BEFORE THE
DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL QUALITY COUNCIL
STATE OF WYOMING

IN THE MATTER OF CHAPTER 1,	)
QUALITY STANDARDS FOR	)
WYOMING SURFACE WATERS,	)
WATER QUALITY RULES AND	)
REGULATIONS	)

STATEMENT OF PRINCIPAL REASONS

Background

The Department of Environmental Quality (DEQ), Water Quality Division (WQD), pursuant to the authority vested in it by the Wyoming Environmental Quality Act, Wyoming Statutes 35-11-101 to 1507 et seq., has been directed by the Environmental Quality Council (EQC) to amend and revise Chapter 1 of the Wyoming Water Quality Rules and Regulations. Chapter 1 contains the water quality standards for surface waters in the state including water classifications and designation of protected uses.

On February 16, 2007, the EQC approved proposed revisions to Chapter 1 except for Appendix H, Agricultural Use Protection which was removed from the rule and remanded back to DEQ for directed revisions. In May of 2007, proposed revisions to Appendix H were posted on the DEQ's website and notice was published in the Casper Star Tribune. On June 15, 2007 comments were received at a Water and Waste Advisory Board (Board) meeting in Casper, Wyoming. On September 14, 2007, the Board held a second meeting in Jackson, Wyoming which included video conference sites at eight other Wyoming municipalities. At the Jackson meeting, testimony was heard and comments were received on the previously published University of Wyoming (UW) report entitled "Water Quality for Wyoming Livestock and Wildlife" which discusses recommended safe drinking water levels for Wyoming livestock and wildlife. On December 7, 2007 the Board received additional public comments regarding DEQ's proposed rule revisions to Chapter 1, Appendix H, Agricultural Use Protection and comments on the response summaries from the previous two Board meetings. On March 28, 2008, the Board considered a final round of public comments and recommended DEQ proceed with formal rulemaking before the EQC. The EQC held one work session on September 30, 2008, and public hearings in Cheyenne on October 24, 2008, Gillette on October 28, 2008, Thermopolis on November 6, 2008, and Laramie on November 20, 2008 related to the proposed Appendix H and

revisions based on the public comments and associated hearing. Chapter 1 and Appendix H were adopted by the EQC on November 20, 2008.

This rule making is a substantial proposed revision to Chapter 1 which describes how effluent limitations and conditions will be applied to produced water discharges in Wyoming Pollutant Discharge Elimination System (WYPDES) permits. All proposed revisions to Chapter 1 are associated with Section 20, Agricultural Water Supply. The major revisions proposed for this rulemaking include:

1. Creating a new Appendix H which provides the procedures for interpreting and implementing the Section 20 narrative standard for the protection of agricultural water supplies through the point source permitting program. Section 20 provides that degradation of surface waters which are designated for agricultural uses shall not be of such an extent to cause a measurable decrease in crop or livestock production. The specific provisions of the new Appendix H include:

    - A discussion of what is meant by "measurable decrease in crop or livestock production";
    - An exemption for historic discharges;
    - Effluent limits on the concentration of a number of pollutants relative to the protection of livestock drinking water supplies;
    - A provision for establishing irrigation limits equal to background water quality;
    - Definitions for "artificially irrigated lands" and "naturally irrigated lands";
    - A 3-tiered decision making process for establishing effluent limits for electrical conductivity (EC) and sodium adsorption ratio (SAR) on permitted discharges that may affect irrigated lands;
    - A provision for landowner waivers of the irrigation limits which would otherwise apply;
    - A provision for establishing effluent limits in circumstances where access to collect site specific data has not been granted.

2. Modifying Section 20 to provide the necessary reference to Appendix H.

3. Revising the Agricultural Use Protection section of the Implementation Policies.

Purpose and Intent of this Proposed Revision

Section 303(c) of the federal Clean Water Act (CWA) provides states, tribes and territories with the primary authority and responsibility to establish water quality standards for waters of the United States within their respective jurisdictions. The CWA also requires states to review their water quality standards at least once every three years and to make revisions where appropriate. This three-year revision cycle is commonly referred to as the "triennial review."

Chapter 1 of the Wyoming Water Quality Rules and Regulations contains the state's surface water quality standards. Water quality standards, once adopted, become state requirements and are submitted to the United States Environmental Protection Agency (EPA), Region VIII for approval under the CWA as the applicable standards in the State of Wyoming.

In this rule making, the Department of Environmental Quality proposes to update the Wyoming surface water quality standards to protect and maintain the designated uses of waters of the state associated with agricultural use and to achieve the goals of the CWA. These goals will be accomplished by creating procedures for implementing the Section 20, Agricultural Water Supply standard through the establishment of effluent limits on point source discharges.

All surface waters in Wyoming are protected to some extent for agricultural uses. "Agricultural uses" are described in Section 3 as being either stock watering or irrigation. The standard that applies to the protection of these uses is contained in Section 20 and states:

Section 20. ***Agricultural Water Supply****. All Wyoming surface waters which have the natural water quality potential for use as an agricultural water supply shall be maintained at a quality which allows continued use of such waters for agricultural purposes.*

Degradation of such waters shall not be of such an extent to cause a measurable decrease in crop or livestock production.

Unless otherwise demonstrated, all Wyoming surface waters have the natural water quality potential for use as an agricultural water supply.

The purpose of this Appendix is to provide the criteria and procedures to be used by the WQD when translating the narrative goals expressed in the Section 20 standard into appropriate WYPDES permit limits where maintaining agricultural use of the receiving waters is an issue.

These rules are also intended to implement various provisions of the Wyoming Environmental Quality Act (WS 35-11-101 through 35-11-1507 et. seq.).

Specifically, these rules are being revised to:

1. Meet the triennial review requirements of the CWA;

2. Provide an improved procedure for implementing the narrative standard found in Section 20 when setting effluent limits on discharges used for agricultural purposes;

3. Implement the applicable provisions of the Wyoming Environmental Quality Act; and

4. Ensure that Wyoming's primacy for delegated programs of the CWA is maintained.

Proposed Revisions to Chapter 1, Wyoming Water Quality Rules and Regulations

Appendix H

Agricultural Use Protection

Section (a) - Purpose

Agricultural use of surface water is an opportunistic endeavor. The varying uses as well as the different qualities of the water found in the state are many and the farming and ranching industries have always had to make do with what water is available. The goal expressed in the Section 20 standard is simply to maintain surface water quality at a level that will continue to support the local agricultural uses that have developed around it.

Though the goal is simple, achieving it is not. For the most part, managing water quality for continued irrigation requires managing the salinity and SAR. Because of local differences in crop types, soil types and natural water quality and availability, it is not possible to establish a single numeric criteria for salinity and SAR that will allow an efficient use of surface water for irrigation purposes. The determination of what is acceptable water quality for irrigation must necessarily involve an evaluation of local agricultural practices and background water quality conditions. For livestock watering uses, it is somewhat less complicated because there are fewer variables to consider.

"Measurable Decrease"

The first task in translating the standard is defining what is meant by "*measurable decrease in crop or livestock production"*. The phrase implies that there is a pre-existing agricultural use of a stream or drainage prior to an application for a WYPDES discharge permit. For livestock watering purposes, a pre-existing use will always be assumed. For irrigation purposes, there needs to be either a current irrigation structure or mechanism in place for diverting water from the stream channel, or in other cases, substantial acreage of naturally sub-irrigated pasture within a stream floodplain. Where neither of these conditions exists, there can be no irrigation use or loss in crop production attributable to water quality.

Where there are pre-existing agricultural uses, it may often be impossible to measure a loss in crops or livestock that can be attributed to water quality because of the many other factors that will effect actual production. It is also important to be able to predict the probability of a measurable decrease in production rather than relying solely on after-the-fact measurements. Therefore, the implementation of the narrative criteria through WYPDES permits will always involve making reasonable judgments and assumptions.

Historic Discharges

As described in Appendix H, Section (a):

"Effluent limits in discharge permits issued prior to January 1, 1998 will not be affected by this Appendix in relation to the protection of agricultural uses. Such permits may be modified or renewed and still receive the same effluent limits and conditions. Where discharges have been occurring prior to January 1, 1998 it will be assumed that the permit limits have been protective of agricultural production. Therefore, it is not necessary to modify those permit limits in order to achieve the goal of "no measureable decrease in crop or livestock production". New discharges to these drainages will receive the same effluent limitations and conditions as the pre January 1, 1998 permits. It is important to note that more stringent effluent limits and/or permit conditions may be added to permits where the quality of the discharge(s) is shown to constitute a threat to any other designated uses described in these regulations."

The current state of energy development is unlike anything that has occurred historically. The impact of historic produced water discharges on surface water quality and the use of produced water for agriculture (primarily ranching) is mitigated to a great extent by the fact that it includes only 470 outfalls distributed over many years across the entire state. In just the past 10 years, coalbed methane has accounted for approximately 8,000 outfalls in just the greater Powder River development area. The sheer scale of this development requires new concepts in regulation. Additionally, the proposed rule is not specific to CBM but applies equally to all discharges of produced water that originated after 1997 including conventional oil and gas development and mining.

This rapid growth in coalbed methane production has raised legitimate concerns over the effects that such large development may have on agricultural production and is the primary impetus for the development of the Agricultural Use Protection Policy. On the other hand, agricultural producers who have been affected over the years by discharges from the historic conventional oil and gas discharges have been overwhelmingly in favor of retaining those discharges. The inclusion of the January 1, 1998 cutoff date achieves the purpose of separating those historic discharges which have been demonstrated to be useful for agricultural purposes from the more recent coalbed methane discharges which present new risks and challenges to agricultural productivity.

Some have contended that the exemption for historic discharges should also extend to all current discharge permits and not be retroactive to permits issued after January 1, 1998. Taking this approach would remove some of the important concepts in the rule. To grandfather all of the current permits would continue to leave most of the bottomlands in the Powder River development area without appropriate protection from potential effects of elevated salinity and SAR. Therefore, DEQ has retained January 1, 1998 as the appropriate point to delineate the regulation of historic discharges.

Section (b) - Live Stock Watering

The basic concept in protecting the livestock watering use is to ensure that water quality is not acutely harmful to livestock or does not contain pollutants in concentrations that would affect growth or reproduction. There are basic effluent limitations for TDS (5000 mg/L), chloride (2,000 mg/L), and sulfate (3000 mg/L) provided in the WYPDES permit regulations *(Chapter 2 of the Water Quality Rules and Regulations)* that are intended to ensure that the water is safe for livestock to drink. These limits have also been included in Chapter 1, Appendix H. The supplemental Agricultural Use Protection policy also includes a number of other pollutants that may have effects on livestock health and production. The policy describes additional limits and provisions that may be applied to discharge permits. In circumstances where initial sampling indicates the presence of any of the parameters listed in the policy, they too will be subject to receiving effluent limits.

On September 14, 2007 the Board received comments on a report which was contracted by the WQD to assist with determining appropriate effluent limits for livestock watering. In the University of Wyoming (UW) report titled "Water Quality for Wyoming Livestock & Wildlife", (Raisbeck et. al., 2007), UW conducted a comprehensive literature search of toxicological values which were determined to have the potential for impacting livestock health and production. During the September Board meeting and at a following meeting on December 7, 2007, the Board heard discussion and public comment about the potential affects to livestock health and production from produced water discharges. Although significant effects to livestock have been observed in scientific studies as described in the UW report, the vast majority of testimony from individuals and stakeholder groups suggested that livestock health and production has not been impacted negatively by produced water discharges at the current levels set in the Agricultural Use Protection Policy and Chapter 2 of the Water Quality Rules and Regulations.

During deliberation at a Board meeting on March 28, 2008, the Board decided and the WQD agreed that the current limits set for protecting agricultural use from produced water are adequately protective of the livestock watering use, although future studies may indicate the need for more protective limits. The EQC also heard testimony about appropriate effluent limits for protection of livestock watering. The EQC concurred, that the recommended standards by the WQD and the Board are protective of the livestock watering use.

Section (b)(i) – Effluent Limits for Livestock Watering

As discussed in the section above, the limits set for protection of livestock watering have been determined to be protective of the livestock watering use. Three parameters (total dissolved solids, sulfates, and chlorides) have historically been and will continue to be used to measure the point when produced water is presumed to be toxic to livestock. In addition, when other parameters listed in the Agricultural Use Protection Policy are observed during initial sampling, then appropriate limits and provisions for each parameter will also be set in WYPDES discharge permits.

This section of Appendix H and the associated implementation policy recognize that poorer quality water has been used historically by the ranching community without indication of a measurable decrease in livestock production. Testimony heard by both the Board and the EQC suggested that livestock, when managed properly, are not necessarily affected by higher concentrations of the listed constituents. During these public meetings and hearings, testimony was also clear that the majority of landowners receiving discharge water consider the water necessary for continuing their operations in an economically feasible manner. For this reason, a provision is included in both the rule and implementation policy which allows for waiving the listed effluent limits when all potentially affected landowners and producers agree to accept the poorer quality water and are willing to assume all potential risks associated with its use.

Another provision of this paragraph allows consideration of background water quality when developing effluent limits. In circumstances when this provision is considered by the WQD, the Division will evaluate when it is appropriate and at what levels effluent limits are set to ensure that discharges do not result in degrading the existing quality of the affected surface water.

Section (c) - Irrigation

The interpretation of the Section 20 standard for irrigation is more complex than for livestock watering because there are more variables than just the quality of the water to consider. However, after considering the local circumstances relative to irrigation and crop production, effluent limits can be established in WYPDES permits that will be protective of the pre-existing irrigation uses. The goal is to ensure that pre-existing irrigated crop production will not be diminished as a result of the lowering of water quality.

The basic water quality parameters of concern with regard to irrigation are EC and SAR. Protection of irrigation uses, where WYPDES permits are involved, amounts to deriving appropriate effluent limits for EC and SAR. Effluent limits for EC were developed to address potential impacts to crop production from harmful levels of salinity, and salinity is often a component of oil and gas discharges. Effluent limits for SAR have been developed to address potential impacts to soil structure and permeability.

Identification and protection of irrigation uses involves a sequence of decisions based upon the

amount and quality of data that is available to the permit writer. The most basic question is whether a proposed discharge will reach irrigated lands. If the discharge will not reach an irrigated field, either because of natural conditions or water management techniques, it could not affect crop production on that field and irrigation driven limits for EC and SAR will not be required.

If the discharge will reach an irrigated field or a naturally irrigated land, a 3-tiered decision making process will be used to establish appropriate effluent limits for EC and SAR.

Section (c)(i) – Irrigated Lands Definitions

"Artificially Irrigated Lands" means the artificially irrigated lands where water is intentionally applied for agricultural purposes. Artificially irrigated lands will be identified by the presence of canals, ditches, spreader dikes, spray irrigation systems or any other constructed mechanism intended to divert water from a stream channel for application on adjacent lands.

Appropriate limits for EC and SAR will be applied on all discharges that can reasonably be expected to reach the diversion point for an artificially irrigated land of any size.

"Naturally Irrigated Lands" means lands along stream channels that have enhanced vegetative production due to periodic natural flooding or sub-irrigation. Naturally irrigated lands are those lands where a stream channel provides for enhanced productivity of plants used for agricultural purposes. Naturally irrigated lands may be identified by an evaluation of infra-red aerial imagery, surficial geologic maps, wetland mapping, landowner testimony, site specific assessment, any combination of that information, or other types of evaluations.

Naturally irrigated lands are commonly referred to as "bottomlands". Though not "irrigated" in the traditional sense, they are characterized by enhanced forage production due to natural overland flooding or sub-irrigation. EC and SAR limits will be applied to WYPDES permits where the produced water discharge may reach stream segments containing single parcels of naturally irrigated land greater than 20 acres in size or multiple parcels in near proximity that total more than 20 acres. In making this estimation, small drainage bottoms may be excluded from consideration. Two specific criteria which may be used to exclude lands include lack of a persistent active channel and unconsolidated floodplain deposits which are generally less than 50 feet in width.

Section (c)(vi)(A) – Tier 1 (default EC and SAR limits)

Section (c)(vi)(A)(I) – Default EC Limits

Tier 1 refers to a procedure for setting default EC and SAR limits and is useful in situations where the irrigated crops are salt-tolerant and/or the discharge water quality is relatively good. The basic idea involves identifying the most salt sensitive forage species that may be affected by

a permitted discharge and basing the effluent limit for EC on the published soil salinity threshold value for that plant. Because the published values represent soil salinities that would support a theoretical 100% yield, this approach assures that there would be no measurable decrease in crop production due to water quality. The primary reference for obtaining salinity threshold values is the Salt Tolerance Database published by the USDA Agriculture Research Service (ARS) but other references may be used for plants not included in the USDA database.

Section (c)(vi)(A)(II) – Soil EC to Water EC Conversion

Once the most sensitive crop for a given agricultural area is identified, EC limits will be determined from the USDA ARS Salt Tolerance Database and converted from the reported soil value to a water value by dividing the soil value by a conversion factor of 1.5.

"In circumstances where the background water quality of the receiving water(s) is known to be significantly better than would otherwise be required based on a theoretical 100% yield, effluent limits may be set to maintain that higher quality." This provision for setting Tier 1 default limits generally refers to perennial or intermittent streams where there is preexisting data to determine background water quality. Where background water is of exceptionally high quality it can support uses other than irrigation. It is DEQ's obligation to preserve that higher quality and ensure the support of all potential uses.

Section (c)(vi)(A)(III) – Default SAR Limits

Default SAR values will be extrapolated from the Hanson et al. (2006) Chart *(see Figure 1, Appendix H)* based upon the default EC value in each circumstance up to a maximum default value of 10. The effluent limit for SAR will be determined in conjunction with EC so that the relationship of SAR to EC remains within the "no reduction in rate of infiltration" zone, as described in Figure 1. The maximum SAR limit is therefore set below the line separating the "no reduction in rate of infiltration" zone from the "slight to moderate reduction in infiltration" zone in the Hanson et al. diagram, which is represented by the following equation: $SAR < (6.67 \times EC) - 3.33$. It should be noted that SAR values are tied to the EC concentration and might need to be adjusted to correlate to the actual EC concentration of the discharge rather than the theoretical maximum.

Use of the Hanson diagram to extrapolate default effluent limits for SAR is capped at a maximum SAR of 10 to minimize the potential for sodium build-up in poorly drained soils. This 10 SAR cap is only intended to apply when utilizing the default procedure and may be modified using the Tier 2 or Tier 3 procedures provided in Sections (c)(vi)(B) and (c)(vi)(C).

Meeting Tier 1 default limits is difficult for most oil and gas producers without additional treatment before the discharge. For this reason, other alternatives for using/discharging produced water beneficially have been developed which are also protective of agricultural uses. Some of these alternatives are discussed below and include Tier 2 effluent limits based on

background water quality, Tier 3 effluent limits based on no harm analysis studies, and a waiver option for setting effluent limits which exceed those derived by the tiered approach.

Section (c)(vi)(IV) – Season of Use

Effluent limits for EC and SAR are intended to apply during times when the water may be applied to irrigated land and when flows are sufficient to support the use. In general, on passively irrigated lands such as those under spreader dike systems and naturally irrigated bottomlands EC and SAR limits will be applied year-round.

Section (c)(vi)(B) – Tier 2 (background water quality)

Tier 2 refers to a process whereby the permit limits may be adjusted to equal background water quality conditions and is intended to be used in situations where the background water quality (EC and SAR) is poorer than the effluent quality. Background water quality is determined by historical data that is sometimes available for larger streams, e.g. perennial and some intermittent streams from gauging stations, or is determined by taking soil samples at the irrigated area(s) and calculating background water quality. It is reasonable to assume that if discharges are regulated in a manner to maintain background water quality, there would be no loss in crop production due to water quality.

On intermittent and ephemeral stream systems where measured water quality data is rarely available, background water quality can be estimated based upon soil salinity conditions on irrigated lands or bottomlands adjacent to the stream channels. This section provides specifications for conducting soil surveys to be used to estimate background water quality.

Tier 2 studies are not specific to each discharger but are rather specific to the drainage affected by the discharge. Upon approval by DEQ of a Tier 2 analysis, the results will be used to set effluent limits for all discharges in the drainage where the discharge may impact the associated irrigated lands.

Section (c)(vii)(C) - Tier 3 (no harm analyses)

Produced water, of lower quality than background, can often still be used for irrigation without a loss in crop productivity. This circumstance, however, cannot be assumed and must be demonstrated. The Tier 3 level of analyses is intended to be used in circumstances where effluent water quality is worse than background water quality.

The actual effects of EC and SAR on crop production are variable based upon soil type and chemistry and may be mitigated to some extent by managing irrigation practices. EC and SAR effluent limits may also be established based upon a scientifically defensible site specific study which examines local soil characteristics, natural water quality, expected crop yield, irrigation practices and/or any other relevant factor related to crop production.

Because of the very site-specific nature of this approach and the number and complexity of variables that may need to be considered, it is not very useful to specify any particular type of analysis in rule. When taking this approach, however, there is a burden of proof placed upon the applicant to demonstrate through a comprehensive study that levels of EC and/or SAR, higher than either the default values or estimated background water quality, would most likely not measurably harm an existing irrigation use. This approach will allow a degree of innovation regarding landowner preferences and management. Refined limits for EC and SAR resulting from a "no harm" analysis should incorporate a reasonable margin of safety to account for variables that cannot be precisely measured or modeled.

Section (c)(vii) – Irrigation Waiver

An exception to EC or SAR limits established under the Tier 1, 2 or 3 procedures may be made when affected landowners request use of the water and thereby accept any potential risk to crop production on their lands. Irrigation waivers will only be granted in association with an irrigation management plan that provides reasonable assurance that the lower quality water will be confined to the targeted lands. Irrigation waivers will also only be approved after all affected land owners approve of the conditions by which the produced water will be discharged, and the discharge will not result in any impairment of other designated uses downstream of the discharge.

Section (c)(viii) – Reasonable Access Requirement

This section recognizes Wyoming landowner's rights to provide or deny access to their property and provides alternatives to applicants when access is denied. This issue may arise because of a Tier 2 analysis when an applicant is denied access needed to obtain site specific data for determining background water quality. If an applicant is unable to obtain access to collect data, Section (c)(viii) stipulates the use of alternate sampling locations, where conditions are expected to be similar in nature, may be used to determine background conditions in lieu of the area being protected. In these cases, WQD will use discretion and best professional judgment to determine if alternative areas are similar in nature.

Effect of the Rule Revision

The WQD anticipates that the result of these proposed revisions will provide a level of surface water protection sufficient to address public health and environmental concerns while allowing the beneficial use of produced water in most circumstances.

Public Participation

Public notice, announcing DEQ's intention to revise the Chapter 1 surface water regulations, was released for the purpose of soliciting comment relating to the proposal on July 15, 2002. A

public meeting was held via the Wyoming Video Conference System on August 6, 2002 during which the department accepted both oral and written comments. The proposed rules and associated policies underwent an extensive review by the Board which included 5 public meetings and 4 solicitations of public comment over a 2-year period.

On February 16, 2007, the EQC approved proposed revisions to Chapter 1 except for Appendix H, Agricultural Use Protection, which was removed from the rule and remanded back to DEQ for further directed revisions. In May of 2007, DEQ completed proposed revisions to Appendix H which were discussed at a June 15, 2007 Board meeting in Casper, Wyoming. On September 14, 2007, the Board held a second meeting in Jackson, Wyoming which included video conference sites at eight other Wyoming municipalities to hear testimony regarding the release of the UW report entitled "Water Quality for Wyoming Livestock and Wildlife". On December 7, 2007 the Board received additional public comments regarding DEQ's proposed rule revisions to Chapter 1, Appendix H, Agricultural Use Protection and comments on the response summaries from the previous two Board meetings. On March 28, 2008, the Board considered a final round of public comments and recommended DEQ proceed with formal rulemaking before the EQC. The EQC scheduled a work session to discuss proposed revisions in a public notice that ran in the Casper Star Tribune on September 9 and September 10, 2008 and was held in Casper, Wyoming on September 30, 2008. The Environmental Quality Council solicited public comments on the proposed rules on July 8, 2008 and July 9 2008 and held public hearings on October 24, 2008 in Cheyenne, Wyoming, October 28, 2008 in Gillette, Wyoming, and on November 6, 2008 in Thermopolis, Wyoming. The EQC also scheduled a final meeting on November 20, 2008 to hear final testimony on Appendix H prior to final approval.

Conclusion. The Council has determined that the adoption of these rules is necessary to update the Wyoming surface water standards to comply with federal regulations and to carry out the responsibilities of the Department of Environmental Quality in regards to the protection of surface water quality in the state.

EXECUTED THIS _____ DAY OF _____, 2008.

FOR THE ENVIRONMENTAL QUALITY COUNCIL

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Chairperson