THE PROPOSED ADAMS COUNTY LANDFILL ENVIRONMENTAL IMPACT STATEMENT NEEDS MORE WORK

by
Christian R. Petrich
and
C. Kent Keller

Numerous comments have appeared on these pages concerning a large, regional, municipal-waste landfill proposed by Waste Management, Inc., for southeastern Adams County. Some local residents are concerned about the landfill, fearing that the landfill will lead to ground water contamination and a decrease in local property values. Other residents see the landfill as a boost for the local economy. Meanwhile, Waste Management, Inc., has compiled a Draft Environmental Impact Statement (DEIS) outlining potential environmental impacts due to the proposed landfill.

The question as to whether the landfill should be built is complex, and is not addressed here. Regardless, the Environmental Impact Study for the project should be accurate, scientifically defensible, and as reasonably complete as possible. Our purpose in reviewing the DEIS was to assess whether the ground water portions of the Waste Management study meet these criteria. This article is a summary of that assessment. We find that while the DEIS states that "impacts to ground water are expected to be less than significant" the evidence provided in the DEIS and supporting Draft Geohydrological Assessment Report (written by Golder Associates of Redmond, Washington) does not fully support this conclusion.

The landfill is proposed for a site approximately six miles east of Washtucna (Adams County) and 2 miles northwest of Hooper (Whitman County). There are two aquifers of primary interest underlying the site occurring between layers of basalt. The shallower aquifer (in the *Wanapum* basalt) is approximately 300 feet below the site; the deeper aquifer (in the *Grande Ronde* basalt) begins at approximately 400 feet below the site.

The proposed landfill would be used to dispose of solid waste from the Seattle area; other communities from eastern Washington and northern Idaho may also choose to dispose of waste in the landfill. Municipal solid waste typically contains a large

percentage of paper products, and smaller percentages of plastics, metals, glass, and other materials. The "other materials" category may include potential ground water contaminants such as yard pesticides, paints, solvents, drain cleaners, etc., despite efforts to keep these materials out of the landfill.

New federal and Washington State standards require, among other things, a synthetic membrane liner below the waste to prevent landfill *leachate* (water that has come in contact with landfill pollutants) from leaking into ground water, and a ground water monitoring system to detect landfill leaks should they occur. When the landfill is filled with waste an impermeable cover is placed over the top to prevent precipitation from entering the landfill and becoming leachate. The reason that landfill regulations require ground water monitoring is that landfill covers and liners may leak, especially given the long time that the landfill will contain potential pollutants. It is therefore prudent to choose a site that is environmentally safe, and that allows reliable ground water monitoring should a leak occur.

There are two major hydrogeologic issues unresolved in the DEIS regarding potential subsurface contamination below the landfill site. The first issue concerns the flow of water between the ground surface and the Wanapum aquifer. This zone consists of various sediments, underlain by either two or three (depending on location) basalt layers. The Geohydrological Assessment documents the occurrence of minor *perched* aquifers (aquifers of limited extent separated from other aquifers by unsaturated zones) between these basalt layers, and also notes that ground water seepage occurs at various times and places where the sediments contact basalt. In such a complex hydrogeological setting water contaminated with leachate could move downward until it reached a perched aquifer or an impermeable zone of basalt, and then move horizontally until it discharged to the ground surface in a spring or a seep. If this water encountered a vertical fracture in a basalt layer it could also move downward toward the underlying Wanapum aquifer. The DEIS and the Geohydrological Assessment do not present an understanding of flow in this complex zone sufficient to identify potential contaminant pathways, which would form the basis for a reliable ground water monitoring system . In fact, the information in the Assessment suggests that the site may be very difficult to adequately monitor for subsurface contamination. The Assessment acknowledges that the hydrogeological characterization it presents "does not represent a definitive understanding of all the details at the site" and that "further work is required to develop the necessary level of knowledge at the site".

The second unresolved issue is that of understanding ground water flow, or *hydraulic connection,* between the Wanapum and the Grande Ronde aquifers beneath the site. If vertical fractures and other discontinuities in the basalt connect the two aquifers such that water flows readily between them, then contaminants could be transmitted between the aquifers as well. The extent to which contamination could occur in these aquifers is important due to the local reliance on both aquifers, particularly the Grand Ronde, for domestic and agricultural uses.

The DEIS and Geohydrological Assessment suggests that there is little hydraulic connection between the aquifers based on results of testing in a single borehole. These testing results are of limited use, since a single vertical borehole to unlikely intersect many of cracks, joints, and faults which typically control ground water flow between aquifer zones. Other findings in the Geohydrological Assessment -- that water levels in the two aquifers appear to be nearly identical, and that they appear to respond similarly to changes in barometric pressure -- would normally be interpreted as evidence showing substantial hydraulic connection between the two aquifers. Commonly used hydrogeological techniques, such as multi-well pumping tests, could be used to evaluate the degree of hydraulic connection between the aquifers. No such tests appear to have been conducted at this site. Thus the evidence given in the Waste Management reports does not adequately support the claim of "little, if any" hydraulic connection between the aquifers.

In summary, the hydrogeological characterization of the proposed landfill site by Waste Management and its consultants is incomplete. The consultants acknowledge this, and suggest a six-page list of additional tasks that will lead to a better understanding of site hydrogeology. Such information about ground water flow and potential contaminant pathways is is essential to an adequate evaluation of the landfill's potential environmental impacts.

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The Mountain Resource Group

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April 24, 1991

Adams County Planning and Building Department
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Dear Adams County Representative:

The following comments are provided in response to the Draft Environmental Impact Statement (DEIS) for the Adams County Solid Waste Landfill and Recycling Center proposed by Waste Management of Washington (WMM). These comments are being submitted on behalf of the Palouse-Clearwater Environmental Institute by the Mountain Resource Group. The comments of Dr. Keller, Dr. Sprenke, and Mr. Petrich focus on hydrogeologic issues; the comments of Mr. Stormo refer to various aspects of the DEIS, including hydrologic and seismic issues.

There are two major hydrogeologic issues that appear unresolved in the DEIS. First, the DEIS and supporting DGAR do not provide a clear understanding of hydraulic connection between the Wanapum and the Grande Ronde aquifers underlying the landfill site. The hydraulic connection between the two aquifers is important due to local reliance on both aquifers for domestic and irrigation uses. It is claimed that there is "little, if any" hydraulic connection between the two aquifers. We find, however, that there is insufficient scientific evidence to support that claim.

Second, the subsurface flow regime between the ground surface and the reported water table at 280 feet is not well understood. Complete information about the subsurface flow regime in this zone and about potential contaminant pathways is essential to the design of a reliable ground water monitoring system for the proposed landfill site; the DEIS provides neither a comprehensive description of the flow regime nor the basis for a ground water monitoring system design. It is not possible to fully evaluate potential environmental impacts without this information.

Respectfully submitted,

C. Kent Keller, Ph.D.

Keith E. Stormo

Christian R. Petrich

Ken Sprenke, Ph.D.

Comments of C.K. Keller

My comments are limited to section 5 of the Draft Geohydrologic Assessment Report (DGAR), supporting the Draft Environmental Impact Statement for the proposed Adams County Solid Waste Landfill and Recycling Center, which was published 18 March 1992.

Physical hydrogeology.

Vertical hydraulic connection in the basalts. A principal issue addressed in the DGAR is the extent to which shallow water-bearing units are connected hydraulically to the deeper Grande Ronde unit, from which most local water supplies are pumped. The authors argue that the hydraulic connection is limited and poor. Such limited connections have been observed in places on the Columbia Plateau, but elsewhere there is evidence for good connection (e.g. Lum et al., 1990; Steele et al., 1989; Tong Li, 1991).

Examination of the hydrographs of nested piezometers in Appendix I indicates that vertical hydraulic gradients between the uppermost (lower Sand Hollow) and next deepest (Slack Canyon) aquifers are generally very small. The usual interpretation of such a water-level pattern is that the two units being monitored are well-connected vertically, i.e. that head differences are dissipated by vertical flow between the two units. In order to demonstrate that the hydraulic connection is in fact poor, the authors would have to demonstrate that there is in fact very little flow between the units.

One way to demonstrate little flow is to show that the material between the units has uniformly small vertical hydraulic conductivity. In this regard the authors refer to their observation of low hydraulic conductivities in the interiors of basalt flows, as indicated by the results of drill stem / packer tests in the drill hole TW-1. The basis of these tests is the measurement of rate of water flow out of an interval of drill hole, under a known pressure. In rock like basalt, where flow occurs in discontinuities, the flow rate is governed by the number and apertures of cracks, joints, and faults which intersect the tested interval of the hole. The diameter and orientation of the hole, which control the volume of the basalt "sampled" by the hole for such features, are thus critically important to interpreting the tests (e.g. Hsieh and Neuman, 1985). The diameter of the hole is nowhere stated in Appendix F, and therfore must be assumed to be the diameter of the bit used to drill hole TW-1, or 5-5/8 inches (Appendix D). The orientation of the hole is vertical. Since the orientations of discontinuities in flow interiors are also dominantly vertical to subvertical, such a hole is oriented parallel or subparallel to most of these discontinuities. Given its small diameter

relative to the spacings of even the most closely-spaced discontinuities (the columnar cooling joints), a single hole of this type can neither intersect nor reveal the hydraulic effects of a representative population of the discontinuities which could conduct vertical flow on the scale of the geologic unit.

The authors state that little vertical connection is indicated by differing degrees of confinement, as indicated in turn by barometric responses of piezometers in the two aquifers. However, most of the paired hydrographs for nested piezometers show precisely in-phase barometric fluctuations of similar amplitude (Appendix I, Figures I-1.2, I-1.3, I-1.4, I-2.3, and I-2.4). The barometric response data therefore are more consistent with similar rather than differing degrees of confinement.

The authors suggest that formation of the zeolite clinoptilolite along fracture and joint surfaces may limit the hydraulic conductivity of these features. It is unclear why this mineral is suggested, since it was neither observed in the laboratory geochemical studies (Appendix M) nor were pore waters demonstrated to be at saturation with respect to it. Montmorillonite was, however, detected in the lab studies (Appendix M). This mineral and its relatives have been observed in Columbia Plateau basalts in previous investigations; groundwaters associated with these phases in the basalts are generally supersaturated with respect to them, which makes it uncertain as to whether their formation is related to groundwater flow (Deutsch et al., 1982). Regardless, any purported effect of clay formation on the hydraulic conductivity of fractures and joints would have to be demonstrated hydraulically, and this has not been done.

In light of the foregoing considerations, the upper and next-deepest aquifers should be considered to be hydraulically well-connected unless additional data show otherwise. Since the vertical hydraulic conductivities of geologic units are notoriously difficult to quantify by single-well tests (e.g. Keller et al., 1989) one useful experiment would be to pump one aquifer and monitor the other aquifer for drawdowns; this is mentioned by the authors.

Vertical flow rates and vertical velocities. It should be noted that even if vertical flow rates (specific discharges) through the basalts are small, mean pore-water velocities (the rates at which water and solutes actually move) could be large through vertically fractured basalt wherever it is saturated, both below and above the zone of continuous saturation. The environmental tracer tritium can be useful in placing upper limits on velocities. Unfortunately, tritium determinations are reported to be "backed up" in the laboratory.

Groundwater recharge. The authors suggest that recharge rates are negligible. These suggestions are based on the results of a soil water balance and

observation that the materials above the Sand Hollow flow top are "dry" (e.g. p. 67). These statements require some clarification. First, soil water balances are notoriously unreliable for calculation of recharge rates in dry climates (Gee and Hillel, 1988). Second, the materials above the regional zone of continuous saturation are "unsaturated" but not "dry". While water will not flow into wells in unsaturated regions, water is present in large quantities in these regions as capillary moisture. The presence of "perched" saturated zones above the zone of continuous saturation shows that recharging groundwater is in fact moving through the unsaturated zone.

Groundwater quality.

Major ions. The analytical results and charge balances in Appendix J appear to be in order. The data presentation is largely adequate and reflects some care in data reduction. However, carbonate (CO_3^{2-}) results in Table J-4 are incorrect. The client reports from the lab (Appendix J) show that in all cases but one, carbonate was not determined at all, whereas Table J-4 indicates that carbonate was determined in these cases to be zero. Non-determination of carbonate at neutral pH is conventional, but this should be clearly indicated.

The greatest problem with the water chemistry data is that there are no reliable data for the proposed site itself. One analysis is reported from an on-site piezometer (P-3AS), but the extremely high pH of the sample indicates that it is contaminated (probably by cement; Freeze and Cherry, 1979) and therefore not representative of formation water. Unfortunately there is thus no basis for identifying the quality of groundwater beneath the site as either a "Wanapum" or "Grande Ronde" water-quality type. (Such a distinction is problematic in any case, given the differences in geographic coverage for the Grande Ronde and Wanapum data sets, and the small differences among all the major-ion chemistries.) The lack of reported results from any of the other on-site piezometers means we do not know at this time if any of them can yield reliable water samples.

Environmental isotopes. The oxygen-18 and deuterium data raise worthwhile hydrologic questions. The authors state that the solid line in Fig. J-4 represents the local meteoric water line. Comparison of a linear regression for the local meteoric line with a linear regression for the reported data would make this statement more convincing; the evaporation plot (Figure J-5) does not actually indicate a lack of evaporative effects on the isotope values as the authors contend (p. J-18), because in many groundwater systems, TDS is controlled primarily by processes other than evaporation.

If the oxygen-18 and deuterium data do follow the local meteoric water line as the authors suggest, then the spread of the data along the line results from a combination of temperature and elevation effects on the isotope content of precipitation (Fritz and Fontes, 1980). Athough the data are sparse, a simple mixing model, as proposed by the authors, is the most obvious hypothesis to explain the spread: a shallow endmember (Saddle Mountains, Wanapum, Palouse Gravels waters) mixing with a deeper endmember (Grande Ronde waters). It is important to note that such a mixing model invokes rather than precludes hydraulic connection between Wanapum and Grande Ronde waters.

Note also that piezometer P-3AS is contaminated, so that its position within the overall isotope trend (Figure J-4) is meaningless.

Summary comment:

The two most useful data sets for understanding groundwater movement beneath the site -- environmental tritium concentrations and aquifer pumping test results -- are not included in the DGAR.

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Signed:

Date:

C. H. H. [illegible]

24 April 1992

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24 April 1992

Adams County Solid Waste Landfill and Recycling Center Draft EIS Comments

By: Christian R. Petrich
April 24, 1992

The following comments are provided in response to the Draft Environmental Impact Statement (DEIS) for the Adams County Solid Waste Landfill and Recycling Center proposed by Waste Management of Washington (WMM).

Hydrogeological Investigation

The DGAR (pp. 70) states that there is very little, if any, vertical hydraulic gradient across the Lower Sand aquifer (although Figure 4-5 shows a significant downward hydraulic gradient from the Lower Sand Aquifer to the Slack Canyon Aquifer in wells P-3AS to P-3AD). The report recognizes that "the absence of significant difference in potentiometric surfaces between the shallow and deep piezometers in the dual completion boreholes could be interpreted to indicate a high degree of hydraulic connection and possible vertical ground water movement across the Lower Sand Hollow basalt flow", based on barometric pressure responses in the two aquifers and based on packer tests in one borehole. Packer tests in one borehole are insufficient for determining hydraulic aquifer interconnection over the area of the proposed landfill; packer testing reflects only a small radial area surrounding TW1. Multi-well, constant-rate pumping test data from both the Wanapum and the Grande Ronde aquifers would provide indications of leakage from upper and lower zones -- which would in turn be an indication of hydraulic interconnection between aquifers.

Figure 5-20 indicates a significant correlation between barometric pressure and depth in Piezometer P-1AD. This is given as evidence suggesting minimal hydraulic connection between the Wanapum and Grande Ronde aquifers. Figure I- 2.4, however, indicates significant correlation between water levels in P-2AS and P-2AD, suggesting a high degree of hydraulic connection between the two aquifers. Figure I-3.4 suggests significant fluctuations due to barometric changes in Well P-3AS. What is the barometric efficiency in these and other wells? Why are barometric efficiencies not given for the "S" wells? Again, conclusions drawn from the barometric response data should be confirmed with multi-well pumping tests.

The DGAR states that the "dense basalt flow interiors are composed of solid basalt rock in which the natural fractures and cooling joints have been sealed by the formation of secondary minerals and clay" (DGAR, pp. 75). Four piezometers, none of which appear to be near the center of the proposed landfill footprint, may not be sufficient for determining with statistical

significance a lack of fracturing in the basalt flow interiors over an area the size of the proposed landfill. Furthermore, has the sealing of natural fractures occurred in recent geologic time, and if so, how are the clay materials being transported?

The original investigation called for the conversion of the deep stratigraphic borehole into a test well for the characterization of monitoring zones. This work was postponed until later investigations (DGAR, pp. 41). Why? Why was the deep corehole abandoned?

The DGAR mentions several times that the Wanapum aquifer appears to be "semi-confined" (DGAR, pp. 69). The aquifer, it is reported, does not appear to respond to barometric changes like a confined aquifer. The barometric data provided in the DGAR are inconsistent; what is the hydraulic evidence in support of the "semi-confined" characteristics?

Gradients for the Grande Ronde and Wanapum aquifers are based on three piezometers (DGAR, pp. 70); this may be insufficient for a complex aquifer system. Figures 5-18 and 5-19 (DGAR) should clearly specify which three piezometers are used for estimating ground water levels. These figures as presented are misleading.

An eroded bedrock surface of a buried stream channel underlying the proposed landfill site (DGAR, pp. 86) should be further evaluated before environmental impacts can be assessed.

The DGAR (pp. 68) notes that "the occurrence of perched water within the flowtops is probably related to the highly porous sections of the flowtops, and appears to be of limited or variable extent". Furthermore, the DGAR notes a "localized transient zone of bedrock-surface seepage occurring in places at the basal part of overlying loess, alluvium, or flood gravels" (DGAR, pp. 66). The hydrogeology of the zone between the proposed landfill site and the reported water table at 280 feet appears poorly understood. Is there vertical and horizontal continuity between perched zones? Where do perched zones discharge to the surface? Do some of the perched zones directly contribute to underlying aquifers? How are the perched zones recharged? Does the flow regime between the ground surface and the Wanapum aquifer change significantly during high precipitation years due to increased recharge? Evidence is given in the DGAR (well logs, geophysical logs) indicating highly permeable, laterally continuous zones capable of allowing leachate migration off-site. The DGAR does not provide sufficient hydrogeological information for the design a reliable monitoring system, and, in fact, it appears that a reliable monitoring system may be difficult to provide for this site. A detailed understanding of ground water presence and migration in the zone between ground surface and the Wanapum aquifer, presented in conjunction with a proposed ground water monitoring system, seems essential to an evaluation of possible environmental impact due to the proposed landfill.

Changes in the conceptual landfill design have resulted in an extension of the landfill to the southwest (DGAR, pp. 86), resulting in an extension of the landfill footprint to the southwest. No test pits were excavated in this part of the proposed landfill for the DEIS; the DGAR

acknowledges some uncertainty about the depth to bedrock in some parts of the landfill footprint. Subsurface information about this area of the proposed landfill is necessary to evaluate potential environmental impacts due to the proposed landfill.

Bedrock excavation (as described on page 86, DGAR) may involve blasting. What will be the effects of blasting on the structural integrity of underlying basalt?

What are preliminary landfill "location constraints" anticipated in the State of Washington's Wellhead Protection Program? (DGAR, pp. 83)

Packer and Slug test results

Slug test results in Piezometer P1-A (S) indicate a hydraulic conductivity value (K) of 2×10^{-7} cm/s (P1-A (S) is at a depth of approximately 305' below ground surface at the top of the Lower Sand Hollow layer). The packer test for the same interval (300-311.67') in the deep corehole (TW1), which is located adjacent to P1-A (S), is given as 2×10^{-3} cm/s. What accounts for the large discrepancy in K values? Also, the slug test in P2-A (S) yielded a K value of 1.8×10^{-6} cm/s in the top of the Lower Sand Hollow aquifer. Again, this is a large difference with hydraulic conductivity values obtained by packer test in the same zone of TW1. These data suggest either flaws in the testing methodology or significant unacknowledged aquifer heterogeneity.

Why was the interior of the Sentinel Gap (T_{fs3}) basalt flow not tested with the packer testing? The interior of this basalt layer, which begins at approximately 100' below ground surface, is reported to be a barrier to vertical flow but was not packer-tested in TW1.

What are the assumptions and limitations of using the Horslev method for slug tests? Are all of the assumptions met in these tests?

Precipitation

The closest weather station from which precipitation data are reported in the DEIS is at Lacrosse, located ten miles to the east of the proposed landfill. Precipitation at the Lacrosse site ranges from 8.88" to 20.35" annually from the period of 1948 to 1986 (mean 13.85, s.d. 2.7). In the DEIS this data is averaged with three other stations (Hatton, Othello, and Lind), and with Hatton alone. The latter is reported as the best average, but Hatton has significantly less precipitation and is 27 miles from the site. It may be that the proposed site receives an annual precipitation closer to 14" annually (Lacrosse) rather than 12" (DGAR, pp. 85), and approximately 20" of precipitation in a wet year. Subsurface recharge due to above-average precipitation may alter perched aquifers underlying the site. Again, an understanding of the flow regime below the site is fundamental to a reliable ground water monitoring system.

Further Hydrogeologic Investigations

Subsurface hydrogeologic characteristics at this site, in both the saturated and overlying unsaturated zones, are not described in the DEIS and supporting documentation with sufficient detail to evaluate possible environmental impacts due to the proposed landfill. It is acknowledged in the DGAR that the hydrogeological characterization "does not represent a definitive understanding of all the details of the site" and that further work "will be required to develop the necessary level of knowledge about the site" (DGAR, pp. 66). This additional work should be conducted and publicly evaluated *prior* to DEIS approval.

The DGAR states that (pp. 69) "Recharge to the Wanapum appears to occur on a local level within the channeled scablands where porous flow tops are exposed or only thinly covered by surficial sediments". Golder Associates suggests a number of shallow seismic refraction traverses across the central area of the site, and approximately 30 test pits within and along the flanks of the landfill area. These test pits, in addition to additional borings in the same area, would provide a better picture of the depth to bedrock and the geometry of the eroded stream channel in the landfill footprint area, and would provide a better description of perched zones of saturation underlying the proposed landfill. The information obtained from the test pits and additional borings may also provide a better understanding of recharge paths to the Wanapum in the landfill area. In addition, ***In situ*** permeability tests of sediments and/or rock underlying the landfill footprint should be conducted.

Golder Associates states that results regarding saturated zones in the basalt flowtops above the Wanapum aquifer are inconclusive. Additional rotary borings into the Lower Sand Hollow and Slack Canyon flowtop aquifers are needed in and around the landfill footprint area to further characterize subsurface hydrogeology.

Golder Associates also recognizes that hydraulic tests conducted to date i.e., packer tests in one well and slug tests in three piezometers, "are strongly influenced by conditions in the immediate vicinity of the borehole". Additional work should include carefully controlled, constant-rate discharge tests in the Slack Canyon flowtop (Grande Ronde) and Lower Sand Hollow (Wanapum) flowtop aquifers, with simultaneous hydraulic response measurements in both aquifers. This may lead to a more reliable indication of vertical flow between these aquifers. Furthermore, test pumping the Sand Hollow aquifer may yield information about possible vertical flow from upper zones.

Possible contaminant migration routes from the landfill footprint area are not clear from the DEIS or the DGAR. This understanding will be required for designing a reliable ground water monitoring system, and to have confidence in the ground water monitoring as an environmental safeguard. One of the best ways to determine potential contaminant pathways at this site may be through the use of multi-well natural- and induced-gradient tracer tests.

Monitoring Wells

The DGAR states (DGAR, pp. 75) that "monitoring wells will be installed within the uppermost monitorable ground water zone at the site (probably the Lower Sand Hollow Flowtop in the Wanapum aquifer)". Monitoring wells in the Lower Sand Hollow Flowtop may be inadequate for detecting possible landfill leachate, given the complex hydrogeology in the zones above the Lower Sand Hollow Flowtop. Again, ground water flow patterns and possible contaminant migration pathways in the zones above the Lower Sand Hollow Flowtop should be much better understood before attempting the design a comprehensive ground water monitoring system, or before evaluating the possible environmental impact due to the proposed landfill.

Landfill Design

Is Waste Management planning any measures that will reduce the toxicity of the waste during the life of the landfill, such as leachate recirculation, etc.? What is the proposed method for accommodating methane production in the landfill?

Summary

The DEIS and supporting hydrogeologic documentation represents a significant step to understanding potential impacts of the proposed landfill. However, the DEIS does not present a clear understanding of subsurface flow in the landfill area, does not clearly document the occurrence and lateral extent of perched saturated zones above the Lower Sand Hollow aquifer, does not provide a clear understanding of hydraulic communication between the Lower Sand Hollow aquifer and the underlying Grande Ronde aquifer nor the potential for vertical flow in upper unsaturated basalt flows, and does not present a clear understanding of potential contaminant flowpaths. The statement that "impacts to ground water are expected to be less than significant" (DGAR, pp. 1-9) is not sufficiently supported by the evidence provided. The issues listed above should be resolved *prior* to DEIS approval.

Signed:

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Adams County Solid Waste Landfill and Recycling Center Draft EIS Comments

By: Kenneth F. Sprenke
April 24, 1992

The following comments are provided in response to the Draft Environmental Impact Statement (DEIS) for the Adams County Solid Waste Landfill and Recycling Center proposed by Waste Management of Washington (WMM). I looked specifically at the subsurface information provided by the deep corehole test on the site.

Figure IV (Correlation of Logs from Deep Corehole) of the report is a compilation of the stratigraphy, rock quality designation, packer test results, and geophysical logs for the deep corehole test performed on the site. These results provide hard data on the subsurface geological, geotechnical, and hydrological conditions below the proposed landfill. The stratigraphy of the site was analyzed very well. It clearly shows the site to be underlain by a series of thick, vertically jointed basalt flows separated by vesicular, weathered flow tops. The core loss and RQD (rock quality designation) show that the basalt flows are competent whereas the flow top zones are extremely fractured. The packer test results show that the thick basalt flows are relatively impermeable compared to the flow top zones which are extremely permeable. The neutron log shows the contrast in porosity and water content between the dense thick flows and the fractured flow top zones. The caliper log shows the instability of the corehole in the flow top zones, further indicating the highly fractured nature of these flow top zones.

My overall conclusion from these data is that the site is underlain by a natural drainage system that will quickly move any effluent laterally away from the site. The effluent will migrate sideways until it intersects the Palouse River valley or finds a route down through fractures to the water table. The complicated nature of this natural subterranean drainage system in which water moves by fracture flow would make the design of an effective monitoring system difficult if not impossible.

The bedrock surface itself is a permeable and fractured flow top zone. This is particularly apparent from the rock quality designation and the packer tests in this material. If the landfill is to be cut into this material, any leaks through the liner will quickly disperse laterally through this pregnable rock. This poses a distinct threat to water quality on surrounding property and to the water quality of the Palouse River.

The second fractured and permeable flow top zone in the vadose zone begins at 153 feet below the surface only 33 feet below the permeable flow top zone described in the previous paragraph. The caliper log and the packer tests show that this zone includes an eight foot interval that is virtually a subterranean cavern as far as water flow is concerned. Any effluent reaching this depth will quickly move laterally off the site to pollute surrounding properties and possibly the Palouse River drainage system.

It is true that the flow tops below the site are separated by relatively massive basalt flows which are relatively impermeable (according to the packer tests) in the immediate neighborhood of the corehole. However, there is no reason to believe that the flow tops are in fact hydraulically isolated from each other over the entire site. The flows, according to the stratigraphic descriptions, are permeated with vertical fractures. It is very likely that the flow tops are vertically interconnected at some point on or near the site. The extremely high horizontal permeability of the flow top zones virtually insures that effluent will move sideways until it finds the vertical routes to the deeper aquifers.

Because effluent may move laterally off the site before it finds a route down to the water table, simply placing monitoring wells below the water table on the site will not ensure detection of contaminants in the deep aquifers. Many monitoring wells surrounding the site would be necessary. Because of the erratic nature of fracture flow in basalt, any attempts to monitor effluent invasion in the vadose zone flow tops would be hopeless.

If a major landfill is to be placed on this site, it had better be designed to never leak. The complicated natural drainage system below the site will make detection and mitigation of leaks a hopeless endeavor.

Signed:

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Review of Draft Environmental Impact Statement (DEIS) for the Adams County Solid Waste landfill and Recycling Center.

by: Keith E. Stormo

Each comment will be consecutively numbered and identified by the page, paragraph and line number in that paragraph if needed (page;paragraph;line number). While reviewing these comments, please refer to the identified location in the DEIS.

1 1-1;6;2 If significant changes occur concerning the nature of the project (i.e., scope of project), additional environmental review may be required.

2 1-3;2-3 Out of twelve sites initially identified, the Holliday Coulee site was picked primarily due transportation access, wildlife and plant habitat, and limited visibility to the site. These should be secondary concerns rather than primary, hydrogeologic and aquifer safety should be the primary criteria.

3 1-13;2;8 This describes a pond to be constructed but then says development is dependent on site-specific soil structure and hydrology. With the coring, test trenches, and site characterization that is already completed, a much better description of location and design should be available.

4 1-15;2-3 If the site is to be developed as proposed and then following completion will be returned to its original use as dryland farming and rangeland, the very low permeability of the cap layer will very likely be compromised due to rodent and other animal burrowing. The roots of rangeland plants and tillage would also very likely increase the permeability of the cap layer to values above the design standards.

5 1-17;5-6 The only traffic impact discussed was the landfill and construction workers. There is no discussion of impacts of garbage hauled from eastern Washington, northern Idaho or if rail problems were to occur. This must be addressed in detail.

6 1-20;4 Only historic locations were discussed, there is no detail of the search for prehistoric evidence in the area. This must be addressed.

7 2-6;ii Even though this area has not been designated as a sole source aquifer it bears many similarities to the Snake River Plain Aquifer that is designated a sole source aquifer. Both have similar multiple-flow basalts and water tables that are not necessarily at the uppermost flowtop.

8 2-8;4;4 There seems to be a large discrepancy in the distance between this spring and the landfill footprint. This sentence states "approximately 5000 feet south" but the spring location on figure 2-3 is shown to be about 500 feet from the proposed landfill footprint.

9 2-12;6 With the seismic impact zone definition of 10% probability not to exceed 0.1 g in 250 years, the data cited of a 90% or greater probability that it will not be exceeded in 250 years is less than 0.1 g. Very careful analysis of the data must be done before these two probabilities can be compared. Especially considering the length of accurate data collection (horizontal vs vertical acceleration), low threshold (0.1 g), and long time (250 years), it is very possible this criteria cannot be proven (see coment #59, #60, 61).

10 2-13;5-6 Due to the recent nature of a number WAC 173 sections (including WRIAs and GWMAs) protection programs or data regarding recharge restrictions, over appropriation, and sole-source aquifer designation have not been presented or compiled. A prudent response would be to look into these areas rather than the statements listed. "... has not *yet* been established for this area. Therefore, no location restrictions in relation to water resources protection *currently* exist." "No land use restrictions related to GWMAs *currently* exist that would affect the proposed landfill." Italics added for clarification. These areas should be addressed in this DEIS because they could at any time become a reality which could halt the further use of the proposed landfill or would show that approval should not have been given if it is.

11 2-21;4-5 This section describes the possible added truck traffic on state and county roads of 123 vehicles each way that could have a major impact on the current road use as questioned in comment #5. The executive summary should mention this possible major impact.

12 2-26;1-2 There is no detailed plan for the soil liner compaction under or the connection and testing of the HDPE liner between adjacent modules. These modules will be constructed at different times and in the intervening time, scuffing, abrasion, and soiling of the liner will occur which will greatly increase the probability of a failure of the HDPE connection between modules. If the HDPE liner of adjacent modules is not planned to be seamed then it is highly probable that liquids at some time would travel between adjacent cell HDPE liners and only have the compacted soil as a barrier. None of the figures or descriptions describe how a cell that may be 300 feet high will be connected to the next cell. If they are not connected to each other then there will be 20 to 30 piles with sloping sides up to 300 feet high in Holliday Coulee. This seems unlikely so one must assume that the cells will be adjoining each other which then leads to the problem of cell to cell liner connection. This must be corrected before design analysis can be completed on this DEIS.

13 2-30;1-2 The evaporation pond design seems to be considerably undersized since 2 of the 6.5 foot depth would be freeboard. There is also the issue of accounting for the more than 300 acre-feet of water that will be pumped from the wells on site. There is no accounting of what purposes this water will be used for. Assuming this water will be used either for dust suppression or washing of equipment, this water will add to the saturation index of the waste material (causing increased leachate) or in the case of washing equipment will have to go directly to the liquid evaporation ponds which would then be too small in either case. Additional design calculations showing the water usage design and use, saturation index of the

waste and evaporation pond capacity should be included before a final review could be completed.

14 2-38;4-8 The detailed plan of liquid and groundwater monitoring must be included in this DEIS to allow a proper assessment of the possible impact of various problematic scenarios. Given the large amount of pumped water applied to the site it is very probable that additional perched zones would be produced which would also have to be monitored and it could possibly seep out just as the spring discussed in comment #8.

15 2-39;1-6 As stated in comment #14, the details of the Solid Waste Handling Facility Permit (SWHFP) must be made available for proper assessment of the landfill gas monitoring, closure and post-closure activities. By the context of the statements in this DEIS ("would be"), the SWHFP document does not seem to be produced yet which precludes a proper assessment of this DEIS.

16 2-40;1-6 As stated in comments #14 & #15, the SWHFP must be made available to properly review the possible environmental impact of this proposed landfill especially with regard to the possible leakage of liquids and the method they would use to remove them from the porous flowtop of the underlying basalt layer.

17 3-3 With dual-completion piezometers in the Wanapum and Grande Ronde aquifers (P-1A, P-2A, P-3A) there is no data or discussion of extended pumping tests from both aquifers at each borehole to determine any possible vertical connection between the waters. Boreholes P1-B, P-2B, and P-3B and TW-1 are all available for near and far range long-term high volume pumping tests to look for any interconnectivity between the waters. Since the chemistry may show differences between these waters it is imperative to demonstrate absolutely no connection at all because during operation the water removed for site use from the Grande Ronde zone will have a pronounced effect on piezometric surfaces and could lead to mixing of the waters. Since WAC 173-304-010 (5) requires use of the best available technology these tests would be absolutely necessary.

18 3-11;5 Statements based on one cored borehole cannot be statistically or even logically based to encompass the whole site (especially based on the location of the one cored borehole). Multiple random cored boreholes would have to be drilled and analyzed to be able to make these broad statements. It is highly probable that cracks exist in the basalt formations that are not filled with secondary rock minerals and it is also very likely that some of these cracks or joints allow the movement of water from one basalt flow to another.

19 3-17;4-5 The design includes considerable amounts of gravels for liquid collection and these are placed above the geo-textile directly above the HDPE. The vast majority of locally avaliable sands and gravelly sands were deposited during the glacial lake Missoula floods. These deposits, or crushed rock, may not be suitable for cell construction which would significantly increase the chances of a liner puncture during construction and later compaction and settling. Data should be presented demonstrating proper material is avaliable.

20 3-17;6 During blasting, shock waves can be focused and reflected by different stratigraphic features that would possibly cause the existing cracks (that are allegedly all cemented) to be opened. This can occur at some distances from the original blast and not necessarily at the surface. This could allow seemingly isolated aquifers to become mixed to an even greater degree than they currently are especially with large amounts of water removed from the Grande Ronde aquifer.

21 3-18;5 Erosion in the excavated area and especially in the partially completed areas after they have risen above the protective depression has not been adequately addressed. The proposed design would have a significant portion of the landfill top and low permeability cover above the surrounding elevation upon completion which would greatly enhance wind and possibly surface water erosion.

22 3-25;6;7 There is an inconsistency between the design drawings (figure 2-8) and the description of possible 2 inch rain event runoff. The statement "Newly constructed modules which are covered with an exposed HDPE liner would have essentially 100% runoff. However, if the lined areas are covered with as little as 3 feet of municipal solid waste, the runoff would be essentially zero ..." could not be compatible with their design drawings. The drawings show the HDPE liner being covered with a geotextile, gravel, another geotextile, and a final protective operations layer (total thickness of two feet) before municipal solid waste would be added to the cell. These inconsistences question the total design details and projected impacts.

23 3-30;2 These liquid volume estimates do not address the additional water that is planned on being pumped for site operations. This would have a considerable effect on the moisture absorption capacity, the possible runoff during storm events, and leachate produced during landfill liquid generation. It is highly probable that the two to three acre liquid evaporation pond would not be sufficient and more than significant surface water impacts would be observed.

24 3-32;5 One cored borehole being used for packer tests does not allow the vertical transmissivity of the whole site to be determined. Since WAC 173-304-010 (5) requires use of the best available technology, all six air-rotary drillholes must be packer tested for statistical and locational variability determinations of the packer tests as presented in appendix F of the DGAR. This data could then be used to help confirm or deny the hypothesized isolation of the subsurface waters.

25 3-34 This artist's conception is only valid if multiple cores covering the whole area demonstrate horizontal continuity of all the flows with similar thicknesses at all boreholes. It is very possible that local disturbances would cause pinching out of thinner flows that would allow the intermingling of waters from different basalt flowtops.

26 3-35;2 The recharge sources for the Wanapum unit are thought to be precipitation, leakage, and lateral inflow and local recharge is derived from irrigation and stream infiltration

in coulees and canyons. The observance of all these types of recharge demonstrates the low probability that true isolation of the aquifer exists and that contamination could lead to contamination of other waters. There are also likely to be discharge zones were the formation has been eroded through which could lead to surface water contamination down gradient.

27 3-40&41 Both of these maps should be oriented with north parallel to the edge and should include enough area surrounding the site so that the Palouse river is included. Alternatively, these two groundwater flow diagrams could be placed on a map of similar scale to figure 1-2 with the proposed layout and facilities included. The location of Washtucna is also questioned because 3-39;1;12 stated it is 6 miles west and 3-42;2;2 states the water supply well is 6 miles southwest and 85;3 of the DGAR states 8 miles from the proposed landfill.

28 3-43 None of the water quality data is from wells that were closest to the site or from boreholes developed for piezometers at the six air-rotary drillholes or the cored borehole. In order to determine the estimated age of the waters, analysis must include assays for ^{14}C Total Organic Carbom (TOC) and for the existence of elevated tritiated water ($^{3}H_2O$) which indicates water recharge as recent as nuclear weapons testing. These are an absolute requirement for proper water quality analysis and comparison.

29 3-44;4-7 These hydrogeologic interpretations are not based on statistical multivariate cluster analysis and it is unlikely given the variation in the data on a number of nearby wells in the same aquifer (26D1, 26G1, 26G2, 27H1, 27R1, & 27R3) that these conclusions are statistically valid. There is also no data concerning analytical statistics, sampling, and well completion which are all important in analyzing this type of data.

30 3-46 With the installation of about 30 different cells at various times during the first half of the landfill life, there will be difficulty in maintaining a high level of competence in installation. The on site crew will only install one cell about every year so it will not be often enough that their expertise will be maintained but it will be often enough that they will feel they know how to do everything. This has been demonstrated in other types of work and is difficult to combat. Inspection and local concern over quality control normally decreases with time after installation which will also contribute to an increased risk of liner failure and possible subsurface contamination. Methods to alleviate these concerns must be presented in this DEIS.

31 3-47;6 This list of uses of the proposed water supply wells includes dust control and vehicle washing. The added demand on the evaporation ponds and the reduction in field capacity of landfill waste for absorption of water has not been addressed in this DEIS and it must be.

32 3-48;5 The current irrigators in the nearby Washtucna Coulee are not the only people necessarily who have water rights to the Grande Ronde Aquifer. Often the water rights are considerably more than is actually being pumped at any time and it is even possible that if all water rights holders were to commence pumping at their allocated flows, there would already be water supply problems. This must be carefully investigated and it does not matter if there

are "no current plans for significant expansion of irrigation activities in the area..." the water may not be available from the Grande Ronde Aquifer at the demand and use that is being described without damage to the current water rights holders.

33 3-50;3;6 The end of the last sentence is missing.

34 3-50;4 The SWHFP plan is necessary to completely evaluate the DEIS.

35 3-55;5-7 The evaporation data and pan coefficient show the evaporation ponds, as designed, probably do not have enough surface area. Even if the ponds were not undersized, they probably would not evaporate completely which would soon lead to overflow.

36 3-57 In addition to this wind direction chart a star-type velocity and direction graph is necessary to properly evaluate the impact of erosion, deposition, and odor.

37 3-63 This table shows that 3 of 4 eastern Washington monitoring stations meet or exceed the state allowed total suspended particulates (TSP) criterion. Therefore, any additional TSP would **increase the noncompliance** with the statute. Site-specific TSP data gathered by long-term studies coupled with local wind and terrain are necessary to show that the state TSP criterion would not be exceeded and the proposed landfill could be permitted.

38 3-67;4 Since odor control and odor movement are very site and environmental condition specific, it is unlikely a study for the Klickitat County EIS would be applicable at the proposed Adams County landfill site. A study for this specific site should be done to determine if odor migration offsite would a significant problem.

39 3-68;2;1 Volatile constituents would evaporate along with the water leaving behind non-volatile constituents. This is just the opposite of what the DEIS states.

40 3-68;5 As long as landfill liquids are in an evaporation pond there is a likely odor problem. Just having evaporation exceed rainfall will not make this odor a less than significant problem.

41 3-68;6 With TSP levels in the region near, at, or above maximum levels, any additional TSP would be a significant adverse impact. Without further detailed study, it is not possible to demonstrate a less-than-significant adverse impact as suggested in this DEIS.

42 3-80;3-4 It is very likely that both of the Swainson's hawk nesting sites would be abandoned. The human activity was not for a constant extended period and due to the landfill activity and other human and traffic activity, the pairs would probably not return to this area.

43 3-88;2 There has been no evidence presented that the mitigation efforts would reduce the potential impacts of these exposures to insignificant levels. Numerous EPA documents state that the increase in cancer risk of 1×10^{-6} is the limit of additional cancer risk. There has been

no data presented that demonstrates the risks would be this low so the assumption must be made that there are significant adverse risks.

44 3-90;5 With containerized waste handling of garbage from Seattle and other locations, data collected in the past about toxic vapors and odors being released prior to the material being received at the proposed Adams County site are probably not valid. The waste collection practices in the past may have enhanced releases prior to the landfill site but compaction in enclosed containers will likely retard the release of these gaseous materials. Recent research regarding this must be included with references so a proper analysis can be done.

45 3-93 The majority of these studies cited are based on data collected when landfill practices were significantly different than this proposed Adams County Landfill. Currently landfill practices generally have lower temperature increases and rapid cover thereby reducing heating which is the primary means of inactivation of viruses. Recent literature should be reviewed in this area.

46 3-94;3 Significant literature exists demonstrating viral particle transport through soil and aquifer matrices at distances greater than 100 feet. With fracture flow in basalt, significant viral transport could occur.

47 3-97;6 With deposition of Spokane Flood materials encompassing the primary sand and gravels in the area which may be sub angular, or if crushed rock were used which would greatly increase the possibility of liner puncture in the drain bed. A geotextile will not give absolute protection against liner puncture by sharp materials. This issue should be addressed by procurement of appropriate sands and gravels for cell construction.

48 3-100 According to this map, irrigated farmland is directly south and south-southwest of the proposed landfill site. According to Figure 3-10, the lower Sand Hollow Flowtop has a southwestern gradient and in Figure 3-11, the Slack Canyon Flowtop has a southern gradient. Any contamination in either of these groundwater sources would very likely lead to contamination of wells used for irrigation. In addition to these irrigation areas, Washtucna drinking water supply wells are located 6 miles southwest of the proposed landfill site. If any contamination of these waters were to occur, it is likely a significant adverse impact would occur that would be very difficult to mitigate. Data presented in this DEIS has not clearly demonstrated that when the liners are breached, groundwaters could not become contaminated.

49 3-113;3 Their description of sanitary wastewater disposal generated at the proposed solid waste landfill includes septic tanks and drain fields. If percolation tests demonstrate a suitable location can be found for a drain field, the same possibility exists that landfill leachate could also percolate and eventually reach groundwater supplies.

50 3-139 Since assumed public perception was not factored into the analysis, all property value changes are invalid. The only real value of property is a buyer's perception of its value. This must be addressed in the impact statement.

51 3-145;2:8 This sentence states: "In addition, a gas venting system within the landfill would be installed...". At other locations in this DEIS, gas venting systems could be installed if necessary. All references to a gas venting system must be consistent to allow proper review. The potential for an significant adverse impact does exist.

52 3-146;4-6 As pointed out in earlier comments there is a lack of evidence to conclude that landfill liquids could not under any circumstances reach the uppermost aquifer and that the upper two groundwater sources are not at all connected. There is also a discrepancy in the location of water supply wells relative to the proposed landfill site. With the groundwater level in the test wells at nearly the same level as the Palouse river it is likely that any contamination could discharge into the Palouse river and then could reach anyone downstream. This section describes the dryland farming and the lack of large scale irrigation as reasons there would be less than significant impact. Again there is no comment on the possibility of vertical fractures that would greatly enhance the downward flow into the aquifers.

53 3-154;5;4 This sentence describes two watering trucks at the active face of the Columbia Ridge Solid Waste Landfill. This demonstrates that the earlier concern about what fraction of the 300 acre feet of pumped water are being added to the water holding capacity of the solid waste. This must be accounted for and all calculations regarding the landfill liquid must take this into consideration and cell, evaporation ponds, and leachate collection designs must be modified accordingly.

54 4-3;3 The data gathered on landfill leachate from a literature review completed in 1974 is at least 20 years old. The landfill practices in existence that would create leachate before this thesis was completed were very different than currently being practiced. This would greatly affect the chemical toxicity and temperature effects on viruses. Therefore the human health risks cannot be dismissed based on this reference or companion references.

55 WAC 173-304-010 (5) Requires the use of the best available technology for siting, and all known available and reasonable methods for designing, constructing, operating and closing solid waste handling facilities. As have been pointed out in a number of these comments the best available technology has not been used or has not been used to its fullest extent in this DEIS.

56 WAC 173-304-407 (8)(c) This statute allows for less than 30 year post-closure monitoring if authorized by the health department. However, throughout this DEIS the post-closure monitoring period has been stated as 30 years. The way this DEIS has presented its post-closure monitoring, they are promising to monitor for 30 years if authorized to construct the landfill. This should be viewed as contractual language and even if the health department authorizes ending of the monitoring, the monitoring will not cease.

57 B-10;1;12 The spring is described as being limited to surface water runoff. In B-10;3;6 the spring is described as draining from the interface between loess and bedrock. Both of these

descriptions cannot be correct. Other references to this spring must be corrected as noted in earlier comments. All of these changes must be analyzed for any adverse impacts.

58 B-16 Based on the proposed landfill operations plan there will be a significant human impact in the Holliday coulee. During a severe winter, the loss of habitat, significant terrain disturbance and the additional human activity would likely have a significant adverse impact on the mule deer population.

The following comment pertain to seismic hazard questions.

59 Figure 3-11 of the DGAR suggests that the proposed site is not in a seismic impact zone. This figure is based on the 1982 United States Geological Survey Open-File Report 82-1033 (USGS OFR 82-1033) by Aglermissen, Perkins, Thenhaus, Hanson and Bender. After reviewing the source report I feel there is reason to believe the seismic impact zone restrictions may apply. Further study in this regard should be completed before approval could be given for the siting of the proposed Adams County Solid Waste Landfill and Recycling Center.

A telephone conversation on 4/21/1992 with Dave M. Perkins of the USGS, who is the second author of the USGS OFR 82-1033, provided further details on their research. The map used in the DGAR as Figure 3-11 from the USGS OFR 82-1033 has been superceded by more recent recalculations and maps by the same authors (MAP MF-2120). The primary reason for the development of these probabilistic maps in 1976, 1982, and 1989 were for off-shore oil exploration risks. This produced a less detailed probabilistic estimate as the distance from the coastline increases. Mr. Perkins also stated that if they were doing it again they would probably have a higher maximum magnitude in seismic source zone 062 which includes eastern Adams county.

The 1976 report was superceded in 1982 by USGS OFR 82-1033 stating: "This new emphasis is possible because of extensive data recently acquired on Holocene and Quaternary faulting in the western United States and new interpretations of geologic structures controlling the seismicity pattern in the central and eastern United States." (USGS OFR 82-1033 page 1).

The probability maps are based on seismic source zones in different areas (Figure 4 page 21 USGS OFR 82-1033). Note the distinction in eastern Washington between Pacific Northwest (area B) and Northern Rocky Mountains (area D) running through Adams County. The rationale for the boundary of each seismic source zone in the USGS OFR 82-1033 was normally in the area description. There is no rationale in USGS OFR 82-1033 for the boundary of zone 062 in the area D section.

The new data in the 1982 report does not seem to include the northern Rocky Mountain area. The authors conclude "In some states other than California, research in Holocene geology will soon make it possible to produce regional maps at detail approaching that of the California hazard map presented in this paper." (USGS OFR 82-1033 p 75). The 1989 maps were based on the 1982 data, and it is possible that research in Holocene geology has been expanded for this region since 1982. Since the best avaliable technology must be used in siting and designing a landfill, this detailed regional hazard map should be produced to determine if the seismic impact zone definition would be exceeded.

Signed

Keith E Stormo

Keith E. Stormo

Date

April 24, 1992

April 24, 1992

April 20, 1992

Department of Ecology
N 4601 Monroe Suite 100
Spokane WA 99205-1295

RE: Ground Water Application No. G3-29055

To Whom it May Concern,

Please find enclosed the original notarized affidavit of publication to appropriate public waters--G3-29055.

We would like it noted that due to the proximity of a proposed regional landfill adjacent to this area, there may be some misdirected opposition to this application.

For the record, this application for irrigation water has been filed because we will soon be losing the lease on a well, formally the Burlington Northern Rail Road well, which currently supplies us with irrigation rights for 120 acres of our property.

It is our desire to continue to irrigate previously irrigated land.

Thank you for your consideration in this matter.

Respectfully,

Heidi A. Evans

Heidi A. Evans
PO Box 64
Hooper WA 99333

Evans

Affidavit of Publication

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
NOTICE OF APPLICATION TO APPROPRIATE PUBLIC WATERS

TAKE NOTICE:

That W. Scott and Heidi A. Evans of Hooper, Washington, on September 26, 1991, under Application No. G3-29055, filed for permit to appropriate public waters, subject to existing rights, from a well in the amount of 1000 gallons per minute, each year, for continuous single domestic and stock-water supply and seasonal irrigation of 152 acres. The source of the proposed appropriation is located within the NE1/4NE1/4NE1/4 of Section 22, Township 15 N., Range 37, E.W.M., in Adams County.

Protests or objections to approval of this application must include a detailed statement of the basis for objections; protests must be accompanied by a two dollar ($2.00) recording fee and filed with the Department of Ecology, at the address shown below, within thirty (30) days from April 9, 1992.

State of Washington
Department of Ecology
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1295
(April 2, 9, 1992)

ok. ESJ

STATE OF WASHINGTON, } ss,
County of Adams,

D. Ruser, being first duly sworn on oath, deposes and says: That (s)he is the Publisher and Manager of the RITZVILLE ADAMS COUNTY JOURNAL, a weekly newspaper, which has been established, published in the English language, and circulated continuously as a weekly newspaper in the City of Ritzville, and in said County and State of general circulation in said county for more than six (6) months prior to the date of the first publication of the Notice hereto attached, and that the said RITZVILLE ADAMS COUNTY JOURNAL was on the 25th day of June, 1973, approved as a legal newspaper by the Superior Court of said Adams County, and that the annexed is a true copy of Notice of Application to Appropriate Public Waters -- G3-29055

as it appeared in the regular and entire issue of said paper itself and not in a supplement thereof for a period of two consecutive week(s) commencing on the 2nd day of April, 1992, and ending on the 9th day of April, 1992, and that said newspaper was regularly distributed to its subscribers during all of this period. That the full amount of $ 31.88 has been paid in full, at the rate of legal.

D. Ruser
D. Ruser

Subscribed and sworn to before me this 10th day of April, 1992.

Notary Public in and for the State of Washington, residing at Ritzville.

My Commission Expires: 12/12/93

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
N. 4601 Monroe, Suite 100 • Spokane, Washington 99205-1295 • (509) 456-2926

March 16, 1992

Mr. and Mrs. W. Scott Evans
101 N. Gray RD
Hooper, WA 99333

Re: Ground Water Application No. G3-29055

Dear Mr. and Mrs. Evans:

We have received your application for the appropriation of water and it has been assigned the above number. Will you please refer to it by number in future correspondence.

Enclosed is a notice of your application which must be published once a week for two consecutive weeks in the Ritzville-Adams County Journal published in Adams County as provided in RCW 90.03.280. This newspaper has general circulation in the locality where the water is to be appropriated and used and is qualified as a legal newspaper as provided in Chapter 65.16 RCW.

Please draw to the publisher's attention that the actual date of the second publication must appear in the space in the notice over the caption "last date of publication".

To assure accuracy, it is the responsibility of the applicant to check the notice carefully before having it published. If an error is detected, do not submit the notice for publication, but refer the error to this office for correction and/or resolution.

Please provide us with the original notarized affidavit of that publication. Publication should start within thirty (30) days and the affidavit must be received in this office within sixty (60) days from date of letter or rejection will be initiated.

Sincerely,

Cindy A. Christian
Allocation and Management Unit
Water Resources Program

CAC:aal
Enclosure - Notice of Application

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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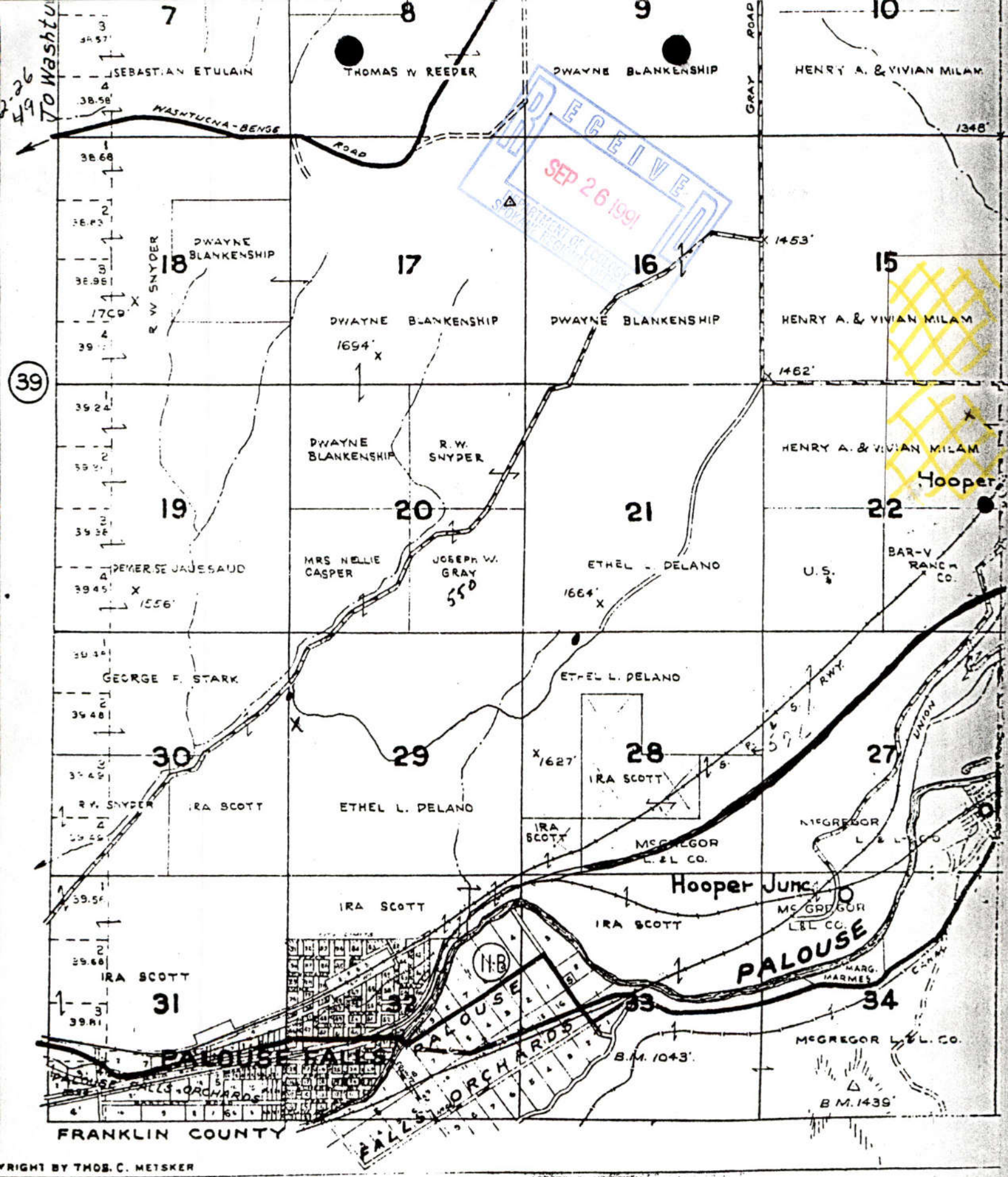
_____

(Last date of publication to be entered above by publisher)

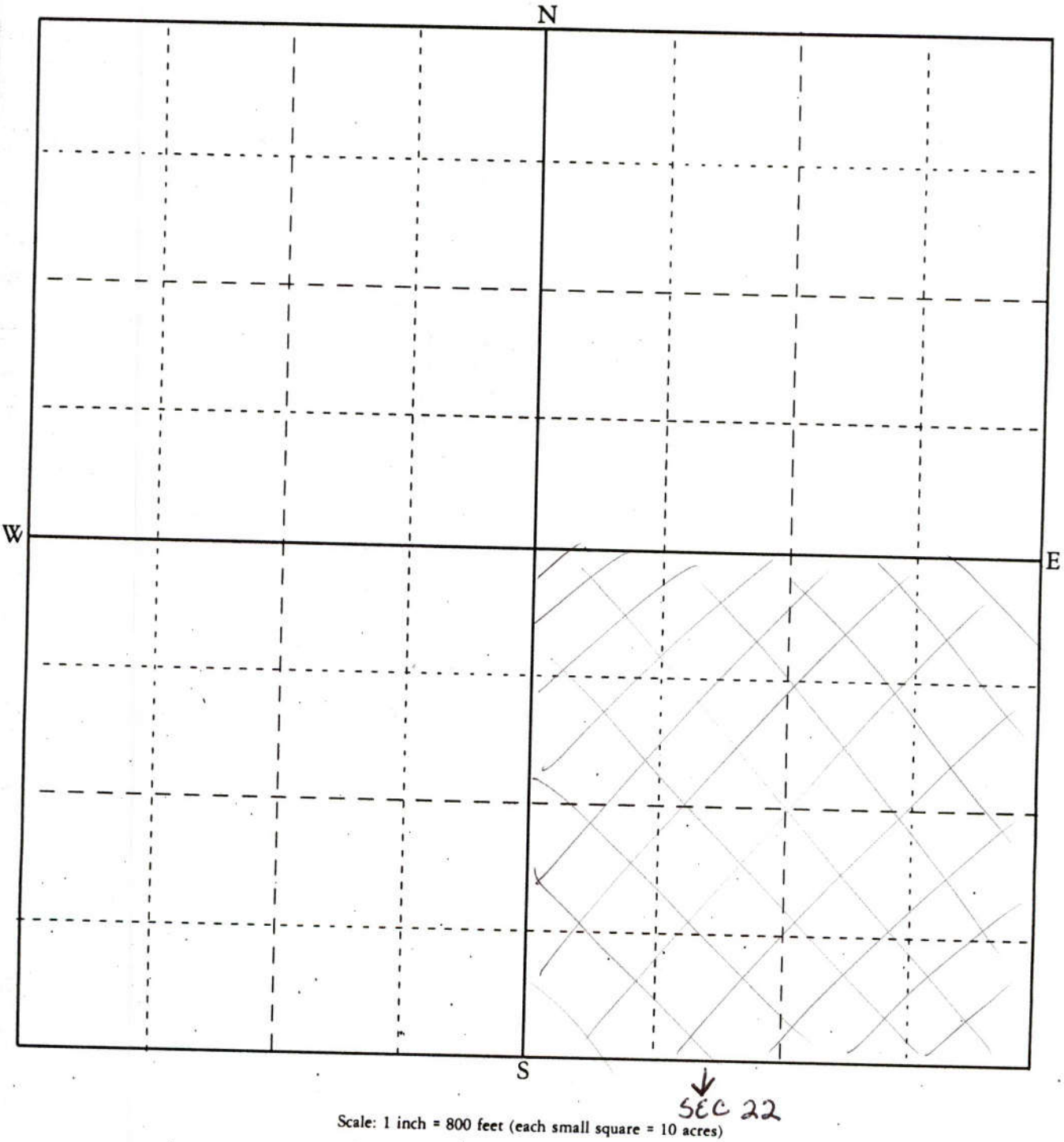
State of Washington
Department of Ecology
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1295

NOTICE



SECTION MAP

Sec. 15 Twp. 15 N. R. 37 Ewm



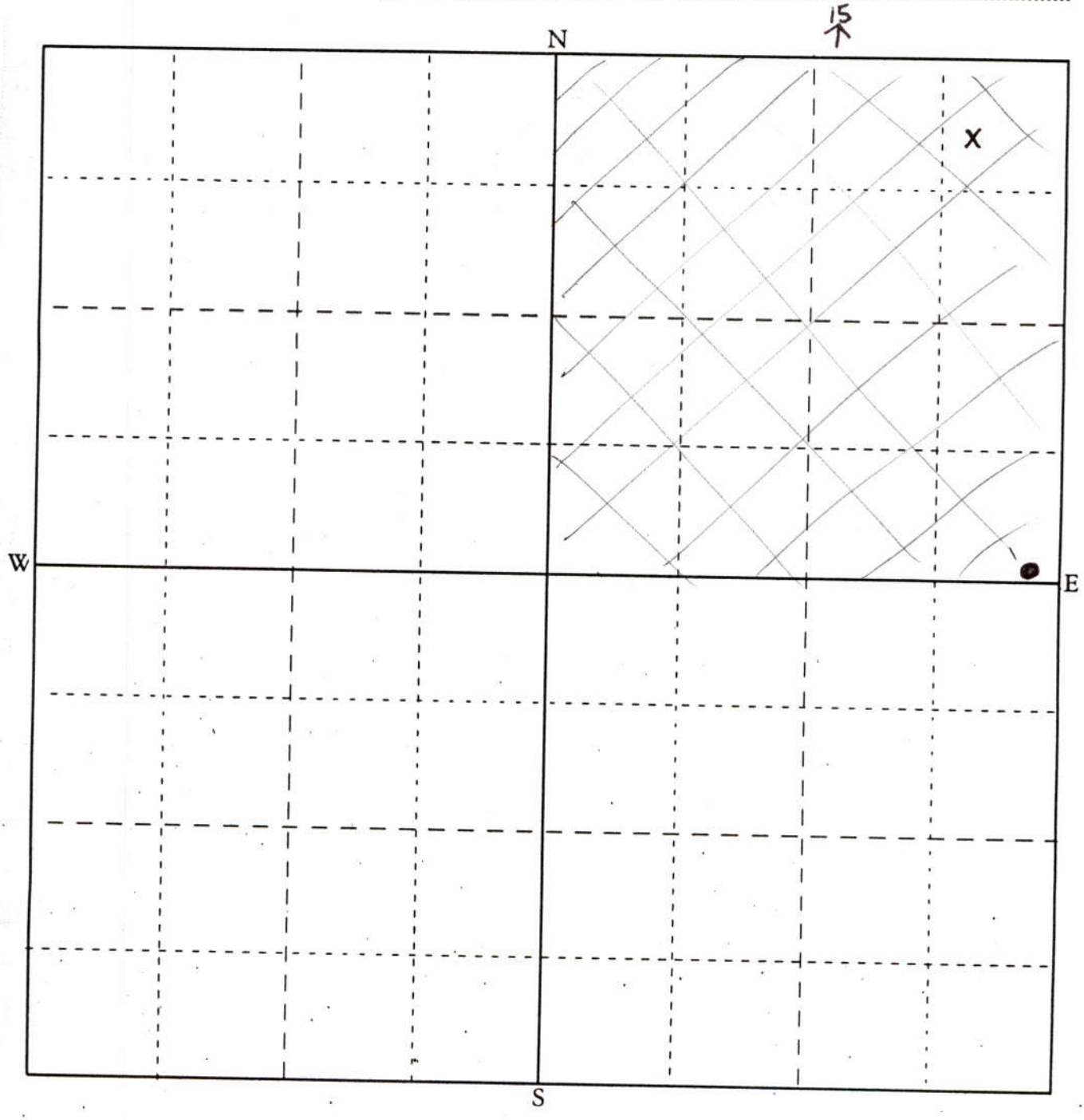
Scale: 1 inch = 800 feet (each small square = 10 acres)

Show by a cross (X) the location of point of diversion (surface water source) or point of withdrawal (ground water source). For ground water applications, show by a circle (O) the locations of other wells or works within a quarter of a mile.

Indicate traveling directions from nearest town in space below

SECTION MAP

Sec. 22 Twp. 15 N. R. 37 EWM



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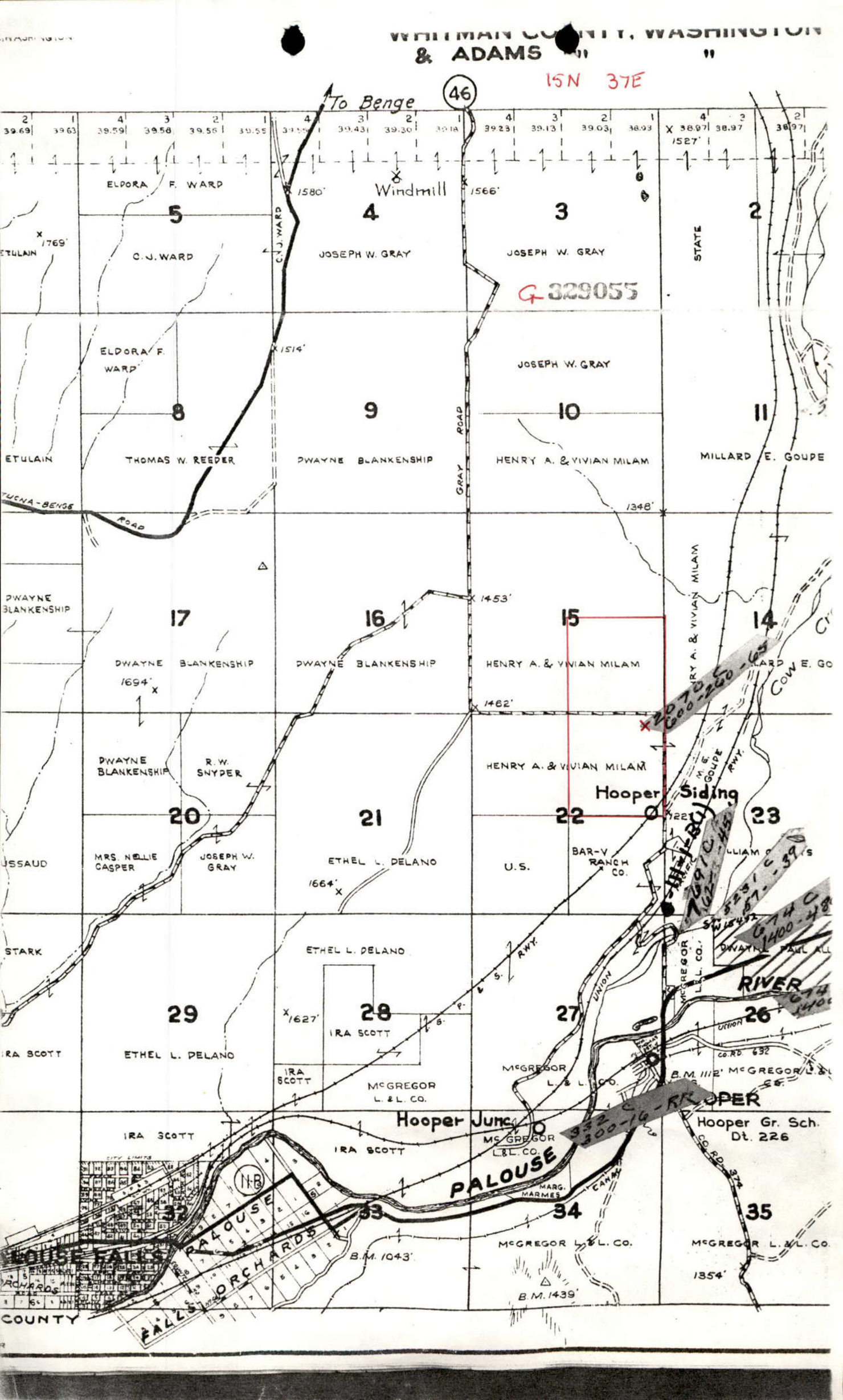
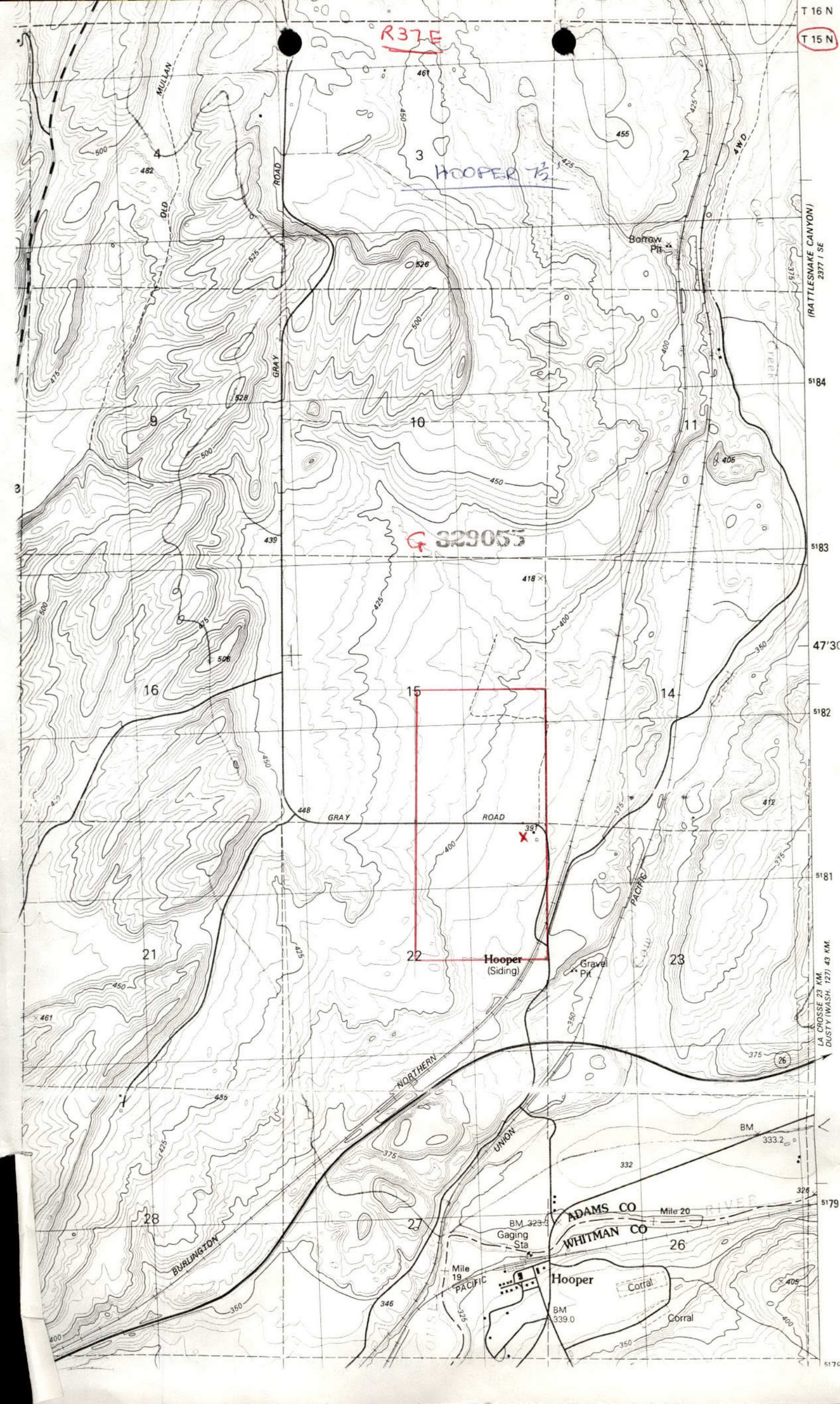

WHITMAN COUNTY, WASHINGTON
& ADAMS
15N 37E
To Benge
46
Windmill
ELDORA F. WARD
C. J. WARD
JOSEPH W. GRAY
STATE
G 329055
ETULAIN
THOMAS W. REEDER
DWAYNE BLANKENSHIP
HENRY A. & VIVIAN MILAM
MILLARD E. GOUPE
TUCNA-BENGE ROAD
GRAY ROAD
R. W. SNYDER
MRS. NELLIE CASPER
JOSEPH W. GRAY
ETHEL L. DELANO
U.S.
BAR-V RANCH CO.
Hooper Siding
IRA SCOTT
McGREGOR L. & L. CO.
Hooper Junc.
Hooper Gr. Sch. Dt. 226
PALOUSE
PALOUSE FALLS
FALLS ORCHARDS
B.M. 1043'
B.M. 1439'
B.M. 1112'
1580'
1566'
1514'
1348'
1453'
1462'
1694'
1664'
1627'
1769'
1527'
1354'
COUNTY


T 16 N
T 15 N
R37E
HOOPER 7½'
MULLAN ROAD
OLD
GRAY ROAD
4WD
Borrow Pit
(RATTLESNAKE CANYON) 2377 I SE
5184
5183
47'30
5182
5181
GRAY ROAD
Hooper (Siding)
Gravel Pit
PACIFIC
NORTHERN PACIFIC
BURLINGTON
UNION
ADAMS CO
WHITMAN CO
Mile 20
Mile 19
Gaging Sta
BM 323.3
BM 333.2
BM 339.0
Hooper
Corral
Corral
LA CROSSE 23 KM.
DUSTY (WASH. 127) 43 KM.
5179