eel River valley and should present good prospects for the development of high-capacity wells.

Lafayette (Teays) Bedrock Valley
Logansport (S.R. 17) to Lake Cicott (U.S. 24)

The direction of the Lafayette (Teays) Bedrock Valley through this segment is generally westward with a slight arcing curve that begins in the section between highways U.S. 31 and S.R. 17 and continues on to the Lake Cicott area near U.S. 24 (Figures 1 and 2). From U.S. 31 to S.R. 17 the valley has a slight southeast to northwest flexure, while westward from S.R. 17 to Lake Cicott the valley is marked by a northeast to southwest trend. Westward from the Lake Cicott area the valley assumes a pronounced southwesterly direction as it approaches the Cass-White county line.

The availability of ground water in this segment of the bedrock valley is generally good with some areas having excellent potential. Three potentially productive zones are present which could yield 500 gpm or more to properly designed wells. These zones are highly variable in thickness and lateral extent, and it is difficult to predict which zone might offer the greatest prospect at any given point for water-supply development. In test hole #121 drilled by the U.S. Geological Survey for the Logansport area ground-water study, all three zones were present in sufficient thickness to merit attention for the development of wells requiring 500 gpm or more. Typically, the upper zone, which occurs from 30 to 60 feet below ground level, contains very coarse sand and gravel and could yield 500 gpm or more to properly constructed large-diameter wells.

The next significant aquifer occurs at a depth of about 100 feet and may exceed 30 feet in thickness. In the areas where the aquifer is of greatest thickness, the yield to a properly constructed well could exceed 1,000 gpm. The final potential zone, a basal sand and gravel, fills the deepest part of the bedrock valley and is by far the most consistent of the three potential zones. However, this aquifer locally contains a number of clay layers, zones of cemented gravel, boulders, and broken limestone, all of which may impact its capability to yield water. In USGS test hole #121, the basal sand and gravel unit from about 208 to 312 feet in depth, represents a potentially excellent source of ground water. Wells completed in this zone should yield in excess of

1,000 gpm. In test well (USGS) #97, which is located slightly over one mile to the south, the basal sand and gravel is fifty feet in thickness and contains scattered clay units and boulder zones that could impact its yield capabilities. The valley through this area is broader than in sections to the east (Cross-Section I-I') (Plate 1, Figure 15. Near the intersection of some of the tributary valleys with the main valley, the width increases to about two miles; however, the deeper part of the valley is generally about one mile in width. Of note in USGS test holes #97 and #108 (copy of drilling log in Appendix A) was the presence of sizeable amounts of wood near the top of the basal sand and gravel unit. Carbon-14 dating placed the age of this organic material at about 21,500 B.P. (N.K. Bleuer, oral communication, 1984), thus indicating that much of the fill material in this part of the valley is of Wisconsinan Age.

Westward in this segment of the bedrock valley, the intermediate level aquifer at about 100 feet depth increases to thicknesses greater than 30 feet and is separated in places by a clay layer which could affect its water development potential. This aquifer locally presents an excellent prospect for the development of wells yielding from 500 to 1,000 gpm. In the area north of Lake Cicott, irrigation wells completed in this aquifer yield in excess of 1,000 gpm.

Lafayette (Teays) Bedrock Valley
Lake Cicott (U.S. 24) to Delphi

Ground water conditions are generally good in much of this segment of the bedrock valley. Both an intermediate and basal sand and gravel aquifer are present in many places in the valley, with the middle zone being the most commonly used. Only a few records are available to substantiate the presence of the basal sand and gravel in this area. However, in T.H. #7 and #8 (Figure 6 and Appendix A) the basal zone is 48 and 70 feet in thickness, respectively. The presence of a basal sand and gravel unit in this part of the bedrock valley is consistent with its occurrence to the east, beginning northeast of Logansport near the Eel River.

Wells drilled in the area underlain by the valley generally encounter a near-surface sand and gravel along with a brown sandy clay. Till or other fine-grained deposits comprise the major component of the fill materials within the valley with "intra-till" sand and gravel units beginning at a depth of about 50 to 100 feet. Most of the sand and gravel zones encountered are in the range of 10 to 20 feet thick. Locally some irrigation wells are completed at depths of about 130 to 150 feet and obtain water from the thicker "intra-till" sand and gravel aquifers. The basal sand and gravel aquifer in T.H. #7 and #8 lies at a depth of about 190 and 180 feet, respectively. The basal zone extends downward to the bedrock surface, with thin layers of clay contained within it. It would appear that this zone has the potential for development of larger volumes of water (500 to 1000 gpm). As can be seen from Cross-Section J-J' (Plate 1, Figure 16), both the intermediate aquifer and basal unit are present in the profile. Unlike the portion of the valley to the east where the valley walls are clearly defined and there is a pronounced change in elevation, the position of the valley in this section is indistinct.

The position of the main thalwag of the bedrock valley is not well documented in this section (Plate 1). The classically-accepted route of the valley is from Lake Cicott southwestward toward Delphi; but a case could be made for a more westerly direction from Lake Cicott into the Monticello area and down a well-defined valley leading southward from Monticello. Major tributary valleys enter the Monticello area from the northeast, and a significant buried valley is present beneath Monticello; however, they do not explain the size and maturity of the valley south of Monticello. From Lake Cicott westward a poorly defined trough in the bedrock surface may actually be the main course of the valley. Because data on the bedrock surface west of Lake Cicott to Monticello are limited, no definitive information is available to prove or disprove the possibility of a westerly direction to the Lafayette (Teays) Bedrock Valley.

The presence of the more easily eroded New Albany Shale may be a major factor in the lack of a clearly defined bedrock valley in this section.

Lafayette (Teays) Bedrock Valley
Delphi to I-65 at Lafayette

The Lafayette (Teays) Bedrock Valley is subdued and indistinct in this part of the state and continues the diffused condition that was present in the area between Lake Cicott and Delphi. The valley typically spans a distance of several miles from wall to valley wall.

The availability of ground water is generally good to excellent in this segment of the valley. In most areas, properly constructed large-diameter wells should be capable of yielding 500 gpm or more. However, localized areas exist where the "intra-

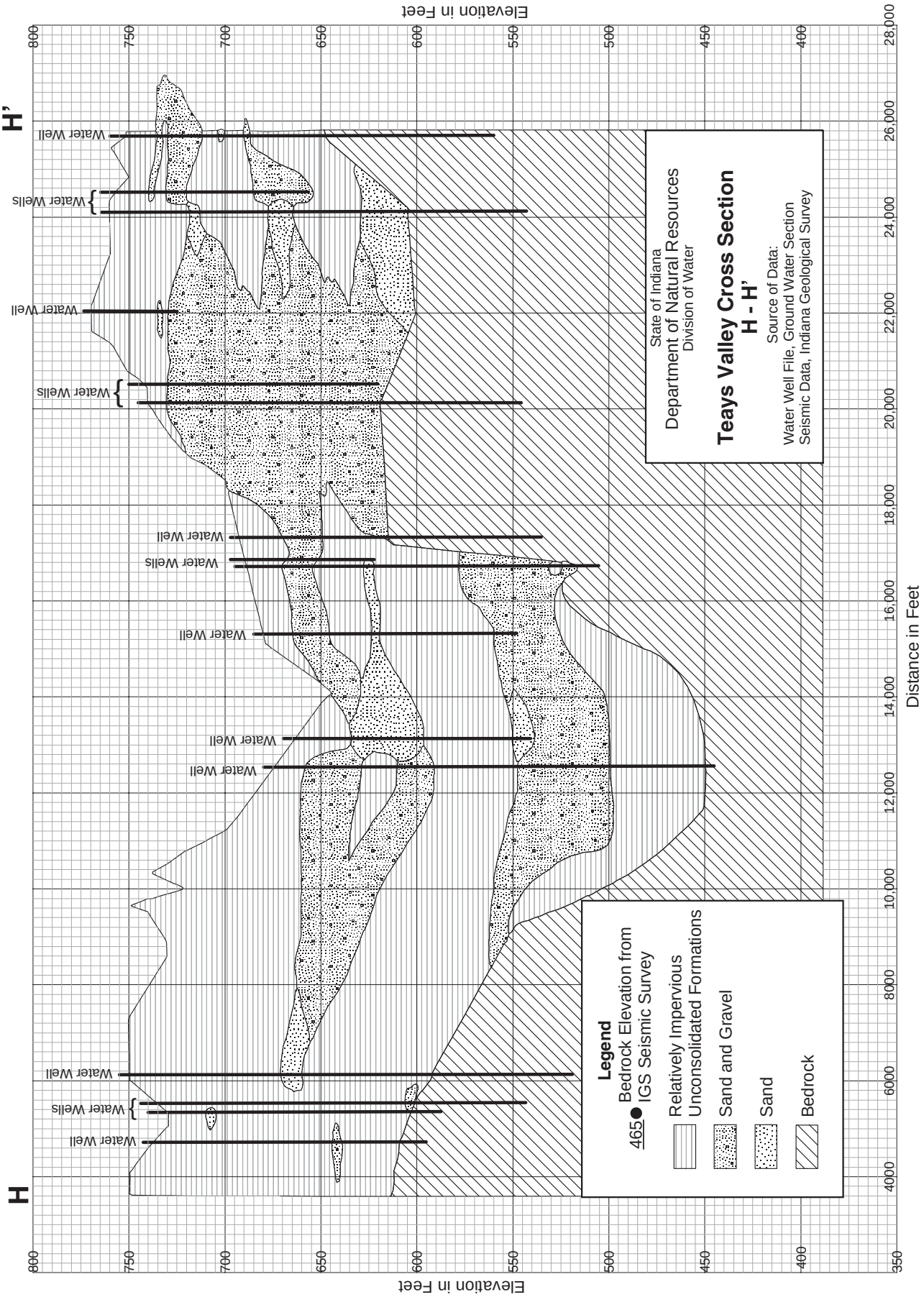

H
H'
Elevation in Feet
Distance in Feet
Legend
Bedrock Elevation from
465 IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
H - H'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey
Water Well
Water Wells

Figure 14

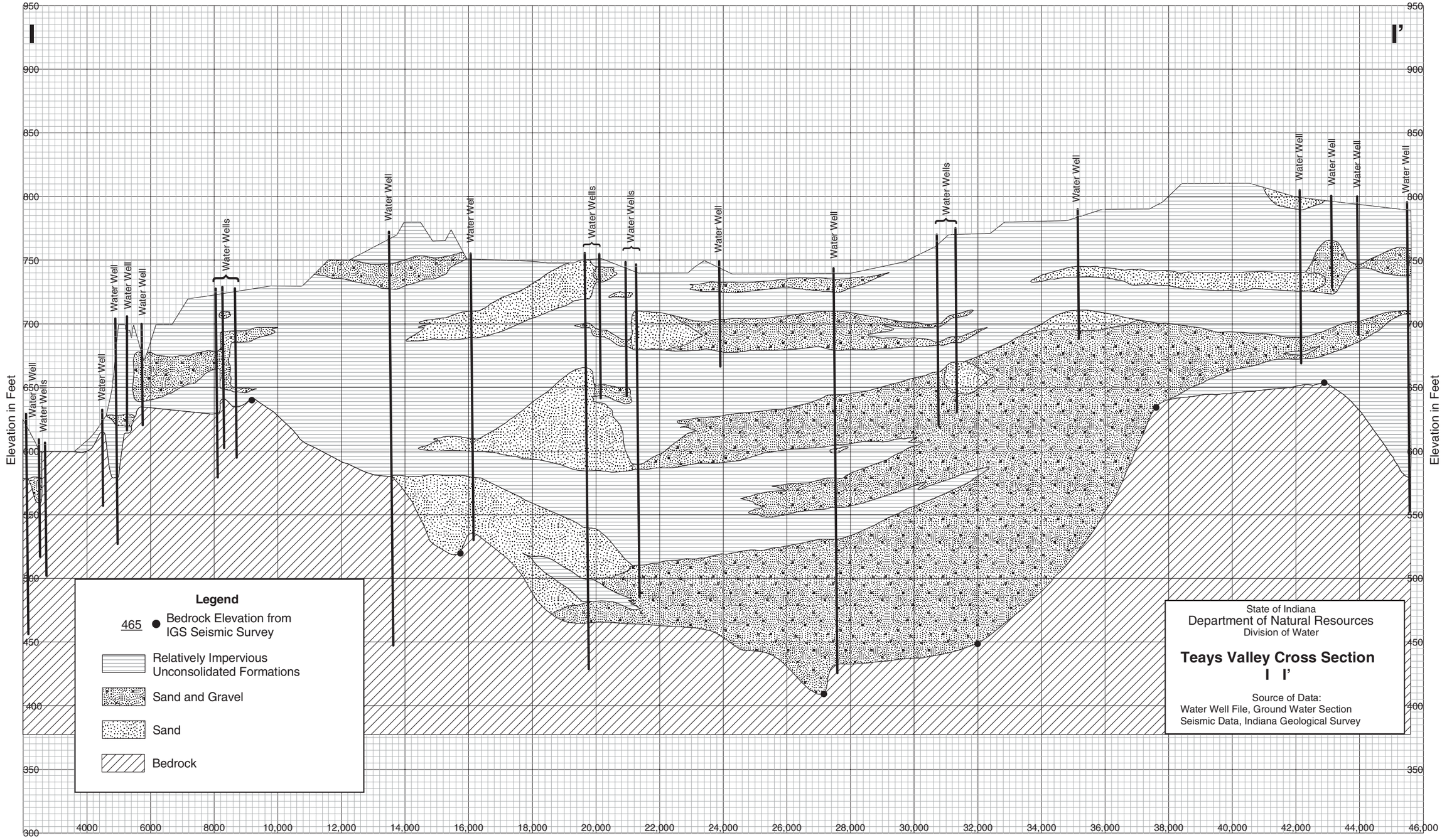
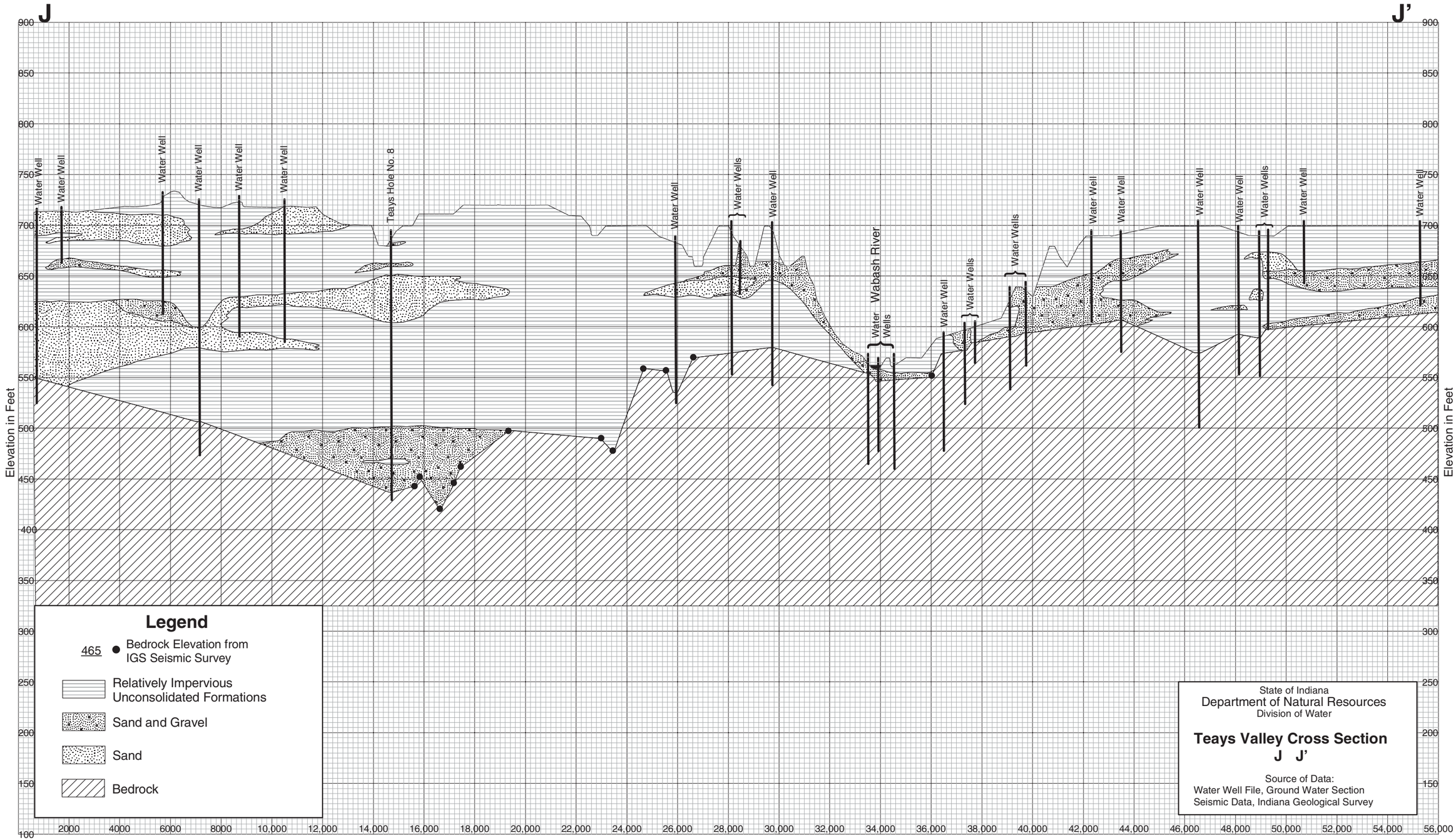

I
I'
Elevation in Feet
Distance in Feet
950
900
850
800
750
700
650
600
550
500
450
400
350
300
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
38,000
40,000
42,000
44,000
46,000
Water Well
Water Wells
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
I I'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 15



Distance in Feet

Figure 16

till" sand and gravel aquifers are thin or absent (Cross Section K-K') (Plate 1, Figure 17), and in these areas the production capability could be substantially less. A basal sand and gravel aquifer is present in T.H. #6 and similar valley fill materials are noted in other wells drilled to the bedrock surface in the area. In T.H. #6 the basal aquifer is present from about 167 to 246 feet. However, it contains cemented zones, occasional layers of clay, broken limestone, and boulders, all of which could affect its capability as an aquifer. It appears that the basal zone may be a viable aquifer for users requiring moderate amounts of water (up to 500 gpm). In the Delphi area, between the Tippecanoe and Wabash Rivers, the water level in the deeper aquifers is typically in the range of 70 to over 100 feet below ground level. Locally, thick sand and gravel deposits are present at a shallow depth, but because of the deep water levels these zones either do not contain water or the available drawdown is such that yields would be substantially affected. For this reason the deeper aquifers are more commonly used. In the valley of the Tippecanoe River, surficial outwash sand and gravel deposits are present where the Lafayette (Teays) Bedrock Valley system underlies the river. These outwash materials may extend to a depth of 60 feet before encountering a clay layer. Sand and gravel deposits occur below the clay separator and extend to the bedrock surface. Near I-65 and the Wabash River the outwash sand and gravel deposits become thicker and more prominent, and the potential for high-capacity wells is substantially increased. A clay-separating unit is also present in this area below the outwash deposits, and the deeper sand and gravel appears to be thicker and more productive than the one to the northeast toward Delphi. The Lafayette (Teays) Bedrock Valley at this point is about four miles in width.

Lafayette (Teays) Bedrock Valley
I-65 at Lafayette to Green Hill

In this segment of the Lafayette (Teays) Bedrock Valley the valley abruptly changes direction from a south-southwest direction at Lafayette to a westerly trend. Most wells drilled to the bedrock in this area encounter black or brown shale of Devonian - Mississippian Age (New Albany Shale). The valley here is characteristically six to seven miles in width, as it approaches the Mississippian (Knobstone) Escarpment. In addition, several major tributary valleys enter the valley in this area. These tributary valleys enter from the northwest to the southeast and intersect the main valley at the point where it turns to the west (Figure 2).

Throughout this segment of the bedrock valley, the modern Wabash River has cut its valley into the glacial sediments filling the larger, pre-existing Lafayette (Teays) Bedrock Valley. The Wabash River follows the trend of the bedrock valley from a point about five miles northeast of Lafayette to a point six miles south of Otterbein, near the small community of Green Hill, a distance of about twenty-two river miles. South of Green Hill, the Wabash flows southwest over shallow bedrock wheras the bedrock valley continues its westward trend. Cross-Section L-L' (Plate 1, Figure 18) illustrates the relationship between the Wabash and Lafayette (Teays) Bedrock Valleys. The Wabash valley is incised approximately 150 to 200 feet into the sediments that filled the valley, leaving about 100 to 150 feet of sediment between the bed of the Wabash River and the bedrock floor of the bedrock valley.

Cross-Section L-L' illustrates the nature of the sediments filling the valley in this area. Thick sand and gravel aquifer zones are separated by equally thick layers of clay or till. These layers appear to be laterally continuous across the valley. Logs of deep wells commonly report thick sand and gravel zones immediately overlying the bedrock surface. This basal aquifer zone, up to 100 feet thick, is commonly used for a water supply.

Over much of this segment of the valley, thick, near-surface sand and gravel deposits are reported. The upper zones may be 50 to 60 feet thick, or can be split up into multiple, thinner zones by intervening clay layers. Thinner layers of sand and gravel, five to twenty feet thick, are often reported scattered throughout the section. Although not shown on the cross-section, these thin zones are common, but of limited areal extent. As many as four or five of these sand and gravel zones are reported on well logs. While these shallower sand and gravel units are sometimes used as domestic water supplies, they are often dry because of deep water levels and the relatively high topographic position. Test Hole #4 located in T. 23 N., R. 5 W., Section 21 (northeast of the intersection of County Road 500W and State Road 43) contains several of these thin zones in addition to the thick basal aquifer (Appendix A).

The ground-water availability throughout this segment of the bedrock valley is generally excellent. Several high-capacity municipal and industrial wells in Lafayette and West Lafayette have reported yields over 2,000 gpm. Many well logs report yields in excess of 500 gpm. These high-capacity wells are large-diameter, 6- to 48-inch, and range in depth from 65 to 230 feet deep.

Water levels in this area vary considerably, depending largely on the elevation and well depth. Generally, shallow wells, up to 140 feet deep, have water levels of around 50 feet or less, while deeper wells, over 175 feet deep, commonly have static water

levels greater than 90 feet. Overall, water levels range from 5 to 130 feet below ground level.

Lafayette (Teays) Bedrock Valley
Green Hill to Little Pine Creek

In this section the courses of Lafayette (Teays) Bedrock Valley and the present-day Wabash River diverge as the Wabash heads southwest. The bedrock valley here gently bends to the northwest and then returns to a west trend. In the eastern portion of this segment the valley is broad, five to six miles across, as in the previously described segment. Beginning just to the west of Otterbein, the valley narrows abruptly to two to three miles across. This narrower portion of the valley is similar to areas in eastern Indiana where the former Teays River flowed over more resistant rock and hence, cut a narrower valley. The sudden narrowing of the valley also represents a change in bedrock to a more resistant bedrock type.

Although data for this segment are less plentiful than for the segment to the east previously described, it appears that there are thick continuous sand and gravel bodies capable of yielding significant quantities of water. Cross-section M-M' (Plate 1, Figure 19) depicts the general conditions in this segment. There appears to be a surficial clay layer of variable thickness covering the area. Thick sand and gravel deposits are encountered at variable depths with interspersed clay layers. Some of these clay layers are thick and may be continuous over a wide area. These clay layers may locally inhibit recharge to the deeper aquifers. Thin sand and gravel layers of limited continuity are present within the clays and may be utilized for domestic water supplies. Test Hole 3-B located in T. 23 N., R. 6 W., Section 22 (northeast of the intersection of County Line Road and Baseline Road) encountered a thick clay sequence from the ground surface to 127 feet (Appendix A and Cross-section M-M', Figure 19). Two thin intra-till sand and gravel zones are encountered within this upper clay. From 127 to 238 feet are mostly sand and gravel with thin clay layers. Shale bedrock is present at 238 feet. Sand and gravel zones up to 128 feet thick are reported on well logs from this area.

Properly constructed wells in this area should be able to produce enough water for most needs. Two high-capacity wells have reported yields of 300 to 1,000 gpm. Domestic wells generally yield from 15 to 40 gpm. Well depths in this area range from 40 to 250 feet, with most wells in the 90 to 180 foot range. Static water levels in this segment are extremely variable, ranging from 19 to 150 feet. In general the deepest wells have deep static levels. The shallow water levels found in shallower aquifers suggest that water is perched in the higher sand and gravel zones by low permeability clay layers.

Lafayette (Teays) Bedrock Valley
Little Pine Creek to Mud Pine Creek

The valley here continues its westward trend following the Benton-Warren county line. The valley width remains approximately two to three miles in the eastern portion of this segment, but about three miles northwest of Pine Village the valley width constricts to less than two miles. At the western edge of this segment, along Mud Pine Creek, the valley widens abruptly to four to five miles across. Two miles southeast of Oxford a major tributary enters the valley. This tributary, trending northeast-southwest can be traced for five miles at which point it divides into a north and east trending branch, each several miles long.

Compared to the previously described valley segments to the east, this segment appears to have a much thicker till and clay cap and less sand and gravel. Cross-section N-N' (Plate 1, Figure 20) shows the general sediment profile in this segment. The main aquifer is the thick basal sand and gravel zone. Thin sand and gravel beds occur within the thick clay sequence and may be used for small-capacity water supplies. In Test Hole 3-A near the eastern edge of this segment, clays and silts extend from ground level to 110 feet depth (Appendix A). No sand and gravel zones significant enough to be a potential aquifer are present within this upper clay unit. The basal zone aquifer, 173 feet of sand and gravel deposits, is present from 110 feet to 283 feet; and limestone bedrock is present at 283 feet.

Ground-water conditions in this segment are good. Small-diameter domestic wells usually yield 10 to 50 gpm, and yields up to 100 gpm have been reported. Two large diameter high-capacity wells drilled by Oxford in the bedrock valley south of town reported yields of 200 and 500 gpm each.

The basal aquifer should be capable of yielding 1,000 gpm to properly constructed wells. Water levels are usually between 25 and 60 feet, although one well had a reported water level of 110 feet and two wells were reportedly flowing wells. The thick, largely untapped, basal sand and gravel zone represents a major water-supply source in this portion of Indiana.

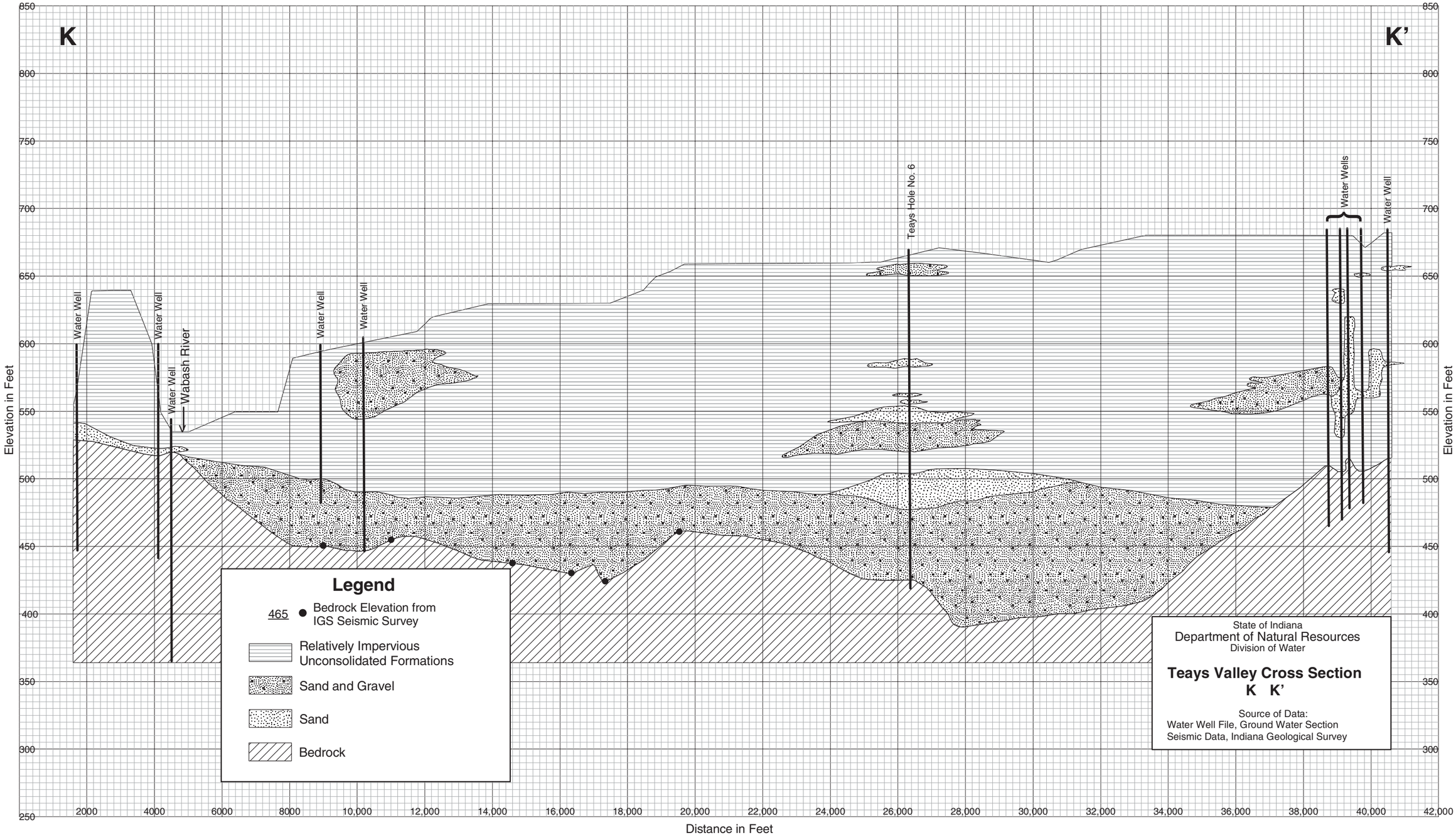

K
K'
Water Well
Water Well
Water Well
Wabash River
Water Well
Water Well
Teays Hole No. 6
Water Wells
Water Well
Elevation in Feet
850
800
750
700
650
600
550
500
450
400
350
300
250
2000
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
38,000
40,000
42,000
Distance in Feet
Legend
465 Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
K K'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 17

L

L’

Elevation in Feet

900
850
800
750
700
650
600
550
500
450
400
350
300
250
200

Water Well
Water Well
Water Well
Water Wells
Water Well
Water Well
Wabash River
Water Well
Water Well
Water Well
Water Wells
Water Well

2000 4000 6000 8000 10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000 26,000 28,000 30,000 32,000 34,000 36,000 38,000 40,000 42,000 44,000 46,000 48,000 50,000

Distance in Feet

Legend

465 ● Bedrock Elevation from IGS Seismic Survey

Relatively Impervious Unconsolidated Formations

Sand and Gravel

Sand

Bedrock

State of Indiana
Department of Natural Resources
Division of Water

Teays Valley Cross Section
L L’

Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 18

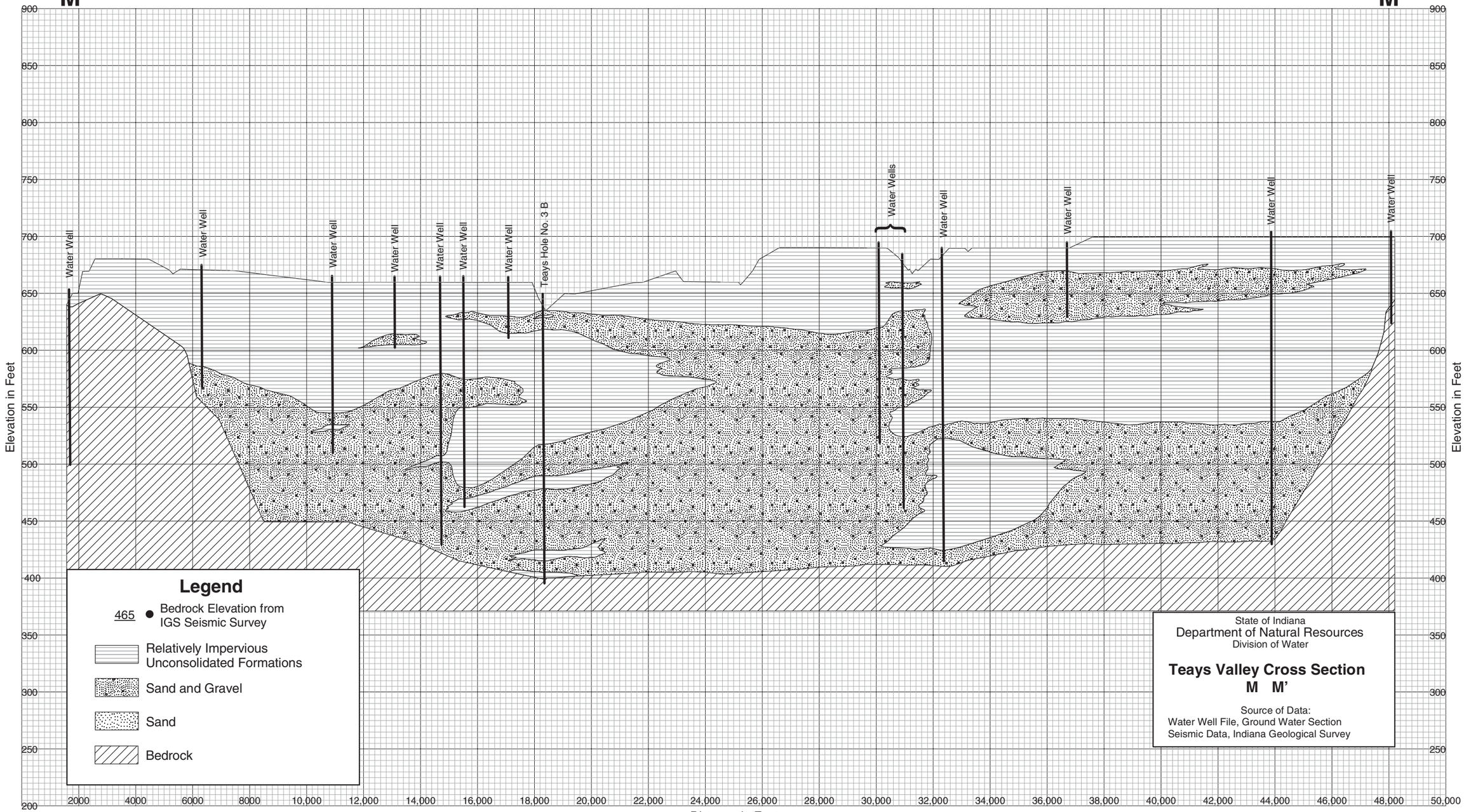

M
M'
Water Well
Water Well
Water Well
Water Well
Water Well
Water Well
Teays Hole No. 3 B
Water Wells
Water Well
Water Well
Water Well
Water Well
Elevation in Feet
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
2000
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
38,000
40,000
42,000
44,000
46,000
48,000
50,000
Distance in Feet
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
M M'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 19

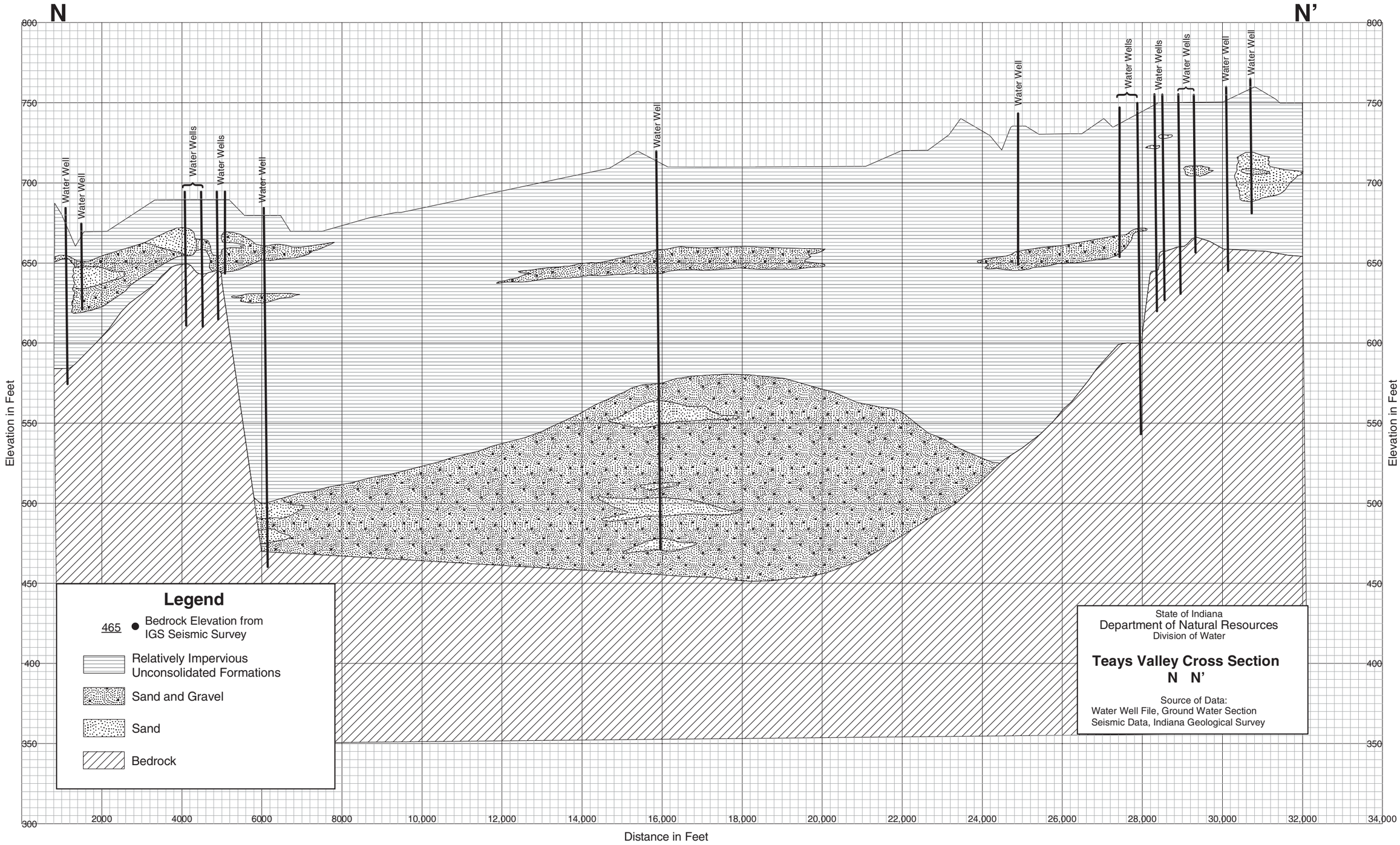

N
N'
Water Well
Water Wells
Elevation in Feet
800
750
700
650
600
550
500
450
400
350
300
2000
4000
6000
8000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
Distance in Feet
Legend
465 ● Bedrock Elevation from IGS Seismic Survey
Relatively Impervious Unconsolidated Formations
Sand and Gravel
Sand
Bedrock
State of Indiana
Department of Natural Resources
Division of Water
Teays Valley Cross Section
N N'
Source of Data:
Water Well File, Ground Water Section
Seismic Data, Indiana Geological Survey

Figure 20

Lafayette (Teays) Bedrock Valley
Mud Pine Creek to Indiana-Illinois State Line

In this segment the valley continues due west, straddling the Benton-Warren county line. The valley is much wider here than in the previous segment, averaging four to five miles. Data in this segment are sparse, but it appears that the sediment fill in the valley becomes progressively more clay rich to the west. The basal sand and gravel in the segment to the east discussed previously, is still present here and is still the main aquifer; but it is thinner and narrower and may be split by a clay layer. Cross-Section O-O' (Plate 1, Figure 21) clearly illustrates the thicker clay fill of this segment and the decreasing thickness of the basal sand and gravel aquifer. As before, thinner sand and gravel zones are present above the basal aquifer.

Two test holes were drilled in this segment. Test Hole 2 is located near the east edge of the segment in T. 24 N., R. 8 W., Section 31 (east of the intersection of U.S. 41 on County Road 1050, less than a mile west of Mud Pine Creek). From the surface to 100 feet there is a sequence of clay with thin layers of sand and gravel. The upper surface of the basal sand and gravel zone lies at a depth of 100 feet and extends downward to 303 feet with only one thin clay break near the top. The bedrock floor of the valley is encountered at 303 feet. Near the west edge of the segment, in T. 24 N., R. 9 W., Section 31 (north of the Benton/Warren County Line near County Road 900W) is Test Hole 1. At this location, clay extends down to 244 feet with scattered sand and gravel zones. The basal sand and gravel zone is found from 244 to 340 feet and is split by a 21 foot layer of sandy clay from 284 to 305 feet. Bedrock lies at 340 feet. Comparison of the two test holes shows the basal aquifer thinning to the west.

Ground-water availability in this segment is more limited than areas previously discussed due to thinner sand and gravel zones. Although most domestic wells provide adequate water (5 to 25 gpm), the area is poorly tested for high-capacity well volumes. One municipal well at Ambia reportedly produced 100 gpm, the highest documented well yield in this segment of the bedrock valley. It is expected that wells drilled into the basal sand and gravel aquifer should produce from 300-600 gpm.

Generalized Ground Water Availability of the Bedrock Aquifers Underlying the Lafayette (Teays) Bedrock Valley

In addition to the unconsolidated materials filling the Lafayette (Teays) Bedrock Valley, the bedrock underlying the valley also contains water-producing units. Because the bedrock supplies water for much of the area around the valley, the potential of obtaining water from the bedrock was evaluated. Many bedrock types are present along the path of the bedrock valley, and the availability of ground water varies with the bedrock type.

Ground-water availability of the bedrock occurring along the valley floor, flanks, and uplands of the Lafayette (Teays) Bedrock Valley is discussed from east to west and oldest to youngest. This discussion focuses primarily on the water-bearing characteristics of the bedrock. For detail on lithology and stratigraphy of the bedrock, refer to the Bedrock Geology section of this report under the heading of Geologic Setting. Figure 4 also provides a map showing the location of bedrock types in and near the bedrock valley.

Ordovician Age bedrock subcrops in the deepest portion of the valley in the eastern part of the state. To the west, progressively younger bedrock units of Silurian, Devonian, and Mississippian Age are present in the valley floor.

Ordovician Age Bedrock

The bedrock formations of Ordovician Age are generally not considered to be a potential source of ground water. Because of the typically shaley nature of this alternating limestone-shale bedrock, little water is usually encountered. However, in some of the test holes drilled for this study, substantial losses in drilling mud occurred where the Ordovician bedrock was encountered which would seem to indicate the potential for sizable volumes of ground water. Excluding these anomalous circumstances, the Ordovician bedrock (Maquoketa Group) is not expected to be a source of water, and dry wells are common.

Silurian Age Bedrock

Overlying the Ordovician bedrock are various formations of Silurian Age. These formations have varying degrees of water-bearing potential depending upon the physical properties and units present. In general the Silurian is considered as a significant aquifer for moderate to large volumes of ground water (150 to 600 gpm).