A group of about seven children are standing outdoors on a paved area. They are dressed in casual clothing like jackets and vests. In the background, there is a multi-story building with windows and some trees. The overall scene is slightly faded, serving as a background for the text.

**Strategies for Addressing Accumulated Damage at Mining Sites:  
Legal Mechanisms in the US and Remedial Technology Options for  
A Selection of Pollution Problems at the  
Dzhidinski Mining District, Republic of Buryatia, Russia  
for presentation at**

**Republic of Buryatia Seminar on  
Legal and Technical Strategies for Addressing Accumulated Damage at  
Mining Sites in the Republic of Buryatia**

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## Examples of Funding Mechanisms for Reclamation of Inactive Mining Sites and Current Operations in US Include:

- Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) – “Superfund” – US Federal Law – to address the cleanup of sites where hazardous substances have been released into the environment or where there is a substantial threat that hazardous substances have been or will be released into the environment.
- Surface Mining Control and Reclamation Act of 1977 (SMCRA) – US Federal Law – Requires payment of \$0.35/ton from current and new operations to Abandoned Mine Land Reclamation Fund for use in state where site is located.
- New Mexico Mining Act of 1993 – NM State Law - owner and/or operator of any facility active for any two year period since 1971 must prepare comprehensive reclamation plan and provide a financial guarantee to assure reclamation before any mining operations can be conducted.

## CERCLA - “Superfund”

Public Law 96-510, 42 USC Sections 9601-9675, Passed December 11, 1980 provides for (among other provisions):

- Clean-up required to attain health based standards and compliance with all appropriate and applicable Federal and State regulatory requirements
- US Environmental Protection Agency (EPA - federal agency with enforcement responsibility) to consult with states before making cleanup decision
- Long-term operation and maintenance after completion of remedial action (clean-up program)
- **Financial liability for payment by responsible parties for full cost of site assessments, hazards ranking system investigation, remedial investigation and feasibility study (RI/FS), completion of remedial action (clean-up) and long-term monitoring and maintenance**
- **Financial liability for payment by responsible parties for accumulated natural resource damages and restoration, including accumulated surface and ground water damage**
- Enforcement and compliance assurance mechanisms include civil (monetary) penalties for failure to report hazardous substance releases, civil penalties violation of remediation action (clean-up) orders by EPA, tripled damages for failure to comply with EPA clean-up order and state enforcement of standards for clean-up

Summary at: “A Citizens Guide to Environmental Laws for Secure Environmental Justice”

[http://www.epa.gov/compliance/ej/resources/reports/annual-project-reports/citizen\\_guide\\_ej.pdf](http://www.epa.gov/compliance/ej/resources/reports/annual-project-reports/citizen_guide_ej.pdf)

SMCRA – Surface Mining Control and Reclamation Act of 1977  
Public Law 95-87, 30 USC Sections 1234-1328, passed August 3, 1977  
Title IV - Abandoned Mine Reclamation

Section 401 – 30USC1231

- A) Abandoned Mine Reclamation Fund - There is created on the books of the Treasury of the United States a trust fund to be known as the Abandoned Mine Reclamation Fund which shall be administered by the Secretary of the Interior. State abandoned mine reclamation funds generated by grants from this title shall be established by each State pursuant to an approved State program.
- B) The fund shall consist of amounts deposited in the fund, from time to time derived from—(1) the reclamation fees levied under section 402;

C) **Moneys in the fund may be used for the following purposes: (1) reclamation and restoration of land and water resources adversely affected by past coal mining, including but not limited to reclamation and restoration of abandoned surface mine areas, abandoned coal processing areas, and abandoned coal refuse disposal areas; .....**

Section 402 – 30USC1232

(A) Payment; **All operators of coal mining operations subject to the provisions of this Act shall pay to the Secretary of the Interior, for deposit in the fund, a reclamation fee of 35 cents per ton of coal produced by surface coal mining** and 13.5 cents per ton of coal produced by underground mining or 10 per centum of the value of the coal at the mine, as determined by the Secretary, whichever is less, except that the reclamation fee for lignite coal shall be at a rate of 2 per centum of the value of the coal at the mine, or 9 cents per ton, whichever is less.

Full text of SMCRA available at:

<http://www.osmre.gov/topic/SMCRA/SMCRA.pdf>

New Mexico Mining Act of 1993  
Chapter 69 Section 39 Parts 1 – 37 New Mexico Statutes Annotated  
69-36-1-20 NMSA

Purposes - The purposes of the New Mexico Mining Act include promoting responsible utilization and reclamation of lands affected by exploration, mining or the extraction of minerals that are vital to the welfare of New Mexico. (69-39-2)

"Reclamation" means the employment during and after a mining operation of **measures designed to mitigate the disturbance of affected areas and permit areas and to the extent practicable**, provide for the stabilization of a permit area following closure that will **minimize future impact to the environment from the mining operation and protect air and water resources**. (69-36-3-K)

Financial Assurance – “require by regulation that the applicant file with the director, prior to the issuance of a permit, financial assurance. **The amount of the financial assurance shall be sufficient to assure the completion of the performance requirements of the permit, including closure and reclamation, if the work had to be performed by the director or a third party contractor and shall include periodic review to account for any inflationary increases and anticipated changes in reclamation or closure costs**. The regulations shall specify that financial requirements shall neither duplicate nor be less comprehensive than the federal financial requirements. **The form and amount of the financial assurance shall be subject to the approval of the director as part of the permit application; provided, financial assurance does not include any type or variety of self-guarantee or self-insurance**; (69-39-7-Q)



**“Citizen Suit”** means **“A person having an interest that is or may be adversely affected may commence a civil action on his own behalf to compel compliance with the New Mexico Mining.”** Such action may be brought against:

the department of environment, the energy, minerals and natural resources department or the commission alleging a violation of the New Mexico Mining Act or of a rule, regulation, order or permit issued pursuant to that act;... a person who is alleged to be in violation of a rule, regulation, order or permit issued pursuant to the New Mexico Mining Act; or...the department of environment, the energy, minerals and natural resources department or the commission alleging a failure to perform any nondiscretionary act or duty required by the New Mexico Mining Act;” ....(69-39-14)

**Civil Penalties** may be assessed by the director or the commission for violations of the New Mexico Mining Act including a violation of a regulation of the commission, an order of the director, a permit condition and the order resulting from a hearing. Civil penalties assessed by the director or the commission shall be imposed pursuant to regulations adopted by the commission. Any penalty assessed shall not exceed ten thousand dollars (\$10,000) per day of noncompliance for each violation.....(69-39-17)

**Criminal Penalties** - Any person who knowingly or willfully violates the New Mexico Mining Act, regulations adopted by the commission or a condition of a permit issued pursuant to the New Mexico Mining Act ... or fails or refuses to comply with a final decision or order of the commission or the director is guilty of a misdemeanor and is subject to a fine not to exceed ten thousand dollars (\$10,000) per day of violation or imprisonment of up to one year, or both. (69-39-18)

Full text of New Mexico Mining Act available in compilation of New Mexico Statutes at:

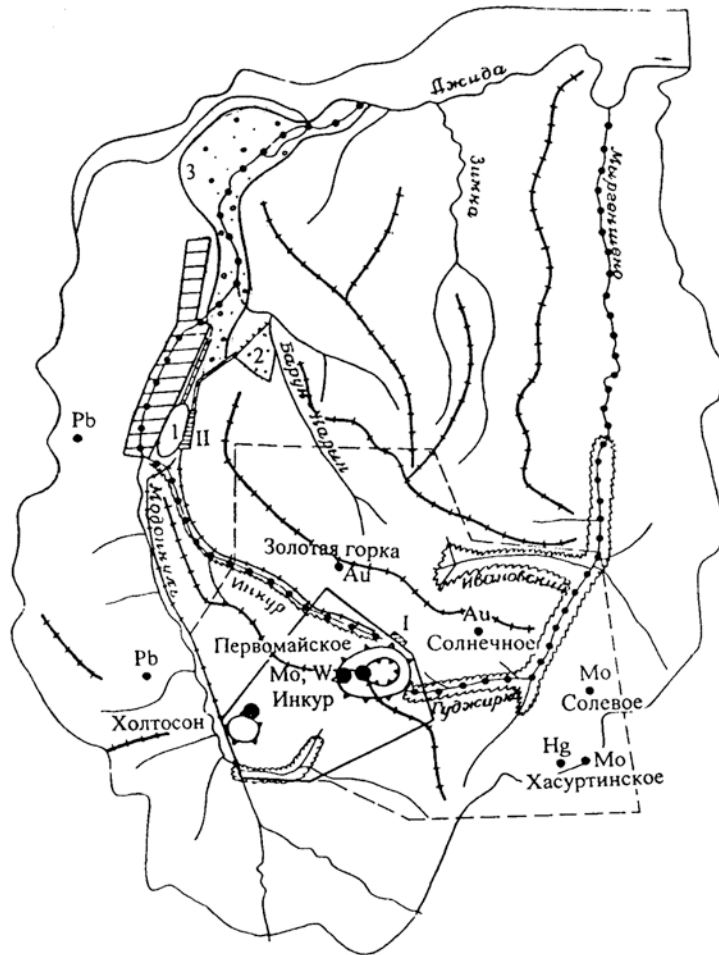
<http://www.conwaygreene.com/nmsu/lpext.dll?f=templates&fn=main-h.htm&2.0>

New Mexico Mining Act Regulations available at:

<http://www.emnrd.state.nm.us/MMD/MARP/MARPRulesandRegulations.htm>

# Examples of Environmental Problems at a Site of Accumulated Damage associated with Mine Operations from Dzhidinski Mining District, Republic of Buryatia

Природно-техногенная система (ПТС)  
Джидинского рудного поля







Problem:  
Surface water flowing over tailings material  
spreading material downstream and into  
groundwater system

2003

2012>





Example of Potential Remedial Action: Lined and armored channel on top of tailings materials to carry stormwater across tailings material to prevent erosion of tailings material during stormwater flow events and wand prevent infiltration of water into tailings. Site: Pecos Lead-Zinc Mine, New Mexico



Construction of permanent diversion channel on top of tailings pile (left side of tailings pile) and temporary diversion channel used on construction of permanent channel (on right side)

Installation of synthetic liner installed on prepared subsurface - “pilotka” - prior to covered with rip-rap to armor channel to prevent erosion. Channel capacity designed to contain 1 in 1250 year flood





Placement of 0.5 m rip-rap carefully placed over synthetic liner to protect permanent diversion channel



Completed permanent diversion channel covered surrounded by tailings covered by 0.5 meter layer of clean soil before revegetation





Problem: Treatment of contaminated mine from flowing from mine portal to remove contaminants from mine drainage in perpetuity

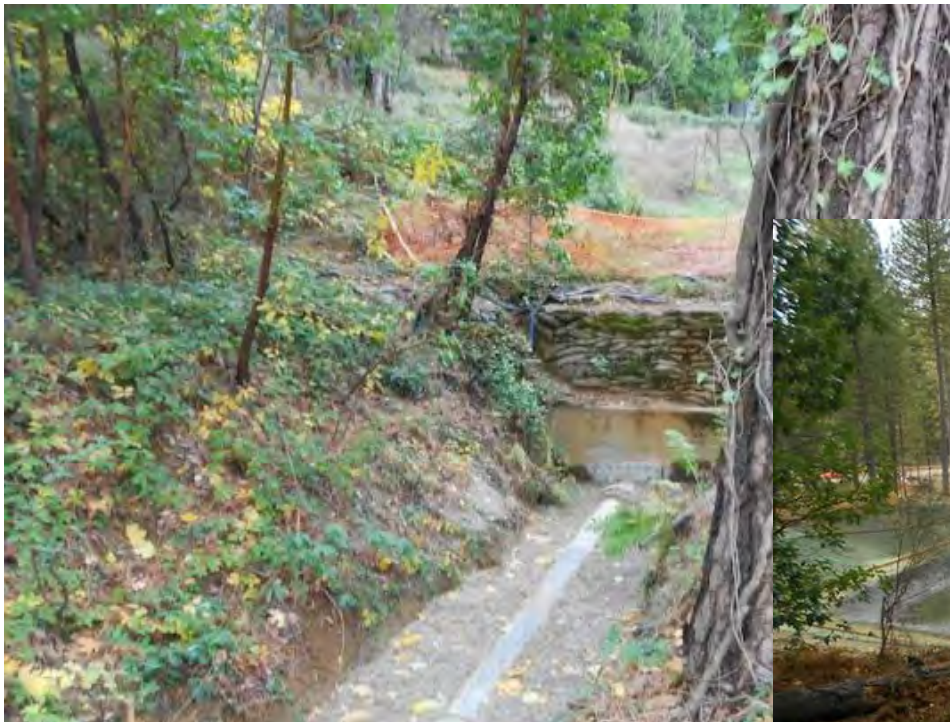




## Potential Remedial Actions:

- 1) Series of lined ponds in cascade (to allow gravity flow) to A) provide sequential treatment for solids removal – settling pond; B) biological and microbial treatment – constructed wetlands with soil and plants (under enclosure to prevent freezing) and C) anoxic limestone filled pond for metals removal or
- 2) sequential treatment including A) settling pond flowing to B) enclosed water treatment technology such as reverse osmosis and/or ion exchange with operation and maintenance to insure optimum system performance.

Example of series of lined ponds in cascade – “Magenta Drain” treatment ponds at Empire Mine State Park, California



Acidic mine water collected at sealed mine adit

Anoxic limestone treatment in finishing pond



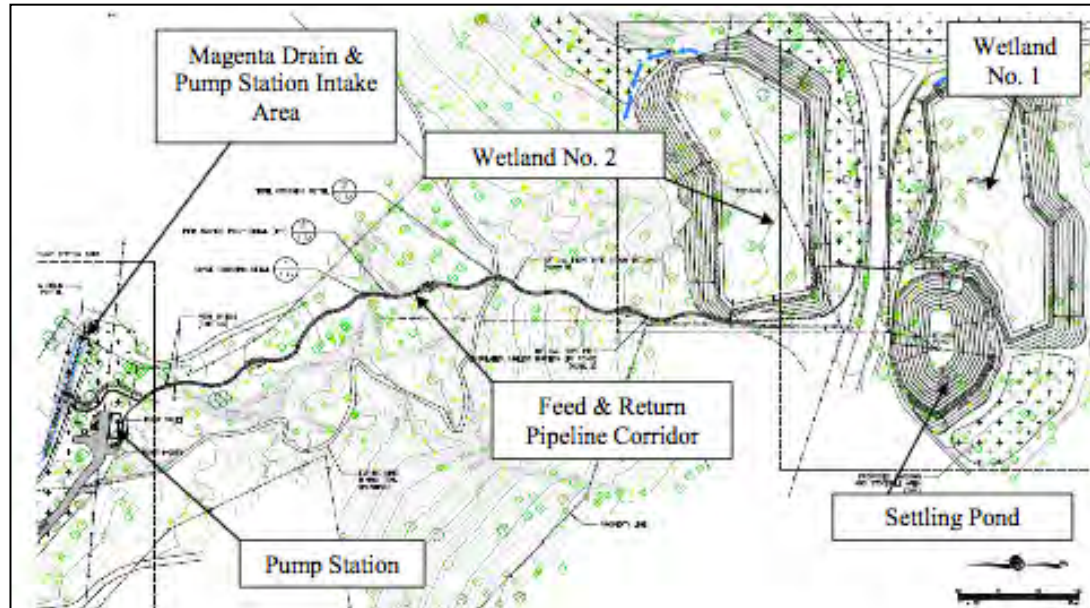
## “Magenta Drain” mine waste treatment at Empire Mine State Park in California – Removal of Arsenic, Iron and Manganese and associated heavy metals from mine Water planned for perpetual treatment

The Empire Mine - [www.empiremine.org](http://www.empiremine.org) - is the site of the oldest, largest, and richest gold (Au) mine in California. From 1850 to its closing in 1956, it produced about 170,000 kg (5.8 million ounces) of Au.... There are about 592 km (367 miles) of underground mine workings. Most of the underground mine workings are flooded, comprising one massive mine pool with an identified underground “spill point” that contributes in maintaining a relatively constant mine pool surface elevation.



The Magenta Drain is a drainage adit that is connected to the mine workings and it discharges net neutral pH mining-influenced water (MIW) with dissolved concentrations of Fe, As, and Mn. Trace amounts of secondary contaminants including Al, Sb, Ba, Cd, Cr, Co, Cu, Pb, Hg, Ni, Th, V, and Zn have also been detected in water samples. Observations suggest that the flow in the Magenta Drain is directly influenced by local rainfall, which infiltrates into the mine pool proper and into mine workings down gradient of the underground spill point, producing a fairly quick flow response to surface water events.





“The goal of this project is to cost-effectively meet some very stringent discharge criteria using passive treatment methods. To the authors’ knowledge, a PTS of similar scope and effluent goals has never been constructed. However, the individual processes of iron hydroxide settling, Arsenic adsorption, manganese oxide adsorption to limestone, and secondary contaminant adsorption to manganese oxide are well documented in the literature. These collective mechanisms were all likely responsible for the success of the wetland bench study in meeting the required effluent standards. It is likely that they will function equally well, if not better, at the design flows anticipated at the Magenta Drain PTS.

The Magenta Drain Passive Treatment System PTS is composed of:

- a water collection structure and pump station
- overland and partially buried conveyance piping
- passive treatment components (settling pond and a multi-celled free water surface wetland) and
- associated infrastructure (vehicle access and utilities)

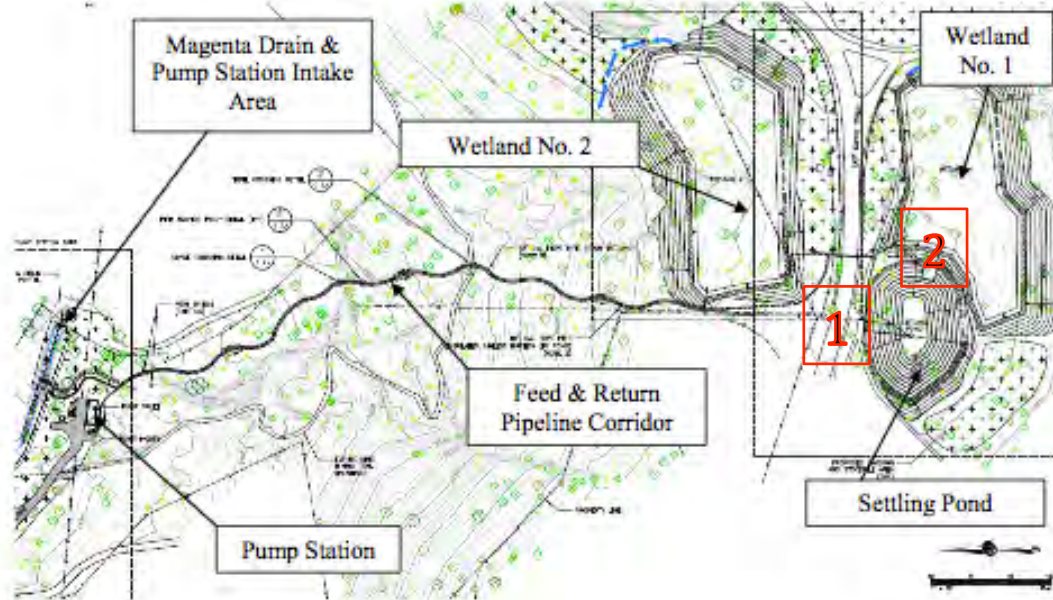
- From “**PROCESS SELECTION & DESIGN OF A PASSIVE TREATMENT SYSTEM FOR THE EMPIRE MINE STATE HISTORIC PARK, CALIFORNIA**”, James Gusek , Lee Josselyn, William Agster, Steve Lofholm, and Daniel Millsap, 2011 National Meeting of the American Society of Mining and Reclamation, Bismarck, ND, June, 2011 – [dmillsaps@parks.ca.gov](mailto:dmillsaps@parks.ca.gov)





1 - Settling Pond

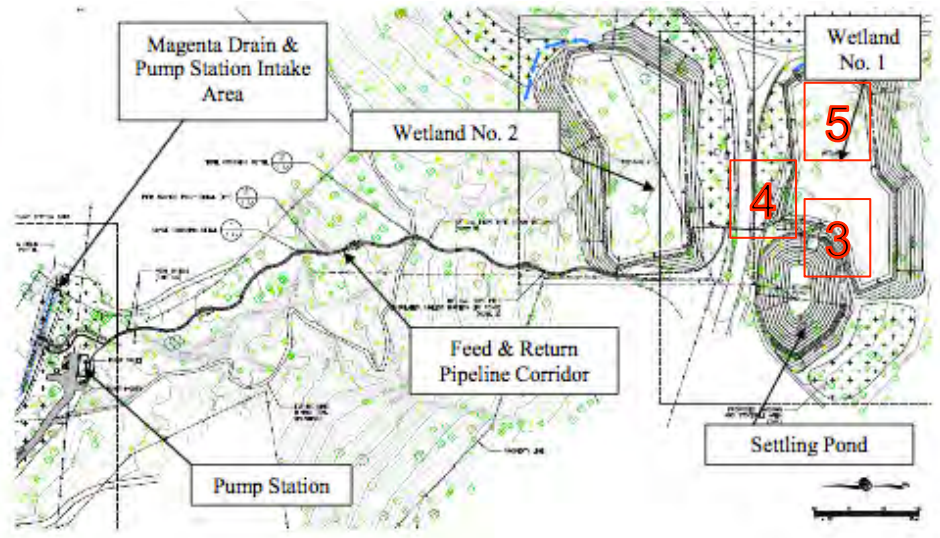
2 - Outfall from Settling Pond to Wetland No.1







3 - Outfall to Wetland No. 1

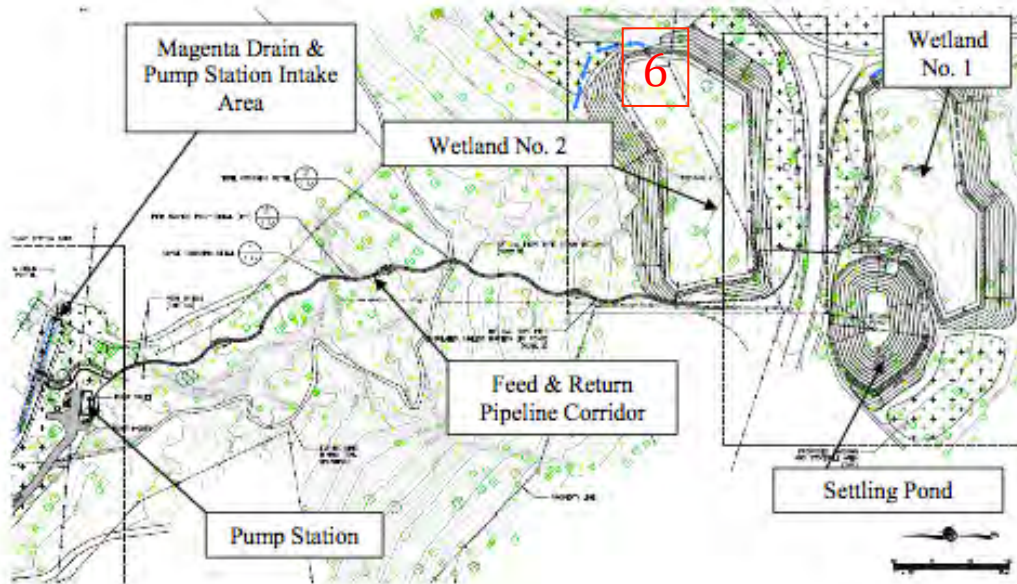


4 - Aquatic plants and drain in Wetland No. 1



5 - Baffles insure long flow path in Wetland No. 1





6 - Wetland No. 2

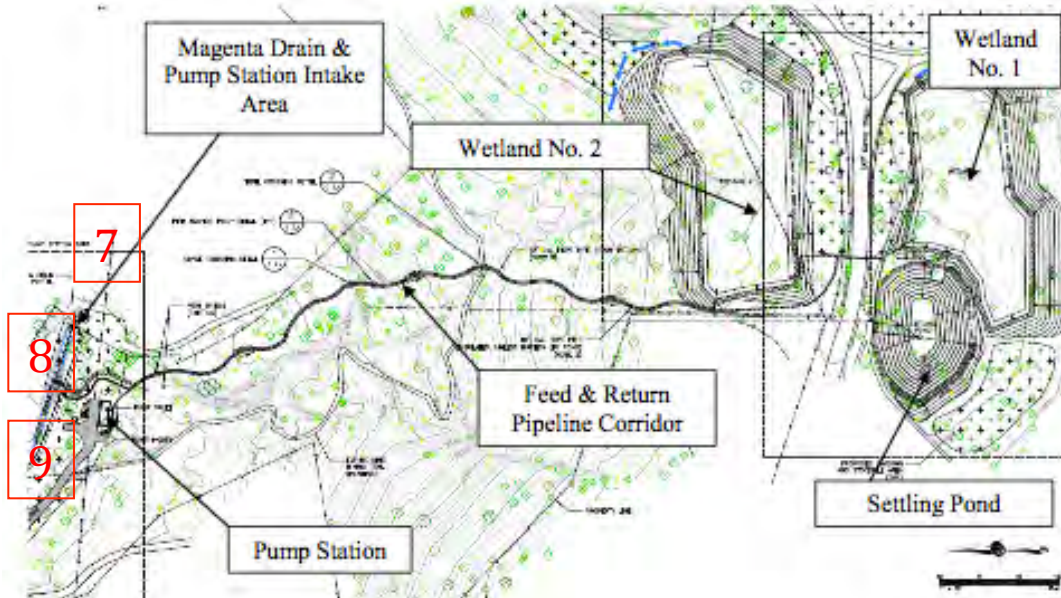




7 - Sealed mine drain where contaminated water is collected and piped to treatment system



8 - Outfall of treated water



9 - Treated water enters stream where contaminated water used to flow

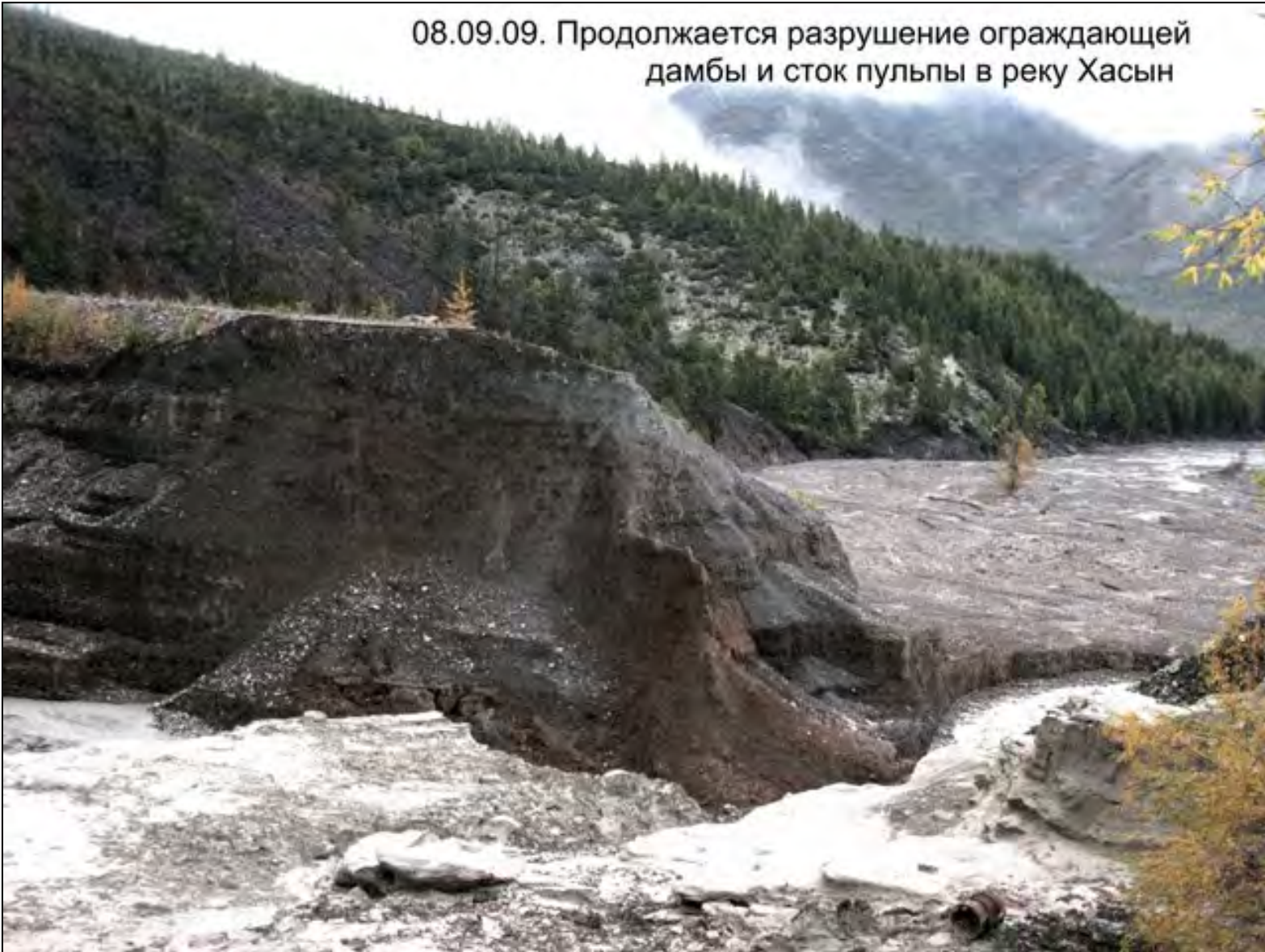


Problem: Tailings liquids against face of dam resulting in potential for ground water seepage through and beyond dam and potential for dam failure by saturation and liquefaction.



Example of tailings dam failure in Russia: Karamken, Magadan Region

08.09.09. Продолжается разрушение ограждающей дамбы и сток пульпы в реку Хасын





Potential Remedial Actions include: 1) Establish and maintain tailings beach to keep liquids from saturating dam; 2) Constructed engineering multi-layer liner with seepage detection systems A) protecting upstream face of dam and B) on prepared and compacted “pillotka” below tailings disposal area to prevent infiltration; 3) constructing (or reconstructing) dam with below ground cutoff trench to prevent subsurface flow below and through dam; 4) constructing (or reconstructing) dam with wide base structural engineered to prevent infiltration; 5) Distribute tailings from multiple discharge points into dam to establish thin layers of tailings to reduce infiltration potential and 6) recycle of liquids from dam to minimize liquids volume to amount needs to prevent wind for carrying fine particles out of dam area.



Samarta Tailings Dam, Buryatia - Example of (1) tailings beach established to keep liquids from saturating dam, (5) use of multiple tailings discharge points to establish thin layers of tailings to reduce infiltration potential and (6) tailings liquid recycle to reduce volume of liquids behind dam.

Thank you for time and attention

